Appendix A
Covered Species Accounts

A.1 Palmate-Bracted Bird's-Beak (Chloropyron palmatum)

A.1.1 Listing Status

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Federal: Endangered.

State: Endangered.

California Native Plant Society (CNPS) California Rare Plant Rank: 1B.1; 1B: Rare, threatened, or endangered in California and elsewhere. 0.1: Seriously endangered in California.

Recovery Plan: Palmate-bracted bird's-beak is included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service [USFWS] 1998).

A.1.2 Species Description and Life History

Palmate-bracted bird's-beak is a winter germinating, highly branched, herbaceous annual plant in the snapdragon family (Scrophulariaceae) that grows from 10 to 30 centimeters (cm) (4 to 12 inches) tall (Calflora 2008; Chuang and Heckard 1973; Hickman 1993). Formerly, it was classified as the morphologically and ecologically distinct subgenus *Hemistegia* of the genus *Cordylanthus* (Chuang and Heckard 1973) but has recently been assigned to a new family and genus as Orobanchaceae: *Chloropyron palmatum* (Tank et al. 2009). All members of *Chloropyron* develop mucilage containing cells in their leaf tissue, are covered with glandular salt-excreting hairs, and grow in saline soils (Chuang and Heckard 1986). Furthermore, all members of the genus are hemiparasitic and can obtain water and nutrients from the roots of other plants (Chuang and Heckard 1971).

Adult plants begin flowering in late May and continue flowering as late as October (L. C. Lee and Associates, and Center for Conservation Biology 2002). While palmate-bracted bird's-beak has a mixed mating system, it requires an insect pollinator to transfer pollen between its male and female reproductive structures in order to set viable seed. The primary pollinators at the Springtown population, near Livermore, Alameda County, are bumblebees (*Bombus vosnesenskii* and *B. californicus*) early in the season and small native bees (*Halictus tripartitus*, *Lasioglossum* [*Dialectus*], and *Lasioglossum* [*Evylaeus*]) later in the season (L. C. Lee and Associates, and Center for Conservation Biology 2002; Saul-Gershenz 2004). No pollinator studies have been conducted for any other populations. Pollinators are critically important for seed set. A study at the Springtown site found that *Lasioglossum* native bee species, which nest in bare soil areas adjacent to palmate-bracted bird's-beak plants, were particularly important, as 96 percent of the bees visiting palmate-bracted bird's-beak from June through July were of this genus (L. C. Lee and Associates, and Center for Conservation Biology 2002; Saul-Gershenz 2004). Those same species of small native bees also utilized nectar and pollen from common spikeweed (L. C. Lee and Associates, and Center for

Conservation Biology 2002). Studies of the important pollinators of crop plants in Yolo County have found that populations of these same species of bees require bare ground and rodent burrows for nest sites and that the intensification of agriculture is eliminating their nesting habitat (Kremen 2001; Kremen et al. 2002a, 2002b; Kremen et al. 2004). Additionally, a shortage of pollinators has been reported in California as a result, at least partly, from the infestation of honeybees with the parasitic mite, *Varroa destructor* (Sousa 2005).

The timing of palmate-bracted bird's-beak seed germination has not been studied, but Fleishman et al. (1994) stated that the seed germinates in January and February. Observations that the seed can float for up to three weeks (Showers 1990) and that individuals are less densely aggregated during years of overland flows than during years of no overland flows (Showers 1988) also suggest that germination occurs during the winter months. Germination of previously buried seed may also be an important factor in the distribution and density of individuals in a population. While no studies have been conducted to determine the germination characteristics of seed under field conditions, seeds can remain viable for at least three years under laboratory conditions (Center for Conservation Biology 1994).

A.1.3 Habitat Requirements and Ecology

This species is restricted to seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 155 meters (500 feet) (USFWS 1998). Small differences in soil topography are critical for seedling establishment, as seedlings establish on banks and sides of raised irrigation ditches and on small berms in areas subject to overland flows (Showers 1988). Extensive soil tests across mound and swale topography at the Springtown population have shown that soil salt concentrations are generally highest in the bottoms of swales and lowest on the tops of mounds (Coats et al. 1988, 1989, 1993). At Springtown, palmate-bracted bird's-beak was found to occur primarily on soils with intermediate salt content along the sides of the swales. The authors concluded that it was generally excluded from the scalds in the swales due to high soil salt content, and it was excluded from the tops of the mounds due to competition from exotic annual grasses (Coats et al. 1988, 1989, 1993). The descriptions of the Woodland population suggest that it also occurs on the sides of small topographic features and that the plants are shaded by dense populations of exotic annual grasses (Foothill Associates 2002; Showers 1988).

The extant population in the Plan Area is located southeast of the City of Woodland in a heavily human-impacted area of what historically was alkaline sink adapted vegetation occurring along both sides of Willow Slough and above the Yolo Basin (U.S. Bureau of Soils 1909a, 1909b; Mann et al. 1911). The hydrology, salts, and clay soils that created and maintained the alkaline sink vegetation were deposited when floodwaters from Putah Creek flowed northward from the area near the city of Davis and emptied into Willow Slough. That flow was supplemented when the combined floodwaters of Putah Creek, Cache Creek, and all of the drainages of the Blue Ridge filled the Cache/Putah Basin, drained eastward through a gap in the Plainfield Ridge, and flowed into the Yolo Basin through Willow Slough (Graymer et al. 2002).

Laguna de Santos Callé, as Willow Slough was previously known, was a unique perennial stream (Eliason 1850; Anonymous 1870) that during the dry season originated from a series of pond-like springs approximately 9 miles southwest of Woodland on the eastern edge of the Plainfield Ridge. As the slough approached the area of Merritt, south of Woodland, it transformed into a 2.5-mile-long, gravel bottomed, linear lake, with an average width of 150 feet and a maximum depth of 75 feet. Approximately 1 mile east of County Road 103, the stream flowing from the lake branched as it dropped over the edge of the alluvial deposits into the Yolo Basin, where it flowed another 2.5 miles northeastward until it emptied into a tule marsh. This perennial stream would have created a very shallow saline water table along Willow Slough that is comparable to the water table along Altamont Creek, which created and maintained the alkaline sink at Springtown. Recent studies show a localized trough in the underlying Tehama formation under this section of Willow Slough and a localized area of shallow groundwater (Wood Rodgers 2004; Lundorff and Scalmanini 2004). Large floods from Cache Creek and Putah Creek have flowed through Willow Slough as recently as 1942, but gravel mining in Cache Creek, dam building on both Cache and Putah Creeks, and the construction of the Willow Slough Bypass have drastically altered the hydrology, salt budgets, and clay deposition patterns in the area of the alkali sink vegetation. Aerial photographs show that all of the alkaline sink vegetation was either converted into rice fields or ditched for drainage, except for a single pool-meadow complex immediately along Willow Slough (U.S. Department of Agriculture [USDA] 1952). That pool has been disked multiple times (Showers 1990, 1996) but the southeastern upper margin of that pool still supports the largest number of plants in the area (Center for Natural Lands Management 2012). Given the intensity and extent of the agricultural impacts to the entire alkali sink area and the irreversible changes in hydrology, the area where palmate-bracted bird's-beak does not currently support alkali sink vegetation, and it would be very difficult to replicate the natural hydrological regimes that would allow that type of vegetation to be successfully restored in the area. However, the historical aerial photographs show that the disked pool-meadow complex did receive extensive amounts of supplemental summer water through ditches draining the upstream rice fields, so it may be possible to restore the appropriate hydrology artificially.

Monitoring studies have documented that populations of palmate-bracted bird's-beak experience significant mortality between early spring and early summer, and then low mortality rates through September (Center for Conservation Biology 1992; Fleishman et al. 1994; Cypher 1998). A positive correlation between high mortality rates and high seedling densities has been demonstrated at some research locations. However, because these data were obtained from field surveys where seedling density was not manipulated, density-independent causes of seedling mortality cannot be ruled out. Alternative explanations for high mortality rates include lack of appropriate hosts, drought stress, and competition with introduced annual grasses. Finally, there are no data describing the soil moisture requirements of palmate-bracted bird's-beak during the period of maximum mortality in spring, but studies have found that plants grow where they have access to adequate levels of soil moisture during the summer rainless period.

According to current data on the species, only perennial plants, such as saltgrass (*Distichlis spicata*), Mojave red sage (*Kochia californica*), and Torrey seepweed (*Suada moquinii*), are assumed to function as appropriate host plants for palmate-bracted bird's-beak (Coats et al. 1988; Cypher 1998; EIP Associates 1998). However, in a greenhouse host-preference experiment, Chuang and Heckard (1971) observed that palmate-bracted bird's-beak was vigorous and produced many flowers when grown with common sunflower (*Helianthus annuus*), which is a summer-flowering annual. This finding suggests that common spikeweed, a summer- and fall-flowering annual plant in the same plant family as common sunflower, and which is closely associated with palmate-bracted bird's-beak in its natural habitat, may be a suitable host. Recent research indicates that alkali heath (*Frankenia salina*) is the most important host plant for this species (Cypher 2015). Because the roots of older perennials become increasingly lignified (woody) and resistant to parasitism, age and spatial distribution of the roots may also contribute to the suitability of a potential host plant for palmate-bracted bird's-beak parasitism (see Marvier and Smith 1997).

A.1.4 Species Distribution and Population Trends

A.1.4.1 Distribution

Palmate-bracted bird's-beak is endemic to the west side of the Sacramento Valley, the north side of the Sacramento National Wildlife Refuge (NWR) Complex, the San Joaquin Valley, and the Springtown area of the Livermore Valley. This species is currently known to exist at six locations outside of the Plan Area: Delevan NWR, Sacramento NWR (established from seed collected at the Delevan NWR), Colusa NWR, the Springtown area, western Madera County, and the combined Alkali Sink Ecological Reserve and Mendota Wildlife Management Area (USFWS 1998).

Very little information exists concerning the historical distribution of palmate-bracted bird's-beak in the Plan Area prior to extensive habitat conversion. The documented locations in the Plan Area consist of an extirpated population that was located northeast of the city of Woodland near the Cache Creek Settling Basin and an extant population located southeast of Woodland (California Natural Diversity Database [CNDDB] 2012; Center for Natural Lands Management 2012; Crampton 1979; Dean 2009). Within the last 25 years, the species has been observed in areas adjacent to the Woodland population in an alkali playa/meadow (Crampton 1979) and on Pescadero silty clay, saline-alkali, and Willows clay soil types (Showers 1988, 1996; EIP Associates 1998; Foothill Associates 2002).

Individuals in the existing Woodland population are generally found on small topographic features such as old irrigation checks, banks of shallow ditches, along the shoreline of a pond, and along the upper margin of a vernal pool. The entire population is limited to Pescadero silty clay, saline-alkali, and Willows clay soil types (Andrews 1970; Showers 1988, 1996; EIP Associates 1998).

A.1.4.2 Population Trends

Little is known about regional population trends of palmate-bracted bird's-beak. The conversion of land to farming and development is resulting in declines because of the destruction of extensive areas of potential habitat in the Sacramento and San Joaquin Valleys (USFWS 1998). However, populations are known to fluctuate. For instance, populations of palmate-bracted bird's-beak in the central San Joaquin Valley, in areas such as Mendota, have fluctuated between 0 and 800 flowering individuals from 1987 to 1993 (Fleishman et al. 2001).

The Colusa, Delevan, and Springtown populations appear to be robust with large populations of between 10,000 and 100,000 flowering individuals in 1991 and 1992, while the Mendota population is small and has fluctuated between 0 and 800 flowering individuals from 1987 to 1993 (Fleishman et al. 2001). Between 1983 and 1990, the Woodland population was restricted to a single property that is known as the City of Woodland Preserve. The size of this population ranged from 200 to 1,400 flowering individuals (EIP Associates 1990). In 1996 and 1998, special-status species surveys of the area discovered additional individuals on the adjoining Woodland Regional Park, Brauner, and Maupin properties (Showers 1996; EIP Associates 1998, Center for Natural Lands Management 2012, Dean 2009).

A.1.5 Threats to the Species

Natural threats to palmate-bracted bird's-beak populations include potential lack of appropriate hosts and pollinators, and competition with introduced annual grasses such as annual ryegrass (Dawson et al. 2007). A number of specific threats to the species were identified in the 1998 recovery plan but only urban expansion, altered hydrology, and limited genetic variation were identified as threats to the Woodland population (USFWS 1998). More recently, the Woodland site has been extensively invaded by annual ryegrass, which poses a severe threat to the species at this site (M. Showers pers. comm.)

Finally, as previously mentioned, studies of the important pollinators of crop plants in Yolo County have found that intensification of agriculture is eliminating the nesting habitat of native bees, upon which the palmate-bracted bird's-beak depends for pollination (Kremen et al. 2001, 2002a, 2002b, 2004). Additionally, a shortage of pollinators has been reported in California as a result, at least partly, from the infestation of honeybees with the parasitic mite, *Varroa destructor* (Sousa 2005).

A.1.6 Species Habitat Model and Location Data

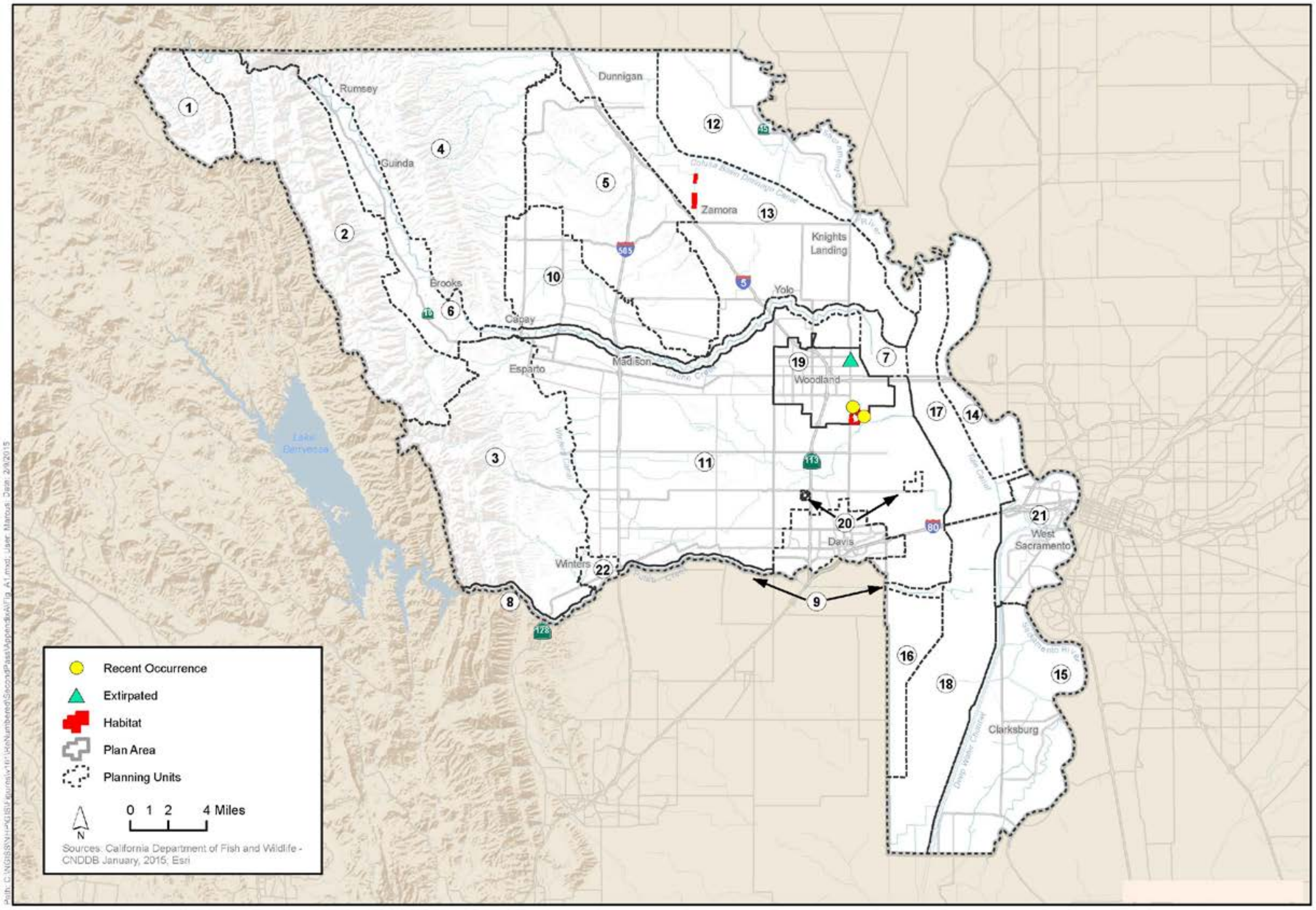
A.1.6.1 Geographic Information System (GIS) Map Data Sources

The palmate-bracted bird's-beak habitat is map based and uses the Yolo NHP vegetation dataset, which is based on a heads-up GIS digitization of the alkali sink habitat in the NHP Plan Area (Figure A-4). A habitat map of the distribution of palmate-bracted bird's-beak habitat in the Plan Area was then created. The habitat type was based on the species requirements as described in Section A.4.3, *Habitat Requirements and Ecology* above and the assumptions described below. Occurrences were mapped as the point at the center of any California Natural Diversity Database (CNDDB) polygons that fall within the Plan Area.

Mapped palmate-bracted bird's-beak habitat is comprised of the following vegetation type.

- **Alkali Sink:** This habitat was mapped based on current and historical soils maps, aerial imagery from 1933 and 1952, and current Google Earth imagery to determine existing land use. Additional habitat was mapped in Planning Unit 13 using polygons supplied by the California Department of Fish and Wildlife (DFW).
- **Assumptions.** Historical and current records of this species in the Plan Area indicate that it was present in the alkaline soil area between Willow Slough and Cache Creek, but that its known current distribution is limited to the mapped alkali sink habitat with some individuals present on adjacent severely disturbed sites.

Figure A-1. Palmate-Bracted Bird's Beak Modeled Habitat and Occurrences



A.2 Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

A.2.1 Listing Status

Federal: Threatened.

State: None.

Recovery Plan: None.

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A.2.2 Species Description and Life History

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is an atypical lepturine; the Lepturinae is a subfamily of the Cerambycidae (longhorn beetle family). Elderberry beetles are separated from all other lepturines by the form of the mandibles, which are broad and short, without internal pubescence (Linsley and Chemsak 1972). Originally described by Horn (1881), valley elderberry longhorn beetle is black in color, with red to orange margins on the elytra (wing covers), which fades to yellow after death. The pronotum (plate behind the head) is smooth, with confluent punctuations. The elytra are densely punctate or rugose. Adult beetles range from 14 to 25 millimeters (mm) (0.55 to 0.98 inch) in length (Linsley and Chemsak 1972).

The valley elderberry longhorn beetle was described as a separate species by Fisher (1921) and was reduced to subspecific status by Doane et al.(1936). The majority of male valley elderberry longhorn beetles can be separated from other subspecies by the short, suberect, pale setae (bristle or hair-like structures) on the antennae (as opposed to dark setae) and the black markings on each forewing (Linsley and Chemsak 1972). The female valley elderberry longhorn beetle cannot be separated morphologically from other subspecies.

Female valley elderberry longhorn beetles lay between eight and 20 eggs in bark crevices on the host plant and produce only one generation per year (Burke 1921; Barr 1991). The host plant is the elderberry (*Sambucus mexicana*, *S. caerulea, S. racemosa, S. glauca*) (Burke 1921; Linsley and Chemsak 1972, 1997; Barr 1991). The eggs, which are white initially then darken to a reddish brown, are 3.5 to 1.25 mm (0.14 to 0.05 inch) in diameter; oblong with a small knob at each end; and have wavy, longitudinal ridges (Burke 1921; Barr 1991). The egg is attached to the shrub by a thin secretion, and the larva encloses within 30 to 40 days (Burke 1921).

The newly emerged larvae bore into the wood of the host plant (Linsley and Chemsak 1972; Barr 1991). Burke (1921) and Eya (1976) reported that the larvae take two years to mature; however, Halstead (1991) believes that one year is the norm. The larva typically bores into the central pith of stems and feeds there; however, on large trunks, the larvae feed on the wood (Burke 1921). The larvae create an elongated, longitudinal gallery through the heart of the stems, filling it with debris and shredded wood (Barr 1991). When the larva is ready to pupate, it chews a circular to slightly oval exit hole (7 to 10 mm [0.28 to 0.39 inch] in diameter) to the outside, which it plugs with frass.

Then the larva backs up into the gallery and constructs a pupal chamber out of shredded wood and frass (Barr 1991). Jones & Stokes (1985, 1986, 1987a, 1987b) and Halstead (1991) reported that 70 percent of exit holes are within 1.2 meters (3.9 feet) of the ground in stems greater than 13 mm (0.51 inch) in diameter; however, holes may be as high as 3 meters (10 feet) above the ground (Barr 1991). Pupae can be found between January and April, and the pupal stage lasts about one month (Burke 1921).

After pupation, the adult remains in the pupal cell for several weeks prior to emergence (Burke 1921). The adult eventually emerges from the pupal chamber through the exit hole (Barr 1991). The adults readily fly from shrub to shrub. Valley elderberry longhorn beetle is most often seen on, in, or immediately under the host plant's flowers. However, copulation occurs on the lower parts of the stems (Barr 1991). The adults feed on the leaves (Linsley and Chemsak 1972; Barr 1991; Talley et al. 2006) and are active from March to early June.

A.2.3 Habitat Requirements and Ecology

The valley elderberry longhorn beetle is completely dependent on its host plant, the elderberry (Linsley and Chemsak 1972, 1997; Eng 1984; Barr 1991; Collinge et al. 2001). This shrub is a component of riparian forests throughout the Central Valley. Although this shrub occasionally occurs outside riparian areas, shrubs supporting the greatest beetle densities are located in areas where the shrubs are abundant and interspersed among dense riparian forest, including Fremont cottonwood (*Populus fremontii*), box elder (*Acer negundo*), California sycamore (*Platanus racemosa*), California walnut (*Juglans californica*), white alder (*Alnus rhombifolia*), willow (*Salix* spp.), button willow (*Cephalanthus occidentalis*), Oregon ash (*Fraxinus latifolia*), wild grape (*Vitis californica*), California hibiscus (*Hibiscus californica*), and poison oak (*Toxicodendron diversilobum*) (Barr 1991; USFWS 1999; Collinge et al. 2001). There is also a strong association between blue elderberries and valley oaks which historically extended beyond riparian zones. Isolated elderberry shrubs separated from contiguous habitat by extensive development are not typically considered to provide viable habitat for valley elderberry longhorn beetle (USFWS 1998; Collinge et al. 2001).

Elderberry savannah was a habitat type that was previously more extensive in the California Central Valley but now is limited to the confluence area of the American River, which is outside the Plan Area (Jones & Stokes 1985, 1986, 1987a, 1987b; Barr 1991; USFWS 1984, 1999), and the valley elderberry longhorn beetle was probably a component of this habitat. Therefore, potential valley elderberry longhorn beetle habitat is defined as stands of elderberry shrubs that are adjacent to, or contiguous with, riparian forest, floodplains, or relict elderberry savannah.

There are no known diseases that are considered a source of mortality for valley elderberry longhorn beetle. Numerous species of Cleridae (checkered beetles), Cucujidae (flat bark beetles), Ostomatidae (bark-gnawing beetles), Elateridae (click beetles), Asilidae (robber flies), Phymatidae (ambush bugs), Reduviidae (assassin bugs), and some Thysanoptera (thrips) are known predators of Cerambycid beetles (Linsley 1961). All are common in the Central Valley, but none have been reported feeding on valley elderberry longhorn beetle.

Birds that hunt insect larvae in wood, such as woodpeckers, creepers, and nuthatches, may also predate upon valley elderberry longhorn beetle but no observations of this have been reported. Due to the valley elderberry longhorn beetle's warning colors, birds may not take adult beetles. Whether these warning colors are genuine or represent Batesian mimicry is unknown.

A.2.4 Species Distribution and Population Trends

A.2.4.1 Distribution

Desmocerus californicus is one of three species of *Desmocerus* in North America. Valley elderberry longhorn beetle is one of two subspecies of *D. californicus*. One subspecies is widespread in coastal California, ranging from Mendocino County southward to western Riverside and northern San Diego Counties, and into the southern Sierra Nevada range (Kern and Tulare Counties).

The valley elderberry longhorn beetle subspecies is a narrowly defined, endemic taxon, limited to portions of the Central Valley (USFWS 1999; USFWS 2006). Studies to assess the distribution and extent of the valley subspecies began in the late 1970s (Eya 1976), and the USFWS proposed the species for listing in 1978. Since valley elderberry longhorn beetle was listed in 1980 (45 FR 52803), numerous distributional studies have been conducted (summarized in Talley et al*.* 2006). This subspecies is endemic to California, occurring below 900 meters (2,953 feet) elevation (USFWS 1999).

In the Central Valley of California, valley elderberry longhorn beetle was first collected from "Sacramento, CA," the precise location unknown (Fisher 1921). Additional material was identified from Putah Creek in Solano and Yolo Counties and from along the Lower American River in Sacramento County (Linsley and Chemsak 1972). Linsley and Chemsak (1972) also reported a single female from the Merced River; however, since the females cannot be separated to subspecific level, the identification is unverified.

Subsequent to various surveys throughout the California Central Valley, the USFWS (1999) prepared a map of the presumed range of valley elderberry longhorn beetle. This map encompasses the entire California Central Valley and the Sacramento River Delta below 900 meters (2,953 feet) elevation.

In Yolo County, numerous records of occupied and potential valley elderberry longhorn beetle habitat occur throughout the Sacramento River corridor (Eya 1976; Jones & Stokes 1985, 1986, 1987a, 1987b; USFWS 1984; Barr 1991; Collinge et al. 2001; California Natural Diversity Database [CNDDB] 2000), as well as along Putah Creek from Monticello Dam east to Davis (Eya 1976; USFWS 1984; Barr 1991; Collinge et al. 2001; CNDDB 2005) and along Cache Creek (Barr 1991; CNDDB 2005). However, because comprehensive surveys for valley elderberry longhorn beetle in Yolo County have not been conducted and because known occurrences throughout the species' range are based mostly on incidental observations (e.g., CNDDB), the population size and locations of this species in the Yolo Natural Community Conservation Plan (NCCP) study area are not fully known. Few surveys focused on valley elderberry longhorn beetle have been conducted within and adjacent to Yolo County, and the total extent of potential habitat is unknown. Within and adjacent to Yolo County exist several preserves, parks, and mitigation banks that support valley elderberry longhorn beetle occurrences, including the Lake Solano Park and the American River Parkway.

A.2.4.2 Population Trends

Habitat occupied by valley elderberry longhorn beetle tends to form and exist in riparian corridors and on the level, open ground of periodically flooded river and stream terraces and floodplains. This geomorphic setting historically has been desirable for agricultural, urban, or industrial development. As a result, much of this habitat type has been converted through dams and levees for use as developable land. Although it has been estimated that 90 percent of California riparian habitat has been lost over the last century and a half (Smith 1980; Barr 1991; Naiman et al. 1993; Naiman and Décamps 1997), these losses are difficult to accurately quantify in terms of direct valley elderberry longhorn beetle habitat losses (Talley et al. 2006). Therefore, an unknown amount of riparian forest and elderberry savannah habitat has been lost and an unknown number of valley elderberry longhorn beetle populations as well (Collinge et al. 2001). Due to current pressures from increasing human populations in California, more valley elderberry longhorn beetle habitat is being encroached on and affected throughout the species' range.

A.2.5 Threats to the Species

The greatest historical threat to valley elderberry longhorn beetle has been the elimination, loss, or modification of its habitat by urban, agricultural, or industrial development and other activities that reduce or eliminate its host plants (Talley et al. 2006). While mitigation and restoration actions do not come close to restoring the enormous amount of habitat lost in the more remote past they appear to be adequate for current levels of impact (Talley et al. 2006). However, Talley et al. (2006) observed that the quality and persistence of mitigation and restoration efforts are uncertain and that there have been declines in the total number of valley elderberry longhorn beetle–occupied sites and in the number of riparian sites. Talley et al. (2006) also noted that the information included in reports is often unusable, making assessments of mitigation and restoration success difficult.

The greatest current threat to valley elderberry longhorn beetle is from the invasive nonnative Argentine ant (*Linepithema humile*) and European earwig (*Forficula auricularia*) (Talley et al. 2006). The nonnative invasive Argentine ant has been observed attacking and killing valley elderberry longhorn beetle larvae. The ants enter the exit hole that the beetle makes prior to pupation and remove the larva (Huxel 2000; Huxel et al. 2003). Given that the invasion of riparian systems by Argentine ant in the Central Valley is continuing to spread, it is unclear how the invasion will impact valley elderberry longhorn beetle, but it appears that the Argentine ant may have caused the disappearance of some populations (Talley et al. 2006). Field bait and trapping experiments have determined that Argentine ant has been introduced widely through mitigation plantings and irrigation (Klasson et al. 2005). Irrigation plays a major role in Argentine ant's rate and distance of dispersal in other ecosystems (Menke and Holway 2006). Those data also suggest that there may be a threshold of Argentine ant density above which valley elderberry longhorn beetle is extirpated from a site (Klasson et al. 2005). If confirmed, this would be a serious threat to valley elderberry longhorn beetle's recovery because once valley elderberry longhorn beetle is extirpated from a site, recolonization is unlikely (Talley et al. 2006). The nonnative invasive European earwig is also considered to be a threat to valley elderberry longhorn beetle through direct predation or by supporting higher populations of predators of insects (Talley et al. 2006), and earwig populations are also significantly larger in mitigation plantings and irrigated areas (Klasson et al. 2005).

Nonnative invasive plant species such as black locust (*Robinia pseudoacacia*), giant reed (*Arundo donax*), red sesbania (*Sesbania punicea*), Himalaya blackberry (*Rubus armeniacus*), tree of heaven (*Ailanthus altissima*), Spanish broom (*Spartium junceum*), Russian olive (*Eleagnus angustifolia*), edible fig (*Ficus carica*), and Chinese tallowtree (*Sapium sebiferum*), may have significant indirect impacts on valley elderberry longhorn beetle by impacting elderberry shrub vigor and recruitment (Talley et al. 2006). It is also predicted that ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum*), *Lolium multiflorum*, and yellow starthistle (*Centaurea solstitialis*) may increase seedling mortality through competition for light and water or through increased fire return intervals (Talley et al. 2006).

The taxonomic status of valley elderberry longhorn beetle was questioned by Halstead (1991) and Halstead and Oldham (2000). However, in a reanalysis of that data in support of the five-year status review, Talley et al. (2006) found that it supported a distinct biomodal distribution separation between California elderberry longhorn beetle and valley elderberry longhorn beetle. That analysis also found that there appeared to be some interbreeding where there is contact between the two subspecies, and molecular genetic study would be required to completely describe their distributions (Talley et al. 2006).

Long-term data regarding site persistence, population size and dynamics, extirpation, and recolonization are also lacking, as are estimates regarding the minimum self-sustaining population size, riparian forest corridor size, or habitat complex size for valley elderberry longhorn beetle or other riparian forest organisms.

A.2.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.14.3, *Habitat Requirements and Ecology* (Figure A-14).

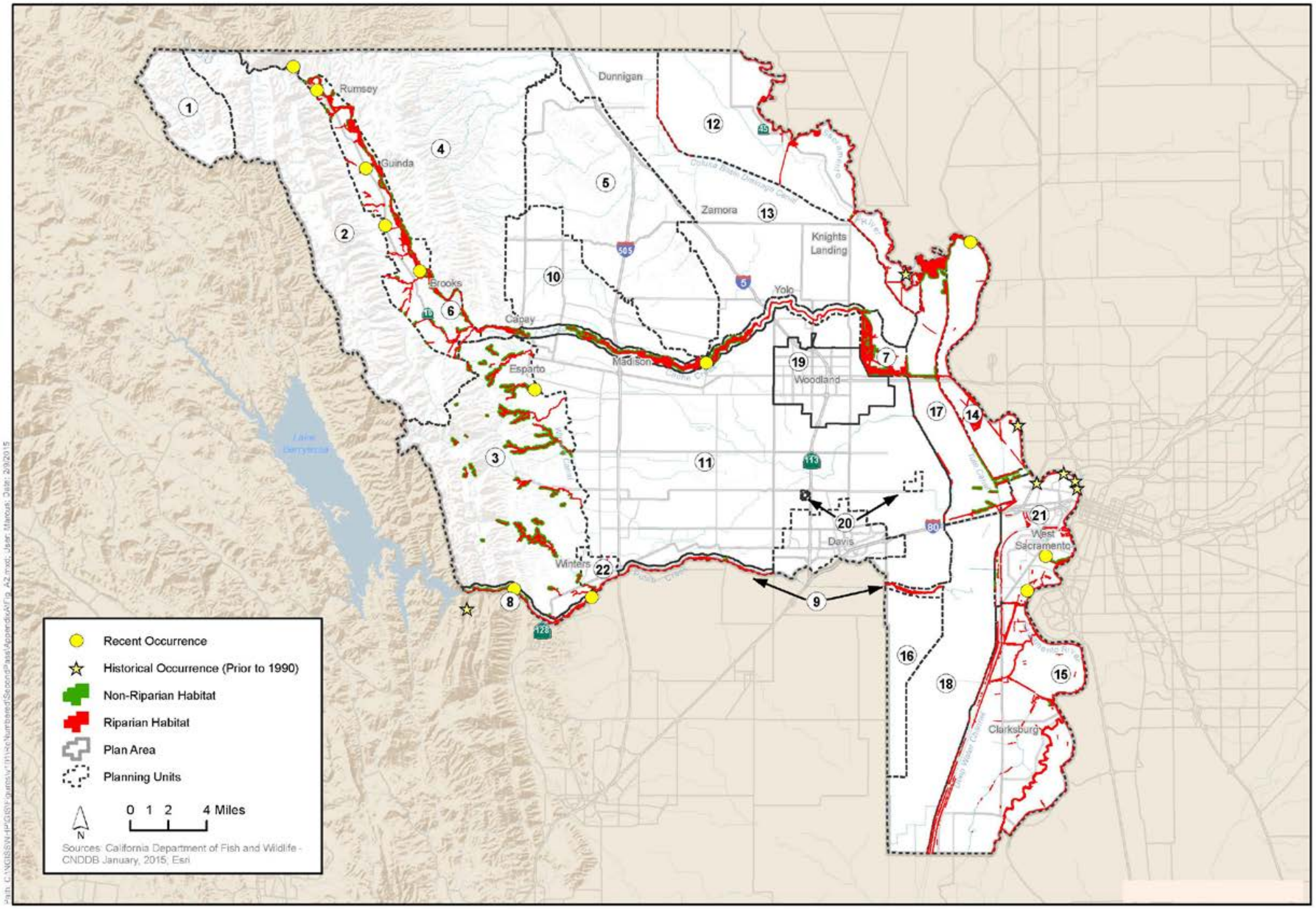
The model parameters include the following:

- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: This is the location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., CNDDB, University of California, Davis).
- Riparian Habitat: This habitat includes all potentially suitable riparian habitat where elderberry shrubs (the species host plant) are most likely to occur. This habitat was modeled by selecting all mapped Valley Foothill Riparian vegetation types.
- Nonriparian Habitat: This habitat includes all potentially suitable areas adjacent to the riparian zone that are likely to also include elderberry shrubs. This habitat was modeled by creating a buffer zone of 250 feet from modeled riparian habitat and selecting the vegetation types listed below.
- Limited modeling to the following Planning Units: 3, 6, 7, 8, 9, 12, 14, 15, 17, 20, 21, 22

A.2.6.1 Nonriparian Habitat–Vegetation Types

- All Annual Grassland
- All Barren
- Carex spp. – *Juncus* spp. – Wet Meadow Grasses Not Formally Defined (NFD) Super Alliance
- *Crypsis* spp. – Wetland Grasses – Wetland Forbs NFD Super Alliance

Figure A-2. Valley Elderberry Longhorn Beetle Modeled Habitat and Occurrences



A.3 California Tiger Salamander (*Ambystoma californiense*)

A.3.1 Listing Status

© William Flaxington

Federal: Threatened range-wide (69 *Federal Register* [FR] 47212); Endangered Sonoma County (65 FR 57242); Endangered Santa Barbara County (68 FR 13498); critical habitat designated (70 FR 49380).

State: Candidate Endangered; Species of Special Concern.

Critical Habitat: Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for California Tiger Salamander; Central Population: Final Rule (70 FR 49380–49458).

The Dunnigan Creek Unit (Central Valley Region Unit 1) of designated critical habitat, comprising 1,105 hectares (2,730 acres), located just west of Interstate 5 and the town of Dunnigan in north-central Yolo County, is the only unit within the Plan Area. Critical habitat has also been designated in Santa Barbara County (69 FR 68568) and within 20 counties in central California, including Yolo County (70 FR 49380).

Recovery Plan: Under development.

A.3.2 Species Description and Life History

The California tiger salamander (*Ambystoma californiense*) is an amphibian in the family Ambystomatidae. These terrestrial salamanders are large and thickset, with a wide, rounded snout (69 FR 47212). Adults range in size from 7.5 to 12.5 centimeters (cm) (2.95 to 4.92 inches) snout-to-vent length (SVL) (Jennings and Hayes 1994). Average SVL for both adult males and females is approximately 9 cm (3.58 inches), although the average total length for males and females is 20.3 and 17.3 cm (7.99 and 6.81 inches), respectively (69 FR 47212). Dorsal (back) coloration consists of a black background on the back and sides, interspersed with white or pale yellow spots or bars (69 FR 47212). Ventral (belly) coloration ranges from almost uniform white or pale yellow to a variegated pattern of white, pale yellow, and black (Jennings and Hayes 1994). The salamander's small eyes have black irises and protrude from their heads (Jennings and Hayes 1994). During the breeding season, the cloacal region of males becomes enlarged (Petranka 1998) and is a useful means of distinguishing sexes. The cloaca is a body cavity that receives the collective discharges from the intestinal, urinary, and reproductive canals. Males also have larger tails with more developed fins.

The California tiger salamander is restricted to grasslands, oak savannah, and coastal scrub communities of lowlands and foothill regions where aquatic sites are available for breeding. California tiger salamanders are typically found at elevations below 460 meters (1,509 feet) (68 FR 13498), although the known elevational range extends up to 1,053 meters (3,458 feet) (Jennings and Hayes 1994). Breeding sites generally consist of natural ephemeral pools (Barry and Shaffer

1994) or artificial ponds that mimic them (e.g., stock ponds that are allowed to dry). Bobzien and DiDonato (2007) report that in the East Bay Regional Park District (Contra Costa and Alameda Counties) California tiger salamanders breed almost exclusively in seasonal and perennial stock ponds. Breeding sites may also include perennial features with open water refugia that do not support populations of bullfrog (*Rana catesbeiana*) or predatory fishes (Holomuzki 1986; Fitzpatrick and Shaffer 2004). Pools characterized by deep water may also support larvae through metamorphosis in relatively dry years (Trenham et al. 2000), whereas shallow pools may not (Semlitsch et al. 1996). Populations associated with shallow, natural vernal pools may be more dependent on suitable hydroperiod (Trenham et al. 2000). As illustrated by the 114-year-old reservoir at Lagunita (Stanford University, Santa Clara County), constructed ponds may also serve as habitat for California tiger salamander as long as they are drained annually, thus preventing exotic fish and amphibian predators (i.e., bullfrogs) from establishing (Barry and Shaffer 1994). Barry and Shaffer (1994) attribute the persistence of the salamander population at Lagunita to (1) large size of both aquatic and terrestrial habitats, and (2) the continuous filling and draining of the reservoir every year, which provides larvae a head start over fish predators each year.

Larvae require a minimum of approximately 10 weeks to complete metamorphic transformation (P. Anderson 1968; Feaver 1971), significantly longer than other amphibians such as the Pacific tree frog (*Pseudacris regilla*) and western spadefoot (*Spea hammondii*). Hydroperiod, or the timing and duration of waters in potential breeding sites, can be critical for reproductive success. Shaffer et al. (2008) indicate that California tiger salamanders can breed successfully in stock ponds, and in natural or constructed vernal pools remaining wet until mid-May. Larvae in coastal regions may not metamorphose until late July, and pools holding water into June, July, or later generally have higher success (Barry and Shaffer 1994). Larvae have been documented overwintering in perennial ponds in the higher elevations of the Ohlone Regional Wilderness in Alameda County (Bobzein and DiDonato 2007). Compared to the western toad (*Bufo boreas*) or western spadefoot, California tiger salamanders are poor burrowers and require subterranean refuges constructed by ground squirrels and other burrowing mammals (Jennings and Hayes 1994). Salamanders spend the dry season, which comprises most of a year, within these burrows (69 FR 47212). Although California tiger salamanders are often considered to be in a state of dormancy, called aestivation, during the period in which in they occupy these burrows, evidence suggests that salamanders may remain active while within their burrows (S. Sweet in litt. in 69 FR 47212).

Males usually migrate to the breeding ponds before females (Twitty 1941; Shaffer et al. 1993, Loredo and Van Vuren 1996; Trenham 1998b) and remain in the ponds for an average of six to eight weeks, while females stay for approximately one to two weeks (USFWS 2004b). Salamanders typically return to the same pond to breed in subsequent breeding seasons (Trenham 1998b). However, interpond dispersal does occur and is dependent on the distance between ponds and the quality of intervening upland habitat (Trenham 1998a). It appears that breeding takes place in pulses, with time between breeding events and the proportion of breeding adults per event associated with rainfall patterns and wetland inundation (J. Alvarez pers. comm.; S. Bobzein pers. comm.; D. Cook pers. comm.; M. Ryan pers. comm.). In Sonoma County there is a main breeding event in mid-December, which corresponds to the first large winter rain event that is sufficient to fill vernal pools, followed by one to two smaller breeding events after the next rainfalls (D. Cook pers. comm.). In drought years, insufficient water in the breeding pools may prevent breeding (Barry and Shaffer 1994). Trenham et al. (2000) found that within a population in Monterey County, female California tiger salamanders skipped breeding opportunities at a higher rate than males in years with later rainfall, a bias attributed to the date of pond filling, but not to total annual rainfall. Barry and Shaffer (1994) suggest that while local California tiger salamander populations may not breed during drought years when ephemeral pools do not fill, the longevity of adults is probably sufficient to ensure population persistence through all but the longest of droughts.

After mating, females lay their eggs in the water of the breeding habitat (Twitty 1941; Shaffer et al. 1993; Petranka 1998). Females usually attach their eggs to twigs, grass stems, vegetation, or debris (Storer 1925; Twitty 1941; Jennings and Hayes 1994). After breeding, adults leave the pool and return to the upland habitat, taking shelter during the day in small mammal burrows and emerging at night to feed during the breeding season (Shaffer et al. 1993; Loredo et al. 1996; Trenham 1998a). In two to four weeks, eggs hatch into aquatic larvae (Petranka 1998). Larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks and then begin consuming larger prey such as small tadpoles (J. Anderson 1968). The larval stage usually lasts three to six months (Petranka 1998), but individuals may remain in their breeding sites over the summer if breeding pools remain inundated (Shaffer and Trenham 2005). The longer the inundation period, the larger the larvae and metamorphosed juveniles are able to grow, and the more likely they are to survive and reproduce (Semlitsch et al. 1988; Pechmann et al. 1989; Morey 1998; Trenham 1998b).

Lifetime reproductive success for California tiger salamanders is generally low, with many individuals breeding only once in their lifetime (Trenham 1998b; Trenham et al. 2000). Over the lifetime of a female, only a small number of metamorphic offspring are produced; and only a small percentage of a cohort survive to become breeding adults (Trenham 1998b; Trenham et al. 2000). Trenham et al. (2000) found that reproduction at Hastings Reserve in Monterey County was lower than replacement in all of six years studied. According to this study, the average female California tiger salamander breeds 1.4 times over a lifetime, producing 8.5 young surviving to metamorphosis per event and 12 lifetime metamorphic offspring per female (Trenham et al. 2000). To achieve 1:1 replacement by this reasoning would require 18.2 percent survival from metamorphosis to breeding; survival at Hastings during this time was only 5 percent, leading the authors to suggest that isolated breeding ponds may be insufficient for maintaining viable populations over the long term.

Juvenile California tiger salamanders have been observed to disperse up to 2.59 kilometers (km) (1.6 mile) from breeding pools to upland areas (Austin and Shaffer 1992). Adults have been observed up to 2 km (1.3 miles) from breeding ponds. Trenham et al. (2001) observed California tiger salamanders moving up to 670 meters (2,198 feet) between breeding ponds in Monterey County. Similarly, Shaffer and Trenham (2005) found that 95 percent of California tiger salamanders resided within 640 meters (2,100 feet) of their breeding pond at Jepson Prairie in Solano County.

Adults emerge from upland sites on rainy nights during fall and winter rains to feed and migrate to breeding ponds (Stebbins 1989, 2003; Shaffer et al. 1993). Adults use the same migratory routes between breeding pools and upland burrows year after year (Petranka 1998; Loredo et al. 1996). Metamorphosed juveniles leave the breeding sites in late spring or early summer and migrate to small mammal burrows (Zeiner et al. 1988; Shaffer et al. 1993; Loredo et al. 1996). Like adults, juveniles may emerge from burrows to feed during nights of high relative humidity (Storer 1925; Shaffer et al. 1993) before settling in their selected upland sites for the summer months. While most California tiger salamanders rely on rodent burrows for shelter, some individuals may utilize soil crevices as temporary shelter during upland migrations (Loredo et al. 1996).

The distance between occupied upland habitat and breeding sites depends on local topography and vegetation, and the distribution of California ground squirrel (*Spermophilus beecheyi*) or other rodent burrows (Stebbins 1989). California tiger salamanders seem to follow the pattern of a broadly defined metapopulation structure, in which a population is divided into a set of subpopulations, some of which become extinct and are later recolonized by migrants from other subpopulations (69 FR 47212). Semlitsch et al. (1996) points out that because many vernal pools and ponds used by salamanders are temporary over geological and ecological time, local extinction must be counterbalanced by colonization of new sites; thus, conservation plans must incorporate terrestrial habitats providing corridors for movement to new sites. In the case of California tiger salamanders, Trenham (1998b) indicates that the spatial arrangement of ponds and the migratory behavior of salamanders substantially affect pond utilization and sustainability of local populations. Interpond distances directly affect the probability of recolonization and subsequent opportunities for population rescue, which is important because physiology limits the distance that amphibians are able to disperse (Semlitsch 2000). While Marsh and Trenham (2001) reviewed the fit between theoretical metapopulations and pond-breeding amphibians and found that random extinctions of local populations were uncommon as long as terrestrial habitats were intact, Trenham and Shaffer (2005) found that local extinctions were likely where the probability of reproductive failure exceeded 0.5, and that reproductive failure was common in both permanent and highly ephemeral pools, underscoring the importance of interconnected breeding sites.

A.3.3 Habitat Requirements and Ecology

A diverse array of flora and fauna have adapted to the seasonal hydric cycle of vernal pools (69 FR 47212). Vernal pools and other seasonal rain pools are the primary breeding habitat of California tiger salamanders (68 FR 13498). Within the species range, there are numerous other sensitive vernal pool species, comprising 24 plants, four crustaceans, and one insect (Keeler-Wolf et al. 1998). Listed vernal pool crustaceans are able to complete their life cycle within a relatively short period of inundation (59 FR 48136). Therefore, many pools that support vernal pool crustaceans may not retain water for the 10 weeks or more required to complete metamorphosis of California tiger salamander larvae (P. Anderson 1968; Feaver 1971). Laabs et al. (2001) reported that, in eastern Merced County, California tiger salamander larvae were observed only in the largest vernal pools. California tiger salamanders, unlike vernal pool crustaceans, are known to successfully reproduce in perennial ponds (69 FR 47212).

Outside of the breeding season, post-metamorphic California tiger salamanders spend most time in burrows of small mammals, such as California ground squirrels and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and Van Vuren 1996; Petranka 1998; Trenham 1998a). Active rodent burrow systems are considered an important component of California tiger salamander upland habitat (Seymour and Westphal 1994; Loredo et al. 1996). Utilization of burrow habitat created by burrowing mammals such as ground squirrels suggests a commensal relationship (a relationship between two species in which one obtains food or other benefits without detriment or benefit to the other) between the two species (Loredo et al. 1996). Loredo et al. (1996) indicate that active ground-burrowing rodent populations are probably necessary to sustain California tiger salamander populations because inactive burrow systems begin to deteriorate and collapse over time. In a two-year radiotelemetry project in Monterey County (Hastings), Trenham (2001) found that salamanders preferentially used open grassland and isolated oaks; salamanders present in continuous woody vegetation were never more than 3 meters from open grassland, potentially because ground squirrels prefer to construct burrows in open habitats (Jameson and Peeters 1988 in Trenham 2001).

A.3.4 Species Distribution and Population Trends

A.3.4.1 Distribution

The California tiger salamander is endemic to California. Within the coastal range, the species occurs from southern San Mateo County south to San Luis Obispo County, with isolated populations in Sonoma and northwestern Santa Barbara Counties (CNDDB 2005). In the Central Valley and surrounding Sierra Nevada foothills, the species occurs from northern Yolo County southward to northwestern Kern County and northern Tulare and Kings Counties (CNDDB 2005). Throughout its range, occurrences of California tiger salamander are strongly associated with uplifted and dissected undeformed to moderately deformed Plio-Pleistocene sediments (Jennings and Hayes 1994, Wahrhaftig and Birman 1965).

Recorded occurrences of California tiger salamanders in Yolo County include an occurrence of several larvae in a stock pond on the west slope of the Capay Hills east of Rumsey Rancheria (Downs 2005), and five occurrences in the northern end of the Solano-Colusa vernal pool region, west and northwest of Dunnigan (CNDDB 2007) (Figure A-15). Four recorded occurrences were located within an area bounded by Interstate 5 to the east, Bird Creek to the south, and Buckeye Creek to the north and west. These four occurrences are from within an area that now comprises the Dunnigan Creek Unit (Central Valley Region Unit 1) of designated critical habitat Land ownership within this unit is entirely private (70 FR 49380) and therefore restricted (another historical, but extirpated occurrence, is recorded from a site adjacent to the designated critical habitat). A fifth recorded occurrence, from 1993, represents an individual found in the Willows apartment complex in Davis, adjacent to a stormwater detention basin managed by the City of Davis (CNDDB 2007). Queries of the online databases of the California Academy of Sciences (2008) and Museum of Vertebrate Zoology (2008) yielded no additional occurrence records.

A.3.4.2 Population Trends

California tiger salamanders still occur throughout much of their historical range (Trenham et al. 2000) and can be common at localities where it still occurs. Total adult population size is unknown, but certainly exceeds 10,000. Populations are thought to be declining due to habitat loss. Approximately 75 percent of the species' historical natural habitat has been lost. The species has been eliminated from 55 to 58 percent of historical breeding sites. Holland (1998) indicated that about 75 percent of the historical vernal pool breeding habitat has been lost, although some question the reliability of this estimate. Barry and Shaffer (1994) stated that this salamander soon will be in danger of extinction throughout its range and noted that it already is gravely threatened in the San Francisco Bay Area and in the San Joaquin Valley. In Santa Barbara County, half of the 14 documented breeding sites have been destroyed or have suffered severe degradation since mid-1999 (65 FR 57242).

Little is known of the population trends of California tiger salamanders in Yolo County. Four of the five recorded occurrences of the species in the county are from within an area that now comprises the Dunnigan Creek Unit (Central Valley Region Unit 1) of designated critical habitat. Land ownership within this unit is entirely private (70 FR 49380) and therefore restricted. The fifth recorded occurrence, in the City of Davis, consists of a solitary individual; lack of supporting habitat suggests this observation is the result of a translocated individual or a released pet (M. Ryan pers. comm.).

A.3.5 Threats to the Species

Conversion of land to residential, commercial, and agricultural activities is considered the most significant threat to California tiger salamanders. These activities result in destruction and fragmentation of upland and/or aquatic breeding habitat, and killing of individual California tiger salamanders (Twitty 1941; Hansen and Tremper 1993; Shaffer et al. 1993; Jennings and Hayes 1994; Fisher and Shaffer 1996; Launer and Fee 1996; Loredo et al. 1996; Davidson et al. 2002).

Fisher and Shaffer (1996) found an inverse relationship between introduced exotics and native amphibians. Exotic species, such as bullfrogs (*Ranacates beiana)*, mosquitofish (*Gambusia affinis*), sunfish species (e.g., largemouth bass [*Micropterus salmoides*] and bluegill [*Lepomis macrochirus*]), catfish (*Ictalurus* spp.), and fathead minnows (*Pimephales promelas*), that live in perennial ponds such as stock ponds are considered to have negatively affected California tiger salamander populations by preying on larval salamanders (Morey and Guinn 1992; Graf and Allen-Diaz 1993; Shaffer et al. 1993; Seymour and Westphal 1994; Fisher and Shaffer 1996; Lawler et al. 1999; Laabs et al. 2001; Leyse 2005). Shaffer et al. (2008) found that for other ambystomatids, introduction of larger fish can result in the loss of salamander life stages within one year while introduction of mosquitofish (*Gambusia affinis*) can eliminate salamanders in three to four years. Native fish, including salmonids, are known to prey on amphibian larvae that are palatable (Hencar and M'Closkey 1996). In a thorough review of available data, Fisher and Shaffer (1996) found that historical California tiger salamander localities are lower in elevation than current ones, implying extirpation in many areas occurring below 200 meters. In general, introduced exotics now occupy lower elevations, and suggest that habitat modification and low levels of topographic relief may facilitate invasion by increasing opportunities for dispersal through interconnected watersheds or suitable terrestrial habitats, or through deposition by floodwaters (Fisher and Shaffer 1996). Bobzein and DiDonato (2007) found pond co-occurrence to be negatively correlated for California tiger salamander and California newt, with sympatry only occurring in xeric regions of oak savannas and open woodland habitats. California newts are generally associated with mesic habitats such as redwood forests, deciduous hardwood forests, and oak bay woodlands, suggesting that California tiger salamanders and California newts segregate out along elevation lines (Bobzein and DiDonato 2007).

Pond size may bear on the ability of California tiger salamander to avoid invertebrate predators. In large fishless ponds, *A. Tigrinum nebulosum* larvae avoided predation by aquatic invertebrates by moving from the shallow, vegetated margins to deeper waters while predators were active (Holomuzki 1986), underscoring the importance of pond size and open water refuge for larval success.

Riley et al. (2003) examined hybridization between California tiger salamanders and an introduced congener, the tiger salamander (*Ambystoma tigrinum*). The tiger salamander has been deliberately introduced as fish bait in California and is contaminating the genome of California tiger salamanders through interbreeding (Riley et al. 2003). In the Salinas Valley, Riley et al. (2003) sampled salamanders from four artificial ponds and two natural vernal pools. Based on mitochondrial DNA and two nuclear loci, Riley et al. (2003) found that hybrids were present in all six ponds, and that these hybrids were viable and fertile. Hybridization with the barred tiger salamander (*Ambystoma tigrinum mavortium*) has been occurring since fishermen and bait shop owners began introducing the species 50 to 60 years ago, resulting 15–30 generations of genetic mixing (Fitzpatrick and Shaffer 2004). Fitzpatrick and Shaffer (2004) report more nonnative alleles in large perennial ponds despite the proximity of ephemeral ponds, perhaps attributable to the presence of open water refugia providing an extended breeding season or facilitating a paedomorphic life history strategy in which adult salamander retain larval characteristics. Fitzpatrick and Shaffer (2007) report evidence of hybrid vigor or increased fitness of hybrids based on early-larval survival. This finding raises questions regarding the relative values of genetic purity verses fitness and viability that are central to developing conservation strategies for California tiger salamander.

Pesticides, hydrocarbons, and other pollutants are all thought to negatively affect breeding habitat, while rodenticides and gases used in burrowing mammal control (e.g., chlorophacinone, diphacinone, strychnine, aluminum phosphide, carbon monoxide, and methyl bromide) are considered toxic to adult salamanders (Salmon and Schmidt 1984). California ground squirrel and pocket gopher control operations may have the indirect effect of reducing the availability of upland burrows for use by California tiger salamanders (Loredo-Prendeville et al. 1994).

Roads can fragment breeding and dispersal migratory routes in areas where they traverse occupied habitat. Features of road construction, such as solid road dividers, can further impede migration, as can other potential barriers such as berms, pipelines, and fences.

In the 70 FR 49380 critical habitat designation for the California tiger salamander, the concept of critical habitat was described as follows: "Critical habitat identifies specific areas, both occupied and unoccupied by a listed species, which are essential to the conservation of the species and that may require special management considerations or protection." 70 FR 49380 further stated that "primary constituent elements for the California tiger salamander are aquatic and upland areas, including vernal pool complexes, where suitable breeding and nonbreeding habitats are interspersed throughout the landscape, and are interconnected by continuous dispersal habitat," and that one or more of the primary constituent elements are present in all areas proposed for designation as critical habitat for the central population.

A recovery plan has not yet been prepared for the California tiger salamander, although the 69 FR 47212 has stated the intention to do so. In the interim, efforts toward conservation and recovery of the species should emphasize habitat preservation. Specifically, efforts should be directed toward protecting sites with vernal pool and other suitable rain pool habitat—in the largest blocks possible—from loss, fragmentation, degradation, and incompatible uses. Surrounding upland habitats will require similar protections that conserve burrowing mammals. Managed grazing programs may be a necessary component at many or all preserve sites in order to maintain the open, low-height grasslands required to sustain populations of California ground squirrels.

Physical disturbances to the underlying soils of seasonal rain pools should be avoided, as such disturbances could reduce their water-retaining capacity (Jennings and Hayes 1994). Such disturbances to vernal pool substrates also could destroy eggs of listed crustacean species.

In locations where roads traverse potential migratory routes, tunnels should be incorporated into the road design (Barry and Shaffer 1994). Barriers to migration, in the form of solid road dividers, should also be avoided on roads traversing potential migratory routes (Shaffer et al. 1989 in Jennings and Hayes 1994). Other potential barriers, such as berms and certain types of pipelines or fences, that can inhibit or prevent migration, should be avoided (Jennings and Hayes 1994).

Pesticides, hydrocarbons, and other pollutants should not be used or applied in a manner that runoff of these substances is transported into potential California tiger salamander breeding habitat. Rodenticides and gases used in burrowing mammal control may be toxic to resident adult and juvenile salamanders. Operations to control California ground squirrel and pocket gopher populations should be avoided in areas where California tiger salamanders may be present due to direct effects on the species and the potential indirect effects of reducing the availability of upland burrows.

Efforts should be undertaken to control the spread and introduction of exotic predatory species such as bullfrogs, mosquitofish, sunfish, catfish, and fathead minnows that live in perennial ponds—especially in areas where California tiger salamanders are known to occur. Although the sale of nonnative tiger salamanders for use as fish bait has been banned in California, efforts should continue to prevent the introduction and spread of this species, which has been shown to interbreed with native California tiger salamanders.

Based on a Monterey County study and a limited understanding of essential terrestrial habitats and buffer requirements of the species, Trenham et al. (2001) recommended that plans to maintain local populations of California tiger salamanders should include pond(s) surrounded by buffers of terrestrial habitat occupied by burrowing mammals, but noted that single isolated ponds might not support populations indefinitely even if surrounded by optimal uplands (Pechman and Wilbur 1994; Semlitsch and Bodie 1998 in Trenham et al. 2001). Based on individual dispersal of juveniles up to 1000 meters from their pool of origin, Searcey and Shaffer (2008) estimated that 95 percent of the reproductive value from a single large pond falls within approximately 2.4 km. Based on these findings, Shaffer et al. (2008) recommend a minimum buffer of 1 mile around breeding pools, relating to a preserve size of approximately 800 hectares (1,977 acres), greatly exceeding the 290-meter upper bound described by Semlitsch and Bodie (2003). This recommendation provides a useful and reasonable guideline for establishing salamander preserves of minimal functional size. Due to the potential for extirpation at single ponds due to random, stochastic events, sites with multiple complexes of vernal pools surrounded by much larger areas of suitable upland habitat should be considered for preserve sites, if feasible. Furthermore, sites with potential linkage corridors to other subpopulations should be considered. Sites chosen for preserves should also be occupied by burrowing mammals, especially California ground squirrels, in order to provide terrestrial habitat. Because contiguous blocks of land this size are not always available (e.g., Sonoma County), an experimental metapopulation approach may be required.

In their final report to USFWS titled "Guidelines for the relocation of California tiger salamanders (*Ambystoma californiense*)," Shaffer et al. (2008) make the following principal management recommendations: (1) eliminate fish and bullfrogs, (2) provide a means for draining all permanent ponds or eliminate them in favor of ephemeral ponds, (3) pools ponds should have sufficient watershed to provide an adequate hydroperiod for metamorphosis (three to six months), and (4) graze or burn to manage upland and wetland vegetation. Maret et al. (2006) found that disturbance or disruption of natural disturbance regimes can increase invisibility by exotic predators, but that disturbance-intolerant fish and bullfrogs can be eliminated by pond drying. Bullfrogs, which prefer permanent or semi-permanent water (Stebbins 1951), may be less likely to establish in ephemeral waters (Barry and Shaffer 1994). Increased drying regimes can limit predators, but can also reduce viability of salamander populations by limiting salamander breeding. However, Maret et al. (2006) found that the negative effects of drying on Sonoran tiger salamanders were generally minor relative to the negative effects of less frequent drying, and recommend ponds of varying depth to maintain a suitable hydroperiod for successful salamander reproduction while keeping exotic predators in check. At appropriate densities, cattle grazing can extend hydroperiod in ephemeral wetlands (Marty 2005) and may be an important factor in counteracting the hydrologic changes associated with climate change (Pyke and Marty 2005). Livestock grazing may also assist in maintaining open grassland and oak savanna communities that support rodents such as California ground squirrel and valley pocket gophers that provide retreats for California tiger salamanders (Bobzein and DiDonato 2007).

The most significant data gaps regarding California tiger salamanders are a lack of knowledge of its distribution and population trends within the Plan Area. California tiger salamanders may be more abundant in the Plan Area than available occurrence records indicate; however, surveys have not been conducted within the Dunnigan Unit of proposed critical habitat area and other areas where the species potentially occurs, and no information indicates recent or ongoing surveys at any Yolo County sites from which occurrences have been recorded.

A.3.6 Species Habitat Model and Location Data

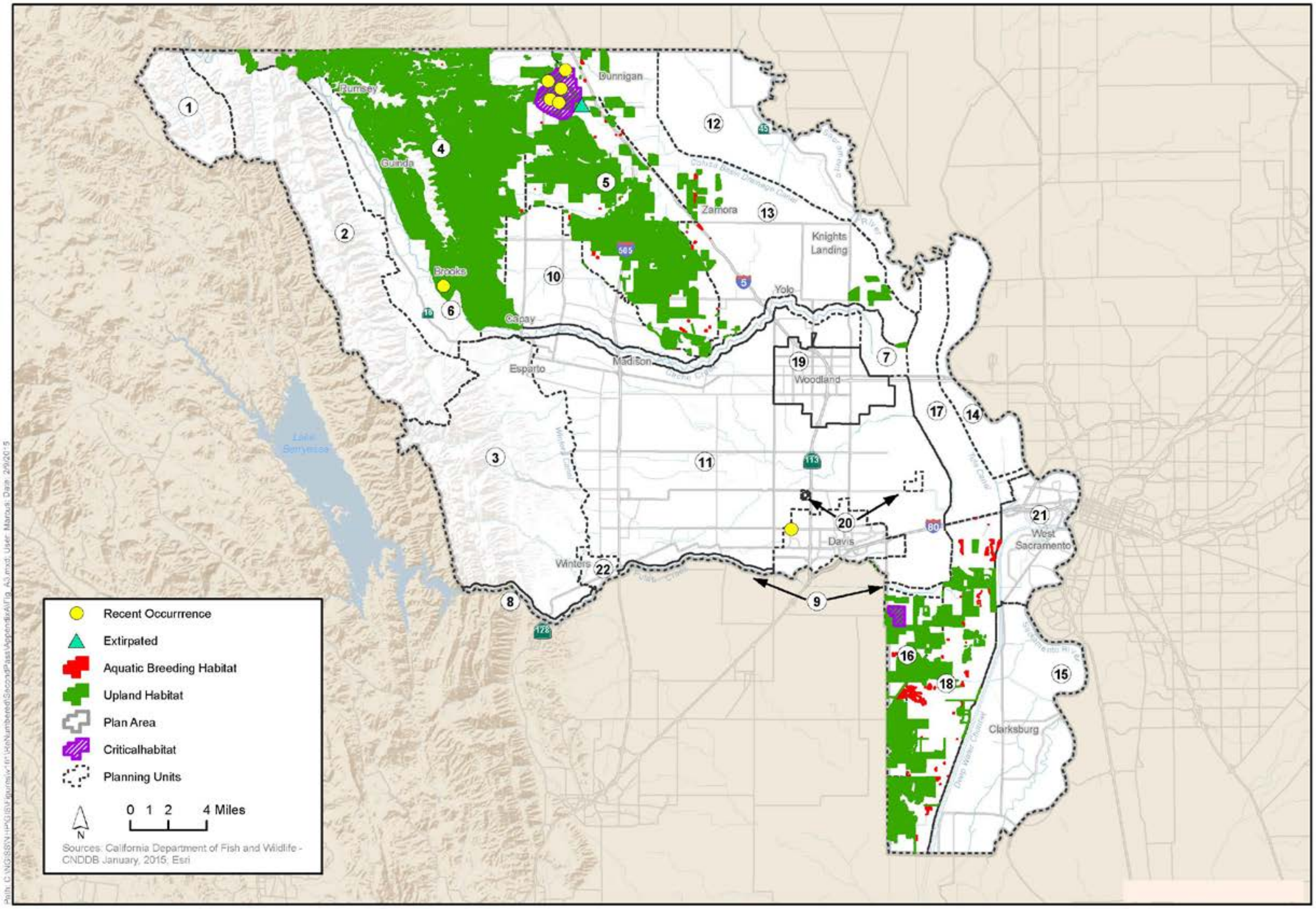
The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.15.3, *Habitat Requirements and Ecology* (Figure A-15). The model parameters include the following.

- Aquatic Breeding Habitat: This habitat includes all potentially suitable aquatic breeding areas and was modeled by selecting all mapped vernal pools, alkali sinks, and ponds (except those that are known to be perennial) as listed below that occur below an elevation 1,509 feet. Habitat located within planning units 1 – 3, 6 – 12, 14, 15, 17, and 19 - 22 is excluded from the model because these Planning Units are not known to be currently occupied and are isolated from occupied habitat areas and are unlikely to be occupied in the future (e.g., presence of levees and highways that create barriers to movement).
- Upland Habitat: This habitat includes all potentially suitable upland nonbreeding habitat (including aestivation and dispersal areas). This habitat was modeled by selecting all mapped vegetation types as listed below that occur within 1.3 miles of modeled breeding habitat and below an elevation 1,509 feet. Studies indicate that 95 percent of California tiger salamanders reside within 2,100 feet of breeding habitat (Shaffer and Trenham 2005). Habitat located within planning units 1 – 3, 6 – 12, 14, 15, 17, and 19 - 22 is excluded from the model for the reasons described above. Upland habitat in the Yolo Bypass is suitable as dispersal habitat but is considered to generally be unsuitable as aestivation habitat because of frequent winter flooding of the Bypass.

A.3.6.1 Upland Habitat – Vegetation Types

- All Annual Grassland
- Blue Oak Woodland
- All Blue Oak – Foothill Pine
- Valley Oak Alliance
- Pastures

Figure A-3. California Tiger Salamander Modeled Habitat and Occurrences



A.4 Western Pond Turtle (*Actinemys marmorata*)

A.4.1 Listing Status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Federal: None.

State: Species of Special Concern.

Recovery Plan: None.

Other Common Names: Northern Pacific Pond Turtle

Other Related Names: *Clemmys marmorata marmorata* (Baird and Girard 1852); *Emys (=Clemmys) marmorata marmorata* (Baird and Girard 1852); *Emys marmorata marmorata* (Baird and Girard 1852).

A.4.2 Species Description and Life History

The western pond turtle (*Actinemys marmorata marmorata*) (Holman and Fritz 2001; McCord and Joseph-Ouni 2006; Obst 2003) is a medium-sized aquatic turtle. Previously assigned to the genus *Clemmys*, Feldman and Parham (2002) have also proposed taxonomic realignments that would place *A. marmorata* within the genus *Emys*; current literature may refer to this taxon under either generic name. The carapace (upper portion of shell) color ranges from brown to black (Holland 1994). The carapace may be unmarked or covered with small, fine dark spots or lines (Holland 1994; Stebbins 2003). Adult size ranges from 8.9 to 21.6 centimeters (3.5 to 8.5 inches) straight-line carapace length (Stebbins 2003). The plastron (lower portion of shell) contains six pairs of yellowish shields, usually with dark blotches (Stebbins 2003). The head usually contains spots or a network of black coloring (Stebbins 2003). Adult females have a more domed, taller carapace, as compared to males, which have a more flattened, lower profile carapace (Holland 1994). Males also have larger, thicker tails than females (Holland 1994). Juveniles have a uniformly brown or olive carapace, with yellow markings along the edge of the marginals (the ring of shields encircling the carapace) and a tail nearly as long as the carapace (Stebbins 2003).

Field observations have reported copulation in May, June, and late August (Holland 1988). Oviposition (egg-laying) may occur as early as late April in central California (Rathbun et al. 1993) to late July, with most occurring in June and July (Holland 1994). A gravid (pregnant) female approaches the nesting site, empties the contents of her bladder onto the soil, excavates a nest chamber 90 to 125 millimeters (3.5 to 4.9 inches) deep and deposits one to 13 hard-shelled eggs (Holland 1994, Jennings and Hayes 1994). Incubation time ranges from 80 to more than 100 days in California (Holland 1994). In Northern California, hatchling western pond turtles (which are about the size of a quarter) overwinter inside the nest chamber and emerge the following spring (Holland 1994). The terrestrial movements of post-emergent hatchlings are poorly understood (Holland 1994), although it is known that at least some move quickly to aquatic habitats.

Adults sometimes engage in extended overland movements, which may be in response to drought or normal movements to aquatic habitats within a home range (Holland 1994). In one study, a turtle was observed making an overland movement of 5 kilometers (km) (3.1 miles), although in all other cases, overland movements were less than 3 km (1.9 miles) (Holland 1994). Such overland movements may be responses to an environmental stress such as drought or may be part of an individual's normal movements within a home range, which may consist of a series of ponds (Holland 1994). In lotic (stream) habitats, individuals move along the watercourse from pool to pool. During the course of one summer, Bury (1972) found average male, female, and juvenile linear movements were 354, 169, and 142 meters (1,161, 554, and 466 feet), respectively. In that study, adult males had the largest home ranges (0.98 hectare [2.42 acres]), followed by juveniles (0.36 hectare [0.89 acre]) and adult females (0.25 hectare [0.62 acre]).

A.4.3 Habitat Requirements and Ecology

The western pond turtle, although primarily found in natural aquatic habitats, also inhabits impoundments, irrigation ditches, and other artificial and natural water bodies (Ernst et al. 1994) and is found at elevations ranging from sea level to 2,041 meters (6,696 feet) (Stebbins 2003). The species is usually found in fresh water, but brackish habitats are also utilized (Ernst et al. 1994; D. Holland pers. comm.). The aquatic habitat may be comprised of either mud or rocky substrates and usually contains some vegetation (Ernst et al. 1994). Habitat quality often seems to be positively correlated with the number of available basking sites (Jennings and Hayes 1994). Turtles seem to avoid areas lacking in significant refugia (Holland 1994). Basking sites may be rocks, logs, vegetation, terrestrial islands within the aquatic habitat, and human-made debris (Holland 1994). Hatchlings use shallow, slow-moving waters with emergent vegetation, such as that found alongside channels of stream or pond margins, while juveniles one year old or older tend to utilize the same aquatic habitats as adults (D. Holland pers. comm.). Western pond turtles may overwinter in aquatic or upland habitats (Holland 1994). Like the giant garter snake (*Thamnophis gigas*), western pond turtles inhabit the irrigation ditches servicing rice agriculture in the Central Valley (E. Hansen, unpublished notes). While rice fields probably confer little advantage for adult western pond turtles, mature rice probably provides valuable cover and foraging habitat for hatchlings.

When overwintering in aquatic habitats, turtles enter a state of torpor and rest quietly on the pond or stream bottom, often in mud or under some type of refugium such as a log or undercut bank (Holland 1994). Overwintering western pond turtles may move between several sites during winter and have been observed swimming under ice in water temperatures as low as 1 degree Celsius (°C) (34 degrees Fahrenheit [F]) (Holland 1994). Individuals may occasionally emerge to bask on warm, sunny days during winter, even in northern Oregon (D. Holland pers. comm.).

Western pond turtles are generalist feeders, with most food being obtained by opportunistic foraging or scavenging (Ernst et al. 1994). Known food items include algae, various plants, crustaceans, various types of insects, spiders, fish, frogs, tadpoles, and birds (Pope 1939 in Ernst et al. 1994; Evenden 1948 in Ernst et al.1994; Carr 1952; Holland 1985; Bury 1986). Scavenging carrion of various vertebrate species may be a locally and/or seasonally important part of the diet (Holland 1994). Neustophagia, (a form of filter feeding) may be utilized to obtain abundant small invertebrate prey such as *Daphnia* (Ernst et al. 1994; Holland 1994).

Upland habitats are also important to western pond turtles for nesting, overwintering, and overland dispersal (Holland 1994). Nesting sites may be as far as 400 meters (1,312 feet) or more from the aquatic habitat, although usually the distance is much less and generally around 100 meters (328 feet) (Jennings and Hayes 1994; D. Holland pers. comm.; Slavens 1995). Nesting sites typically have a southern or western aspect, with slopes of 0 to 46 percent and compact, dry soils (Holland 1994; Bury et al 2001). When turtles choose to overwinter in upland habitats, individuals typically leave the aquatic habitat in late fall, moving as much as 500 meters (1,640 feet) from the aquatic habitat

(Holland 1994). Turtles typically burrow into duff (leaf litter) and/or soil, where they remain during the winter months (Holland 1994). For reasons not entirely clear, western pond turtles may move into upland habitats for variable intervals at other times of the year, during which times they may be found burrowed into duff or under shrubs (Rathbun et al. 1993).

Raccoons (*Procyon lotor*), bullfrogs (*Rana catesbeiana*), largemouth bass (*Micropterus salmoides*), gray fox (*Urocyon cineroargenteus*), coyote (*Canis latrans*), and feral and domestic dogs (*Canis familiaris*) are known to be major predators of western pond turtles (Holland 1994). Holland (1994) indicates that other known predators include Osprey (*Pandion haliaetus*), Bald Eagle (*Haliaetus leucocephalus*), black bear (*Euarctos americanus*), river otter (*Lutra canadensis*) (Manning 1990), and mink (*Mustela vison*).Numerous other fish, amphibian, bird, and mammal species are suspected to prey on the species (Holland 1994). Raccoons, in particular, are known to depredate nests, sometimes destroying all nests in an entire communal nesting area (D. Holland pers. comm.).

Western pond turtles spend considerable time basking in order to thermoregulate, preferring body temperatures between 24°C and 32°C (75°F and 90°F). Turtles seem to avoid body temperatures above 34°C (93°F) and usually cease basking at body temperatures well below their critical thermal maximum of 40°C (104°F). Individuals often bask above the water level on emergent logs, rocks, rocks, vegetation, or other objects. Turtles may sometimes bask at the surface, however, and sometimes within vegetation, where water temperatures may be 10°C to 15°C (18°F to 27°F) warmer than the water immediately below (Holland 1994). This type of basking may be utilized when air temperatures become too high for aerial basking (D. Holland pers. comm.). Western pond turtles also spend considerable time foraging (Holland 1994). Foraging may occur during the day or night (D. Holland pers. comm.; N. Sisk pers.obs.). Intraspecific (within-species) aggressive interactions, in the form of open-mouth gestures and shoving or bumping to secure positions on basking sites, are also common among western pond turtles (Holland 1994).

Nonnative invasive species are a threat to western pond turtles. Bullfrogs and exotic large predatory fish (e.g., largemouth bass) compete for invertebrate prey with western pond turtles and are known to eat hatchlings and small juveniles. Carp alter or eliminate emergent vegetation required as microhabitat by hatchlings (Holland 1994). Exotic turtles, including painted turtles, snapping turtles, and sliders, may compete with pond turtles for food and basking sites (D. Holland pers. comm.). These exotic turtles also may harbor and transmit diseases, such as upper respiratory diseases, to pond turtles (Holland 1994). Cattle trample and eat aquatic vegetation that serves as habitat for hatchlings and may crush nests. Domestic dogs sometimes kill or injure turtles (D. Holland pers. comm.).

A.4.4 Species Distribution and Population Trends

A.4.4.1 Distribution

The range of the western pond turtle in North America extends primarily from Pacific slopes of western Washington State (where it may now be extinct) south to the San Francisco Bay area, where it intergrades with the southwestern pond turtle (*C. m. pallida*) (Stebbins 2003). The range of the southwestern pond turtle (which does not occur in the Plan Area) extends from the zone of intergradation with the western pond turtle in central California, south to Baja California Norte, Mexico. Outside California, occurrences east of the Pacific crest include the Truckee, Carson, and East Walker Rivers in Nevada; Drews Creek in Lake County, Oregon; the Canyon Creek area in Lake County, Oregon; and introduced occurrences along the Deschutes River at Bend in Deschutes

County, Oregon (Jennings and Hayes 1994; Stebbins 2003). In California, the western pond turtle ranges primarily from Pacific slopes along the Oregon-California state boundary south to the San Francisco Bay area (Stebbins 2003). Occurrences east of the crest of the Sierra Nevada Mountain Range include Susanville in Lassen County (Stebbins 2003). Molecular analyses place western pond turtles into four distinct groups, or clades, which include (1) a Northern clade extending from Washington south to San Luis Obispo County, California, west of the Coast Ranges; (2) a San Joaquin Valley clade from California's Great Central Valley; (3) a Santa Barbara clade from California's Santa Barbara and Ventura counties; and (4) a Southern clade occurring south of the Tehachapi Mountains and west of the Transverse Range south to Baja California, Mexico (Spinks and Shaffer 2005).

Queries conducted in January 2008 of the collection database of the California Academy of Sciences (2008) yielded seven Yolo County records of western pond turtles, all from 1997. Two of those records were from Davis Creek, near Davis Creek Reservoir in western Yolo County. The remaining five records were from the University of California (UC) Davis Arboretum (n = 1) and Arboretum Waterway (n = 4). Spinks et al. (2003) estimate a naturally occurring population of 53 individuals (95 percent CI = 48, 66) within the Arboretum Waterway. A similar query of records of the Museum of Vertebrate Zoology (2008) in Berkeley yielded no record of the western pond turtle in Yolo County. The California Natural Diversity Database (CNDDB) (2007) lists one record from 1990 of multiple western pond turtle individuals along Putah Creek and an unnamed tributary. This site is located less than 1.6 kilometers (1 mile) south-southeast of Winters, along the southern boundary of Yolo County. The CNDDB reports another occurrence from 2005 within Cache Creek, extending for 5.3 miles between Camp Haswell to an upper regional park, northwest of Capay Valley. A healthy population is also present at the Cache Creek Nature Preserve just west of Woodland (Spinks pers. comm.) Jennings and Hayes' (1994) distribution map shows one other extant occurrence from near the northeast corner of Yolo County and three extant occurrences from the Sacramento River Basin, along the southeastern boundary of Yolo County. At least three western pond turtles were observed within the Willow Slough Bypass between County Road 104 and County Road 105 during 2007 (E. Hansen unpublished notes). No other records from Yolo County, either extant or extirpated, were discovered.

More recent observations of western pond turtle have been made by Whisler (pers. comm., 2015). These include the following:

- Sacramento River at Gray's Bend (planning unit 12). Western pond turtle observe at Gray's Bend in1983, and were repeatedly observed through 2012.
- Putah Creek Riparian Reserve at UC Davis (between the University Airport and the Old Davis Road Bridge: planning unit 9). Western pond turtles observed throughout this area in 2014.
- Putah Creek Sinks (2010 and 2011) in the Yolo Bypass Wildlife Area: planning unit 18). Western pond turtles observed in the Putah Creek Sinks along with red-eared sliders and American bullfrogs.
- Lower Willow Slough area (planning unit 11): One adult western pond turtle observed sunning in the Conaway Ranch Water Delivery Canal at Yolo CRs 104 and 27 on March 27, 2010. The area is dominated by rice.
- Sacramento River Delta (planning unit15): Western pond turtles observed in Babel Slough and Winchester Lake during 2015. They probably occur in Elk Slough as well.
- West Sacramento (planning unit 21). Several western pond turtles in the borrow sloughs near the Water Treatment Plant south of Burrows Road in 2009.

- City Davis (planning unit 20). Several western pond turtles observed at the storm water detention basins and other ponds in Davis (West Davis Pond) and North Davis Ponds (Northstar Park Pond and Julie Partansky Pond). Red-eared sliders and American bullfrogs have also been observed at these ponds and are breeding successfully.

A.4.4.2 Population Trends

Populations in Washington State, where the species may be extinct (Stebbins 2003), have likely suffered the most. Stable populations remain in southern Oregon (D. Holland pers. comm.); however, northern Oregon populations have suffered severe declines (Hays et al. 1999), and most populations throughout the range have exhibited some declines (Holland and Bury 1998; D. Holland pers. comm.).

In California, Jennings and Hayes (1994) consider the western pond turtle as endangered from the Mokelumne River south and threatened elsewhere within the state. Loss of habitat is the most significant factor in western pond turtle declines. Over 90 percent of the historical wetlands in California have been drained, filled, or diked to support agricultural and urban development (Frayer et al. 1989). Many populations throughout California are heavily adult-biased (D. Holland pers. comm.), an indication that little recruitment is occurring within those populations. In the Central Valley, pond turtles were exploited for food from the 1890s to the 1920s, which is believed to have played an important role in the declines in the San Francisco area and Central Valley (Storer 1930; Hays et al. 1999).

It is likely that the western pond turtle once occurred in a relatively continuous distribution within suitable habitat in Yolo County, although there is no known site in the county where extirpation of a population has occurred. The population at the UC Davis Arboretum is characterized by a demographic profile characteristic of senescing populations, but has been supplemented by at least 33 captive-hatched individuals since 1996 (Spinks et al. 2003). Because the oldest record obtained from the County is from 1990, status changes that may have occurred prior to 1990 would not be evident from an examination of existing records. Moreover, although no extirpations have been recorded at any known occupied sites in Yolo County, recent survey data could not be located, and data on population trends at those sites are lacking. Therefore, with the exception of the UC Davis Arboretum, current status and population trends of the western pond turtle within the Plan Area are unknown.

A.4.5 Threats to the Species

The most significant threats to the western pond turtle are the continuing loss, degradation, and fragmentation of occupied habitats (D. Holland pers. comm.). Agricultural-related disturbances to wetlands and streams such as changes in the hydrological regime (e.g., water diversions) and removal of aquatic vegetation can render such wetlands unsuitable for pond turtles (D. Holland pers. comm.). The destruction of upland habitats comprising communal nesting areas for agricultural or urban development can result in significant adverse consequences on recruitment for many individuals or an entire population (D. Holland pers. comm.). Water releases from reservoirs, which alter the natural hydrologic regime, may adversely affect downstream habitat by eliminating or altering basking sites, refugia, foraging areas, and hatchling microhabitat (Holland 1991; Hays et al. 1999; U.S. Fish and Wildlife Service [USFWS] 1999). The potential transmission of parasites and diseases from exotic turtle species is a serious concern (Holland 1994; Jennings and Hayes 1994; Hays et al. 1999). Exotic turtles released into the wild typically originate from pet stores, where they are often kept in common containers under unsanitary conditions. When reared under such conditions, the potential for harboring and transmitting exotic pathogens and parasites is greatly increased when these diseased or parasite-ridden turtles are released into habitats occupied by pond turtles. Other threats include collection of individuals for the pet trade and shooting or other means of indiscriminate killing by humans (Holland 1994). Extended drought and associated fire can also result in significant mortality of western pond turtles (Holland 1991). Holland (1994) indicated that mortality caused by automobile strikes probably matches or exceeds mortality from most other anthropogenic sources.

Jennings and Hayes (1994) consider the variation in nesting location in response to variation in habitat, movement responses to habitat change, patterns of movement in the absence of change, and recolonization ability in structurally different habitats to be the most significant data gaps for the species. The lack of data on these parameters led Rathbun et al. (1992) to recommend protecting at least 500 meters (1,640 feet) from known occupied aquatic habitat to avoid impacts to nesting habitat. No recovery plan has been prepared for California populations of western pond turtles because the species is not listed, but the species is included among the recovery goals and objectives contained in the USFWS's (1999) *Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*)*, a species that shares the same wetland habitat types as the western pond turtle. The Plan does not propose any conservation measures designed to benefit the western pond turtle exclusively; however, recovery actions (e.g., habitat protection and restoration) undertaken in the Plan are expected to provide secondary benefits to the species.

Several conservation measures should be implemented in areas where the western pond turtle is known to occur. Populations of exotic predators or competitors, such as bullfrogs, large fish (e.g., largemouth bass), and turtles, should be controlled in habitats occupied by western pond turtles; and efforts to prevent their spread or introduction should be undertaken throughout the Plan Area. Controlling population size and spread of exotic wildlife within Yolo County could also reduce the transmission of infectious diseases to pond turtle populations. Protecting suitable nesting habitat, especially known historical nesting sites, is crucial. Jennings and Hayes (1994) recommended fencing off corridors between aquatic habitats and nesting habitat, and around nesting habitat, in a manner that allows turtle movement to and from nesting areas and prevents trampling of nests during incubation. To reduce the incidence of mortality caused by automobile strikes, the construction of new roads near occupied western pond turtle habitat should be avoided when possible. Maintaining a natural flow regime within lotic habitats occupied by western pond turtles is also of considerable importance in maintaining and improving existing habitat conditions. Considering the abundance of suitable aquatic habitat, western pond turtles may be more widely distributed within the Plan Area than indicated by existing occurrence records.

A.4.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.4.3, *Habitat Requirements and Ecology* (Figure A-4). The model parameters include the following.

- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., CNDDB, California Academy of Sciences Herpetology Department Collection Catalog).

- Other Unmapped Incidental Sightings Where Species is Known to Occur:

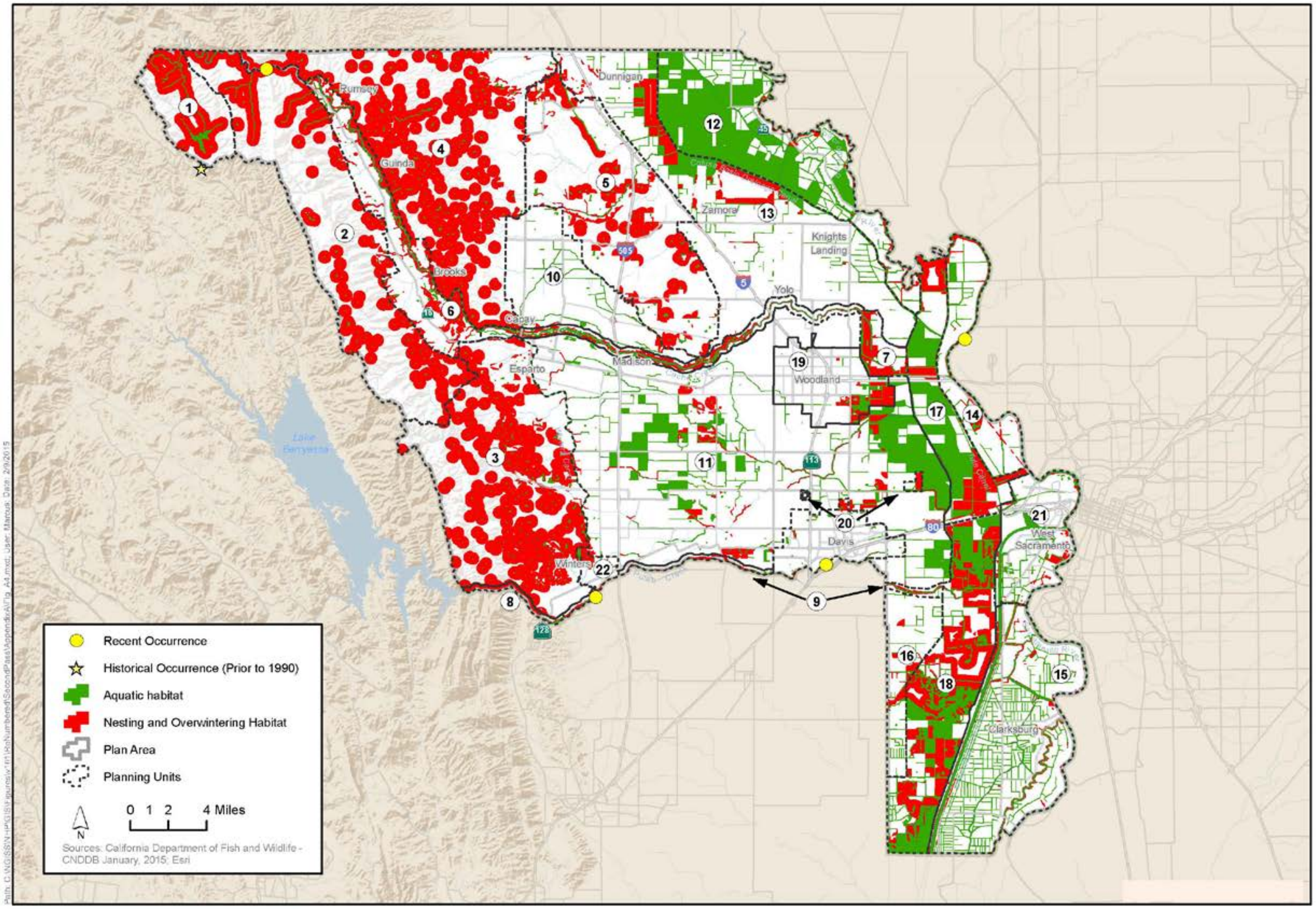
Unmapped Incidental Sighting	Source
Willow Slough Bypass between County Road 104 and County Road 105	Hansen pers. comm.
Cache Creek Nature Preserve just west of Woodland	Spinks pers. comm.

- Aquatic Habitat: This habitat includes all potentially suitable aquatic habitat and was modeled by selecting all mapped land cover types as listed below and by selecting and buffering 10 feet all perennial streams from the National Hydrography Dataset (Ernst et al. 1994) and perennial ponds in the Yolo NHP geographic information system (GIS) database set. Because the water land cover type includes water in small agricultural water conveyance channels that does not support habitat, the model overestimates the extent of this habitat type within the Valley Landscape Unit.

A.4.6.1 Aquatic Habitat – Vegetation Types

- Water
- Bulrush – Cattail Wetland Alliance
- Bulrush – Cattail Fresh Water Marsh Not Formally Defined (NFD) Super Alliance
- Alkali Bulrush – Bulrush Brackish Marsh NFD Super Alliance
- Rice
- Nesting and Overwintering Habitat: This habitat includes all potentially suitable nesting habitat. This habitat was modeled by selecting all natural vegetation types that occur within 1,312 feet of aquatic habitat (maximum distance nest can be from aquatic habitat) (Jennings and Hayes 1994; D. Holland pers. comm.; Slavens 1995; Bury et al. 2001). This habitat also includes all potentially suitable overwintering habitat outside of the nesting habitat. This habitat was modeled by selecting all natural vegetation types that occur between 1,312 feet and 1,640 feet from aquatic habitat (maximum distance of overwintering from aquatic habitat) (Holland 1994). Note that nesting habitat may also be used as overwintering habitat. Both modeled nesting and overwintering habitat exclude urban and agriculture vegetation types.

Figure A-4. Western Pond Turtle Modeled Habitat and Occurrences



A.5 Giant Garter Snake (*Thamnophis gigas*)

A.5.1 Listing Status

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Federal: Threatened.

State: Threatened.

Recovery Plan: Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*) (USFWS 1999).

Revised Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*) (USFWS 2015)

A.5.2 Species Description and Life History

The giant garter snake (*Thamnophis gigas*) is an aquatic snake endemic to the Central Valley of California. Described as among California's most aquatic garter snakes (Fitch 1940), giant garter snakes are associated with low-gradient streams, and valley floor wetlands and marshes; they have adapted successfully to regions of rice agriculture. Giant garter snakes are one of the largest snakes in the genus *Thamnophis*. A sexually dimorphic species, females can reach sizes in excess of 1 meter (3.3 feet) and 850 grams (1.87 pounds), while proportionally smaller males seldom exceed 250 grams (0.55 pound). Giant garter snakes possess a dark brown or olive background color separated by light-colored longitudinal stripes. For this species, coloration is geographically and individually variable. Snakes from the San Joaquin Valley region may exhibit a black-checkered pattern along the back and sides, and often lack a distinct dorsal stripe; while snakes from the Sacramento Valley region are typically darker, with a complete dorsal stripe that varies from bright yellow to orange or dull brown. Originally considered a subspecies of *Thamnophis ordinoides* (Fitch 1940), the giant garter snake has undergone a lengthy series of taxonomic revisions, finally being accorded full species status based on morphological and distribution data in the late 1980s (Rossman and Stewart 1987), a classification later confirmed through genetic analyses (Paquin 2001; Paquin et al. 2006).

Upon emerging from overwintering sites, male giant garter snakes immediately disperse in search of mates and will continue breeding from March into early May. Female giant garter snakes brood young internally, giving birth to live young from late July through early September (Hansen and Hansen 1990). Young immediately disperse and seek shelter to absorb their yolk sacs, after which they molt and begin feeding on their own. Brood size ranges from 10 to 46 young, with a mean of 23.1 (n=19) (Hansen and Hansen 1990). Averaging 3 to 5 grams (0.11 to 0.18 ounce) with a snout-to-vent length of approximately 20.6 centimeters (8.1 inches), young giant garter snakes will double their size within their first year (Hansen and Hansen 1990; U.S. Fish and Wildlife Service [USFWS] 1999). Sexual maturity probably averages three years in males and five years in females (G. Hansen pers. comm.; USFWS 1999).

Giant garter snakes are strongly associated with aquatic habitats, typically overwintering in burrows and crevices near active season foraging habitat (Hansen 2004a; Hansen 2004b). Individuals have been noted using burrows as far as 50 meters (164 feet) from marsh edges during the active season, and retreating as far as 250 meters (820 feet) from the edge of wetland habitats while overwintering, presumably to reach hibernacula above the annual high water mark (Hansen 1986; Wylie et al. 1997; USFWS 1999).

Changing agricultural regimes, development, and other shifts in land use create an ever-changing mosaic of available habitat. Giant garter snakes disperse in response to these changes in order to find suitable sources of food, cover, and prey. Connectivity between regions is therefore extremely important for providing access to available habitat and for genetic interchange. In an agricultural setting, giant garter snakes rely largely upon the interconnected network of canals and ditches that provide irrigation and drainage to provide this connectivity. The canals and ditches within the Plan Area likely serve an important role in giant garter snake movement.

Data based on radiotelemetry studies show that home range varies by location, with median home range estimates varying between 9.2 hectares (23 acres) (range 4.2 to 82 hectares [10.3 to 203 acres], n=8) in a semi-native perennial marsh system and 53.2 hectares (131 acres) (range 1.3 to 1,330 hectares [3.2 to 2,792 acres], n=29) in a managed refuge (USFWS 1999).

A.5.3 Habitat Requirements and Ecology

Habitats occupied by giant garter snakes typically contain permanent or seasonal water, mud bottoms, and vegetated dirt banks (Fitch 1940; Hansen and Brode 1980). Abundances and densities of giant garter snakes vary with context of habitat; they are lowest in seasonal/managed marshes (dry in summer, flooded in winter for waterfowl habitat), greatest in natural marshes, and intermediate in rice fields (Wylie et al. 2012). Prior to reclamation, these wetlands consisted of freshwater marshes and low-gradient streams. In some rice-growing areas, giant garter snakes have adapted to vegetated, artificial waterways and associated rice fields (Hansen and Brode 1993) where velocities fall within tolerable limits (E. Hansen in litt. 2009).

This species appears to be mostly absent from permanent waters that support established populations of predatory game fishes; from streams and wetlands with sand, gravel, or rock substrates; and from riparian woodlands lacking suitable basking sites, prey populations, and cover vegetation (Hansen and Brode 1980; Rossman and Stewart 1987; Brode 1988; USFWS 1999). The species may also avoid natural or artificial waterways that undergo routine dredging, mechanical or chemical weed control, or compaction of bank soils (Hansen 1988; Hansen and Brode 1993). Giant garter snakes are associated with aquatic habitats characterized by the following features: (1) sufficient water during the snake's active season (typically early spring through mid-fall) to supply cover and food such as small fish and amphibians; (2) emergent, herbaceous wetland vegetation, such as cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.), accompanied by vegetated banks to provide basking and foraging habitat and escape cover during the active season; (3) upland habitat (e.g., bankside burrows, holes, and crevices) to provide short-term refuge areas during the active season; and (4) high ground or upland habitat above the annual high water mark to provide cover and refuge from flood waters during the dormant winter period (Hansen and Brode 1980; Hansen 1998).

Survivorship and longevity of giant garter snakes are largely unknown, with few quantitative studies of survivorship available for the genus as a whole. One proxy comes from data on individual survival rates for a population of valley garter snakes (*Thamnophis sirtalis fitchi*) at a mountain lake in Northern California. Snakes from this population exhibited first-year survivorship among neonates ranging from 28.7 to 43.0 percent, with a second-year neonate survivorship of 16.4 percent. Survival of yearling snakes was greater than that of juveniles, at 50.8 percent, while survival of snakes two years and older decreased to 32.7 percent (Jayne and Bennett 1990). In a different study, Lind et al. (2005) found that survival estimates for female Pacific coast aquatic garter snakes (*Thamnophis atratus*) in northwestern California was higher than that of males, which is consistent with trends reported for giant garter snakes in the Natomas Basin (Jones & Stokes 2007).

Spending cool winter months in dormancy or periods of reduced activity, giant garter snakes typically emerge from late March to early April and remain active through October; the timing of annual activity is subject to varying seasonal weather conditions. Daily activity consists of emerging from burrows after sunrise, basking to warm bodies to active temperatures, and foraging or courting for the remainder of the day (Hansen and Brode 1993). Like others in their genera, giant garter snakes likely rely on chemical cues to determine reproductive status and to locate mates (Shine et al. 2003; O'Donnell et al. 2004; E. Hansen, pers. obs.). Activity generally peaks during spring emergence and courtship from April into June, whereupon observations of giant garter snakes diminish significantly until a second peak is observed after females give birth during late July into August (Hansen and Brode 1993; Wylie et al. 1997; USFWS 1999; Hansen 2004b). Giant garter snakes then remain actively foraging and occasionally courting until the onset of cooler fall temperatures.

Giant garter snakes feed on small fishes, tadpoles, and small frogs (Hansen 1980; USFWS 1999), specializing in ambushing prey underwater (Brode 1988). Historically, giant garter snakes preyed on native species such as the thick-tailed chub (*Gila crassicauda*) and California red-legged frog (*Rana aurora draytonii*), which have been extirpated from the giant garter snake's current range), as well as the pacific treefrog (*Pseudacris regilla*) and Sacramento blackfish (*Orthodox microlepidus*) (Cunningham 1959; Rossman et al*.* 1996; USFWS 1999). Giant garter snakes now utilize introduced species, such as small bullfrogs (*Rana catesbeiana*) and their larvae, carp (*Cyprinus carpio*), and mosquitofish (*Gambusia affinis*). While juveniles probably consume insects and other small invertebrates, giant garter snakes are not known to consume larger terrestrial prey such as small mammals or birds.

Large vertebrates, including raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), red foxes (*Vulpes vulpes*), gray foxes (*Urocyon cinereoargentius*), river otters (*Lutra canadensis*), opossums (*Didelphis virginiana*), harriers (*Circus cyaneus*), hawks (*Buteo* spp.), herons (*Ardea herodius*, *Nycticorax nyctycorax*), egrets (*Ardea alba*, *Egretta thula*), and American bitterns (*Botaurus lentiginosus*) prey on giant garter snakes (USFWS 1999). In areas near urban development, giant garter snakes may also fall prey to domestic or feral house cats (G. E. Hansen pers. comm.). In permanent waterways, introduced predatory game fishes, such as bass (*Micropterus* spp.), sunfish (*Lepomis* spp.), and channel catfish (*Ictalurus* spp.), prey on giant garter snakes and compete with them for smaller prey (Hansen 1998; USFWS 1993).

Giant garter snakes coexist with the valley garter snake (*Thamnophis sirtalis fitchi*). In limited instances, both may be found together with the mountain garter snake (*Thamnophis elegans elegans*), a subspecies of western terrestrial garter snake, in locations where this species' range extends to the floor of the Central Valley. The extent of competition among these species is unknown but, generally, differences in habitat use and foraging behavior allow their coexistence (C; USFWS 1999).

A.5.4 Species Distribution and Population Trends

A.5.4.1 Distribution

The current known distribution of giant garter snakes is variable, and extends from near Chico in Butte County south to the Mendota Wildlife Area in Fresno County. Occurrences of giant garter snakes are not known from the northern portion of the San Joaquin Valley north to the eastern fringe of the Sacramento-San Joaquin River Delta, where the floodplain of the San Joaquin River is limited to a relatively narrow trough (Hansen and Brode 1980; USFWS 1993). The resulting gap of approximately 100 kilometers (km) (62.3 miles) separates the southern and northern populations, with no giant garter snakes known from the lowland regions of Stanislaus County (California Natural Diversity Database [CNDDB] 2004; Hansen and Brode 1980). Scattered records within the Sacramento-San Joaquin River Delta suggest that giant garter snakes may have occupied this region at one time, but longstanding reclamation of wetlands for intense agricultural applications has eliminated most suitable habitat (CNDDB 2004; Hansen 1986). Recent records within the Sacramento-San Joaquin Delta are haphazard, and repeated surveys have failed to identify any extant population clusters in the region (Hansen 1986; Patterson and Hansen 2002; Patterson 2003). Recent occurrence records indicate that, within this range, garter snakes are distributed in 13 unique population clusters coinciding with historical flood basins, marshes, wetlands, and tributary streams of the Central Valley (Hansen and Brode 1980; Brode and Hansen 1992; USFWS 1999). These populations are isolated, without protected dispersal corridors to other adjacent populations, and are threatened by land use practices and other human activities, including development of wetland and suitable agricultural habitats.

One of these 13 extant giant garter snake populations, the northern Yolo Basin population is distributed along the northeastern edge of the Yolo Basin near the Sacramento River. Yolo County is well within the Central Valley proper and includes the floodplains of the Sacramento River as well as those of Cache, Willow, and Putah Creeks. Upon receding, these creeks may have provided the wetland habitat and prey utilized by giant garter snakes during the spring and summer active season. The historical distribution of giant garter snakes in Yolo County is unclear, however, with the majority of sightings made only in recent decades (Hansen 1986; CNDDB 2007).

Giant garter snakes are documented in two distinct concentrations along the eastern edge of Yolo County (CNDDB 2007; Hansen 2006, 2007a, 2008; Wylie et al. 2004; Wylie and Martin 2005; Wylie and Amarello 2006). The first concentration lies in the northeastern portion of Yolo County, northwest of Knights Landing and in the southern end of the Colusa Basin near Sycamore Slough and the Colusa Basin Drainage Canal. Wylie and Amarello (2006) report a population density in the Colusa Basin Drainage Canal of 20±3 snakes/km during 2006, falling within 2003 and 2004 confidence intervals, noting, however, that local distribution appears to have shifted away from areas formerly in rice production that have either been fallowed or converted to other crop types. The second concentration lies in the east-central portion of Yolo County, with records in the Yolo Bypass east of Conaway Ranch near the Tule Canal, the Willow Slough/Willow Slough Bypass from Conaway Ranch south to the Yolo Wildlife Area, the Davis Wetlands complex south of Conaway Ranch between the Willow Slough Bypass and the Yolo Bypass, the Yolo Wildlife Area along the east edge of the Yolo Bypass west levee, and the adjacent ricelands east of the Yolo Wildlife Area. Surveys conducted in 2005, 2006, and 2007 resulted in captures of 34, nine, and one unique individual(s), respectively, in the Yolo Wildlife Area; eight, 18, and eight unique individuals, respectively, in the adjacent ricelands; and 36 unique individuals (2007 only) in the Davis Wetlands complex (Hansen in. litt. 2006, 2007, 2008). Hansen (2006, 2007a, 2008) reports an even distribution within size classes, estimating local populations ranging from 8 ± 2.6877 (95 percent confidence interval (C.I.) = 7 to 20) to 57 ± 9.53 (95 percent C.I. = 45 to 84) in the Yolo Wildlife Area; 5 ± 0.4932 (95 percent C.I. = 5 to 5) to 17 ± 5.9655 (95 percent C.I. = 12 to 39) in the adjacent ricelands; and from 26 ± 21.2829 (95 percent C.I. = 11 to 120) to 67 ± 59.7094 (95 percent C.I. = 22 to 322) within the Davis Wetlands Complex (Hansen 2006, 2007a, 2008). Queries of the online databases of the California Academy of Sciences (2008) and Museum of Vertebrate Zoology (2008) yielded one additional occurrence record (CAS 178594) situated within downtown Davis; however, the stated location for this record (a frontage road one mile east of the Yolo Causeway) conflicts with the stated coordinates, leaving the true location unclear.

Evidence that giant garter snakes may once have been distributed throughout the easterly reaches of Yolo County is illustrated by reported sightings in portions of Solano County adjacent to Yolo County, in South Fork Putah Creek near Davis, and in the Liberty Farms region of the Yolo Basin. Repeated attempts to assess local distribution suggest that both the Liberty Farms and Putah Creek populations are probably extirpated (Hansen 1986; Wylie and Martin 2005; D. Kelly pers. comm.).

Genetic analyses of tissue samples collected from giant garter snakes in the Yolo Wildlife Area and adjacent ricelands are ongoing. Engstrom (2007) reports that the Yolo Basin population is genetically very similar to those of the Natomas and Middle American Basins, but that genetic diversity within the Yolo Basin is lacking, which is typical of recently colonized populations. Engstrom reports, however, that there appears to be very little gene flow between the Yolo Basin and neighboring populations, and that ongoing migration into the Yolo Basin is not significant.

A.5.4.2 Population Trends and Abundance Estimates

Prior to listing in 1971, giant garter snakes were known from 16 localities, representing nine distinct populations based on available literature and museum records (Hansen and Brode 1980; USFWS 1993). Range-wide status surveys of the giant garter snake conducted during the mid-1970s and 1980s indicate that they have been extirpated from the San Joaquin Valley south of Mendota in Fresno County, an area comprising as much as one-third of the snake's former range (Fitch 1940; Hansen and Brode 1980; Rossman and Stewart 1987; Stebbins 2003). Once plentiful in areas such as Mendota, Los Baños, and Volta, giant garter snakes are now known from only a small number of localities in the southern aspect of their range (USFWS 1999; Dickert 2003; Hansen 2007b). Giant garter snakes have not been documented from Burrell in Fresno County northward to Stockton since prior to 1980 and now appear to be most abundant in regions of the northern Sacramento Valley that are dominated by rice agriculture (USFWS 1993, 1999; CNDDB 2007).

Abundances and densities of giant garter snakes vary with context of habitat; they are lowest in managed seasonal marshes (dry in summer, flooded in winter for waterfowl habitat), greatest in natural marshes, and intermediate in rice fields (Wylie et al. 2011). In general, giant garter snakes select areas with a dense network of canals, often in close proximity to rice agriculture, with a low density of streams and close to open water and wetlands, compared to available environments in the Sacramento Valley (Halstead et al. 2010).

Most density estimates for giant garter snakes have been derived from linear trapping transects along canals, linear wetlands, or ecotones between deep water and upland habitat. Standard survey methodology for giant garter snake entails transects consisting of 50 floating aquatic funnel traps (Casazza et al. 2000) located along the open water/terrestrial or open water/emergent vegetation interface in areas of standing or slow-moving water and, where possible, emergent aquatic vegetation. Traps are spaced approximately 10 meters (33 feet) apart, resulting in traplines of approximately 500 meters (1,640 feet).

Lineal densities of individuals captured per transect (and extrapolated to lineal miles of habitat) can be converted into two-dimensional densities (snakes/acre) in two ways: First, the “area of influence” around a transect may provide a small-scale reference based on the spatial behavior of snakes (Wylie et. al 2010). Thus, a trapline is typically estimated to adequately sample the number of snakes present in an area of 100 meters on either side of the transect, or a total area of 200 meters by 500 meters = 100,000 square meters (approximately 25 acres). Thus, using the “area of influence” approach, snake densities reported per lineal mile are based on a total area of 80 acres.

Secondly, on a landscape scale, the density of the number of snakes captured along lineal structures (e.g., canals, shorelines) is derived from the overall density of conveyances per acre of surrounding habitat. Thus, the number of snakes per lineal mile is multiplied with the number of lineal miles of canal per acre of snake habitat. This measure is perhaps a more meaningful estimator for landscape and population-level measurements of giant garter snake densities in agricultural areas, where rice paddies and conveyance channels are both considered habitat. But such densities are more challenging to derive for more complex natural and restored wetlands, due to the contorted shoreline and the difficulty to delineate habitat in emergent marshes and wetlands.

Hansen and Brode (1993) estimated a local population size of 1,000 snakes per square mile (1.56 snakes per acre) of rice lands based on year-to-year mark recapture rates (U.S. Fish and Wildlife Service 1999). Giant Garter snake population densities (snakes per lineal mile of rice irrigation canal) in Yolo county ranged from 13 (95 percent C.I. = 11 to 32) to 92 (95 percent C.I. = 72 to 135) in the Yolo Wildlife Area; 8 (95 percent C.I. = 8 to 8) to 27 (95 percent C.I. = 19 to 63) in the adjacent ricelands; and from 42 (95 percent C.I. = 18 to 193) to 108 (95 percent C.I. = 35 to 518) within the Davis Wetlands Complex (Hansen in. litt. 2006, 2007, 2008). For the Colusa Drain and adjacent rice habitat, a mean density of 22.6 snakes per lineal mile of survey was determined for three consecutive years (Wylie and Amarello 2008). The U.S. Geological Survey (USGS) (Wylie et al. 2000a, 2000b, 2001, 2002, 2004) reported linear densities in selected trapping areas ranging from 13 (95 percent C.I. = 10–19) to 88 (95 percent C.I. not reported) giant garter snakes per linear mile from 1999 to 2003 in the Natomas Basin. Mean landscape-level densities of giant garter snakes reported from the Natomas Basin (all habitats combined) range from 5.1 to 22.7 giant garter snakes per linear mile (Table 1) and have fluctuated considerably among the years.

Table A-1. Giant Garter Snake Densities (Individuals Captured per Mile Surveyed) Reported in Rice and Other Wetland Habitats from Various Sites in the Sacramento Valley, 1999–2010

Location	Habitat	Individuals Captured	Miles	Individuals per Mile	Reference
Badger Creek (southern Sacramento County)	Natural wetlands	103	0.5	221.0	Wylie et al 2010
Colusa NWR	Managed wetlands	22	1.1	20.2	Wylie et al 2010
Colusa NWR	Restored wetlands				
Gilsizer Slough (Sutter County)	Rice	67	1.8	37.8	Wylie et al 2010
Colusa Drain (2003)	Rice	40	2.4	16.8	Wylie and Amarello 2008
Colusa Drain (2004)	Rice	24	2.4	10.0	Wylie and Amarello 2008
Colusa Drain (2006)	Rice	30	2.4	12.4	Wylie and Amarello 2008
Natomas Basin	Rice	141	4.1	34.1	Wylie et al 2010
Butte and Glenn Counties	Rice	28	3.5	7.5	Wylie et al. 2011
Natomas Basin Average (1999-2004)	All	NA	NA	22.7	Jones and Stokes 2005
Natomas Basin 2009	All	155	19. 3	8.0	Jones and Stokes 2010
Natomas Basin 2010	All	112	22.1	5.1	ICF 2011

Note:
NWR = National Wildlife Refuge.

In general, higher densities of snakes were recorded in linear drainage and irrigation features associated with rice, compared with managed or seasonal marsh habitats (ICF 2011). The availability of managed marsh habitat has been deemed important for giant garter snakes when they emerge from winter dormancy and begin feeding, dispersing, and mating – at which times rice fields and other aquatic habitats are not available (ICF 2011). Core home range size of radio-tagged female garter snakes (Valcarel et al. 2011) were smaller in rice habitats and overlapped considerably more, compared to those in restored wetlands in Gilsizer Slough (Sutter County).

A.5.4.3 Giant Garter Snake Habitat Types and Populations in the Yolo NHP Area

The NHP geospatial database was developed from the California Department of Fish and Wildlife (DFW) Wildlife Habitat Relationships (WHR) database, which identifies vegetation communities according to their function as habitat for the giant garter snake. Aquatic habitat availability is the primary determinant of giant garter snake abundance; therefore, this analysis only considers aquatic habitats as an obligate habitat prerequisite for the species. For the purpose of this analysis, and to facilitate the crosswalk of modeled habitat types with those reported in the literature (e.g., Wylie et al. 2010) aquatic habitat was categorized as follows:

Rice: Rice agriculture has become a major habitat for giant garter snakes in the Central Valley (Hansen and Brode 1993). Within the giant garter snake focal areas of the NHP Plan Area (i.e., Planning Units 11, 12, 13, and 19), rice land habitat is an important element of the species' life history. The primary giant garter snake habitat within rice lands are the conveyance channels and irrigation canals, which provide foraging and movement habitat and which ensure spatial connectivity of habitat and populations within the rice agricultural landscape. Studies indicate that despite the presence of ditches or drains, giant garter snakes will generally abandon aquatic habitat that is not accompanied by adjacent shallow-water wetlands or rice fields (Jones and Stokes 2008; Wylie et al. 2006). Giant garter snakes tend to expand their foraging activities from the canals and ditches into rice fields soon after the rice plants emerge above the water's surface, and they continue to use the fields until the water is drained during late summer or fall (Hansen and Brode 1993). During the winter period, banks along the ditches provide crucial hibernacula that are protected from flooding. Thus, within rice lands, a greater density of canals and irrigation structures is expected to support higher densities of giant garter snakes, due to a greater and more stable prey base and the presence of habitat refugia in times when some canals are dry or during maintenance events. In addition, complex habitat structure providing cover from predation and perhaps locally lower predation rates may also contribute to higher giant garter snake densities. Isolated patches of habitat containing small, discrete snake populations would likely result where this aquatic connectivity is lost.

Wylie et al (2011) provide the currently best available landscape-level estimates of giant garter snake density in rice-dominated agricultural areas, based on captures and recaptures at 44 transects along linear canals within rice fields and in managed wetlands in Butte and Glenn County from 2008 through 2010. To make the results of Wylie et al (2011) more applicable to the rice area in the Plan Area, the total density of snakes per lineal mile of canal habitat from all transects, including those that did not result in snake captures, was calculated. Density estimates ($\bar{x}$ =7.48, sd = 8.10, range = 0 to 19.65) were calculated from data provided by Wylie et al. (2011). These estimates are among the lowest estimates compared to other recent studies in adjacent areas (Table 1), but probably are realistic estimates for a large landscape area, since Wylie's et al. (2011) study included transects that did not yield captures. Wylie et al. (2011) established a lower confidence interval boundary of 0.2 snakes per ha (= 0.49 per acre) at the study site with the lowest overall density of snakes (excluding sites that had no snake captures), which translates into a low estimate of 6.34 snakes/mile for occupied sites. This estimate is also well within the range of data for giant garter snakes in Sacramento Valley (Table 1). An upper estimate of snake density was derived as the mean plus one standard deviation from Wylie et al. (2011). Thus, a high estimate of the area-wide density of snakes was calculated as ($\bar{x}$ + sd) = 15.58 snakes/mile. The distribution of giant garter snakes in the Plan Area is probably clumped and likely disjunct (Glenn Wylie, pers. comm.), with large areas of unoccupied habitat interspersed by patches of higher population densities. Such distributions have been related to historical (Paquin et al. 2006) and spatial dynamics of habitat manipulations and conveyance management (Hansen and Brode 1983). In addition, the presence and abundance of prey and non-native and native predators (e.g., bull frogs, predatory fish, egrets, and herons) may also affect the metapopulation structure of giant garter snakes in the Plan Area.

Based on 117 miles of drainage canals within rice lands in the Colusa Basin Subpopulation (Planning Units 12 and 13) and 32 miles in the Willow Slough/Yolo Bypass Subpopulation (Planning Units 11 and 19), and the conservative mean estimate of 7.48 snakes per lineal mile of canals, which takes into account currently unoccupied habitat, a total estimate of giant garter snakes for the 29,470 acres of riceland of the relevant Planning Units is 1,122 giant garter snakes, or 0.039 snakes per acre of rice. This density estimate compares well with the landscape level estimate of 0.41 snakes per acre derived from Wylie et al. (2010). Although the habitat model for giant garter snake also included irrigated croplands and seasonal managed wetlands, for the purpose of estimating snake population size, these habitat types were assumed not to provide year-round stable habitat and thus were not included for the calculation of a population estimate.

Seasonal/Managed Wetlands: Some of the emergent wetland types and vegetation associations in the Colusa Basin Subpopulation and the Willow Slough/Yolo Bypass Subpopulation are considered marginal habitat, as they are flooded primarily during winter only. Hence, they may not provide the warm water summer habitat for giant garter snake but rather lower-quality winter cold water foraging habitat and put snakes at risk in their winter hibernacula. Based on visual estimates from summer aerial imagery (September 2011), approximately 80 percent of the mapped seasonal wetlands are winter flooded, but considerable inaccuracies and resolution incongruence exist. No densities of giant garter snakes were assigned to these acreages because they are not expected to provide summer aquatic habitat for the species.

Summer Flooded/Perennial Wetlands: Wetlands that are flooded during summer or are perennial provide the highest quality habitat for giant garter snake. Since existing summer-flooded, perennial or natural wetlands could not be distinguished from the fresh emergent wetland data layer in the NHP geographic information system (GIS) database, it was necessary to estimate the proportion of summer flooded wetlands that potentially provide garter snake habitat functions. The percentage of habitat that is summer flooded managed/seasonal wetlands was identified by overlaying the NHP habitat GIS layer for managed wetlands and estimating the proportion in each parcel that could be considered summer flooded or perennial wetland from 2011 aerial imagery. Approximately 900 acres were considered summer flooded permanent or seasonal wetlands that may be expected to provide habitat functions for giant garter snake.

Only one local density estimate (i.e., 20.2 snakes/mile of transect) exists for giant garter snakes in managed wetlands from a study on the Colusa NWR, which was translated into a density of 0.25 individuals/acre (based on a 100 m buffer on each side of the transect as described by Wylie et. al 2011). Based on a density of 0.25 snakes per acre, the population estimate for the estimated summer flooded or perennial wetlands in the conservation focal areas is 900x.25 = 225 snakes.

Restored Wetlands: Wetlands restored specifically for giant garter snake habitat provide an opportunity to produce high densities of snakes. Ideally, these habitats function as natural perennial wetlands and provide year-round habitat function for the species. Studies of restored wetlands specifically as habitat for giant garter snake are only just beginning. Local density estimates for giant garter snakes in restored wetlands in the Colusa Wildlife Refuge range from 48 to 194 snakes per mile depending on the trapping location on the Refuge, similar to values in a previous year (87-169/mile) (Wylie et al. 2002). Framed by a minimum density estimate of 0.063 snakes/acre (or 5.8 snakes/mile) (ICF 2010, 2011) and a conservative maximum density value of 0.46 snakes/acre (37.6 snakes/mile) (Wylie et al. 2010), an average landscape-level density estimates from all studies (except natural wetlands) (Wylie 2010) results in a mean of 0.21 snakes/acre of restored wetland (sd=0.137), with a low to high estimate ($\bar{x} \pm sd$) of 0.073 to 0.348 snakes/acre.

A.5.4.4 Plan Area Population Estimate Summary

No systematic density evaluation or survey of giant garter snakes in the NHP Plan Area has been conducted to date. Thus, an estimate of a total population size of giant garter snakes cannot be derived based on systematic demographic studies. Instead, landscape-level densities observed in multiple studies were used to estimate population sizes, based on the acreage or spatial extent of the respective habitat type. Population estimation was separated by habitat type, based on the different observed densities of giant garter snakes in rice and seasonal/managed wetlands. The distribution of giant garter snake aquatic habitat types by Planning Unit and subpopulation is presented in Table 2, and resulting population estimates are presented in Table 3.

Table A-2. Acreage of Giant Garter Snake Aquatic Habitat

	Colusa Basin Subpopulation			Willow Slough/Yolo Bypass Subpopulation[a]			
Aquatic Habitat Type	**PU 12**	**PU13**	**Subtotal**	**PU11**	**PU19**	**Subtotal**	**Total**
Rice – miles of canals	113	4	117	28	4	32	149
Rice - acreage	20,045	1,592	21,637	6,535	1,298	7,833	29,470
Managed/seasonal wetland	840	3,063	3,903	587	0	587	4,490
Managed summer flooded and perennial wetlands	168	612.6	780.6	117.4	0	117.4	898
Total acreage	**20,885**	**4,655**	**25,540**	**7,122**	**1,298**	**8,420**	**33,960**

[a] Excluding the Yolo Bypass (Planning Units 17 and 18) within which no conservation actions are proposed by the Implementing Entity.

Table A-3. Giant Garter Snake Population Estimate by Subpopulation and Habitat Type

	Colusa Basin Subpopulation			Willow Slough/Yolo Bypass Subpopulation[a]			
Aquatic Habitat Type	**PU 12**	**PU13**	**Subtotal**	**PU11**	**PU19**	**Subtotal**	**Total**
Rice	845	30	875	209	30	239	1115
Managed/seasonal wetland – winter flooded	0	0	0	0	0	0	0
Managed summer flooded and perennial wetlands	42	153	195	29	0	29	225
Total number of snakes	**887**	**183**	**1,070**	**239**	**30**	**269**	**1,339**

[a] Excluding the Yolo Bypass (Planning Units 17 and 18) within which no conservation actions are proposed by the Implementing Entity.

A.5.5 Threats to the Species

Continued loss of wetland or other suitable habitat resulting from agricultural and urban development constitutes the greatest threat to this species' survival. Conversion of Central Valley wetlands for agriculture and urban uses has resulted in the loss of as much as 95 percent of historical habitat for the giant garter snake (Wylie et al. 1997). In areas where the giant garter snake has adapted to agriculture, maintenance activities such as vegetation and rodent control, bankside grading or dredging, and discharge of contaminates, threaten their survival (Hansen and Brode 1980; Brode and Hansen 1992; Hansen and Brode 1993; USFWS 1999; Wylie et al. 2004). Within agricultural areas, giant garter snakes are also threatened by fluctuations in the amount and locations of rice production, and by the conversion of rice lands to other crop types. Giant garter snakes are subject to mortality through loss or degradation of habitat; predation of juvenile giant garter snakes by introduced predators; elimination of giant garter snakes or prey species by pesticides and other toxins; road mortality; maintenance and modification of agricultural ditches, drains, and flood control systems; and flooding (Hansen 1986; USFWS 1999). Snakes remaining in rice fields are subject to threats from mechanical harvesting, including disrupted foraging, thermoregulating, or direct mortality; the extent of these threats is unknown (USFWS 2006). For many snake species, chemoreceptivity plays an integral role in habitat (Clark 2004) and mate selection (Shine et al. 2003; O'Donnell et al. 2004) in snakes' ability to navigate through their habitat, find overwintering sites, and locate mates. In developed areas, threats of vehicular mortality also are increased. Paved roads likely have a higher rate of mortality than dirt or gravel roads due to increased traffic and traveling speeds, and as many as 31 giant garter snake traffic mortalities have been reported during a four-year period in the Natomas Basin (Hansen and Brode 1993).

The loss of wetland habitat is compounded by elimination or compaction of adjacent upland and associated bankside vegetative cover, as well as water fouling; these conditions are often associated with cattle grazing (Thelander 1994). While cattle grazing and irrigated pastures may provide the summer water that giant garter snakes require, high stocking rates may degrade habitat by removing protective plant cover and underground and aquatic retreats such as rodent and crayfish burrows (Hansen 1986; USFWS 1999). Studies of wandering garter snakes (*Thamnophis elegans vagrans*) in Northern California have shown population numbers to be much higher in areas where grazing was excluded (Szaro et al. 1985). Radiotelemetry studies in perennial wetlands where grazing was differentially excluded show that giant garter snakes avoid areas where grazing is frequent (Hansen 2002). Cattle grazing may, however, provide an important function in controlling invasive vegetation that can compromise the overall value of wetland habitat (Hansen 2002).

Giant garter snakes are also threatened by the introduction of exotic species. Examinations of gut contents confirm that introduced bullfrogs (*Rana catesbeiana*) prey on juvenile giant garter snakes throughout their range (Treanor 1983; Dickert 2003; Wylie et al. 2003). While the extent of this predation and its effect on population recruitment is poorly understood, estimates based on preliminary data from a study conducted at Colusa National Wildlife Refuge suggests that 22 percent of neonate (newborn) giant garter snakes succumb to bullfrog predation (Wylie et al. 2003). Other studies of bullfrog predation on snakes have documented bullfrogs ingesting other species of garter snakes up to 80 centimeters (31.5 inches) long, resulting in a depletion of this size-class within the population (Bury and Wheelan 1984). Introduced predatory game fishes, such as black bass (*Micropterus* spp.), sunfish (*Lepomis* spp.), and channel catfish (*Ictalurus* spp.), prey on giant garter snakes and compete with them for smaller prey (Hansen 1988; USFWS 1993).

Selenium contamination and impaired water quality have been identified as a threat to giant garter snakes, particularly in the southern portion of their range (USFWS 1999). While little data are available regarding the effects of specific contaminants, the bioaccumulative properties of selenium in the food web have been well documented in the Kesterson National Wildlife Refuge area (Saiki and Lowe 1987; Ohlendorf et al. 1988; Saiki and May 1988; Saiki et al. 1991; USFWS 1999).

Recent findings demonstrate that giant garter snakes are extant within Yolo County (CNDDB 2007; Hansen 2006, 2007a, 2008; Wylie et al. 2003, 2004, 2006). However, little is known of their regional distribution or their population status throughout the remainder of Yolo County. While some estimates are available (e.g., Hansen and Brode 1993; Wylie et al. 2004), giant garter snake population sizes and densities are not well known throughout their range. Differential dispersal and home range patterns between males and larger females who spend the majority of the active season gestating young are not reported. Lifetime dispersal patterns of both neonates and adults of this species are unknown.

Until uncertainties regarding population structure, population dynamics, and the strength, frequency, and direction of environmental fluctuations and edge effects are resolved, it is impossible to establish population numbers as a delisting criterion for this species (USFWS 1999). Current criteria for assessing the species' status include the quality and distribution of available habitat and the presence of both young and adults, indicating a stable population structure within known populations (USFWS 1993, 1999).

Throughout the Central Valley, GIS modeling has been used to analyze microhabitat characteristics and suitability of aquatic and upland habitats for the giant garter snake (Hansen 2003). Modeling includes the use of 23 distinct habitat variables correlated with giant garter snake life history and ecological requirements. Data are maintained within a comprehensive database, which is updated in response to changes in land use or habitat management. Coverage currently includes all navigable waterways within California Department of Boating and Waterways Aquatic Weed Control Division's Water Hyacinth and *Egeria densa* Control Program service areas, spanning the Central Valley from the Port of Sacramento in Sacramento County south to the Mendota Pool area in Fresno and Madera Counties, and in select areas within Sacramento, Sutter, and Yuba Counties.

In the Central Valley, rice fields have become important habitat for giant garter snakes. Irrigation water typically enters the rice lands during April along canals and ditches. Giant garter snakes use these canals and their banks as permanent habitat for both spring and summer active behavior and winter aestivation. Where these canals are not regularly maintained, lush aquatic, emergent, and streamside vegetation develops prior to the spring emergence of giant garter snakes. This vegetation, in combination with cracks and holes in the soil, provides much-needed shelter and cover during spring emergence and throughout the remainder of the summer active period.

Rice is planted during spring, after the winter fallow fields have been cultivated and flooded with several inches of standing water. In some cases, giant garter snakes move from the canals and ditches into these rice fields soon after the rice plants emerge above the water's surface, and they continue to use the fields until the water is drained during late summer or fall (Hansen and Brode 1993). It appears that the majority of giant garter snakes move back into the canals and ditches as the rice fields are drained, although a few may overwinter in the fallow fields, where they hibernate within burrows in the small berms separating the rice checks (Hansen 1998).

While within the rice fields, the snakes forage in the shallow warm water for small fish and the tadpoles of bullfrogs and treefrogs. For shelter and basking sites, giant garter snakes utilize the rice plants, vegetated berms dividing the rice checks, and vegetated field margins. Gravid (pregnant) females may be observed within the rice fields during summer, and at least some giant garter snakes are born there (Hansen and Brode 1993; Hansen 1998). Suitability of rice fields for giant garter snakes may vary by crop type. Wild rice species (e.g., *Zizania* spp.) may reach 5 to 6 feet in height, obscuring sunshine and limiting opportunities for snakes to thermoregulate. White or brown rice species are shorter in stature, providing superior basking opportunities.

Water is drained from the fields during late summer or fall by a network of drainage ditches. These ditches are sometimes routed alongside irrigation canals and are often separated from the irrigation canals by narrow vegetated berms that may provide additional shelter. Drainage typically occurs one month prior to harvest for white or brown rice and two to three weeks prior to harvest for wild rice crops (D. Sills pers. comm.). Remnants of old sloughs also may remain within rice-growing regions, where they serve as drains or irrigation canals. Giant garter snakes may use vegetated portions along any of these waterways as permanent habitat. Studies indicate that despite the presence of ditches or drains, giant garter snakes will generally abandon aquatic habitat that is not accompanied by adjacent shallow-water wetlands (Hansen 2008, Jones and Stokes 2008, Wylie et al. 2006), underscoring the important role that this crop plays in this species' life history.

Central Valley wetland conservation occurs through a combination of both public and privately managed refuges, mitigation banks, and duck clubs, creating a large network of wetland preserves throughout the historical range of the giant garter snake. A large percentage of these wetland conservation efforts, however, are geared toward waterfowl management, often placing greater emphasis on winter water rather than the summer water upon which giant garter snakes depend (G. Hansen pers. comm.; USFWS 1999). With proper consideration given to design, location, and management, these efforts might also significantly benefit the giant garter snake and other wetland-dependent species (USFWS 1999).

Under the 1999 *Draft Recovery Plan for the Giant Garter Snake* (*Thamnophis gigas*), initiation of the delisting process is anticipated by 2028, given that defined recovery criteria are adequately met. To accomplish the recovery of this species, the U.S. Fish and Wildlife Service emphasizes habitat protection; public participation, outreach, and education; habitat management and restoration; surveying and monitoring; and continued research (USFWS 1993).

A.5.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.5.3, *Habitat Requirements and Ecology* (Figure A-5). The model parameters were limited to regions east of Highway 113 and Interstate 5 and include the following.

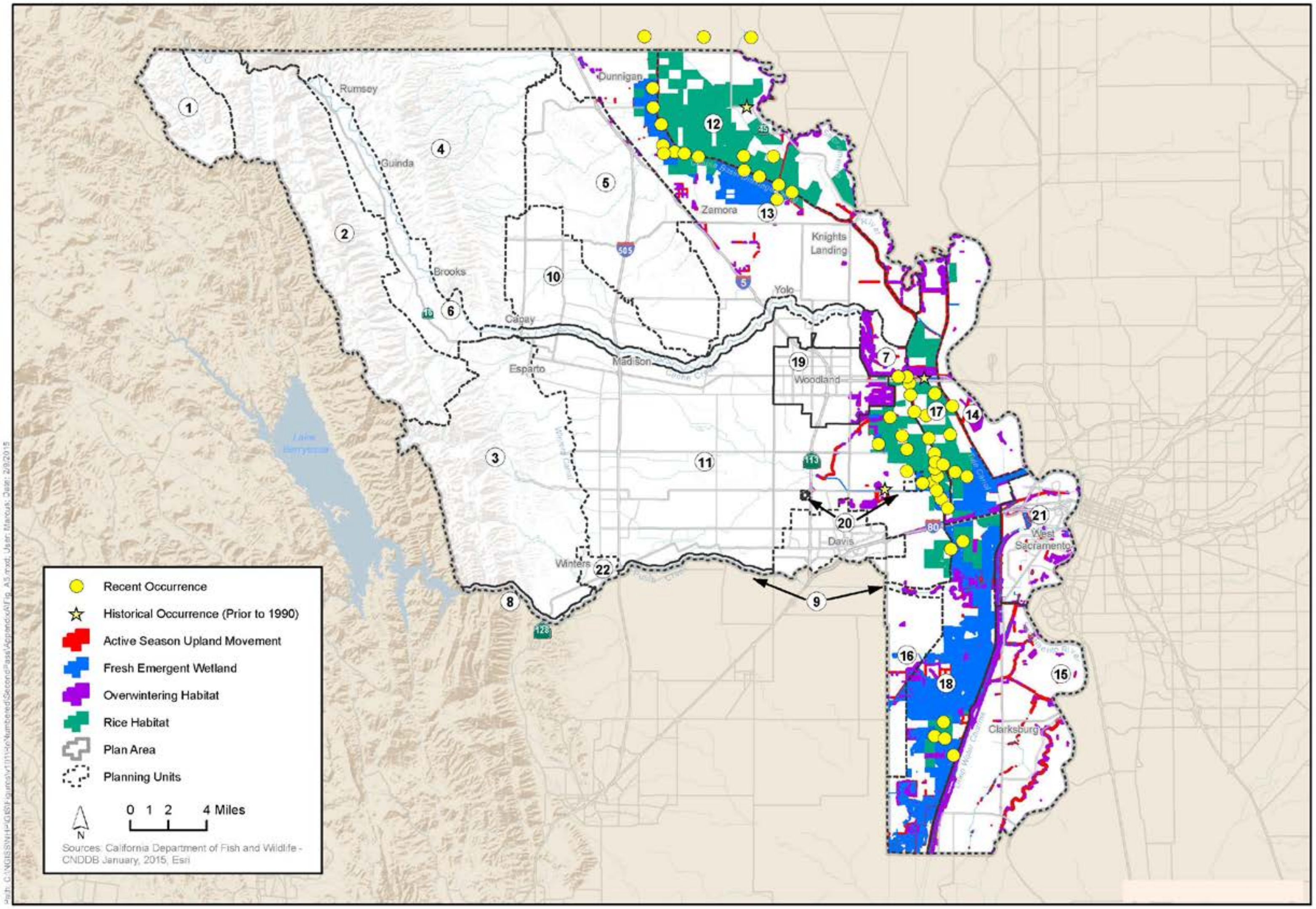
- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., California Natural Diversity Database [CNDDB]; U.S. Geological Survey; Eric Hansen).
- Rice Habitat: Based on the known distribution of giant garter snake within the Plan Area (Figure A-19). This habitat includes all mapped rice land that occur east of Highway 113 and east of Interstate 5 from its junction with Highway 113. Mapped rice land includes associated water conveyance channels.
- Fresh Water Emergent Habitat: Based on the known distribution of giant garter snake within the Plan Area (Figure A-19) this habitat includes all mapped fresh emergent wetland that occurs east of Highway 113 and east of Interstate 5 from its junction with Highway 113. Freshwater emergent habitat is generally seasonal or managed wetlands that may support inclusions of perennial wetland.
- Active Season Upland Movement: This habitat includes all potentially suitable active season upland movement habitat adjacent to modeled rice, open water, and fresh emergent wetland land cover types with the potential to provide basking and short-term refuge. This habitat was modeled by selecting all natural vegetation types that occur within 200 feet of modeled rice and fresh emergent wetland land cover types (Hansen 1986; Wylie et al. 1997; USFWS 1999). Note

that if habitat in this category remains outside the winter flood zone it may also be used for overwintering.

- Overwintering Habitat: This habitat includes all potentially suitable overwintering habitat outside of the active season upland movement habitat that may provide long-term refuge during the winter. This habitat was modeled by selecting all natural vegetation types that occur between 200 feet and 820 feet from modeled rice and fresh emergent wetland land cover types (Hansen 1986, Wylie et al. 1997, USFWS 1999).

- Aquatic Habitat: This habitat type includes all aquatic features that might be used by the giant garter snake. This habitat was modeled by selecting all open water features that occur east of Highway 113 and east of Interstate 5 from its junction with Highway 113. Larger water features including Cache and Putah Creeks, the Sacramento River, and the Deep Water Channel were excluded along with water features surrounded by development without surrounding upland habitat. (Hansen 1986, Wylie et al. 1997, USFWS 1999).

Figure A-5. Giant Garter Snake Modeled Habitat and Occurrences



A.6 Swainson's Hawk (*Buteo swainsoni*)

A.6.1 Listing Status

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Federal: Bird of Conservation Concern (U.S. Fish and Wildlife Service [USFWS] 2008).

State: Threatened.

Recovery Plan: None.

A.6.2 Species Description and Life History

Swainson's hawk (*Buteo swainsoni*) is a long-winged, medium-sized soaring raptor, (48 to 56 centimeters [19 to 22 inches] and 693 to 1367 grams [24.46 to 48.26 ounces]) that nests and roosts in large trees in flat, open grassland or agricultural landscapes. Females average larger than males, but there are no distinguishing plumage characteristics for separating the sexes.

Swainson's hawk is characterized by its long, narrow, and tapered wings held in flight in a slight dihedral shape. The body size is somewhat smaller, thinner, and less robust than other *Buteos*, although the wings are at least as long as other *Buteos*. This body and wing shape allows for efficient soaring flight and aerial maneuverability, important for foraging, which Swainson's hawks do primarily from the wing, and during courtship and inter-specific territorial interactions.

There are three definitive plumage morphs: light, rufous, and dark. However, there are numerous intermediate variations between these plumage morphs. The two most distinguishing plumage characteristics are a dark breast band and the contrasting darker flight feathers and lighter wing lings on the underwings, giving most individuals a distinctive bicolored underwing pattern. These characteristics are most pronounced in lighter morph birds and become less so as the plumage darkens, and are indistinguishable in the definitive dark morph, which is completely melanistic. All three definitive plumage morphs are present in the Central Valley with a relatively large proportion of the population categorized as intermediate morph, with varying amounts of streaking or coloration in the belly and wing linings.

A.6.2.1 Seasonal Patterns

Swainson's hawks arrive on their breeding grounds in the Central Valley from early March to early April. The breeding season extends through mid-to-late August, when most young have fledged and breeding territories are no longer defended. By late August pre-migratory groups begin to form. The fall migration begins early- to mid-September. By early October, most Swainson's hawks have migrated out of the Central Valley. Central Valley Swainson's hawks winter from Central Mexico, to northern and central South America (Bradbury et al. in preparation). This differs from what is known about the migratory pattern and wintering grounds of Swainson's hawk populations outside of the Central Valley, most of which take a different migratory route and winter entirely in southern

South America, with the largest wintering populations known to occur in northern Argentina (England et al. 1997).

A.6.2.2 Reproduction

Swainson's hawks exhibit a high degree of nest site fidelity, using the same nests, nest trees, or nesting stands for many years (England et al. 1997). Pairs are monogamous and may maintain bonds for many years (England et al. 1997). Immediately upon arrival onto breeding territories, breeding pairs begin constructing new nests or repairing old ones. One to four eggs are laid in mid- to late April followed by a 30- to 34-day incubation period. Nestlings begin to hatch by mid-May followed by an approximately 20-day brooding period. The young remain in the nest until they fledge in 38 to 42 days after hatching (England et al. 1997). Studies conducted in the Sacramento Valley indicate that one or two, and occasionally three, young typically fledge from successful nests (Estep in preparation). The rate of young fledged per nest in the Central Valley is among the lowest recorded in the entire species range. This geographic difference in reproductive success may be related to the reliance on small voles that may not meet the high energetic demands of breeding adults and developing young compared to the diets that include a higher proportion of gophers, rabbits, ground squirrels and other larger mammals consumed in other locations (S. England pers. comm.). In Yolo County, fledging rates ranged from 1.15 to 1.96 young per successful nest from 1988 to 2000 (Table 1) (Estep in preparation).

After fledging, young remain near the nest and are dependent on the adults for about four weeks, after which they permanently leave the breeding territory (Anderson et al. in preparation).

A.6.2.3 Home Range/Territory Size

Home ranges are highly variable depending on cover type, and fluctuate seasonally and annually with changes in vegetation structure (e.g., growth, harvest) (Estep 1989; Woodbridge 1991; Babcock 1995). Smaller home ranges consist of high percentages of alfalfa, fallow fields, and dry pastures (Estep 1989; Woodbridge 1991; Babcock 1995). Larger home ranges were associated with higher proportions of cover types with reduced prey accessibility, such as orchards and vineyards, or reduced prey abundance, such as flooded rice fields. Swainson's hawks regularly forage across a very large landscape compared with most raptor species. Data from Estep (1989) and England et al. (1995) indicate that it remains energetically feasible for Swainson's hawks to successfully reproduce when food resources are limited around the nest and large foraging ranges are required. Radio-telemetry studies indicate that breeding adults in the Central Valley routinely forage as far as 30 kilometers (km) (18.7 miles) from the nest (Estep 1989; Babcock 1995).

Home ranges (calculated as minimum convex polygons) for 12 Swainson's hawks in the Central Valley, including six in Yolo County, averaged 27.6 square kilometers (km^2)(10.7 square miles [mi^2]) (range: 3.36 to 87.18 km^2 [1.3 to 33.7 mi^2) (Estep 1989). Using similar methods, four Swainson's hawks in West Sacramento averaged 40.5 km^2 (15.6 mi^2) (range: 7.2 to 76.6 km^2 [2.8 to 29.6 mi^2]), and included fields planted in grain, alfalfa, tomatoes, and safflower, as well as fallow fields (Babcock 1995).

Swainson's hawks in the central region of the Central Valley (including Yolo County) had the shortest distances between nests of those reported in England et al. (1997); on average, nests were 1.14 km (0.7 miles) apart (Estep 1989). Nesting density in the Central Valley was calculated at 30.2 pairs/100 km^2 (11.7 pairs/100 mi^2) (range: 21.4 to 39.1 km^2; [8.3 to 15.1 mi^2]) (England et al.

1995). This high nest density was attributed to widely available, uniformly distributed optimal foraging habitat and relatively abundant nesting sites along narrow riparian corridors, farm shelterbelts, roadside trees, remnant groves, and isolated trees. Results from a 2007 baseline survey of nesting Swainson's hawks in Yolo County indicate a nesting density within the survey area (excluding the higher elevation portions of the county of 98 pairs/100 km^2 (37.8/100 mi^2), the highest nesting density reported for this species (Estep 2008).

A.6.2.4 Foraging Behavior and Diet

Swainson's hawks hunt primarily from the wing, searching for prey from a low-altitude soaring flight, 30 to 90 meters (98.4 to 295.2 feet) above the ground and attack prey by stooping toward the ground (Estep 1989). This species is also highly responsive to farming activities that expose and concentrate prey, such as cultivating, harvesting, and disking. During these activities, particularly late in the season, Swainson's hawks will hunt behind tractors searching for exposed prey. Other activities, such as flood irrigation and burning, also expose prey and attract foraging Swainson's hawks.

In the Central Valley, Swainson's hawks feed primarily on small rodents, usually in large fields that support low vegetative cover (to provide access to the ground) and high densities of prey (Bechard 1982; Estep 1989). These habitats include hay fields, grain crops, certain row crops, and lightly grazed pasturelands. Fields lacking adequate prey populations (e.g., flooded rice fields) or those that are inaccessible to foraging birds (e.g., vineyards and orchards) are rarely used Estep 1989; Babcock 1995; Swolgaard 2004).

Meadow vole (*Microtus californicus*) is the principal prey item taken by Swainson's hawks in the Central Valley (Estep 1989). Pocket gopher (*Thomomys bottae*) is also an important prey item. Other small rodents, including deer mouse (*Peromyscus californicus*) and house mouse (*Mus musculus*) are also taken along with a variety of small birds, reptiles, and insects.

During late summer, the diet of post-breeding adults and juveniles includes an increasing amount of insects, including grasshoppers and dragonflies. Dragonflies may constitute a major proportion of the diet of post-breeding and migrant birds. In the Central Valley during summer, dragonfly species that swarm in large numbers and that are a potentially important, abundant food source are common green darner (*Anax junius*), spot-winged glider (*Pantalahy hymenaea*), and wandering glider (*Pantala flavescens*). In alfalfa and corn crops in Idaho, post-breeding flocks also forage primarily on grasshoppers (Johnson et al. 1987). Dragonflies are also the primary prey for wintering birds in Argentina (Jaramillo 1993).

Following their arrival back on the breeding grounds, Swainson's hawks again shift their diet to include larger prey such as small rodents, rabbits, birds, and reptiles (England et al. 1997). This shift to a higher quality diet is prompted by the nestlings' nutritional demands during rapid growth and the adults' high energetic costs of breeding.

A.6.3 Habitat Requirements and Ecology

A.6.3.1 Nesting

Throughout much of its range, both in North and South America, the Swainson's hawk inhabits grasslands, prairies, shrub-steppes, and agricultural landscapes, including dry and irrigated row crops, alfalfa and hay fields, pastures, and rangelands. They nest in trees most often in riparian woodlands and farm shelterbelts (England et al. 1997), as well as in urban/suburban areas with large trees adjacent to suitable foraging habitat (England et al. 1995; James 1992). Suitable nest trees are usually deciduous and tall (up to 30.48 meters [100 feet]); but in suburban/urban areas, most nest trees are conifers (England et al. 1997; England et al. 1995). Nests are built of sticks sometimes several feet in diameter. They are generally placed in the uppermost and outermost branches that will support the nest, often in mistletoe clumps (England et al. 1997).

In the Central Valley, Swainson's hawks usually nest in large native trees such as valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*), walnut (*Juglans hindsii*), and willow (*Salix* spp.), and occasionally in nonnative trees such as eucalyptus (*Eucalyptus* spp.). Nests occur in riparian woodlands, roadside trees, trees along field borders, isolated trees, small groves, and on the edges of remnant oak woodlands. Stringers of remnant riparian forest along drainages contain the majority of known nests in the Central Valley (Estep 1984; Schlorff and Bloom 1984; England et al. 1997). This appears to be a function of nest tree availability, however, rather than dependence on riparian forest. Nests are usually constructed as high as possible in the tree, providing protection to the nest as well as visibility from it.

Tables 1 and 2 indicate the nesting habitat results from the 2007 baseline survey (Estep 2008). Riparian habitat was the most frequently used nesting habitat type, followed by roadside tree rows, isolated trees, and rural residential trees. Valley oak (*Quercus lobata*) was the most frequently used nest tree species, followed by Fremont cottonwood (*Populus fremontii*), walnut (*Juglans hindsii*), willow (*Salix* spp.), and eucalyptus trees (*Eucalyptus* spp.).

Table A-4 Nesting Habitat Associations of Swainson's Hawk Territories in the Yolo County Study Area, 2007

Nesting Habitat Type	Number of Territories	Percent of Total
Riparian (natural)	106	36.6
Roadside Tree Row	39	13.4
Riparian (channelized)	36	12.4
Isolated Tree	32	11.0
Rural Residential	26	9.0
Tree Row	19	6.6
Isolated Roadside Tree	15	5.2
Eucalyptus Grove	6	2.1
Oak Grove	4	1.4
Urban	3	1.0
Cottonwood Grove	1	0.3
Savanna	1	0.3
Farmyard	1	0.3
Mixed Grove	1	0.3
Total	**290**	**100**

Table A-5. Nest Tree Species used by Nesting Swainson's Hawks in the Yolo County Study Area, 2007

Tree Species	Number of Active Nest Sites	Percent of Total
Valley Oak	101	35.7
Cottonwood	76	26.9
Walnut	33	11.7
Willow	32	11.3
Eucalyptus	26	9.2
Pine	7	2.5
Locust	4	1.4
Redwood	2	0.7
Sycamore	2	0.7
Total	**283**	**100**

A.6.3.2 Foraging

Swainson's hawks are essentially plains or open-country hunters, requiring large areas of open landscape for foraging. Historically, the species used the grasslands of the Central Valley and other inland valleys, and valley oak savanna with and understory of *Elymus triticoides*. With substantial conversion of these grasslands to farming operations, Swainson's hawks have shifted their nesting and foraging into those agricultural lands that provide low, open vegetation for hunting and high rodent prey populations.

Foraging habitat value is a function of patch size (i.e., Swainson's hawks are sensitive to fragmented landscapes; use will decline as suitable patch size decreases), prey accessibility (i.e., the ability of hawks to access prey depending on the vegetative structure), and prey availability (i.e., the abundance of prey populations in a field). In the Central Valley, agricultural land use or specific crop type determines the foraging value of a field at any given time. Cover types were evaluated by Estep (1989) and ranked based on these factors. However, suitability ranking is based on a variety of site-specific issues and at a landscape level should be characterized only on a general basis. On a site-specific level – important for land management purposes to maximize foraging value – individual cover types can be assessed based on site-specific and management conditions.

Important land cover or agricultural crops for foraging are alfalfa and other hay, grain and row crops, fallow fields, dryland pasture, and annual grasslands. The matrix of these cover types across a large area creates a dynamic foraging landscape as temporal changes in vegetation results in changing foraging patterns and foraging ranges.

Hay crops, particularly alfalfa, provide the highest value because of the low vegetation structure (high prey accessibility), relatively large prey populations (high prey availability), and because farming operations (e.g., weekly irrigation and monthly mowing during the growing season) enhance prey accessibility. Most row and grain crops are planted in winter or spring and have foraging value while the vegetation remains low, but become less suitable as vegetative cover and density increases. During harvest, vegetation cover is eliminated while prey populations are highest, significantly enhancing their suitability during this period. Some crop types, such as rice, orchards, and vineyards, provide little to no value because of reduced accessibility and relatively low prey populations.

A.6.4 Species Distribution and Population Trends

A.6.4.1 Distribution

In North America, Swainson's hawks nest in the grassland plains and agricultural regions from southern Canada (and possibly in the northern provinces and territories, and Alaska) to northern Mexico. Other than a few documented small wintering populations in the United States (Herzog 1996; England et al. 1997), the species winters primarily in the Pampas region of Argentina. The Central Valley population winters between Mexico and central South America (Bradbury et al. in preparation).

Early accounts described Swainson's hawk as one of the most common raptors in California, occurring throughout much of lowland the portions of the state (Sharp 1902). Since the mid-1800s, native habitats that supported the species have undergone a gradual conversion to agricultural or urban uses. Today, native grassland habitats are virtually nonexistent in the state, and only remnants of the once vast riparian forests and oak woodlands still exist (Katibah 1983). While the species has successfully adapted to certain agricultural landscapes, this habitat loss has caused a substantial reduction in the breeding range and in the size of the breeding population in California (Bloom 1980; England et al. 1997). Current breeding populations occur primarily in the Central Valley, but also in the Klamath Basin, the northeastern plateau, Owens Valley, and rarely in the Antelope Valley (Grinnell and Miller 1944; Bloom 1980; Garrett and Dunn 1981). The bulk of the Central Valley population resides in Yolo, Sacramento, Solano, and San Joaquin Counties.

In Yolo County, the species is distributed throughout the low elevation agricultural region east of the Interior Coast Range. Closely associated with agricultural cover type, the distribution of the species generally follows the pattern of hay, grain, and row crops. The majority of nesting pairs occur from several miles north of Woodland south to Putah Creek and east to the Sacramento River. Fewer pairs occur in the predominantly rice growing region in the northeastern portion of the county, in the orchard region in the northwest and southwest portions of the county, and the wetland-dominated areas of the southern panhandle. They generally avoid scrub, chaparral, savannah, or oak-dominated habitats in the western portion of the county. The highest nesting concentrations are north of Woodland to County Road 12; along oak and cottonwood-dominated riparian corridors such as Willow Slough, Putah Creek, and the Sacramento River; and between Davis and Woodland, and west to approximately Interstate 505 and east to the Sacramento River (Estep 2008).

A.6.4.2 Population Trends

Swainson's hawk populations have declined in California, Utah, Nevada, and Oregon (England et al. 1997). Populations in other western states are considered stable. Bloom (1980) reported a statewide estimate of 375 breeding pairs. This was followed by estimates of 550 (California Department of Fish and Game [DFG] 1988) in the late 1980s and 800 to 1,000 breeding pairs in the late 1990s (Swainson's Hawk Technical Advisory Committee 1999). However, none of these estimates was generated using a statistically based statewide survey effort and would be considered less credible than the results of a more statistically valid approach. The most recent statewide population estimate for California is 2,081 breeding pairs (Anderson et al. 2006) and is based on a statistically valid statewide survey effort conducted in 2005 and 2006. While this estimate is higher than the original statewide estimate that led to the state listing of the species (Bloom 1980) and subsequent estimates through the 1980s and 1990s, it represents a substantial decline (50–90 percent) of the historical statewide breeding population in California (Bloom 1980).

Baseline surveys conducted in 2007 located a total of 290 active breeding territories in Yolo County (Estep 2008). This was the first comprehensive baseline of this species in the County, and thus cannot be used to assess a trend in the number of breeding pairs in the County. However, based on the results of a long-term population study conducted in Yolo County since the mid-1980s (Estep in preparation), there appears to have been an upward trend in the number of breeding pairs (Table 3). While this may be at least partially attributed to increasing observer detection skill in the early years of the study, this local population appears to be at least stable with respect to the number of breeding pairs. Whether or not this population is stable based on productivity and recruitment is undetermined.

Table A-6. Swainson's Hawk Activity Data: Yolo County Study Area 1988–2000[a]

Year	Active Territories	Nesting Pairs	Successful Nests	Number of Young	Fledging Rate per Successful Nest
1988	55	48	46	62	1.34
1989	71	61	60	90	1.50
1990	85	72	70	118	1.69
1991	108	95	83	122	1.45
1992	122	110	94	136	1.45
1993	101	80	68	105	1.54
1994	137	128	110	188	1.70
1995	140	110	83	110	1.33
1996	139	101	75	107	1.43
1997	125	78	66	92	1.39
1998	158	103	27	31	1.15
1999	131	127	71	139	1.96
2000	136	126	69	102	1.48

[a] From Estep, J. A. In preparation. Ecology of the Swainson's Hawk in the Central Valley of California.

A.6.5 Threats to the Species

Swainson's hawks face different threats in different portions of their range. In California, causes of population decline are thought to be loss of nesting habitat (Schlorff and Bloom 1984) and loss of foraging habitat to urban development and to conversion to unsuitable agriculture such as orchards and vineyards (England et al. 1997; England et al*.* 1995). Nestlings are vulnerable to starvation and fratricide (i.e., the larger nestling killing the smaller nestling in times of food stress); predation from other raptors, crows, and ravens cause significant nestling losses. Natural population cycles of voles in central California may be a major factor in reproductive success where vole population crashes suppress reproduction or lead to increased starvation rates of nestlings (J. Estep pers. comm.). In addition, insecticides and rodenticides may contribute to these rates by reducing prey abundance. There is little evidence that adult Swainson's hawks are killed by natural predators, but collisions with moving vehicles and illegal shooting and trapping have been identified as sources of mortality (England et al. 1997).

Well-documented mass poisoning of hundreds or thousands of Swainson's hawks wintering in Argentina (Woodbridge et al. 1995; Goldstein et al. 1996) have led to that country's ban of an insecticide (organophosphate monocrotophos) used on alfalfa and sunflower fields to control grasshopper populations. Levels of dichlorodiphenyldichloroethylene (DDE), a breakdown product of DDT, in Swainson's hawks from the Central Valley may have been high enough to negatively affect reproductive success during the decades when it was used extensively in the United States. However, levels of DDE measured in eggs collected in 1982–1983 were not considered high enough to indicate a health threat (Risebrough et al. 1989).

Where populations are limited by inadequate nesting and foraging habitat, the most effective approach for Swainson's hawk conservation may be in management of agricultural landscapes (Smallwood 1995). Nesting density is greatest in cultivated areas where tree density (Schmutz 1984) and prey availability (Bechard 1982) are highest. Alfalfa fields are among the more valuable foraging habitats in California, even when compared with nonagricultural areas. However, valuable prey species such as pocket gophers (*Thomomys* spp.) and other small mammals may be exterminated in such fields (Smallwood 1995). While agricultural areas may benefit these hawks, fully realizing the conservation potential of cultivated areas to Swainson's hawks will be impaired when prey populations are controlled by means of poisons. Maintenance of critical prey populations is necessary to attain the full benefits of alfalfa fields and other agricultural crops to Swainson's hawks (Smallwood 1995).

In contrast to some agricultural landscapes, Swainson's hawks are absent from or are in very low densities in large expanses of annual grasslands in the Central Valley (Detrich 1996 cited in Woodbridge 1998). These grasslands have high densities of nocturnal, burrowing rodents that are rarely available as prey to Swainson's hawks and have low densities of voles (*Microtus* spp.) and pocket gophers that the hawks prefer (Woodbridge 1998). Because voles are active during the day and live among vegetation, they are especially accessible and important prey for hawks. Restoring perennial grasslands and promoting agriculture that supports high densities of voles and pocket gophers would create or enhance foraging habitat and could potentially expand Swainson's hawk distribution in Yolo County.

Many populations of prey species, especially voles, mice and insects, fluctuate due to annual, seasonal, and local geographic variations in rainfall, predation pressures, natural population cycles, and agricultural practices, including changing crop types, harvesting, applying rodenticides and insecticides, flood irrigating, and disking. The timing of harvesting and disking also strongly affects prey abundance (Woodbridge 1998). The importance of crop types for foraging habitat rest on two variables: abundance of voles and other important prey, and amount of vegetative cover that affects access to prey (Estep 2009). Alfalfa is an important habitat because although it supports lower populations of voles, the amount of vegetative cover is not sufficient to provide much protection to voles from foraging hawks. Tomato and beets fields, in contrast, support high populations of voles, but their higher vegetative cover provides better protection for voles, thereby decreasing those habitats' value. Furthermore, as crops mature, their protective cover for rodents increases, making prey less available to hawks (Bechard 1982; Woodbridge 1998; Estep 2009). In agricultural landscapes, prey abundance and accessibility to hawks continuously change through the breeding season. All of these factors play major roles in reproductive success (J. Estep pers. comm.). To reduce negative effects on regional populations, large areas of optimal foraging habitats should be preserved or managed for populations of Swainson's hawks and their prey (DFG 1994). Better understanding of the dynamics and processes of how agricultural practices affect these populations on a landscape level would help to guide conservation planning.

In areas with suitable foraging habitat that lack Swainson's hawks, surveys of potential nest trees should be conducted to assess whether the hawk population is limited by lack of suitable nest trees. Also, the relationship between Swainson's hawks and locally breeding red-shouldered hawks, red-tailed hawks, and great horned owls should be studied to determine whether competition for nest trees and prey are negatively affecting the Swainson's hawk population or distribution in Yolo County.

A.6.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.6.3, *Habitat Requirements and Ecology* (Figure A-6). The model parameters include the following.

Nesting Habitat: This modeled habitat type includes all potentially suitable nesting habitat and was modeled by selecting all mapped vegetation types as listed below that occur below an elevation of 350 feet outside of Planning Units 3 and 4 (Hofmann pers. comm.). In addition, all remnant woody vegetation outside of blue oak woodland and blue oak foothill pine occurring in isolated patches or isolated trees in agricultural fields or field borders (Tuil 2008) outside of Planning Units 3 and 4 below an elevation of 350 feet were included as potential nesting habitat to the extent that they were mapped. The majority of isolated trees and roadside and field border trees, which are commonly used as Swainson's hawk nest trees, were not mapped and thus the extent and distribution of potential nesting habitat is underestimated. The elevation limit was based on the elevational extent of potential nesting habitat in the Plan Area.

- Eucalyptus
- Valley Oak Woodland
- Fremont Cottonwood – Valley Oak – Willow (Ash – Sycamore) Riparian Forest Not Formally Defined (NFD) Association
- Great Valley Valley Oak Riparian Association
- Mixed Fremont Cottonwood – Willow spp. NFD Alliance
- Mixed Willow Super Alliance
- Valley Oak – Fremont Cottonwood – (Coast Live Oak) Riparian Forest NFD Association
- Valley Oak Alliance –Riparian
- White Alder (Mixed Willow) Riparian Forest NFD Association
- Undifferentiated Riparian Woodland/Forest
- Agricultural Foraging Habitat: This modeled habitat type includes all of the annually cultivated irrigated cropland and semi-perennial hay crops (e.g., alfalfa) listed below that occur at an elevation of 500 feet or lower. While there is a high degree of variability in the suitability of these agricultural crop types, because they rotate annually or periodically, field-level value changes across the landscape each year.
    - All Field Crops
    - All Grain/Hay Crops
    - Pasture (alfalfa)

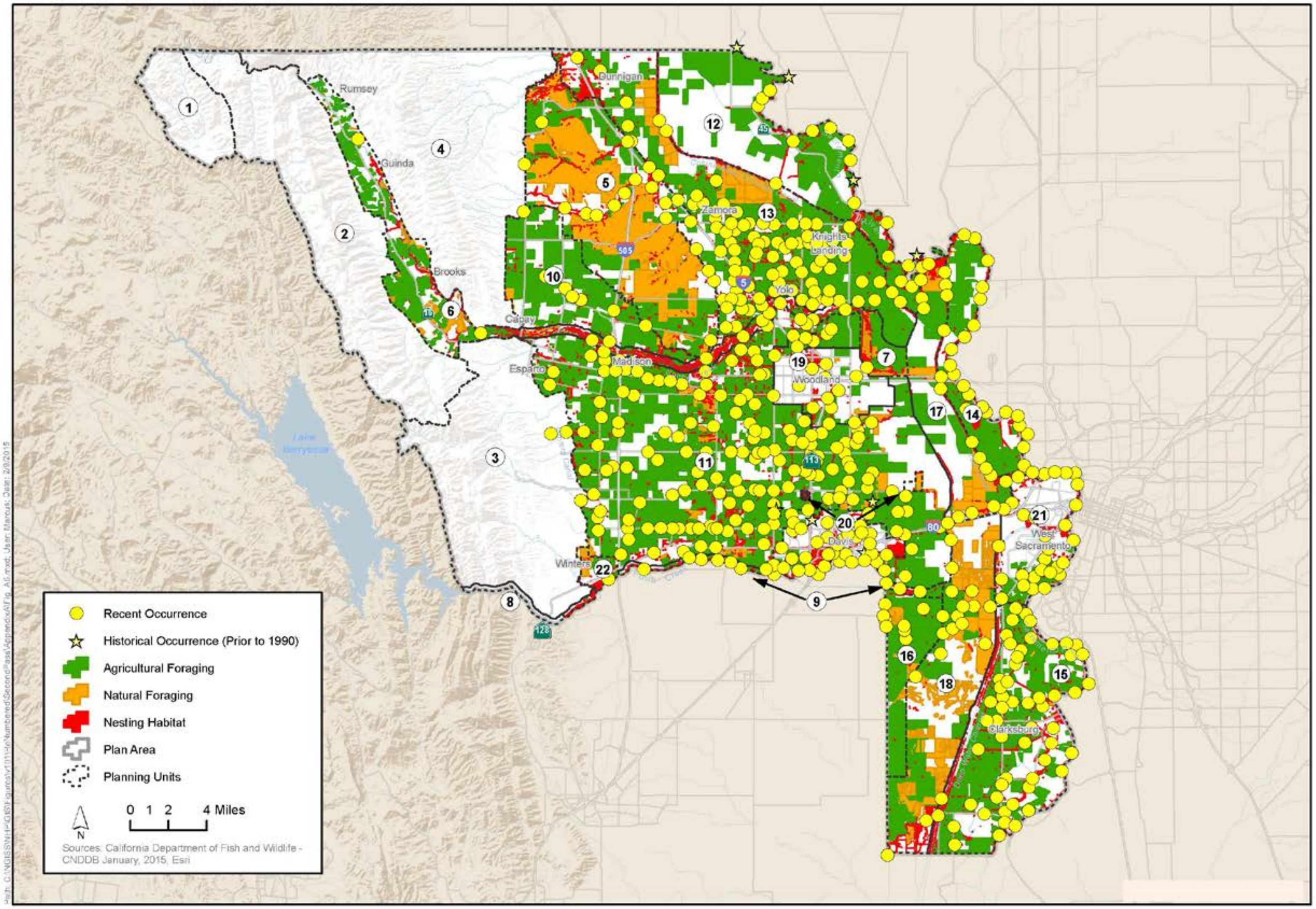
  - Native Pasture
  - Miscellaneous Grasses
  - Mixed Pasture
  - All Truck and Berry Crops
- Natural Foraging Habitat: This modeled habitat type includes the uncultivated grassland and seasonal wetland land cover types listed below that occur at an elevation of 500 feet or lower. These land cover types generally produce less available microtine prey due to dryer conditions or periodic inundation. While suitable foraging habitat, these types are expected to be used less frequently than cultivated habitats.
  - California Annual Grassland Alliance
  - Upland Annual Grassland and Forbs Formation
  - Alkali Sink
  - Vernal Pool Complex
  - *Carex* spp. *Juncus* spp. Wet Meadow Grasses NFD Super Alliance
  - *Crypsis* spp. Wetland Grasses – Wetland Forbs NFD Super Alliance
  - Undetermined Alliance – Managed
- Modeling limited to Planning Units: 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 14, 16, 17, 18, 19, 20, 21, 22

A.6.6.1 Cumulative Nest Locations and Sightings

Figure A-20 displays the cumulative distribution of recent and historical nest locations and sightings (nesting records with lower mapping precision) from a variety of data sources.

- Nest Locations (2007 surveys): Nest locations mapped from 2007 surveys (Estep 2008).
- Other Recent Nest Locations: Location where the nests have relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., California Natural Diversity Database [CNDDB], California Department of Fish and Wildlife [DFW], and Chris DiDio of the University of California, Davis (UC Davis).
- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., CNDDB, California Department of Fish and Game, Chris DiDio of UC Davis, UC Davis Museum of Wildlife and Fish Biology, California eBird, Avian Knowledge Network).

Figure A-6. Swainson's Hawk Modeled Habitat and Occurrences



A.7 White-Tailed Kite (*Elanus leucurus*)

A.7.1 Listing Status

Federal: None.

State: Fully Protected.

Recovery Plan: None.

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A.7.2 Species Description and Life History

The white-tailed kite (*Elanus leucurus*) is a medium-sized (32- to 38-centimeter) raptor of open grasslands, savannahs, and agricultural areas. It is identified by its unique plumage and habit of hovering while hunting. It has long, narrow, and pointed wings and a long, bright-white tail, face, and underside that contrast with distinctive black patches on the inner wings. Adults also have gray backs and red eyes. The sexes are similar, but the female has a slightly darker back (Dunk 1995).

A.7.2.1 Seasonal Patterns

Although apparently a resident bird throughout most of its breeding range, dispersal occurs during the nonbreeding season, resulting in some range expansion during the winter. Stendell (1972) believed it to be resident, becoming nomadic during periods of low prey abundance. While population changes and local and regional movements appear to be somewhat predictable based on vole and other rodent cycles, it remains unknown whether in Northern California this constitutes a migration movement or nomadic response to changes in the prey populations (Dunk and Cooper 1994).

A.7.2.2 Reproduction

The breeding season from pair bonding to juvenile independence occurs from approximately January to October with peak activity occurring from May through August (Dunk 1995). Nests are constructed of loosely piled sticks and twigs that are lined with grass, straw, or rootlets. The nest is placed near the top of a dense oak, willow, or other tree; usually 6 to 20 meters above ground in trees that vary from 3 to 50 meters in height (Dixon et al. 1957). Females typically lay a clutch of four eggs, with a range of three to six. The female incubates exclusively and performs most brooding while the male provisions the female and nestlings. Eggs are incubated for about 28 days. Young fledge in 35–40 days following hatching, with the peak fledging period occurring in May–June (Erichsen 1995).

A.7.2.3 Home Range/Territory Size

Territory size is variable and regulated primarily by prey abundance and vegetation structure (i.e., accessibility of prey); however, this species also responds to the abundance of interspecific and intraspecific competitors (Dunk 1995; Erichsen 1995). Reported average territory sizes include 1.6–21.5 hectares (ha) (Dunk and Cooper 1994), 19–52 ha with a mean of 29 ha (Waian 1973), and 17–120 ha (Henry 1983). As with other raptors species, particularly those occurring in agricultural habitats, home ranges may overlap and foraging may be limited to a small portion of the total area. This may be a result of competition or fluctuating prey accessibility due to changes in vegetation structure (Henry 1983). Communal roosts are used during the nonbreeding season (Waian and Stendell 1970). Home ranges for nonbreeders is more difficult to determine since communal roosts may be tens of kilometers away (Dunk 1995).

A.7.2.4 Foraging Behavior and Diet

White-tailed kites generally hunt from a central perch over areas as large as 3 square kilometers (km^2) (Warner and Rudd 1975), but foraging usually occurs within 0.8 km from the nest during the breeding season (Hawbecker 1942). Kites are not particularly territorial. The nest site and the immediate surrounding area are defended against other raptors and crows (Pickwell 1930, Dixon et al. 1957). Small wintering territories of about 0.10 km^2 have been documented to be defended as well (Bammann 1975).

The white-tailed kite preys mostly on voles, but also takes other small, diurnal mammals, and occasionally birds, insects, reptiles, and amphibians. Small mammal prey comprises 95 percent of the kite diet (Dunk 1995). It forages in undisturbed, open grasslands, meadows, farmlands and emergent wetlands, ungrazed grasslands, fence rows and irrigation ditches adjacent to grazed lands (Dunk 1995). It soars, glides, and hovers less than 30 meters above the ground in search of prey. It hunts almost exclusively by hovering from 5 to 25 meters in height, with hovering bouts lasting up to 60 seconds. During this time, kites scan the ground searching for prey and watching for potential competitors or predators. The hovering bout ends in a dive to the ground for prey; flight to another location; soaring or interacting with another bird; or flight to the perch (Warner and Rudd 1975).

A.7.2.5 Predation

The primary cause of egg mortality is inclement weather and predation (Stendell 1972). Circumstantial evidence suggests red-tailed hawks may take adults (Pinkston and Caraviotis 1980). Skeletons of immature white-tailed kites with feathers on wings have been found beneath perches used by larger raptors, also suggesting predation (Dunk 1995).

A.7.3 Habitat Requirements and Ecology

A.7.3.1 Nesting

The white-tailed kite inhabits low elevation, open grasslands, savannah-like habitats, agricultural areas, wetlands, and oak woodlands (Dunk 1995). Habitat elements that influence nest site selection and nesting distribution include habitat structure (usually trees with a dense canopy) and prey abundance and availability (primarily the association with meadow vole), while the association with specific vegetation types (e.g., riparian, oak woodland, etc.) appears less important (Erichsen 1995; Dunk 1995). White-tailed kite nests have been documented in a variety of tree species, including valley oak (*Quercus lobata*), Fremont cottonwood (*Populus fremontii*), willow (*Salix* spp.), live oak (*Quercus wislizenii*), box elder (*Acer negundo*), ornamental trees including olive and pine trees, and occasionally in tall shrubs (Dixon et al. 1957; Dunk 1995).

Nest trees appear to be selected on the basis of structure and security, and thus typically have a dense canopy or are within a dense group of trees, such as riparian forest or oak woodland. Kites will occasionally use isolated trees, but this is relatively rare. Most nests in the Sacramento Valley are found in oak/cottonwood riparian forests, valley oak woodlands, or other groups of trees and are usually associated with compatible agricultural foraging habitat, such as pasture and hay crops, compatible row and grain crops, or natural vegetation such as seasonal wetlands and annual grasslands (Erichsen 1995).

Kites often nest in close association with other nesting kites and with several other raptors. These include the Swainson's hawk (*Buteo swainsoni*), red-tailed hawk (*Buteo jamaicensis*), and red-shouldered hawk (*Buteo lineatus*) (particularly in riparian habitats of the Sacramento Valley).

A.7.3.2 Foraging

The white-tailed kite uses a variety of foraging habitat types, but those that support larger and more accessible prey populations are more suitable. The presence and abundance of white-tailed kites are strongly correlated with the presence of meadow voles (Stendell 1972). As a result, population cycles of meadow voles can also influence nesting and wintering abundance of white-tailed kites. Cover types that appear to be preferred include alfalfa and other hay crops, irrigated pastures, and some cultivated habitats, particularly sugar beets and tomatoes, both of which can support relatively large populations of voles (Estep 1989) and which have been highly correlated with kite nest site densities (Erichsen et al. 1994). Kites also forage in dry pastures, annual grasslands, rice stubble fields, and occasionally in orchards (Erichsen 1995).

Winter foraging habitat is similar to breeding season foraging habitat (particularly the association with agricultural habitats and vole populations); however, there is less association with riparian forests and woodlands.

A.7.4 Species Distribution and Population Trends

A.7.4.1 Distribution

The white-tailed kite was threatened with extinction in North America during the early twentieth century (Eisenmann 1971). Until the 1960s, the species was considered declining throughout its North American range, but since then has recovered in some areas. Currently, the distribution of the species includes the East Coast and southeast United States, the southwest United States from Texas to California, and north to Washington State, and from Mexico to South America (Dunk 1995). Relatively stable resident populations occur in California, portions of coastal Oregon and Washington, southern Florida, southern Texas, and portions of northern Mexico. The species is considered rare in remaining portions of its North American range. Range expansion has also been noted in some Central American locales (Eisenmann 1971).

White-tailed kite has been reported from most of the open, lowland habitats in Yolo County. The species is underreported in the California Natural Diversity Database (CNDDB 2009) with only six nest sites reported, all in the vicinity of Davis. A total of 13 nest sites was reported during a survey of the lowland portion of Yolo County conducted in 2007 (Estep 2008). Most were found in riparian areas, including three along Putah Creek, three along Willow Slough, two along Dry Slough, one along the Sacramento River, one along the Willow Slough Bypass, and one along the Knights Landing Ridge Cut. Two nonriparian sites included one in West Sacramento and one near Dunnigan. Whisler (pers. comm., 2015) reported several suburban nests in east and north Davis and the Willowbank area (planning unit 20), El Macero Golf Course, and UC Davis during 2001 and 2002. No trend information for Yolo County is available.

A.7.4.2 Population Trends

California populations were also thought to be seriously declining prior to the 1960s, likely due to habitat loss, shooting, and possible egg collecting (Pickwell 1930; Waian and Stendell 1970). From the 1940s to the 1970s, populations and distribution increased (Fry 1966, Waian and Stendell 1970, Eisenmann 1971) due to protection from shooting and possibly due to increasing agricultural development, which may have increased rodent habitat and expanded the foraging range of white-tailed kite (Eisenmann 1971; Small 1994). In the Sacramento Valley, the kite has increased predominantly in irrigated agricultural areas where meadow vole (*Microtus californicus*) populations are found (Warner and Rudd 1975).

California is currently considered the breeding range stronghold for white-tailed kite in North America, with nearly all areas up to the western Sierra Nevada foothills and southeast deserts occupied (Small 1994; Dunk 1995). It is common to uncommon and a year-round resident in the Central Valley, other lowland valleys, and along the entire length of the coast (Dunk 1995).

Although white-tailed kite is probably resident through most of its breeding range, dispersal occurs during the non-breeding season, leading to a winter range expansion that includes most of California (Small 1994; Dunk 1995).

While white-tailed kite populations may have recovered to some extent since the 1960s as a result of agricultural crop conversions in Yolo County, the species is also subject to interspecific competition with nesting great-horned owls, Swainson's hawks, red-tailed hawks, and red-shouldered hawks, which can result in territory abandonment or nest failure. Erichsen (1995) reported six of 13 kite nest failures in riparian areas due to displacement by nesting Swainson's hawks.

A.7.5 Threats to the Species

A.7.5.1 Urbanization/Fragmentation

Urbanization, including residential and commercial development and infrastructure development (roads and oil, water, gas, and electrical conveyance facilities) is one of the principal causes of continuing habitat loss for white-tailed kite and is a continuing threat to remaining populations, particularly in rapidly urbanizing areas in the Sacramento Valley. Urbanization permanently removes habitat and results in permanent abandonment of nesting territories. Proximity to urban areas also influences kite occurrence. While there are examples of kites nesting and roosting in urban areas, in general, the species is intolerant of noise and human activities and will abandon nesting areas that are subject to increasing levels of human disturbances. Kites are also sensitive to habitat fragmentation. Low density urbanization or isolation of habitats, even if relatively large patches remain undisturbed, also leads to territory abandonment.

A.7.5.2 Agricultural Crop Conversion

As noted above, white-tailed kite populations are closely associated with rodent abundance and accessibility, which can be influenced by crop patterns. Kite populations have recovered to some extent in California due in part to the expansion of compatible agricultural types. The conversion to crop patterns that do not support sufficient rodent prey or that restrict accessibility to prey can result in the abandonment of traditionally active territories.

A.7.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.7.3, *Habitat Requirements and Ecology* (Figure A-7). The model parameters include the following. CNDDB Location: These are locations where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (CNDDB).

- Nesting Habitat: This habitat type includes all potentially suitable nesting habitat, which was modeled by selecting all mapped vegetation types as listed below that occur below an elevation of 500 feet. In addition, all remnant woody vegetation occurring in isolated patches or isolated trees in agricultural fields or field borders (Yolo County Remnant Woody Vegetation mapping project)[1] were included as potential nesting habitat.
- Primary Foraging Habitat: This habitat includes all potentially suitable foraging habitat on the valley floor that is of higher value because these vegetation types are nearer to nesting habitat and have the physical structure and planting/harvesting patterns to make higher density prey available to white-tailed kites. This habitat was modeled by selecting all mapped pasture types (including alfalfa) and annual grasslands, that occur at an elevation of 500 feet or lower and are within 1 mile of modeled nesting habitat and reported nesting location in all ecoregions.
- Secondary Foraging Habitat: This habitat includes all potentially suitable foraging habitat that is also nearer to nesting habitat but has crop and vegetation communities that are used less frequently than those in the Primary Foraging category. This habitat was modeled by selecting all mapped vegetation types as listed below that occur at an elevation of 500 feet or lower and are within 1 mile of modeled nesting habitat and reported nesting location in all ecoregions.

A.7.6.1 Nesting Habitat – Vegetation Types

- Blue Oak Woodland
- Blue Oak – Foothill Pine
- Eucalyptus
- Valley Oak Woodland
- Fremont Cottonwood – Valley Oak – Willow (Ash – Sycamore) Riparian Forest NFD Association
- Great Valley – Valley Oak Riparian Association
- Mixed Fremont Cottonwood – Willow spp. NFD Alliance
- Mixed Willow Super Alliance

[1] GIS layer prepared by J. Tuil in 2008 for Yolo County NHP.

- Valley Oak – Fremont Cottonwood – (Coast Live Oak) Riparian Forest NFD Association
- Valley Oak Alliance – Riparian
- White Alder (Mixed Willow) Riparian Forest NFD Association
- Undifferentiated Riparian Woodland/Forest

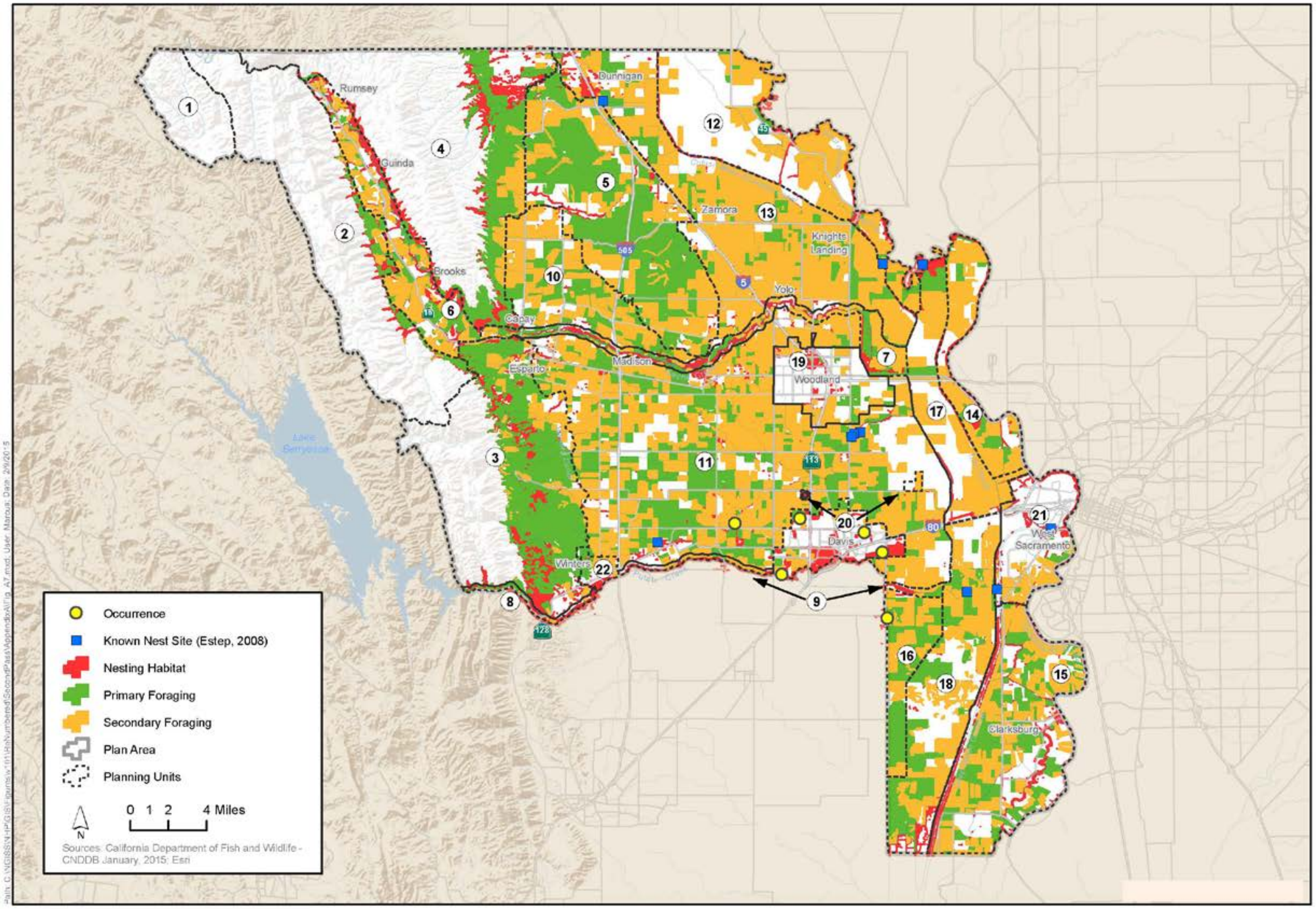
A.7.6.2 Primary Foraging Habitat – Vegetation Types

- All pasture types (including alfalfa)
- Annual grassland

A.7.6.3 Secondary Foraging Habitat – Vegetation Types

- *Crypsis*
- Carex
- Undetermined Alliance – Managed
- Alkali Sink
- Vernal Pool Complex
- Grain/Hay Crops
- Field Crops
- Truck/Berry Crops

Figure A-7. White-Tailed Kite Modeled Habitat and Occurrences



A.8 Western Yellow-Billed Cuckoo (*Coccyzus americanus*)

A.8.1 Listing Status

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Federal: Threatened.

State: Threatened.

Recovery Plan: None.

A.8.2 Species Description and Life History

A.8.2.1 Description

The western yellow-billed cuckoo (*Coccyzus americanus*) is a medium-sized bird about 30 centimeters (11.8 inches) in length with a wingspan of 38–43 centimeters (15–17 inches). The species has a slender, long-tailed profile, with a fairly stout and slightly down-curved bill, which is blue-black with yellow on the base of the lower mandible. Plumage is grayish-brown above and white below, with red primary flight feathers. The tail feathers are boldly patterned with characteristic rows of large white spots on the underside. The legs are short and bluish-gray. Adults have a narrow, yellow eye ring. Juveniles resemble adults, except the tail patterning is less distinct, and the lower bill may have little or no yellow (Hughes 1999).

A.8.2.2 Seasonal Patterns

In California on the Sacramento River, birds arrive onto breeding territories; pair formation occurs from late June to mid-July following the northward migration from South America and is followed by nest building and raising of young (Halterman 1991). The species is restricted to the mid-summer period for breeding presumably due to a seasonal peak in large insect abundance (Rosenberg et al. 1982). To accommodate this, development of young is very rapid with a breeding cycle of 17 days from egg-laying to fledging. Following a relatively short period of post-fledging juvenile dependency, cuckoos migrate out of California from approximately mid-August to early September. The species migrates to South America during the nonbreeding season and is thus not present in the Central Valley between October and May.

A.8.2.3 Reproduction

The pair constructs a flimsy twig nest which is typically 5 to 40 feet above the ground in dense canopy cover. Nests in the riparian forest along the South Fork of the Kern River consisted of twigs and were lined with roots and dried leaves and were rimmed with pine needles. Clutch size is usually three to four eggs, rarely five (Bent 1940). Both the female and the male incubate the eggs, which lasts for 10 to 11 days (Hamilton and Hamilton 1965). Both parents also share incubating and brooding duties and provision young with food. Young develop very rapidly and fledge from six to eight days post-hatching. Parental care continues for an additional three to four weeks before the southern migration begins (Halterman 1991).

In the well-studied Kern River population, it was found that 70 percent of western yellow-billed cuckoo pairs were monogamous, while the remaining 30 percent included a helper at the nest (Laymon 1998). When prey is abundant, cuckoos increase clutch size and may lay eggs in nests of other western yellow-billed cuckoo pairs and other nests of other species (Fleischer et al. 1985; Laymon 1998; Hughes 1999). Further, the Kern River studies determined that cuckoos tend to lay more eggs when they are able to feed nestlings a high percentage diet of katydids, and they tend to fledge more young when prey are easily and quickly captured (Laymon 1998).

A.8.2.4 Home Range/Territory Size

Limited information is available on home range and territory size. Territory size at the South Fork Kern River ranged from 8 to 40 hectares (ha) (20 to 100 acres) (Laymon and Halterman 1985), and on the Colorado River as small as 4 ha (10 acres) (Laymon and Halterman 1989). Patch size, type and quality of habitat, and prey abundance largely determine the size of territories (Halterman 1991).

Western yellow-billed cuckoos are loosely territorial and do not defend territories, but given uniform habitat they are regularly spaced through the landscape (Laymon 1998). Laymon (1980) found nests placed as close as 60 meters (197 feet) apart along the Sacramento River in an area where foraging habitat was abundant but nesting habitat was extremely limited. Breeding densities at the South Fork Kern River from 1985 to 1996 averaged 0.85 pairs/40 ha and ranged from a low of 0.15 pairs/40 ha in 1990 to a high of 1.4 pairs/40 ha in 1993 (Laymon unpublished data in Laymon 1998).

A.8.2.5 Foraging Behavior and Diet

Western yellow-billed cuckoos are primarily foliage gleaners (Laymon 1998). The typical strategy is to slowly hop from limb to limb in the canopy searching for movement of prey. They also sally from perches to catch flying insects or drop to the ground to catch grasshoppers or tree frogs (Laymon 1998).

Food resources vary greatly from year to year and significantly affect reproductive success (Laymon et al. 1997). Cuckoos forage within the riparian canopy primarily on slow-moving insects. The principal food item is green caterpillar (primarily sphinx moth larvae) (44.9 percent), with lesser amounts of katydids (21.8 percent), tree frogs (23.8 percent), and grasshoppers (8.7 percent). The diet also includes cicadas, dragonflies, butterflies, moths, beetles, and spiders (Laymon et al. 1997). Primary food items, particularly sphinx moth larvae, are associated with cottonwood trees and likely explain high reported use of cottonwood trees as foraging habitat for cuckoos (Laymon and Halterman 1985).

A.8.3 Habitat Requirements and Ecology

The western yellow-billed cuckoo is a riparian obligate species. Its primary habitat association is willow-cottonwood riparian forest, but other species such as alder (*Alnus glutinosa*) and box elder (*Acer negundo*) may be an important habitat element in some areas, including occupied sites along the Sacramento River (Laymon 1998). Nests are primarily in willow trees; however, other species are occasionally used, including cottonwood and alder. Along the Sacramento River, English walnut trees and more rarely prune, plum, and almond trees in adjacent orchards have also been reportedly used for nesting (Laymon 1980). Several nests on the Sacramento River were draped with wild grape (Gaines and Laymon 1984; Laymon 1998). Nest site height in willow trees average 4.3 meters (14.1 feet), but those in cottonwood trees have been reported at 30 meters (98.4 feet). Canopy cover is typically dense (averaging 96.8 percent at the nest) and large patch sizes (generally greater than 20 ha [49.4 acres] are typically required (Laymon 1998).

While western yellow-billed cuckoos nest primarily in willow (*Salix* spp.) trees, cottonwood (*Populus fremontii*) trees are important as foraging habitat, particularly as a source of insect prey. All studies indicate a highly significant association with relatively expansive stands of mature cottonwood-willow forests, especially dynamic riverine habitats where the river is allowed to meander and willows and cottonwoods can regenerate on point bars and stream banks (Grecco 2008). However, western yellow-billed cuckoos will occasionally occupy a variety of marginal habitats, particularly at the edges of their range (Laymon 1998). Continuing habitat succession has also been identified as important in sustaining breeding populations (Laymon 1998). Meandering streams that allow for constant erosion and deposition create habitat for new rapidly-growing young stands of willow, which create preferred nesting habitat conditions. Channelized streams or levied systems that do not allow for these natural processes become over-mature and presumably less optimal (Grecco 2008).

Along the Sacramento and Feather Rivers, primary factors influencing nest site selection include the presence of cottonwood/willow riparian forest, patch size, and density of understory vegetation. Laymon and Halterman (1989) found a significant trend toward increased occupancy with increased patch size. In California, except for the population along the Colorado River, cuckoos occupied 9.5 percent of 21 sites 20 to 40 ha in extent, 58.8 percent of 17 sites 41 to 80 ha in extent, and 100 percent of 7 sites greater than 80 ha in extent (Laymon and Halterman 1989). On the Sacramento River, Halterman (1991) found that the extent of patch size was the most important variable in determining occupancy.

A.8.4 Species Distribution and Population Trends

A.8.4.1 Distribution

There are two currently recognized subspecies, *C.a. occidentalis*, found west of the Rocky Mountains and *C.a. americanus*, found in deciduous forests east of the Rocky Mountains. There is a continuing debate over the taxonomic separation of the two subspecies, which is based primarily on morphological and plumage differences (Banks 1988; Franzreb and Laymon 1993), and more recently on genetics studies initiated by the U.S. Fish and Wildlife Service during the status review for federal listing.

The range of western yellow-billed cuckoo historically extended from southern British Columbia to the Rio Grande in northern Mexico, and east to the Rocky Mountains (Bent 1940). Currently the only known populations of breeding western yellow-billed cuckoo are several disjunct locations in California, Arizona, and western New Mexico (Halterman 1991). Western yellow-billed cuckoos winter in South America from Venezuela to Argentina after a southern migration that extends from August to October (Laymon and Halterman 1985). They migrate north in late June and early July (DeSchauensee 1970).

In California, where much of its historical range has been greatly reduced, western yellow-billed cuckoos still occur in isolated sites in the Sacramento Valley from Tehama to Sutter Counties, along the South Fork of the Kern River, and in the Owens Valley, Prado Basin, and Lower Colorado River Valley (Gaines and Laymon 1984; Laymon 1998).

A.8.4.2 Population Trends

Studies conducted since the 1970s indicate that there may be fewer than 50 breeding pairs in California (Gaines 1977; Laymon and Halterman 1987; Halterman 1991; Laymon et al. 1997). While a few occurrences have been detected elsewhere recently, including the Eel River, the only locations in California that currently sustain breeding populations include the Colorado River system in Southern California, the South Fork Kern River east of Bakersfield, and isolated sites along the Sacramento River in Northern California (Laymon and Halterman 1989; Laymon 1998).

Declines in numbers of the western yellow-billed cuckoo in California are a result of “removal widely of essential habitat conditions,” as described by Grinnell and Miller (1944). These declines have continued primarily in the San Joaquin Valley, north coast, and central coast (where the populations had been extirpated by 1977) (Gaines and Laymon 1984), and the species was nearly extirpated in the Lower Colorado River Valley by 1999. In the Sacramento Valley, only 1 percent of the species’ historical habitat remains to support a small population estimated at only 50 pairs in 1987 and 19 pairs in 1989 (Laymon and Halterman 1989). Population estimates based on surveys conducted in 1999 are similar to those from the 1980s (66 FR 38611). Because no surveys have been conducted since 1999, the current status of the Sacramento Valley population is not known.

A.8.4.3 Distribution and Population Trends in the Plan Area

The historical distribution of western yellow-billed cuckoo extended throughout the Central Valley, where the species was considered common (Belding 1890). In the mid-1940s, Grinnell and Miller (1944) still considered the Central Valley distribution to extend from Bakersfield to Redding. While there are few historical records from Yolo County, presumably the species nested within the county along the west side of the Sacramento River and possibly along smaller tributary drainages, including Putah Creek, Willow Slough, and Cache Creek.

Since 1965, there have been nine records of western yellow-billed cuckoo in Yolo County, including the following:

- Willow Slough in 1965
- Sacramento River in 1977
- Elkhorn Regional Park in 1982
- Gray’s Bend in 1997
- City of Davis in 2001
- Putah Creek Sinks in June 2005
- Cache Creek Settling Basin in July 2005
- Fremont Weir in June 2006
- Fremont Weir in July 2006

These records were reported in Gaines (1974), Yolo Audubon Society Checklist Committee (2004), Yolo Audubon Society (2005), and by Steve Hampton.[2] All of these records are presumed to be migrants or nonbreeding individuals. While there are no confirmed breeding records for Yolo County, they are fairly common nesters just across the Sacramento River in Sutter County, especially in riparian forests along the western toe drain of the Sutter Bypass. Up to 15 birds responded to taped vocalizations while canoeing this area in a single day in mid-June 1995 (Beedy pers. obs.).

Very little potential breeding habitat remains in Yolo County, and the mostly channelized and riprapped banks of the Sacramento River provide few opportunities for river meandering and/or riparian restoration that would provide suitable western yellow-billed cuckoo breeding habitat (Grecco 2008). While migrants could potentially use riparian habitats along the Sacramento River and other watercourses, there are few areas that support sufficient contiguous patches of suitable habitat to support breeding cuckoos.

A.8.5 Threats to the Species

Historical declines have been due primarily to the removal of riparian forests in California for agricultural expansion and urban expansion (66 FR 38611). Habitat loss and degradation continues to be the most significant threat to remaining populations. Habitat loss continues as a result of bank stabilization and flood control projects, urbanization along edges of watercourses, agricultural activities, and river management that alter flow and sediment regimes. Fragmentation reduces the ability of an area to sustain a population, leading to local extirpations and the loss of dispersal corridors (66 FR 38611). Nesting cuckoos are sensitive to habitat fragmentation that reduces patch size to less than 100 by 300 meters (Hughes 1999). Fragmentation of occupied habitats could make nest sites more accessible and more vulnerable to predation. Adults have been preyed upon by falcons (Hector 1985), and nestlings have been taken by hawks, jays, grackles (*Quiscalus quiscala*) (Nolan and Thompson 1975; Launer et al. 1990) and by various snake and mammal species (Nolan 1963). Predation is a significant source of nest failures, which have been recorded at 80 percent in some areas (Hughes 1999). In addition, pesticide use associated with agricultural practices may also pose a long-term threat to cuckoos. Pesticides may affect behavior and cause death or potentially affect prey populations (Hughes 1999; 66 FR 38611).

Overuse by livestock has been a major factor in the degradation and modification of riparian habitats in the western United States. The effects include changes in plant community structure and species composition, and relative abundance of species and plant density. (Wiggins 2005). Harris et al. (1986) believed that termination of grazing along portions of the South Fork of the Kern River in California was responsible for increases in riparian vegetation.

Another likely factor in the loss and modification of the western yellow-billed cuckoo is the invasion by the exotic tamarisk (*Tamarisk* sp.). The spread and persistence of tamarisk has resulted in significant changes in riparian plant communities. In monotypic tamarisk stands, the most striking change is the loss of community structure. The multi-layered community of herbaceous understory, small shrubs, middle-layer willows, and overstory deciduous trees is often replaced by one monotonous layer. Plant species diversity has declined in many areas and relative species abundance has shifted in others. Other effects include changes in percent cover, total biomass, fire cycles, thermal regimes, and perhaps insect fauna (Rosenberg et al. 1991; Busch and Smith 1993). Conversion to tamarisk typically coincides with reduction or complete loss of bird species strongly

[2] http://www.geocities.com/rainforest/canopy/6181/yolo.html.

associated with cottonwood-willow habitat, including the western yellow-billed cuckoo (Hunter et al. 1987; Hunter et al. 1988; Rosenberg et al. 1991).

West Nile virus is spreading throughout portions of the western United States and poses a threat to bird species. The National Wildlife Health Center of the U.S. Geological Survey (USGS) has identified the western yellow-billed cuckoo as a species that may be affected by West Nile virus (USGS 2003).

Significant data gaps relating to many aspects of the life history of the western yellow-billed cuckoo exist. Data gaps include spacing parameters, the capacity for producing offspring, sources of mortality, mating system dynamics, and population structure. Brood parasitism by the western yellow-billed Cuckoo requires further study to identify the physiological and behavioral controls associated with the production of extra eggs. The current extent and causes of eggshell thinning and the effects of pesticides on cuckoos and the availability of prey need to be understood (Laymon 1998). Furthermore, detailed censuses of declining western populations must continue to determine locations of remnant populations and viable sizes necessary for future conservation programs (Laymon 1980).

A habitat model developed by Gaines (1974) for the western yellow-billed cuckoo in the Sacramento Valley includes the following: patch size of at least 25 acres, at least 100.5 meters (330 feet) wide and 302 meters (990 feet) long, within 100.5 meters (330 feet) of surface water, and dominated by cottonwood/willow gallery forest with high-humidity microclimate. Halterman and Laymon (1989) further refined the model by classifying habitat patch sizes for suitability. A willow-cottonwood forest patch greater than 604 meters (1,980 feet) wide and greater than 81 ha (200 acres) is classified as optimum habitat; a patch 201 to 603.5 meters (660 to 1,980 feet) wide and 41.5 to 81 ha (102.5 to 200 acres) is suitable; a patch 100.5 to 201 meters (330 to 660 feet) wide and 20 to 40 ha (50 to 100 acres) is marginal, and smaller patches are unsuitable. Management objectives for the Sacramento Valley include six subpopulations of 25 pairs each to maintain viable populations sizes (Laymon 1998). To achieve this goal, it would be necessary to establish or preserve at least 6,070 ha (15,000 acres) of optimum/suitable habitat. As of 1998, only 2,367 ha (5,850 acres) of habitat were considered suitable (Laymon 1998).

Many large riparian areas along the Sacramento River in Tehama County and along the Feather River in Yuba and Sutter Counties appear to be unoccupied but apparently represent suitable habitat for western yellow-billed cuckoo (Gaines and Laymon 1984). In addition, factors determining local population fluctuations need to be fully understood in order to guide effective management actions to increase and stabilize populations at local carrying capacity.

A.8.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.8.3, *Habitat Requirements and Ecology* (Figure A-8). The model parameters include the following.

- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., Yolo Audubon Society records).

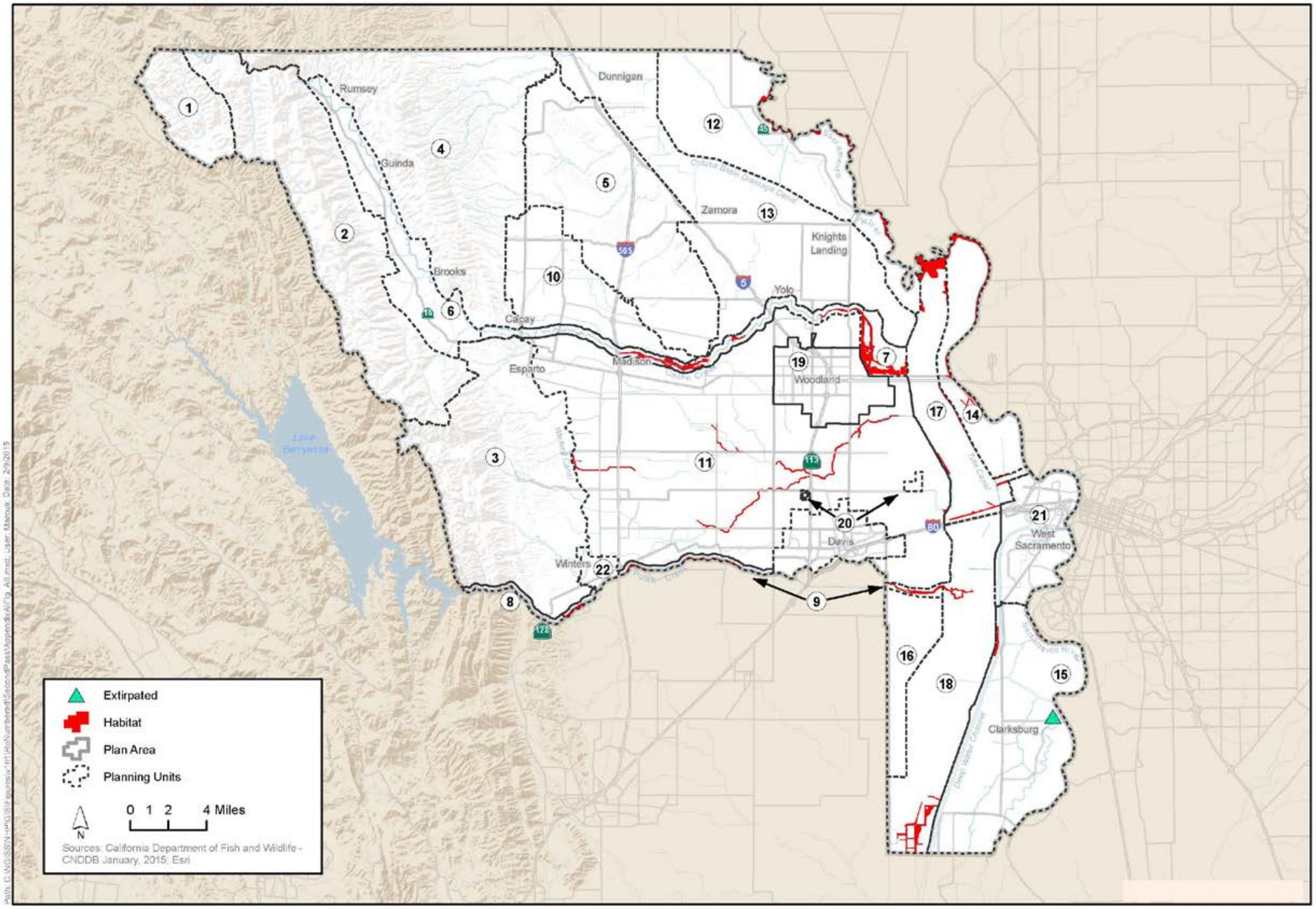
- Nesting/Foraging Habitat: This habitat includes all potentially suitable habitat. This habitat was modeled by selecting all mapped vegetation types as listed below that occur in patch sizes of 25 acres or greater and have a width of at least 330 feet.
- Limited modeling to Planning Units: 7, 8, 9, 11, 12, 14, 15, 17, 18.

A.8.6.1 Nesting/Foraging Habitat – Vegetation Types

- Fremont Cottonwood – Valley Oak – Willow (Ash – Sycamore) Riparian Forest Not Formally Defined (NFD) Association
- Mixed Fremont Cottonwood – Willow spp. NFD Alliance
- Mixed Willow Super Alliance
- White Alder (Mixed Willow) Riparian Forest NFD Association

Undifferentiated Riparian Woodland/Forest

Figure A-8. Western Yellow-Billed Cuckoo Modeled Habitat and Occurrences



A.9 Western Burrowing Owl (*Athene cunicularia hypugaea*)

A.9.1 Listing Status

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Federal: Species of Conservation Concern (U.S. Fish and Wildlife Service [USFWS] Regions 1, 2, and 6) (USFWS 2002).

State: Species of Special Concern.

Recovery Plan: None.

A.9.2 Species Description and Life History

Western burrowing owls (*Athene cunicularia hypugaea*) inhabit much of the western United States and southern interior of western Canada (Haug et al. 1993). They are unique among the North American owls in that they nest and roost in burrows. This small owl stands about 22.86 centimeters (9 inches) tall. The sexes are similar (although females are often slightly darker than males) with distinct oval facial ruff, white eyebrows, yellow eyes, and long stilt-like legs. Wings are relatively long (51–61 centimeters [20–24 inches]) and somewhat rounded. The owl is sandy colored with pale white spots on the head, back, and upperparts of the wings and white-to-cream with barring on the breast and belly (Haug et al*.* 1993).

A.9.2.1 Seasonal Patterns

Burrowing owls are resident in northern California. The breeding season (defined as from pair bonding to fledging) generally occurs from February to August with peak activity occurring from April through July (Haug et al*.* 1993). Pairs may be resident at breeding sites throughout the year or migrate out of the breeding area during the nonnesting season. Some individual birds only winter in the region. Thus, the demographics of this species in the region are relatively dynamic. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they had been reproductively successful (Lutz and Plumpton 1999). Additionally, burrowing owls often return as breeding adults to the general area in which they were born. For these reasons, efforts that enhance productivity help to ensure continued use of burrows and territories.

Migration patterns vary among burrowing owls. As noted above, in Northern California burrowing owls are generally year-round residents although some may migrate from or migrate to other regions during winter. Those burrowing owls that do migrate often return to the same nesting territories in successive years.

A.9.2.2 Reproduction

Adults begin pair bonding and courtship in February through March. Following pair formation, a nest is established in the natal burrow and females lay a clutch of six to 11 eggs. Average clutch size is seven to nine. Eggs are incubated entirely by the female for a period of between 28 and 30 days. During this time, the female is provisioned with food by the male. Following hatching, the young remain in the natal burrow for two to four weeks, after which they begin to emerge from the burrow and can be observed roosting at the burrow entrance. The female begins hunting as young become less dependent. Adults also often relocate chicks to satellite burrows presumably to reduce the risk of predation (Desmond and Savidge 1998) and possibly to avoid nest parasites (Dechant et al. 2003). After approximately 44 days, young leave the natal burrow and by 49–56 days begin to hunt live insects. On average, three to five young fledge, but fledging rates can range from a single chick to as many as eight or nine (Lutz and Plumpton 1999). During this time, the juveniles expand their range and may find cover in the satellite burrow. The juveniles continue to be provisioned by the adults until mid-September when they molt into adult plumage and begin to disperse (Landry 1979). King and Belthoff (2001) report that dispersing young use satellite burrows in the vicinity of their natal burrows for about two months after hatching before departing the natal area.

A.9.2.3 Home Range/Territory Size

Few valid measures of territory or home range size of burrowing owls have been published; home range has not often been measured directly (e.g., via telemetry studies), and is highly subject to observer bias or equipment effect. Accordingly, caution is warranted when interpreting home range estimates. Gervais et al. (unpublished 2000 report) estimated that the mean minimum convex polygon (MCP) home range estimates for 22 burrowing owls in Fresno and Kings Counties, California was 1.89 square kilometers (km^2) (467 acres). Haug and Oliphant (1990) estimated that the mean MCP for six owls in Saskatchewan was 2.41 km^2 (595 acres).

In Colorado, Plumpton and Lutz (D. Plumpton pers. comm.) recorded densities of nesting burrowing owls that ranged from 21 to 34 pairs on roughly 9.06 km^2 (2,240 acres) of available habitat (i.e., 0.43 $km^2$and 0.26 km^2 [106 and 65 acres]/pair, respectively). Thomsen (1971) estimated territory size based on nearest-neighbor distances between nest burrows, producing a result of six pairs of owls averaging 0.008 km^2, with a range of between 0.0004 to 0.016 km^2 (1.98 acres; range: 0.1 to 4.0 acres). The preceding values demonstrate the disparity among studies, the different values attained when using different methods of estimating abundance, and the risk in relying on the results of a single study.

A.9.2.4 Foraging Behavior and Diet

Burrowing owls are active day and night and will hunt throughout the 24-hour day, but are mainly crepuscular, hunting mostly at dusk and dawn, and are less active in the peak of the day. They tend to hunt insects in daylight and small mammals at night. They usually hunt by walking, running, hopping along the ground, flying from a perch, hovering, and fly-catching in mid-air.

Burrowing owls tend to be opportunistic feeders. Large arthropods, mainly beetles and grasshoppers, comprise a large portion of their diet. In addition, small mammals, especially mice and voles (*Microtus, Peromyscus*, and *Mus* spp.) are also important food items. Other prey animals include reptiles and amphibians, young cottontail rabbits, bats, and birds, such as sparrows and horned larks. Consumption of insects increases during the breeding season (Zarn 1974; Tyler 1983;

Thompson and Anderson 1988; John and Romanow 1993; Green et al. 1993; Plumpton and Lutz 1993a). Productivity may increase in proportion to the amount of mice and voles in the diet (D. Plumpton unpublished data).

As with most raptors, burrowing owls select foraging areas based on prey availability as well as prey abundance. Prey availability (the ability of a raptor to detect prey) decreases with increasing vegetative cover, thus foraging habitat suitability decreases with increasing grass height or vegetative density.

A.9.3 Habitat Requirements and Ecology

Burrowing owls are found in open, dry grasslands, agricultural and range lands, and desert habitats often associated with burrowing animals (Klute et al. 2003). They also occupy golf courses, airports, road and levee embankments, and other disturbed sites where there is sufficient friable soil for burrows (Haug et al. 1993). Because they typically use the burrows created by other species, particularly the California ground squirrel (*Spermophilus beecheyi*), presence of these species is usually a key indicator of potential occurrence of burrowing owl (Gervais et al*.* 2008). Burrowing owls in cismontane California were likely historically associated with herbaceous vegetation suppressed by tule elk herds.

A.9.3.1 Nesting

In northern California, most nest sites occur in abandoned ground squirrel burrows; however, other mammal burrows and various artificial sites, such as culverts, pipes, rock piles, and artificially constructed burrows are also used (Gervais et al. 2008). Burrowing owls generally select sites in relatively sandy habitats that allow for modification of burrows and maximize drainage. In addition to providing nesting, roosting, and escape burrows, ground squirrels improve habitats for burrowing owls in other ways. Burrowing owls favor areas with short, sparse vegetation (Coulombe 1971; Haug and Oliphant 1990; Plumpton and Lutz 1993b) to facilitate viewing and hunting, which is typical around active sciurid colonies. Additionally, burrowing owls may select areas with a high density of burrows (Plumpton and Lutz 1993b). Typical habitats are treeless, with minimal shrub cover and woody plant encroachment, and have low vertical density of vegetation and low foliage height diversity (Plumpton and Lutz 1993b). While occupied burrows are sometimes found in flat landscapes, often in elevated mounds created by burrowing activity, they are also commonly found on hillsides, levee slopes, or other vertical cuts, probably to facilitate drainage and maximize visibility. Nest sites are also often associated with nearby perches, including stand pipes, fences, or other low structures.

Optimal nesting locations are within an open landscape with level to gently sloping topography, sparse or low grassland or pasture cover, and a high density of burrows.

Burrowing owls are tolerant of human-altered open spaces, such as areas surrounding airports, golf courses, and military lands, where burrows are readily adopted (Thomsen 1971; Gervais et al. 2008). Burrowing owls may select areas adjacent to unimproved and improved roads (Brenckle 1936; Ratcliff 1986); a modest volume of vehicle traffic does not appear to significantly affect behaviors or reproductive success (Plumpton and Lutz 1993c). In the South San Francisco Bay region, in the Sacramento area, and in several locations in and around the City of Davis, burrowing owls nest and winter in highly human-affected environments and can adjust to most types of human activity if habitats remain in a suitable condition.

The dimensions of the nest burrow vary with location, age of burrow, and the species that originally excavated it. Typical burrows constructed by ground squirrels are from 3 to 6 inches in diameter and extend underground at a gradual downward slope from 3 to 10 feet with an enlarged cavity at the end of the burrow. Burrow entrances are often adorned with various objects as well as feathers and pellets. The burrow is often lined with grass or other material (Haug et al. 1993).

Burrowing owls are solitary nesters or may nest in loose colonies – usually from 4 to 10 pairs (Zarn 1974); however, larger colonies have been documented. Most pairs occupy a natal burrow and at least one additional satellite burrow.

As semi-colonial owls, colony size is indicative of habitat quality. Colony size is also positively correlated with annual site reuse by breeding burrowing owls; larger colonies (those with more than five nesting pairs) are more likely to persist over time than colonies containing fewer pairs or single nesting pairs (DeSante et al. 1997). Nest burrow reuse by burrowing owls has been well documented (Martin 1973; Gleason 1978; Rich 1984; Plumpton and Lutz 1993b; Lutz and Plumpton 1999). Former nest sites may be more important to continued reproductive success than are mates from previous nest attempts (Plumpton and Lutz 1994). Past reproductive success may influence future site re-occupancy by burrowing owls. Female burrowing owls with large broods tend to return to previously occupied nest sites, while females that failed to breed or produced small broods may change nest territories in subsequent years (Lutz and Plumpton 1999).

In general, burrowing owls show a high degree of nest site fidelity and reuse the same nesting burrows and satellite burrows for many years if left undisturbed (Haug et al. 1993).

A.9.3.2 Foraging

Burrowing owls forage in open grasslands, pasturelands, agricultural fields and field edges, fallow fields, and along the edges of roads and levees. Vegetation is low to maximize visibility and access. Short perches such as fence posts are often used to enhance visibility. While they will defend the immediate vicinity of the nest, burrowing owls will often forage in common areas (Haug et al. 1993).

A.9.4 Species Distribution and Population Trends

A.9.4.1 Distribution

There are two subspecies of burrowing owls in North America (Dechant et al. 2003). The breeding range of *A. cunicularia floridana* is restricted to Florida and adjacent islands. The breeding range of *Athene cunicularia hypugaea* extends south from southern Canada throughout most of the western half of the United States and south to central Mexico. The winter range is similar to the breeding range except that most owls from the northern areas of the Great Plains and Great Basin migrate south and southern populations are resident year-round (Haug et al. 1993).

Burrowing owls were once widespread and generally common over western North America, in treeless, well-drained grasslands, steppes, deserts, prairies, and agricultural lands (Haug et al. 1993). The owl's range has contracted in recent decades, and populations have been generally diminished in some areas.

In California, burrowing owls are widely distributed in suitable habitat throughout the lowland portions of the state; however, occupied sites have ranged from 200 feet below sea level at Death Valley to above 12,000 feet at Dana Plateau in Yosemite National Park (California Department of

Fish and Game [DFG] 2000; Gervais et al. 2008). In southern California, the species is fairly common along the Colorado River Valley (Rosenberg et al. 1991) and in the agricultural region of the Imperial Valley. Only small, scattered populations are thought to occur in the Great Basin and the desert regions of southern California (DeSante et al. 1997). Burrowing owl breeding populations have greatly declined along the California coast, including the southern coast to Los Angeles, where these owls have been eliminated from virtually all private land, and occur only in small populations on some federal lands (Trulio 1997; Garrett and Dunn 1981). Breeding populations in Central California include the southern San Francisco Bay south of Alameda and Redwood City, the interior valleys and hills in the Livermore area, and the Central Valley (DeSante et al. 1997; Gervais et al. 2008).

The current distribution of burrowing owls in Yolo County is localized primarily in remaining low elevation uncultivated areas, such as the grasslands along the western edge of the Central Valley, the pasturelands in the southern panhandle, and the Yolo Bypass Wildlife Area. Other sites include some urban and semi-urban areas, particularly in and around the City of Davis, and other scattered locations associated with edges of cultivated lands.

While comprehensive surveys of the plan area have not been conducted, coordinated surveys have been undertaken in portions of the county. The majority of recent information is a result of these efforts, including monitoring surveys in and around the City of Davis (McNerney pers. comm.); surveys conducted by the California Department of Fish and Game at the Yolo Bypass Wildlife Area; and surveys coordinated by the Burrowing Owl Preservation Society in coordination with the Institute of Bird Populations on 12 selected 5-square-mile survey blocks in Yolo County in 2007 and 2014 (Wilkerson pers. comm., Catherine Portman pers. comm.). Additional data is gathered and reported incidentally by knowledgeable individuals from other areas of the County.

The results of these surveys and incidental reports indicate that the majority of known burrowing owl breeding locations are in the southern portion of Yolo County, centered in and around the City of Davis, the Yolo Bypass Wildlife Area, and the southern panhandle. A total of 50 breeding pairs were reported in Yolo County in 2007 (Table A9-1), and surveys of these same sites in 2014 indicated that only 15 breeding pairs were present in these locations. These data represent only reported sightings from several locations in Yolo County where surveys were conducted and data were recorded and made available. This summary does not represent the total number of burrowing owl breeding pairs in the county. However, it does represent the most significant known breeding areas for burrowing owl in Yolo County.

During 2010 and 2011, there were 6 documented burrowing owl nests northeast of Davis along the north side of CR 28H between CR 102 and 104 (Whistler pers. comm.). During 2015, Whisler observed only one pair of burrowing owl north of CR 28H, just west of CR 104. This pair was in the former ConAgra (Hunt-Wesson) property nesting on a dirt mound.

A.9.4.2 Population Trends

Overall population trend throughout the subspecies' North American range is reportedly declining. James (1993) reports that 54 percent of the areas sampled reported declining burrowing owl populations. Breeding Bird Surveys (BBS) conducted between 1980 and 1989 also report significant declines in many areas (Haug et al. 1993).

Burrowing owl was formerly common or abundant throughout much of California, but a decline noticeable by the 1940s (Grinnell and Miller 1944) has continued to the present time. The decline has been almost universal throughout California. Conversion of grasslands and pasturelands to incompatible crop types and the destruction of ground squirrel colonies have been the main factors causing the decline of the burrowing owl population (Zarn 1974; Gervais et al. 2008). Assimilation of poisons applied to ground squirrel colonies also affects burrowing population levels (Gervais et al. 2008).

A census of burrowing owls from 1991 to 1993 (DeSante et al. 1997) estimated there were approximately 10,000 pairs of burrowing owls in California. Over 70 percent of the owls in California are in the Imperial Valley, an area that represents less than 2 percent of the state's landmass (D. Plumpton pers. comm.). Numbers have been declining for decades in several areas of the state. Owls are extinct or have been reduced to very low numbers in several parts of the state, including coastal southern California and parts of the San Francisco Bay area. The statewide census indicated there has been a 50 percent decline in numbers of owls and the number of breeding groups in some parts of the state from the 1980s to 1990s.

Although California has a significant burrowing owl population, development pressures and recent population trends suggest that the species may continue to be extirpated from large portions of its range in California during the next decade. In the San Francisco Bay area, burrowing owls are commensal with the California ground squirrel and reside in undeveloped grassland remnants amid a rapidly expanding human population. An estimated 167 nesting pairs (1.8 percent of California's population) remain (all figures as of 1991, based on DeSante et al. [1997]), representing a decline of approximately 50 percent since the mid-1980s. In the southern California coastal population, burrowing owls have been almost entirely extirpated from private lands and are now found only on a few undeveloped federal lands, where an estimated 260 nesting pairs (3 percent of California's population) persist. An estimated 2,224 nesting pairs exist in the Central Valley (24 percent of California's population). Burrowing owls are mostly commensal with the round-tailed ground squirrel (*Spermophilus tereticaudus*) in the Imperial Valley, where burrowing owls are almost completely relegated to irrigation canal banks and where an estimated 6,570 nesting pairs (71 percent of California's population) remain (all data from DeSante et al. 1997, presented also in Barclay et al. 1998).

Table A-7. Breeding Season Burrowing Owl Occurrences Reported from Yolo County in 2007

Location	No. of Breeding Pairs	No. of Unpaired Singles	Total No. of Adults	No. of Young
Davis city limits	21	6	48	61
Yolo Bypass Refuge	19		38	60
Davis vicinity	4	4	12	
Woodland vicinity	3		6	
South panhandle	3		6	11
Total	**50**	**10**	**110**	**132**

There is evidence that the overall population in the county has declined based on severe declines or extirpations of known colonies. For example, the owl colony on the University of California, Davis campus had declined from 22 pairs in 1981 to one pair in 1991, then rebounded to several pairs in the late 1990s (Johnson pers. comm.). Another colony of 10 pairs documented in 1976 near the Yolo County Airport had been eliminated when the location was flooded in 1983 to create a pond

(California Natural Diversity Database [CNDDB] 2007). More recently, a small colony on the north side of Winters was displaced by grading activities in preparation of a new development project.

However, burrowing owls have increased or continue to be relatively stable during the last several years in other areas, such as the Mace Ranch Preserve and the Wildhouse agricultural buffer and golf course (McNerney pers. comm.) in the Davis area. Habitat restoration efforts by the California Department of Fish and Wildlife (DFW) at the Yolo Bypass Wildlife Area may also be responsible for the increase in reported occurrences of owls at that location. Thus, in some areas owls appear to respond favorably to protection and restoration efforts.

A.9.5 Threats to the Species

Urbanization, including residential and commercial development and infrastructure development (roads and oil, water, gas, and electrical conveyance facilities) is one of the principal causes of habitat loss for burrowing owls and is a continuing threat to remaining northern California populations. Urbanization permanently removes habitat and has led to permanent abandonment of many burrowing owl colonies in the developing portions of the Central Valley, Bay Area, and throughout the state (Gervais et al. 2008).

Burrowing owls have shown a high level of tolerance for human encroachment, degradation of native habitats, and fragmentation of habitats (Gervais et al. 2008). Owls will often continue to occupy traditional sites as long as essential habitat elements remain present and until the extent of available habitat is reduced below the species' habitat requirement thresholds. Some burrowing owls nest on the edges of agricultural areas and forage in suitable agricultural landscapes, such as recently harvested fields, alfalfa and other hay fields, irrigated pastures, and fallow fields. The conversion of these fields to incompatible crop types, such as orchards, vineyards, and other crops that are not conducive to burrowing owl foraging, reduce available foraging habitat and lead to abandonment of traditional nesting areas. Many burrowing owl nests are known to occur along the outside slope or at the toe of levees. Levee stability practices for flood control, including vegetation removal, grading, and reinforcing with rock can destroy burrowing owl nesting habitat.

Although burrowing owls are relatively tolerant of low levels of human activity, human-related impacts such as shooting and burrow destruction adversely affect this species (Zarn 1974; Haug et al. 1993). Rodent control, particularly along levees and roadsides, can decimate ground squirrel populations and ultimately reduce available nesting and cover habitat for burrowing owls. Artificially enhanced populations of native predators (e.g., gray foxes, coyotes) and introduced predators (e.g., red foxes, cats, dogs) near burrowing owl colonies can also be a significant local problem. Burrowing owls also get tangled in loose fences, abandoned wire, fishing line, rat traps, and other materials.

The overall effect of population-level threats (e.g., habitat conversion or ground squirrel eradication) is of much greater concern than sources of individual mortality (e.g., shooting or vehicle collisions), as these former forces operate at a population, regional, and/or range-wide level. As obligate burrow nesters that do not excavate their own burrows, burrowing owls are largely dependent on burrowing mammals that have no legal status or protection, and are commonly and purposefully eradicated by humans. Whereas individual mortality cumulatively represents a significant number of individuals, a population that is secure and productive can offset these losses. Conversely, populations that are failing because of population-level effects cannot be sustained even in absence of direct sources of individual mortality. In California, significant economic development pressures exist, and habitat conversion for human purposes continues to degrade the abundance and quality of owl nesting habitat (Barclay et al. 1998). Few provisions exist to protect habitats over time. As a result, burrowing owls appear to be declining throughout most of California.

Important conservation milestones, such as the investigation and rejection of the case for changing the status of the burrowing owl to either threatened or endangered at the state or federal levels, have been reached in recent years. Significant data gaps exist in regard to migration, dispersal from nesting sites, and other aspects of annual movements. Small body size and habit of dwelling in burrows make the burrowing owl a poor choice for study using radio telemetry. Accordingly, much of what is known is the result of leg-banding studies that rely on visual detection or physical recapture of previously banded owls. These results are very specific to location, based on small sample sizes, and subject to observer effects. Accordingly, these data are not reliable for inference across the range of these owls, and should not be extrapolated to a specific location. Anecdotal accounts offer the most locality-specific data on dispersal, but few reliable data exist.

Burrowing owls are known to reoccupy habitats over their lifespan, if these habitats remain suitable (Rich 1984; Lutz and Plumpton 1999). Accordingly, preservation of large areas of consistently suitable habitat is the most important management and conservation option available. These habitats will include native grasslands that also support the native suite of species—including ground squirrels—that dig burrows, and prey such as voles, mice, ground beetles, and grasshoppers.

A.9.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.9.3, *Habitat Requirements and Ecology* (Figure A-9). The model parameters include the following.

- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (e.g., CNDDB, Burrowing Owl Preservation Society, City of Davis, Yolo Basin Wildlife Area).
- Primary Habitat: This habitat includes all potentially suitable habitat in preferred natural habitats, pastures, and other open or barren areas on the lower slopes and valley floors. This habitat was modeled by selecting all mapped land cover types as listed below, where they occur in the Central Valley, Dunnigan Hills, and Yolo Bypass ecoregions.
- Other Habitat: This habitat includes selected pasture types, where uncultivated field borders may be suitable for potential nesting burrows and fields may be suitable for foraging. This habitat was modeled by selecting all pasture types except for turf farms, within the Central Valley, Dunnigan Hills, and Yolo Bypass ecoregions.
- Added Land Cover that was had the vegetation type 'Semi-Agriculture/Incidental to Agriculture' that was within 50' of habitat that was modeled with the aforementioned criteria.

A.9.6.1 Primary Habitat – Vegetation Types

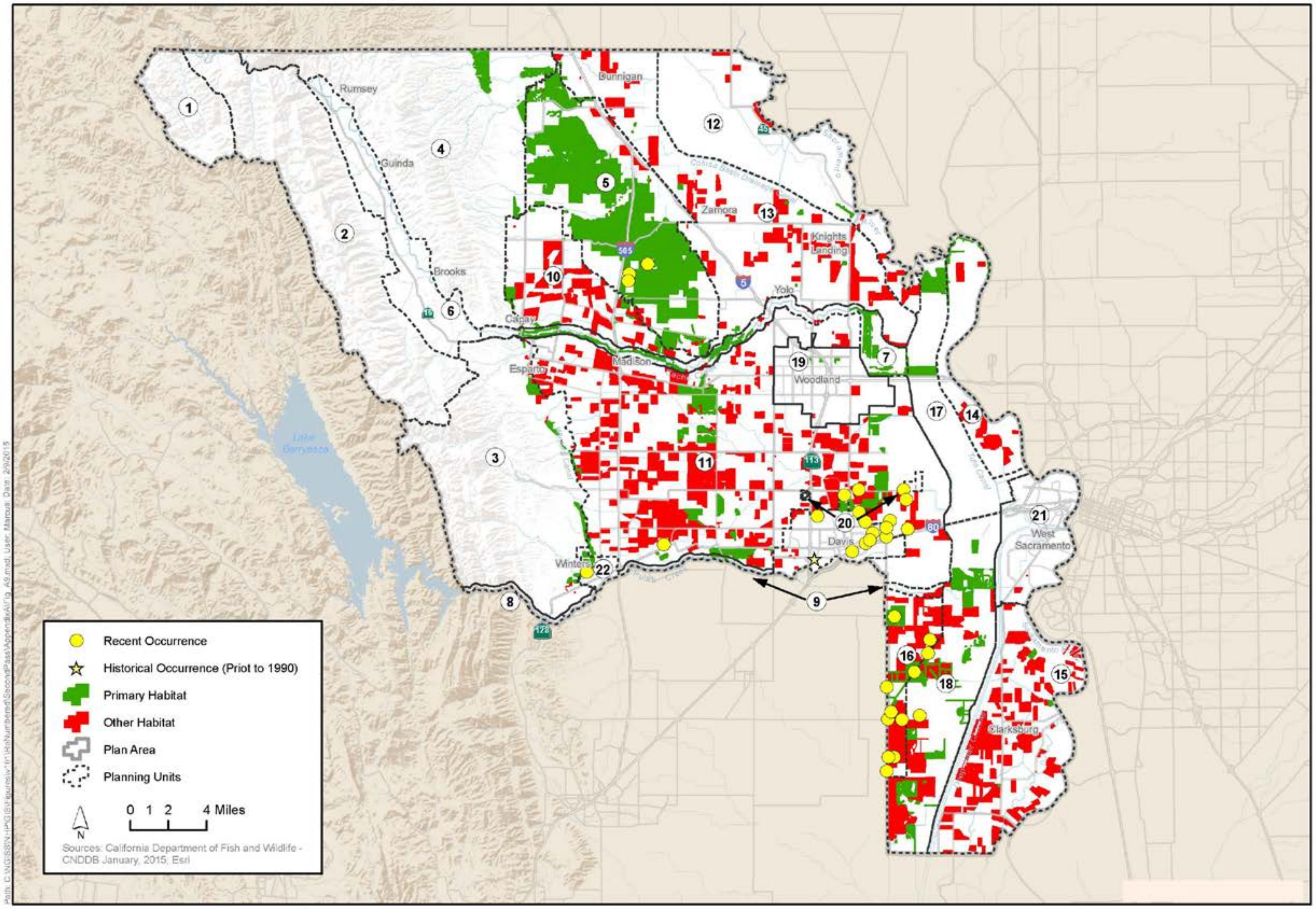
- California Annual Grasslands Alliance
- Upland Annual Grasslands and Forbs Formation
- Barren – Anthropogenic

- Native Pasture

A.9.6.2 Other Habitat – Vegetation Types

- Mixed Pasture
- Miscellaneous Grasses (grown for seed)
- Alfalfa

Figure A-9. Western Burrowing Modeled Habitat and Occurrences



A.10 Least Bell's Vireo (*Vireo bellii pusillus*)

A.10.1 Listing Status

Federal: Endangered.

State: Endangered.

Recovery Plan: The U.S. Fish and Wildlife Service (USFWS) prepared a *Draft Recovery Plan for the least Bell's Vireo (*Vireo bellii pusillus*)* in 1998 (USFWS 1998).

A.10.2 Species Description and Life History

Least Bell's vireo is the smallest subspecies of the Bell's vireo (*Vireo bellii*). The Bell's vireo can range from 4.3 to 4.7 inches (11–12 centimeters) in length and has a wingspan of 7.1 inches (18 centimeters). It weighs approximately 0.2–0.4 ounce (7–10 grams) (Brown 1993). It is drably colored and indistinctly marked. The least Bell's vireo is the grayest subspecies of Bell's vireo and has very little yellow or green in its plumage.

A.10.2.1 Seasonal Patterns

Least Bell's vireos are migratory and usually arrive to their California breeding grounds in mid-March to early April from their wintering grounds in Mexico. Observations of banded birds suggest that returning adult breeders may arrive earlier than first-year birds by a few weeks (Kus unpublished data in Kus 2002a). Least Bell's vireos begin departing for their wintering grounds by late July but are generally present on their breeding grounds until late September (Garrett and Dunn 1981; Salata 1983).

A.10.2.2 Reproduction

Egg-laying begins one to two days after nest completion. Typically three to four eggs are laid. Average clutch sizes of nonparasitized nests observed with complete clutches have ranged from 3.1 to 3.9 in recent years. Both parents share in incubation, which takes approximately 14 days. After hatching, nestlings are fed by both parents for 10 to 12 days until fledging (USFWS 1998). Adults continue to care for the young at least two weeks after fledging when territorial boundaries may be relaxed as family groups range over larger areas. Fledglings usually remain in the territory or its vicinity for most of the season. Least Bell's vireo pairs may attempt up to five nests in a breeding season, although most fledge young from only one or two. Few nests are initiated after mid-July. Long-term annual rates of hatching success (the percentage of eggs laid that hatch) have ranged from 53 to 83 percent in the major study populations at the San Luis Rey, Santa Margarita, and Tijuana Rivers. The annual average number of fledglings produced per pair has ranged from 0.9 to 4.5, with long-term averages ranging between 1.8 and 3.2 (USFWS 1998).

Nests are typically placed in the fork of a tree or shrub branch in dense cover within 3 to 6 feet (1 to 2 meters) of the ground. Both members of the pair construct the cup-shaped nest from leaves, bark, willow catkins, spider webs, and other material, in about four to five days. The female selects the nest site (Bent 1950; Barlow 1962). Nests are placed in a wide variety of plant species, but the majority are placed in willows (*Salix* spp.) and mule fat (*Baccharis glutinosa*). Nests tend to be placed in openings along the riparian edge, where exposure to sunlight allows the development of shrubs.

A.10.2.3 Home Range/Territory Size

Territory size ranges from 0.5 to 7.5 acres, but on average are between 1.5 and 2.5 acres in southern California (USFWS 1998). Newman (1992) investigated the relationship between territory size, vegetation characteristics, and reproductive success for populations in San Diego County, but found no significant factors that could account for the variability in territory size found at his sites. Spatial differences in riparian habitat structure, patch size, and numerous other factors result in differences in the density of territories within and between drainages. Embree (1992) concluded that patch size and crowding did not influence least Bell's vireo reproductive success, at least not through the mechanisms of singing rates and attraction of predators.

A.10.2.4 Foraging Behavior and Diet

Least Bell's vireos are insectivorous and prey on a wide variety of insects, including bugs, beetles, grasshoppers, moths, and especially caterpillars (Chapin 1925; Bent 1950). They obtain prey primarily by foliage gleaning (picking prey from leaf or bark substrates) and hovering (removing prey from vegetation surfaces while fluttering in the air). Foraging occurs at all levels of the canopy but appears to be concentrated in the lower to mid-strata, particularly when pairs have active nests (Grinnell and Miller 1944; Goldwasser 1981; Gray and Greaves 1981; Salata 1983; Miner 1989). Miner (1989) determined that least Bell's vireo foraging time across heights was not simply a function of the availability of vegetation at those heights; rather; it represented an actual preference for the 3-to-6–meter zone. Foraging occurs most frequently in willows (Salata 1983; Miner 1989), but occurs on a wide range of riparian species and even some non-riparian plants that may host relatively large proportions of large prey (Miner 1989).

A.10.3 Habitat Requirements and Ecology

A.10.3.1 Nesting

The least Bell's vireo is an obligate riparian breeder that typically inhabits structurally diverse woodlands, including cottonwood-willow woodlands/forests, oak woodlands, and mule fat scrub (USFWS 1998). Two features appear to be essential for breeding habitat: (1) the presence of dense cover within 3 to 6 feet (1 to 2 meters) of the ground, where nests are typically placed; and (2) a dense stratified canopy for foraging (Goldwasser 1981; Gray and Greaves 1981; Salata 1981, 1983; RECON 1989). While least Bell's vireo typically nests in willow-dominated areas, plant species composition does not seem to be as important a factor as habitat structure.

Early successional riparian habitat typically supports the dense shrub cover required for nesting and a diverse canopy for foraging. While least Bell's vireo tends to prefer early successional habitat, breeding site selection does not appear to be limited to riparian stands of a specific age. If willows and other species are allowed to persist, within five to 10 years they form dense thickets and become suitable nesting habitat (Goldwasser 1981; Kus 1998). Tall canopy tends to shade out the shrub layer in mature stands, but least Bell's vireo will continue to use such areas if patches of understory exist. In mature habitat, understory vegetation consists of species such as California wild rose (*Rosa californica*), posion oak (*Toxicodendron diversiloba*), California blackberry (*Rubus ursinus*), grape (*Vitis californica*), and perennials that can conceal nests. Nest site characteristics are highly variable and no features have been identified that distinguish nest sites from the remainder of the territory (Hendricks and Rieger 1989; Olson and Gray 1989; RECON 1989).

A.10.3.2 Foraging

Least Bell's vireos forage primarily within and at all levels of the riparian canopy (Salata 1983); however, they will also use adjacent upland scrub habitat, in many cases coastal sage scrub. In addition to use as foraging habitat, these areas also provide migratory stopover grounds and dispersal corridors for non-breeding adults and juveniles (Kus and Miner 1989; Riparian Habitat Joint Venture [RHJV] 2004). Vireos along the edges of riparian corridors maintain territories that incorporate both habitat types, and a significant proportion of pairs with territories encompassing upland habitat place at least one nest there (Kus and Miner 1989).

Little is known about least Bell's vireo wintering habitat requirements. They are not exclusively associated with riparian habitat during winter, and can occur in mesquite scrub vegetation to a greater degree than riparian areas in winter (Kus unpublished data in USFWS 2006). Least Bell's vireo may also occur in palm groves or along hedgerows associated with agriculture and rural residential areas.

A.10.4 Species Distribution and Population Trends

A.10.4.1 Distribution

The least Bell's vireo is one of four subspecies of Bell's vireo and is the only subspecies that breeds entirely in California and northern Baja California. *V. bellii arizonae* is found along the Colorado River and may occur on the California side, but otherwise occurs throughout Arizona, Utah, Nevada, and Sonora, Mexico.

A riparian obligate, the historical distribution of the least Bell's vireo extended from coastal southern California through the San Joaquin and Sacramento valleys as far north as Tehama County near Red Bluff. The Sacramento and San Joaquin valleys were considered the center of the species' historical breeding range supporting 60 to 80 percent of the historical population (51 FR 16474). The species also occurred along western Sierra foothill streams and in riparian habitats of the Owens Valley, Death Valley, and Mojave Desert (Cooper 1861 and Belding 1878 in Kus 2002a; Grinnell and Miller 1944). The species was reported in Grinnell and Miller (1944) from elevations ranging from -175 feet in Death Valley to 4,100 feet at Bishop, Inyo County. These and other historical accounts described the species as common to abundant, but no reliable population estimates are available prior to the species' federal listing in 1986. The last known nesting pair of LBVI in the Sacramento Valley was observed in 1958 (Cogswell 1958, Goldwasser 1978).

During 2010-2013, least Bell's vireo surveys were conducted in the Putah Creek Sinks located in the Yolo Bypass Wildlife Area (Whisler 2013, 2015). The focus of this study was to determine whether least Bell's vireos were breeding in the Putah Creek Sinks. The field survey methods were consistent with the U.S. Fish and Wildlife Service (2001) least Bell's vireo survey guidelines and the Yolo Audubon Society's Yolo County Breeding Bird Atlas survey methods.

Least Bell's vireos were observed during the 2010 and 2011 breeding seasons; none were detected during 2012, and one individual was observed in May 2013. Brown-headed cowbirds were common in the survey area during each year.

During 2010, two pairs of least Bell's vireos were observed in the survey area along with one or two additional individuals. Both pairs of vireos were observed performing courtship activities and territorial defense against other least Bell's vireos. On April 26, an adult least Bell's vireo was observed carrying nesting material. There was no evidence of successful nesting by least Bell's vireos. No obvious signs of nesting (e.g., active nests, fledglings, or adults carrying food) were observed during the surveys. The territories were occupied throughout the typical nesting season (April through mid-August).

In 2011**, t**he two 2010 least Bell's vireo territories were occupied by two least Bell's vireo pairs. The male in each pair was observed singing and defending the territory, signs of breeding behavior. Courtship activities were observed in one of the two pairs. One male was also defending its territory from a third adult. There were no further least Bell's vireo detections in late July or August of 2011.

There were no least Bell's vireo detections during 2012. Apparently the birds did not return to the survey area or they were not detected. One vireo was detected in 2013 on May 9, but none were detected after that date. 2015 surveys are ongoing (Whisler et al. 2015).

A.10.4.2 Population Trends

Coinciding with widespread loss of riparian vegetation throughout California (Katibah 1984), Grinnell and Miller (1944) began to detect population declines in the Sacramento and San Joaquin Valley region by the 1930s. Surveys conducted in late 1970s (Goldwasser et al. 1980) detected no least Bell's vireos in the Sacramento-San Joaquin Valleys, and the species was considered extirpated from the region. By 1986, the USFWS determined that least Bell's vireo had been extirpated from most of its historical range and numbered approximately 300 pairs statewide (51 FR 16474). The historical range was reduced to six California counties south of Santa Barbara, with the majority of breeding pairs in San Diego County (77 percent), Riverside County (10 percent), and Santa Barbara County (9 percent) (51 FR 16474).

Since federal listing in 1986, populations have gradually increased and the species has recolonized portions of its historical range. Increases have been attributed primarily to riparian restoration and efforts to control the brood parasite brown-headed cowbird (Kus 1998 and Kus and Whitfield 2005 in Howell et al. in press). By 1998, the total population was estimated at 2,000 pairs and recolonization was reported along the Santa Clara River in Ventura County, the Mojave River in San Bernardino County, sites in Monterey and Inyo counties (Kus and Beck 1998; Kus 2002a; USFWS 2006), and a single nest reported from Santa Clara County near Gilroy in 1997 (Roberson et al. 1997). Still, the distribution remained largely restricted to San Diego County (76 percent) and Riverside County (16 percent) (USFWS 2006).

By 2005, the population had reached an estimated 2,968 breeding pairs (USFWS 2006) with increases in most Southern California counties and San Diego County (primarily Camp Pendleton Marine Corps Base) supporting roughly half of the current population (USFWS 2006).

Distribution and Population Trends in the Plan Area

Two singing least Bell's vireo males were detected, positively identified, and photographed in the southern portion of the Yolo Bypass Wildlife Area in Yolo County in mid-April 2010 and have subsequently returned in the spring of 2011 (J. P. Galván pers. comm.). The next closest recent record occurred in June 2005 and was approximately 66 miles south of the current record at the San Joaquin River National Wildlife Refuge in the San Joaquin and Tuolumne River floodplain (Howell et al. in press). In June 2005, least Bell's vireos were detected nesting at the San Joaquin River National Wildlife Refuge, west of Modesto in Stanislaus County, the first nesting record of the species in the Central Valley in over 50 years (Howell et al. in press). A single breeding pair nested at the refuge in 2005, 2006, and 2007. The pair successfully nested in 2005 and 2006 and the nest was depredated in 2007. No least Bell's vireos were detected in 2008 or 2009 (Howell et al. in press).

A.10.5 Threats to the Species

A major factor leading to declines in populations of least Bell's vireo is the loss and degradation of riparian woodland habitat throughout the species' range. Habitat loss and degradation can occur through clearing of vegetation for agriculture, timber harvest, development, or flood control. Flood control and river channelization eliminates early successional riparian habitat that least Bell's vireo (and many other riparian focal species) use for breeding. Dams, levees and other flood control structures hinder riparian reestablishment, creating more "old-growth" conditions (dense canopy and open understory) that are unfavorable to breeding vireos. Finally, habitat degradation encourages nest predation and parasitism. Agricultural land uses and water projects not only directly destroy habitat, but may also reduce water tables to levels that inhibit the growth of the dense vegetation least Bell's vireo prefer (RJHV 2004). Grazing can also have a significant effect on riparian vegetation (Sedgwick and Knopf 1987). Cattle and other livestock can trample vegetation and eat seedlings, saplings, shrubs, and herbaceous plants. This can lead to a reduction in cover and nesting sites, and affect insect prey populations. Insecticides may also be a threat to this species since it is insectivorous and its greatest declines are in areas with intensive agriculture (Holstein 2003).

Brood parasitism from brown-headed cowbirds (*Molothrus ater*) has a major negative impact on least Bell's vireo. Livestock grazing has reduced and degraded the lower riparian vegetation favored by the Least Bell's Vireo (Overmire 1962) and provided foraging areas for the brown-headed cowbird. Row crops and orchards also provide feeding grounds for the parasite. By as early as 1930, nearly every least Bell's vireo nest found in California hosted at least one cowbird egg (USFWS 1998). Since a parasitized nest rarely fledges any vireo young, nest parasitism of least Bell's vireo results in drastically reduced nest success (Goldwasser 1978; Goldwasser et al. 1980; Franzreb 1989; Kus 1999; Kus 2002b).

Predation is a major cause of nest failure in areas where brown-headed cowbird nest parasitism is infrequent or has been reduced by cowbird trapping programs. Most predation occurs during the egg stage. Predators likely include western scrub jays (*Aphelocoma californica*), Cooper's hawks (*Accipiter cooperii*), gopher snakes (*Pituophis melanoleucus*) and other snake species, raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), coyotes (*Canis latrans*), long-tailed weasels (*Mustela frenata*), dusky-footed woodrats (*Neotoma fuscipes*), deer mice (*Peromyscus maniculatus*), rats (*Rattus* spp.), and domestic cats (*Felis domesticus*) (Franzreb 1989).

A.10.6 Species Habitat Model and Location Data

The habitat model for this species was based on known recent sightings and the distribution of land cover types that are known to support its habitat as described above in Section A.27.3, *Habitat Requirements and Ecology* (Figure A-27).

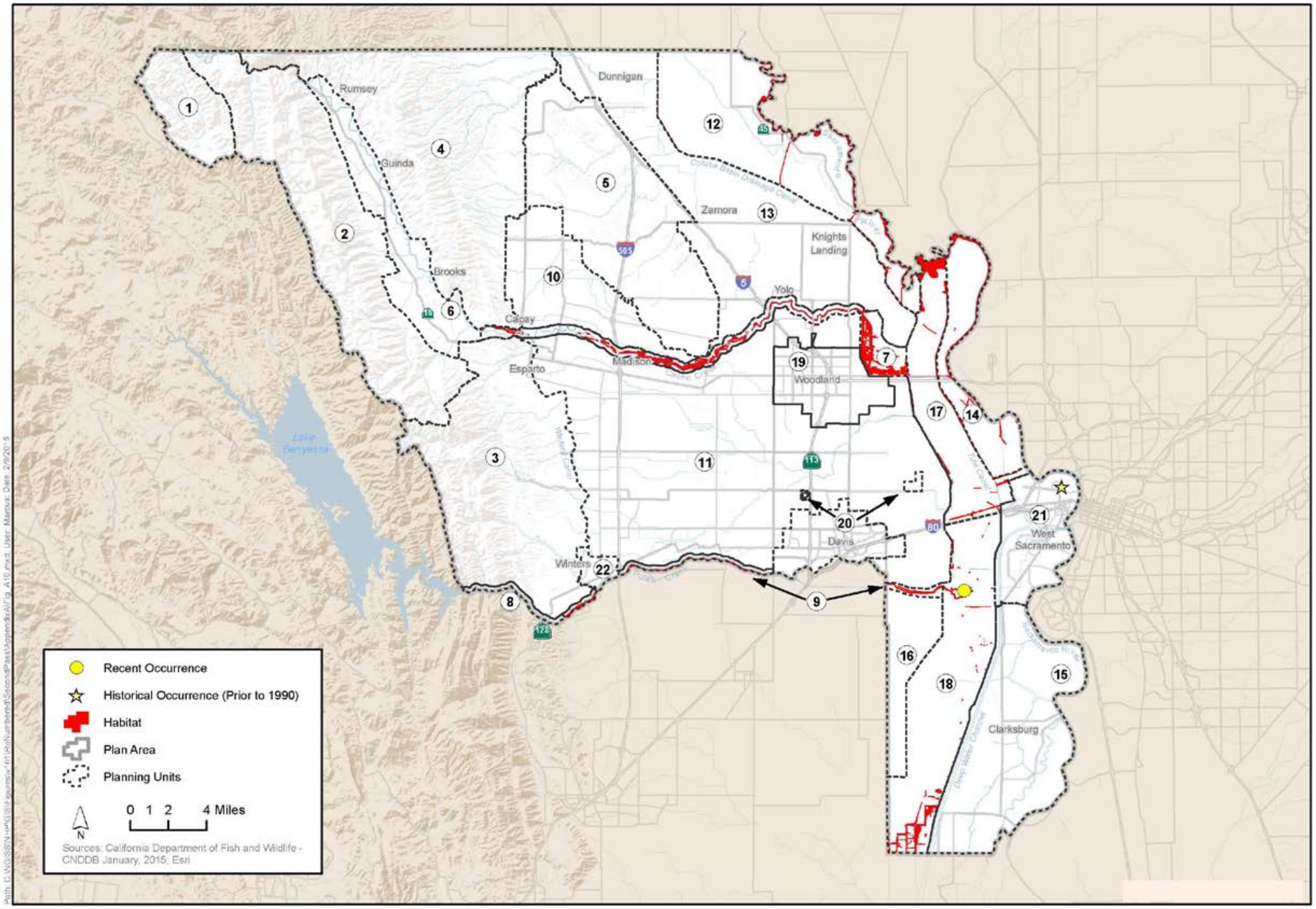
The model parameters include the following.

- Known Recent Sightings: Location where the species has relatively recently (post-January 1, 1980) been documented according to one or more species locality records databases (e.g., California Natural Diversity Database [CNDDB], BIOS, University of California, Davis Museums collections, etc.).
- Nesting/Foraging Habitat: This habitat includes all potentially suitable breeding and foraging riparian areas and was modeled by selecting all mapped vegetation types as listed below.
- Limited modeling to Planning Units: 7, 9, 12, 14, 17, 18.

A.10.6.1 Nesting/Foraging Habitat – Vegetation Types

- Blackberry Not Formally Defined (NFD) Super Alliance
- Coyote Bush
- Fremont Cottonwood – Valley Oak – Willow (Ash – Sycamore) Riparian Forest NFD Association
- Mixed Fremont Cottonwood – Willow spp. NFD Alliance
- Mixed Willow Super Alliance
- White Alder (Mixed Willow) Riparian Forest NFD Association
- Undifferentiated Riparian Bramble
- Undifferentiated Riparian Woodland/Forest

Figure A-10. Least Bell's Vireo Modeled Habitat and Occurrences



A.11 Bank Swallow (*Riparia riparia*)

A.11.1 Listing Status

Federal: None.

State: Threatened.

Recovery Plan: Recovery Plan: Bank Swallow *(Riparia riparia)* (California Department of Fish and Game [DFG] 1992).

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A.11.2 Species Description and Life History

The bank swallow (*Riparia riparia*) breeds throughout much of the Northern Hemisphere and migrates to spend the winter months in South America, Africa, and southern Asia. It is the smallest of the North American swallows (approximately 13 centimeters [5.12 inches] long). Bank swallows are distinguished from other swallows by their distinctive, complete brown breast band, contrasted against white underparts and its dark brown upper parts. Sexes are similar and cannot be distinguished based solely on plumage characteristics (DFG 1992).

A.11.2.1 Seasonal Patterns

Bank swallows arrive in California from their wintering grounds in the southern Amazon basin from mid-March to May and reestablish breeding colonies shortly after arrival. During spring migration, the first individuals arrive in California in mid-March, with numbers peaking in May; during fall migration, the first individuals leave in late July, with a few birds remaining until mid-September (Humphrey and Garrison 1987; Garrison 1999; Garrison 2002). After breeding, bank swallows join mixed-species flocks of swallows that congregate at wetlands and other areas with high concentrations of aerial insect prey, until they depart California for their southward migration in August and September.

A.11.2.2 Reproduction

Bank swallows nest in colonies in vertical cliffs, most often in lowland riverbanks, coastal bluffs, open pit mines, and roadcuts (DFG 1992). Following a short courtship, both sexes spend four to five days digging a nest burrow in soft sand/loam strata. Females typically lay four or five eggs, and feed their young at the nest until the young fledge in 18 to 20 days later. Banks swallows are primarily monogamous, and each pair tends one nest. However, extra-pair copulations are frequent which enhances the genetic diversity of a brood and colony (Garrison 1999).

A.11.2.3 Home Range/Territory Size

Bank swallows actively defend nest burrows and the immediate vicinity of individual burrows. They defend the area around an occupied burrow early in the nesting period. Females select burrows and frequently reject burrows excavated by males until a burrow is suitable for nesting. Thus, typically the number of burrows outnumbers the pairs of bank swallows in a given colony (Garrison 1999).

A.11.2.4 Foraging Behavior and Diet

Bank swallows often join mixed-species flocks of swallows while foraging over water, meadows, bogs, and other sites where concentrations of aerial insects can be found. At nesting colonies, they forage mostly within 200 meters (656 feet) of their nesting burrows, but this range can vary depending on the distance to good foraging areas. Analysis of contents of 394 stomachs from throughout Canada and the United States disclosed 33.5 percent ants, bees, and wasps; 26.6 percent flies; 17.9 percent beetles; 10.5 percent mayflies; 8 percent bugs; and a few dragonflies, butterflies, and moths (Garrison 1999, 2002).

A.11.3 Habitat Requirements and Ecology

A.11.3.1 Nesting

Important breeding habitat characteristics include soil moisture, texture, orientation of bank face, bank height, verticality (slope) of the face, and proximity of the colony to foraging areas (DFG 1992). Bank swallow colonies are often found in fine silt and sandy loam soils (DFG 1992) represented as three main types: sea cliffs, or hard consolidated sand; river banks of sand and sandy earth; and actively worked sand and gravel pits (Hickling 1959 as cited in DFG 1992). In California, bank swallows most often nest in steep earthen riverbanks subject to frequent winter erosion events. Nest sites consist of burrows dug into a vertical earthen bank 45 to 90 centimeters (cm) (17.72 to 35.43 inches) deep, 5 cm (1.97 inches) high, and 7.6 cm (2.99 inches) wide (Garrison 1999). Sites with grassland adjacent to vertical banks are considered of highest suitability (Garcia et al. 2008).

Unique combinations of optimal habitat characteristics may dictate the size and success of individual bank swallow colonies. Burrows that remain available from a previous season may be used in subsequent years. Bank swallow nesting colonies range in size from relatively small (10 burrows) to very large (3,000 burrows) (DFG 1992). Suitable burrows for nesting are at least 1 meter (3.3 feet) above ground or water for predator avoidance, and heights of occupied colony banks in California averaged 3.3 meters (10.83 feet) (SD = 1.7, range 1.3 to 7.3, n = 23) (Garrison 2002).

A.11.3.2 Foraging

Bank swallows are aerial insectivores that forage over lakes, ponds, rivers and streams, meadows, fields, pastures, and bogs (Garrison 1999). Grasslands and croplands immediately adjacent to colonies also provide foraging habitat for bank swallows (DFG 1992). Adult birds foraging along the Sacramento River typically forage within 50 to 200 meters (164 to 656 feet) of the colony location (Garrison 1998), and the normal maximum foraging distance can be as great as 8 to 10 kilometers (5.0 to 6.2 miles) (Mead 1979).

A.11.4 Species Distribution and Population Trends

A.11.4.1 Distribution

During the summer months in the western hemisphere, bank swallows range throughout most of Alaska and Canada, southward from eastern Montana to Nevada, and eastward across the United States to Georgia. They are variably distributed throughout California, Texas, and New Mexico. Within California, regular breeding of the Bank Swallow occurs in Siskiyou, Shasta, and Lassen Counties, and along the Sacramento River from Shasta County south to Yolo County (DFG 2000). Other subspecies are also widespread and common in Europe, Asia, and Africa (Garrison 1999). Bank swallows winter primarily in South America, especially in the southern Amazon Basin and Pantanal (Garrison 1999), although a few winter along the Pacific coast of Mexico (Howell and Webb 1995).

A.11.4.2 Population Trends

Bank swallows historically nested throughout the lowlands of California (Grinnell and Miller 1944). The species once bred at coastal sites from Santa Barbara County south to San Diego County. They have now disappeared as a breeding bird from Southern California (Garrett and Dunn 1981). The historical population along the Sacramento River was most likely larger than it is today, but no population data exist from that era (DFG 1992).

The colonial nesting habits of the bank swallow and the short-lived nature of colony sites make it difficult to consistently census the species accurately from point counts on Breeding Bird Surveys (Garrison 1999), so trends reported from that data set are not informative. According to DFG (2000), estimates of breeding pairs in Sacramento River habitats dropped from 13,170 in 1986 to 5,770 in 1997. In 1998, the number of breeding pairs dropped to 4,990 before rebounding in 1999 to 8,210 pairs. Since 2000, numbers have fluctuated between 6,320 and 8,530 pairs (Garcia et al. 2008). Population size can vary greatly over relatively short time periods because of the poor durability of nesting sites and weather-influenced mortality on wintering grounds (Garrison 1999).

A.11.4.2.1 Distribution and Population Trends in the Plan Area

In Yolo County, colonies ranging from 10 to 400 burrows were observed along the Sacramento River and Cache Creek in 1987 (California Natural Diversity Database [CNDDB] 2005). Breeding occupancy was estimated as ranging 10 to 70 percent at the various colonies. However, many of the colonies were unoccupied or inactive. During a survey in 2000, four colonies totaling 488 burrows were found along the Sacramento River in Yolo County between Verona and Knight's Landing (R. Schlorff and C. Swolgaard unpublished data). Assuming an occupancy rate of 45 percent, as used by California Department of Fish and Wildlife (DFW) (Wright et al. 2011), this population was estimated at 202 pairs. An active colony persisted along Cache Creek in a gravel quarry until at least 2001 (Yolo Audubon Society 2004).

April 10, 2011, Whisler (pers. comm. 2015) observed bank swallows nest-building in the bank of the cross-channel from the Port of West Sacramento to the Sacramento River. The colony failed when the Sacramento River rose from heavy rains that spring. This was likely the southernmost colony along the Sacramento River, and in the most urban area along the Sacramento River. No colonies have been detected since then (Whisler pers. comm. 2015).

A.11.5 Threats to the Species

In California, the loss of nesting habitat is the most significant threat to bank swallows. Nesting habitat is lost through conversion of natural waterways to flood control channels, stabilization of riverbanks for flood control, and other activities that change the natural flow of rivers and prevent the creation of new nesting habitat. Bank stabilization projects are currently the single greatest threat to the state's largest bank swallow population, which breeds along the Sacramento River from Shasta to Yolo counties (Garrison 1998). These projects have had a significant effect on nesting habitat when banks are sloped to 45 degrees and include large rocks. Colony sites are also destroyed by road building and by increased regulation of water flow from reservoirs that can reduce needed winter bank erosion (to maintain vertical banks) or increase summer flows, which can flood nests and intensify erosion during the breeding season (Humphrey and Garrison 1987; Garrison 1999; Garcia et al. 2008). Destruction of nest sites or burrow collapse due to natural or human-related alteration of banks has been found to be the most significant, direct cause of mortality. Bank swallow young and eggs are the primary victims of this type of mortality (DFG 1992). In addition, gopher snakes (*Pituophis melanolencus*) are a significant predator of eggs and nestlings, and raptors such as peregrine falcons (*Falco peregrinus*) and American kestrels (*F. sparverius*) may take young and adults (DFG 1992).

Other factors that affect swallow populations include fluctuations in the genetic structure of a population; demographic factors such as recruitment rates, sex ratios, and survivorship; climate; and catastrophic events, including flooding, drought, fire, and epidemics (DFG 1992). Bank swallows are generally tolerant of human disturbance in the general vicinity of colonies (Garrison 1999).

A habitat suitability index model was developed to evaluate habitat for breeding colonies within the continental United States (Garrison 1989). The model assumed that a bank suitable for a nesting colony must be at least 5 meters (16.7 feet) long; that suitable foraging habitat occurs within 10 kilometers (6 miles) of the colony; that insect prey are not limited; and that optimal colony locations are in vertical banks, greater than 1 meter (3.3 feet) tall, greater than 25 meters (83 feet) long, and consisting of suitable soft soils (sand, loamy sand, sandy loam, loam, and silt loam) in strata greater than 0.25 meter (0.8 foot) wide. The habitat variables incorporated into the model included soil texture class and width in strata, slope of bank, height of bank, and length of bank.

A significant data gap exists in regard to locations of recently occupied bank swallow colony sites and population sizes in Yolo County, especially along Cache Creek. More information is also needed to assess the effects of pesticides and other contaminants, predation, and local river dynamics and flood control projects on the swallows and their nesting colonies.

Extinction probabilities of bank swallow colonies along the Sacramento River decreased with proximity to the nearest grassland, decreased with colony size, and increased with maximum water discharge (Moffatt et al. 2005). Creation of vertical banks in friable sandy soils and road cuts can directly benefit the bank swallow if large rocks (rip-rap) are not placed on the slopes. Artificial banks and enhanced natural banks were built along Sacramento River to mitigate loss of colony sites from flood control projects (Garrison 1991). The artificial banks provided some initial success in that bank swallows occupied artificial and enhanced sites for a few years following construction. Nestlings at the artificial and enhanced colonies were produced at levels similar to natural sites. However, these colonies were abandoned after three years because maintenance activities such as vegetation removal and bank maintenance were conducted on the sites, thereby rendering them unsuitable as bank swallow habitat (Garrison 1991).

Habitat enhancement is feasible, but to ensure suitable quality of artificial banks, the sites must be maintained. Habitat enhancement is currently considered inappropriate for the long-term maintenance of bank swallows because maintenance, such as excavation with hand tools, is costly to maintain and monitor over time (Garrison 1991; DFG 1992).

A recovery plan written for the bank swallow in California proposed long-term strategies to preserve bank swallow habitat including developing set-back levees and a riverine meander-belt, preserving major portions of remaining habitat, and developing reach-by-reach habitat maintenance strategies based on the results of a population analysis of the Sacramento River population outlined in the recovery plan (DFG 1992).

The population of bank swallows inhabiting the Sacramento River and its major tributaries are the core of the State's population. These areas, therefore, provide the most important habitat for the long-term maintenance and recovery of bank swallows (DFG 1992). The population analysis in the recovery plan (DFG 1992) indicated that "the risk of low numbers in some years was substantial for the Sacramento River bank swallow population and, under most modeled conditions, was considerably higher than the risk of near local extinction."

A.11.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.11.3, *Habitat Requirements and Ecology* (Figure A-11).

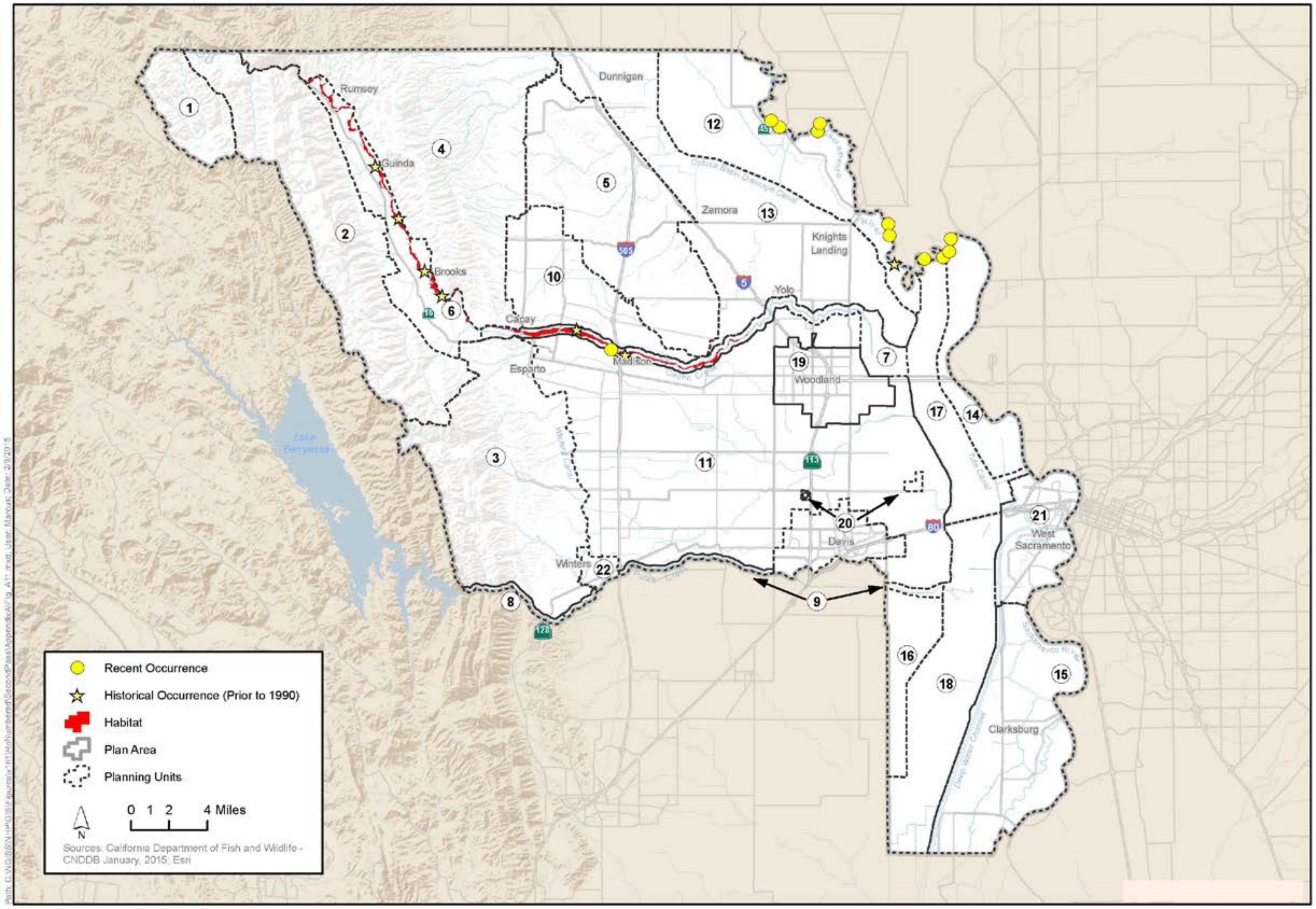
The model parameters include the following.

- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Location where the species has relatively recently (post-January 1, 1990) been documented according to one or more species locality records databases (i.e., California Natural Diversity Database [CNDDB], Ed Whisler, John Sterling, Chris Alford).
- Nesting Habitat: This habitat includes all potentially suitable breeding habitat in stream channels with suitable nesting substrate of vertical and friable river banks that are free of rip-rap. This habitat was modeled by selecting all mapped land cover types as listed below that occur in the Yolo Bypass, Central Valley and Capay Valley ecoregions.
- Limited modeling to the following Planning Units: 6, 7, 12, 14, 17.

A.11.6.1 Breeding – Land Cover Type

- Barren – Gravel and Sand Bars

Figure A-11. Bank Swallow Modeled Habitat and Occurrences



A.12 Tricolored Blackbird (*Agelaius tricolor*)

A.12.1 Listing Status

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Federal: None.

State: Endangered.

Recovery Plan: None; however, a conservation strategy for this species was prepared (Tricolored Blackbird Working Group 2007).

A.12.2 Species Description and Life History

Tricolored blackbirds (*Agelaius tricolor*) form the largest colonies of any North American passerine bird, and these may consist of tens of thousands of breeding pairs (Beedy and Hamilton 1999). Tricolored blackbirds are largely endemic to California and the state is home to more than 95 percent of the global population.

This species closely resembles red-winged blackbird (*Agelaius phoeniceus*), with subtle differences in coloration, bill shape, and overall morphology (Beedy and Hamilton 1999). The adult male is black, with shades of glossy blue, and has a bright red patch on the wing (an epaulet), similar to that of a red-winged blackbird. However, the epaulet of tricolored blackbirds is deeper red with a white lower border, as opposed to an orange-red patch with a yellowish border or no border at all. The adult females are brownish and black, streaked with gray, with small reddish epaulets (rarely visible in the field) and pale gray or whitish chin and throat. Tricolored blackbirds have longer, slightly narrower wingtips and thinner bills than the red-winged blackbirds (Beedy and Hamilton 1999).

A.12.2.1 Seasonal Patterns

Many tricolored blackbirds reside throughout the year in the Central Valley of California (Beedy 2008). However, local populations can move considerable distances, and some are migratory and move from inland breeding locations to wintering habitats in the Sacramento-San Joaquin River Delta and coastal areas. During the breeding season, most birds nest in the San Joaquin Valley and in Sacramento County in their first breeding efforts. They may later move northward into the Sacramento Valley, northeast California, and southern Oregon to nest again (Hamilton 1998; Beedy 2008). Thus, individual tricolored blackbirds may occupy and breed at several sites, or re-nest at the same site, during a given breeding season, depending on environmental conditions and their previous nesting success (Hamilton 1998; Beedy and Hamilton 1999; Meese 2006). In fall, after the nesting season, large roosts form at managed wildlife refuges and other marshes near abundant food supplies such as rice (*Oryza sativa*) and water grass (*Echinochloa crus galli*) (Beedy and Hamilton 1997). During winter, many tricolored blackbirds move out of the Sacramento Valley to the Sacramento-San Joaquin River Delta. Large flocks also winter in the central and southern San Joaquin Valley, and at the dairy farms in coastal areas such as Point Reyes and Monterey County (Beedy and Hamilton 1997). In early March to early April, these flocks move from wintering areas to their breeding colonies in Sacramento County and the San Joaquin Valley (Beedy and Hamilton 1997).

A.12.2.2 Reproduction

Tricolored blackbirds nest colonially, enabling them to synchronize their timing of nest building and egg laying (Beedy and Hamilton 1999). A few breeding colonies documented during fall months (September to November) had more protracted nest-building periods that led to asynchronous egg laying and fledging of young (Orians 1960). Females typically lay three to four eggs and incubate them for 11 to14 days, then both parents feed young until they fledge nine to 14 days after hatching (Beedy and Hamilton 1999).

A.12.2.3 Home Range/Territory Size

As many as 20,000 to 30,000 nests have been recorded in cattail (*Typha* spp.) marshes of 4 hectares or less, with individual nests less than 0.5 meter from each other (Neff 1937; DeHaven et al. 1975). Nest heights range from a few centimeters to about 1.5 meters above water or ground at colony sites in freshwater marshes (Neff 1937) and up to 3 meters in the canopies of willows (*Salix* spp.) and other riparian trees; rarely, they are built on the ground. The species typically selects breeding sites adjacent to open accessible water and places its nests in a protected nesting substrate, often including either flooded or thorny or spiny vegetation. Breeding colonies must have suitable foraging space providing adequate insect prey within a few kilometers (Beedy and Hamilton 1999).

A.12.2.4 Foraging Behavior and Diet

Diets of adult tricolored blackbirds are dependent on geographic location and the availability of local insect foods. Among the most important prey for adults provisioning nestlings include Coleopterans (beetles), Orthopterans (grasshoppers, locusts), Hemipterans (true bugs), other larval insects, and Arachnids (spiders and allies) (Crase and DeHaven 1977; Beedy and Hamilton 1999). The primary diet of a colony depends on the local food availability, and large hatches of dragonflies (Odonata) are especially favorable to this species (Meese pers. comm.); they are also attracted to large outbreaks of grasshoppers (Orians 1961). Adult females require insects to form eggs, and nestlings require insects since they are unable to digest plant materials until they are at least nine days old and ready to leave their nests (Beedy and Hamilton 1999). During the nonbreeding season, tricolored blackbirds often congregate at dairy feedlots to consume grains and other livestock feed, while others forage on insects, grains, and other plant material in grasslands and agricultural fields (Beedy and Hamilton 1999; Skorupa et al. 1980).

A.12.3 Habitat Requirements and Ecology

A.12.3.1 Nesting

Tricolored blackbird colonies require access to water, suitable nesting substrates (including marsh vegetation or thorny or spinous vegetation to protect them from mammalian predators), and foraging habitat with significant populations of insect prey within a few miles (Beedy and Hamilton 1999; Hamilton 2004). Breeding habitat includes diverse wetland and upland and agricultural areas, including those with dense cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), willows (*Salix* spp.), blackberry (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), and nettles (*Urtica* sp.) (Neff 1937; Hamilton 1998; Beedy and Hamilton 1999). Some of the largest colonies are in silage and grain fields in the San Joaquin Valley, and many are in the vicinity of dairies and feedlots (Hamilton 1998, Beedy and Hamilton 1999).

A.12.3.2 Foraging

Tricolored blackbirds forage in areas that provide abundant insects, including pastures, dry seasonal pools, agricultural fields such as alfalfa and rice, feedlots, and dairies. Tomatoes may occasionally be used as foraging habitat. With the loss of the natural flooding cycle and most native wetland and upland habitats in the Central Valley, breeding tricolored blackbirds now forage primarily in anthropogenic habitats. Tricolored blackbirds have been able to exploit foraging conditions created when shallow flood-irrigation, mowing, or grazing keeps the vegetation at an optimal height (less than 15 centimeters [cm]). Preferred foraging habitats include crops such as rice, alfalfa, safflower, irrigated pastures, and ripening or cut grain fields (e.g., oats wheat, silage) as well as annual grasslands and shrublands (Beedy and Hamilton 1999; Beedy 2008).

In recent years, an increasing percentage and now large majority of adults have foraged on grains provided to livestock as in cattle feedlots and dairies. Tricolored blackbirds also forage in remnant native habitats, including wet and dry vernal pools and other seasonal wetlands, riparian scrub habitats, and open marsh borders. Vineyards, orchards, and row crops (sugar beets, corn, peas, beets, onions, etc.) do not provide suitable nesting substrates or foraging habitats for tricolored blackbirds (Beedy and Hamilton 1999). Both adults feed the nestlings; adults feeding young typically forage within 5 kilometers (km) (3.11 miles) of the colony, but can range up to 13 km (8 miles) from the colony (Beedy and Hamilton 1999).

Some small breeding colonies may occur at private and public lakes, reservoirs, and parks provided that they are near suitable foraging habitats. Many of these colonies are surrounded by shopping centers, subdivisions, and other urban development; adults from such colonies forage in undeveloped uplands nearby.

A.12.4 Species Distribution and Population Trends

A.12.4.1 Distribution

Tricolored blackbirds are endemic to the western edge of North America; however, about 95 percent of the global population resides in California where breeding has occurred in 46 counties (Beedy and Hamilton 1999). Except for a few peripheral sites, the geographic distribution has not declined; breeding colonies in northeastern California, southern Oregon, Washington, western Nevada, and central and western Baja California have been documented (Beedy and Hamilton 1999). While the overall geographic breeding distribution of the species may not have changed since historical times, there are now large gaps in their former range encompassing entire counties (e.g., Kings, San Joaquin, Riverside, San Bernardino counties).

A.12.4.2 Population Trends

The first systematic surveys of the tricolored blackbird's population status and distribution were conducted by Neff (1937). During a five-year interval, he found 252 breeding colonies in 26 California counties; the largest colonies were in rice-growing areas of the Sacramento Valley. Neff observed as many as 736,500 adults per year (1937) in eight Central Valley counties. The largest colony he observed, in Glenn County, covered almost 24 hectares (59 acres), and contained more than 200,000 nests (about 300,000 adults). Several other colonies in Sacramento and Butte counties contained more than 100,000 nests (about 150,000 adults).

DeHaven et al. (1975) estimated that the overall population size in the Sacramento and northern San Joaquin Valleys had declined by more than 50 percent since the mid-1930s. DeHaven et al. (1975) performed surveys in the areas surveyed by Neff (1937) and observed significant population declines and reductions of suitable habitat since Neff's surveys. Orians (1961) observed colonies of up to 100,000 nests in Colusa, Yolo, and Yuba counties but did not attempt to survey the entire range of the species. Recent statewide censuses have shown dramatic declines in tricolored blackbird numbers in the Central Valley (Beedy and Hamilton 1997; Hamilton et al. 1999; Hamilton 2000; Green and Edson 2004; Cook and Toft 2005). Statewide totals of adults in four late-April surveys covering all recently known colony sites were 369,359 in 1994, 237,928 in 1997, 104,786 in 1999, and 162,508 in 2000 (Hamilton 2000). In April 2004, statewide surveys focused on only those colonies that had supported greater than 2000 adults in at least one previous year. Of 184 sites surveyed, only 33 supported active colonies at the time of the survey. Of the 33 colonies, 13 held greater than 2000 adults each, collectively representing greater than 96 percent of the census total (Green and Edson 2004). A statewide survey performed on April 25 to 27, 2008 found a total of 394,858 adults at 155 sites in 32 counties (Kelsey 2008). The most recent statewide survey for tricolored blackbirds was conducted in 2014, at which time the number of tricolors dropped to 145,135 birds (Meese 2014).

A.12.4.3 Distribution and Population Trends in the Plan Area

In Yolo County, tricolored blackbirds historically bred primarily in marshes with emergent vegetation. The species forages in grasslands, wetlands, and agricultural fields from March through July, but are irregular visitors during the remainder of the year (Yolo Audubon Society Checklist Committee 2004). Recent surveys revealed very few nesting colonies in Yolo County (Meese pers. comm.). Fourteen colonies were documented in the county from 1994 to 2004, with populations estimated from 15 to 1,500 adults. Surveys in 2007 revealed a highly successful colony of more than 30,000 breeding adults in milk thistle on the Conaway Ranch in the Yolo Bypass. This was one of only three documented colonies statewide that were large and successful, and this colony was estimated to have produced about 30,000 young (Meese 2007). Other recent colony sites in the county included: "Bill's Grasslands," a newly-discovered colony located within a patch of Himalayan blackberry approximately one km south of the intersection of County Roads 92B and 15B, that was active in 2006 and again in 2007. This colony was active again in 2012 in a slightly different location off Road 92B. Another colony in milk thistle on County Road 88B, about two km north of State Route 16 that was active in 2005 and 2007, but not in 2006. Four small colonies were also found in the Yolo Bypass in 2005 that have not been occupied since. A historical colony at the Sunsweet Drying facility, just south of County Road 27 and about 1 km west of I-505, has not been active in the past three years (Meese pers. comm.). A total of 1,900 adults were observed at two colonies in the Yolo Bypass during the 2008 statewide survey (Kelsey 2008).

A.12.5 Threats to the Species

A.12.5.1 Habitat Loss and Degradation

The greatest threats to this species are the direct loss and degradation of habitat from human activities (Beedy and Hamilton 1999). Most native habitats that once supported nesting and foraging tricolored blackbirds in the Central Valley have been replaced by urbanization and agricultural croplands unsuited to their needs. In Sacramento County, an historical breeding center of this species, the conversion of grassland and pastures to vineyards expanded from 3,050 hectares in 1996 to 5,330 hectares in 1998 (DeHaven 2000) to 6,762 hectares in 2003 (California Agriculture Statistics Services).[3] Conversions of pastures and grasslands to vineyards in Sacramento County and elsewhere in the species' range in the Central Valley have resulted in the recent loss of several large colonies and the elimination of extensive areas of suitable foraging habitat for this species (Cook 1996; DeHaven 2000; Hamilton 2004).

A.12.5.2 Direct Mortality During Crop Harvest

Entire colonies (up to tens of thousands of nests) in cereal crops and silage are often destroyed by harvesting and plowing of agricultural lands (Beedy and Hamilton 1999; Hamilton 2004; Cook and Toft 2005). While adult birds can fly away, eggs and fledglings cannot. The concentration of a high proportion of the known population in a few breeding colonies increases the risk of major reproductive failures, especially in vulnerable habitats such as active agricultural fields.

A.12.5.3 Predation

Historical accounts documented the destruction of nesting colonies by a diversity of avian, mammalian, and reptilian predators (Beedy and Hamilton 1999). Recently, especially in permanent freshwater marshes of the Central Valley, entire colonies have been lost to black-crowned night-herons (*Nycticorax nycticorax*) and common ravens (*Corvus corax*). Recently, cattle egrets (*Bubulcus ibis*) have been observed preying on tricolored blackbird nests, and at one colony in Tulare County more than 125 egrets were present throughout the breeding season (Meese 2007). Some large colonies (up to 100,000 adults) may lose more than 50 percent of nests to coyotes (*Canis latrans*), especially in silage fields, but also in freshwater marshes when water is withdrawn (Hamilton et al. 1995). Thus, water management by humans often has the effect of increasing predator access to active colonies.

A.12.5.4 Poisoning and Contamination

Various poisons and contaminants have caused mass mortality of tricolored blackbirds. McCabe (1932) described the strychnine poisoning of 30,000 breeding adults as part of an agricultural experiment. Neff (1942) considered poisoning to regulate numbers of blackbirds preying upon crops (especially rice) to be a major source of mortality. This practice continued until the 1960s, and thousands of tricolored blackbirds and other blackbirds were exterminated to control damage to rice crops in the Central Valley. Beedy and Hayworth (1992) observed a complete nesting failure of a large colony (about 47,000 breeding adults) at Kesterson Reservoir, Merced County, and selenium toxicosis was diagnosed as the primary cause of death. At a colony in Kern County, all eggs sprayed by mosquito abatement oil failed to hatch (Beedy and Hamilton 1999). Hosea (1986) attributed the loss of at least two colonies to aerial herbicide applications.

[3] http://www.nass.usda.gov/ca/.

A.12.5.5 Other Conservation Issues

Important information gaps in the ecology of the species include the effects of land use changes on the reproductive success of colonies and on the distribution of wintering birds, the relationship of invertebrate prey abundance and brood size, winter distribution, diet, and survival rates, and measures of suitable foraging habitat (Beedy and Hamilton 1999; Meese 2007).

Tricolored blackbirds have been the focus of recent management concern due to population decline, very limited global range, and vulnerability of large breeding colonies to habitat losses, predation, and human-induced impacts. Recommendations for the species conservation (Beedy and Hamilton 1999; Hamilton 2004) include frequent monitoring of breeding and wintering population sizes, colony locations, and reproductive success; protection of colony locations and foraging habitats; protection of colonies on farmland by avoiding harvesting/tilling until young have fledged; providing adequate protection in Habitat Conservation Plans; focusing on dairy-dependence for breeding and wintering populations; developing or restoring breeding habitat near reservoirs, rice fields, alfalfa fields and other optimal foraging habitats; and managing major predators in or near breeding colonies, including common ravens, black-crowned night-herons, cattle egrets, and coyotes when feasible.

A.12.6 Species Habitat Model and Location Data

The habitat model for this species was based on the distribution of land cover types that are known to support its habitat as described above in Section A.31.3, *Habitat Requirements and Ecology* (Figure A-31). The model parameters include the following.

- Known Recent Colonies in Yolo NCCP/HCP Species Locality Database: Location where colonies have relatively recently (post-January 1, 2000) been documented according to one or more species locality records databases (i.e., California Natural Diversity Database [CNDDB], John Kemper, University of California, Davis (UC Davis) Museum of Wildlife and Fish Biology, BIOS, Bob Meese, Avian Knowledge Network).
- Known Recent Sightings in Yolo NCCP/HCP Species Locality Database: Other location where the species has relatively recently (post-January 1, 1990) been documented, but not identified as a colony site, according to one or more species locality records databases (i.e., CNDDB, John Kemper, UC Davis Museum of Wildlife and Fish Biology, BIOS, Bob Meese, Avian Knowledge Network).
- Nesting Habitat: This habitat includes all potentially suitable breeding habitat in natural habitat communities. This habitat was modeled by selecting all mapped vegetation types as listed below that occur in the Yolo Bypass, Central Valley, Capay Valley, and Dunnigan Hills ecoregions.
- Foraging Habitat: This habitat includes all potentially suitable foraging habitat. This habitat was modeled by selecting all mapped vegetation types listed below that occur within 13 km (8 miles) of nesting habitat.

A.12.6.1 Nesting Habitat – Vegetation Types

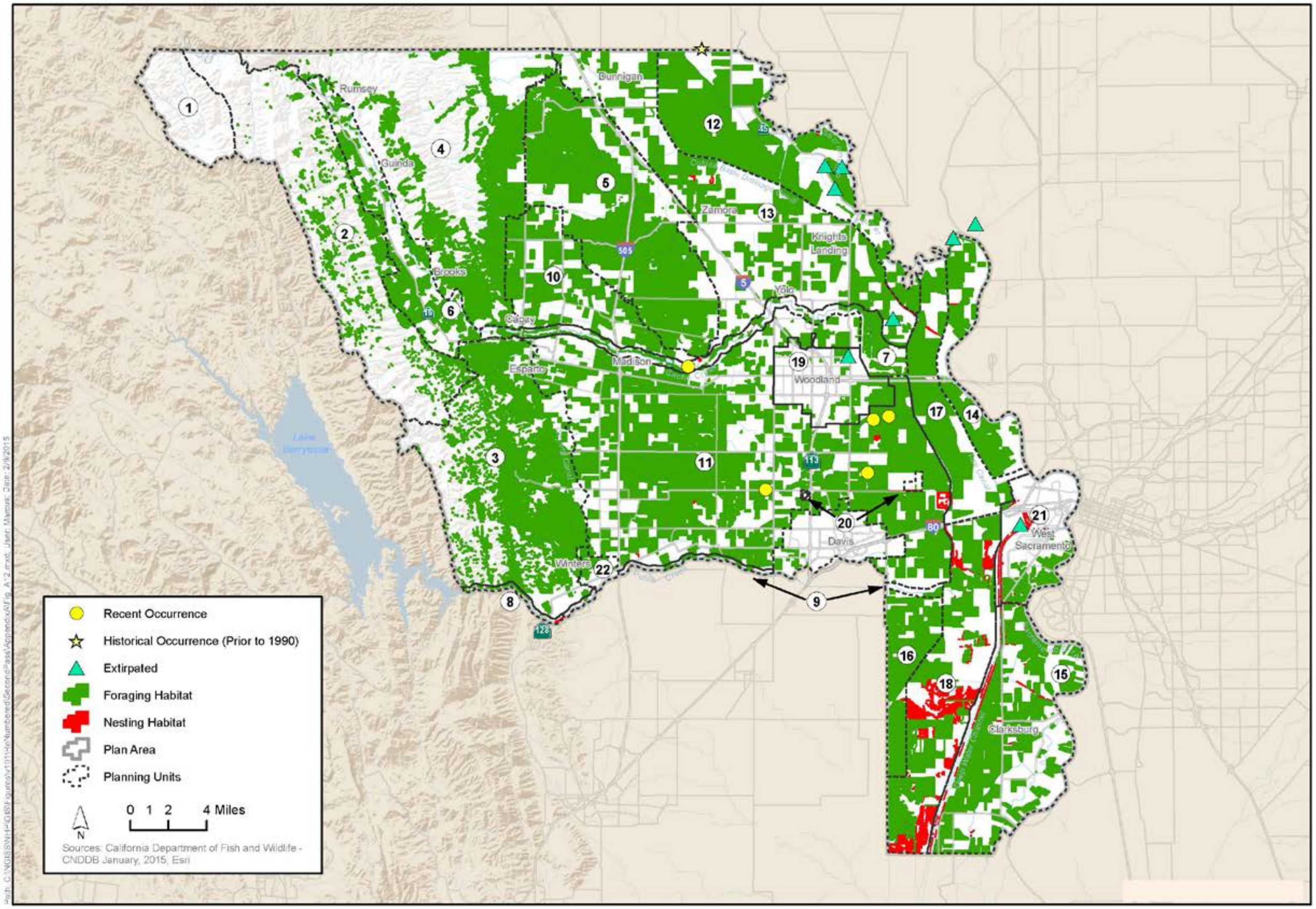
- Alkali Bulrush – Bulrush Brackish Marsh Not Formally Defined (NFD) Super Alliance
- Bullrush – Cattail Wetland Alliance
- Bulrush – Cattail Fresh Water Marsh NFD Super Alliance

- Blackberry NFD Super Alliance
- Undifferentiated Riparian Bramble and Other

A.12.6.2 Foraging Habitat – Vegetation Types

- All Annual Grassland
- All Pasture
- Safflower and Sorghum
- Grain and Hay Crops
- Rice
- Undetermined Alliance – Managed
- Livestock Feedlots
- Poultry Farms

Figure A-12. Tricolored Blackbird Modeled Habitat and Occurrences



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Appendix B
Common and Scientific Names of Species Mentioned in the Text

Type	Common Name	Scientific Name
Plants	Alder	*Alnus* sp.
Plants	Alkali coyote thistle	*Eryngium aristulatum*
Plants	Alkali heath	*Frankenia salina*
Plants	Alkali milkvetch	*Astragalus tener* var. *tener*
Plants	Annual hairgrass	*Deschampsia danthonoides*
Plants	Arroyo willow	*Salix lasiolepis*
Plants	Ash	*Fraxinus* spp.
Plants	Baby blue-eyes	*Nemophila menziesii*
Plants	Baker's navarretia	*Navarretia leucocephala* ssp. *bakeri*
Plants	Baltic rush	*Juncus balticus*
Plants	Barbed goatgrass	*Aegilops triuncialis*
Plants	Bearded popcornflower	*Plagiobothrys hystriculus*
Plants	Beardless wild-rye	*Elymus triticoides*
Plants	Bent-flowered fiddleneck	*Amsinckia lunaris*
Plants	Bigleaf maple	*Acer macrophyllum*
Plants	Birch-leaf mountain mahogany	*Cercocarpus betuloides*
Plants	Black oak	*Quercus kelloggii*
Plants	Black willow	*Salix gooddingii*
Plants	Blue dicks	*Dichelostemma capitatum*
Plants	Blue elderberry	*Sambucus nigra* ssp. *cerulea*
Plants	Blue gum eucalyptus	*Eucalyptus globulus*
Plants	Blue oak	*Quercus douglasii*
Plants	Brittlescale	*Atriplex depressa*
Plants	Broadleaf filaree	*Erodium botrys*
Plants	Brome grass	*Bromus* spp.
Plants	Buckbrush	*Ceanothus cuneatus*
Plants	Buckeye	*Aesculus californicus*
Plants	Bulrush	*Schoenoplectus* (formerly *Scirpus*) spp.
Plants	Bush lupine	*Lupinus* spp.
Plants	Bush seepweed	*Suaeda moquinii*
Plants	Butter and eggs	*Triphysaria eriantha*
Plants	California bay/laurel	*Umbellularia californica*
Plants	California blackberry	*Rubus ursinus*
Plants	California bulrush	*Schoenoplectus californicus*
Plants	California coffeeberry	*Rhamnus californica*
Plants	California juniper	*Juniperus californica*
Plants	California plantain	*Plantago erecta*
Plants	California rose	*Rosa californica*
Plants	California sycamore	*Platanus racemosa*
Plants	California yerba santa	*Eriodictyon californicum*
Plants	California/wild grape	*Vitis californica*
Plants	Canyon live oak	*Quercus chrysolepsis*
Plants	Cattail	*Typha* spp.
Plants	Chamise	*Adenostoma fasciculatum*
Plants	Clover	*Trifolium* spp.

Type	Common Name	Scientific Name
Plants	Colusa grass	*Neostapfia colusana*
Plants	Colusa layia	*Layia septentrionalis*
Plants	Common manzanita	*Arctostaphylos manzanita*
Plants	Common spikeweed	*Centromadia pungens*
Plants	Cottonwood	*Populus* sp.
Plants	Coyote brush	*Baccharis pilularis*
Plants	Curly dock	*Rumex crispus*
Plants	Cutleaf filaree	*Erodium cicutarium*
Plants	Deerweed	*Lotus scoparius*
Plants	Delta tule pea	*Lathyrus jepsonii* var. *jepsonii*
Plants	Dove weed	*Eremocarpus setigerus*
Plants	Downingia	*Downingia* spp.
Plants	Drymaria-like western flax	*Hesperolinon drymarioides*
Plants	Duckweed	*Lemna minor*
Plants	Elderberry	*Sambucus* spp.
Plants	Eucalyptus	*Eucalyptus* spp.
Plants	Ferris' milk-vetch	*Astragalus tener* var. *ferrisiae*
Plants	Fiddleneck	*Amsinckia* spp.
Plants	Filaree	*Erodium* spp.
Plants	Fireweed	*Amsinckia menziesii*
Plants	Flat-face downingia	*Downingia pulchella*
Plants	Foothill pine	*Pinus sabiniana*
Plants	Fremont cottonwood	*Populus fremontii*
Plants	Giant reed	*Arundo donax*
Plants	Gumplant	*Grindelia camporum*
Plants	Hall's harmonia	*Harmonia hallii*
Plants	Heartscale	*Atriplex cordulata*
Plants	Heckard's pepper-grass	*Lepidium latipes* var. *heckardii*
Plants	Himalayan blackberry	*Rubus armeniacus*
Plants	Interior live oak	*Quercus wislizeni*
Plants	Iris-leaved rush	*Juncus xiphioides*
Plants	Italian ryegrass	*Lolium multiflorum*
Plants	Ithuriel's spear	*Triteleia laxa*
Plants	Jepson's milk-vetch	*Astragalus rattanii* var. *jepsonianus*
Plants	Knobcone pine	*Pinus attenuata*
Plants	Leather oak	*Quercus durata*
Plants	Locust	*Robinia* spp.
Plants	Manzanita	*Arctostaphylos* spp.
Plants	Mason's lilaeopsis	*Lilaeopsis masonii*
Plants	McNab cypress	*Cupressus macnabiana*
Plants	Medusahead	*Taeniatherum caput-medusae*
Plants	Milk thistle	*Silybum marianum*
Plants	Miner's lettuce	*Claytonia perfoliata*
Plants	Miniature lupine	*Lupinus bicolor*
Plants	Morrison's jewelflower	*Streptanthus morrisonii* ssp. *morrisonii*

Type	Common Name	Scientific Name
Plants	Mulefat	*Baccharis salicifolia*
Plants	Narrow willow	*Salix exigua*
Plants	Needlegrass	*Nassella* spp.
Plants	Palmate-bracted bird's-beak	*Chloropyron palmatum*[2]
Plants	Pappose tarweed	*Centromadia parryi*
Plants	Perennial pepperweed	*Lepidium latifolium*
Plants	Pickleweed	*Salicornia subterminalis*
Plants	Pitcher sage	*Lepechinia calycina*
Plants	Poison oak	*Toxicodendron diversilobum*
Plants	Popcornflower	*Plagiobothrys stipitatus*
Plants	Pricklegrass	*Crypsis* spp.
Plants	Rancher's fireweed	*Amsinckia menziesii* var. *intermedia*
Plants	Rayless golden aster	*Heterotheca oregona*
Plants	Red willow	*Salix laevigata*
Plants	Redberry	*Rhamnus crocea*
Plants	Ripcut brome	*Bromus diandrus*
Plants	Rose mallow	*Hibiscus lasiocarpus*
Plants	Round-leaved fillaree	*California macrophylla*[2]
Plants	Rushes	*Juncus* spp.
Plants	Saline clover	*Trifolium depauperatum* var. *hydrophilum*
Plants	Salt cedar, tamarisk	*Tamarix* sp.
Plants	Saltgrass	*Distichlis spicata*
Plants	San Joaquin spearscale	*Atriplex joaquinana*
Plants	Scrub oak	*Quercus berberidifolia*
Plants	Sedge	*Carex* spp.
Plants	Shining willow	*Salix lucida*
Plants	Silver bush lupine	*Lupinus albifrons*
Plants	Slender oats	*Avena barbata*
Plants	Small fescue	*Vulpia microstachys*
Plants	Soft chess	*Bromus hordeaceus*
Plants	Solano grass	*Tuctoria mucronata*
Plants	Spikerushes	*Eleocharis* spp.
Plants	Swamp timothy	*Crypsis schoenoides*
Plants	Sycamore	*Platanus* sp.
Plants	Tomcat clover	*Trifolium willdenovii*
Plants	Toyon	*Heteromeles arbutifolia*
Plants	Tules	*Schoenoplectus* sp. or *Scirupus* sp.
Plants	Valley oak	*Quercus lobata*
Plants	Vinegar weed	*Trichostema lanceolatum*
Plants	Wedgeleaf	*Ceanothus* spp.
Plants	White alder	*Alnus rhombifolia*
Plants	Whiteleaf manzanita	*Arctostaphylos viscida*
Plants	Wild oats	*Avena fatua*
Plants	Willow	*Salix* spp.
Plants	Yellow star-thistle	*Centaurea solstitialis*

Type	Common Name	Scientific Name
Plants	Yerba santa	*Eriodictyon californicum*
Plants	Zoro fescue	*Vulpia myuros*
Invertebrates	Ancient ant	*Pyramica reliquia*
Invertebrates	Argentine Ant	*Linepithema humile*
Invertebrates	California linderiella	*Linderiella occidentalis*
Invertebrates	Conservancy fairy shrimp	*Branchinecta conservatio*
Invertebrates	Midvalley fairy shrimp	*Branchinecta mesovallensis*
Invertebrates	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*
Invertebrates	Vernal pool fairy shrimp	*Branchinecta lynchi*
Invertebrates	Vernal pool tadpole shrimp	*Lepidurus packardi*
Amphibians	California tiger salamander	*Ambystoma californiense*
Amphibians	Foothill yellow-legged frog	*Rana boylii*
Amphibians	Western spadefoot	*Spea hammondii*
Reptiles	Common kingsnake	*Lampropeltis getula*
Reptiles	Giant garter snake	*Thamnophis gigas*
Reptiles	Gopher snake	*Pituophis melanoleucus*
Reptiles	Northern alligator lizard	*Elgaria coerulea*
Reptiles	Western fence lizard	*Sceloporus occidentalis*
Reptiles	Western pond turtle	*Actinemys* (formerly *Clemmys* and *Emys*) *marmorata*
Reptiles	Western rattlesnake	*Crotalus viridis*
Reptiles	Western skink	*Eumeces skiltonianus*
Birds	Acorn woodpecker	*Melanerpes formicivorus*
Birds	American bittern	*Botaurus lentiginosus*
Birds	American coot	*Fulica americana*
Birds	American crow	*Corvus brachyrhynchos*
Birds	American goldfinch	*Spinus tristis*
Birds	American kestrel	*Falco sparverius*
Birds	American pipit	*Anthas rubescens*
Birds	American robin	*Turdus migratorius*
Birds	Anna's hummingbird	*Calypte anna*
Birds	Ash-throated flycatcher	*Myiarchus cinerascens*
Birds	Bald eagle	*Haliaeetus leucocephalus*
Birds	Band-tailed pigeon	*Patagioenas fasciata*
Birds	Bank swallow	*Riparia riparia*
Birds	Barn owl	*Tyto alba*
Birds	Bewick's wren	*Thryomanes bewickii*
Birds	Black-crowned night heron	*Nycticorax nycticorax*
Birds	Black-headed grosbeak	*Pheucticus melanocephalus*
Birds	Black-necked stilt	*Himantopus mexicanus*
Birds	Blue grosbeak	*Passerina caerulea*
Birds	Blue-gray gnatcatcher	*Polioptila caerulea*
Birds	Brewer's blackbird	*Euphagus cyanocephalus*
Birds	Bufflehead	*Bucephala albeola*
Birds	Bullock's oriole	*Icterus bullockii*
Birds	Bushtit	*Psaltriparus minimus*

Type	Common Name	Scientific Name
Birds	California black rail	*Laterallus jamaicensis coturniculus*
Birds	California gull	*Larus californicus*
Birds	California quail	*Lophortyx californicus*
Birds	California thrasher	*Toxostoma redivivum*
Birds	California towhee	*Pipilo crissalis*
Birds	Cedar waxwing	*Bombycilla cedrorum*
Birds	Common goldeneye	*Bucephala clangula*
Birds	Common moorhen/gallinule	*Gallinula chloropus*
Birds	Dark-eyed junco	*Junco hyemalis*
Birds	Double-crested cormorant	*Phalacrocorax auritus*
Birds	Eared grebe	*Podiceps nigricollis*
Birds	European starling	*Sturnus vulgaris*
Birds	Fox sparrow	*Passerella iliaca*
Birds	Golden eagle	*Aquila chrysaetos*
Birds	Golden-crowned sparrow	*Zonotrichia atricapilla*
Birds	Grasshopper sparrow	*Ammodramus savannarum*
Birds	Great blue heron	*Ardea herodias*
Birds	Great egret	*Ardea alba*
Birds	Great horned owl	*Bubo virginianus*
Birds	Greater white-fronted goose	*Anser albifrons*
Birds	Hairy woodpecker	*Picoides villosus*
Birds	Hermit thrush	*Catharus guttatus*
Birds	Horned lark	*Eremophila alpestris*
Birds	House finch	*Carpodacus mexicanus*
Birds	House sparrow	*Passer domesticus*
Birds	House wren	*Troglodytes aedon*
Birds	Hutton's vireo	*Vireo huttoni*
Birds	Killdeer	*Charadrius vociferus*
Birds	Lark sparrow	*Chondestes grammacus*
Birds	Lazuli bunting	*Passerina aemona*
Birds	Least Bell's vireo	*Vireo bellii pusillus*
Birds	Least bittern	*Ixobrychus exilis*
Birds	Lesser goldfinch	*Carduelis psaltria*
Birds	Lesser nighthawk	*Chordeiles acutipennis*
Birds	Loggerhead shrike	*Lanius ludovicianus*
Birds	Long-eared owl	*Asio otus*
Birds	Mallard	*Anas platyrhynchos*
Birds	Marsh wren	*Cistothorus palustris*
Birds	Mountain plover	*Charadrius montanus*
Birds	Mountain quail	*Oreortyx pictus*
Birds	Mourning dove	*Zenaida macroura*
Birds	Northern harrier	*Circus cyaneus*
Birds	Northern mockingbird	*Mimus polyglottos*
Birds	Northern pintail	*Anas acuta*
Birds	Northern pygmy-owl	*Glaucidium gnoma*

Type	Common Name	Scientific Name
Birds	Nuttall's woodpecker	*Picoides nuttallii*
Birds	Oak titmouse	*Baeolophus inornatus*
Birds	Orange-crowned warbler	*Vermivora celata*
Birds	Osprey	*Pandion haliaetus*
Birds	Pied-billed grebe	*Podilymbus podiceps*
Birds	Pileated woodpecker	*Dryocopus pileatus*
Birds	Prairie Falcon	*Falco mexicanus*
Birds	Purple martin	*Progne subis*
Birds	Redhead	*Aythya americana*
Birds	Red-tailed hawk	*Buteo jamaicensis*
Birds	Red-winged blackbird	*Agelaius phoeniceus*
Birds	Ruby-crowned kinglet	*Regulus calendula*
Birds	Ruddy duck	*Oxyura jamaicensis*
Birds	Rufous-crowned sparrow	*Aimophila rufeceps*
Birds	Savannah sparrow	*Passerculus sandwhichensis*
Birds	Sage sparrow	*Amphispiza belli*
Birds	Short-eared owl	*Asio flammeus*
Birds	Snow goose	*Chen caerulescens*
Birds	Snowy egret	*Egretta thula*
Birds	Song sparrow	*Melospiza melodia*
Birds	Sora	*Porzana Carolina*
Birds	Spotted towhee	*Pipilo maculatus*
Birds	Swainson's hawk	*Buteo swainsoni*
Birds	Tricolored blackbird	*Agelaius tricolor*
Birds	Tundra swan	*Cygnus columbianus*
Birds	Virginia rail	*Rallus limicola*
Birds	Western bluebird	*Sialia Mexicana*
Birds	Western burrowing owl	*Athene cunicularia hypugaea*
Birds	Western kingbird	*Tyrannus verticalis*
Birds	Western meadowlark	*Sturnella neglecta*
Birds	Western screech-owl	*Otus kennicottii*
Birds	Western scrub-jay	*Aphelocoma californica*
Birds	Western snowy plover	*Charadrius alexandrinus nivosus*
Birds	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*
Birds	White-breasted nuthatch	*Sitta carolinensis*
Birds	White-crowned sparrow	*Zonotrichia leucophrys*
Birds	White-tailed kite	*Elanus leucurus*
Birds	Wrentit	*Chamaea fasciata*
Birds	Yellow-billed magpie	*Pica nuttalli*
Birds	Yellow-breasted chat	*Icteria virens*
Birds	Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Birds	Yellow-rumped warbler	*Dendroica coronata*
Mammals	American badger	*Taxidea taxus*
Mammals	Black-tailed jackrabbit	*Lepus californicus*
Mammals	Bobcat	*Lynx rufus*

Type	Common Name	Scientific Name
Mammals	Brown rat	*Rattus norvegicus*
Mammals	California ground squirrel	*Otospermophilus beecheyi*
Mammals	California meadow vole	*Microtus californicus*
Mammals	Cottontail	*Sylvilagus audubonі*
Mammals	Coyote	*Canis latrans*
Mammals	Deer mouse	*Peromyscus maniculatus*
Mammals	Fox squirrel	*Sciurus niger*
Mammals	Gray fox	*Urocyon cinereoargenteus*
Mammals	House mouse	*Mus musculus*
Mammals	Mule deer	*Odocoileus hemionus*
Mammals	Pallid bat	*Antrozous pallidus*
Mammals	Pronghorn	*Antilocarpa americana*
Mammals	Raccoon	*Procyon lotor*
Mammals	Roof rat	*Rattus rattus*
Mammals	San Joaquin pocket mouse	*Perognathus inornatus inornatus*
Mammals	Striped skunk	*Mephitis mephitis*
Mammals	Townsend's big-eared bat	*Corynorhinus townsendii*
Mammals	Tule elk	*Cervus elephas*
Mammals	Virginia opossum	*Didelphis virginiana*
Mammals	Western gray squirrel	*Sciurus griseus*
Mammals	Western red bat	*Lasiurus blossevillii*

Appendix C

Evaluation of Species Considered for Coverage

C.1 Introduction

Pursuant to the Endangered Species Act (ESA) and Natural Community Conservation Planning Act (NCCPA), incidental take authorizations may be required for species covered under the Yolo HCP/NCCP ("covered species") to implement the covered activities over the term of the Yolo HCP/NCCP. Species the Yolo Habitat Conservancy (Conservancy) considered for coverage were special-status species that could be present in the Plan Area. The Conservancy limited consideration for coverage of nonlisted species to special-status species because, by definition, federal and state wildlife agencies recognize these species as declining and therefore more likely than other nonlisted species to become listed at some time during implementation of the covered activities. For the purpose of the HCP/NCCP, the Conservancy defines special-status species as species that meet one or more of the following criteria:

- Listed as threatened or endangered under the ESA;
- Proposed or candidates for listing under the ESA;
- Listed as threatened or endangered under the California Endangered Species Act (CESA);
- Candidates for listing under CESA;
- California species of concern;
- Plants listed as rare under the California Native Plant Protection Act (NPPA); or
- Plants included in the California Native Plant Society (CNPS) Rank 1A, 1B, or 2.

Sources of information used to identify the special-status species that could be present in the Plan Area are as follows:

- Department of Fish and Wildlife's (DFW's) California Natural Diversity Database (CNDDB);[1]
- U.S. Fish and Wildlife Service (USFWS) list of endangered and threatened species that occur in or may be affected by projects in Yolo County;[2]
- Yolo County General Plan; and
- Recorded observations of special-status species provided by local resource experts.

The Conservancy evaluated approximately 175 species for inclusion as covered species. The Conservancy assembled the evaluation list based on species legal status, conservation status, and potential occurrence in the Plan Area based on the sources of information described above. Table C-1 lists these special-status species and evaluates them for coverage.

1 Source: CNDDB RareFind 3 database (2006) and http://imaps.dfg.ca.gov/viewers/cnddb_quickviewer/.
2 Source: http://www.fws.gov/sacramento/es/spp_lists/auto_list.cfm.

C.2 Selection of Proposed Covered Species

The Conservancy used five criteria to evaluate the potential species identified in Table C-1. The Conservancy recommended these species for coverage if they met all five criteria described below.

- **Geographic Range.** The species is currently known to occur or is expected to occur in the Plan Area based on knowledge of the species' geographic range and the presence of suitable habitat.
- **Listing Status.** The species is either currently listed under the ESA or CESA, is likely to become listed during the term of the Permits, or is fully protected under the California Fish and Game Code.
- **Effects of Covered Activities.** The species could be adversely affected by covered activities that are currently occurring within the Plan Area or are likely to occur over the life of the Permits.
- **Adequacy of Existing Data on the Species.** Sufficient data is available regarding the species' life history, habitat requirements, and presence in the Plan Area to adequately evaluate effects on the species and develop appropriate conservation measures.
- **Cost and Funding.** Funding will be available to provide sufficient monitoring and conservation over the 50-year permit term to meet NCCP standards for the species.

The Conservancy applied these criteria iteratively from reviews conducted by the planning team based on a variety of published and unpublished information sources and input from the Advisory Committee, DFW, USFWS, the Independent Science Advisors, independent species experts, and the public.

Table C-1 presents the evaluation process and results of the process for each of the special-status animal and plant species considered. As a result of this evaluation, the Conservancy identified 12 species as meeting the criteria for inclusion as covered species in the Yolo HCP/NCCP; Chapter 1, *Introduction*, Table 1–1, lists these species.

C.2.1 Species Range Evaluation

The Conservancy used the following data sources to evaluate the potential for the species on the draft species list to occur within Yolo County.

The Conservancy used available database sources to display species ranges in an interactive form and on hardcopy maps. Biologists used these ranges to determine the likelihood of a species occurring within the study area. The ranges provided rationale for inclusion on the list based on the potential for a species to occur within the study area. Range and distribution sources included:

- **CNPS Quads**. A database containing U.S. Geological Survey (USGS) 7.5-minute quadrangles for which plant species are known to occur.
- **CalJep Ranges**. A database containing distributions for plant species based on suitable habitat. In addition to known distributions, this database provides possible distributions for each species based on potential habitat.
- **Critical Habitat**. Proposed and designated USFWS critical habitats for plant and wildlife species within the study area. Critical habitats represent important areas of habitat that should be protected to ensure recovery of threatened and endangered species.

- **California Wildlife Habitat Relationships (CWHR) Ranges**. A database containing distributions for wildlife species. Ranges are given only for the species level; subspecies are not recognized in this database.
- **Online Databases** (e.g., Birds of North America, Butterflies and Moths of North America), regional experts and their knowledge of species on selected species when GIS data was unavailable for a given species.

Location databases provided documentation of known locations for individual species. These locations are based on confirmed sightings of a species in a specific area. The Conservancy combined this data with known or predicted ranges to further refine the draft species list. Locations sources included:

- **CNDDB Location**s. Location database containing confirmed species locations for both plant and wildlife species.
- **USFWS Locations**. Location database containing confirmed species points for both plant and wildlife species.
- **Conservancy Database**. A database compilation based on several local data sources of confirmed species locations for both plant and wildlife species.

Species were evaluated to determine whether they occur or are likely to occur within Yolo County. Existing information regarding locations of occurrences and suitability of habitat conditions were assessed for the Plan Area. On the basis of this review, each species was placed in one of the following three categories:

- **Present**. The species has been documented to occur in the Plan Area.
- **Potentially Present**. Suitable habitat exists in the Plan Area and the known current or historical range of the species is sufficiently close to the Plan Area such that species presence is possible.
- **Absent**. Neither the species nor its habitat has been documented to occur within the Plan Area and its known current or historical ranges do not indicate a potential for occurrence.

The Conservancy retained species categorized as present or potentially present for consideration for coverage under this criterion.

C.2.2 Listing Status Evaluation

The Conservancy intended this criterion to identify those species on the initial list that either are currently listed as state or federally endangered or threatened or have a designated sensitivity status or known trend that indicates they are likely to be state-listed or federally listed over the life of the plan.

The Conservancy updated the state and federal listing status for all species on the draft covered species list, including the following state or federal listing or status categories to indicate species appropriateness for coverage:

- Listed or proposed for listing as endangered or threatened under the federal ESA.
- Listed or candidate for listing as endangered, threatened, or rare under CESA.

- Listed as rare under California NPPA.
- Species designated as Fully Protected under the California Fish and Game Code.
- DFW Species of Special Concern Species.
- Designated as Sensitive by the U.S. Bureau of Land Management (BLM) or U.S. Department of Agriculture (USDA) Forest Service (USFS).
- Identified by the California Native Plant Society (CNPS) Rare Plant Ranks 1 and/or 2, as species that meet the definition of threatened, or endangered as defined under the California Environmental Quality Act (CEQA).

Species identified with lower status designations (e.g., CNPS Ranks 3 and 4 and species covered only under the Migratory Bird Treaty Act [MBTA]) were not considered as likely to be listed over the life of the plan, unless other supporting information was available that suggested potential for listing.

C.2.3 Potential for Covered Activities to Adversely Affect the Species

The HCP/NCCP will support issuance of the permits that provide incidental take authorization for covered activities. Therefore, the Conservancy only proposed for covereage species likely to be taken by covered activities. The Conservancy determined potential for take of the species based on the habitats the species use, the timing of their occurrence, and evaluation of the types of activities covered in the HCP/NCCP and the potential to cause take as a result of direct mortality during operations, habitat modification that could lead to harm or mortality, or disturbance by human activity.

There are some species that initial evaluation indicates could be affected by covered activities, but for which the eventual Yolo HCP/NCCP conservation measures may indicate that to achieve conservation goals no take of the species would be allowed. Such species are considered to meet the potential to be affected criterion because the plan would provide for their conservation through avoidance measures and the applicants would request that such species be covered in the federal and state permits and authorizations issued.

C.2.4 Sufficiency of Species Data for Planning

To obtain regulatory coverage for a species through the HCP/NCCP, sufficient data on the species' life history, habitat requirements, and occurrence in the Plan Area must be available to adequately evaluate the likely effects of covered activities and to develop appropriate conservation measures. Without sufficient data, a scientifically justified conservation strategy cannot be developed and the species would be removed from the final draft species list.

The Conervancy drafted detailed species accounts summarizing life history, distribution, and threats and limiting factors for a set of 69 species considered likely to be included as covered species (Appendix A, *Covered Species Accounts*). The Conservancy reviewed species accounts and other available information to determine the extent of known scientific information and data for each species. The Conservancy also considered recommendations from the wildlife agencies. The Conservancy did not recommend for coverage those species for which the Conservancy considered available scientific and commercial information and data to be inadequate to support the assessment of impacts and the development of a conservation strategy.

C.2.5 Cost and Funding

The Conservancy evaluated the likelihood that a conservation strategy could be implemented for each of the covered species to meet the NCCPA and FESA standards, given costs and likely funding. Species that were listed or proposed for listing were given the highest priority for coverage, and covered species that could be added to the list at a reasonable cost were then added. For example, for species that were not listed or proposed for listing, the Conservancy prioritized addition of those species that are expected to benefit from the conservation actions of another covered species and would therefore not require a relatively large additional cost to cover. The Conservancy only applied this criterion to species that met all the other four criteria for including on the covered species list.

Table C-1. Evaluation of Special-Status Animals for Coverage under the Yolo Natural Heritage Program

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Mammals								
Taxidea taxus American badger	-/SSC/-	-	+	+	+	N/A	No	Although a special-status species that has experienced local declines in some areas of the state, there is no indication that it has experienced declines sufficient to warrant listing within the plan timeframe. This species is not covered in other local HCP/NCCPs. While there are no documented occurrences in the Plan Area, this species could potentially occur in grassland habitats along the western edge of the valley. Coverage is not recommended because the species is not currently listed, has low potential to be listed within the plan timeframe, and because the lack of confirmed sightings suggest the species may not currently occur in the Plan Area.
Bassariscus astutus Ringtail	-/FP/-	+	+	-	+	N/A	No	The ringtail is state Fully Protected, and thus cannot be taken. While the species is known to occur in dense riparian woodlands, the limited extent of suitable riparian habitat in the Plan Area limits the potential for occurrence primarily to the upper reaches of Putah and Cache Creeks, and thus also limits the potential for effect. Continuing ongoing conservation efforts and additional conservation afforded under this plan are expected to benefit the ringtail.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								Coverage is not recommended because the species cannot be taken due to its status as Fully Protected, and is unlikely to be affected by covered activities.
Perognathus inornatus inornatus San Joaquin pocket mouse	-/-/-	-	+	+	+	N/A	No	The California Department of Fish and Wildlife (DFW) includes this species on its Special Animals list because it is a BLM sensitive species and is an IUCN candidate. It is not, however, a state species of special concern, nor does it have any other status. This species' range includes the grassland and savannah habitats that occur around the perimeter of the Central Valley up to about 1,500 feet, and grassland habitats in the Central Coast ranges. Most reported occurrences from CNDDB are from the San Joaquin Valley. Few records have been reported from the Sacramento Valley and none from Yolo County. Coverage is not recommended because this species has low potential to be listed within the Plan timeframe.
Antrozous pallidus Pallid bat	-/SSC/-	-	+	+	+	N/A	No	In addition to being a state species of special concern, this species is also included on the International Union for the Conservation of Nature (IUCN) Red List as Least Concern and is designated as High Priority by the Western Bat Working Group (WBWG). While declines of this species have been reported, the pallid bat is widespread throughout California. There are insufficient data to indicate that listing of this species would be warranted within the plan timeframe. This species is not covered in most other local HCP/NCCPs.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								This widely distributed species roosts in small colonies in caves, rock crevices, and tree hollows, but will also use bridges and buildings. Potential to adversely affect is based on the potential for removal of occupied trees, buildings, and bridges. Coverage is not recommended because the species has low potential to be listed.
Lasiurus blossevillii Western red bat	-/SSC/-	-	+	-	+	N/A	No	In addition to being a state species of special concern, this species is also designated as High Priority by WBWG. While declines of this species have been reported, the western red bat is widespread throughout California. There are insufficient data to indicate that listing of this species would be warranted within the plan timeframe. This species is not covered in other local HCP/NCCPs. This species roosts in trees and is usually solitary. In the Plan Area, potentially occupied habitat includes mature riparian – usually cottonwood/sycamore riparian woodland. Potential to affect based on the potential for removal of active roost trees. Coverage is not recommended because the species has low potential to be listed and existing protections and proposed conservation efforts, particularly for riparian habitat, are expected to benefit this species.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Corynorhinus townsendii Townsend's western big-eared bat	-/C/-	+	+	-	-	N/A	No	In addition to being a state species of special concern, this species is also included on the IUCN Red List as Vulnerable and is designated as High Priority by WBWG. This species has been more widely studied in California and may be more vulnerable due to its more colonial nature relative to other sensitive bat species, such as western red bat. It is therefore reasonable to conclude that this species could be listed within the plan timeframe. It is also included as a covered species in the East Contra Costa HCP/NCCP. This is a highly colonial bat that typically occupies natural caves; however, it is also known to colonize old structures such as barns. It is widely distributed throughout most of California and while there are no known roosts or maternity sites from the Plan Area, suitable roost or maternity sites are likely available in the western uplands and there is potential for occurrence in old barns and other structures on the valley floor. Coverage is not recommended because the species does not have a high likelihood of being affected by covered activities, and because there is not sufficient information available to develop an adequate conservation strategy for the species.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Birds								
Xanthocephalus xanthocephalus Yellow-headed blackbird	-/SSC/-	-	+	+	+	N/A	No	Priority 3 as a state species of special concern with relatively stable populations since 1980. Not covered or considered for coverage in other HCP/NCCPs. The species is unlikely to be listed within the plan timeframe. Most occurrences of this species are from wetland habitats in the Yolo Bypass, primarily on the Yolo Bypass Wildlife Area, and thus covered activities are not expected to substantially affect this species' habitat. Coverage is not recommended because the species has a relatively low potential for future listing and because it occurs primarily in areas not affected by covered activities.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Agelaius tricolor Tricolored blackbird	BCC/SSC/ -	+	+	+	+	+	Yes	Significant and dramatic population declines and covered or considered for coverage under all other regional HCP/NCCPs. This species is likely to be listed within the plan timeframe. Most nesting occurs in wetland habitats within the Yolo Bypass, but the species forages more widely throughout the Plan Area and has potential to nest in remnant wetland patches and some agricultural habitats. Sensitive to disturbances and habitat loss. Coverage is recommended because the species has a high potential for future listing and because it could be affected by covered activities.
Ammodramus savannarum Grasshopper sparrow	-/SSC/-	+	+	-	+	-	No	Population declines have been reported for this species, particularly in the Central Valley, and there is a reasonable likelihood of future listing. This species is not considered for coverage in other regional HCP/NCCPs. Very occasional records of the species from the Plan Area with breeding documented only in the Yolo Bypass. Potential to occur in western grasslands and some restored grassland areas in the interior of the Plan Area. Coverage is not recommended because the Yolo HCP/NCCP covered activities are not likely to result in take of the species.
Icteria virens	-/SSC/-	-	+	+	+	N/A	No	Covered under the San Joaquin County HCP, and considered for coverage under the Solano and South Sacramento County

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Yellow breasted chat								HCPs. A fairly conspicuous species and relatively good occurrence and distribution data are available to evaluate trends. Federal and state listing are unlikely due to wide distribution. This species occurs in riparian habitat and has been reported from upper Putah Creek. It could be affected by actions that modify riparian habitat. However, there may be few covered activities that are likely to modify currently suitable riparian habitat. Coverage is not recommended for this species because state or federal listing is not anticipated, and adverse effects to occupied riparian habitat are expected to be minimal.
Progne subis Purple martin	-/SSC/-	+	+	-	+	N/A	No	There are no recent breeding occurrences of this species from the Plan Area; urban-nesting birds from Sacramento may occasionally forage in Yolo County agricultural lands. Suitable woodland habitat may occur in the western portion of the Plan Area, but there are no reported occurrences. Due to substantial population declines since the 1960s, it is reasonable that this species could become listed within the plan timeframe. Its distribution in the Central Valley is limited to several urban sites, including Sacramento. Since the species is not known to nest within the Plan Area, and with the exception of the Sacramento urban sites is absent from the region; project activities are not expected to adversely affect this species. Riparian protection and

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								restoration and upland conservation actions are expected to benefit this species. Coverage is not recommended because the species is not known to nest within the Plan Area and thus would not be affected by covered activities. Although the species has a high potential for future listing, current and proposed protections and conservation efforts would improve habitat conditions for this species.
Riparia riparia Bank swallow	-/T/-	+	+	+	+	+	Yes	Possibility for nesting colonies along the Sacramento River near Fremont Weir, and along portions of Cache Creek. This species is state listed and due to long term and continuing population declines could become federally listed within the plan timeframe. Coverage is recommended because the species is currently listed and because it could be affected by covered activities.
Lanius ludovicianus Loggerhead shrike	BCC/SSC/ -	-	+	+	+	N/A	No	This species is fairly widespread in agricultural and grassland habitats throughout the lowland portion of the Plan Area and could be affected by covered activities. Coverage is not recommended, however, because there is a low potential for future listing.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]: Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding	Proposed for Coverage	Comments and Rationale
Athene cunicularia hypugaea Western burrowing owl	BCC/SSC/ -	+	+	+	+	+	Yes	This species is a covered species under all regional Central Valley HCP/NCCPs. Populations have and continue to decline due to widespread urbanization and agricultural conversion. It has a moderate to high likelihood of becoming state-listed within the plan timeframe. It is less likely to become federally listed due to relatively stable populations in many areas outside of California. This species occurs throughout the Plan Area, but other than individual occurrences is largely restricted to the Yolo Bypass and several other localized sites. Burrowing owls could potentially be affected from removal of grassland and pastureland habitats associated with covered activities. Coverage is recommended because there is a reasonably high potential for future listing and because the species could be affected by covered activities.
Asio otus Long-eared owl	-/SSC/-	-	+	+	+	N/A	No	This species has been a state species of special concern since 1978. Its range includes all of California with the exception of much of the Central Valley. There is little recent reliable data on the abundance of this elusive species and insufficient data to indicate that a listing is warranted within the plan timeframe. Although there are no recently reported occurrences of this species from the plan area, long-eared owl could occur in riparian and other woodland habitats and potentially be

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								affected from removal of riparian woodland and other woodland nesting habitats and grassland/seasonal wetland habitats foraging habitats. Coverage is not recommended because there is relatively low potential for future listing, there are no recently reported breeding occurrences in the vicinity of covered activities, and conservation efforts, particularly riparian protection and restoration, are expected to increase habitat and opportunities for occurrence.
Asio flammeus Short-eared owl	-/SSC/-	-	+	+	+	N/A	No	This species has been a state species of special concern since 1978. While local population declines have been reported and there are few recent breeding records from the Plan Area, there is insufficient data on statewide populations to indicate that a listing would be warranted within the plan timeframe. Coverage is not recommended because there is relatively low potential for future listing and most currently suitable habitat occurs on the Yolo Bypass Wildlife Area.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Coccyzus americanus occidentailis Western yellow-billed cuckoo	C,BCC /E/-	+	+	+	+	+	Yes	This species is currently state listed. It is a covered species in the San Joaquin County HCP. It is not known to breed in the Plan Area and there is currently insufficient available breeding habitat; however, there have been recent migratory and breeding season occurrences, including several from the Cache Creek Settling Basin and Putah Creek Sinks. Since the status of the developing riparian forest within the Cache Creek Settling Basin is unclear, the species could potentially be affected. Coverage is recommended because the species is listed, appears to be re-inhabiting some portions of the Plan Area, and because the species could be affected by covered activities. Existing and proposed protections and conservation effects to maintain and restore riparian habitats would benefit this species and potentially increase its occurrence and use of the Plan Area.
Chlidonias niger Black tern	-/SSC/-	+	+	+	+	-	No	This species was recently designated a state species of special concern. While local population declines are reported, particularly from the Central Valley, the species continues to occupy most of its historical range in northeastern California and adapted somewhat to rice agriculture in the Sacramento Valley. The stability of the population over the long-term is uncertain, however. While unlikely to be listed federally, there is a reasonable potential for state listing within the plan timeframe.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								Migrants have been documented in the Yolo Basin, where it is associated with rice fields. Breeding habitat is available where wetlands and rice agriculture occur in the Plan Area, but breeding has not yet been confirmed. Most observations have been on rice lands in the Yolo Bypass Wildlife Area; however, rice-associated habitat could also be affected by farm management activities on private lands in the Yolo Bypass and the Colusa Basin. Coverage is not recommended because there is not a high potential for future listing, and the funding expected to be available is not expected to be sufficient to cover this species.
Charadrius alexandrinus Snowy plover (interior population)	BCC/SSC/ -	+	+	-	+	N/A	No	The range of the inland population of the snowy plover includes a small portion of the Plan Area in the Yolo Basin. This population is a state species of special concern and a federal bird of conservation concern. It is reasonable that this population (along with the coastal population that is currently federally listed) could become listed within the plan timeframe. However, most of the few records of this species from the Plan Area are from the Yolo Bypass Wildlife Area. Coverage is not recommended because the species is not expected to be affected by covered activities.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Charadrius montanus Mountain plover	BCC/SSC/ -	+	+	-	+	N/A	No	In addition to being a state species of special concern and federal bird of conservation concern, the mountain plover is also designated as Vulnerable on the IUCN Red List. The species is being considered as a covered species on the Solano County HCP. While there is potential that the species could become federally listed within the plan timeframe, since the species only winters in California, it is unlikely that the species would become state listed. Mountain plovers do not breed in California, but the species has been reported during winter at several sites in Yolo and Solano Counties, including occasional occurrences in the Yolo Basin. However, given that the species only winters in a small portion of the plan area and potential winter habitat in Yolo County is abundant, potential impacts are limited to temporary displacement during winter foraging, and thus covered activities are not expected to affect this species. Coverage is not recommended because the species is not expected to be affected by covered activities.
Laterallus jamaicensis coturniculus California black rail	BCC /T,FP/-	+	+	-	+	N/A	No	This state-listed species is also being considered as a covered species in the Solano HCP/NCCP, and is a covered species in the San Joaquin County HCP. This species is closely associated with tidal marsh habitats and could potentially occur in marshes on the Yolo Basin Wildlife Area or other portions of the south bypass. Only one

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								black rail has been reported from Yolo County and is presumed to have been detected in the Yolo Bypass. Coverage is not recommended because the species is not expected to be affected by covered activities.
Falco peregrinus anatum American Peregrine Falcon	BCC/FP/-	+	+	-	+	N/A	No	The peregrine falcon was recently delisted by the USFWS and DFW, following recovery from pesticide-related population decline. It remains state fully protected; and is a federal bird of conservation concern. It is a covered species in the Natomas Basin HCP, and is being considered for coverage in the South Sacramento County HCP. There is only one breeding record of peregrine falcon from the extreme southwest corner of the Plan Area at Monticello Dam. It is occasionally observed foraging in the Plan Area during the winter. Potential effects are limited to temporary displacement of foraging individuals during winter. Thus, the project is not expected to adversely affect this species. This species is not proposed for coverage because neither conservation actions nor covered activities are expected to affect this species.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Haliaeetus leucocephalus Bald eagle	-/E,FP/-	+	+	-	+	N/A	No	The bald eagle was recently delisted by the USFWS and currently has no federal status. It remains a state endangered species and state fully protected species. The species is being considered for coverage under the South Sacramento County HCP. There is currently one bald eagle nesting territory in the Plan Area. It occurs on federal Bureau of Land Management (BLM) land in the northwest corner of the county. Other potential nesting habitat occurs in remote higher elevation areas of the county that are not subject to covered activities. Wintering bald eagles occur in the Cache Creek canyon between the county line and Rumsey, an area also not subject to covered activities. Thus, project activities are not expected to adversely affect this species. Coverage is not recommended because the species is not expected to be affected by covered activities.
Circus cyaneus Northern harrier	-/SSC/-	-	+	+	+	N/A	No	This is a covered species under the San Joaquin County HCP and is being considered for coverage under the Solano HCP/NCCP and South Sacramento HCP. This species occurs throughout the lowland portion of the Plan Area. While declines of this species have been documented locally, it remains widespread throughout California and population trends suggest a relatively stable statewide population. However, because this species occurs in lowland areas subject to a variety of land use changes including

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								urbanization and agricultural crop conversion, it continues to be susceptible to future declines. This species nests and forages in agricultural and grassland habitats and has potential to be affected by covered activities, including direct mortality from agricultural operations. Coverage is not recommended for coverage because the species has low potential for future listing.
Elanus leucurus White-tailed kite	-/FP/-	+	+	+	+	+	Yes	The white-tailed kite is state Fully Protected and therefore cannot be taken. It is being considered for coverage under the South Sacramento County HCP. DFW considered this a 'watch' species (Shuford and Gardali 2008), but it was not included on the list of bird species of special concern primarily because breeding bird surveys conducted between 1968 to 2004 (Sauer et al. 2005) indicate relatively stable populations. However, this species has historically suffered substantial population declines with nesting populations that continue to fluctuate. While federal listing is unlikely, there is reasonable potential for the species to become state listed within the plan timeframe. The species uses riparian and other woodland nesting habitats and grassland/agricultural foraging habitats and could be affected by covered activities. Coverage is recommended because the species could become listed and would be affected by covered activities.

Scientific Name/ Common Name	Status[a] (Federal/State/ CNPS)	Selection Criteria For Coverage[b]					Proposed for Coverage	Comments and Rationale
		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Buteo swainsoni Swainson's hawk	BCC /T/-	+	+	+	+	+	Yes	The state-threatened Swainson's hawk is a covered species or is being considered for coverage in Central Valley regional HCPs/NCCPs. Swainson's hawks nest in riparian woodlands, roadside trees, tree rows, isolated trees, woodlots, and trees in farmyards and rural residences. They forage in grasslands and agricultural fields. Nest sites and foraging habitat would be affected by covered activities. Coverage is recommended because the species is listed and because it could be affected by covered activities.
Aquina chrysaetos Golden eagle	BCC/FP/-	+	+	-	+	N/A	No	The golden eagle is a state Fully Protected species and therefore cannot be taken. It is also protected under the federal Bald and Golden Eagle Protection Act. The species was formerly a state species of concern, but was removed from that list and is currently on DFW's Watch List. It is also designated as a Least Concern species on the IUCN Red List and is a federal Bird of Conservation Concern. The East Contra Costa HCP/NCCP and San Joaquin County HCP both include the golden eagle as a covered species, and the Solano and Sacramento HCPs are considering the species for coverage. Golden eagles nest only in the higher elevations of the western uplands and occasionally forage in the grasslands on the western edge of the valley. They also occasionally hunt on the valley floor during winter. Covered activities will have

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								a minimal effect on this species other than to potentially reduce available foraging habitat on the valley floor. Coverage is not recommended because no direct effects on breeding sites are expected from covered activities and because the potential loss of lowland habitat from covered activities is not expected to substantially modify foraging use of the valley floor.
Aythya Americana Redhead (nesting)	-/SSC/-	-	+	-	+	N/A	No	This species has declined throughout much of its range in California in recent years. Restricted primarily to state and federal refuges, restoration activities in these areas have failed to restore deep water habitats required by redhead. However, this species would likely respond to changes in refuge management and thus there is no indication that it would become listed within the plan timeframe. It is not covered or being considered for coverage in other Central Valley regional HCPs/NCCPs. This species breeds in the Yolo Bypass – mainly on the DFW refuge. No other suitable habitat exists for this species within the Plan Area. Coverage is not recommended because this species is not expected to be affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Ixobrychus exilis Least bittern (nesting)	-/SSC/-	-	+	-	+	N/A	No	This species has been documented more regularly in recent years, and while possibly attributed to an increase in observer coverage, information on population trends are unreliable. While this species has declined as a result of loss of freshwater marsh habitats, there is no indication that a listing of this species would be warranted within the plan timeframe. This species occurs in fresh water marsh habitats on the Yolo Bypass Wildlife Area. Available habitat may currently be limited to the Yolo Bypass Wildlife Area, but other suitable habitat may occur elsewhere in the bypass (e.g., Conaway Ranch) that could be subject to covered activities. Coverage is not recommended because this species is not expected to be listed within the plan timeframe and because all reported occurrences are from the Yolo Bypass Wildlife Area and thus would not be affected by covered activities.
Falco mexicanus Prairie falcon	BCC/-/-	-	+	-	+	N/A	No	Recently dropped as a state species of special concern, the prairie falcon has low potential for future listing. It is not covered under most other local HCP/NCCPs. This species occurs only in the high elevations of the western mountains where only two nest sites have been reported. They may occasionally use the foothill grasslands for foraging and are found occasionally in the valley during winter. Covered activities are not expected to affect this species.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								Coverage is not recommended because the species has low potential for future listing and would not be affected by covered activities.
Pica nuttalli Yellow-billed magpie	-/-/-	-	+	+	+	N/A	No	Susceptible to West Nile virus and suffering recent population declines that are not related to habitat loss. This species is found throughout the lowland areas of the Plan Area including urban areas. If populations rebound due to West Nile virus resistance, the potential for future listing would be very low, as habitat remains abundant. This species could be affected by covered activities. Coverage is not recommended because the species has a low potential for future listing.
Reptiles								
Thamnophis gigas Giant garter snake	T/T/-	+	+	+	+	+	Yes	This state and federally listed species is covered under all other local HCP/NCCPs. Potential effects could occur through disturbance of watercourses and adjacent upland habitats from covered activities. Coverage is recommended because this species is listed and could be affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Phrynosoma coronatum frontale Coast horned lizard	-/SSC/-	+	-	-	+	N/A	No	This species is covered under the San Joaquin County HCP. The potential for future listing is considered moderate but may be possible within the plan timeframe. While considered within the range of the species, there are no documented occurrences from the Plan Area. Loss of grassland habitats along the western edge of the valley would reduce available habitat for this species, but no direct impacts on this species are expected to occur. Conservation actions through the upland strategy are expected to enhance conditions. This species is neither recommended for coverage nor as a species of local concern because it is not known to occur in the Plan Area and thus would not be subject to impacts from covered activities.
Actinemys marmorata Western pond turtle	-/SSC/-	+	+	+	+	+	Yes	In addition to being a state species of special concern, this species is also designated as Vulnerable on the IUCN Red List. It is covered or considered for coverage on all local HCP/NCCPs. It is reasonable that this species could become listed within the plan timeframe. This species could potentially be affected by ground disturbances in watercourses and adjacent uplands associated with covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								Coverage is recommended because there is reasonable potential for future listing and because the species could be affected by covered activities.
Amphibians								
Rana aurora draytonii California red-legged frog	T/SSC/-	+	-	-	+	N/A	No	This species is covered under the East Contra Costa HCP/NCCP and the San Joaquin County HCP and is considered for coverage under the Solano HCP. While within the former range of the species, there are no reported occurrences from the Plan Area and the potential for occurrence is low. Suitable habitat could be affected through disturbance of ponds or streams and associated uplands, but direct impacts are not expected to occur. This species is not recommended for coverage because it is not known to occur in the Plan Area and would therefore not be subject to impacts from covered activities.
Rana boylii Foothill yellow-legged Frog	-/SSC/-	+	+	+	+	-	No	This species is covered under the East Contra Costa HCP/NCCP and the San Joaquin County HCP and is considered for coverage under the Solano HCP/NCCP. Reported declines of foothill yellow-legged frog range-wide could potentially lead to listing of this species within the plan timeframe. This species is known to occur in foothill streams within the Plan Area, portions of which could be affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								Coverage is not recommended because the covered activities and conservation will focus on the eastern portion of the Plan Area, and the available funding is not expected to be sufficient to cover this species.
Spea hammondii Western spadefoot toad	-/SSC/-	+	+	+	+	-	No	This species is covered under the San Joaquin County HCP and is considered for coverage under the South Sacramento County HCP. Reported declines of the species and ongoing range reduction and habitat degradation could potentially lead to listing with the plan timeframe. While within the species' range, there are no recent reported occurrences from the Plan Area. However, this species is secretive and its presence can be difficult to determine. Some grassland/wetland habitats along the western edge of the valley are suitable for this species. Potential effects to suitable habitat could occur through disturbance of vernal pools and intermittent streams and adjacent grassland habitats from covered activities, particularly in the grasslands along the western edge of the valley. Coverage is not recommended because listing is not highly likely in the near future, effects to this species are expected to be minimal, if any, and the available funding is not expected to be sufficient to cover this species.

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Ambystoma californiense California tiger salamander (Central Valley DPS)	T/T/-	+	+	+	+	+	Yes	This federally listed species is covered or is being considered for coverage under most of the other local HCP/NCCPs. As of February 2009 this species is a candidate for state listing as endangered. This species is known to occur at one site in the Dunnigan Hills and potentially occurs in other similar habitats along the western edge of the valley. Potential effects could occur through disturbance of vernal pools and ponds and adjacent grassland habitats from covered activities. Coverage is recommended because the species is listed and could be affected by covered activities.
Invertebrates								
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	T/-/-	+	+	+	+	+	Yes	This federally listed species is covered under all other local HCP/NCCPs. Associated with the elderberry shrub, a common species within the Plan Area, potentially occupied habitat for this species could be affected by covered activities. Coverage is recommended because the species is listed and could be affected by covered activities.
Lepidurus packardi Vernal pool tadpole shrimp	E/-/-	+	+	-	+	N/A	No	This federally listed species is known to occur in vernal pool habitats within the Plan Area. Coverage is not recommended because this species is not expected to be adversely affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Branchinecta conservatio Conservancy fairy shrimp	E/-/-	+	+	+	+		No	This federally listed species is known to occur in vernal pool habitats within the Plan Area. Coverage is not recommended because this species is not expected to be adversely affected by covered activities.
Branchinecta lynchi Vernal pool fairy shrimp	T/-/-	+	+	-	+	N/A	No	Coverage is not recommended because this species is not expected to be adversely affected by covered activities.
Branchinecta mesovalleyensis Mid-valley Fairy Shrimp	-/-/-	+	+	-	+	N/A	No	Coverage is not recommended because this species is not expected to be adversely affected by covered activities.
Linderiella occidentalis California linderiella	-/SA/-	+	+	1	+	N/A	No	Coverage is not recommended because this species is not expected to be adversely affected by covered activities.
Pryamica reliquia Ancient ant	-/-/-	+	+	-	+	N/A	No	This species is known from one site in the Plan Area. While there is a reasonable potential for listing within the plan timeframe, through continued protection of the occupied site, covered activities are not expected to affect this species. Additional conservation efforts may enhance or increase potential habitat for this species. Coverage is not recommended because the species is not expected to be affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Lytta molesta Molestan blister beetle	-/SSC/-	-	+	+	-		No	This species is known from only one historical occurrence in the Plan Area. Its life history, distribution, and habitat requirements are largely unknown and thus the species has low potential for listing within the plan timeframe. The species is thought to be associated primarily with vernal pool grasslands and perhaps other grassland types and thus has potential to occur along the western edge of the valley. Conservation effects are likely to protect and potentially enhance habitat conditions. Coverage is not recommended because insufficient information on the species life history and habitat requirements are available to assess impacts and conservation strategies; and as a result the species has low potential for future listing.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Plants								
Amsinckia lunaris Bent flowered fiddleneck	-/-/1B	-	+	-	+	N/A	No	This species is widely distributed in the inner and outer Coast Ranges from Colusa and Lake Counties in the north to Santa Cruz County in the south. There are no recent records from the Plan Area. It potentially occurs in woodland and grassland habitats in the mid- to high elevations in the western portion of the Plan Area. Coverage is not recommended because the species has low potential for future listing due to its relatively wide distribution., and low potential for take due to lack of recent records and limited extent of covered activities in its potential habitat
Astragalus tener var. *ferrisiae* Ferris' milk-vetch	-/-/1B	+	+	-	+	N/A	No	This species is known only from vernal pool grassland habitats on the DFW Tule Ranch Unit within the Yolo Bypass Wildlife Area. While it has a reasonable potential for future listing, this area is not expected to be affected by covered activities. Coverage is not recommended because the species is unlikely to be affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Astragalus tener var. *tener* Alkali milk-vetch	-/-/1B	+	+	+	+	-	No	Alkali milk-vetch is almost always found on alkaline or saline soils occurring in vernally wet playas, flats, fallowed rice fields, and vernal swales in valley/foothill grasslands below 500 feet (Solano HCP, 2009; San Joaquin County HCP 2000). It is covered in the Solano and San Joaquin County HCPs. There is the potential for the listing of this species within the plan timeframe due to development impacts in the south San Francisco Bay area and agricultural impacts in the Central Valley. The species is known from several alkaline sites near Woodland and Davis, Grasslands Regional Park, and the Tule Ranch Preserve. Remaining suitable habitat may be subject to the effects of covered activities. Coverage is not recommended because the species does not have a high potential for being listed, and the available funding is not expected to be sufficient to cover this species.
Atriplex depressa Brittlescale	-/-/1B	+	+	+	+	-	No	Brittlescale grows on alkaline or clay soils occurring in grasslands contained by valleys or foothills, meadows saltbrush, vernal pools, and at the edge of playas (San Joaquin County HCP 2000; Solano HCP 2009; ECCC HCP 2007). It is covered in the Solano and San Joaquin County HCPs. While brittlescale is a widespread species it may be declining due to loss of habitat through current and future development which may lead to listing during the plan

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								timeframe. The species is known from several alkaline sites near Woodland and Davis. Remaining suitable habitat may be subject to the effects of covered activities. Coverage is not recommended because the species does not have a high potential for being listed, and the available funding is not expected to be sufficient to cover this species.
Atriplex joaquinana San Joaquin spearscale	-/-/1B	+	+	+	+	-	No	San Joaquin spearscale grows on alkaline clay soils in alkali grasslands and meadows or on the margins of alkali scrub (ECCC HCP 2007), and is also found in seasonal alkali wetlands and sinks in chenopod scrub, meadows, playas, and valley/grassland foothills (Solano HCP 2009). It is covered in the Solano and East Contra Costa County HCPs. It has been reported from several locations in the Plan Area. While San Joaquin spearscale is a widespread species it may be declining due to loss of habitat through current and future development which may lead to listing during the plan period. Coverage is not recommended because the species does not have a high potential for being listed, and the available funding is not expected to be sufficient to cover this species.
Chloropyron palmatum Palmate-bracted bird's-beak	E/E/1B	+	+	+	+	+	Yes	Palmate-bracted birds-beak is known from one extant population southeast of Woodland. Given rarity of this species and its limited distribution with the Plan Area, take

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								authorization would be expected to be granted by the USFWS only for management and research purposes. Coverage is recommended because the species is listed and because future management of the extant site could affect individual plants.
Fritillaria pluriflora Adobe-lily	-/-/1B	-	+	+	+	N/A	No	This species is broadly distributed on gently sloping hillsides with clay soils from Yolo County to Glenn County in the inner Coast Range and in clay soils in the uplands surrounding vernal pool complexes in Butte and Tehama Counties. While recent population declines have been reported, listing potential within the plan timeframe is considered relatively low. Coverage is not recommended because there is relatively low potential for future listing and there is relatively low potential for take due to limited extent of covered activities in its potential habitat.
Hibiscus lasiocarpus Rose-mallow	-/-/2	-	+	+	+	N/A	No	This species is broadly distributed throughout the Delta and Sacramento Valley in riparian areas, springs, and seeps and is not likely to be listed within the plan timeframe. Therefore, coverage is not recommended.
Lathyrus jepsonii var. *jepsonii* Delta tule pea	-/-/1B	+	+	-	+	N/A	No	Delta tule pea grows in tidally influenced freshwater and brackish marshes, commonly along slough edges and levees (Solano HCP 2009; San Joaquin County HCP 2000). It is covered in the Solano and San Joaquin County HCPs. There

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
								are no reported occurrences from the Plan Area; however, it is known from sites near the county border in Solano County and there are numerous occurrences throughout the legal Delta. It has potential to occur in fresh and brackish water marshes in the Yolo Bypass. While it could become listed within the plan timeframe, covered activities are not expected to affect the species. Coverage is not recommended because the species is not likely to be affected by covered activities.
Lepidium latipes var. *heckardii* Heckard's peppergrass	-/-/1B	+	+	+	+	-	No	Heckard's peppergrass grows on alkaline flats and in alkaline grasslands along the edges of vernal pools (Solano HCP 2009). It is proposed for coverage in the Solano HCP. Present within the Plan Area in large playa pools at DFW Tule Ranch Preserve and at sites near Woodland. Coverage is not recommended because the species does not have a high potential for being listed, and the available funding is not expected to be sufficient to cover this species.
Lilaeopsis masonii Mason's lilaeopsis	-/R/1B	+	+	-	+	N/A	No	Mason's lilaeopsis grows in regularly flooded tidal zones, on mud banks and flats, and along eroding creek banks, sloughs, and rivers. It is also found in freshwater marshes, brackish marshes, and riparian scrub vegetation types that are tidally influenced (Solano HCP 2009; SJ HCP 2000; DFG 2000). It is covered in the San Joaquin County HCP and proposed for coverage in the Solano HCP. It has been reported from the Plan Area, but has potential to occur in the Yolo Bypass.

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		Listing Potential	**Likely to Occur in the Plan Area**	**Potential to Adversely Affect[d]**	**Sufficient Information**	**Cost and Funding**		
								Although broadly distributed, the species has potential to become listed within the plan timeframe; however, covered activities are not expected to affect potential habitat for this species. . Not recommended for coverage because the species is not expected to be affected by covered activities.
Navarretia leucocephala ssp. *bakeri* Baker's navarretia	-/-/1B	+	+	+	+	-	No	This subspecies has been observed in vernal pool and swales in northern California counties from Mendocino and Tehama in the north to Marin, Napa, and Solano in the south. It is present within the Plan Area in large playa pools at DFW Tule Ranch, and is potentially present at sites near Woodland. Coverage is not recommended because the species does not have a high potential for being listed, and the available funding is not expected to be sufficient to cover this species.
Neostapfia colusana Colusa grass	T/E/1B	+	+	-	+	N/A	No	This listed species is present only at Grasslands Regional Park. Given rarity of this species and its limited distribution with the Plan Area, take authorization would be expected to be granted by the USFWS only for management and research purposes. Coverage is not recommended because this species is not expected to be adversely affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Streptanthus morrisonii ssp. *Morrisoni i* Morrison's jewel flower	-/-/1B	+	+	-	+	N/A	No	This species is primarily restricted to rocky serpentine habitats in the higher elevations of the western portion of the Plan Area. These areas are not expected to be affected by covered activities and conservation efforts under the HCP/NCCP will target high quality sites for preservation. Coverage is not recommended because the species is not expected to be affected by covered activities, and conservation under the plan will preserve occupied sites.
Layia septentrionalis Colusa layia	-/-/1B	+	+	-	+	N/A	No	This species is primarily restricted to rocky serpentine habitats in the higher elevations of the western portion of the Plan Area. These areas are not expected to be affected by covered activities and conservation efforts under the HCP/NCCP will target high quality sites for preservation. Coverage is not recommended because the species is not expected to be affected by covered activities and conservation under the plan will preserve occupied sites.
Harmonia hallii Hall's harmonia	-/-/1B	+	+	-	+	N/A	No	This species is primarily restricted to rocky serpentine habitats in the higher elevations of the western portion of the Plan Area. These areas are not expected to be affected by covered activities. Coverage is not recommended because the species is not expected to be affected by covered activities and conservation under the plan will preserve occupied sites.

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Hesperolinon drymarioides Drymaria-like western flax	-/-/1B	+	+	-	+	N/A	No	This species is primarily restricted to rocky serpentine habitats and cismontane woodland sites in the higher elevations of the western portion of the Plan Area. These areas are not expected to be affected by covered activities. Coverage is not recommended because the species is not expected to be affected by covered activities and conservation under the plan will preserve occupied sites.
Eriogonum nervulosum Snow Mountain buckwheat	-/-/1B	+	+	-	+	N/A	No	This species is primarily restricted to rocky serpentine habitats in the higher elevations of the western portion of the Plan Area. These areas are not expected to be affected by covered activities. Coverage is not recommended because the species is not expected to be affected by covered activities and conservation under the plan will preserve occupied sites.
Tuctoria mucronata Solano grass	E/E	+	-	+	+	N/A	No	This listed species is present only at Grasslands Regional Park. Given rarity of this species and its limited distribution with the Plan Area, take authorization would be expected to be granted by the USFWS only for management and research purposes. Coverage is not recommended because the species is not expected to be adversely affected by covered activities.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Astragalus rattanii Jepson's milk vetch	-/-/1B	+	+	-	+	N/A	No	This species is primarily restricted to rocky serpentine habitats in the higher elevations of the western portion of the Plan Area. These areas are not expected to be affected by covered activities. Coverage is not recommended because the species is not expected to be affected by covered activities and conservation under the plan will preserve occupied sites.
Atriplex cordulata Heartscale	-/-/1B	+	-	-	+	N/A	No	This species occurs in alkaline soils on the valley floor. Known to occur at Jepson Prairie and several other Solano County locations, but the only reported occurrence from Yolo County has been extirpated. So currently the species is not known to occur in the Plan Area. Not recommended for coverage because the species is not known to occur in the Plan Area, very little suitable habitat remains, and remaining alkaline soil sites in the Plan Area are likely to be high priority conservation sites.
Atriplex persistens Vernal pool smallscale	-/-/1B	+	-	-	+	N/A	No	This species occurs in alkaline soils on the valley floor. Known to occur at Jepson Prairie, but has not been reported from Yolo County. So the species is not known to occur in the Plan Area. Not recommended for coverage because the species is not known to occur in the Plan Area, very little suitable habitat remains, and remaining alkaline soil sites in the Plan Area are likely to be high priority conservation sites.

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		Listing Potential	Likely to Occur in the Plan Area	Potential to Adversely Affect[d]	Sufficient Information	Cost and Funding		
Erodium macrophyllum Round-leaved filaree	-/-/2	-	-	-	-	N/A	No	This species occurs primarily in grassland habitats. While it may have occurred historically, there are no occurrence records for Yolo County. Its status as a List 2 species also suggests that it is more widespread elsewhere, reducing its potential to be listed during the Plan timeframe. Not recommended for coverage because the species is not known to occur in the Plan Area.

[a]Status Explanations

Federal

E = listed as endangered under the federal Endangered Species Act (ESA)
T = listed as threatened under the federal ESA
C = candidate for listing under the federal ESA
BCC = U.S. Fish and Wildlife Service bird of conservation concern
NSC = National Marine Fisheries Service species of concern
– = no status

State

E = listed as endangered under the California ESA
T = listed as threatened
C = Candidate for listing under CESA
SSC = California species of special concern
FP = fully protected under the California Fish and Game Code
R = listed as rare under the California Native Plant Protection Act
– = no status

California Native Plant Society (CNPS)

1A = presumed extinct in California
1B = rare or endangered in California and elsewhere
2 = rare and endangered in California, more common elsewhere
3 = species lacking sufficient information to determine status
4 = limited distribution, low threats at this time
– = no status

[b] **Criteria met or not**

+ = Species meets the selection criterion
– = Species does not meet the selection criterion
U = Uncertain whether species meets selection criterion. More investigation required.

[c] **Listing Potential**

The potential for future listing was determined on the basis of the following criteria:

Current status:

If currently state or federally listed, or state Fully Protected, automatically meets criteria
If other special-status designation (SSC, CNPS List 1B, etc.) then
Range and population trends (is species trending downward or stabilized?)
Reports of substantial population declines or threats

C.3 References

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Appendix D
Glossary of Terms

The terms in this glossary are defined as they specifically apply to their usage in the Yolo Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP).

Adaptive management. The U.S. Fish and Wildlife Service (USFWS) Five-Point Policy broadly defines adaptive management "…as a method for examining alternative strategies for meeting measurable biological goals and objectives, and then if necessary, adjusting future conservation management actions according to what is learned" [1] and the Natural Community Conservation Planning Act (NCCPA) defines adaptive management as "…to use the results of new information gathered through the monitoring program of the plan and from other sources to adjust management strategies and practices to assist in providing for the conservation of covered species." [2]

Alkali prairie natural community. The alkali prairie natural community is characterized by soils composed of saline-alkaline clay with salts that include sodium, magnesium, and boron. Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up this natural community. It often includes seasonally flooded areas or seasonally saturated soils. Vegetation of the alkali prairie natural community is generally dominated by saltgrass. Some areas also include flat-face downingia, curly dock, gumplant, alkali coyote thistle, and alkali heath. Very small patches of alkali-adapted species are present in the natural community and include pickleweed, bush seepweed, alkali heath, common spikeweed, annual hairgrass, and special status species such as alkali milk-vetch, brittlescale, San Joaquin spearscale, Heckard's peppergrass, and Ferris' milk-vetch.

Antedecent streams. Streams that during and for a time after a disturbance of their drainage area maintain the courses they had taken before the disturbance.

Anthropogenic. Caused or produced through human agency.

Attribute. An ecological variable measured when conducting HCP/NCCP effectiveness monitoring actions (Section 6.2, *Monitoring Program*). Atkinson et al. (2004)[3] defines an attribute as "…any component or condition of the system that can be quantifiably measured, for example, forest cover, precipitation or arthropod species diversity".

Avoidance and minimization measures. Measures that when implemented are designed to eliminate or reduce the potential adverse effects of covered activities on natural communities and covered species addressed by the HCP/NCCP.

Baseline protected lands. See *Category 1 Baseline Public and Easement Lands.*

Baseline public and easement lands. Lands throughout the Plan Area with varying levels of conservation prior to HCP/NCCP permit issuance. See *Category 1 baseline public and easement lands, Category 2 baseline public and easement lands,* and *Category 3 baseline pubic and easement lands.* These categories are used for the gap analysis to assess the baseline level of natural community and covered species habitat conservation in the Plan Area, and are factored into the amount of additional conservation needed through the HCP/NCCP.

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1 65 FR 106.
2 California Fish and Game Code sections 2800-2835.
3 Atkinson, A. J., P. C. Trenham, R. N. Fisher, S. A. Hathaway, B. S. Johnson, S. G. Torres, and Y. C. Moore. 2004. Designing monitoring programs in an adaptive management context for regional multiple species conservation plans. U.S. Geological Survey Technical Report. USGS Western Ecological Research Center, Sacramento, CA.

Biodiversity. Within a given area, the variety of ecosystems and organisms considered at all levels, from genetic variants of a single species through arrays of species to arrays of genera, families, and higher taxonomic levels.

Biological goal. The USFWS and NMFS Five-Point Policy for Habitat Conservation Plans (HCPs) defines biological goals as: "In the context of HCPs, biological goals are the broad, guiding principles for the operating conservation program of the HCP… Multiple species HCPs may categorize goals by species or by habitat, depending on the structure of the operating conservation program."[4] The HCP/NCCP biological goals represent the broad principles used to guide development of the conservation strategy to meet the statutory criteria of the NCCPA and sections 7 and 10 of the Endangered Species Act (ESA).

Biological objective. The USFWS and NMFS Five-Point Policy for Habitat Conservation Plans defines biological goals as "…the different components needed to achieve the biological goal such as preserving sufficient habitat, managing the habitat to meet certain criteria, or ensuring the persistence of a specific minimum number of individuals… Biological objectives should include the following: species or habitat indicator, location, action, quantity/state, and timeframe needed to meet the objective".[5]

Biological opinion (BO or BiOp). The document stating the opinion of USFWS or NMFS as to whether or not a federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.[6] A BO is one of the decision documents of a consultation under section 7 of the ESA.

Blue oak woodland natural community. The blue oak woodland natural community generally consists of lands with an overstory of scattered trees dominated by blue oaks, although the canopy can be nearly closed on some sites. Associated shrub species include poison oak, California coffeeberry, buckbrush, and common manzanita. The ground cover is composed mainly of species such as brome grass, wild oats, needlegrass, filaree, and fiddleneck. Table 2-1, *Natural Communities and Other Land Cover Types,* list the land cover types that make up this natural community.

California salamander breeding pools. Stock ponds or other ponds or pools hold water seasonally, for a sufficient depth and duration to support the California tiger salamander breeding cycle, and are surrounded by suitable uplands.

Candidate species. Defined under the California Endangered Species Act (CESA) as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that the commission has formally noticed as being under review by the department for addition to either the list of endangered species or the list of threatened species, or a species for which the commission has published a notice of proposed regulation to add the species to either list."[7] Defined under the ESA section 4(b)(3) as a species under consideration for official listing as threatened or endangered.

Category 1 baseline public and easement lands. Land for which the primary management goal is related to ecological protection. The land predominantly consists of suitable habitat and is covered by an irrevocable conservation mandate that precludes changes in land use that could result in degradation or loss of ecological functions. The irrevocable conservation mandate is a perpetual

[4] 65 FR No. 106 at 35242, June 1, 2000.
[5] 65 FR No. 106 at 35242.
[6] 50 CFR §402.02.
[7] California Fish and Game Code §2068.

conservation easement or, in the case of Yolo Bypass Wildlife Area, a state mandate. This category is also referred to as *baseline protected lands*.

Category 2 baseline public easement and lands. Land without an irrevocable conservation mandate, but with a management goal and/or acquisition purpose related to ecological protection. The land is predominantly natural habitat or in a use that supports covered species habitat. This category includes public lands held in fee title and private lands in cases where a conservation entity (e.g., land trust) holds fee title without permanent easements in place. While Category 2 Public and Easement Lands were used to inform the development of the HCP/NCCP conservation commitments, these lands are not considered to meet the definition of "protected" under the Yolo HCP/NCCP conservation strategy.

Category 3 baseline public and easement lands. Land that consists of public open space, but its primary goal is not related to ecological protection and it has no irrevocable conservation mandate. The land includes natural habitat or use that supports covered species habitat. This category includes public land without a conservation mandate or private lands held in fee title by a conservation organization (i.e., agricultural land trust) without permanent conservation easements in place.

Chamise natural community. The chamise natural community consists of shrubs dominated by chamise, either in nearly pure stands or in mixed stands of chamise and other scrub species. Some of the species commonly found in these natural communities after a fire include California yerba santa, pitcher sage, and deerweed. Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up this natural community.

Changed circumstances. USFWS regulations define changed circumstances as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the [USFWS] and that can be planned for…" [8] and the NCCPA defines changed circumstances as "…reasonably foreseeable circumstances that could affect a covered species or geographic area covered by the plan."[9].

Certificate of Inclusion (COI). The authorization by the holder of a section 10(a)(1)(a) incidental take permit (Permittee) for another entity to use the permit as a long as the activities of that entity meet all of the requirements of the HCP/NCCP, in this case the HCP/NCCP. For example, a land developer, whose project meets all HCP/NCCP requirements and has applied to a city (e.g., West Sacramento) for use of the city's permit, may receive a certificate of inclusion from the city to allow incidental take during project construction.

Channel. The natural or artificial area within which water flows on a regular basis, typically on an annual basis.

Climate change/Global climate change. A long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years.

Closed-cone pine-cypress natural community. The closed-cone pine-cypress natural community is composed of the knobcone pine alliance and MacNab cypress alliance vegetation types. This natural community is commonly found on serpentine soils; in Yolo County, it often includes leather

[8] 50 CFR §17.3.

[9] Fish and Game Code §2805(c).

oak and foothill pine. Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up closed-cone pine-cypress natural community.

Compliance monitoring. Monitoring that will be undertaken by the Implementing Entity to demonstrate its compliance with the terms and conditions of HCP/NCCP ESA section 10 and NCCPA permits.

Connectivity. The measure of how connected or spatially continuous parts of the biological features of a landscape are to each other. Connectivity is defined here to encompass habitat and ecological connectivity. Habitat connectivity is species-specific and relates to the ease of movement (or the lack of barriers to movement) of individuals of a species from one patch of habitat to another. The level of connectivity is dependent on the species means of movement. Movement by wildlife may be by walking, swimming, or flying and for plants by dispersal of seed, pollen or vegetative propagules via animals, wind, water, gravity or other movement mechanism. Land corridors containing specific conditions are necessary for connectivity of wildlife and plants that move along the ground surface while birds and bats have different factors that affect connectivity of their habitat patches that depend on the distances the species are willing to fly and the type and extent of land cover the species is willing to fly over. Ecological connectivity includes and is broader than habitat connectivity. Ecological connectivity encompasses ecological processes across the landscape such as flow of water in watersheds and streams and encompasses habitat connectivity for any number of species. Ecological connectivity relates to the level of disruption to the continuity of ecological processes.

Conserve/conserving/conservation. The ESA (section 3(3)) defines the terms *conserve*, *conserving*, and *conservation* as the methods and procedures necessary to bring any endangered or threatened species to the point at which the measures provided under the Act are no longer necessary. Such methods and procedures include, but are not limited to, activities associated with resource management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transportation. The NCCPA (Section 2085(c)) defines *conserve*, *conserving*, and *conservation* as the use of methods and procedures within the plan area that are necessary to bring any covered species to the point at which the measures provided pursuant to [the California Endangered Species Act] are not necessary, and for covered species that are not listed pursuant to [the California Endangered Species Act], to maintain or enhance the condition of a species so that listing pursuant to [the California Endangered Species Act] will not become necessary.

Conservation easement. As used in the HCP/NCCP, conservation easements are voluntary, legally binding agreements between a landowner and an easement holder (typically the Conservancy) that restrict certain uses of the land to protect certain wildlife, fish, and plant species and natural communities while allowing the continued use of the land by the landowner. Under the HCP/NCCP, the conditions of conservation easements must provide sufficient protection of a sufficient amount of land to achieve the HCP/NCCP biological goals and objectives.

Conservation lands. Lands that the Conservancy will protect above and beyond the *mitigation land* commitments, to meet conservation requirements of the NCCP Act. These include *newly protected* lands, *restored/created* lands, and *pre-permit reserve lands*.

Conservation measure. Specified actions identified in HCPs and Natural Community Conservation Plans (NCCPs) that are designed to collectively achieve the HCP and NCCP biological goals and objectives and to satisfy federal and state regulatory requirements. The USFWS/NMFS Five-Point

Policy for Habitat Conservation Plans (65 FR No. 106) indicates that "Conservation measures identified in an HCP, its accompanying incidental take permit, and/or [Implementing Agreement], if used, provide the means for achieving the biological goals and objectives".

Conservation strategy. The operating elements of a HCP/NCCP. The HCP/NCCP Conservation Strategy encompasses the biological goals and objectives, conservation measures, conservation land assembly principles, monitoring program, and adaptive management plan. The HCP/NCCP Conservation Strategy serves as part of a conservation plan defined in Section 10(a)(2)(A) of the ESA as a planning document that is a mandatory component of an incidental take permit application, also known as a Habitat Conservation Plan or HCP.

Conservation Reserve Area (CRA). An area within which the Conservancy will prioritize conservation actions for HCP/NCCP covered species.

Constituent elements (of designated critical habitat). Defined in the ESA and ESA regulations as the physical and biological features of designated or proposed critical habitat essential to the conservation of the species, including, but not limited to: 1) space for individual and population growth, and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and 5) habitats that are protected from disturbance or are representative of the historic geographic and ecological distributions of a species (ESA §3(5)(A)(i), 50 CFR §424.12(b)).

Construction monitoring. Monitoring by biologists of project construction sites implementing covered activities to ensure that the applicable HCP/NCCP avoidance and minimization measures (Section 5.4.4, *Avoidance and Minimization Measures*) are implemented in accordance with HCP/NCCP requirements.

Cover (e.g., canopy cover, areal cover). The area of ground covered by vegetation of particular species or vegetation type, generally expressed as a percentage.

Covered activities. The range of activities for which ESA section 10 and NCCPA permit coverage are being sought under a HCP/NCCP. HCP/NCCP covered activities are described in Chapter 3, *Covered Activities*.

Covered species. Species identified in a HCP/NCCP for which the permit applicants are seeking authorization for take under the ESA and Section 2835 of the NCCPA. The HCP/NCCP covered species are identified in Chapter 1, *Introduction*.

Creation. The undertaking of actions that establish habitat for a species or a natural community in a location that historically did not support the habitat or natural community.

Critical habitat/designated critical habitat. The specific areas designated by USFWS and NMFS within the geographical area occupied by a threatened or endangered species at the time it is listed on which are found those physical or biological features essential (constituent elements) to the conservation of the species and which may require special management considerations or protection. Critical habitat also includes specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of the species.[10] Designated critical habitats for listed species are described in 50 CFR §17 and §226.

[10] 16 U.S.C. § 1532(5)(A).

Cultivated land seminatural community. The cultivated land seminatural community consists of nonrangeland agricultural crops that provide habitat for covered species. Table 2-1, *Natural Communities and Other Land Cover Types,* lists the crop types that make up this seminatural community. Crop types that do not provide habitat for covered species are not included in the cultivated land seminatural community. The cultivated land natural community type also does not include rangelands, which typically include grassland, oak woodlands, and other natural communities that are not cultivated.

Cumulative effects. Cumulative effects result from the incremental impact of the covered activities when viewed together with past, present, and reasonably foreseeable future actions. The ESA regulations define cumulative effects as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." [11] In the case of the HCP/NCCP, the "federal action" is the issuance of incidental take permits by USFWS, and the federal "action area" is the HCP/NCCP Plan Area, as no impacts of covered activities are anticipated to extend beyond the Plan Area boundary. This definition only applies to ESA Section 7 analyses and differs from the broader definition under National Environmental Policy Act of 1969 (NEPA) and California Environmental Quality Act of 1970 (CEQA). Habitat Conservation Plans (HCPs) are not required to discuss cumulative effects, however, as stated in the Habitat Conservation Planning Handbook, "the applicant should help ensure that those considerations required of the [USFWS and NFMS] by Section 7 have been addressed in the HCP" (USFWS and NMFS 1996). Accordingly, the HCP/NCCP addresses the cumulative effects that could result from state, local, and private activities (Section 4.6, *Cumulative Effects*). Cumulative effects of all projects with a federal nexus are analyzed in the HCP/NCCP EIR/EIS and are not addressed in the HCP/NCCP.

Delist/delisting. Defined in the USFWS/NMFS Habitat Conservation Planning Handbook (USFWS and NMFS 1996)[12] as to "remove from the Federal list of endangered and threatened species (50 CFR 17.11 and 17.12) because such species no longer meets any of the five listing factors provided under section 4(a)(1) of the ESA and under which the species was originally listed (i.e., because the species has become extinct or is recovered)."

Direct effects. Immediate effects of a covered activity on a species or its habitat that occur at the same time and place as the covered activity.

Dominance. The extent to which a given species predominates in a community by virtue of its size, abundance, or relative cover. A "dominant species" is one that comprises the greatest or shares in comprising the greatest volume, number, or cover in a geographic area.

Ecologically improved. The site functions ecologically better than the functions present on the site prior to ground disturbance.

Ecosystem. A community of organisms and their physical environment interacting as an ecological unit.

Ecosystem function. Processes operating at the ecosystem level, such as the cycling of matter, energy, and nutrients.

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[11] 50 CFR §402.02.

[12] USFWS (United States Fish and Wildlife Service) and NMFS (National Marine Fisheries Service). 1996. *Habitat Conservation Planning and Incidental Take Permit Processing Handbook*. November 4, 1996.

Ecosystem/Ecological processes. Physical, chemical, and biological events and conditions that connect organisms with their environment, such as energy capture, production, nutrient cycling, hydrology, and natural disturbance.

Effect mechanism. As used in the HCP/NCCP, actions or results of actions to implement a covered activity that result in an adverse effect on natural communities and covered species.

Effectiveness monitoring. HCP/NCCP monitoring actions that will be conducted to 1) to assess *in* the effectiveness of habitat restoration, enhancement, and management techniques in achieving the desired habitat conditions for covered and other native species (i.e., are the hypotheses supporting the actions validated), 2) to assess covered species responses to the implementation of conservation measures, and 3) to document progress made toward achieving the HCP/NCCP biological goals and objectives. Results of effectiveness monitoring provides the information necessary to adjust HCP/NCCP implementation through adaptive management to improve the effectiveness of the conservation measures better ensure that the biological goals and objectives achieved. HCP/NCCP effectiveness monitoring requirements are described in Section 6.3, *Monitoring Program*.

Endangered species. Defined in the ESA as "...any species [including subspecies or qualifying distinct population segment] which is in danger of extinction throughout all or a significant portion of its range." (Section 3(6) of ESA). The California Endangered Species Act (CESA) defines an endangered species as "…a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease. Any species determined by the commission as 'endangered' on or before January 1, 1985 is an 'endangered species.'" (California Fish and Game Code 2062).

Enhance/enhancement. The improvement of an existing degraded natural community or habitat. Enhancement involves improving the function of specific constituent elements of a species habitat that have been degraded or lost, typically due to human actions.

Environmental gradient. A change in physical and ecological parameters in geographic space, as characterized by transition zones between land cover types and natural communities or topographic gradients.

Extinct species. A species no longer in existence.

Extirpated species. A species no longer surviving in regions that were once part of its range.

Floristic-based vegetation types. Establishment of HCP/NCCP vegetation classification system based on plant species associations.

Fossorial. Adapted for digging or burrowing into the ground.

Fresh emergent wetland natural community. The fresh emergent wetland natural community includes aquatic and semiaquatic vegetation types listed in Table 2-1, *Natural Communities and Other Land Cover Types*. The fresh emergent wetland natural community is most commonly found on level to gently rolling landscapes along rivers, lakes, and creeks but can be found anywhere the topography allows perennial or seasonal soil saturation or flooding by fresh water. Perennially flooded areas are typically dominated by cattails, tule, and California bulrush that can reach up to 12 feet in height. Seasonally saturated or inundated areas contain much shorter vegetation and are more variable in the composition of their plant species. Dominant species in many lower elevation seasonal wetlands include swamp timothy, Baltic rush, iris-leaved rush, and spikerushes.

Fully protected species. Species designated in California Fish and Game Code sections 3511, 4700, 5050, and 5515 for which take, as defined under the California Endangered Species Act (see definition of "take"), is prohibited and may not be authorized by the Department of Fish and Game except for scientific purposes.

Geographic Information System (GIS). Computer-based mapping technology that manipulates geographic data in digital layers and enables one to conduct a wide array of environmental analyses.

Grassland Natural Community. The grassland natural community is composed of five vegetation types that support grasses and associated annual and perennial forbs: California grasslands alliance, *Lotus scoparius* alliance, sparse bush lupine/annual grasses/rock outcrop alliance, upland grasslands and forbs formation, and urban ruderal. In many cases, grassland is dominated by native and exotic forbs in certain seasons or during different periods within a season (D'Antonio et al. 2007). Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up this natural community.

Habitat. The environmental conditions that support occupancy of a given organism in a specified area (Hall et al. 1997[13]). In scientific and lay publications, habitat is defined in many different ways and for many different purposes. For the purpose of the HCP/NCCP, habitat is defined as the specific places where the environmental conditions (i.e., physical and biological conditions) required to support occupancy by individuals or populations of a given species are present. Habitat may be occupied (individuals or population of the species are, or have recently been, present) or unoccupied (individuals or populations of species are not present, but conditions are such that it is expected they could occupy the site at a future time). Also see "species habitat models."

Habitat function. The ability of the environment to provide conditions that support the persistence of individuals and populations, corresponding to Hall et al. definition of "habitat quality" (1997). The precise meaning of function varies by species and depends on the subject species' specific needs in the context of a particular area. High functioning habitat for some species comprises only foraging and resting elements; for others it comprises foraging, resting, and nesting elements; for still others it may encompass all elements needed for the species to complete its lifecycle. Low functioning habitat would include only the minimal elements that support occurrence of the species. High functioning habitat tends to support larger numbers of species than lower functioning habitat.

Habitat fragmentation. Discontinuity in the spatial distribution of resources and conditions present in an area that support a particular species relative to a historical condition that affects occupancy, reproduction, or survival of the species. Examples of anthropogenic mechanisms that may result in fragmentation of habitat include conversion of natural landscapes to urban and agricultural uses and construction of infrastructure (e.g., roads, canals).

Harass. Harass is a form of take identified in the ESA (ESA §3(19)) and is further defined by USFWS to include "…actions that create the likelihood of injury to listed species to such an

extent as to significantly disrupt normal behavior patterns which include, but are not limited

to, breeding, feeding or sheltering (50 CFR §17.3).

[13] Hall, L. S., P. R. Krausman, and M. L. Morrison. 1997. The habitat concept and a plea for standard terminology. *Wildlife Society Bulletin* 25(1): 173-182.

Harm. Harm is a form of take identified in the ESA (ESA §3(19)) and is further defined by USFWS to include "…significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR §17.3).

Hydrology. The movement of surface and subsurface water flows in a given area. The hydrology of an area is intimately connected with its precipitation, soils, and topography.

Implementing agreement. An agreement that legally binds HCP/NCCP Permittees to the requirements of the HCP/NCCP and ESA section 10 and NCCPA permits. The HCP/NCCP Implementing Agreement is provided in Appendix E. *Implementing Agreement*.

Implementing Entity. Individual or group of individuals tasked with ensuring that HCP/NCCP actions are undertaken for the life of the HCP/NCCP. The structure of the HCP/NCCP Implementing Entity is described in Chapter 7, *Plan Implementation*.

Incidental take. Take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant (50 CFR §402.02).

Indirect effects. Reasonably foreseeable effects that are caused by covered activities but occur at a different time or place

Independent science review. Scientists and recognized specialists assembled for the purpose of conducting independent reviews of and formulating recommendations for inclusion in the conservation elements a HCP/NCCP. Independent science review is discretionary for HCPs and is required under NCCPA Section 2810(b)(5) for NCCPs.

Lacustrine. Open water associated with lakes and ponds.

Lacustrine and riverine natural community. The lacustrine and riverine natural community includes a variety of lakes, reservoirs, and ponds (lacustrine); and rivers and streams (riverine). The lacustrine and riverine natural community is designated as open water in the land cover database (Table 2-1, *Natural Communities and Other Land Cover Types*). The natural community mapping for the Yolo HCP/NCCP does not differentiate lacustrine from riverine. See also definitions for *lacustrine* and *riverine.*

Land acquisition. As used in the HCP/NCCP, the placement of conservation easements on or the fee title purchase of land parcels to protect natural communities and covered species habitat under the HCP/NCCP.

Land cover type. The dominant feature of the land surface discernible from aerial photographs and defined by vegetation, water, or human uses. Also refers to habitat and vegetation types specified in the HCP/NCCP vegetation classification system.

Landscape-level. Related to the overall condition of hydrological, physical, chemical, and biological processes in the Plan Area, across a variety of natural communities and covered species habitats.

Landscape-level monitoring. Monitoring, including gathering and review of new information developed by others, that is conducted to assess the overall status, distribution, and trends related to selected populations of covered species and the status and distribution of natural communities over the term of the HCP/NCCP. Landscape-level monitoring collects information necessary to better inform implementation of the HCP/NCCP in light of new information and changes in environmental conditions.

Land trust. A private, nonprofit organization, that actively works to, conserve land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements.

Land use authority. As used in the HCP/NCCP, an entity that reviews land use applications and holds the decision-making power for approval of such land use applications. For example, Yolo County, Woodland, West Sacramento, Davis, and Winters all have land use authority within their jurisdictional boundaries.

Land use designation. The designation, by parcel, in an adopted city or county general plan of the allowable uses for that parcel.

Listed species. A species that is listed as threatened or endangered under the ESA or CESA.

Maintain (habitat functions). Actions taken to ensure that the existing function of a habitat is not reduced over time or by some human activities. In the context of natural habitat areas, maintaining the baseline habitat functions of the habitat areas, which require periodic management activities to provide the baseline level of habitat function (e.g., period control of nonnative species) (see definition of "manage/management" below). In the context of created habitats (e.g., croplands, managed wetlands), maintaining the intended habitat functions of croplands and managed wetlands protected in the HCP/NCCP conservation lands system, which annually requires seasonal management activities to ensure that the intended habitat functions for the target covered species are maintained (e.g., providing for the planting of high wildlife habitat value crop types on agricultural lands, irrigation of managed wetlands, maintaining dams/berms to maintain water in impoundments).

Manage/management. In the context of HCP/NCCP conservation lands, actions implemented to maintain the existing ecological functions of the land particularly for covered species occurrences and habitat, including infrastructure (e.g., maintenance of fences), over time.

Matrix. The background or surrounding area of a landscape with a high degree of connectivity to a protected area.

Metapopulation. A group of partially isolated populations belonging to the same species that are connected by pathways of immigration and emigration. Exchange of individuals occurs between such populations, enabling recolonization of sites from which the species has recently become extirpated.

Mitigation. In the context of the HCP/NCCP, the protection or restoration of natural communities and covered species habitat necessary replace the ecological functions of natural communities and species habitats affected by implementation of the covered activities. Also the protection of existing unprotected species occurrences or the establishment of new species occurrences to offset impacts of covered activities on species occurrences.

Mitigation banks. USFWS, CDFW, Environmetnal Protection Agency, Regional Water Quality Control Board, and/or USACE approved commercial enterprises that sell mitigation credits to satisfy mitigation requirements.

Mitigation lands. Lands the Conservancy will protect to mitigate the impacts of take consistent with Section 10(a)(1)(B) of the Endangered Species Act. These include *newly protected* mitigation lands and *restored/created* mitigation lands.

Mitigation Receiving Site. A mitigation receiving site is a property that is encumbered by a conservation easement for the purpose of providing mitigation credits to offset the impacts of future development

Mixed chaparral natural community. The mixed chaparral natural community consists of dense stands of drought-adapted *sclerophyllous* (hard-leaved) shrubs. Nine vegetation types make up the mixed chaparral natural community. The most common vegetation type in mixed chaparral is an association of scrub oak, toyon, common manzanita, and birch-leaf mountain mahogany. Other dominant nonserpentine mixed chaparral plant species include California bay and buckbrush. In serpentine soils, the vegetation is dominated by California bay and leather oak on more mesic sites and by whiteleaf manzanita on drier sites. Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up this natural community.

Modeled habitat. See "species habitat models."

Montane hardwood natural community. The montane hardwood natural community typically consists of a dominant hardwood tree component with a poorly developed shrub understory and little herbaceous vegetation. Tree spacing ranges from 10 to more than 30 feet apart. The montane hardwood natural community is composed of black oak alliance, canyon live oak alliance, and mixed oak alliance. Some areas that have been mapped as montane hardwood natural community in the Plan Area might be better characterized as live oak-foothill pine. Soil depth may be shallow or deep. Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up this natural community.

Natural community. A collection of species that co-occur in the same or overlapping physical space and interact through trophic and spatial relationships. Communities are typically characterized by reference to one or more dominant species. Refers to the natural communities addressed under the HCP/NCCP.

Natural disturbance. Partial or complete removal of physical habitat (e.g., vegetation, leaf litter, soil) in an area as a result of a natural event such as fire, wind throw, land slide, and flood scour. Natural disturbance regimes are defined by the frequency and intensity of disturbance events (e.g., fire return time and flood frequency). Disturbance mechanisms may be artificially created to re-introduce a natural disturbance regime that has been altered by human actions, e.g., controlled fire instead of wild fire.

Newly protected lands. Lands that were not previously protected through a conservation easement or other mechanism, and that the Conservancy places under a permanent conservation easement and enrolls in the reserve system. These include lands protected for mitigation and conservation lands to meet NCCPA requirements. Category 2 baseline public and easement lands (Section 6.2.2.2, *Baseline Public and Easement Lands*) will only count toward newly protected lands upon wildlife agency approval, and if placed in a perpetual conservation easement.

Nonnative species. A species that is not native to the ecosystem or region under consideration.

No Surprises assurances. Assurances to permit holders that if unforeseen circumstances arise, the USFWS will not require more land, water, or money or additional restrictions on the use of land, water, or other natural resources beyond the level stated in the HCP without the consent of the Permittee (63 *Federal Register* 35, February 23, 1998). Also see "unforeseen circumstances."

Oak-foothill pine natural community. The oak-foothill pine natural community includes large areas dominated by interior live oak and foothill pine. Tree density can range from open savanna with scattered trees to a closed-canopy forest. Other associated tree species include interior live oak, California buckeye, and valley oak. The understory consists primarily of annual grasses and forbs, sometimes with a shrub component. The shrub understory may include buckbrush, redberry, poison oak, silver bush lupine, and blue elderberry. The oak-foothill pine natural community is represented by three vegetation types: interior live oak-blue oak (foothill pine) association, interior live oak alliance, and foothill pine alliance. Table 2-1, *Natural Communities and Other Land Cover Types*, lists the land cover types that make up this natural community.

Occurrence (covered species). The HCP/NCCP defines a "known occurrence" as the specific collection of individuals of a species uniquely identified in Appendix A, *Covered Species Accounts* and a "new occurrence" as a continuous patch of habitat supporting one or more individuals or multiple patches of habitat supporting one or more individuals found within 0.25 mile of each other and not separated by significant habitat discontinuities.

Patch. The basic unit of the landscape that changes and fluctuates in a process called *patch dynamics*. Patches have a definite shape and spatial configuration, and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.

Permanent effect/. In the context of the HCP/NCCP, impacts of HCP/NCCP covered activities that result in 1) the injury or mortality of a covered wildlife species, 2) removal of a covered plant species, 3) irreversible permanent removal, degradation, or alteration of a land cover type supporting habitat for covered and other native species, or 3) adverse affects on the functions of a land cover type as habitat for covered species for more than one year following implementation of the activity.

Permit Applicants/Permittees. Those entities requesting a section 10(a)(1)(B) incidental take permit from the U.S. Fish and Wildlife Service and a section 2835 take permit under the Natural Community Conservation Planning Act from the California Department of Fish and Wildlife for the species and activities covered in the HCP/NCCP. The HCP/NCCP Permit Applicants/Permittees are identified in Chapter 1, *Introduction*.

Plan Area. The geographical extent of land covered under the HCP/NCCP. The USFWS/NMFS HCP handbook (USFWS and NMFS 1996) defines a conservation plan area as the lands and other areas encompassed by specific boundaries which are affected by the conservation plan and incidental take permit. The Plan Area for the HCP/NCCP is identified in Chapter 1, *Introduction.*

Planning surveys. In the context of HCP/NCCP, surveys conducted by project proponents to qualify for coverage under HCP/NCCP permits and used in the project-planning process to identify constraints, determine which HCP/NCCP avoidance and minimization measures are applicable to their projects, and calculate impact fees.

Planning unit. Large sections of the Plan Area each dominated by different large-scale ecological, geomorphic, and/or land use conditions. Each planning unit supports its own predominant ecological, topographical, landscape, and other natural community conditions that differentiate it from other planning units, excepting planning units 19-22 for which encompass the cities of

Woodland, Davis, West Sacramento, and Winters. While planning unit were generally identified for major natural geomorphic and ecological features, the specific planning Unit boundaries were delineated using clearly recognizable features, such as roads and parcel boundaries, rather than vegetation, soil type, or geologic feature edges, to allow for easy identification of those boundaries for planning and implementation of the HCP/NCCP. The primary purpose of Planning Units is to describe the specific areas in which conservation actions (such as land acquisition and habitat restoration) will occur without necessarily identifying individual parcels for the actions. The HCP/NCCP planning unit boundaries are defined in Chapter 5, *Conservation Strategy*.

Population. A group of individuals of the same species inhabiting a given geographic area, among which mature individuals reproduce or are likely to reproduce. Ecological interactions and genetic exchange are more likely among individuals within a population than among individuals of separate populations of the same species.

Practicable. USFWS must make a finding for issuance of ESA section 10 incidental take permits that the "applicant will, to the maximum extent practicable, minimized and mitigate the impacts" of any take of endangered and threatened wildlife and fish species (ESA Section 10(a)(2)(B)(ii)). No definition of "practicable" is provided in ESA or its implementing regulations. Under the Clean Water Act, practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose (45 *Federal Register* 85344, December 24, 1980: U.S. Environmental Protection Agency, Part 40 Code of Federal Regulations 230.3, Definitions). This Clean Water Act definition is used for the HCP/NCCP.

Preconstruction surveys. In the context of HCP/NCCP, surveys conducted by project proponents for certain biological resources immediately prior to construction to ensure that species and habitat avoidance and minimization measures can be effectively implemented during construction.

Pre-permit reserve lands. Categories 1 and 2 baseline public and easement lands (Table 6-1(a)) that are enrolled into the *Reserve System*. Category 2 baseline public and easement lands that are counted as newly protected lands (defined above) are not also counted as pre-permit reserve lands.

Proposed species. Defined in ESA regulations as any species of fish, wildlife or plant that is proposed in the Federal Register to be listed as threatened or endangered under section 4 of the Act. (50 CFR §402.02).

Protect/Protection. Changing the status of a property that supports a natural community, covered species occurrence, or covered species habitat from unprotected status (under which the land use could change and these resources degraded or lost) to a protected status in which these resources cannot be degraded or lost (i.e., changing the status of lands with no status or Category 2 baseline public and easement land status to Category 1 baseline public and easement land status). The change in land status to "protected" is achieved through a permanent conservation easement on lands owned by a local agency (including the HCP/NCCP Implementing Entity) or private entity (or comparable federal or state designation on federal and state lands) to maintain the existing extent of species habitat and natural communities. Minimum conservation easement requirements to meet the protection standard under the HCP/NCCP are described in Section 7.9, *Conservation Easement Requirements*. In the HCP/NCCP, the Implementing Entity's acquisition of land by fee title always implies a permanent conservation easement is placed on the property at the time of or immediately following the acquisition.

Protected lands. Plan Area lands supporting natural communities, covered species occurrences, or covered species habitat that are existing Category 1 baseline public and easment land or will be elevated to Category 1 public and easement lands with implementation of the HCP/NCCP (i.e., HCP/NCCP conservation lands).

Range. The geographic area a species is known or believed to occupy.

Recovery. Defined in ESA regulations as improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act (50 CFR §402.02). The process by which the decline of an endangered or threatened species is arrested or reversed or threats to its survival neutralized so that its long-term survival in nature can be ensured. Recovery entails actions to achieve the conservation and survival of a species, including actions to prevent any further erosion of a population's viability and genetic integrity, as well as actions to restore or establish environmental conditions that enable a species to persist (i.e., the long-term occurrence of a species through the full range of environmental variation) (USFWS and NMFS 1998)

Recovery Plan. A document published by the U.S. Fish and Wildlife Service or National Marine Fisheries Service that lists the status of a listed species and the actions necessary to remove the species from the endangered species list.

Remnant habitat/natural community. Small fragmented patches of habitat or natural communities that continue to persist within a highly altered landscape (e.g., small stands of valley oak that persist within the largely agricultural landscape of lowland portions of the Plan Area).

Reserve System. The assemblage of all lands in the Plan Area managed under the provisions of Conservation Measure 1 for conservation of natural communities or covered species.

Restore/restoration. In the context of natural communities and habitat, the establishment of a natural community or species habitat in an area that historically supported it, but no longer supports it because of the loss of one or more required ecological factors. Restoration may involve altering the substrate or other physical features to improve site's ability to support the historical natural community or species habitat.

Restored/created lands. Lands that the Conservancy places under a permanent conservation easement, or that are already protected through a conservation easement, and the Conservancy restores or creates as a wetland natural community type. (Also see *Restored/restoration* and *Create/creation*.)

Riparian habitat/vegetation. Vegetation associated with river, stream, or lake banks and floodplains. Also defined by U.S. Fish and Wildlife Service (1997[14]) as plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies (i.e., rivers, streams, lakes, or drainage ways). Riparian areas have one or both of the following characteristics: 1) distinctively different vegetation than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms due to the greater availability of surface and subsurface water.

Riverine. Open water associated with rivers and streams.

Ruderal. A species or plant community that typically occurs on highly disturbed sites.

[14] USFWS (United States Fish and Wildlife Service). 1997. A system for mapping riparian areas in the western United States. December 1997.

Section 7 of the ESA. Defined in the Section 7 Consultation Handbook (USFWS and NMFS 1998)[15] as "the section of the Endangered Species Act of 1973, as amended, outlining procedures for interagency cooperation to conserve Federally listed species and designated critical habitats. Section 7(a)(1) requires Federal agencies to use their authorities to further the conservation of listed species. Section 7(a)(2) requires Federal agencies to consult with the Services to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Other paragraphs of this section establish the requirement to conduct conferences on proposed species; allow applicants to initiate early consultation; require FWS and NMFS to prepare biological opinions and issue incidental take statements. Section 7 also establishes procedures for seeking exemptions from the requirements of section 7(a)(2) from the Endangered Species Committee. [ESA §7]"

Section 9 of the ESA. Defined in the Section 7 Consultation Handbook (USFWS and NMFS 1998) as "the section of the Endangered Species Act of 1973, as amended, that prohibits the taking of endangered species of fish and wildlife. Additional prohibitions include: 1) import or export of endangered species or products made from endangered species; 2) interstate or foreign commerce in listed species or their products; and 3) possession of unlawfully taken endangered species. [ESA §9]"

Section 10 of the ESA. Defined in the Section 7 Consultation Handbook (USFWS and NMFS 1998) as "the section of the Endangered Species Act of 1973, as amended, that provides exceptions to section 9 prohibitions. The exceptions most relevant to section 7 consultations are takings allowed by two kinds of permits issued by the Services: 1) scientific take permits and 2) incidental take permits. The Services can issue permits to take listed species for scientific purposes, or to enhance the propagation or survival of listed species. The Services can also issue permits to take listed species incidental to otherwise legal activity. [ESA §10]"

Signature (in remote sensing of resources). Characteristic value, color, or texture on an aerial or satellite imagery that correlates to a particular land cover type. Distinguishable signatures were used in the mapping of land cover types from remote imagery in the HCP/NCCP Geographic Information System (GIS) Land Cover database.

Special participating entity. A public entity or private individual that may conduct projects or undertake other activities in the plan area that are covered activities in the Yolo HCP/NCCP and that may affect covered species and require take authorization from USFWS or CDFW, but are not subject to the jurisdiction of one or more Permittees. These entities or individuals may pursue coverage under the Permits and the Yolo HCP/NCCP through the special participating entity process defined in Chapter 4 (Section 4.2.1.3) and also described in Chapter 7 (Section 7.2.5).

Species habitat models. HCP/NCCP-specific models developed to spatially define the extent of potential covered species habitat (sometimes divided into habitat subtypes such as separating foraging and nesting habitats) in the Plan Area for the purpose of preparing the Conservation Strategy and conducting the covered activities impact assessment. The models are based on various combinations of parameters of vegetation, soils, water features, geology, and topography used to circumscribe potential habitat for each of the species and species-specific requirements and behaviors (e.g., maximum typical distance between patches of nesting and foraging habitats that a

[15] USFWS (United States Fish and Wildlife Service) and NMFS (National Marine Fisheries Service). 1998. Endangered Species Act Consultation Handbook. Procedures for Conducting Section 7 Consultations and Conferences. Final Draft. Washington, D.C. March.

species will travel) that can be spatially modeled using available and specifically developed GIS databases. The structure, underlying assumptions, and GIS-data layers comprising the habitat models are described for each species in Appendix A, *Covered Species Accounts*.

Stream, perennial. A stream that flows throughout the year that is supplied by both rainfall runoff and groundwater including substantial dry season inputs.

Stream, intermittent. A stream that flows only at parts of the year (mainly winter and spring) and which ceases to flow occasionally or seasonally because bed seepage and evaporation exceed the available water supply.

Stream, ephemeral. A stream that flows only briefly in direct response to precipitation in the immediate vicinity, and that does not receive groundwater input.

Succession. The change in the composition and structure of a biological community over time. Successional patterns often shift dramatically following a major disturbance (e.g., fire, flood, anthropogenic clearing of land).

Take. ESA defines take as "…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." (ESA §3(19). Under the California Endangered Species Act, take means to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (§86 California Fish and Game Code).

Temporary effects. Alteration of land cover for less than one year that allows the disturbed area to recover to pre-project or ecologically improved conditions within one year (e.g., prescribed burning, construction staging areas) of completing covered activities. See *ecologicall improved,* abo ve. Also termed *temporary loss.*

Threatened species. Defined in the ESA as "...any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Section 3(19)). The California Endangered Species Act (CESA) (California Fish and Game Code 2062) defines a threatened species as "…a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter. Any animal determined by the commission as "rare" on or before January 1, 1985, is a "threatened species."

Unforeseen circumstances. The USFWS defines unforeseen circumstances as those "changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by the plan developers and the [USFWS and NMFS] at the time of the conservation plan's negotiation and development and that result in a substantial and adverse change in the status of a covered species"[16]. Under ESA regulations, if unforeseen circumstances arise during the term of the HCP/NCCP, USFWS may "not require the commitment of additional land, water, or financial compensation, or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the conservation plan" unless the HCP/NCCP Permittees consent.[17] Similarly, unforeseen circumstances are defined in the NCCPA as "changes affecting one or more species, habitat, natural community, or the geographic area covered by a conservation plan that could not reasonably have been anticipated

[16] 50 CFR §17.3, 50 CFR §222.102.
[17] 50 CFR §17.22(b)(1)(5)(iii); 50 CFR §222.307(g)(3)(iii).

at the time of plan development, and that result in a substantial adverse change in the status of one or more covered species"[18]. The NCCPA further provides that, in the event of unforeseen circumstances, DFW shall not require "additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources…without the consent of the plan participants for a period of time specified in the implementation agreement."

Unoccupied habitat. Habitat that exhibits all the elements necessary for a species, but the species is not currently present.

Urban Planning Units. In the context of HCP/NCCP, refers to planning units 19-22 within which the Cities of Woodland, Davis, West Sacramento, and Winters are located. These planning units are where the local agencies anticipate most urban development will occur under their respective general plans.

Valley foothill riparian natural community. The valley foothill riparian natural community consists of a multilayered woodland plant community with a tree overstory and diverse shrub layer. Canopy species include mature valley oak, Fremont cottonwood, ash, and willows. In a mature riparian forest, canopy heights reach approximately 100 feet, and canopy cover ranges from 20 to 80 percent. Blue elderberry, California rose, poison oak, and California blackberry may form dense thickets in the understory of mature riparian forests. California grape creates a dense network of vines in the canopy. In areas that are disturbed by frequent flooding, fire, or human activity, this natural community often consists of smaller trees, more shrubs, and more invasive nonnative species. The valley foothill riparian natural community is usually associated with streams and creeks with low-velocity flows, floodplains, and low topography. The valley foothill riparian natural community is composed of 13 vegetation types listed in Table 2-1, *Natural Communities and Other Land Cover Types*, reflecting the diversity of riparian conditions.

Valley oak woodland natural community. The valley oak woodland natural community consists of tree stands that are dominated by valley oak located outside of riparian zones. The valley foothill riparian natural community, defined above, can be dominated by valley oak but encompasses streamside communities that have a higher abundance of typical riparian species, such as cottonwoods, ash, and willows. The valley oak woodland natural community is usually located below 5,000 feet and on sites that support deep, well-drained alluvial soils, most often on valley floors. Table 2-1, *Natural Communities and Other Land Cover Types,* lists the land cover types that make up this natural community.

Vegetation/vegetative community. A natural or artificial terrestrial community defined by the dominant vegetation and the vegetation structure.

Vernal pool complex natural community. The vernal pool complex natural community consists of complexes of seasonal pools within a grassland matrix. These seasonal pools form in shallow depressions that hold water due to the slow infiltration rate of the underlying clay alluvium soil. The vernal pools on the clay alluvium soils of the floodplains contain a mixture of two general types in basins between seasonal drainages: smaller vernal pools connected by swales and larger playa-type vernal pools. The vernal pool complex natural community supports a number of characteristic plant species, including downingia, vernal pool goldfields, popcorn flower, and woolly marbles. Local concern plant species that occur in the vernal pool complex natural community include Ferris' milk vetch, alkali milk-vetch, brittlescale, San Joaquin spearscale, Heckard's peppergrass, Colusa grass,

[18] Fish and Game Code §2805(k).

Solano grass, and Baker's navarretia. Table 2-1, *Natural Communities and Other Land Cover Types,* lists the land cover types that make up this natural community.

Wetlands. Areas subject to seasonal or perennial flooding or ponding, or that possess saturated soil conditions and that support predominantly hydrophytic or "water-loving" herbaceous plant species. The term wetland(s) is used to refer to all wetland types. Under USACE and EPA regulations wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."[19] The USFWS and the State of California define wetlands more broadly. Under the HCP/NCCP, wetlands are defined to include all areas meeting the USACE and the State of California's definitions for wetlands.

[19] 33 CFR 328.3(b); 40 CFR 232.2

Appendix E
Implementing Agreement

IMPLEMENTING AGREEMENT

for the

YOLO HABITAT CONSERVATION PLAN/NATURAL COMMUNITY CONSERVATION PLAN

by and among

THE UNITED STATES FISH AND WILDLIFE SERVICE

THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

THE YOLO HABITAT CONSERVANCY

THE COUNTY OF YOLO

THE CITY OF DAVIS

THE CITY OF WEST SACRAMENTO

THE CITY OF WINTERS

AND

THE CITY OF WOODLAND

Final—April 2018

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1.0 PARTIES TO THIS AGREEMENT

The Parties to this Implementing Agreement ("Agreement") are the Yolo Habitat Conservancy ("Conservancy"), the County of Yolo, the City of Davis, the City of West Sacramento, the City of Winters, and the City of Woodland (collectively referred to with the Conservancy as the "Permittees"), the California Department of Fish and Wildlife ("CDFW"), and the United States Fish and Wildlife Service ("USFWS") (collectively with CDFW, the "Wildlife Agencies").

2.0 RECITALS; PURPOSES OF THE AGREEMENT

2.1. Recitals

The Parties have entered into this Agreement in consideration of the following facts:

(a) The Plan Area as defined below and as described in the Yolo Habitat Conservation Plan/Natural Community Conservation Plan ("Yolo HCP/NCCP" or "Plan") has been determined to provide, or potentially provide, habitat for the Covered Species set forth in Appendix A (Covered Species Accounts) of the Plan; and

(b) The Permittees have developed a series of conservation measures, described in the Yolo HCP/NCCP, to conserve, manage, avoid, minimize, and mitigate to the maximum extent practicable the effects of Take of Covered Species associated with and/or incidental to the Permittees' Covered Activities. The same conservation measures also provide for the conservation and management of the Covered Species in the Plan Area.

2.2. Purposes

The purposes of this Agreement are:

(a) To assure the conservation of Covered Species within the Plan Area by providing for actions that will be taken to conserve, manage, avoid, minimize, and mitigate the effects of Covered Activities on the Covered Species;

(b) To ensure the efficient, timely, and successful implementation of the terms and conditions of the Yolo HCP/NCCP, this Agreement, and the Permits; and

(c) To describe remedies and recourse should any Party fail to perform the obligations set forth in this Agreement.

(d) To note the existence of long term assurances to the Permittees that, pursuant to the federal "No Surprises" provisions of 50 Code of Federal Regulations, sections 17.22(b)(5) and 17.32(b)(5), and California Fish and Game Code section 2820, subdivision (f), as long as the terms and conditions of the Permits, the Yolo HCP/NCCP, and this Agreement are fully satisfied. The Wildlife Agencies will not require of the Permittees the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources, either to minimize and mitigate the impacts of Authorized Take, or to provide for the conservation and management of the Covered Species in the Plan Area, except as provided in the Permits, the Yolo HCP/NCCP, and this Agreement.

3.0 DEFINITIONS

The following terms as used in this Agreement will have the meanings set forth below. Terms specifically defined in applicable federal or state statutes or the regulations adopted by USFWS and CDFW under those statutes will have the same meaning when used in this Agreement.

3.1. Agreement

"Agreement" refers to this Implementing Agreement.

3.2. Authorized Take

"Authorized Take" means the extent of incidental Take of Covered Species authorized by USFWS in the Federal Permit issued to the Permittees pursuant to Section 10(a)(1)(B) of the ESA, and the extent of Take of Covered Species authorized by CDFW in the State Permit issued to the Permittees pursuant to California Fish and Game Code section 2835.

3.3. CDFW

"CDFW" means the California Department of Fish and Wildlife, a department of the California Natural Resources Agency.

3.4. CEQA

"CEQA" means the California Environmental Quality Act (Public Resources Code §§ 21000 et seq.) and all regulations promulgated thereunder.

3.5. Certificate of Inclusion

"Certificate of Inclusion" means a document executed by a Permittee and a third party that extends the incidental take authorization granted to Permittee to such third party for the purpose of carrying out a Covered Activity in the Plan Area. Execution of a Certificate of Inclusion by the third party places the third party under the legal control of Permittee for purposes of enforcing and implementing the Permits, including the HCP/NCCP and this Agreement. A Certificate of Inclusion template is included as Exhibit A hereto.

3.6. CESA

"CESA" means the California Endangered Species Act (Fish & Game Code §§ 2050 et seq.) and all regulations promulgated thereunder.

3.7. Changed Circumstances

"Changed Circumstances," as defined in the "No Surprises" rule at 50 C.F.R. § 17.3, means changes in circumstances affecting a species or the geographic area covered by the Yolo

HCP/NCCP that have been reasonably anticipated by the Parties and that have been planned for in the Yolo HCP/NCCP. "Changed Circumstances" are defined under Fish & Game Code § 2805(c) to mean reasonably foreseeable circumstances that could affect a Covered Species or the Plan Area. Changed Circumstances and planned responses to those circumstances are described in Chapter 7 of the Yolo HCP/NCCP. Changes in circumstances that are not identified as Changed Circumstances will be treated as Unforeseen Circumstances.

3.8. Conservancy

"Conservancy" refers to the Yolo Habitat Conservancy, a joint powers agency organized under California law by the County of Yolo and the incorporated cities of Davis, Woodland, Winters, and West Sacramento.

3.9. Covered Activities

"Covered Activities" means the otherwise lawful activities and projects described in Chapter 3 of the Yolo HCP/NCCP that the Permittees or Third Party Participants may implement in the Plan Area for which incidental Take is authorized by the Wildlife Agencies pursuant to the Permits.

3.10. Covered Species

"Covered Species" means the species, listed and non-listed, which the Yolo HCP/NCCP has addressed in a manner sufficient to meet all criteria for issuing an incidental take permit under the ESA and a take permit under the NCCPA. Covered Species are listed in Chapter 1 of the Yolo HCP/NCCP and described in Appendix A to the Yolo HCP/NCCP.

3.11. Effective Date

"Effective Date" means the date of the first business day after all of the following have occurred: this Agreement has been fully executed by all Parties; issuance of both Permits; and all applicable implementing ordinances have been adopted by each of the Cities and County as provided in Section 7.4 of the Yolo HCP/NCCP.

3.12. ESA

"ESA" means the Federal Endangered Species Act of 1973, as amended (16 U.S.C §§ 1531–1544) and all rules, regulations, policies, and guidelines promulgated pursuant to that Act.

3.13. Federal Permit

"Federal Permit" means the federal incidental Take permit issued by USFWS to the Permittees pursuant to Section 10(a)(1)(B) of the ESA.

3.14. Fully Protected Species

"Fully Protected Species" means any species identified in California Fish & Game Code sections 3511, 4700, 5050, or 5515 that occur within the Plan Area.

3.15. HCP

"HCP" means the habitat conservation plan prepared by the Permittees for the Plan Area and approved by the USFWS pursuant to Section 10 of the ESA. The HCP will be referred to in this document collectively with the NCCP as the Yolo HCP/NCCP.

3.16. Listed Species

"Listed Species" means a species (including a subspecies, or a distinct population segment of a species) that is listed as an endangered or threatened species under ESA or as an endangered, threatened or candidate species under CESA.

3.17. NCCP

"NCCP" means the natural community conservation plan prepared by the Permittees for the Plan Area and approved by CDFW pursuant to Section 2820 of the Fish & Game Code and the provisions of the NCCPA. The NCCP will be referred to in this document collectively with the HCP as the Yolo HCP/NCCP.

3.18. NCCPA

"NCCPA" means the California Natural Community Conservation Planning Act (Fish & Game Code §§ 2800 et seq.) and all regulations promulgated thereunder.

3.19. Neighboring Landowner

"Neighboring Landowner" means an owner of specific types of agricultural lands that are within a defined distance of suitable habitat for either Valley elderberry longhorn beetle, giant garter snake, western pond turtle, or California tiger salamander (set forth in Chapter 5, Section 5.4.4 of the Yolo HCP/NCCP) on lands included in the reserve system who has received a Certificate of Inclusion from the Yolo Habitat Conservancy pursuant to the Permits and the Yolo HCP/NCCP (see Section 7.3.3 of this Agreement) that extends Authorized Take coverage for one or more of these four Covered Species resulting from specified agricultural land uses.

3.20. NEPA

"NEPA" means the National Environmental Policy Act (42 U.S.C. §§ 4321 et seq.) and all rules, regulations, policies, and guidelines promulgated pursuant to that Act.

3.21. Non-listed Species

"Non-listed Species" means a species (including a subspecies, variety, or a distinct population segment) that is not listed as endangered or threatened under the ESA or listed as an endangered, threatened, or candidate species under the CESA.

3.22. Party or Parties

"Party" or "Parties" means any or all of the signatories to this Agreement.

3.23. Permits

“Permits” means the State Permit and the Federal Permit, which incorporate the Yolo HCP/NCCP by reference.

3.24. Permit Term

“Permit Term” shall mean the 50-year duration of the Permits, commencing upon the date the Permits are issued.

3.25. Permittees

“Permittees” means the Yolo Habitat Conservancy, the County of Yolo, and the cities of Davis, West Sacramento, Winters, and Woodland.

3.26. Plan

“Plan” refers to the Yolo HCP/NCCP.

3.27. Plan Area

“Plan Area” means the geographic area covered by the Yolo HCP/NCCP, as described in Chapter 1 (Introduction) and depicted in Figure 1-1 thereof. The Plan Area includes the County of Yolo in its entirety, consisting of approximately 653,549 acres and also includes 1,174 acres along the south bank of Putah Creek in Solano County designated the “Extended Plan Area for Riparian Restoration” in Figure 1-1. This area is included in the Plan Area only for the purpose of providing additional sites for riparian restoration to support the Covered Species.

3.28. Rough Proportionality

“Rough Proportionality” means implementation of Yolo HCP/NCCP conservation measures in a manner that is that is roughly proportional in time and extent to the impact on habitat or Covered Species authorized under the Yolo HCP/NCCP and as required by Fish & Game Code § 2820(b)(9).

3.29. Special Participating Entity

“Special Participating Entity” and “Special Participating Entities” are public entities or private individuals that may conduct projects or undertake other activities in the Plan Area that are Covered Activities in the Yolo HCP/NCCP and that may affect Covered Species and require Take authorization from USFWS or CDFW, but are not subject to the jurisdiction of one or more Permittees. These entities or individuals may pursue coverage under the Permits and the Yolo HCP/NCCP through the Special Participating Entity process defined in Chapter 4 (Section 4.2.1.3) and also described in Chapter 7 (Section 7.2.5).

3.30. State Permit

"State Permit" means the state Take permits issued to the Permittees pursuant to Section 2835 of the California Fish and Game Code.

3.31. Take

"Take" and "Taking" have the meaning set forth in the ESA and its implementing regulations. Take of listed plant species is not prohibited under the ESA; however, the plant species identified in the Yolo HCP/NCCP are listed on the Federal Permit as Covered Species in recognition of the conservation measures provided for such species under the Yolo HCP/NCCP and receive No Surprises Assurances under the Permit. For purposes of determining any outstanding mitigation owed upon termination of the Permit under Section 16, Take includes impacts to Covered plant species.

In the context of the Fish & Game Code Section 86 Take or Taking means to hunt, pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture, or kill.

3.32. Third Party Participants

"Third Party Participants" refers to any or all of the following: private project participants, Special Participating Entities, Neighboring Landowners, and any other person or entity that is not a Permittee and that receives Authorized Take coverage from a Permittee in accordance with the Permits, the Yolo HCP/NCCP and this Agreement.

3.33. Unforeseen Circumstances

"Unforeseen Circumstances" as defined in the "No Surprises" rule and codified at 50 C.F.R § 17.3, means, changes in circumstances affecting a Covered Species or the geographic area covered by the Yolo HCP/NCCP that could not reasonably have been anticipated by the Permittees, USFWS or CDFW during the development of the Yolo HCP/NCCP, and that result in a substantial and adverse change in the status of a Covered Species. In the context of the NCCPA, changes affecting one or more species, habitats, natural communities, or the geographic area covered by a conservation plan that could not reasonably have been anticipated at the time of Yolo HCP/NCCP development, and that result in a substantial adverse change in the status of one or more Covered Species (Fish & Game Code § 2805(k)).

3.34. USFWS

"USFWS" means the United States Fish and Wildlife Service.

3.35. Wildlife Agencies

"Wildlife Agencies" means USFWS and CDFW.

4.0 INCORPORATION

4.1. Incorporation of the Plan

The Yolo HCP/NCCP and each of its provisions are intended to be, and by this reference are, incorporated herein. Notwithstanding such incorporation, the Parties acknowledge that the Permittees drafted the Yolo HCP/NCCP and submitted it to the Wildlife Agencies to support their application for the Permits. Characterizations, analyses, and representations in the Yolo HCP/NCCP, in particular, those regarding Federal or State laws, regulations, policies, and guidance represent the views of the Permittees and shall not control the administration of the Permits by USFWS and CDFW in accordance with Federal and State laws, regulations, policies, and guidance. In the event of any direct contradiction, conflict or inconsistency between this Agreement, the Yolo HCP/NCCP, or the Permits, the terms of the Permits shall control.

Each Party acknowledges that no representation, inducement, promise or agreement, oral or otherwise, has been made by the other Party or anyone acting on behalf of the other Party that is not embodied in the Yolo HCP/NCCP, this Agreement, or the Permits.

5.0 IMPLEMENTATION ROLES AND RESPONSIBILITIES

The general roles and responsibilities of the Parties for the implementation of the Yolo HCP/NCCP are as follows.

5.1. Responsibilities of Permittees

Permittees will fully and faithfully perform all obligations assigned to them collectively, and to each of them individually, under the Permits, the Yolo HCP/NCCP, and this Agreement.

5.2. USFWS Cooperation and Assistance

USFWS will provide timely technical assistance and review, collaboration and consultation to the Permittees regarding implementation of the Yolo HCP/NCCP throughout the duration of the Federal Permit, to the extent appropriate funds are available for that purpose. Nothing in this Agreement shall require the USFWS to act in a manner contrary to the requirements of the Anti-Deficiency Act. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the United States Treasury.

5.3. CDFW Responsibilities

CDFW will provide timely technical assistance and review, collaboration and consultation to the Permittees regarding implementation of the Yolo HCP/NCCP, as provided in this Agreement and the Yolo HCP/NCCP, throughout the duration of the State Permit. CDFW will also use all reasonable efforts to assist the Permittees to achieve the Yolo HCP/NCCP biological goals and objectives for the Covered Species, as described in Yolo HCP/NCCP Chapter 6.

5.4. Role of Conservancy

The Permittees are individually and collectively responsible for compliance with all applicable terms and conditions of the Permits. As of the Effective Date of this Agreement, the Permittees have elected to assign primary responsibility for implementing the Yolo HCP/NCCP to the Conservancy on behalf of the other Permittees. The Conservancy may delegate the implementation of specific actions to other Parties or qualified third parties, including but not limited to public agencies, private conservation organizations, university scientists, and contractors, but the Conservancy itself will remain responsible for ensuring overall implementation of the Yolo HCP/NCCP on behalf of the other Permittees in accordance with the Permits.

As further described in Chapter 7 (including but not limited to Section 7.3) of the Yolo HCP/NCCP, the Conservancy's responsibilities generally include, but are not necessarily limited to, implementation and management of all of the following elements of the Yolo HCP/NCCP:

Administration of the Yolo HCP/NCCP, including staffing, and providing necessary scientific, legal, and financial expertise and consulting services;

Oversight of Permit compliance and related implementation actions;

Creation of the reserve system;

Management, enhancement, and restoration of reserve system lands;

Monitoring, adaptive management, and efforts to address Changed Circumstances;

Securing necessary funding to implement the Yolo HCP/NCCP; and

Addressing reporting and information management requirements.

At any time during the Permit Term, the Permittees may elect to create a different or additional implementing entity to assume some or all of the responsibilities of the Conservancy with respect to implementing the Yolo HCP/NCCP and ensuring compliance with this Agreement and the Permits. In such event, the Permittees shall notify the Wildlife Agencies of their intentions and the Parties shall meet and confer in good faith to determine whether an amendment to this Agreement is required.

5.5. Yolo HCP/NCCP Implementation Key Deadlines for Compliance

The Parties' agreement about how key elements of the Yolo HCP/NCCP will be implemented over time is summarized in the implementation compliance deadlines set forth in Table 7-2 of the Yolo HCP/NCCP and further explained in Chapter 7 of the Yolo HCP/NCCP. The Parties recognize that, under certain circumstances, it might be reasonable and appropriate to modify one or more of the deadlines by modifying or amending the Permits, the Yolo HCP/NCCP, or this Agreement, as provided in Section 15 of this Agreement. However, absent such a modification or amendment, the Conservancy, on behalf of the Permittees, will meet the implementation deadlines set forth in Table 7-2 of the Yolo HCP/NCCP. If a changed or unforeseen circumstance occurs, that inhibits the ability to meet the implementation deadlines set forth in Table 7-2 of the Yolo HCP/NCCP, the Conservancy will follow the procedures set forth in Section 7.7.1 of the Yolo HCP/NCCP.

5.6. Duty to Enforce

The Permittees shall undertake all necessary action to enforce all applicable terms of the the Permits, the Yolo HCP/NCCP, and this Agreement as to itself and Third Party Participants over which Permittees have committed to enforce the terms of the Permits, the Yolo HCP/NCCP, and this Agreement. Any non-compliance by a Permittee or a Third Party Participant with applicable terms of the Permits, the Yolo HCP/NCCP, or this Agreement may be deemed by either wildlife agency a violation of the Permit by Permittee. In addition, any failure by Permittee to enforce the applicable provisions of the Permits, the Yolo HCP/NCCP, or this Agreement against itself, a Third Party Participant may be deemed by either wildlife agency a non-compliance by Permittee with the Permit, the `Yolo HCP/NCCP, or this Agreement and a violation of the Permit by Permittees. Wildlife agencies shall take into account all efforts undertaken by Permittees to enforce the terms of the Permits, the Yolo HCP/NCCP, and this Agreement as to itself, the Third Party Participant and all actions taken by Permittees to redress the effects of such non-compliance, particularly the enforcement efforts and redress actions specifically described in the Yolo HCP/NCCP.

6.0 COLLABORATION AND DISPUTE RESOLUTION

6.1. Collaboration

The Parties agree that successful collaboration among them is important to the success of the Yolo HCP/NCCP. Notwithstanding any other provision of the Permits, the Yolo HCP/NCCP, or this Agreement, each Party will make a reasonable effort to: meet and confer with any other Party upon the request of that Party to address matters pertaining to the Permits, the Yolo HCP/NCCP, or this Agreement; provide relevant, non-proprietary, non-confidential information pertaining to the Yolo HCP/NCCP upon the request of any Party; and provide timely responses to requests from any Party for advice, concurrence, or review and comment on reports, surveys or other documents relating to the Permits, the Yolo HCP/NCCP, or this Agreement.

6.2. Dispute Resolution

The Parties recognize that disputes concerning implementation of, compliance with, or termination of the Permits, the Yolo HCP/NCCP, or this Agreement may arise from time to time.

The Parties intend to resolve most disputes at the staff or field personnel level. However, the Parties recognize that some disputes might not be resolved at the staff or field personnel level. The Parties agree to work together in good faith to resolve such disputes using the informal dispute resolution procedure set forth in this Section. Any Party may seek any available remedy without regard to this Section if the Party concludes, in its reasonable judgment, that the circumstances so warrant. However, unless the Parties agree upon another dispute resolution process, or unless a Party has initiated administrative proceedings or litigation related to the subject of the dispute in federal or state court, the Parties agree to use the following procedures to attempt to resolve disputes.

6.2.1 Notice of Dispute; Meet and Confer

If one or both Wildlife Agencies objects to any action or inaction by the Conservancy or any Permittee on the basis that the action or inaction is inconsistent with the Permits, the Yolo HCP/NCCP, or this Agreement, it will provide written notice to the Conservancy, the Permittee(s), and both Wildlife Agencies, unless providing written notice would preclude a necessary, immediate response to circumstances which may appreciably reduce the likelihood of survival and recovery of a species in the wild as reasonably determined by a Wildlife Agency. The notice shall identify the objection(s) of the Wildlife Agencies and adequately explain the basis thereof.

The Conservancy or a Permittee, as appropriate, will respond in writing to the notice within thirty (30) days of receipt. The response shall describe actions that the Conservancy or Permittee proposes to take to resolve the objection or, alternatively, the response may explain why the objection is unfounded. If the response resolves the objection to the satisfaction of the Wildlife Agencies, the agency will so notify other recipients of the original notice of objection and, in turn, the Conservancy or Permittee will implement any actions proposed in the response.

If the response does not resolve the objection to the Wildlife Agency’s satisfaction, the Wildlife Agency will notify the Conservancy or Permittee and any other recipients of the original notice. The Wildlife Agencies, Conservancy, and any relevant Permittee will then meet and confer to attempt to resolve the dispute. The meeting will occur within a reasonable time designated by the Wildlife Agencies, taking all relevant circumstances into account. Generally, unless the circumstances require otherwise, the meeting shall occur within 30 days after the Conservancy and affected Permittee(s) receive the Wildlife Agencies response, but it may also occur at a later time if the Wildlife Agencies, Conservancy, and relevant Permittee agree. A Conservancy representative will take notes at the meeting, summarize the outcome, and distribute meeting notes to each Party in attendance.

If a dispute among the Parties pertains to a specific project, the proponent of the project shall be allowed to provide input into the dispute resolution process by reviewing the initial notice from one or both Wildlife Agencies and submitting its own response and, if applicable, by participating in the meeting referenced above. For purposes of this provision, a dispute pertains to a specific project if USFWS and/or CDFW objects to an action or inaction by a Permittee with regard to a specific project, such as the Permittee’s determination of appropriate mitigation requirements for the project, or a Permittee objects to an action or inaction by the USFWS or CDFW with regard to a specific project.

The Conservancy or any other Permittee will use the same procedure to raise and resolve objections to any action or inaction of a Wildlife Agency, and the Wildlife Agency will respond in the same manner to notices delivered by any Permittee. If a dispute arises among the Permittees regarding the action or inaction of a Permittee, the Permittees shall use the same procedure to raise and to resolve objections to the Permittee's action or inaction, but shall not be required to provide notice to the Wildlife Agencies, and the Wildlife Agencies shall not be required to meet and confer with the Permittees.

6.2.2 Elevation of Dispute

If the Parties do not resolve a dispute after completing the dispute resolution procedure in Section 6.2.1, above, any one of the Parties may elevate the dispute to a meeting of the chief executives of the involved Parties. For purposes of this provision, "chief executive" means the Conservancy Executive Director, the city manager of a city, the county administrator of the County, the CDFW Regional Manager, and the USFWS Field Supervisor. Each Party will be represented by its chief executive in person or by telephone at the meeting, and the meeting will occur within 45 days of a request by any Party following completion of the dispute resolution procedure.

7.0 TAKE AUTHORIZATIONS

As described in this Section, commencing upon issuance of the Permits, the Permittees and certain authorized third parties are granted Take authorization under the Permits. The Take authorization is for Covered Activities including all activities identified as such in Chapter 3 of the Yolo HCP/NCCP. The Permits do not authorize Take resulting from other projects or activities that are not identified as Covered Activities in Chapter 3.

7.1. Permit Coverage; Training

The Permittees' Take authorization covers all of their respective elected officials, officers, directors, employees, agents, subsidiaries, contractors, and other acting on their behalf in performing any Covered Activity. Each Permittee will be responsible for supervising compliance with the relevant terms and conditions of the Permits by those acting on its behalf, and any contracts between a Permittee and any such person or entity regarding the implementation of a Covered Activity will require compliance with the Permits.

Within one year of issuance of the Permits, the Conservancy will develop an implementation handbook and other materials that it believes will assist the other Permittees in complying with the Permits, the Yolo HCP/NCCP, and this Agreement. Among other things, the implementation handbook will describe the permit application process and provide illustrative examples. Additionally, to help ensure continued compliance with the Permits, the Conservancy will periodically train staff of each Permittee of the requirements of the Permits and any related matters. In this context, "periodically" means at least once every five years <u>or</u> sooner if at least 50% of the relevant staff positions within a Permittee agency (as determined by each Permittee) have new personnel.

7.2. Compliance Procedures and Actions for Permittees

Each Permittee will ensure that the implementation of its public projects that constitute Covered Activities will comply with the Permits. As further described in Chapter 4 (Section 4.2) and depicted in Figures 4-1 of the Yolo HCP/NCCP, each Permittee will follow a defined process for project compliance with the Permits. Conservancy staff will provide technical assistance as necessary to ensure accurate completion of all required application documentation and similar materials.

Each Permittee will also document its compliance with the Permits, and provide a copy of that documentation to the Conservancy for tracking, reporting, and related purposes. To the extent a Permittee pays any fees pursuant to the funding strategy described in Chapter 8 of the Yolo HCP/NCCP, such fees shall be paid in the same amount and time as fees paid by private project participants. Other alternative compliance actions, such as land dedications in lieu of fee payment, shall be handled in the manner described in Chapter 7 (including but not limited to Section 7.5.9) of the Yolo HCP/NCCP.

7.3. Extension of Take Authorization to Third Party Participants

As set forth in the Yolo HCP/NCCP, various third party participants may receive Take coverage in appropriate instances. Such participants include private project participants, Special Participating Entities, and neighboring landowners. The Permittees may extend Authorized Take coverage to “Third Party Participants” and will be responsible for determining whether applicants from potential Private Project Participants comply with all such terms and conditions and will make findings supporting such a determination before extending Authorized Take coverage.

7.3.1 Private Project Participants

The County and the Cities will each require proponents of private projects that are subject to their land use or other regulatory authority and fall within the categories of projects and activities described in Chapter 3 of the Yolo HCP/NCCP to comply with all applicable terms and conditions of the Permits, and will extend Authorized Take coverage to such projects as provided in Chapter 4 (Section 4.2.1.1 and 4.2.1.2) and depicted in Figure 4-2 of the Yolo HCP/NCCP. The Permittee with jurisdiction over a private project, the lead agency Permittee under CEQA) shall be responsible for determining whether applications and other materials and actions are sufficient to comply with all applicable terms and conditions of the Permits.

7.3.1.1. Implementing Ordinances

The HCP/NCCP review process will be integrated into the established project planning, environmental review, and entitlement processes of the County and the Cities. Before the Effective Date, the Cities and the County will each consider the adoption of an implementing ordinance substantively similar to the model ordinance attached to this Agreement as **Exhibit B** that sets forth the application process for potential private project participants. The implementing ordinance will, among other things: provide for the imposition of plan fees, as provided in Section 8.2 of this Agreement and further described in Chapter 8 (Section 8.4.1) of the Yolo HCP/NCCP; establish the jurisdiction’s procedure for extending Authorized Take coverage to private project participants, as provided in Section 7.3.1 of this Agreement; and provide for the conveyance of land in lieu of fees, in accordance with Section 9.3.2 of this Agreement and Chapter 7 (Section 7.5.9) of the Yolo HCP/NCCP. The Cities and the County may extend Authorized Take coverage to Third Party Participants only after adopting an implementing ordinance in accordance with this Section. In addition, the Permittees recognize that the Wildlife Agencies' findings regarding the adequacy of funding for Yolo HCP/NCCP implementation will be based, in part, on the expectation that the Cities and the County will adopt implementing ordinances that require the payment of Yolo HCP/NCCP fees and that failure by a City or the County to adopt an implementing ordinance will prevent the Permits from taking effect.

The model ordinance in **Exhibit B** is intended to exemplify the necessary substantive terms of an implementing ordinance; it is not intended to dictate the precise terms of each such ordinance. The County and each City may each adapt the model ordinance to reflect its independent findings, to maximize administrative efficiency, or for other reasons, provided the substance of the operative terms in the model ordinance is reflected in each implementing ordinance.

7.3.2 Special Participating Entities

The Conservancy may extend Take authorization to Special Participating Entities pursuant to a contractual agreement that defines any and all planning, implementation, management, enforcement and funding responsibilities necessary for the entity to comply with the Permits, the Yolo HCP/NCCP and this Agreement. Chapter 4 (Section 4.2.1.3) describes the application, review, and approval process for Special Participating Entities to be covered under the Permits and the Yolo HCP/NCCP. The Conservancy shall be responsible for determining if applications or requests from Special Participating Entities comply with all applicable authorities. Initially, the Conservancy must determine the eligibility of a proposed Special Participating Entity to receive coverage (i.e., whether it qualifies as such an entity) pursuant to factors described in Chapter 7 (Section 7.2.5). For Special Participating Entities deemed eligible, the Conservancy will enter into a contract with the entity with the provisions described in Chapter 4 (Section 4.2.1.3), receive an application package, notify the affected jurisdiction(s), and take other steps culminating in the issuance of a Certificate of Inclusion. The Conservancy shall enforce the terms of the Permit, the Yolo HCP/NCCP and this Agreement with regard to any such Special Participating Entity and shall withdraw the Certificate of Inclusion and terminate any Take authorization extended to the Special Participating Entity if the Special Participating Entity fails to comply with such terms.

7.3.3 Neighboring Landowners

The Conservancy may extend Authorized Take coverage to landowners who are engaged in normal agricultural and rangeland activities (described in Appendix M, Yolo Agricultural Practices) for lands located within a defined distance of land acquired for or enrolled in the Yolo HCP/NCCP reserve system, as further described in Chapter 3 (Section 3.5.6), Chapter 5 (Section 5.4.4), and Chapter 7 (Section 7.7.7.1) of the Yolo HCP/NCCP. Take Authorization is available to qualified landowners only for four Covered Species: California tiger salamander, valley elderberry longhorn beetle, giant garter snake, and western pond turtle. The process for extending Authorized Take coverage to such landowners is entirely voluntary, and landowners may elect to participate in their sole discretion. Interested landowners must prepare an

HCP/NCCP enrollment application package consisting of baseline surveys, an identification of ongoing and expected future agricultural and rangeland activities on the property, and the payment of a fee to cover enrollment costs. The Conservancy may approve applications that meet all the requirements of the Yolo HCP/NCCP, including but not limited to a landowner commitment to implement avoidance and minimization provisions regarding Take of the applicable Covered Species (see Chapter 4, Section 4.3 of the Yolo HCP/NCCP).

If approved, the Conservancy will extend Authorized Take of one (or more) of the four Covered Species through issuance of a Certificate of Inclusion. Take extended through issuance of a Certificate of Inclusion will only include the take of populations or occupied habitat above baseline conditions. The Conservancy may add conditions to a certificate of inclusion for the sake of ensuring that these and other related goals and objectives are met. Certificates of inclusion are personal to a landowner and do not transfer in the event of a change of ownership.

7.3.4 Liability for Actions of Third Party Participants

The Wildlife Agencies shall enforce this Agreement by ensuring that the Permittees comply with all terms and conditions of the Permits, the Yolo HCP/NCCP and this Agreement. The Permittees shall be responsible for complying with all applicable terms and conditions of this Agreement and shall enforce this agreement by ensuring that all Third Party Participants comply with all applicable terms and conditions of the Permit, the Yolo HCP/NCCP and this Agreement.

7.4 Ongoing Role of Wildlife Agencies

As of the Effective Date, the Permittees may implement Covered Activities and extend Authorized Take coverage to Third Party Participants in accordance with the Permits without the prior approval of the Wildlife Agencies, except as provided in Section 7.3, above. As further described in Chapter 7 of the Yolo HCP/NCCP, the Wildlife Agencies will monitor implementation of the Yolo HCP/NCCP to ensure overall compliance with the Permits. To ensure the Wildlife Agencies are adequately informed about the Permittees’ use and extension of Authorized Take coverage, the Permittees will provide copies of any application and supporting information required in Chapter 4 of the Yolo HCP/NCCP for any Covered Activity upon the request of any Wildlife Agency.

As further described in Chapters 6 and 7 of the Yolo HCP/NCCP, the Wildlife Agencies’ approval is required for certain components of the conservation strategy and specific administrative tasks or procedures. For example, the Wildlife Agencies will be third party beneficiaries on conservation easements recorded on reserve system lands, as further described in Chapter 7 of the Yolo HCP/NCCP. The Wildlife Agencies will also participate in implementation of the Yolo HCP/NCCP adaptive management program, as further described in Chapter 6 of the Yolo HCP/NCCP.

7.5 The Migratory Bird Treaty Act

The Federal Permit will constitute a Special Purpose Permit under 50 C.F.R. § 21.27 for the Take of migratory birds protected by the MBTA that are Covered Species and that are also listed under the ESA as threatened or endangered. The Federal Permit will specify the amount and/or number of any listed Covered bird, subject to all of the terms and conditions of those authorities. The

Special Purpose Permit will be valid for three years and will be renewed by USFWS pursuant to the MBTA provided the Permittees are in compliance with the Federal Permit. Each renewal of the Special Purpose Permit shall be for a period of three years, or more if the permit duration is extended by law, provided that the Federal Permit remains in effect for such period.

If and when any other Covered Species that is a migratory bird becomes a Listed Species under the ESA, the Federal Permit will also constitute a Special Purpose Permit for that species as of the date the Federal Permit becomes effective as to such species, as provided in Section 17.1, below.

7.6 Take Authorizations for Fully Protected Species

CDFW acknowledges and agrees that the Yolo HCP/NCCP includes measures that are intended to conserve and manage white-tailed kite, a Covered Species and a Fully Protected Species, as a result of the implementation of Covered Activities. However, if implementation of Covered Activities causes the take of white-tailed kite, CDFW acknowledges and agrees that the take is authorized under the State Permit, pursuant to Fish & Game Code § 2835.

7.7 Take Authorizations for Plant Species Under the ESA

The take of Covered Species that are federally listed plants is not prohibited under the ESA except on federal land or in violation of state law. The palmate-bracted bird’s beak is included on the list of Covered Species and the Federal Permit in recognition of the benefits provided for that species under the Yolo HCP/NCCP and in the event palmate-bracted bird’s beak becomes subject to the same take prohibitions in the ESA as listed wildlife species.

8.0 CONDITIONS ON COVERED ACTIVITIES; FEES

Chapter 6 of the Yolo HCP/NCCP presents the Conservation Strategy. The Conservation Strategy identifies the intended biological outcomes of Yolo HCP/NCCP implementation and describes the means by which these outcomes will be achieved. The Conservation Strategy includes specific and measurable biological goals and objectives and includes a comprehensive set of conservation measures designed to conserve Covered Species and the natural communities upon which they depend.

As discussed in this Section, the Conservation Strategy works in coordination with Conditions on Covered Activities described in Chapter 4 (Section 4.3), defined below, that appropriately avoid and minimize the impacts of the Covered Activities on the biological resources addressed in the Yolo HCP/NCCP. The Conservation Strategy also provides for the establishment of monitoring and adaptive management programs to ensure that the Yolo HCP/NCCP conservation measures can evolve as new data and information become available. Additionally, the payment of certain fees for implementation of the Yolo HCP/NCCP, as described in Chapter 8 thereof, is also a key component of the Yolo HCP/NCCP’s overall approach to achieving its objectives. Finally, the Yolo HCP/NCCP outlines the requirements of the Permittees and Third Party Participants for implementation of the Conservation Strategy.

In this Section and in Section 9, below, this Agreement addresses key aspects of implementation of the Conservation Strategy. This Section focuses on describing various strategies intended to avoid, minimize, and mitigate impacts to Covered Species and natural communities resulting from Covered Activities. Such strategies include, among other things, the avoidance and minimization measures described in Chapter 4 of the Yolo HCP/NCCP, the Conservation Strategy set forth in Chapter 6 of the Yolo HCP/NCCP, as well as application and survey requirements described in various Yolo HCP/NCCP chapters. The avoidance and minimization measures described in Chapter 4 of the Yolo HCP/NCCP are referred to herein and in the Yolo HCP/NCCP as “Conditions on Covered Activities” or “Conditions.” Most of these Conditions apply to specific types of Covered Activities; no individual Covered Activity is anticipated to need to comply with all Conditions. The Permittees will ensure that all applicable Conditions are incorporated in Covered Activities, as provided in this Section.

8.1 Avoidance and Minimization of Impacts

As noted above, Chapter 4 of the Yolo HCP/NCCP includes Conditions to avoid, minimize, and mitigate the Take of Covered Species resulting from Covered Activities. These Conditions are designed to form a countywide program that will be implemented systematically to: prevent Take of individuals of certain Covered Species; avoid impacts to Covered Species to the maximum extent practicable; minimize adverse effects on Covered Species and natural communities to the maximum extent practicable; and avoid and minimize direct and indirect impacts on wetlands and streams. Each Permittee will incorporate all applicable Conditions within all Covered Activities that it implements. In addition, the County and the Cities will require all applicable Conditions as conditions of approval for all other projects that they approve, and the Conservancy will ensure that the Conditions are incorporated in all Special Participating Entity Covered Activities. Local implementing ordinances, addressed briefly in Section 7.3.1.1, above, will be adopted by the County and each City to assist in achieving these requirements.

8.1.1 Avoidance and Minimization of Impacts to Species Protected Under Laws Other Than the ESA or CESA

All Covered Species that are birds are protected under the Migratory Bird Treaty Act. As provided in Section 7.6, above, the Federal Permit will be a Special Purpose Permit under the Migratory Bird Treaty Act for the least Bell’s vireo and western yellow-billed cuckoo, which are each a Listed Species under the ESA. However, unless and until the western burrowing owl, Swainson’s hawk, white-tailed kite, bank swallow or the tricolored blackbird become Listed Species under the ESA and the Federal Permit becomes a Special Purpose Permit for those species. The Migratory Bird Treaty Act prohibits killing or possessing birds or their young, nests, feathers, or eggs; therefore, the Special Purpose Permit only addresses harm and harassment in the form of habitat loss.

The Permits authorize Take of Covered Species only. Covered Activities affecting other species that are not Covered Species must comply with applicable state and federal laws that protect such species.

8.1.2 Exemptions from Conditions to Avoid and Minimize Impacts

Certain Covered Activities will not disturb the ground or will have little measurable impact on Covered Species or natural communities. These Covered Activities will receive the same

Authorized Take coverage as other Covered Activities. However, as further described in Chapter 4 (Section 4.5) of the Yolo HCP/NCCP, some or all conditions on Covered Activities described Chapter 4, including the process for project compliance described therein, will not apply to these Covered Activities.

8.2 Yolo HCP/NCCP Fees

As provided in this Section and further described in Chapter 8 of the Yolo HCP/NCCP, the Conservancy will use revenues generated from certain fees placed on Covered Activities to fund the implementation of the conservation strategy described in Chapter 6 of the Yolo HCP/NCCP and various other implementation activities set forth in Chapter 7 thereof. Such actions include, but are not limited to creation of the reserve system, management of reserve system lands, monitoring of and reporting on Yolo HCP/NCCP implementation, adaptive management, responses to Changed Circumstances, and related planning and administrative costs. These actions, together with the avoidance and minimization measures provided for in Section 8.1, above, will fulfill all requirements under the ESA and the NCCPA to conserve, manage, avoid, minimize and mitigate the impacts of Covered Activities on Covered Species and provide for the conservation of the Covered Species in the Plan Area.

The Yolo HCP/NCCP includes several types of fees which are referred to collectively in this Agreement as the “Yolo HCP/NCCP Fees.” The Yolo HCP/NCCP Fees, exemptions from the fees, fee credits, and the method of calculating the fees is further described in Chapter 8 of the Yolo HCP/NCCP. The Conservancy will administer the Yolo HCP/NCCP Fees in accordance with the text of Chapter 8 and this Agreement.

8.2.1 Fee Exemptions

Certain Covered Activities will have little or negligible adverse effects on Covered Species or natural communities, have primarily or entirely beneficial effects, or will be difficult and expensive to track and report. As further described in Chapter 8 (Section 8.4.1.1) of the Yolo HCP/NCCP, the requirement to pay Yolo HCP/NCCP fees does not apply to these Covered Activities. These Covered Activities will receive the same Authorized Take coverage as other Covered Activities, and Take from these Covered Activities will be tracked and reported in the same way as Authorized Take from other Covered Activities. Covered Activities that are exempt from Yolo HCP/NCCP Fees are identified in Chapter 8, Section 8.4.1.1, and these exemptions overlap with exemptions from Conditions on Covered Activities referenced in Section 8.1.2, above.

8.2.2 Fee Collection and Payment

The Permittees will ensure that all applicable Yolo HCP/NCCP Fees are paid, and all applicable fee credits are applied, for all Covered Activities, as further described in Chapter 8 of the Yolo HCP/NCCP. The County and the Cities will make payment of all applicable Yolo HCP/NCCP Fees a condition of final approval for private project participant Covered Activities; the Conservancy will require payment of all applicable Fees for Special Participating Entity Covered Activities; and the Permittees will pay all applicable Fees for Covered Activities that they implement. The Conservancy may require Special Participating Entities to pay additional amounts as described in Chapter 8 (Section 8.4.1.9), including an amount in addition to applicable Fees to reimburse the Conservancy for costs associated with extending take coverage to Special Participating Entities and to help fund conservation actions intended to contribute to the conservation of Covered Species.

The Cities and the County will collect fee payments from private project participants and provide the fee revenues to the Conservancy at least quarterly. The Conservancy will comply with all provisions of the Mitigation Fee Act (Gov. Code §66000, et seq.) to the extent those provisions are applicable the deposit, accounting, expenditure and reporting of such fee revenues.

8.2.3 Fee Adjustments

As further described in Chapter 8 (Section 8.4.1.6) of the Yolo HCP/NCCP, the Conservancy will use two mechanisms for adjusting Yolo HCP/NCCP Fees: automatic adjustments that occur annually; and periodic adjustments that occur following an assessment process every five years. The annual adjustments will proceed in accordance with the indices and procedures generally depicted in Table 8-10 of the Yolo HCP/NCCP and related text in Chapter 8 (Section 8.4.1.6.1). The Conservancy's governing board will determine the date of the annual adjustments within six months of the Effective Date.

In addition, the Conservancy will conduct a periodic assessment every five years to review the costs and underlying assumptions used in developing the original funding strategy (or any updates to those assumptions, if appropriate). Each assessment shall also include an evaluation of the remaining costs to implement the Yolo HCP/NCCP. Other factors set forth in Chapter 8 (Section 8.4.1.6.2) may also be considered by the Conservancy in conducting the periodic assessment. Within a reasonable time after completing the periodic assessment, the Conservancy will adopt any fee adjustments necessary based on the assessment to ensure full funding of the mitigation share of remaining Yolo HCP/NCCP implementation costs, as well as the endowment contribution and Yolo HCP/NCCP Preparation fees. The five-year timeframe shall be calculated starting with the first full calendar year after the Effective Date. Automatic annual increases will resume and build on the results of the periodic assessment and any related fee adjustments.

8.2.4 Fee Credits

As further described in Chapters 7 (Section 7.5.9) and 8 (Section 8.4.1.8) of the Yolo HCP/NCCP, the Conservancy may approve fee credits for the conveyance of lands that are added to the reserve system. The fee credits may be used for some of the Yolo HCP/NCCP Fees that apply to one or more Covered Activities. Fee credits do not have any value except as credits for Yolo HCP/NCCP Fees incurred during the Permit Term. Fee credits remaining after the Permit Term will have no value, and no payment or "refund" will be made.

The procedures for requesting a fee credit and for all Conservancy actions relating to such requests are set forth in the above-referenced Chapters of the Yolo HCP/NCCP. The Conservancy will follow those procedures in deciding fee credit requests. Among other things, it will prepare a written determination stating whether any proposed fee credit meets the requirements of the Yolo HCP/NCCP and this Agreement, and whether, or to what extent, the credit is approved by the Conservancy. The written determination will include the amount of any approved credit. The amount of an approved fee credit may be deducted from the Yolo HCP/NCCP Fees that apply to any Covered Activity implemented by the Permittee, private project proponent, or Special Participating Entity that received the approved credit. In some instances, the Conservancy may not approve a proposed fee credit (as set forth in Chapter 8, Section 8.4.1.8). Additionally, the Conservancy may disapprove a requested fee credit on a case-by-case basis in its sole discretion.

8.2.5 Fee Payment Timing

All applicable Yolo HCP/NCCP Fees, subject to any fee credits, will be collected before implementation of the Covered Activity for which the fees are required. The County and the Cities will require private project participants to pay all applicable fees before or concurrent with the issuance of a grading permit for each private project proponents' Covered Activity. If a grading permit is not required for the Covered Activity, payment of the fees will be required before the first building or other construction permit is issued. The Conservancy will require Special Participating Entities to pay all applicable fees before initiating ground-breaking activities for their Covered Activities, and the Permittees will pay all applicable fees before implementing any Covered Activity.

9.0 CREATION OF RESERVE SYSTEM

The creation and management of a Yolo HCP/NCCP reserve system is one of three primary elements of the Conservation Strategy. The Conservancy will establish the reserve system as provided in Chapter 6 (Section 6.4.1) of the Yolo HCP/NCCP and this Agreement. The reserve system will include select protected areas existing at time of Yolo HCP/NCCP approval (called "pre-permit reserve lands" and defined below) as well as the permanent protection of additional lands to be acquired in accordance with the Yolo HCP/NCCP. Reserve system lands will be actively managed and enhanced for the benefit of Covered Species and, in some instances, the Conservancy will also implement natural community restoration and creation actions.

The Yolo HCP/NCCP includes certain deadlines for the completion of the reserve system assembly and other actions described in Chapter 6 of the Yolo HCP/NCCP as part of Conservation Measure 1. The Conservancy will assemble the reserve system in accordance with the schedule set forth in Table 7-2, which is based on the "stay-ahead" provision described in Chapter 7 (Section 7.5.3.3) of the Yolo HCP/NCCP. Restoration and creation actions included in Conservation Measure 2 (Chapter 6, Section 6.4.2) of the Yolo HCP/NCCP will occur prior to natural community losses and consistent with the stay-ahead provision, as well as the biological objectives included in Table 6-8 of the Yolo HCP/NCCP. Management and enhancement actions described in Conservation Measure 3 will occur through the Permit Term.

9.1 Criteria for Reserve System Lands

As described in Chapter 6 (Section 6.4.1) of the Yolo HCP/NCCP, the Conservancy will follow certain reserve design assembly principles—including specific siting, design, and prioritization criteria—in establishing the reserve system. Additionally, the Conservancy will meet the land acquisition and pre-acquisition assessment requirements set forth in Sections 6.4.1.5 and 6.4.1.6 of Chapter 6.

9.2 Permanent Protection of Reserve System Lands

The Conservancy may use various mechanisms to achieve the conservation acreages required by the Yolo HCP/NCCP (see Table 6-2(a)). Such mechanisms include: acquiring land in fee title and conserving it with a permanent conservation easement; acquiring a permanent conservation easement; the preservation of fee title or permanent conservation easement interests by a conservation organization; and the purchase of mitigation credits from private mitigation or conservation banks. The Conservancy will use each of these mechanisms in compliance with certain requirements set forth in the Yolo HCP/NCCP, including but not limited to Chapters 6 (Section 6.4.1.3) and 7 (Section 7.5.5).

Additionally, the Conservancy will also enroll baseline public and easement lands—as described in Section 6.4.1.7 of Chapter 6 and Section 7.5.11 of Chapter 7 of the Yolo HCP/NCCP—in the reserve system as “pre-permit reserve lands” if certain requirements are met (i.e., the Wildlife Agencies have each approved incorporation of these lands into the Reserve system).

9.2.1 Conservation Easements

The Conservancy expects to rely extensively on the purchase of conservation easements to assemble the reserve system. Conservation easements are the preferred habitat protection method for actively cultivated lands, as certain ongoing agricultural uses support achievement of the Yolo HCP/NCCP biological goals and objectives. Procedures and requirements for conservation easements are described in several sections of the Yolo HCP/NCCP, including but not limited to: Section 7.5.5 (Conservation Easements) and Section 7.5.10 (Use of Mitigation Banks). While the Conservancy will itself acquire conservation easements in the course of assembling the reserve system, the Yolo HCP/NCCP also specifically authorizes conservation easements acquired by other qualified easement holders, as defined in California Civil Code section 815 *et seq.,* to assemble the reserve system.

Section 7.5.5 of Chapter 7 of the Yolo HCP/NCCP describes the minimum requirements of a conservation easement under the Yolo HCP/NCCP for inclusion in the reserve system.

For purposes of lands added to the Reserve System, the Conservancy will use a conservation easement template agreed to by the Parties (Appendix K of the Yolo HCP/NCCP). Reasonable variations from the template may be needed to address site-specific constraints. Both Wildlife Agencies, along with the Conservancy, must review and approve any modifications to the template easement prior to its execution.

9.3 Stay-Ahead or Rough Proportionality Requirement

Under Fish & Game Code § 2820(b)(3)(B), the conservation strategy of an NCCP must be implemented at or faster than the rate of loss of natural communities or habitat for Covered Species. To assist in applying this requirement to implementation of the Yolo HCP/NCCP, the Plan includes schedules and procedures referenced in Chapter 7 (Section 7.5.3).

9.3.1 Failure to Stay Ahead or to Maintain Rough Proportionality

If rough proportionality is not being maintained pursuant to Chapter 7 (including Section 7.5.3.1) of the Yolo HCP/NCCP, the Conservancy and the Wildlife Agencies will meet and confer to determine a plan of action that will remedy the situation and achieve compliance. The plan of action may include any of the solutions identified in Section 7.5.3.3 of Chapter 7 of the Yolo HCP/NCCP, or it may include other strategies developed by the Parties.

If the Conservancy is unable to achieve compliance after the exercise of all available authority and use of all available resources, the Wildlife Agencies will reevaluate the Permits, relevant components of the Yolo HCP/NCCP, and this Agreement. The Wildlife Agencies may advise the Conservancy on a potential modification or amendment that would address the compliance situation or, if no such strategy appears viable, the Wildlife Agencies may suspend or revoke their Permits, in whole or in part. All Parties acknowledge that failure to fulfill the requirements of the Yolo HCP/NCCP and the Permits would constitute a violation of the Permits and the Wildlife Agencies will take appropriate responsive actions to address any such violation in accordance with the ESA and NCCPA, which could include suspension or revocation of the Permits, in whole or in part. The partial suspension or revocation may include removal of one or more Covered Species or reduction in the scope of the Take Authorizations.

9.3.2 Conveyance of Land in Lieu of Yolo HCP/NCCP Fees to Maintain Rough Proportionality

As set forth in Chapter 8 (Section 8.4.4.2), if the Conservancy determines it is at risk of failing to meet the stay-ahead provision for land acquisitions as described in Chapter 7 of the Yolo HCP/NCCP, after consultation with the Wildlife Agencies it may notify the other Permittees that it is necessary to temporarily require project proponents to provide land instead of paying all or a portion of the Yolo HCP/NCCP fee.

9.4 Additional Criteria for Lands Conveyed in Lieu of Fee Payment

As set forth in other Sections of this Agreement, under certain circumstances lands may be conveyed to the reserve system in lieu of payment of some (or rarely, all) applicable Yolo HCP/NCCP fees. Chapter 7 (Section 7.5.9.1) describes the process for including these conveyances in the reserve system and counting them toward the reserve system requirements of the Yolo HCP/NCCP. Additionally, Section 7.5.9.1 of Chapter 7 sets forth three criteria that any such conveyance must satisfy in order to be eligible for credit:

The land must satisfy the criteria for reserve lands in Chapter 6 of the Yolo HCP/NCCP, as demonstrated by a field assessment conducted by the project proponent and verified in the field by the Conservancy;

The land must be within a priority acquisition area, or the unique and high values of the land must justify its inclusion in such an area; and

The Conservancy and the Wildlife Agencies must approve the transaction consistent with applicable requirements in the Yolo HCP/NCCP, including but not limited to Chapter 7, Section 7.5 (Land Acquisition, Step 12).

9.5 Lands Conveyed by Entities other than Permittees

Lands acquired through partnerships with non-Permittees can be counted toward reserve system requirements if such lands meet the criteria for reserve lands described in Chapter 6 of the Yolo HCP/NCCP, and the additional criteria described in Chapter 7.5 of the Yolo HCP/NCCP.

9.6 Lands in Private Mitigation Banks

Lands in private mitigation banks within the Plan Area can be counted toward the reserve system requirements of the Yolo HCP/NCCP as described in Chapter 7 (Section 7.5.10) of the Plan. Banks approved following the Effective Date must be consistent with the conservation, monitoring, adaptive management, and other relevant provisions of the Yolo HCP/NCCP. A Permittee or Third Party Participant may purchase credits at a private mitigation bank to fulfill the requirements of the Yolo HCP/NCCP only if the bank occurs within the Plan Area and meets all relevant standards pertaining to the reserve system, habitat enhancement, adaptive management, and monitoring described in Chapters 6 and 7 of the Plan.

9.7 Gifts of Land

The Conservancy may accept lands in fee title, or conservation easements on lands, as a gift or charitable donation. Such lands may be added to the reserve system only if they meet the criteria for reserve lands in Chapter 6 and the nature of the real property interest is consistent with the requirements of Chapter 7. The Conservancy may sell or exchange lands it receives as a gift or donation that do not meet the requirements of Chapters 6 or 7 of the Plan.

10.0 MANAGEMENT OF RESERVE SYSTEM LANDS

10.1 Reserve Management Plans

As provided in Conservation Measure 3 (Chapter 6, Section 6.4.3), all reserve system lands will be managed in perpetuity in accordance with one or more management plans. The Conservancy will update management plans from time to time according to the process as set forth in Chapter 6 (Section 6.4.3.3).

10.1.1 Role of the Wildlife Agencies in Preparation of Reserve Unit Management Plans

As indicated in Section 10.1, above, the Wildlife Agencies must approve all reserve unit management plans.

The Conservancy will incorporate comments submitted by the Wildlife Agency in the revised draft Reserve Unit Management Plan to the extent that the Conservancy determines the comments can be incorporated. In the event that the Conservancy determines that some or all of the Wildlife Agency comments cannot be incorporated, it will notify the Wildlife Agency of its determination and the basis for such. The Conservancy will then work with the Wildlife Agency to determine if other measures can be developed that adequately address the Wildlife Agency's concerns. All changes to Reserve Unit Management Plans require Wildlife Agency review and approval.

The same Wildlife Agency review procedure will apply to all revisions to reserve unit management plans. These Wildlife Agency review procedures will also apply to site-specific management plan revisions in situations where the requested revision is not consistent with the applicable reserve unit management plan or an applicable reserve unit management plan has yet to be established.

11.0 MONITORING, ADAPTIVE MANAGEMENT AND CHANGED CIRCUMSTANCES

The Conservancy will implement the Yolo HCP/NCCP monitoring and adaptive management program as provided in this Section and further described in Chapter 6 (Section 6.5) of the Plan. The overarching purpose of the Yolo HCP/NCCP monitoring and adaptive management program is to inform and—in some instances—refine Plan implementation to ensure compliance with Plan requirements and continually improve outcomes for covered species and natural communities. The scope of the monitoring and adaptive management program is limited by the assurances provided by the Wildlife Agencies, under applicable law (see Section 12, below). These assurances include the commitment that if Unforeseen Circumstances arise, the Permittees will not be required to provide additional land, water, or financial obligation beyond the obligations of the Yolo HCP/NCCP.

11.1 Monitoring

The Conservancy will conduct three main types of monitoring, as further described in Chapter 6 (Section 6.5.3) of the Plan:

Compliance Monitoring—Compliance monitoring will track the status of Yolo HCP/NCCP implementation and verify that the Conservancy is meeting the requirements of the Plan and terms and conditions of the Permits.

Effectiveness Monitoring—Effectiveness monitoring assesses the biological success of the Plan—specifically, it evaluates the implementation and success of the conservation strategy described in Chapter 6 thereof.

Targeted Studies—Targeted studies will identify the best methodologies for monitoring, provide information about the efficacy of reserve system management techniques, and resolve critical uncertainties in order to improve reserve system management.

The Conservancy will provide the results of all monitoring annually in the annual report described in Section 14.1, below. As noted in Section 5.4, above, the Conservancy may delegate monitoring responsibilities and other tasks to other Parties or qualified third parties, including but not limited to public agencies, private conservation organizations, university scientists, and consultants.

11.2 Adaptive Management

The Conservancy will implement the adaptive management program described in Chapter 6 (Section 6.5) of the Yolo HCP/NCCP. Generally, the purpose of adaptive management is to adapt the design and management of the reserve system to maximize the likelihood of the successful implementation of the conservation strategy. The Conservancy will have ultimate responsibility for implementing the adaptive management program and will ultimately decide what adaptations will be made in the management of reserve system lands. However, as briefly set forth below, the Conservancy will consider the advice of the Wildlife Agencies, science advisors, other land management agencies, and the public, as provided in this Section and as further described in Section 6.5 of Chapter 6 of the Plan.

11.2.1 Role of Wildlife Agencies

The Wildlife Agencies will provide biological expertise and policy-level recommendations to the Conservancy regarding potential changes to the design and management of the reserve system based on the results of monitoring and the advice of science and technical advisors (see Section 11.2.2, below). The Conservancy will confer with the Wildlife Agencies before initiating adaptations to the design or management of the reserve system. The Conservancy and Wildlife Agencies will attempt in good faith to reach agreement regarding any such adaptations or alternative adaptations that the Wildlife Agencies may propose. If they cannot reach agreement, any of them may initiate the dispute resolution procedure provided in Agreement Section 6.2.

11.2.2 Role of Science and Technical Advisors

The Conservancy will consult with science and technical advisors regarding the scientific aspects of Plan implementation through a Science and Technical Advisory Committee. This consultation effort is detailed in Chapter 7 (Section 7.2.4.2) of the Yolo HCP/NCCP. The Conservancy will select advisors with input from the Wildlife Agencies. As may be appropriate, the Conservancy will incorporate recommendations provided by these advisors into Yolo HCP/NCCP implementation, if agreed to by the Wildlife Agencies.

11.2.3 No Increase in Take

Neither Section 11.2 nor any other Section of this Agreement authorizes changes in the design or management of the reserve system, or any other aspect of the Plan, that would increase the amount and nature of the Take of Covered Species, or increase the impacts of the Take of Covered Species, beyond that analyzed in the Yolo HCP/NCCP, any amendments thereto, or included on the Permits. Any such change must be reviewed as a Permit amendment under Section 15.4 of this Agreement.

11.3 Changed Circumstances

In the event a Changed Circumstance identified in Chapter 7 of the Yolo HCP/NCCP occurs, the Conservancy will implement the remedial measures or actions prescribed in Chapter 7 (Section 7.7.1) for that Changed Circumstance. Eight Changed Circumstances are listed in Section 7.7.1.2 and are as follows: new species listings; climate change; wildfire; non-native invasive species or disease; flooding; drought; earthquakes; and loss of Swainson's hawk habitat and populations declining below the threshold. Neither the Conservancy nor any other Permittee or Third Party Participant will be required to take any additional action to respond to a Changed Circumstance (i.e., any action not otherwise required by the Permits), except as described in Chapter 7 (Section 7.7.1) of the Yolo HCP/NCCP.

Changed Circumstances are provided for in the Yolo HCP/NCCP and therefore are not Unforeseen Circumstances. The Yolo HCP/NCCP describes the Permittees' responses to Changed Circumstances, as well as the funding to assure that the responses are implemented. Therefore, Changed Circumstances and the remedial actions in response to Changed Circumstances do not require an Amendment of the Yolo HCP/NCCP or the Permits. The Parties agree that Chapter 7 (Section 7.7.1) of the Yolo HCP/NCCP identifies all Changed Circumstances and describes appropriate and adequate responses for them. Other changes not identified as Changed Circumstances will be treated as Unforeseen Circumstances, as provided in Chapter 7 (Section 7.7.1) and Section 12.4, below.

11.3.1 Initiating Responses to Changed Circumstances

The Conservancy will immediately notify the Wildlife Agencies after learning that any of the Changed Circumstances listed in Chapter 7 (Section 7.7.1.2 and thereafter) of the Yolo HCP/NCCP has occurred. The Conservancy will respond to Changed Circumstances as described in Chapter 7 of the Yolo HCP/NCCP, including by taking the actions identified in connection with each of the specific changed circumstances described therein.

If a Wildlife Agency determines that a Changed Circumstance has occurred and that the Conservancy has not responded as described in Chapter 7 of the Yolo HCP/NCCP, the Wildlife Agency will notify the Conservancy, specifically identifying the Changed Circumstance and will direct the Conservancy to make the appropriate changes. Within 30 days after receiving such notice, the Conservancy will make the appropriate changes and report to the Wildlife Agency on its actions. Such changes are provided for in the Yolo HCP/NCCP, and hence do not constitute Unforeseen Circumstances or require an amendment of the Permits or Yolo HCP/NCCP.

After it has initiated remedial measures to a Changed Circumstance as described in Chapter 7, the Conservancy will promptly inform the Wildlife Agencies of its actions. The Conservancy will continue implementation of any such remedial measures to completion and will describe in its Annual Report for that year the Changed Circumstance and the remedial measures implemented. Subsequent Annual Reports will track the response of the reserve system and the Covered Species to evaluate whether remedial measures implemented as a result of Changed Circumstances have been effective.

12.0 REGULATORY ASSURANCES AND PROTECTIONS

The ESA regulations and provisions of the NCCPA provide for regulatory and economic assurances to parties covered by approved HCPs or NCCPs concerning their financial obligations under a plan. Specifically, these assurances are intended to provide a degree of certainty regarding the overall costs associated with mitigation and other Conservation Measures, and add durability and reliability to agreements reached between permit holders and Wildlife Agencies. That is, if Unforeseen Circumstances occur that adversely affect species covered by an HCP or an NCCP, the Wildlife Agencies will not require of the permit holder any additional land, water, or financial compensation nor impose additional restrictions on the use of land, water, or other natural resources without their consent.

The assurances provided under the ESA and the NCCPA do not prohibit or restrain USFWS, CDFW, the Permittees or any other public agency from taking additional actions to protect or conserve species covered by an NCCP or HCP. The State and federal agencies may use a variety of tools at their disposal and take actions to ensure that the needs of species affected by unforeseen events are adequately addressed.

12.1 ESA Regulatory Assurances: The “No Surprises” Rule

The “No Surprises” regulation at 50 C.F.R. §§ 17.22(b)(5) and 17.32(b)(5), apply only to incidental take permits issued in accordance with paragraph (b)(2) of this section where the conservation plan is being properly implemented, and apply only with respect to species adequately covered by the conservation plan. These assurances cannot be provided to Federal agencies. Pursuant to the “No Surprises” regulation, USFWS shall not require the Permittees to provide additional land, water or other natural resources, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level provided for under the Yolo HCP/NCCP.

12.2 NCCPA Regulatory Assurances

Provided that the Yolo HCP/NCCP is being implemented consistent with the substantive terms of this Agreement, the Plan, and the State Permit, CDFW shall not require the Permittees to provide additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources during the term of the State Permit without the consent of Permittees. Adaptive management modifications and Plan responses to Changed Circumstances are provided for under the Yolo HCP/NCCP, as set out in Chapters 6 and 7 thereof. Accordingly, the resources identified to support such modifications and planned responses, together with the other resources commitments of the Permittees reflected in the Yolo HCP/NCCP, constitute the extent of the obligations of the Permittees pursuant to the assurances provided for in the NCCPA. Section 2823 of the Fish & Game Code provides, however, that CDFW shall suspend or revoke any permit, in whole or in part, issued for the take of a species subject to Section 2835 if the continued take of the species would result in jeopardizing the continued existence of the species. Responses to a jeopardy determination are addressed in Section 16 of this Agreement.

12.3 Assurances for Third Party Participants

Pursuant to the "No Surprises" regulations described in Agreement Section 12.1, in the event of a finding of Unforeseen Circumstances, USFWS cannot require the commitment of additional land, water or financial compensation without the consent of the affected Permittee or Third Party Participant, provided that the Permittees have complied with their obligations under the Federal Permit. Likewise, as provided in Agreement Section 12.2, CDFW will not require any Permittee or Third Party Participant to provide, without its consent, additional land, water or financial compensation, or additional restrictions on the use of land, water, or other natural resources, for the purpose of conserving Covered Species with respect to Covered Activities, even in the event of Unforeseen Circumstances, provided the Permittees are properly implementing the State Permit, the Yolo HCP/NCCP, and this Agreement. If there are Unforeseen Circumstances, additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources will not be required of a Third Party Participant without its consent for the term of this Agreement, unless CDFW determines that the Yolo HCP/NCCP is not being implemented consistent with the substantive terms of the State Permit, the Plan, and this Agreement.

Nothing in this Agreement will preclude the Permittees from imposing on Third Party Participants any mitigation, compensation, or other requirements in excess of those required by the Permits for impacts other than impacts of Covered Activities on Covered Species. Such other impacts may include, but are not limited to, impacts on parks, recreational facilities, and agriculture.

12.4 Unforeseen Circumstances

12.4.1 USFWS Determination of Unforeseen Circumstances

If USFWS believes an Unforeseen Circumstance exists, it shall provide written notice of its finding of Unforeseen Circumstances to the Conservancy. The USFWS shall clearly document the basis for the finding regarding the existence of Unforeseen Circumstances pursuant to the requirements of 50 C.F.R. §§ 17.22(b)(5)(iii)(C) and 17.32(b)(5)(iii)(C). Within thirty (30) days of receiving such notice, the Executive Director (and/or any other Permittee) and the USFWS shall meet and confer to consider the facts cited in the notice and potential changes to the Conservation Strategy.

If such a finding is made and additional measures are needed, the Permittees will work with the Wildlife Agencies to appropriately and voluntarily redirect resources to address the Unforeseen Circumstances, consistent with the intent of the Yolo HCP/NCCP.

12.4.2 CDFW Determination of Unforeseen Circumstances

If CDFW believes an unforeseen circumstance exists, it shall provide written notice of its proposed finding of unforeseen circumstances to the Conservancy. CDFW shall clearly document the basis for the proposed finding regarding the existence of Unforeseen Circumstances. Within thirty (30) days of receiving such notice, the Executive Director (and/or any other Permittee) and CDFW shall meet and confer to consider the facts cited in the notice and potential changes to the Conservation Strategy.

Thereafter, CDFW may make an Unforeseen Circumstances finding, if appropriate, based on the best scientific evidence available. If such a finding is made and additional measures are needed, the Permittees will work with the Wildlife Agencies to appropriately and voluntarily redirect resources to address the Unforeseen Circumstances, consistent with the intent of the Yolo HCP/NCCP.

12.4.3 Interim Obligations Upon a Wildlife Agency Proposed Finding of Unforeseen Circumstances

If a Wildlife Agency finds that an Unforeseen Circumstance has occurred with regard to a Covered Species and that additional measures are required for the Covered Species as a result, during the period necessary to determine the nature, scope and location of any additional measures, the Permittees will avoid causing an appreciable reduction in the likelihood of the survival and recovery of the affected species. The Permittees will not be responsible for implementing any additional measures unless the Permittees consent to do so.

12.4.4 Land Use and Regulatory Authority of the County and Cities

The Parties acknowledge that the adoption and amendment of general plans, specific plans, community plans, zoning ordinances and other land use and regulatory ordinances, and the granting of land use entitlements or other regulatory permits by the County or Cities are matters within the sole discretion of the County or Cities and will not require amendments to the Permits, or the approval of other Parties to this Agreement. However, no such action by the County or Cities will alter or diminish their obligations under the Permits, the HCP/NCCP, or this Agreement.

13.0 FUNDING

The Permittees warrant that they will expend such funds as may be necessary to fulfill their obligations under the Yolo HCP/NCCP. The Permittees will promptly notify the Wildlife Agencies of any material change in the Permitees' financial ability to fulfill their obligations. The Permittees do not intend to use, nor are they required to use, funds from their respective general funds to implement the Yolo HCP/NCCP. Instead, they intend to fund all actions required by the Permits, the Yolo HCP/NCCP and this Agreement through a comprehensive funding strategy further described in Chapter 8 of the Plan and summarized in Table 8.6 thereof.

13.1 Plan Funding Strategy

The Permittees intend to obtain sufficient funds through a comprehensive strategy further described in Chapter 8 of the Plan that includes: (1) HCP/NCCP fees, including public and private sector development effect fees and related charges that will adjust over time as provided in Chapter 8 (Section 8.4.1.6) of the Plan; (2) local funding from Permittees, other local government agencies, and private foundations described in Chapter 8 (Section 8.4.2) of the Plan; (3) interest income from the Yolo HCP/NCCP endowment and revenues not yet spent described in Chapter 8 (Section 8.4.2.5) of the Plan; and (4) state and federal funding, including but not limited to grant programs and other sources described in Chapter 8 (Section 8.4.3) of the Plan. All funds acquired for Plan implementation and related costs must be expended in a manner consistent with applicable laws and regulations. Generally, the HCP/NCCP fees constitute the primary source of funding for the mitigation component of the Plan, and the other funding categories set forth above will contribute to the conservation component of the Plan (or, in the case of interest income on the Yolo HCP/NCCP endowment, to post-permit costs as set forth in Section 13.3, below).

The Permittees will adhere to all timing and other requirements described in Chapter 8 of the Plan in the course of administering the funding strategy set forth therein. The Permittees may use or establish other funding sources during the course of implementing the Yolo HCP/NCCP, including but not limited to utility surcharges, special taxes or assessments, or bonds, to the extent allowed by law.

As further provided in Section 18.9, below, this Agreement does not require the obligation, appropriation, or expenditure of any money without express authorization by, as applicable, the governing boards of any Permittee.

13.2 State and Federal Funding

As further described in Chapter 8 (Section 8.4.3) of the Plan, funding may be provided by one or more state and federal programs. Neither state nor federal funds can be guaranteed and the state or federal government may contribute less than the estimates in the Yolo HCP/NCCP. These funds could only be utilized to assist in meeting the conservation components of the Yolo HCP/NCCP and these funds are not required to satisfy the issuance criteria for the ESA and NCCPA. The Yolo HCP/NCCP has estimated that state or federal funds could be sufficient to acquire 11,464 acres of land to the reserve system (based on an average cost of $6,821/acre to acquire contribution easements). This acreage represents 34 percent of the total reserve system of 33,362 acres and, in monetary terms, constitutes 21 percent of total Plan costs because funding is restricted to acquisition alone. If the state or federal government contribute only a portion of the total cost of acquiring a conservation easement, the Conservancy will measure the contribution of the state or federal government to that transaction as a percentage share of the overall amount of land acquired in proportion to the overall cost of the acquisition.

State and federal funding sources for land acquisition could come from a variety of sources, including those listed in Table 8-11 of the Plan. If state and federal funds are unable to contribute the estimated amounts, the Permittees and Wildlife Agencies will follow the approach set forth in Section 13.4, below. If necessary or appropriate, the Parties will reevaluate the Yolo HCP/NCCP and work together to develop or identify an alternative funding mechanism.

13.3 Funding for Management and Monitoring in Perpetuity

As described in Chapter 8 (Section 8.4.4.5) of the Plan, after expiration of the Permits, the Permittees are obligated to continue to protect, manage, and maintain the reserve system. Funding provided by interest on the Yolo HCP/NCCP endowment is expected to fully fund all post-permit costs. The Permittees' obligations with regard to Yolo HCP/NCCP requirements other than reserve management requirements will terminate upon expiration of the Permits.

13.4 Effect of Funding Shortfalls

If overall HCP/NCCP fee revenues fall short of expectations, such as if fewer Covered Activities are implemented than projected by the Plan and less HCP/NCCP fees are collected, the resulting shortfall in Plan funding could prevent or constrain the Permittees' ability to fully implement the Yolo HCP/NCCP. As set forth in Chapter 8 (Section 8.4.4.3) of the Plan, if fee revenues do not keep pace with reserve system operation and management needs, the Permittees will consider various options in consultation with the Wildlife Agencies. Any shortfall in non-fee revenues, such as local, state or federal agency contributions, will be treated similarly, with the Conservancy first making reasonable adjustments to expenditures to reduce costs while continuing to meet Plan obligations. If such adjustments are inadequate, the Conservancy will consult with the Wildlife Agencies to determine the best course of action.

In any circumstance where consultation occurs, the ultimate course of action will vary depending upon a full consideration of relevant factors. Such factors may include, but are not limited to, the rate of acquisition of reserve system lands or whether the amount and rate of Take is less than anticipated in the Plan. If it appears that the level of Authorized Take by the Permits will not be used during their term, substantially reducing HCP/NCCP fee revenues, the Parties anticipate that the Permittees will apply for an amendment to extend the Permits in accordance with Section 17.3, below, to allow the full use of Authorized Take and full implementation of the Yolo HCP/NCCP. Alternatively, the Permittees may apply for a Permit modification or amendment in accordance with Section 15 of this Agreement to reduce the amount of Authorized Take and related obligations in the Permits. Any such application will be treated as a request for a major amendment and processed in accordance with Chapter 7 of the Plan.

14.0 REPORTING AND INFORMATION MANAGEMENT

The Conservancy, on behalf of all Permittees, will report on and manage information regarding Plan implementation as provided in this Section and as further described in the Yolo HCP/NCCP, including but not limited to Chapters 6-7 thereof. The main elements of the Conservancy's reporting and information management obligations are set forth in this Section.

14.1 Annual Report; Related Documents

The Conservancy will prepare an annual report on Plan implementation and related matters, as summarized in Chapter 7 (Sections 7.9.1 and 7.9.3) of the Plan. The Conservancy will also prepare an annual work plan and budget and, every ten years, a comprehensive review document. The annual report will summarize actions taken to implement the Yolo HCP/NCCP during the previous calendar year. All annual reports, work plans and budgets, and ten-year review documents will have a standardized format developed by the Conservancy and will be submitted to the Wildlife Agencies, made available to interested members of the public, and maintained on the Conservancy website. The required contents and timeframes for submittal of the annual report, annual work plan and budget and ten-year review documents are set forth in Chapter 7 (Sections 7.9.1 through 7.9.4) of the Plan.

14.2 Compliance Tracking

As provided in Chapter 7 of the Plan (Section 7.9.2), the Conservancy will track all aspects of compliance with the Permits, the Yolo HCP/NCCP, and this Agreement. It will maintain related information and data of various types, all as set forth in Section 7.9.2 of Chapter 7, to track progress toward successful implementation of the conservation strategy. This information and data will be linked to supporting information that documents Plan compliance and, where feasible, will be stored and archived electronically.

The database developed for Plan compliance tracking must be compatible with the HabiTrak system developed by CDFW. The Conservancy's database will be developed to assemble, store, and analyze all monitoring data in the database, including but not limited to data from the monitoring and adaptive management program described in Chapter 6 of the Plan. The Conservancy will make the database available to CDFW and the other Parties. All recipients of sensitive species information will keep such information confidential to the extent permitted by the Freedom of Information Act, the California Public Records Act, or other applicable laws. The Conservancy may determine, in its sole discretion, whether to provide any information in the database to third parties, including but not limited to Third Party Participants.

15.0 MODIFICATIONS AND AMENDMENTS

The Parties may from time to time modify or amend the Yolo HCP/NCCP, this Agreement, or the Permits, in accordance with this Section and the requirements of the ESA, CESA, NCCPA, NEPA, and CEQA. Three types of modifications are recognized in Chapter 7 (Section 7.8) of the Plan. In order of significance, the three types of modifications and related procedural and substantive requirements are as follows:

15.1 Administrative Changes

The Parties understand that ordinary administration and implementation of the Yolo HCP/NCCP will require minor variations in the way certain conservation actions are implemented. Such administrative changes, as described in Chapter 7 (Section 7.8.1) of the Plan, will not require modification or amendment of the Permits, the Plan, or this Agreement. Administrative changes to the Plan that may be approved pursuant to this Section include, but are not limited to, the examples described in Chapter 7 (Section 7.8.1) of the Plan.

15.2 Minor Modifications

The Conservancy, USFWS, or CDFW may propose minor modifications, defined in Chapter 7 (Section 7.8.2) of the Plan, by providing written notice to all of the other Parties. Such notice will include the information required by Section 7.8.2.1 of Chapter 7, including a statement of the reason for the proposed modification and an analysis of its environmental effects, if any, including any effects on Covered Species. The Conservancy, USFWS, and CDFW may submit comments and indicate approval/disapproval of the proposed minor modification within 60 days of receiving notice from the Party proposing the modification. Proposed modifications will become effective upon written approval of the Conservancy, USFWS, and CDFW. All decisions to approve or deny a proposed minor modification shall be supported by a written explanation.

The Wildlife Agencies may not propose or approve as a Minor Modification any revision to the Permits, the Yolo HCP/NCCP or this Agreement if either of the Wildlife Agencies determines that such amendment would result in adverse effects on the environment that are new or significantly different from those analyzed in connection with the original Yolo HCP/NCCP, or additional Take not analyzed in connection with the original Yolo HCP/NCCP.

If any Party does not concur with a proposed minor modification for any reason, it will not be incorporated into the Yolo HCP/NCCP. Additionally, if the Wildlife Agencies do not concur that a proposed modification meets the requirements for a minor modification set forth in the Plan, the proposal may be submitted as a request for an amendment pursuant to Section 15.4, below. The dispute resolution process set forth in Section 6, above, is available to resolve disagreements regarding proposed minor modifications.

15.3 Amendment of this Agreement

This Agreement may be amended only by a written agreement executed by the authorized representatives of all Parties.

15.4 Amendment of the Yolo HCP/NCCP and the Permits

Any proposed changes to the Yolo HCP/NCCP that do not qualify for treatment as administrative actions or minor modifications, as set forth above, will require an amendment to the Plan. Revisions of the Plan that would require an amendment of one or more of the Permits include, but are not limited to, the examples described in Chapter 7 (Section 7.8.3) of the Plan. A Plan amendment will also require corresponding amendments to the Permits. The Permittees may submit a formal application, consistent with the requirements of Chapter 7 (Section 7.8.3), for an amendment to the Plan and the Permits. The Permittees will provide written notice to all of the other Parties of any proposed Permit amendment. The Wildlife Agencies shall process any such application in accordance with all applicable laws and regulations, including but not limited to the ESA, CESA, NEPA, NCCPA and CEQA.

Each Wildlife Agency will review and approve or disapprove the proposed Plan and Permit amendment with detailed written findings, commensurate with the level of environmental review appropriate to the magnitude of the proposed amendment.

16.0 REMEDIES AND ENFORCEMENT

Except as set forth below, each Party shall have all remedies otherwise available to enforce the terms of the Permits, the Yolo HCP/NCCP, and this Agreement and to seek remedies for any breach hereof. Notwithstanding the foregoing, however, none of the Parties shall be liable in damages to the other Parties or to any other person or entity, including Third Party Participants, for any breach of this Agreement, any performance or failure to perform a mandatory or discretionary obligation imposed by this Agreement, or any other cause of action arising from this Agreement. In the event of any dispute that may entitle a Party to seek remedies or enforcement action pursuant to this Section, the dispute resolution procedures of Section 6, above, are available to resolve any disagreements.

16.1 Injunctive and Temporary Relief

The Parties acknowledge that the Covered Species are unique and that their loss as species would result in irreparable damage to the environment, and that therefore injunctive and temporary relief may be appropriate to ensure compliance with the terms of this Agreement. Nothing in this Agreement is intended to limit the authority of the federal and state governments to seek civil or criminal penalties or otherwise fulfill their enforcement responsibilities under the ESA, CESA, or other applicable laws.

16.2 Federal Permit

16.2.1 Permit Suspension or Revocation

USFWS may suspend or revoke the Federal Permit for cause in accordance with the laws and regulations in force at the time of such suspension. The regulations governing permit suspension and revocation are currently codified at 50 C.F.R. §§13.27 (suspension) and 13.28, 17.22(b)(8) and 17.32(b)(8). Suspension or revocation may apply to the entire Permit, or only to specified Covered Species, Covered Lands, or Covered Activities.

16.2.2 Reinstatement of Suspended Permit

In the event USFWS suspends the Federal Permit, in whole or in part, as soon as possible after such suspension, the USFWS will meet and confer with the Permittees concerning how the suspension can be lifted. After conferring with the Permittees, the USFWS shall identify reasonable, specific actions, if any, necessary to effectively redress the suspension. In making this determination the USFWS shall consider the requirements of the ESA, regulations issued thereunder, the conservation needs of the Covered Species, the terms of the Federal Permit and this Agreement, and any comments or recommendations received from the Permittees (during the meeting and confer process or otherwise). As soon as possible, but not later than 30 days after the conference, the USFWS shall send the Permittees written notice of any available, reasonable actions necessary to effectively redress the suspension. Upon performance of such actions, the USFWS shall immediately reinstate the Federal Permit. It is the intent of the Parties that in the event of any total or partial suspension of the Federal Permit, all Parties shall act expeditiously and cooperatively to reinstate the Federal Permit.

16.3 State Permit

The following terms and conditions address the requirements of Fish & Game Code § 2820(b)(3), relating to suspension or revocation of the State Permit in whole or part, in the event of a violation or other occurrence within the scope of subsection (b)(3).

16.3.1 Permit Suspension

In the event of any material violation of the State Permit or material breach of this Agreement by the Permittees, CDFW may suspend the State Permit in whole or in part; provided, however, that it will not suspend the State Permit until it has: (1) pursued dispute resolution in accordance with Section 6 of this Agreement; (2) requested that the Permittees take appropriate remedial actions; and (3) providing the Permittees with written notice of the facts or conduct which may warrant the suspension, and an adequate and reasonable opportunity for the Permittees to demonstrate why suspension is not warranted. These actions may be taken concurrently or sequentially, as appropriate, in the sole discretion of the CDFW.

16.3.2 Reinstatement of Suspended State Permit

In the event CDFW suspends the State Permit, in whole or in part, as soon as possible but no later than ten (10) days after such suspension, CDFW shall confer with the Permittees concerning how the suspension can be lifted. After conferring with the Permittees, the CDFW shall identify reasonable, specific actions, if any, necessary to effectively redress the suspension. In making this determination, CDFW shall consider the requirements of the NCCPA, the conservation needs of the Covered Species, the terms of the State Permit and this Agreement, and any comments or recommendations received from the Permittees (during the meeting and confer process or otherwise). As soon as possible, but not later than 30 days after the conference, CDFW shall send the Permittees written notice of any available, reasonable actions necessary to effectively redress the suspension. Upon satisfactory performance of such actions as determined by the CDFW, the CDFW shall immediately reinstate the State Permit. It is the intent of the Parties that in the event of any total or partial suspension of the State Permit, all Parties shall act expeditiously and cooperatively to reinstate the State Permit.

16.3.3 Permit Revocation or Termination

Except as set forth in Section 16.3.4, below, CDFW agrees that it will revoke or terminate the State Permit, in whole or in part, only: (1) for a violation of the State Permit or breach of this Agreement by the Permittees where the Permittees fail to cure the violation or breach after receiving actual notice of it from CDFW and a reasonable opportunity to cure it, or CDFW determines in writing that such violation or breach cannot be effectively redressed by other remedies or enforcement action; or (2) where revocation of the State Permit, in whole or in part, is necessary to avoid the likelihood of jeopardy to a Listed Species.

CDFW agrees that it will not revoke or terminate the State Permit, in whole or in part, for a material violation of the State Permit or a material breach of this Agreement without first requesting the Permittees take appropriate remedial action, and providing the Permittees with notice in writing of the facts or conduct which warrant the partial or total revocation or termination and a reasonable opportunity, but not less than sixty (60) days, to demonstrate or achieve compliance with the NCCPA, the State Permit, and this Agreement. CDFW agrees that it will not revoke or terminate the State Permit, in whole or in part, to avoid the likelihood of jeopardy to a Listed Species, without first (1) notifying the Permittees of those measures, if any, that the Permittees may undertake to prevent jeopardy to the Listed Species and maintain the State Permit, and (2) providing a reasonable opportunity to implement such measures.

16.3.4 Rough Proportionality

As provided in Section 9.4.2, above, in the event that CDFW has determined that the Permittees have failed to meet the rough proportionality standard provided in Section 9.4.2 of this Agreement, and if the Permittees have failed to cure the default or entered into an agreement to do so within forty-five (45) days of the written notice of such determination, CDFW shall suspend the State Permits in whole or in part in accordance with California Fish and Game Code section 2820.

16.4 Obligations in the Event of Suspension or Revocation

In the event of revocation or termination of a Permit, or of suspension of a Permit pursuant to Sections 16.2 or 16.3, above, consistent with the requirements of 50 Code of Federal Regulations sections 17.32(b)(7) and 17.22(b)(7), the Permittees remain liable for all incidental take of Covered Species that occurred prior to revocation and shall fully implement all measures required under the Yolo HCP/NCCP to minimize and mitigate for such take until the applicable Wildlife Agency determines that all Take of Covered Species that occurred under the Permit has been mitigated to the maximum extent practicable in accordance with the Yolo HCP/NCCP. Regardless of whether the Permit is terminated, suspended, or revoked, the Permittees acknowledge that lands added to the reserve system must be protected, managed and monitored in perpetuity.

16.5 Inspections by Wildlife Agencies

The Wildlife Agencies may conduct inspections and monitoring of the site of any Covered Activity, and may inspect any data or records required by the Permits, in accordance with applicable law and regulations. The Wildlife Agencies will also have reasonable access, as set forth in the Conservation Easement Templates included as Appendix K to the Plan, to conduct inspections of the reserve system.

17.0 TERM OF AGREEMENT

17.1 Effective Date

This Agreement shall be effective the date of the first business day after all of the following have occurred: this Agreement has been fully executed by all Parties; issuance of both Permits; and all applicable implementing ordinances have been adopted by each of the Cities and County as provided in Section 7.4 of the Yolo HCP/NCCP.

17.2 Initial Term

This Agreement, the Yolo HCP/NCCP, and the Permits will remain in effect for a period of 50 years, unless extended, from issuance of the original Permits, except as provided below in Section 17.4, or unless all Permits are permanently terminated pursuant to Section 16 above.

17.3 Extension of the Permits

Upon agreement of the Parties and compliance with all applicable laws, the Permits may be extended beyond the initial term in accordance with regulations of the Wildlife Agencies in force on the date of such extension. If Permittees desire to extend the Permits, they will so notify the Wildlife Agencies at least 180 days before the term is scheduled to expire. Extension of the Permits constitutes extension of the Yolo HCP/NCCP and this Agreement for the same amount of time, subject to any modifications that the Wildlife Agencies may require at the time of extension.

17.4 Withdrawal of the State and Federal Permit

Upon ninety (90) days written notice to the Wildlife Agencies, the Conservancy, and all other Permittees, any Permittee, except for the Conservancy, may unilaterally withdraw from the Permits by surrendering the Permits to the USFWS and CDFW in accordance with the regulations in force on the date of such surrender. As a condition of withdrawal, the Permittee will remain obligated to ensure implementation of all existing and outstanding minimization and mitigation and conservation measures required under the Permits for any Take that the Permittee itself caused and any Take by private project participants for which the Permittee extended Authorized Take coverage prior to withdrawal. If a Permittee withdraws before causing or extending any Authorized Take coverage under the Permits, the Permittee will have no obligation to ensure implementation of any minimization or mitigation measures. Surrender of the Permits constitutes a surrender of the Permittee's Authorized Take coverage under the Permits.

Withdrawal by a Permittee shall not diminish or otherwise affect the obligations of the remaining Permittees under the Permits, the Yolo HCP/NCCP, or this Agreement. The Permittees acknowledge that if one or more Permittees withdraws from the Permits and, as a result of the withdrawal, it is no longer feasible or practicable to implement the Permits and the Yolo HCP/NCCP successfully, it may be necessary to modify the Plan or to amend the Permit, or both, in response to the withdrawal.

Within forty-five (45) days after receiving written notice of withdrawal from a Permittee, the Wildlife Agencies, the Conservancy and all Permittees will meet to discuss and evaluate whether the Yolo HCP/NCCP can be successfully implemented without the participation of the withdrawing Permittee. Relevant factors in this evaluation include but are not limited to whether, without the participation of the withdrawing Permittee, Yolo HCP/NCCP implementation will continue to be adequately funded, whether the Permittees can continue to comply with the stay-ahead requirement, whether all required conservation actions can be implemented, and whether the overall Conservation Strategy can be implemented consistent with the Yolo HCP/NCCP. Based on this meeting or meetings, and based on any other relevant information provided by the Conservancy or the remaining Permittees, the Wildlife Agencies will determine whether it is necessary to modify the Yolo HCP/NCCP or amend the Permits, or both, in response to the withdrawal.

Upon ninety (90) days written notice to USFWS and CDFW, the Permittees collectively may withdraw from the Permits by surrendering the Permits. As a condition of such withdrawal, the Permittees will be obligated to ensure implementation of all existing and outstanding minimization, mitigation, and conservation and management measures required under the Permits for any Take that occurred prior to such withdrawal, to the maximum extent practicable pursuant to 50 C.F.R. 17.22(b)(7) and 17.32(b)(7) for the Federal Permit, and pursuant to Fish and Game Code sections 2820, 2821 and 2834 for the State Permit, until:

(1) The applicable Wildlife Agencies determine that all Take of Covered Species that occurred under the Permits has been addressed in accordance with the Yolo HCP/NCCP, which determination the Wildlife Agencies will make as soon as reasonably possible. The conservation measures required for Take that occurred prior to withdrawal are the same as the conservation measures required to comply with the rough proportionality requirement,

in accordance with Agreement Section 9.3 and Chapter 7 (Section 7.5.3) of the Plan, with regard to Take that occurred prior to withdrawal; and

(2) The Wildlife Agencies, the Conservancy and all Permittees meet to identify and evaluate activities that could voluntarily be undertaken or continued in support of the Conservation Strategy notwithstanding the collective withdrawal.

If the Permittees collectively notify USFWS in writing that they plan to withdraw from the Permits or to discontinue the Covered Activities, they will surrender: (1) the Federal Permit issued by that agency pursuant to the requirements of 50 C.F.R 13.26; and (2) the State Permit pursuant to Fish and Game Code section 2835 including but not limited to the assurances or authorization for any Take that has not occurred at the time of withdrawal. Additionally, the Permittees will provide a status report detailing the nature and amount of any incidental take of the Covered Species, the minimization and mitigation measures provided for take up through the date of early surrender, and the status of compliance with all other terms of the Permits and Yolo HCP/NCCP. Within 90 days after receiving the surrendered Permits and a status report meeting the requirements of this paragraph, USFWS will use reasonable efforts to give written notice to the Permittees identifying all required outstanding mitigation and minimization measures.

Regardless of withdrawal and surrender of the Permits, the Permittees acknowledge that lands in the reserve system must be protected, managed and monitored in perpetuity.

18.0 MISCELLANEOUS PROVISIONS

18.1 Calendar Days

Throughout this Agreement and the Yolo HCP/NCCP, the use of the term “day” or “days” means calendar days, unless otherwise specified

18.2 Response Times

Except as otherwise set forth herein or as statutorily required by CEQA, NEPA, CESA, ESA, NCCPA or any other laws or regulations, the Wildlife Agencies and the Permittees will use reasonable efforts to respond to written requests from a Party in a timely manner and generally within a forty-five (45) day time period, unless another time period is required by the Permits, the Yolo HCP/NCCP or this Agreement. The Parties acknowledge that the Cities and the County are subject to the Permit Streamlining Act and that nothing in this Agreement will be construed to require them to violate that Act. In addition, the Wildlife Agencies will provide timely review of proposals for Covered Activities to be implemented directly by the Permittees, where such review is required by the Permits.

18.3 Notices

The Conservancy will maintain a list of individuals responsible for ensuring Plan compliance for each of the Parties, along with addresses at which those individuals may be notified (“Notice List”). The Notice List as of the Effective Date is provided below. Each Party will report any changes of names or addresses to the Conservancy and the other Parties in writing.

Any notice permitted or required by the Permits, the Yolo HCP/NCCP, or this Agreement will be in writing, and delivered personally, by overnight mail, or by United States mail, postage prepaid. Notices may be delivered by facsimile or electronic mail, provided they are also delivered by one of the means listed above. Delivery will be to the name and address of the individual responsible for each of the Parties, as stated on the most current Notice List.

Notices will be transmitted so that they are received within deadlines specified in this Agreement, where any such deadlines are specified. Notices delivered personally will be deemed received on the date they are delivered. Notices delivered via overnight delivery will be deemed received on the next business day after deposit with the overnight mail delivery service. Notices delivered via noncertified mail will be deemed received seven (7) days after deposit in the United States mail. Notices delivered by e-mail or other electronic means will be deemed received on the date they are received.

The following Notice List contains the names and notification addresses for the individuals currently responsible for overseeing and coordinating Plan compliance:

County: County Administrator – Patrick Blacklock; 625 Court Street, Room 202 Woodland, CA 95695; Patrick.blacklock@yolocounty.org; 530-666-8150	**Davis:** Davis City Manager – Michael Webb; 23 Russell Blvd., Suite 1 Davis, CA 95616; cmoweb@cityofdavis.org; 530-757-5602
Woodland: Woodland City Manager – Paul Navazio; 300 First Street Woodland, CA 95695; 530-661-5813	**Winters**: Winters City Manager – John Donlevy, Jr.; 318 First Street Winters, CA 95694; john.donlevy@cityofwinters.org; 530-795-4910 x110
West Sacramento: West Sacramento City Manager – Martin Tuttle; 1110 West Capitol Avenue West Sacramento, CA 95691; 916-617-4500	**Conservancy**: Executive Director – Petrea Marchand; 611 North Street, Woodland CA 95695; 530-723-5504

18.4 Entire Agreement

This Agreement, together with the Yolo HCP/NCCP and the Permits, constitutes the entire agreement among the Parties. This Agreement supersedes any and all other agreements, either oral or in writing, among the Parties with respect to the subject matter hereof and contains all of the covenants and agreements among them with respect to said matters, and each Party acknowledges that no representation, inducement, promise of agreement, oral or otherwise, has been made by any other Party or anyone acting on behalf of any other Party that is not embodied herein.

18.5 Defense

The USFWS and the Permittees acknowledge that the Permittees have a significant and independent interest in maintaining the validity and effectiveness of the Permit, the Yolo HCP/NCCP, and this Agreement, and supporting documentation, including documentation under NEPA and ESA, and that the Permittees' interests may not be adequately protected or represented in the event of a judicial challenge to the Permit unless some or all of the Permittees are able to participate in such litigation. Subject to Agreement Section 18.9 (Availability of Funds), the USFWS will, upon the request of the Permittees, and subject to the responsibilities of the U.S. Department of Justice in the conduct of litigation, use reasonably available resources to provide appropriate support to the Permittees in defending, consistent with the terms of the federal Permit, lawsuits against the Permittees arising out of the USFWS's approval of the federal Permit.

Upon request, CDFW will, to the extent authorized by California law, cooperate with the Permittees in defending, consistent with the terms of the Yolo HCP/NCCP, lawsuits arising out of the Permittees' adoption of this Agreement and the Plan.

18.6 Attorneys' Fees

If any action at law or equity, including any action for declaratory relief, is brought to enforce or interpret the provisions of this Agreement, each Party to the litigation will bear its own attorneys' fees and costs, provided that attorneys' fees and costs recoverable against the United States will be governed by applicable federal law.

18.7 Availability of Funds

Implementation of this Agreement and the Yolo HCP/NCCP by USFWS is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the United States Treasury. The Parties acknowledge and agree that USFWS will not be required under this Agreement to expend any federal agency's appropriated funds unless and until an authorized official of that agency affirmatively acts to commit to such expenditures as evidenced in writing.

Implementation of this Agreement and the Yolo HCP/NCCP by CDFW is subject to the availability of appropriated funds. Nothing in this Agreement will be construed by the Parties to require the obligation, appropriation, or expenditure of any money from the Treasury of the State of California. The Parties acknowledge and agree that CDFW will not be required under this Agreement to expend any state appropriated funds unless and until an authorized official of that agency affirmatively acts to commit such expenditure as evidenced in writing.

Implementation of this Agreement and the Yolo HCP/NCCP by the Permittees is subject to the availability of their respective appropriated funds, including but not limited to any special purpose revenues dedicated to implement the Plan. Nothing in this Agreement will be construed to require the obligation, appropriation, or expenditure of any money without express authorization by the County Board of Supervisors, appropriate City Councils and/or governing board of the Conservancy. Notwithstanding these requirements and limitations, to maintain the rights and assurances afforded by the Permits, the Yolo HCP/NCCP, and this Agreement the Permittees are required to fund their respective obligations under the Permits as provided in Section 13, above. The Parties acknowledge that if the Permittees fail to provide adequate funding for their respective obligations under the Permits, the Permits may be suspended or revoked in accordance with the Permits and applicable laws and regulations and summarized in Section 16, above.

18.8 Governing Law

This Agreement will be governed by and construed in accordance with the laws of the United States and the State of California, as applicable.

18.9 Duplicate Originals

This Agreement may be executed in any number of duplicate originals. A complete original of this Agreement will be maintained in the official records of each of the Parties hereto.

18.10 Relationship to the ESA, CESA, NCCPA and Other Authorities

The terms of this Agreement are consistent with and will be governed by and construed in accordance with the ESA, CESA, NCCPA and other applicable state and federal laws. In particular, nothing in this Agreement is intended to limit the authority of USFWS and CDFW to seek penalties or otherwise fulfill their responsibilities under the ESA, CESA and NCCPA. Moreover, nothing in this Agreement is intended to limit or diminish the legal obligations and responsibilities of USFWS as an agency of the federal government or CDFW as an agency of the State of California.

18.11 No Third Party Beneficiaries

Without limiting the applicability of rights granted to the public pursuant to the ESA, CESA, NCCPA or other applicable law, this Agreement will not create any right or interest in the public, or any member thereof, as a third party beneficiary thereof, nor will it authorize anyone not a Party to this Agreement to maintain a suit for personal injuries or property damages under the provisions of this Agreement. The duties, obligations, and responsibilities of the Parties to this Agreement with respect to third party beneficiaries will remain as imposed under existing state and federal law.

18.12 References to Regulations

Any reference in the Permits, the Yolo HCP/NCCP, or this Agreement to any law, regulation, or rule of the Wildlife Agencies will be deemed to be a reference to such law, regulation, or rule in existence at the time an action is taken.

18.13 Applicable Laws

All activities undertaken pursuant to the Permits must be in compliance with all applicable local, state and federal laws and regulations.

18.14 Severability

In the event one or more of the provisions contained in this Agreement is held to be invalid, illegal or unenforceable by any court of competent jurisdiction, such portion will be deemed severed from this Agreement and the remaining parts of this Agreement will remain in full force and effect as though such invalid, illegal, or unenforceable portion had never been a part of this Agreement. The Permits are severable such that revocation of one of the Federal or State Permits does not automatically cause revocation of the other. For example, if CDFW revokes the State Permit, it does not automatically cause revocation of the Federal Permit.

18.15 Due Authorization

Each Party represents and warrants that (1) the execution and delivery of this Agreement has been duly authorized and approved by all requisite action, (2) no other authorization or approval, whether of governmental bodies or otherwise, will be necessary in order to enable it to enter into and comply with the terms of this Agreement, and (3) the person executing this Agreement on behalf of each Party has the authority to bind that Party.

18.16 Assignment

Except as otherwise provided herein, the Parties will not assign their rights or obligations under the Permits, the Yolo HCP/NCCP, of this Agreement to any other individual or entity.

18.17 Headings

Headings are used in this Agreement for convenience only and do not affect or define the Agreement's terms and conditions.

18.18 Legal Authority of CDFW

CDFW enters into this Agreement pursuant to the NCCPA.

18.19 No Limitation on the Police Power of the Cities or the County

Nothing in the Permits, the Yolo HCP/NCCP, or this Agreement limits the exercise of or in any way surrenders the police power of the Cities or the County.

18.20 Agreement with USFWS not an Enforceable Contract.

Notwithstanding any language to the contrary in this Agreement, this Agreement is not intended to create, and shall not be construed to create an enforceable contract between the USFWS and Permittee under law with regard to the Permit or otherwise and neither Party to this Agreement shall be liable in damages to the other Party or any other third party or person for any performance or failure to perform any obligation identified in this Agreement. The sole purposes of this Agreement as between the USFWS and Permittee are to clarify the provisions of the HCP and the processes the Parties intend to follow to ensure the successful implementation of the HCP in accordance with the Permit and applicable Federal law.

IN WITNESS WHEREOF, THE PARTIES HERETO have executed this Implementing Agreement to be in effect as of the date described in Section 17.1 above.

BY _______________________________________ Date ________
Assistant Regional Director
U.S. Fish and Wildlife Service, Region 8
Sacramento, California

BY _______________________________________ Date ________
Deputy Director
California Department of Fish and Wildlife
Ecosystem Conservation Division
Sacramento, California

BY _______________________________________ Date _________
___________________, Chair
Yolo Habitat Conservancy Board of Directors

BY _______________________________________ Date _________
[Title]
County of Yolo

BY _______________________________________ Date _________
[Title]
City of Davis

BY _______________________________________ Date _________
[Title]
City of West Sacramento

BY _______________________________________ Date _________
[Title]
City of Winters

BY _______________________________________ Date _________
[Title]
City of Woodland

Exhibit A
YOLO HCP/NCCP
CERTIFICATE OF INCLUSION TEMPLATE

The United States Fish and Wildlife Service and the California Department of Fish and Wildlife have issued Permits pursuant to the federal Endangered Species Act and the California Natural Community Conservation Planning Act (collectively "Permits") authorizing "Take" of certain species in accordance with the terms and conditions of the Permits, the Yolo Habitat Conservation Plan/Natural Community Conservation Plan ("Yolo HCP/NCCP") and the associated Implementing Agreement. Under the Permits, certain third parties are eligible to receive "Take" coverage for certain species provided all applicable terms and conditions of the Permits, the Yolo HCP/NCCP, and the Implementing Agreement are met.

The third parties eligible to receive such coverage include:

> **Special Participating Entities** pursuant to Section 7.3.2 of the Implementing Agreement and Chapter 4 (Section 4.2.1.3) and Chapter 7 (Section 7.2.5) of the Yolo HCP/NCCP. Special Participating Entities are defined in the Implementing Agreement (Section 3.29) as "public entities or private individuals that may conduct projects or undertake other activities in the Plan Area that are Covered Activities in the Yolo HCP/NCCP and that may affect Covered Species and require Take authorization from USFWS or CDFW, but are not subject to the jurisdiction of one or more Permittees."
>
> **Neighboring Landowners** pursuant to Section 7.3.3 of the Implementing Agreement and Chapter 3 (Section 3.5.6), Chapter 5 (Section 5.4.4), and Chapter 7 (Section 7.7.7.1) of the Yolo HCP/NCCP. "Neighboring Landowner" means an owner of specific types of agricultural lands that are within a defined distance of suitable habitat for either Valley elderberry longhorn beetle, giant garter snake, western pond turtle, or California tiger salamander (set forth in Chapter 5, Section 5.4.4 of the Yolo HCP/NCCP) on lands included in the reserve system who has received a Certificate of Inclusion from the Yolo Habitat Conservancy pursuant to the Permits and the Yolo HCP/NCCP (see Section 7.3.3 of the Implementing Agreement) that extends Authorized Take coverage for one or more of these four Covered Species resulting from specified agricultural land uses.

This Certificate of Inclusion is issued to ____________________________________, a *[specify Special Participating Entity or Neighboring Landowner]*.

For Special Participating Entities, use the following text:

This Certificate of Inclusion covers the project known and referred to as ____________________________. That project consists of *[briefly describe the nature of the project]*, as more fully set forth in the Special Participating Entity Agreement executed by and between the Conservancy and the _______________________________ in connection therewith.

Coverage under the Permits will become effective upon receipt of the fully-completed and executed Certificate of Inclusion and Special Participating Entity Agreement by the Yolo Habitat Conservancy. The terms of the Permits, the Yolo HCP/NCCP and Implementing Agreement apply to the activities covered by this Certificate of Inclusion. Similarly, compliance with all material terms and provisions of the Special Participating Entity Agreement entered into concurrently herewith is required to maintain the Take coverage provided through this Certificate. The Conservancy will withdraw this Certificate and terminate the Take authorization extended hereunder if you fail to comply with such terms.

For Neighboring Landowners, use the following text:

As the owner/operator of the property described by Assessor's Parcel Number (or address) and gross acreage on Exhibit 1 attached hereto and incorporated herein by this reference, you are entitled to the protection of the Permits to Take those species identified in Chapter 3 (Section 3.5.6) of the Yolo HCP/NCCP and Section 7.3.3 of the Implementing Agreement in connection with normal agricultural and rangeland activities (described in Appendix M, Yolo Agricultural Practices) occurring within a defined distance of land acquired for or enrolled in the Yolo HCP/NCCP pursuant.

In the event that the property depicted on Exhibit 1 is used for other purposes, Take Authorization under the Permits will automatically cease. Such authorization is provided as described in the Permits, the Yolo HCP/NCCP, and the Implementing Agreement. By signing this Certificate of Inclusion you signify your election to receive Take Authorization under the Permits in accordance with the terms and conditions thereof, including but not limited to your compliance with all applicable avoidance and minimization measures regarding Take of applicable Covered Species (see Chapter 4, Section 4.3 of the Yolo HCP/NCCP).

This Certificate of Inclusion does not give state and federal agencies additional regulatory control over the signatory nor require the signatory to provide additional information not called for in the Certificate of Inclusion, but instead ensures compliance with 50 Code of Federal Regulations, section 13.25(e). Coverage under the Permits will become effective upon receipt of the fully-completed and executed Certificate of Inclusion by the Yolo Habitat Conservancy. ***In the event that the subject property is sold or leased, buyer or lessee must be informed of these provisions and execute a new Certificate of Inclusion.*** Please note that the Take coverage extended through this Certificate of Inclusion includes only the Take of populations or occupied habitat above baseline conditions (as determined by reference to the baseline studies submitted with your Yolo HCP/NCCP enrollment package application.

Special Participating Entity/Owner	**Yolo Habitat Conservancy**
______________________________	______________________________
Signature	Signature
______________________________	______________________________
Date	Date

EXHIBIT B
Model Ordinance
Ordinance No. __-___

An Ordinance of the *[Council/Board]* Providing for Implementation of the Yolo HCP/NCCP, Including Related Procedures and Fees

The *[Council/Board]* hereby ordains as follows:

1. <u>Purpose, Findings, and Authority</u>.

A. The Yolo Habitat Conservation Plan/Natural Communities Conservation Plan ("Yolo HCP/NCCP") has been developed to provide for the conservation of 12 sensitive species and the natural communities and agricultural land on which they depend, and to provide a streamlined permitting process to address the effects a range of future anticipated activities on those species. The Yolo HCP/NCCP was developed by the County of Yolo and the cities of Davis, Woodland, Winters, and West Sacramento (with the University of California, Davis, in an *ex officio* capacity) through the Yolo County Habitat/Natural Community Conservation Plan Joint Powers Agency, known and referred to informally as the Yolo Habitat Conservancy ("Conservancy").

B. The purpose of this Ordinance is to provide for implementation of the Yolo HCP/NCCP in a manner that achieves, among other things, the following objectives:

- To protect, enhance, and restore natural communities and cultivated lands, including rare and endangered species habitat, and provide for the conservation of covered species within Yolo County;
- To replace the current system of separately permitting and mitigating individual projects with a conservation and mitigation program, set forth in the Yolo HCP/NCCP, that comprehensively coordinates the implementation of permit requirements through the development of a countywide conservation strategy, including identification of priority acquisition areas in riparian zones or other locations with important species habitat;
- To provide for additional habitat conservation that is otherwise unlikely to take place in Yolo County. Effects on natural resources and associated mitigation requirements for at-risk species are addressed more efficiently and effectively than the current piecemeal mitigation process. This approach benefits both listed species and project proponents; and
- To ensure that the Conservancy, in its capacity as the implementing entity for the Yolo HCP/NCCP, receives the local development mitigation fees necessary to assist with plan implementation and all of the related objectives set forth above.

C. In preparing the Yolo HCP/NCCP, the Conservancy worked in association with the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife, as well as an advisory committee composed of local stakeholders from the agricultural, environmental, and development communities. This *[Council/Board]* adopted the Yolo HCP/NCCP on _____________, 2018, and approved a revised and restated joint powers agreement for the Conservancy on _____________, 2018 to address implementation of the Yolo HCP/NCCP.

D. On __________________, 2018, the *[Council/Board]* considered the Final Environmental Impact Statement/Environmental Impact Report ("Final EIS/EIR") prepared for the Yolo HCP/NCCP pursuant to the National Environmental Policy Act and the California Environmental Quality Act, adopted a Notice of Determination, and took certain related actions involving the Yolo HCP/NCCP. The *[City/County]* General Plan contemplates the adoption and implementation of the Yolo HCP/NCCP and includes specific goals and policies integral to its success, including:

- *[Add any General Plan goals, policies, or other language demonstrating that Yolo HCP/NCCP implementation is consistent with the General Plan]*

E. The California Constitution authorizes the *[City/County]* to adopt ordinances that protect the health, safety, and welfare of its citizens. Further, California Government Code § 66000 *et seq.* authorizes the Conservancy to impose fees and other exactions to provide necessary funding for conservation and other activities required to mitigate the adverse effect of development projects and other covered activities (as defined below) within Yolo County, including within the incorporated cities. In accordance with the Implementing Agreement, as set forth below, the Conservancy may authorize the *[City/County]* to collect such fees from project applicants on behalf of the Conservancy and remit them to the Conservancy.

2. Addition of Chapter { } to Title { } of the *[City/County]* Code.

Chapter __ is hereby added to Title __ of the *[City/County]* Code to read as follows:

TITLE/CHAPTER ___
YOLO HCP/NCCP

Sections:

______ Purpose
______ Incorporation by Reference
______ Definitions
______ Application to Covered Activities
______ Mitigation Fees
______ Authorized Take Coverage
______ Service Fees
______ Guidelines
______ Interpretation
______ Operative Date

Section ______ Purpose.

The Yolo Habitat Conservation Plan/Natural Communities Conservation Plan ("Yolo HCP/NCCP") has been developed to provide for the conservation of 12 sensitive species and the natural communities and agricultural land on which they depend, and to provide a streamlined permitting process to address the effects a range of future anticipated activities on those species. The Yolo HCP/NCCP was developed by the County of Yolo and the cities of Davis, Woodland, Winters, and West Sacramento (with the University of California, Davis, in an *ex officio* capacity) through the Yolo County Habitat/Natural Community Conservation Plan Joint Powers Agency, known and referred to informally as the Yolo Habitat Conservancy ("Conservancy")

The purpose of this Ordinance is to provide for implementation of the Yolo HCP/NCCP in a manner that achieves, among other things, the following objectives: (a) To protect, enhance, and restore natural communities and cultivated lands, including rare and endangered species habitat, and provide for the conservation of covered species within Yolo County; (b) To replace of the current system of separately permitting and mitigating individual projects with a conservation and mitigation program, set forth in the Yolo HCP/NCCP, that comprehensively coordinates the implementation of permit requirements through the development of a countywide conservation strategy, including identification of priority acquisition areas in riparian zones or other locations with important species habitat; (c) To provide for additional habitat conservation that is otherwise unlikely to take place in Yolo County and benefit both listed species and project proponents by ensuring a more efficient, effective approach to mitigation; and (d) to ensure that the Conservancy, in its capacity as the implementing entity for the Yolo HCP/NCCP, collects the local development mitigation fees necessary to assist with plan implementation and all of the related objectives set forth above.

Section ______ Incorporation by Reference.

The Yolo HCP/NCCP is incorporated by reference as though fully set forth herein. Complete copies of the Yolo HCP/NCCP and related documents are available at the offices of the Conservancy (as of the adoption of this ordinance, *[insert]*), and online at www.yolohabitatconservancy.org. *[Insert any additional references that may be appropriate, such as availability at City/County offices and websites.]*

Section ______ Definitions.

The definitions set forth in this Section shall govern the application and interpretation of this *[Title/Chapter]*. Words and phrases not defined in this Section shall be interpreted so as to give this *[Title/Chapter]* its most reasonable application.

A. "Building Permit" includes, in connection with a Covered Activity only, a full structural building permit as well as a partial permit, such as a foundation-only permit, grading permit, or any other permit or approval authorizing a ground-disturbing activity in furtherance of a Covered Activity.

B. "Conservancy" refers to the Yolo Habitat Conservancy, a joint powers agency consisting of the County of Yolo and the cities of Davis, Woodland, Winters, and West

Sacramento (with the University of California, Davis, in an *ex officio* capacity). The formal, legal name of the joint powers agency is the Yolo County Habitat/Natural Community Conservation Plan Joint Powers Agency.

C. "Covered Activity" and "Covered Activities" mean the activities and projects described in Chapter 3 of the Yolo HCP/NCCP proposed for implementation within the Plan Area and not otherwise exempted from the requirements of the Yolo HCP/NCCP.

D. "Covered Species" means the species, listed and non-listed, which are identified in Chapter 1 of the Yolo HCP/NCCP and described in Appendix A to the Yolo HCP/NCCP. Covered Species are those at-risk species that are covered by the Take Permits issued by the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife.

E. "Implementing Agreement" means that agreement made and entered into by and between the U.S. Fish and Wildlife Service, the California Department of Fish and Wildlife, the Conservancy, the County of Yolo, and the cities of Davis, West Sacramento, Winters, and Woodland, that defines the parties' respective roles and responsibilities and provides a common understanding of the actions that will be undertaken to implement the HCP/NCCP.

F. "Mitigation Fees" means any fees adopted by the Conservancy, and any amendments thereto, that apply (unless exempted) to Covered Activities within the Plan Area in accordance with Chapter 8 of the Yolo HCP/NCCP and documents cited or relied on therein.

G. "Plan Area" means the geographic area covered by the Yolo HCP/NCCP, as described in Chapter 1 (Introduction) and depicted in Figure 1-1 thereof. The Plan Area includes the County of Yolo in its entirety, consisting of approximately 653,549 acres and also includes 1,174 acres along the south bank of Putah Creek in Solano County designated as the "Extended Plan Area for Riparian Restoration" in Figure 1-1. This area is included in the Plan Area only for the purpose of providing additional sites for riparian restoration to support the Covered Species.

H. "Planning Permit(s)" means any discretionary permit that authorizes a ground-disturbing activity for a Covered Activity, including but not limited to *[list each agency's common discretionary land use approvals here, such as a tentative map, parcel map, conditional use permit, development agreement]*, or any other discretionary permit, excluding actions of general application such as general plan amendments, zoning and rezoning, annexation, specific plans, and other area or regional land use actions.

I. "Project Applicant(s)" means a person or entity applying for a Planning Permit for a project authorizing a ground-disturbing activity for a Covered Activity, including any person or entity that is a "Third Party Participant" within the meaning of Section 3.32 of the Implementing Agreement.

J. "Take" has the meaning set forth in the federal Endangered Species Act and its implementing regulations, as well as impacts to plants identified as Covered Species. "Take" shall also have the meaning set forth in California Fish & Game Code Section 86 (i.e., to hunt pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture, or kill).

K. “Take Permits” means the federal Incidental Take Permit issued by the U.S. Fish and Wildlife Service to the Conservancy, the County, and each of the four cities based on the Yolo HCP/NCCP pursuant to Section 10(a)(1)(B) of the federal Endangered Species Act, and shall also include related state permits and approvals provided for in Section 86 of the California Fish & Game Code with regard to activities subject to the California Endangered Species Act (Fish & Game Code § 2050 *et seq.*) and the California Natural Community Conservation Planning Act (Fish & Game Code §§ 2800-2835).

L. “Yolo HCP/NCCP” shall mean the Yolo Habitat Conservation Plan/Natural Communities Conservation Plan.

Section ______ Application to Covered Activities.

As set forth in Section 8.1 of the Implementing Agreement, all Project Applicants for Covered Activities within the Plan Area shall comply with the conditions set forth in Chapter 4 of the Yolo HCP/NCCP to avoid, minimize, and mitigate the Take of Covered Species resulting from Covered Activities. Each Planning Permit application for a Covered Activity within the Plan Area shall include details on the manner and timing for project compliance with the Yolo HCP/NCCP in the form and manner required by the Director of *[Name of Administering Department]*. Applicable conditions of approval on Covered Activities from Chapter 4 of the Yolo HCP/NCCP as well as other measures required to implement the Yolo HCP/NCCP conservation strategy shall be included in each Planning Permit approval for a Covered Activity.

Section ______ Mitigation Fees.

A. As a condition of each approval for a Covered Activity, the Mitigation Fees shall be paid in full by the Project Applicant to the *[City/County]* no later than the date of issuance by the *[City/County]* of a Building Permit. The Mitigation Fees paid by Project Applicants shall be transferred (along with Mitigation Fee payments provided for public agency projects) to the Conservancy on a quarterly basis, or more frequently if requested by the Conservancy. Mitigation fees shall be paid to the *[City/County]* at the time of issuance of the first Building Permit if more than one Building Permit is required for the project.

B. If the Conservancy, pursuant to the terms of the Yolo HCP/NCCP, authorizes another manner of compensation in lieu of the Mitigation Fees (such as a conveyance of land in lieu of Mitigation Fees pursuant to the Implementing Agreement and the Yolo HCP/NCCP), the Project Applicant shall provide the *[City/County]* with written documentation from the Conservancy of compliance with such alternative manner of payment and the dollar equivalent amount of such alternative manner of compensation.

C. In the event the *[City/County]* determines a project requiring a Planning Permit is exempt from payment of the Mitigation Fees, whether because it is not a Covered Activity or for other appropriate reasons described in the Yolo HCP/NCCP, no Mitigation Fees shall be required for the project. Notwithstanding the applicability of an exemption, if appropriate based on facts and circumstances relevant to the project, the *[City/County]* shall advise the applicant of the potential need for any federal, state, or other permits or approvals relating to rare species or associated habitats.

D. The *[City/County]* may collect the Mitigation Fees on behalf of the Conservancy if authorized to do so by the Conservancy. Any appeals relating fee determinations shall be heard by the *[City/County]* pursuant to the process established for hearing appeals of the Planning Permit associated with the fee determination.

E. On at least a quarterly basis through and including December of each calendar year, the *[City/County]* shall provide the Conservancy with information regarding applications and approvals for Take authorization under the Yolo HCP/NCCP, including Take associated with projects that are exempt from the fees and/or conditions of the Yolo HCP/NCCP. The quarterly reporting shall also include the same information regarding public agency projects and associated Take.

Section ______ Service Fees.

The *[City/County]* may collect duly adopted service fees from Project Applicants to compensate for the *[City/County]*'s costs associated with its administration and implementation of the Yolo HCP/NCCP and related permitting process. Any such fees shall be in addition to, and not a deduction from, the Mitigation Fees adopted by the Conservancy.

Section ______ Authorized Take Coverage.

Upon payment in full of the Mitigation Fees and approval of Planning Permits incorporating all applicable Yolo HCP/NCCP conditions of approval, the Project Applicant shall receive authorized Take coverage for the Covered Activity in accordance with the terms of the Take Permits, the Yolo HCP/NCCP, and the Implementing Agreement.

Section ______ Guidelines.

The *[insert designee department head or other individual]* may adopt guidelines to assist with the implementation and administration of all aspects of this *[Title/Chapter]*.

Section ______ Interpretation.

In the event of a conflict between any term or requirement of this *[Title/Chapter]*, the Take Permits, the Yolo HCP/NCCP, and the Implementing Agreement, the term or requirement of the Take Permits shall govern.

Section ______ Operative Date.

This *[Title/Chapter]* shall be operative upon the occurrence of all of the following: The Conservancy's adoption of the Mitigation Fees; the full execution of the Implementing Agreement; the adoption of the Yolo HCP/NCCP and implementing ordinances by each of the

Cities and the County; and the issuance of the Take Permits by the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife.

3. Severability.

If any section, subsection, sentence, clause or phrase of this Ordinance is held by court of competent jurisdiction to be invalid, such decision shall not affect the remaining portions of this Ordinance. The *[Council/Board]* hereby declares that it would have adopted this Ordinance and each section, sentence, clause or phrase thereof irrespective of the fact that one or more sections, subsections, sentences, clauses or phrases be declared invalid.

4. Effective Date.

This Ordinance shall take effect and be in force thirty (30) days following its adoption and, prior to the expiration of fifteen (15) days after its adoption, it shall be published once in the *[insert preferred newspaper]*, a newspaper of general circulation, printed and published in the County of Yolo, with the names of the Board/Council members voting for and against the Ordinance.

PASSED AND ADOPTED by the *[Council/Board]* of the *[Jurisdiction]*, this __ day of _____________, 2018, by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

[Include agency-specific signature blocks]

Appendix F
STAC Evaluation Criteria

Covered Species Habitat Evaluation and Scoring Worksheet for Prospective Conservation Easement Properties in Yolo County

Science and Technical Advisory Committee
Yolo HCP/NCCP

Property Name:_________________________

Property Information

Property information is initially submitted by the landowner. The application materials include the following landowner sections that are then filled out and submitted to the staff. This information is then reviewed and further investigated by the Science and Technical Advisory Committee or other entity or individual conducting the evaluation. At that time any missing details are added to the extent available. This is done as part of the pre-field evaluation and during the field evaluation when the evaluator has access to the landowner, who can address any remaining questions.

Landowner and Location

Landowner:________________________________ **Date of Site Visit**:___________
Address:____
Property Location:____
____
APN No.:________________________
Planning Unit No.: ______ Size of Property (ac):______________________
Application for: Conservation Easement ____ Mitigation Receiving Site____

Map Indicating Location within Plan Area:

Map or Aerial Photo of Property:

General Description of Property

(Include size and configuration, land uses, structures, water and riparian features, trees, proximity to roads and urban areas)

Existing Easements on Property

(Include powerlines, roads, agricultural, conservation, other easements)

Sources of Water (Other than groundwater)

(Other sources of water currently used for agriculture on property)

Crop History on Property (past 10 years)

(Describe the 10-year crop history on each field)

General Description of Surrounding Area

(Include land uses, major crop types and distribution, condition of adjacent properties, proximity to other conservation properties, availability of nesting trees, proximity to other biological features)

Property Scoring and Evaluation

Each property will be evaluated based on existing habitat conditions for each of the 12 Covered Species and its potential contribution to meeting the conservation objectives for each of the Covered Species addressed in the HCP/NCCP. The conservation objectives indicate the number of habitat acres needed for each species, minimum patch sizes, and geographic considerations to address the distribution of protected lands throughout the Plan Area. The scoring system addresses key habitat attributes for each species and can total to a maximum of 100 points for each species. Attributes are divided into broader evaluation categories with the primary focus on onsite habitat conditions. Management and other landscape attributes are also included, where applicable. Some of these may be redundant for multiple species, but should still be included in the scoring for each species in order to retain scoring consistency. Some species, such as the Swainson's hawk are more wide-ranging and have broader habitat requirements. Others, such as the valley elderberry longhorn beetle, the California tiger salamander, and the riparian obligate species – least Bell's vireo and yellow-billed cuckoo – are more geographically restricted or have narrower habitat requirements and thus are evaluated using fewer species-specific attributes. Others, such as the giant garter snake have geographic limitations as determined by the conservation objectives; however, landscape and management attributes may still apply. A numeric score is derived for each species for which habitat is present on the evaluated property; however, an in-field qualitative assessment is also conducted by the STAC, which also contributes to the overall scoring and recommendation. The scores for all applicable Covered Species are then summarized following the species-specific evaluations. A recommendation is made on the basis of evaluation scores, other qualitative attributes, the number of Covered Species that would benefit from protection of the property, and the contribution to meeting the conservation objectives.

Pre-Field Evaluation

Before beginning the field evaluation, a pre-field evaluation is conducted to determine whether or not habitat is present on the site that potentially supports covered species. This is done initially by reviewing the GIS database for covered species habitat followed by a Google Earth review to confirm the presence of habitats identified in the GIS database. The following table is then used as a checklist for applicable species for which the field evaluation will include. Species for which habitat is present are then evaluated using the guidance in the following sections.

Table 1. Covered Species Checklist

Project Name (fill in below)	Covered Species	Habitat Present – Species Evaluated (Y/N)?
	Swainson's hawk	
	White-tailed kite	
	Burrowing owl	
	Tricolored blackbird	
	Yellow-billed cuckoo	
	Least Bell's vireo	
	Bank swallow	
	Giant garter snake	
	Western pond turtle	
	California tiger salamander	
	Valley elderberry longhorn beetle	
	Palmate-bracted birds beak	

Swainson's Hawk

Conservation of the Swainson's hawk will be met by achieving conservation objectives for cultivated lands, grasslands, and riparian natural communities, and protecting a segment of the nesting population. To be considered for Swainson's hawk conservation, a property must have a minimum of 80 contiguous acres of suitable foraging habitat or be contiguous with existing protected properties that support suitable Swainson's hawk foraging habitat. The scoring system for Swainson's hawk consists of eight attributes aggregated into four evaluation types that together represent the important attributes for evaluating Swainson's hawk habitat suitability:

ONSITE FORAGING HABITAT

1. Availability of onsite foraging habitat

ONSITE NESTING HABITAT

2. Availability of onsite potential nest trees

LANDSCAPE FACTORS

3. Foraging habitat offsite on surrounding lands within 1 mile
4. Availability of offsite potential nesting trees within 1 mile
5. Documented Swainson's hawk nesting within 4 miles
6. Proximity to other protected properties

MANAGEMENT FACTORS

7. Habitat enhancement practices
8. Factors that increase mortality risk or degrade habitat value

Attribute scores 1-8 are tallied as outlined in the tables below. Scores are then aggregated as applicable to create scores for each of the four evaluation types. These are evaluated separately with recommendations made on the basis of the individual scores, emphasizing onsite foraging habitat.

SWHA 1. Availability of onsite foraging habitat. A property may have a variety of crops or cover types, each with different habitat value. Value is attributed in the following table on the basis of seasonal variability and differences in prey abundance and accessibility between the different foraging land uses. To simplify the evaluation and to account for seasonal and annual changes in the landscape, all crops that are seasonal or annually rotational are combined into a single category (rotational row/grain crops). To assess all potential foraging habitat types, determine the number of acres of each type, then calculate proportions of each. Relative values of different types are reflected in the multiplier values. Next, multiply the proportional values by the multiplier to derive a point score for each type. Then sum the scores for total points.

SWHA 1. Foraging Habitat – onsite (maximum 20 points)						
Vegetation Type	**Acres**	**Percent of Total**	**Variability**	**Factors Influencing Score**	**Multiplier**	**Score**
Alfalfa and other multiple-cut hays			Consistent – high	Moderate to high prey abundance, high prey accessibility	0.20	
Native perennial grassland			Consistent – moderate to high	High prey abundance, moderate prey accessibility	0.16	
Pastures – hayed-moderately grazed or managed grass			Consistent – moderate to high	Moderate prey abundance, high prey accessibility	0.16	
Rotational row/grain crop			Variable from low to moderate	Moderate prey abundance – low to moderate accessibility	0.14	
Irrigated pasture – grazed only			Consistent – moderate	Low to moderate prey abundance – high prey accessibility	0.12	
Dryland pasture – annual grassland			Consistent – moderate	Low to moderate prey abundance, moderate to high accessibility	0.10	
Managed seasonal wetland			Variable – low to moderate	Low to moderate prey abundance, moderate prey accessibility	0.05	
Rice			Low to none	Low prey abundance, low prey accessibility	0.0	
Orchard/Vineyard			Low to none	Low prey abundance, low prey accessibility	0.0	
Developed			None	Low prey abundance, low prey accessibility	0.0	
Other non-habitat			None	No prey accessibility, out of range, topography.	0.0	
Total Acres					**Total Score**	

FIELD NOTES: *Describe the current foraging habitat conditions: crops, farming methods, irrigation, crop rotation, etc.*____

____

____

____

SWHA 2. Availability of onsite potential nest trees. Potential nest trees add value to the property by providing future nesting opportunities. Swainson's hawks generally use mature trees but nest in a variety of conditions from single isolated trees to dense riparian woodlands. All have similar value with regard to the nest site itself. But different nesting habitat types can be distinguished by other factors, including their long-term sustainability, ability to regenerate, and protection from removal or disturbances. The scoring is therefore based on these factors as well as the number of trees. A suitable tree is generally defined on the basis of minimum tree height by species documented for Yolo County Swainson's hawk nest trees: valley oak - 30 feet; walnut - 30 feet; cottonwood - 40 feet, willow - 20 feet; redwood and other suitable conifers - 40 feet; eucalyptus - 50 feet; sycamore - 40 feet; locust - 20 feet. However, the determination of a suitable nest tree should also be made on the basis of site examination in order to include trees that otherwise appear suitable but may not reach the minimum heights noted here.

The second evaluation attribute is the availability of onsite nesting trees. Add up (or estimate if numerous) the total number of trees on the property. Then standardize by converting these totals to the number of trees per 100 acres. Different nesting types have been given different values based on the factors described for each in column four. The multiplier reflects those differences. The maximum score for this attribute is 20 points. So if the score is greater than 20, it receives a total of 20 points. This indicates that at some point more trees do not improve habitat value. If the score is less than 20, then it receives that number.

SWHA 2. Availability of Onsite Potential Nest Trees (max score of 20)					
Type	**Total Number**	**Number per 100 acres**	**Factors Influencing Score**	**Multiplier**	**Score**
Riparian Woodland			High sustainability, expansion, regeneration, low disturbance from farming	3	
Tree Grove			Mod to high sustainability, regen, low to mod disturbance from farming	2.6	
Tree Row			Low to moderate sustainability, regen, mod disturbance from farming	2.4	
Farmyard Trees			Low sustainability, regeneration, mod to high disturbance from farming	2.2	
Isolated Trees			Low sustainability, regeneration, high disturbance from farming	2.0	
Total trees				**Total Score**	

FIELD NOTES: *Describe nesting habitat conditions: habitat types, tree species, condition.*

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SWHA 3. Foraging habitat offsite on surrounding lands within 1 mile. The foraging value of a property is in part based on the availability of suitable foraging habitat in the surrounding area. The assumption is that a property that includes suitable foraging habitat but is isolated from other suitable foraging habitat (i.e., surrounded by a high proportion of rice, orchards, vineyards, or other unsuitable crop types) is less likely to be regularly used compared with one that occurs within a matrix that includes a predominance of suitable habitat. A one-mile radius area from the boundary of the applicant parcel is used as the evaluation area. This area is considered sufficient to describe surrounding land uses and has the greatest influence on the value of the applicant parcel. Scoring is similar to onsite foraging habitat in that acres are calculated for each type and totaled, a percent of total for each is then calculated, and a multiplier is applied using the same proportional scale as onsite foraging but that totals to a maximum of 14 points. The lower total point value assigned to offsite foraging habitat compared with onsite foraging habitat (attribute number 1) reflects the lack of control that onsite managers have over the type of crop and land uses on offsite lands.

SWHA 3. Foraging Habitat – offsite within 1 mile (maximum 14 points)						
Vegetation Type	**Acres**	**Percent of Total**	**Variability**	**Factors Influencing Score**	**Multiplier**	**Score**
Alfalfa and other multiple-cut hays			Consistent – high	Moderate to high prey abundance, high prey accessibility	0.14	
Native perennial grassland			Consistent – moderate to high	High prey abundance, moderate prey accessibility	0.112	
Pastures – hayed-moderately grazed or managed grass			Consistent – moderate to high	Moderate prey abundance, high prey accessibility	0.112	
Rotational row/grain crop			Variable from low to moderate	Moderate prey abundance – low to moderate prey accessibility	0.098	
Irrigated pasture – grazed only			Consistent – moderate	Low to moderate prey abundance – high prey accessibility	0.084	
Dryland pasture – annual grassland			Consistent – moderate	Low to moderate prey abundance – mod to high prey accessibility	0.07	
Managed seasonal wetland			Variable – low to moderate	Low to moderate prey abundance – mod prey accessibility	0.056	
Rice			Low to none	Low prey abundance, low prey accessibility	0.0	

Orchard/Vineyard			Low to none	Low prey abundance, low prey accessibility	0.0	
Developed			None	Low prey abundance, low prey accessibility	0.0	
Other non-habitat			None	No prey accessibility, out of range, topography.	0.0	
Total Acres					**Total Score**	

FIELD NOTES: *Describe the current foraging habitat conditions within 1 mile of the property:*

SWHA 4. Availability of offsite potential nesting trees within 1 mile. Offsite nesting habitat also enhances overall value by providing nesting opportunities in the vicinity of the evaluated property and thereby potentially increasing the foraging use of the evaluated property. Here we use the same approach as we used for onsite nesting habitat. In this case, each nesting habitat type is differentially valued based on its assigned multiplier, which reflects the influencing factors noted, similar to onsite nesting habitat. However, in this case, the total number of trees for each type are quantified out to 1 mile from the parcel boundary and then standardized by calculating the number of trees per 100 acres. Then applying the multiplier gives a score for each type. Total points, which cannot exceed 14, are derived by summing the individual scores. As with the onsite nesting, a total that exceeds 14 is scored as 14, and a total less than 14 is scored as that number.

SWHA 4. Availability of Offsite Potential Nesting Trees within 1 mile (maximum score of 14 points)

Type	Total Number	Number per 100 acres	Factors Influencing Score	Multiplier	Score
Riparian Woodland			High sustainability, expansion, regeneration, low disturbance from farming	3	
Tree Grove			Mod to high sustainability, regeneration, low to mod disturbance from farming	2.6	
Tree Row			Low to mod sustainability, regeneration, moderate disturbance from farming	2.4	
Farmyard Trees			Low sustainability, regeneration, mod to high disturbance from farming	2.2	
Isolated Trees			Low sustainability, regeneration, high disturbance from farming	2.0	
Total trees				**Total Score**	

FIELD NOTES: *Describe nesting habitat conditions: habitat types, tree species, condition within 1 mile of the property.*____

SWHA 5. Documented Swainson's hawk nesting within 4 miles.

This attribute assumes that the proximity of active Swainson's hawk nest sites to the evaluated property influences the habitat value of that property. Foraging use of a property is assumed to decrease with increasing distance of active nests. The evaluated distance extends out 4 miles rather than 1 mile as in the offsite foraging and nesting attributes because Swainson's hawks regularly travel large distances while foraging and because the presence of active nests sites is considered to have greater value with regard to the potential use of the evaluated property than unoccupied habitat. The evaluation of this attribute is simplified by scoring that is based on the nearest recorded nest. Multiple nests, or nesting density, does not influence the score. For this attribute, select only one of the 5 distance categories using information on the current nesting distribution.

SWHA 5. Documented Nesting (select one; max 12 points)		
Distance	**Points**	**Score**
Onsite	12	
Within 1 mile	6	
Within 2 miles	4	
Within 3 miles	2	
Within 4 miles	1	

FIELD NOTES: *Describe the nesting distribution within 4 miles of the property.*

SWHA 6. Proximity to other protected properties.

Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. Many of these provide valuable habitat for the Swainson's hawk. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

SWHA 6. Proximity to other Protected Properties (Select one; maximum 6 points)		
Proximity	**Max Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 mile	2	
Within 5 miles	1	

FIELD NOTES: *Describe other protected parcels within 5 miles.* ___________________________

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SWHA 7. Habitat enhancement practices. While agricultural productivity must remain the primary objective for landowners, there are several wildlife enhancement practices that can be prescribed for cultivated lands that benefit the Swainson's hawk. Additional credit in the evaluation is given to those properties that currently engage in management activities that provide benefit or those that agree to additional conservation easement conditions that require implementation of the management activity.

SWHA 7. Habitat Enhancement Practices (max 14 points)			
Management Activity	**Definition**	**Points**	**Score**
Hedgerow creation	Hedgerows are at least 15-feet wide and at least 400 linear feet. They typically are established along agricultural field borders or along the edges of water conveyance canals. They may be dominated by open native perennial grasses to enhance prey populations but can also include trees and shrubs. They provide refuge to rodent prey species and nesting/cover habitat for many species.	5	
Riparian restoration	Riparian restoration is the re-establishment of native trees and shrubs along natural streams and along some large, permanent water conveyance channels, such as the DWSC and the Knights Landing Ridge Cut. Riparian restoration can provide nesting, roosting, and cover habitat for several Covered Species, including Swainson's hawk, white-tailed kite, least Bell's vireo, Yellow-billed cuckoo, and valley elderberry longhorn beetle.	4	
Tree planting	Planting of trees can provide future nesting habitat for Swainson's hawks and white-tailed kites and can be particularly valuable where suitable trees are lacking or are in decline. Points are scored based on planting or agreement to plant at least 5 trees per 100 acres and accompanied by a plan that establishes remedial measures in the event of mortality.	3	
Postpone disking and bedding of fields until late August	For crops that are harvested during the summer, including wheat and early-harvested tomatoes, postponing disking and bedding retains waste material in the field and continues to provide habitat for rodent prey species that can then be accessed by foraging Swainson's hawks. Postponing disking until late August creates a final pulse of foraging activity in those fields just prior to migration.	1	

Maintaining trees and encouraging regeneration	The ongoing loss of mature trees and the lack of regeneration of valley oaks is an important habitat issue in Yolo County. Landowners that avoid cultivating in the root zone of trees or that otherwise take action to protect trees on their property provide benefit to Swainson's hawks and white-tailed kites.	1	
Other (describe below)			
	SCORE:		

FIELD NOTES: *Describe the management activities that the landowner is currently performing or intends to perform under the easement conditions to enhance habitat for Swainson's hawk.*

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SWHA 8. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging Swainson's hawks. Examples include properties with nesting habitat along busy highways; properties with large wind turbines near foraging or nesting habitat; properties with electrical substations; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to planned urban development. Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

SWHA 8. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum score of 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value:*____

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – Swainson's Hawk

Evaluation Type	Factor #	Factor	Max. Points	Score	Combined Score
Foraging Habitat	SWHA 1	Foraging Habitat – onsite	20		
Nesting Habitat	SWHA 2	Nesting Habitat – onsite	20		
Landscape Factors	SWHA 3	Foraging habitat – offsite	14		
	SWHA 4	Nesting habitat – offsite	14		
	SWHA 5	Documented nesting	12		
	SWHA 6	Proximity to protected parcels	6		
Management Factors	SWHA 7	Habitat Enhancement	14		
	SWHA 8	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

White-Tailed Kite

Conservation of the white-tailed kite will be met by achieving conservation objectives for cultivated lands, grasslands, managed seasonal wetlands, and riparian natural communities. There are no species-specific objectives for white-tailed kite because its habitat requirements overlap considerably with the Swainson's hawk. However, like the Swainson's hawk, to be considered for white-tailed kite conservation, a property must have a minimum of 80 contiguous acres of suitable foraging habitat or be contiguous with existing protected properties that support suitable white-tailed kite foraging habitat. In addition, there are some differences, particularly with regard to the foraging use of managed seasonal wetlands and rice fields. Therefore, the scoring for white-tailed kite will use the same attribute scoring as the Swainson's hawk with the exception of onsite foraging habitat (WTKI 1), which considers the value of these foraging habitat types; and the proximity to documented white-tailed kite nest sites (WTKI 2). As with the Swainson's hawk scoring, attributes are aggregated into four evaluation types, onsite foraging, onsite nesting, landscape factors, and management factors.

WTKI 1. Availability of onsite foraging habitat. The availability of onsite foraging habitat for the white-tailed kite is addressed similarly to the Swainson's hawk except the scoring reflects the higher values associated with grassland, seasonal wetlands, and rice habitats. The kite's foraging behavior, including hovering or kiting, allows it greater accessibility to rodent prey in some cover types. Also, since it also occurs in Yolo County during the winter (unlike the Swainson's hawk), rice fields also provide some foraging value during this period. The kite can also utilize rice checks more effectively due to its foraging behavior.

To assess all potential foraging habitat types, determine the number of acres of each type, then calculate proportions of each. Relative values of different types are reflected in the multiplier values. Next, multiply the proportional values by the multiplier to derive a point score for each type. Then simply sum the point values for a total score (maximum of 20 points) for this attribute.

WTKI 1. Foraging Habitat – onsite (maximum 20 points)

Vegetation Type	Acres	Percent of Total	Variability	Factors Influencing Score	Multiplier	Score
Alfalfa and other multiple-cut hays			Consistent – high	Moderate to high prey abundance, high prey accessibility	0.20	
Native perennial grassland			Consistent – moderate to high	High prey abundance, moderate prey accessibility	0.18	
Pastures – hayed and moderately grazed/managed grasslands			Consistent – moderate to high	Moderate prey abundance, high prey accessibility	0.18	
Managed seasonal wetland			Seasonally variable – moderate	Moderate prey abundance – high prey accessibility	0.16	
Irrigated pasture			Consistent – moderate	Low to moderate prey abundance – high prey accessibility	0.14	
Dryland pasture – annual grassland			Consistent – moderate	Low to moderate prey abundance – moderate to high prey accessibility	0.12	
Rotational row/grain crop			Variable from low to moderate	Moderate prey abundance – low to moderate prey accessibility	0.10	
Rice			Seasonally variable	Low prey abundance, high prey accessibility	0.08	

Orchard/Vineyard			Low to none	Low prey abundance, low prey accessibility	0.0	
Developed			None	Low prey abundance, low prey accessibility	0.0	
Other non-habitat			None	No prey accessibility, out of range, topography.	0.0	
Total Acres					**Total Score**	

FIELD NOTES: *Describe the current foraging habitat conditions: crops, farming methods, irrigation, crop rotation, etc.*____.

WTKI 2. Availability of onsite potential nest trees. Potential nest trees add value to the property by providing future nesting opportunities. White-tailed kites use a variety of nesting tree types and conditions from small willow trees to mature valley oaks. They typically nest in riparian woodlands, groves, or savannahs, but may also be found in tree rows and occasionally in isolated trees. All have similar value with regard to the nest site itself. But, as with Swainson's hawk, different nesting habitat types can be distinguished by other factors, including their long-term sustainability, ability to regenerate, and protection from removal or disturbances. The scoring is therefore based on these factors as well as the number of trees. A suitable tree is generally defined on the basis of minimum tree height by species documented for Yolo County white-tailed kite nest trees: valley oak - 30 feet; walnut - 30 feet; cottonwood - 40 feet, willow - 15 feet; redwood and other suitable conifers - 40 feet; eucalyptus - 50 feet; sycamore - 40 feet; locust - 20 feet. However, the determination of a suitable nest tree should also be made on the basis of site examination in order to include trees that otherwise appear suitable but may not reach the minimum heights noted here.

The second evaluation attribute is the availability of onsite nesting trees. Add up (or estimate if numerous) the total number of trees on the property. Then standardize by converting these totals to the number of trees per 100 acres. Different nesting types have been given different values based on the factors described for each in column four. The multiplier reflects those differences. The maximum score for this attribute is 20 points. So if the score is greater than 20, it receives a total of 20 points. This indicates that at some point more trees do not improve habitat value. If the score is less than 20, then it receives that number.

WTKI 2. Availability of Onsite Potential Nest Trees (max 20 points)					
Type	**Total Number**	**Number per 100 acres**	**Factors Influencing Score**	**Multiplier**	**Score**
Riparian Woodland			High sustainability, expansion, regeneration, low disturbance from farming	3	
Tree Grove or Savannah			Mod to high sustainability, regen, low to mod disturbance from farming	2.6	
Tree Row			Low to moderate sustainability, regen, mod disturbance from farming	2.4	
Farmyard Trees			Low sustainability, regeneration, mod to high disturbance from farming	2.2	
Isolated Trees			Low sustainability, regeneration, high disturbance from farming	2.0	
Total trees				**Total Score**	

FIELD NOTES: *Describe nesting habitat conditions: habitat types, tree species, condition.*

WTKI 3. Foraging habitat offsite on surrounding lands within 1 mile. The foraging value of a property is in part based on the availability of suitable foraging habitat in the surrounding area. The assumption is that a property that includes suitable foraging habitat but is isolated from other suitable foraging habitat (i.e., surrounded by a high proportion of orchards, vineyards, or other unsuitable crop types) is less likely to be regularly used compared with one that occurs within a matrix that includes a predominance of suitable habitat. A one-mile radius area from the boundary of the applicant parcel is used as the evaluation area. This area is considered sufficient to describe surrounding land uses and has the greatest influence on the value of the applicant parcel. Scoring is similar to onsite foraging habitat in that acres are calculated for each type and totaled, a percent of total for each is then calculated, and a multiplier is applied using the same proportional scale as onsite foraging but that totals to a maximum of 14 points. The lower total point value assigned to offsite foraging habitat compared with onsite foraging habitat (attribute number 1) reflects the lack of control that onsite managers have over the type of crop and land uses on offsite lands.

WTKI 3. Foraging Habitat – offsite within 1 mile (maximum 14 points)

Vegetation Type	Acres	Percent of Total	Variability	Factors Influencing Score	Multiplier	Score
Alfalfa and other multiple-cut hays			Consistent – high	Moderate to high prey abundance, high prey accessibility	0.14	
Native perennial grassland			Consistent – moderate to high	High prey abundance, moderate prey accessibility	0.13	
Pastures – hayed and moderately grazed/managed grasslands			Consistent – moderate to high	Moderate prey abundance, high prey accessibility	0.13	
Managed seasonal wetland			Seasonally variable – moderate	Moderate prey abundance – high prey accessibility	0.11	
Irrigated pasture			Consistent – moderate	Low to moderate prey abundance – high prey accessibility	0.10	
Dryland pasture – annual grassland			Consistent – moderate	Low to moderate prey abundance – moderate to high prey accessibility	0.08	
Rotational row/grain crop			Variable from low to moderate	Moderate prey abundance – low to moderate prey accessibility	0.07	
Rice			Seasonally variable	Low prey abundance, high prey accessibility	0.06	
Orchard/Vineyard			Low to none	Low prey abundance, low prey accessibility	0.0	
Developed			None	Low prey abundance, low prey accessibility	0.0	
Other non-habitat			None	No prey accessibility, out of range, topography.	0.0	
Total Acres					**Total Score**	

FIELD NOTES: *Describe the current foraging habitat conditions within 1 mile of the property:*

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WTKI 4. Availability of offsite potential nesting trees within 1 mile. Offsite nesting habitat also enhances overall value by providing nesting opportunities in the vicinity of the evaluated property and thereby potentially increasing the foraging use of the evaluated property. Here we use the same approach as we used for onsite nesting habitat. In this case, each nesting habitat type is differentially valued based on its assigned multiplier, which reflects the influencing factors noted, similar to onsite nesting habitat. However, in this case, the total number of trees for each type are quantified out to 1 mile from the parcel boundary and then standardized by calculating the number of trees per 100 acres. Then applying the multiplier gives a score for each type. Total points, which cannot exceed 14, are derived by summing the individual scores. As with the onsite nesting, a total that exceeds 14 is scored as 14, and a total less than 14 is scored as that number.

WTKI 4. Availability of Offsite Potential Nesting Trees within 1 mile (maximum 14 points)					
Type	**Total Number**	**Number per 100 acres**	**Factors Influencing Score**	**Multiplier**	**Score**
Riparian Woodland			High sustainability, expansion, regeneration, low disturbance from farming	3	
Tree Grove			Mod to high sustainability, regeneration, low to mod disturbance from farming	2.6	
Tree Row			Low to mod sustainability, regeneration, moderate disturbance from farming	2.4	
Farmyard Trees			Low sustainability, regeneration, mod to high disturbance from farming	2.2	
Isolated Trees			Low sustainability, regeneration, high disturbance from farming	2.0	
Total trees				**Total Score**	

FIELD NOTES: *Describe nesting habitat conditions: habitat types, tree species, condition within 1 mile of the property.*____________________________________

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WTKI 5. Documented white-tailed kite nesting within 1 mile. This attribute assumes that the proximity of active white-tailed kite nest sites to the evaluated property influences the habitat value of that property. Foraging use of a property is assumed to decrease with increasing distance of active nests. White-tailed kites occupy relatively small home ranges, typically foraging within 1 mile of the nest. The evaluation of this attribute is simplified by scoring that is based on the nearest recorded nest. Multiple nests, or nesting density, does not influence the score. For this attribute, select only one of the 5 distance categories using information on the current nesting distribution.

WTKI 5. Documented Nesting (select one; maximum 12 points)		
Distance	**Points**	**Score**
Onsite	12	
Within 0.25 mile	6	
Within 0.5 miles	4	
Within 1 miles	2	
>1 mile	0	

FIELD NOTES: *Describe reported nesting occurrences within 1 mile of the property.*

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WTKI 6. Proximity to other protected properties. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. Many of these provide valuable habitat for the white-tailed kite. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

WTKI 6. Proximity to other Protected Properties (Select one; max 6 points)		
Proximity	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 mile	1	
>2 miles	0	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ____________________

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WTKI 7. Habitat enhancement practices. While agricultural productivity must remain the primary objective for landowners, there are several wildlife enhancement practices that can be prescribed for cultivated lands that benefit the white-tailed kite. Additional credit in the evaluation is given to those properties that currently engage in management activities that provide benefit or those that agree to additional conservation easement conditions that require implementation of the management activity.

WTKI 7. Habitat Enhancement Practices (maximum 14 points)			
Management Activity	**Definition**	**Points**	**Score**
Hedgerow creation	Hedgerows are at least 15-feet wide and at least 400 linear feet. They typically are established along agricultural field borders or along the edges of water conveyance canals. They may be dominated by open native perennial grasses to enhance prey populations but can also include trees and shrubs. They provide refuge to rodent prey species and nesting/cover habitat for many species.	5	
Riparian restoration	Riparian restoration is the re-establishment of native trees and shrubs along natural streams and along some large, permanent water conveyance channels, such as the DWSC and the Knights Landing Ridge Cut. Riparian restoration can provide nesting, roosting, and cover habitat for several Covered Species, including Swainson's hawk, white-tailed kite, least Bell's vireo, Yellow-billed cuckoo, and valley elderberry longhorn beetle.	4	
Tree planting	Planting of trees can provide future nesting habitat for Swainson's hawks and white-tailed kites and can be particularly valuable where suitable trees are lacking or are in decline. Points are scored based on planting or agreement to plant at least 5 trees per 100 acres and accompanied by a plan that establishes remedial measures in the event of mortality.	3	
Postpone disking and bedding of fields until late August	For crops that are harvested during the summer, including wheat and early-harvested tomatoes, postponing disking and bedding retains waste material in the field and continues to provide habitat for rodent prey species that can then be accessed by foraging white-tailed kites. Postponing disking until late August creates a final pulse of foraging activity in those fields just prior to migration.	1	
Maintaining trees and encouraging regeneration	The ongoing loss of mature trees and the lack of regeneration of valley oaks is an important habitat issue in Yolo County. Landowners that avoid cultivating in the root zone of trees or that otherwise take action to protect trees on their property provide benefit to Swainson's hawks and white-tailed kites.	1	
Other (describe below)			
	SCORE:		

FIELD NOTES: *Describe the management activities that the landowner is currently performing or intends to perform under the easement conditions to enhance habitat for white-tailed kite.*

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WTKI 8. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging white-tailed kites. Examples include properties with nesting habitat along busy highways; properties with large wind turbines near foraging or nesting habitat; properties with electrical substations; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to planned urban development. Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

WTKI 8. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum score of 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:______________________________________

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – White-tailed Kite

Evaluation Type	Factor #	Factor	Max. Points	Score	Combined Score
Foraging Habitat	WTKI 1	Foraging Habitat – onsite	20		
Nesting Habitat	WTKI 2	Nesting Habitat – onsite	20		
Landscape Factors	WTKI 3	Foraging habitat – offsite	14		
	WTKI 4	Nesting habitat – offsite	14		
	WTKI 5	Documented nesting	12		
	WTKI 6	Proximity to protected parcels	6		
Management Factors	WTKI 7	Habitat Enhancement	14		
	WTKI 8	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Burrowing Owl

Burrowing owl conservation will be met through the protection of non-rice cultivated lands and grassland habitats. However, occupied habitat includes other key attributes, including the presence of ground squirrels or other conditions that facilitate the creation of nesting and wintering burrows. Other than occasional isolated pairs that may occur throughout the agricultural landscape, burrowing owls occupy a relatively small proportion of the plan area where habitat conditions are suitable. These conditions include a relatively flat grassland or pastureland landscape with short vegetation height and presence of ground squirrels. To address these primary habitat conditions as well as other landscape and management factors, seven attributes are included for burrowing owl: onsite land cover/habitat type, offsite land cover/habitat type, presence of burrow habitat, proximity to known occupied sites, proximity to other protected lands, habitat enhancement practices, and factors that degrade habitat value. Attributes are aggregated into four evaluation types, onsite foraging, onsite nesting, landscape factors, and management factors. Other, more specific habitat attributes, such as perch availability and grazing, will be addressed qualitatively during the site assessment.

BUOW 1. Onsite Land Cover/Foraging Habitat. Burrowing owls are typically found in uncultivated grassland habitats. Grass height is generally low (from barren ground to <1 foot). They are also found along the perimeter of some cultivated fields where there is an uncultivated edge, on uncultivated levee slopes, and in some ruderal patches. This attribute addresses the overall land cover type on the property.

BUOW 1. Onsite Land Cover/Foraging Habitat (max 20 points)

Vegetation Type	Acres	Percent of Total	Multiplier	Score
Uncultivated grassland <1 ft			0.2	
Irrigated pasture			0.16	
Alfalfa and grass hay			0.10	
Idle or ruderal			0.06	
Rotational cropland			0.04	
Uncultivated grassland >1 ft.			0.02	
Managed seasonal wetland			0.01	
Rice			0.0	
Orchard/Vineyard			0.0	
Developed			0.0	
Other non-habitat			0.0	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the current onsite habitat conditions.*____________________________

BUOW 2. Presence of Burrow Habitat. Burrowing owl burrows are often initially constructed by California ground squirrels. Therefore, the presence of ground squirrels can be important in the maintenance and development of burrowing owl habitat. Burrowing owls will also use other structures, such as small culverts, pipes, rock piles, and artificial burrows as nesting and winter burrow habitat. Artificial structures often encourage ground squirrels to occupy an area. Because burrowing owls have relatively small home ranges, grassland habitats that are otherwise suitable are used less with increased distance from suitable burrow habitat. Therefore, the presence of onsite burrow habitat is considered an essential element in the evaluation of burrowing owl habitat. Scoring is based on a range within each category below. Select the condition and then a score with the range that best characterizes the extent of the condition.

BUOW 2. Presence of Burrow Habitat (select one; maximum 18 points)		
Condition	**Point Range**	**Score**
>2 ground squirrel burrows per acre onsite	14 to 18	
Ground squirrel burrows present but less than 2 per acre onsite	8 to 14	
Ground squirrel burrows not present but on adjacent property	4 to 8	
Other possible habitat present (berms, soil/rock piles, etc.)	1 to 4	
No ground squirrel or other burrow habitat present	0	

FIELD NOTES: *Describe the type and extent of burrow habitat present:*____________________

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BUOW 3. Offsite Land Cover Type. Offsite land cover type describes the overall landscape within which the property occurs. As with other species, surrounding lands affect the quality of the onsite habitat and long-term sustainability of suitable habitat conditions for burrowing owls.

BUOW 3. Offsite Land Cover/Habitat within 1 mile (max 16 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Uncultivated grassland <1 ft.			0.16	
Irrigated pasture			0.13	
Alfalfa and grass hay			0.08	
Idle or ruderal			0.05	
Rotational cropland			0.03	
Uncultivated grassland >1 ft			0.02	
Managed seasonal wetland			0.01	
Rice			0.0	
Orchard/Vineyard			0.0	
Developed			0.0	
Other non-habitat			0.0	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the current habitat conditions within 1 mile of the property:*

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BUOW 4. Proximity to Occupied Burrowing Owl Burrows. The distribution of burrowing owls within the Plan Area is limited primarily to the Woodland-Davis area and the lower Yolo Basin. While burrowing owls have been documented elsewhere, these sites that occur as solitary occurrences or in small patches of remaining habitat, are considered less sustainable. Using an attribute that addresses proximity to known occupied burrows will further emphasize protection of those areas where burrowing owls are known to occur and where long-term sustainability is more likely.

BUOW 4. Proximity to Occupied Burrowing Owl Burrows (select one, max 18 points)		
Distance	**Points**	**Score**
Onsite	18	
Within 0.5 mile	12	
Within 1 mile	6	
Within 2 miles	2	
>2 miles	0	

FIELD NOTES: *Describe occurrences within 2 miles of the property.*______________________

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BUOW 5. Proximity to other protected properties. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. Many of these provide valuable habitat for the burrowing owl. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

BUOW 5. Proximity to other Protected Properties (Select one; maximum 6 points)		
Proximity	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ____________________

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BUOW 6. Habitat Enhancement Practices. Where habitat conditions are otherwise suitable, burrowing owls may respond to certain habitat enhancement practices such as creating berms and mounds to attract ground squirrels and facilitate burrowing owl use.

BUOW 6. Habitat Enhancement Practices (maximum 24 points)			
Management Activity	**Definition**	**Points**	**Score**
Hedgerows	Hedgerows are at least 15-feet wide and at least 400 linear feet. They typically are established along agricultural field borders or along the edges of water conveyance canals. They may be dominated by open native perennial grasses to enhance microtine prey populations but can also include scattered trees and shrubs. They provide refuge to rodent prey species and nesting/cover habitat for many species.	5	
Berm and mounds	Berms, mounds, and rock piles attract ground squirrel activity, which in turn facilitates use by burrowing owls.	5	
Livestock grazing	Grazing can be an effective tool for maintaining low grass heights, which is required for burrowing owl occupancy.	5	
Nest boxes	Underground nest boxes can provide nesting opportunities for burrowing owls in areas where they are lacking. They can also supplement natural burrows.	5	
Other (describe below)			
	SCORE:		

FIELD NOTES: *Describe the management activities that the landowner is currently performing or intends to perform under the easement conditions to enhance habitat for burrowing owls.*

BUOW 7. Factors that increase mortality risk or degrade habitat value.

Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging burrowing owls. Examples include properties with nesting habitat along busy highways; properties with large wind turbines near foraging or nesting habitat; properties with electrical substations; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to planned urban development. Rodent control and use of insecticides can also degrade habitat value. Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

BUOW 7. Factors that Increase Mortality Risk or Degrade Habitat Value (max 0 points)

Disturbance Activity	Point Range	Score
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Rodent control and insecticide use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:

Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – Burrowing Owl

Evaluation Type	Factor #	Factor	Max. Points	Score	Combined Score
Foraging Habitat	BUOW 1	Land cover/habitat – onsite	20		
Nesting Habitat	BUOW 2	Presence of burrow habitat	18		
Landscape Factors	BUOW 3	Land cover/habitat – offsite	16		
	BUOW 4	Proximity to Occupied burrows	18		
	BUOW 5	Proximity to protected parcels	6		
Management Factors	BUOW 6	Habitat Enhancement	20		
	BUOW 7	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Tricolored Blackbird

Tricolored blackbird conservation will be met through the protection of cultivated land, pastureland, and grassland foraging habitat, and the protection and restoration of freshwater emergent wetlands. To be considered for tricolored blackbird conservation, a property must have a minimum of 0.5 contiguous acres of suitable emergent wetland or other suitable nesting habitat. .Other potential nesting habitats considered in the evaluation include blackberry bramble and willow scrub. To address these primary habitat conditions as well as other landscape and management factors, seven attributes are included for tricolored blackbird: onsite land cover/habitat type, onsite nesting habitat, offsite land cover/habitat, documented nesting, proximity to other protected properties, habitat enhancement practices, and factors that degrade habitat value. Attributes are aggregated into four evaluation types, onsite foraging, onsite nesting, landscape factors, and management factors. Other, more specific habitat attributes will be addressed qualitatively during the site assessment.

TCBB 1. Onsite Land Cover/Habitat Type. Tricolored blackbirds typically occur in grassland, pastureland, and some agricultural landscapes. This attribute addresses the overall onsite land cover type.

TCBB 1. Onsite Land Cover/Habitat (maximum 20 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Uncultivated grassland			0.20	
Irrigated pasture			0.16	
Alfalfa and grass hay			0.14	
Managed seasonal wetland			0.12	
Rice			0.10	
Idle or ruderal			0.08	
Rotational cropland			0.06	
Orchard/Vineyard			0.0	
Developed			0.0	
Other non-habitat			0.0	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the onsite land cover characteristics.*______________________________

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TCBB 2. Onsite Nesting Habitat. The presence of nesting habitat is essential. Nesting habitat consists of both native (emergent marsh, willow scrub) and non-native (blackberry bramble, milk thistle) types. Most occupied nesting habitats are greater than 0.5 acres, so this is used as the minimum acreage size. The quality or suitability of the habitat to meet the nesting requirements of tricolored blackbirds will be assessed during the field visit.

TCBB 2. Onsite Nesting Habitat >0.5 acre (maximum 20 points)		
Habitat Type	**Points**	**Score**
Cattail/Tule Marsh	20	
Blackberry bramble	16	
Willow scrub	12	
Milk thistle	8	
Other (describe below)	0 to 20	
None	0	

FIELD NOTES: *Describe the type, size, and characteristics of potential nesting habitat.*________

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TCBB 3. Offsite Land Cover/Habitat. As with other highly mobile species, the overall landscape in which the property occurs is an important attribute in determining the suitability of the property for tricolored blackbird. For this attribute, total the acres of each land cover/habitat type within a 1 mile radius, calculate the percentage of total for each, then multiply the percent of total by the multiplier. The multiplier distinguishes the difference in habitat value of each type. The scores are the summed for a total score.

TCBB 3. Offsite Land Cover/Habitat within 1 mile (maximum 14 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Uncultivated grassland			0.14	
Irrigated pasture			0.11	
Alfalfa and grass hay			0.10	
Idle or ruderal			0.08	
Managed seasonal wetland			0.07	
Rice			0.06	
Rotational cropland			0.04	
Orchard/Vineyard			0.0	
Developed			0.0	
Other non-habitat			0/0	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the land cover characteristics within 1 mile.*______________________

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TCBB 4. Offsite Nesting Habitat. The proximity of offsite suitable nesting habitat also determines the potential use of the property by tricolored blackbirds. In this case, we do not distinguish by habitat value of the different potential nesting habitat types, but instead by simply using the distance of any suitable nesting habitat type to the property within a 1-mile radius.

TCBB 4. Offsite Nesting Habitat >0.5 acre (maximum 14 points)		
Distance	**Points**	**Score**
Within 0.25 miles	14	
From 0.25 to 0.5 miles	10	
From 0.5 to 1 mile	5	
>1 mile	0	

FIELD NOTES: *Describe the type, size, and characteristics of potential offsite nesting habitat and its proximity to the property.*____

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TCBB 5. Documented Nesting. Close proximity to active colony sites can increase the foraging habitat value of the property for tricolored blackbirds.

TCBB 5. Documented Nesting (select one; max 14 points)		
Distance	**Points**	**Score**
Onsite	14	
Within 0.5 mile	10	
Within 1 mile	4	
Within 2 miles	2	
Within 3 miles	1	
>3 miles	0	

FIELD NOTES: *Describe the nesting distribution within 3 miles of the property.*_____________

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TCBB 6. Proximity to other protected properties. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. Some of these provide valuable habitat for the tricolored blackbird. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

TCBB 6. Proximity to other protected properties (select one, max 6 points)		
Proximity	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	
>2 miles	0	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ______________________

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TCBB 7. Habitat Enhancement Practices. Where habitat conditions are otherwise suitable, tricolored blackbirds may benefit from certain habitat enhancement practices.

TCBB 7. Habitat Enhancement Practices (maximum 12 points)			
Management Activity	**Definition**	**Points**	**Score**
Hedgerow creation	Hedgerows are at least 15-feet wide and at least 400 linear feet. They typically are established along agricultural field borders or along the edges of water conveyance canals. They may be dominated by open native perennial grasses to enhance microtine prey populations but can also include scattered trees and shrubs. They provide refuge to rodent prey species and nesting/cover habitat for many species.	3	
Marsh restoration	Restoring cattail/tule marsh in otherwise suitable grassland or pastureland landscapes can facilitate future occupancy of tricolored blackbirds	3	
Marsh protection	Actions that protect the integrity of marsh habitats, including cattle exclusion and ensuring a sufficient water supply.	3	
Postpone harvest	Postponing harvest operations where tricolored blackbirds have nested can increase reproductive output.	3	
Other (describe below)			
	SCORE:		

FIELD NOTES: *Describe the management activities that the landowner is currently performing or intends to perform under the easement conditions to enhance habitat for tricolored blackbirds.*

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TCBB 8. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging tricolored blackbirds. Examples include properties with nesting habitat along busy highways; properties with large wind turbines near foraging or nesting habitat; properties with electrical substations; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

TCBB 8. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:___

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – Tricolored Blackbird					
Evaluation Type	**Factor #**	**Factor**	**Max. Points**	**Score**	**Combined Score**
Foraging Habitat	TCBB 1	Foraging Habitat – onsite	20		
Nesting Habitat	TCBB 2	Nesting Habitat – onsite	20		
Landscape Factors	TCBB 3	Foraging habitat – offsite	14		
	TCBB 4	Nesting habitat - offsite	14		
	TCBB 5	Documented nesting	14		
	TCBB 6	Proximity to protected parcels	6		
Management Factors	TCBB 7	Habitat Enhancement	12		
	TCBB 8	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Yellow-billed Cuckoo

Conservation of yellow-billed cuckoo is met through the protection and restoration of mature cottonwood-willow riparian forest. To be considered for yellow-billed cuckoo conservation, a property must have a minimum of 25 contiguous acres of suitable riparian habitat or be contiguous with existing protected properties that support suitable riparian habitat. As a riparian obligate species, the yellow-billed cuckoo is largely restricted to this habitat type for all life requisites. Therefore, only two species-specific attributes are assigned to this species, the availability of suitable riparian forest, and restoration of suitable riparian forest. Two general attributes, proximity to protected parcels and factors that degrade value are also included.

YBCU 1. Availability of Suitable Riparian Forest. Riparian forest must be present onsite. The riparian must be dominated by mature cottonwood and willow trees. Sites with more complex structure and species composition, including Oregon ash and box elder, have greater value. If habitat is considered suitable, scoring is based entirely on the patch size of the riparian forest. The minimum patch size for yellow-billed cuckoo is considered to be 25 acres.

YBCU 1. Availability of Suitable Riparian Forest (select one, max 70 points))	
Estimated Acres	**Score**
>50	70
25 to 50	50
<25	0

FIELD NOTES: *Describe the size, structure, and species composition of the riparian habitat.*

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YBCU 2. Proximity to Protected Parcels. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

YBCU 2. Proximity to other Protected Properties (Select one; max 6 points)		
Proximity	**Pts. Max**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ___________________________

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YBCU 3. Habitat enhancement practices. Restoration of cottonwood-willow riparian forest can increase the potential for future yellow-billed cuckoo occupancy. Additional credit in the evaluation is given to those properties that currently engage in management activities that provide benefit or those that agree to additional conservation easement conditions that require implementation of the management activity.

YBCU 3. Habitat Enhancement Practices (max 24 points)			
Management Activity	**Definition**	**Points**	**Score**
Riparian restoration	Riparian restoration is the re-establishment of native trees and shrubs along natural streams and along some large, permanent water conveyance channels, such as the Deep Water Ship Channel and the Knights Landing Ridge Cut. To restore habitat for yellow-billed cuckoo, riparian restoration must be dominated by a cottonwood/willow over- and mid-story structure. Riparian restoration projects that provide this habitat in excess of 25 contiguous acres, receives points for this attribute.	24	
Other (describe below)			
	SCORE:		

FIELD NOTES: *Describe the management activities that the landowner is currently performing or intends to perform under the easement conditions to enhance habitat for yellow-billed cuckoo.*____

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YBCU 4. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging yellow-billed cuckoos. Examples include properties with nesting habitat along busy highways; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances Also, the use of pesticides can reduce the availability of insect prey species and degrade overall habitat value. Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

YBCU 4. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:____

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type. In addition to the two species-specific factor (YBCU 1 and YBCU 3), scoring factors for yellow-billed cuckoo include two relevant landscape and management factors (YBCU 2 and YBCU 4).

Scoring Summary – Yellow-billed Cuckoo					
Evaluation Type	**Factor #**	**Factor**	**Max. Points**	**Score**	**Combined Score**
Primary Habitat	YBCU 1	Availability of Riparian Forest	70		
Landscape Factors	YBCU 2	Proximity to protected parcels	6		
Management Factors	YBCU 3	Habitat Enhancement	24		
	YBCU 4	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Least Bell's Vireo

Conservation of least Bell's vireo is met through the protection and restoration of riparian habitats. To be considered for least Bell's vireo conservation, a property must have a minimum of 1.5 contiguous acres of suitable riparian habitat or be contiguous with existing protected properties that support suitable riparian habitat. The least Bell's vireo is a riparian obligate species. Surface water is also required during the entire nesting season. Therefore, only two additional species-specific attributed is assigned to this species, the availability of suitable riparian habitat and restoration of suitable riparian habitat. The least Bell's vireo is typically found in structurally diverse riparian habitats or in dense early successional riparian communities that include a diverse understory that may include boxelder, California rose, California blackberry, and mugwort.

LBVI 1. Availability of Suitable Riparian. Riparian forest must be present onsite. The riparian should be relatively dense, early successional, or structurally diverse. If habitat is considered suitable, scoring is based entirely on the patch size of the riparian habitat. Average home range size is approximately 1.5 acres, so 1.5 acres is used here as the minimum patch size.

LBVI 1. Availability of Suitable Riparian (select one, max 70 points)

Estimated Acres	Points	Score
>10	70	
5-10	50	
2 to 5	25	
<1.5	0	

FIELD NOTES: *Describe the size, structure, and species composition of the riparian habitat.*____

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LBVI 2. Proximity to Protected Properties. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

LBVI 2. Proximity to other Protected Properties (Select one; maximum 6 points)		
Proximity	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ______________________________

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LBVI 3. Habitat enhancement practices. Restoration of riparian habitat can increase the potential for future least Bell's vireo occupancy. Additional credit in the evaluation is given to those properties that currently engage in management activities that provide benefit or those that agree to additional conservation easement conditions that require implementation of the management activity.

LBVI 3. Habitat Enhancement Practices (max 24 points)			
Management Activity	**Definition**	**Points**	**Score**
Riparian restoration	Riparian restoration is the re-establishment of native trees and shrubs along natural streams and along some large, permanent water conveyance channels, such as the Deep Water Ship Channel and the Knights Landing Ridge Cut. To restore habitat for least Bell's vireo, riparian restoration must target a structurally diverse community with relatively dense mid-story and shrub components. Riparian restoration projects that provide this habitat in excess of 1.5 contiguous acres, receives points for this attribute.	24	
Other (describe below)			
	SCORE:		

FIELD NOTES*: Describe the management activities that the landowner is currently performing or intends to perform under the easement conditions to enhance habitat for least Bell's vireo.*

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LBVI 4. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging least Bell's vireo. Examples include properties with nesting habitat along busy highways; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

LBVI 4. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:______________________________________

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type. In addition to the two species-specific factor (LEVI 1 and LEVI 3), scoring factors for least Bell's vireo include two relevant landscape and management factors (LEVI 2 and LEVI 4).

Scoring Summary – Least Bell's Vireo

Evaluation Type	Factor #	Factor	Max. Points	Score	Combined Score
Primary Habitat	LBVI 1	Availability of Riparian	70		
Landscape Factors	LBVI 2	Proximity to protected parcels	6		
Management Factors	LBVI 3	Habitat Enhancement	24		
	LBVI 4	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Bank Swallow

Bank swallow conservation must occur in Planning Unit 7, which is the Cache Creek corridor. Nesting habitat for bank swallows includes steeply-sloped channel banks along the creek that have soils suitable for creating nesting holes and that are subject to periodic erosion events. To be considered for bank swallow conservation, a property must have a minimum of 17 feet of contiguous vertical, open, channel bank. Since conserved habitats are restricted to the Cache Creek drainage, the only specific attribute used in the evaluation is the availability of suitable cut bank habitat. Suitability is evaluated during the site visit on the basis of slope, soil characteristics, and location above high water. So scoring for the attribute is yes/no. A more qualitative evaluation of potential habitat is addressed in the field evaluation notes, but is not specifically scored.

BASW 1. Availability of Suitable Channel Banks. Bank swallows dig nest holes in erodible soils, usually in steeply-sloped channel banks along rivers and large creeks. Other than some potential habitat along the west side of the Sacramento River, the only location in the Plan Area that supports suitable conditions for bank swallow nests is along Cache Creek.

BASW 1. Availability of Suitable Channel Banks (max 84 points)		
Condition	**Points**	**Score**
Vertical, erodible channel bank exceeding 40 contiguous feet or multiple sites exceeding 17 feet in width and above high water line.	94	
Vertical, erodible channel bank from 17 to 40 contiguous feet in width and above high water line.	80	

FIELD NOTES: *Describe the size, slope, and other conditions of the cut bank and surrounding area.*____

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BASW 2. Proximity to Protected Parcels. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

BASW 2. Proximity to other Protected Properties (Select one; maximum 6 points)		
Proximity	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ____________________________

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BASW 3. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for nesting and foraging for bank swallow. Examples include properties with nesting habitat along busy highways; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

BASW 3. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum score of 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, turbines, substations, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:____

Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type. In addition to the species-specific factor (BASW 1), scoring factors for bank swallow include two relevant landscape and management factors (SWHA 6 and SWHA 8).

Scoring Summary – Bank Swallow					
Evaluation Type	**Factor #**	**Factor**	**Max. Points**	**Score**	**Combined Score**
Nesting Habitat	BASW 1	Availability of suitable channel banks	94		
Landscape Factors	BASW 2	Proximity to protected parcels	6		
Management Factors	BASW 3	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Giant Garter Snake

Giant garter snake occurs in the Colusa and Yolo Basins within the Plan Area. There are no reported occurrences of this species west of the Colusa and Yolo Basins. Therefore conservation for this species will be met though protection of rice lands and associated upland habitats, and protection and restoration of freshwater emergent marsh and lacustrine or riverine natural communities within the modeled habitat area in the Colusa and Yolo Basins. In additional to the natural community protection and restoration, giant garter snake habitat should be associated with a water conveyance system to facilitate movement and habitat elements such as emergent and submergent vegetation to provide habitat for prey resources and to provide basking sites for snakes. To be considered for giant garter snake conservation, a property must have a minimum of 320 acres that supports both aquatic and upland habitat components, or be contiguous with existing protected properties that support suitable giant garter snake habitat.

GGS 1. Onsite Land Cover. Onsite land cover type is included to characterize the overall land use within the property boundary. A predominance of land cover types that are used by giant garter snake, such as rice farming, and large wetland communities, can therefore be differentiated from properties that support primarily upland crops that provide limited to no value.

GGS 1. Onsite Land Cover/Habitat (max. 12 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Emergent marsh			0.12	
Seasonal wetland			0.08	
Rice			0.10	
Grassland			0.05	
Irrigated pasture			0.02	
Hay crops			0.00	
Rotational cropland			0.00	
Orchard/Vineyard			0.00	
Developed			0.00	
Other non-habitat			0.00	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the current habitat conditions:*____________________________

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GGS 2. Onsite Aquatic Habitat Type. The giant garter snake is an aquatic snake and so requires open water within an emergent marsh complex or other wetland community, surrogate wetlands such as flooded rice fields, or stream or other water conveyance channels that support aquatic vegetation. This attribute addresses the specific aquatic type present.

GGS 2. Onsite Aquatic Habitat Type (max 5 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Emergent marsh complex			0.05	
Stream or water conveyance channel			0.04	
Rice			0.04	
Seasonal wetland			0.03	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the current habitat conditions.*____________________________

GGS 3. Presence of water conveyance channels or other movement habitat. Sufficient aquatic movement habitat is essential to maintain viable and genetically robust giant garter snake populations. Giant garter snakes rely on water conveyance channels – mostly irrigation channels – for local, dispersal, and migratory movements. Therefore the presence of water conveyance channels is an important habitat element within the overall landscape. Instead of quantifying or more closely evaluating the suitability of water conveyance channels, this is a present/not present response based on the presence of permanent water conveyance channels that connect with and continue through adjacent lands. A more qualitative assessment is conducted during the site visit.

GGS 3. Presence of Water Conveyance Channels or other Aquatic Movement Habitat (max 8 points)		
Present/Not Present	**Points**	**Score**
Permanent water conveyance channel that connects with and continues through adjacent lands – present.	8	
Permanent water conveyance channel that connects with and continues through adjacent lands – not present.	0	

FIELD NOTES: *Describe the current habitat conditions.*

GGS 4. Presence of Adjacent Upland Habitat. Upland habitat adjacent to aquatic habitat is used by giant garter snakes for movement, basking, breeding, and overwintering. The upland habitat must be above typical inundation elevation during the inactive season. This attribute is also scored as a present/not present and then addressed in greater detail during the site visit.

GGS 4. Presence of Adjacent Upland Habitat (max 8 points		
Type	**Points**	**Score**
Suitable uplands immediately adjacent to aquatic habitat – present.	8	
Suitable uplands immediately adjacent to aquatic habitat – not present.	0	

FIELD NOTES: *Describe the current habitat conditions.*________________________________

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GGS 5. Presence of Basking Habitat. Basking habitat, usually floating reeds, rocks, or other debris along drainages, channels, and other aquatic habitats, is also an important habitat element for giant garter snakes. This attribute is also scored as a present/not present and discussed in greater, but qualitative detail during the site visit.

GGS 5. Presence of Basking Habitat (max 2 points)		
Present/Not Present	**Points**	**Score**
Basking habitat – present.	2	
Basking habitat – not present.	0	

FIELD NOTES: *Describe the current habitat conditions.*________________________________

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GGS 6. Offsite Land Cover/Habitat within 1 mile. Giant garter snake populations benefit from larger suitable landscapes. Fragmented landscapes and small habitat patches do not represent a sustainable condition. Therefore, surrounding lands are essential to maintain a healthy, productive landscape for giant garter snake.

GGS 6. Offsite Land Cover/Habitat within 1 mile (max 15 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Emergent marsh			0.15	
Rice			0.13	
Seasonal wetland			0.10	
Grassland			0.05	
Irrigated pasture			0.04	
Hay crops			0.0	
Rotational cropland			0.0	
Orchard/Vineyard			0.0	
Developed			0.0	
Other non-habitat			0.0	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the current habitat conditions within 1 mile.* ____________________

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GGS 7. Documented Occurrences.
Close proximity to documented occurrences increases the opportunity for future occupancy.

GGS 7. Documented Occurrences (select one, max 10 points)		
Distance	**Points**	**Score**
Onsite	10	
Within 0.5 mile	5	
Within 1 mile	3	
Within 2 miles	2	
Within 3 miles	1	

FIELD NOTES: *Describe reported occurrences within 3 miles of the property.*_______________

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GGS 8. Proximity to Protected Parcels.
Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area.

It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

GGS 8. Proximity to other Protected Properties (select one, max 6 points)		
Distance	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ______________________________
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GGS 9. Habitat Enhancement Practices.

Where habitat conditions are otherwise suitable, giant garter snake may benefit from certain habitat enhancement practices.

GGS 9. Habitat Enhancement Practices (max 20 points)			
Management Activity	**Definition**	**Points**	**Score**
Marsh restoration	Restoring freshwater emergent marsh increases high value habitat for giant garter snake.	10	
Hedgerow creation	Hedgerows are at least 15-feet wide and at least 400 linear feet. They typically are established along agricultural field borders or along the edges of water conveyance canals. They may be dominated by open native perennial grasses to enhance microtine prey populations but can also include scattered trees and shrubs. They provide refuge to rodent prey species and nesting/cover habitat for many species.	4	
Marsh protection	Actions that protect the integrity of marsh habitats, including cattle exclusion and ensuring a sufficient water supply.	3	
Rice field flood-up/draw-down	Timing the spring flood up and fall draw-down of rice fields to correspond with giant garter snake active and inactive periods to maximize reproduction and reduce mortality.	3	
	SCORE:		

FIELD NOTES: *Describe the enhancement practices.*________________________________

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GGS 10. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for giant garter snake. Examples include properties with habitat adjacent to busy roadways; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

GGS 10. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:____

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – Giant Garter Snake

Evaluation Type	Factor #	Factor	Max. Points	Score	Combined Score
Land Cover/ Habitat	GGS 1	Onsite Land Cover	8		
	GGS 2	Aquatic habitat Type	5		
	GGS 3	Channel habitat (movement/dispersal)	12		
	GGS 4	Adjacent upland	8		
	GGS 5	Basking habitat	2		
Landscape Factors	GGS 6	Offsite land cover/habitat	15		
	GGS 7	Documented occurrences	20		
	GGS 8	Proximity to protected parcels	10		
Management Factors	GGS 9	Habitat Enhancement	20		
	GGS 10	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Western Pond Turtle

Conservation for the western pond turtle will be met through the protection of suitable aquatic habitats, rice, and associated grassland and other uncultivated uplands. To be considered for conservation of western pond turtle, properties must include a minimum of 2.5 acres of aquatic habitat (e.g., perennial streams, larger water conveyance channels, or large ponds) adjacent to at least 200 feet suitable upland habitat.

WPT 1. Aquatic Habitat. Other than the use of upland habitats for nesting, western pond turtles are entirely aquatic and require permanent streams, lakes, or ponds. In the Plan Area, suitable aquatic habitat for the western pond turtles is found primarily in larger creeks and sloughs, such as Putah Creek, Cache Creek, and Babel Slough, and in large water conveyance channels, such as the Knights Landing Ridge Cut and Willow Slough Bypass. The relatively few permanent ponds or lakes in the Plan Area tend to support predatory species and are therefore given lower value than other aquatic features.

WPT 1. Aquatic Habitat (select one) (max 20 points)		
Type	**Point Range**	**Score**
Natural perennial stream	15-20	
Permanent water conveyance channel	10-15	
Large pond or lake	5-10	

FIELD NOTES: *Describe the current habitat conditions.*______________________________

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WPT 2. Availability of Adjacent Upland Habitat. Western pond turtles require upland habitat for nesting, overwintering, and dispersal. Because of the extent of cultivation that occurs in the Plan Area, suitable upland habitat should be immediately adjacent to aquatic habitat, should extend at least 20 feet from the edge of the high water aquatic habitat, and extend for a minimum of 200 feet along the aquatic habitat. Suitable upland habitats include adjacent riparian vegetation (on slopes not exceeding 50%, hedgerows, uncultivated grasslands and pasturelands, and some uncultivated ruderal or weedy habitats.

WPT 2. Availability of Adjacent Upland Habitat (at least 20 feet-wide, 200-feet-long, and uncultivated) (max 20 points)		
Type	**Points**	**Score**
Uncultivated grassland	20	
Riparian	18	
Pasture	10	
Ruderal	6	
Cultivated cropland	4	
None	0	

FIELD NOTES: *Describe the current habitat conditions.*______________________________

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WPT 3. Presence of Basking Habitat. Basking habitat, usually logs or rocks is an important western pond turtle habitat element. This attribute is also scored as a present/not present but the range of points is dependent on the extent and quality of the basking habitat, which is qualitatively measured during the site visit.

WPT 3. Presence of Basking Habitat (max. 20 points)		
Present/Not Present	**Point Range**	**Score**
Basking habitat – present.	10 to 20	
Basking habitat – not present.	0	

FIELD NOTES: *Describe the current habitat conditions.*__________________________________

WPT 4. Documented Occurrences. Close proximity to documented occurrences increases the opportunity for future occupancy.

WPT 4. Documented Occurrences (select one, max 14 points)		
Distance	**Points**	**Score**
Onsite	14	
Within 0.5 mile	8	
Within 1 mile	4	
Within 2 miles	2	
Within 3 miles	1	
>3 miles	0	

FIELD NOTES: *Describe the distribution within 3 miles of the property.* ____________________

WPT 5. Proximity to Protected Parcels. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

WPT 5. Proximity to other Protected Properties (select one, max 6 points)		
Distance	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ___________________________

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WPT 6. Habitat Enhancement Practices. Where habitat conditions are otherwise suitable, western pond turtles may benefit from certain habitat enhancement practices. To receive credit for enhancements, they need to be in association with existing pond turtle habitat. For example, hedgerow creation must be adjacent to a suitable aquatic habitat. Hedgerows along non-aquatic field borders do not necessarily benefit pond turtles. Flooded rice has been shown to support juvenile pond turtles, but this occurs only where other suitable aquatic habitat for pond turtles occurs adjacent to rice fields. Therefore, management of rice fields must also be in association with suitable aquatic habitat. Likewise, marsh creation and protection must also be in association with existing aquatic habitat for pond turtles.

WPT 6. Habitat Enhancement Practices (maximum 20 points)			
Management Activity	**Definition**	**Points**	**Score**
Hedgerow creation	Hedgerows are at least 15-feet wide and at least 400 linear feet. To benefit pond turtles, they must be along the edges of suitable aquatic habitat, including large water conveyance canals. They may be dominated by open native perennial grasses to enhance microtine prey populations but can also include scattered trees and shrubs. They provide refuge to rodent prey species and nesting/cover habitat for many species, including pond turtles.	8	
Marsh restoration	Restoring freshwater emergent marsh adjacent to existing suitable aquatic habitat can increase cover habitat for western pond turtle.	7	
Marsh protection	Actions that protect the integrity of marsh habitats, including cattle exclusion and ensuring a sufficient water supply can also benefit pond turtles.	3	
Rice field flood-up/draw-down	Timing the spring flood up and fall draw-down of rice fields to correspond with emergence of hatchling pond turtles.	2	
Other (describe below)			
	SCORE:		

FIELD NOTES: *Describe the enhancement practices.*____________________________________

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WPT 7. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for western pond turtle. Examples include properties with habitat adjacent to busy roadways; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

WPT 7. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:____

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – Western Pond Turtle					
Evaluation Type	**Factor #**	**Factor**	**Max. Points**	**Score**	**Combined Score**
Land Cover/ Habitat	WPT 1	Aquatic habitat	20		
	WPT 2	Adjacent upland	20		
	WPT 3	Basking habitat	20		
Landscape Factors	WPT 4	Documented occurrences	14		
	WPT 5	Proximity to protected parcels	6		
Management Factors	WPT 6	Habitat Enhancement	20		
	WPT 7	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

California Tiger Salamander

Conservation of the California tiger salamander will be met through the protection of grassland landscapes where aquatic habitats are available for breeding. To be considered for California tiger salamander conservation, properties must include a minimum of 100 acres of intact grassland and include suitable aquatic features or be contiguous with other protected habitat suitable for California tiger salamander. Vernal pools and other seasonal rain pools are the primary breeding habitat for California tiger salamanders. However, the species is also known to occur in artificial ponds, including stock ponds. All known occurrences in the Plan Area are associated with stock ponds in the northern Dunnigan Hills. In artificial sites, water management is a key issue related to occurrence. Sufficient water must be present in the stock ponds to support the duration of breeding and larval development periods. California tiger salamanders migrate seasonally between subterranean overwintering sites and breeding pools. The species often uses ground squirrel burrows or other rodent burrows as overwintering habitat, and thus the presence of ground squirrels or other rodent activity is an important habitat element. Three species-specific attributes are included for California tiger salamander, Land Cover Type, Availability of Onsite Aquatic Habitat, and Presence of Ground Squirrels.

CTS 1. Land Cover Type. California tiger salamander occurs in grassland and oak savannah communities. Irrigated pastures, if they are associated with grassland landscapes, may also be used occasionally.

CTS 1. Land Cover/Habitat (max 20 points)				
Vegetation Type	**Acres**	**Percent of Total**	**Multiplier**	**Score**
Grassland			0.2	
Oak Savannah			0.2	
Irrigated pasture			0.1	
Hay and grass crops			0.0	
Rotational cropland			0.0	
Orchard/Vineyard			0.0	
Developed			0.0	
Total Acres			**Total Score**	

FIELD NOTES: *Describe the land use and habitat conditions.* ____________________________

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CTS 2. Availability of Onsite Aquatic Habitat. California tiger salamanders require aquatic habitats for breeding and larval development. Suitable aquatic habitat is an essential habitat element for this species. This attribute is scored as present or not present. The point range is dependent on the quality of the habitat, which is qualitatively measured during the site visit.

CTS 2. Availability of Onsite Aquatic Habitat (select one) (max 20 points)		
Condition	**Points**	**Score**
Stock pond or other aquatic breeding habitat present	10 to 20	
Stock pond or other aquatic breeding habitat not present	0	

FIELD NOTES: *Describe the aquatic habitat (size, depth, vegetation)*______________________

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CTS 3. Presence of Ground Squirrels. California tiger salamanders often use California ground squirrel burrows as overwintering habitat. The presence of ground squirrels in an otherwise suitable habitat area increases the likelihood of future occupancy.

CTS 3. Presence of Ground Squirrels (select one) (max 14 points)		
Condition	**Points**	**Score**
Ground squirrel activity present	14	
Ground squirrel activity not present	0	

FIELD NOTES: *Describe the extent of ground squirrel activity.*___________________________

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CTS 4. Documented Occurrences. Close proximity to documented occurrences increases the opportunity for future occupancy.

CTS 4. Documented Occurrences (select one, max 40 points)		
Distance	**Points**	**Score**
Onsite	40	
Within 0.5 mile	20	
Within 1 mile	10	
Within 2 miles	5	
Within 3 miles	1	
>3 miles	0	

FIELD NOTES: *Describe the distribution within 3 miles of the property.* ________________

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CTS 5. Proximity to Protected Properties. Existing protected properties that are fully protected as per the Yolo JPA definition are scattered throughout the Plan Area. It is assumed that closer proximity to other protected lands enhances the value of the evaluated property by providing nearby stable long-term habitat value.

CTS 5. Proximity to other Protected Properties (select one, max 6 points)		
Distance	**Points**	**Score**
Adjacent	6	
Within 1 mile	3	
Within 2 miles	1	
>2 miles	0	

FIELD NOTES: *Describe other protected parcels within 2 miles.* ________________________

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CTS 6. Factors that increase mortality risk or degrade habitat value. Some activities or proximity issues can increase the risk of mortality and degrade habitat value for California tiger salamander. Examples include properties with habitat adjacent to busy roadways; proximity to extreme disturbances (e.g., pumping stations, industrial/manufacturing complexes), properties adjacent to recreational areas, planned urban development, or other areas that are subject to substantial human presence and disturbances, overgrazing, and degrading of stock ponds by cattle. Presence of predatory fish can also degrade habitat value. Scoring is based on the onsite assessment and ranges from negative 1 to negative 10 points using the collective opinion of the STAC evaluation staff.

CTS 6. Factors that Increase Mortality Risk or Degrade Habitat Value (maximum score of 0 points)		
Disturbance Activity	**Point Range**	**Score**
Potential mortality due to proximity to high risk roads, etc.	-1 to -10	
Proximity to extreme urban disturbances	-1 to -10	
Recreational disturbances including off-road vehicle use	-1 to -10	
Overgrazing and degrading of stock ponds by cattle	-1 to -10	
Other (describe below)	-1 to -10	
	SCORE:	

FIELD NOTES: *Describe the current disturbances and land use practices that increase mortality risk or degrade habitat value*:____

Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type.

Scoring Summary – California Tiger Salamander					
Evaluation Type	**Factor #**	**Factor**	**Max. Points**	**Score**	**Combined Score**
Land Cover/ Habitat	CTS 1	Land Cover Type	20		
	CTS 2	Aquatic breeding habitat	20		
	CTS 3	Presence of ground squirrel	14		
Landscape Factors	CTS 4	Documented occurrences	40		
	CTS 5	Proximity to protected parcels	6		
Management Factors	CTS 6	Factors that Degrade Value	0		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Valley Elderberry Longhorn Beetle

Conservation for valley elderberry longhorn beetle will be met through the protection of riparian habitats along Putah Creek or Cache Creek that support mature elderberry shrubs. Conservation can also be achieved through protection of shrubs along smaller drainages, such as Willow Slough or Dry Slough. The species can also benefit from the protection of some upland sites where isolated elderberry shrubs may occur. However, the scoring is scaled based on the potential long-term sustainability of mature elderberry shrubs. The two largest streams, Putah Creek and Cache Creek, with the most extensive riparian systems provide higher value and long-term benefit than do shrubs along smaller streams or isolated upland shrubs that may be more subject to incidental disturbances or have less likelihood of occupancy by valley elderberry longhorn beetle. Only one species-specific attribute is included for valley elderberry longhorn beetle, the Presence of Mature Elderberry Shrubs.

VELB 1. Presence of Mature Elderberry Shrubs. The elderberry shrub is the host plant for valley elderberry longhorn beetle and therefore necessary for the occurrence of this species. Scoring is based on location and number of shrubs present.

VELB 1. Presence of Mature Elderberry Shrubs			
Location/condition	**Number of Shrubs**	**Points**	**Score**
Putah/Cache Creek	>10	100	
	5 to 10	75	
	1 to 5	50	
Other Riparian	>10	75	
	5 to 10	50	
	1 to 5	25	
Upland Sites	>10	50	
	5 to 10	25	
	1 to 5	5	

FIELD NOTES: *Describe the number, size, and condition of shrubs.*

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Scoring Summary

The scoring summary consists of total points for each of the scoring factors, aggregated by evaluation type. For valley elderberry longhorn beetle, only one attribute is assigned, presence of elderberry shrubs. The scoring is scaled according to the location or habitat association and the number of shrubs present. Elderberry shrubs that occur along Putah or Cache Creek and that would be incorporated into a preserve design are assumed to potentially receive maximum protection. Shrubs along smaller streams or isolated upland shrubs are potentially more subject to disturbances and are assumed less likely to be occupied by valley elderberry longhorn beetle.

Scoring Summary – Valley Elderberry Longhorn Beetle					
Evaluation Type	**Factor #**	**Factor**	**Points**	**Score**	**Combined Score**
Presence/ Absence	VELB 1	Presence of mature elderberry shrubs	100		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring. The STAC will then make a recommendation using both the scoring evaluation and other factors that may contribute to the conservation of the species.

Palmate-Bracted Bird's Beak

In Yolo County, this species is known to occur only in the vicinity of the remaining alkali sink community southeast of Woodland. This location is one of only seven known occurrence sites for the palmate-bracted bird's beak. Opportunity for protection and preservation of this species in Yolo County is focused on the Woodland Regional Park, where the species is known to occur. This species is also known to occur on the adjacent protected properties to the north and to the east. While the City of Woodland intends to protect this population , bringing the property into the Yolo Habitat Conservancy's preserve network will ensure long-term protection, management, and monitoring of the population. It will also meet the conservation objectives for this species under the HCP/NCCP. Its adjacency with other protected properties to the north and east will future enhance the potential for long-term protection and sustainability of this endangered plant population.

PBBB-1. Presence/Absence. Associated with alkali sink seasonal wetland communities, this rare, endangered plant is known from only seven sites within its range and only one site in Yolo County.

PBBB-1. Presence/Absence of Palmate-bracted Bird's Beak	
Presence/Absence	**Score**
Present	100
Absent	0

FIELD NOTES: ____

Scoring Summary – Palmate-bracted Bird's Beak					
Evaluation Type	**Factor #**	**Factor**	**Max. Points**	**Score**	**Combined Score**
Presence/ Absence	PBBB-1	Presence of plants	100		

Summary Description, Rationale, and Qualitative Assessment

This section summarizes the scoring evaluation and includes a qualitative assessment that addresses other attributes of the property beyond that which are addressed in the scoring.

Multi-Species Summary

In this section, summarize the presence or absence of each Covered Species on the property being evaluated. Fill in the following table to indicate whether or not habitat is present for each species and the combined total score for each species evaluated (i.e., the total of the each of the evaluation categories for each species).

Species	Habitat Present (Y/N)	Combined Score
Swainson's hawk		
White-tailed kite		
Burrowing owl		
Tricolored blackbird		
Yellow-billed cuckoo		
Least Bell's vireo		
Bank swallow		
Giant garter snake		
Western pond turtle		
California tiger salamander		
Valley elderberry longhorn beetle		
Palmate-bracted bird's beak		

Briefly summarize species evaluation (if habitat is not present, indicate with N/A:

Swainson's hawk:

White-tailed kite:

Burrowing Owl:

Tricolored Blackbird:

Yellow-billed Cuckoo:

Least Bell's Vireo:

Bank Swallow:

Giant Garter Snake:

Western Pond turtle:

California Tiger Salamander:

Valley Elderberry Longhorn Beetle:

Palmate-bracted Bird's Beak:

Recommendation

Recommendations for parcel acquisition are made on the basis of the individual evaluation scores, the number of Covered Species that would benefit from conservation of the property, other qualitative attributes of the property, both positive and negative, that are not specifically addressed in the scoring, and the extent to which the property contributes to species conservation and meets the objectives of the conservation strategy.

Appendix G

Pollinator Conservation Strategy

Yolo Natural Heritage Program (HCP/NCCP)

Pollinator Conservation Strategy

Prepared by
The Xerces Society for Invertebrate Conservation
Portland, Oregon / Sacramento, California

Yolo Natural Heritage Program (HCP/NCCP)

Pollinator Conservation Strategy

Prepared by
Scott Hoffman Black, Matthew Shepherd, Mace Vaughan,
Caitlin LaBar, and Nathan Hodges

The Xerces Society for Invertebrate Conservation
Portland, OR / Sacramento, CA

November 2009

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Pollination is "central to all human beings, livestock, and wildlife" (Kevan 1999). Plant pollination by insects is one of the most widespread and important ecosystem services and is essential in both natural and agricultural landscapes. It is estimated that 60 – 90% of the world's flowering plants depend on animals—most of them insects—for pollination.

Research shows that native bees contribute substantially to the pollination of many crops, including watermelon, canola, sunflower, and tomatoes. The value of crop pollination by native, wild bees in the United States is estimated at $3 billion. In Yolo County, extensive studies demonstrate the significant role of native pollinators in the economic viability of agriculture. In addition, native bees provide incalculable value as pollinators of native plants.

Animal pollinators in North America include bees, butterflies, moths, wasps, flies, beetles, ants, bats, and hummingbirds. Insects make up the vast majority of pollinator species, and bees are the most important pollinators in temperate North America.

There are approximately 4,000 species of native bees in North America. Bee habitat requires two basic components: flowers on which to forage and nest sites. Many pollinators are adapted to forage on particular plants, so a diverse community of pollinators requires a diverse array of flowers. Most native bees are solitary nesting. Around 70% of bee species nest in the ground, excavating shallow tunnels in patches of bare soil, with most of the remaining 30% nesting in cavities in old trees or plant stems. Bumble bees require a small cavity such as an abandoned rodent hole.

Foraging and nesting habitat needs to be within the flight range of a bee. Most solitary wild bees have maximum foraging ranges between 150 and 600 meters. Foraging ranges and species richness are strongly influenced by the landscape structure (habitat area and connectivity) within 250 meters of the location. The presence or absence of seminatural habitat has a dramatic effect on nesting and connectivity between habitats is critical for offspring production.

There is evidence of declines in both managed and wild pollinators. European pollinator monitoring programs have found significant declines in pollinators, and although pollinators have been monitored less intensively outside of Europe, declines of some prominent taxa such as bumble bees have been well-documented. Causes of declines are difficult to pinpoint, but loss of habitat due to increasing urbanization, expansion of intensive agriculture, invasive species, disease, parasites, and the widespread use of pesticides all negatively impact pollinator populations. Protecting, enhancing, or providing new habitat is the best way to conserve native pollinators.

Each of the six major landscapes in Yolo County—agriculture, grasslands, woodlands, shrubland and scrub, riparian and wetland, and urban and barren—are affected to a greater or lesser degree by one or more of these threats.

This paper outlines the importance of pollinators to these landscapes and the threats these animals face. It also identifies strategies that offer ways to halt or reverse pollinator declines.

SECTION 1

INTRODUCTION

Pollination is "central to all human beings, livestock, and wildlife" (Kevan 1999). Plant pollination by insects is one of the most widespread and important ecosystem services on the planet and is essential in both natural and agricultural landscapes. It is estimated that 60 – 90% of the world's flowering plants depend on animals—most of them insects—for pollination (Kremen et al. 2007). Of the 124 most commonly cultivated crops in the world, eighty-seven are animal pollinated (Klein et al. 2007), and insect-pollinated forage plants such as alfalfa and clover also provide feed for the animals that give us dairy and meat products (Richards & Kevan 2002). Calculated by volume, roughly 35% of the food humans consume is dependent on pollination by animals (Klein et al. 2007).

Animal pollinators in North America include bees, butterflies, moths, wasps, flies, beetles, ants, bats, and hummingbirds. Insects make up the vast majority of pollinator species, and bees (Hymenoptera) are the most important pollinators in temperate North America. Although the nonnative honey bee (*Apis mellifera*) provides the bulk of crop pollination in the U.S., native bees are known to provide important pollination services to crops (e.g., Kevan et al. 1990, Ricketts 2004, Klein et al. 2007), and are estimated to contribute $3 billion worth of crop pollination annually to the U.S. economy (Losey & Vaughan 2006). In Yolo County, extensive studies of different crops demonstrate the significant role of native pollinators in the economic viability of those crops (Kremen et al. 2001, Kremen et al. 2002a, Kremen et al. 2002b, Kremen et al. 2004). In addition, native bees provide incalculable value as pollinators of native plants (Kearns et al. 1998, Kremen et al. 2002a).

Of the other orders of pollinating insects, flies (Diptera) provide substantial pollination services (Speight 1978, Kearns 2001, Larson et al. 2001) especially in alpine areas and tundra. Other insects such as beetles (Coleoptera) and wasps (Hymenoptera) provide pollination services, though to a lesser extent (e.g., Frankie et al. 1990, Irvine & Armstrong 1990, Kevan 1999). Most butterfly and moth species (Lepidoptera) visit flowers for nectar, although their contribution to pollination services may be limited (Jennersten 1988, Frankie et al. 1990, Allen-Wardell et al. 1998, Westerkamp & Gottsberger 2000).

Many of these same native pollinator species play a keystone species roll in the health and sustainability of native ecosystems, and are a critical resource for endangered Yolo County plant species such as palmate-bracted bird's-beak, (*Cordylanthus palmatus*) (Saul-Gershenz et al. 2004).

Pollinating insects are necessary for wild plant reproductive success and fitness. Pollinator-plant interactions are seldom completely obligate, instead forming complex pollination webs in which a single plant may receive many visits from different pollinator species and each pollinator may, in turn, visit multiple plants of many different species (Kearns et al. 1998). This pollination web provides a degree of redundancy which may help buffer natural fluctuations in pollinator and/or plant populations. Despite this resiliency, research demonstrates that the loss or decline of pollinator populations can have direct effects on the plants they pollinate and vice versa.

In a review of research addressing the reproductive requirements of twenty-six rare or endangered plant species in the western United States, Tepedino et al. (1997) found that in order to set fruit most of the plants required pollination, usually by native bees. The authors suggest that any management plan hoping to aid in the recovery of an insect pollinated native plant must not only address the requirements of the plant itself, but the native pollinators that enable the plant to reproduce.

1.1 POLLINATORS AND WILDLIFE

The plant communities that pollinators sustain also provide food and shelter for many other animals such as birds, small mammals, and bears. Pollinators are important in wildlife food webs both as an essential step in the availability of seeds, nuts, fruit, and berries and as direct prey. Bears, rodents, small mammals, birds, and many terrestrial invertebrates all have significant dietary components that are attributable directly or indirectly to pollinators.

Pollinators also maintain vegetation communities which provide habitat for wildlife. While pollinator insects perform pollination services only as adults, their larvae are ecologically significant and can shape vegetation communities, provide food for songbirds, decompose detritus, and act as pest control agents. Very little research has been conducted to quantitatively assess the extent to which pollinators and pollination products contribute to the diet of wildlife, but qualitatively it is possible to recognize how important pollinators are in a functional ecosystem.

The following are examples of the importance of pollination to wildlands and wild animals.

- Many migratory songbirds require a diet of berries, fruits, and seeds from insect-pollinated plants, and pollinators (both adults and larvae) are an important component of the diet of many fledglings (Buehler et al. 2002).
- Summerville and Crist (2002) found that forest moths had "important functional roles as selective herbivores, pollinators, detritivores, and prey for migratory passerines."

Given the ecological services insect pollinators perform in natural ecosystems a strong case can be made for pollination being a keystone interaction in nearly all terrestrial ecosystems, necessary not only for plant reproduction, but forming the basis of an energy-rich food web that extends throughout trophic levels (Kearns et al. 1998, Vasquez & Simberloff 2003).

1.2 POLLINATORS AND AGRICULTURE

Honey bees provide the bulk of crop pollination in the U.S., yet the number of managed honey bee hives has declined by 60% in the U.S. since 1950 (Winfree et al. 2007b). In typical year, the U.S. beekeeping industry loses 15 – 20% of hives from a variety of problems, including diseases, pests, pesticide poisoning. Over the last three years, losses of 35% or more have been recorded due to Colony Collapse Disorder. Recent research (much of it in Yolo County) on crop pollination, however, has demonstrated that native bees also make a significant contribution to crop pollination—in some cases providing all of the pollination required when enough habitat is available (Greenleaf & Kremen 2006a, Klein et al. 2007). Today, habitat supporting these native pollinators is increasingly important as honey bee hives become more expensive and difficult to acquire.

Research demonstrates that native bees contribute substantially to the pollination of many crops, including watermelon (Kremen et al. 2002a; Kremen et al. 2004; Winfree et al. 2007b), canola (Morandin & Winston 2005), sunflower (Greenleaf & Kremen 2006b), tomatoes (Greenleaf and Kremen 2006a), and blueberry (Cane 1997; Javorek et al. 2002). The value of crop pollination by native, wild bees in the United States is estimated at $3 billion (Losey & Vaughan 2006).

1.3 POLLINATORS IN NATURAL AREAS: BENEFITS TO AGRICULTURE

The role that adjacent natural habitat plays in providing crop pollination services is increasingly well understood. Proximity to natural or semi-natural non-agricultural land is often an important predictor of pollinator diversity in cropland (Haughton et al. 2003; Bergman et al. 2004; Kim et al. 2006; Kremen et al. 2004; Morandin & Winston 2006; Hendrickx et al. 2007). Natural areas near to farms can also be important sources of pollinators that can recolonize agricultural areas that lost native pollinators due to a pesticide treatment or temporary habitat loss (Öckinger & Smith 2007).

In conjunction with on-farm habitat provided by untilled field margins, hedgerows, bare ground, and non-crop flowers in the agricultural fields, nearby natural habitat is integral to maintaining a long-term population of native pollinators in agricultural landscapes. Pollinators in these areas can provide valuable crop pollination services and add resiliency to the agricultural pollination system. So that natural areas and wildlands close to farms can provide these services, however, it is important that management of those non-arable lands takes into account native pollinators.

1.4 POLLINATORS IN DECLINE

There is ongoing debate in the scientific community as to whether pollinators, and in particular bees which are the most important crop pollinator taxon, are declining at a global scale (Kearns et al. 1998; Steffan-Dewenter et al. 2005; Biesmeijer et al. 2006; NRC 2007). Allen-Wardell et al. (1998) found evidence of declines in both managed and wild pollinators. European pollinator monitoring programs have found significant declines in pollinators as well as the plants they pollinate (Biesmeijer et al. 2006; NRC 2007). Although pollinators have been monitored less intensively outside of Europe, declines of some prominent taxa such as bumble bees have been well-documented (NRC 2007; Evans et al. 2008).

Causes of declines are difficult to pinpoint, but loss of habitat due to increasing urbanization, expansion of intensive agriculture, invasive species, disease, parasites, and the widespread use of pesticides all have negative impacts on pollinator populations (Kearns et al. 1998; Cane & Tepedino 2001; Spira 2001; Goulson 2003; Desneaux et al. 2007; Hendrickx et al. 2007; Steffan-Dewenter & Westphal 2008). As pressure on pollinators increases in developed and agricultural areas, the role that habitat in undeveloped areas can play as long-term refugia for pollinator populations is substantial. Protecting, enhancing, or providing new habitat is the best way to conserve native pollinators (Kremen et al. 2007).

SECTION 2
HABITAT NEEDS, LANDSCAPE STRUCTURE, AND THREATS

2.1 HABITAT NEEDS OF NATIVE POLLINATOR INSECTS

The first step in developing a conservation strategy that will provide for pollinators in Yolo County is to understand the habitat features required by bees and other insect pollinators. These can be divided into two main categories: a diversity of native flowers that will provide nectar and pollen, and egg-laying or nesting sites. Proximity of these resources to each other is also important to consider, as they need to be within the flight range of pollinators.

Diversity of native flowers

A plant community that will support an abundance of diverse pollinators should not only be rich in species but also bloom through a long season. Forage resources are necessary throughout a pollinator's adult life and most species benefit from a succession of blooming plants to provide adequate forage (Bowers 1985; Dramstad & Fry 1995; Kremen et al. 2002a). The wide variety of pollinators and their differing size and body morphology (for example, variations in tongue length between species) means that some species can reach the nectar or pollen in flowers that other pollinators cannot. Many pollinator species have morphological features specific to foraging on certain flower species (Speight 1978; Dramstad & Fry 1995; Thorp 2000; Thorp et al. 2002; Goulson & Darvill 2004). For example, there are short-, medium-, and long-tongued species of bumble bees that preferentially forage on plants with corresponding variations in corolla tube length (Pyke 1982). Flies also have tongues of varying lengths and can be quite specialized foragers (Kearns 2001; Larson et al. 2001). A diverse community of insect pollinators, therefore, requires a diverse array of floral resources (Bowers 1985; Dramstad & Fry 1995; Kremen et al. 2002a; Holzschuh et al. 2008; Wojcik et al. 2008).

Key Points

- *Pollinators need flowers on which to forage.*
- *The plant community should be diverse and bloom through a long season.*
- *Many pollinators are adapted to forage on particular plants.*
- *A diverse community of pollinators requires a diverse array of flowers.*

Nesting or egg-laying sites

<u>Bees</u>

Bees need nest sites. When supporting populations of native bees, protecting or providing nest sites is as important as, if not more important than, providing flowers (Tscharntke et al. 1998; Cane 2001; Potts et al. 2005).

Native bees often nest in inconspicuous locations. For example, many excavate tunnels in bare soil, others occupy tree cavities, and a few even chew out the soft pith of the stems of plants like elderberry or blackberry to make nests (O'Toole & Raw 1999, Michener 2000). It is important to retain as many naturally occurring sites as possible and to create new ones where appropriate.

North America has approximately 4,000 species of native bees (Winfree et al. 2007a). The majority, about 70% or very roughly 2,800 species, are ground nesters. These bees usually need

Table 1. General Habitat Requirements of Native Bees and Butterflies

Pollinator	Food	Shelter
Solitary bees	Nectar and pollen	Most nest in bare or partially vegetated, well-drained soil; many others nest in narrow tunnels in dead standing trees, or excavate nests within the pith of stems and twigs; some construct domed nests of mud, plant resins, saps, or gums on the surface of rocks or trees
Bumble bees	Nectar and pollen	Most nest in small cavities (approx. softball size), often underground in abandoned rodent nests or under clumps of grass, but can be in hollow trees, bird nests, or walls
Honey bees	Nectar and pollen	Hollow trees for feral colonies
Butterflies and Moths – larva	Leaves of larval host plants	Larval hostplants
Butterflies and Moths - pupa	Non-feeding stage	Protected site such as a bush, tall grass, a pile of leaves or sticks or, in the case of some moths, underground
Butterflies and Moths – adult	Nectar; some males obtain nutrients, minerals, and salt from rotting fruit, tree sap, animal dung and urine, carrion, clay deposits, and mud puddles	Protected site such as a tree, bush, tall grass, or a pile of leaves, sticks or rocks

(Adapted from: *Native Pollinators*. Feb. 2006. NRCS Fish and Wildlife Habitat Management Leaflet. No. 34.)

direct access to the soil surface (Potts et al. 2005) to excavate and access their nests. Ground-nesting bees seldom nest in rich soils, so poor quality sandy or loamy soils may provide fine sites. The great majority of ground-nesting bees are solitary, with one female excavating and provisioning her own nest. These may be in large aggregations with hundreds or thousands of bees excavating nests in the same area. Some species, however, will share the nest entrance or cooperate to excavate and supply the nest (Michener 2000).

Approximately 30% (around 1,200 species) of bee species in North America are wood nesters. These are almost exclusively solitary. Generally, these bees nest in abandoned beetle tunnels in logs, stumps, and snags. A few can chew out the centers of woody plant stems and twigs (Michener 2000), such as elderberry, sumac, and in the case of the large carpenter bee, agave or even soft pines. Dead limbs, logs, or snags should be preserved wherever possible. Some wood-nesters also use materials such as mud, leaf pieces, or tree resin to construct brood cells in their nests (O'Toole & Raw 1999).

Bumble bees are the native species usually considered to be social. There are about 45 species in North America (Kearns & Thomson 2001). They nest in small cavities, such as abandoned rodent nests under grass tussocks or in the ground (Kearns & Thompson 2001). Leaving patches of rough undisturbed grass in which rodents can nest will create future nest sites for bumble bees (McFrederick & LeBuhn 2006).

<u>Butterflies</u>
Lepidoptera lay their eggs on or close to the plant on which their larvae will feed once they hatch (Feber et al. 1996; Ries et al. 2001; Croxton et al. 2005). If conserving strong butterfly populations is a management goal, caterpillar hostplants are a necessary part of the habitat (Feber et al. 1996). Some butterflies may rely on plants of a single species or genus for host-plants (the monarch is an example, feeding only on species of milkweed, *Asclepias* sp.), whereas others may exploit a wide range of plants, such as some swallowtails (*Papilio* sp.), whose larvae can eat a range of trees, shrubs, and forbs (Scott 1986). In order to provide egg-laying habitat for the highest number of butterflies and moths, growers should first provide plants that can be used by a number of species. Later those plants can be supplemented with hostplants for more specialized species.

<u>Flies</u>
Several families of flies contain pollinating species. The most important are the families Syrphidae (syrphid or flower flies) and Bombyliidae (bee flies) (Speight 1978; Kearns 2001). Most syrphid flies are aphidophagous as larvae, and therefore require habitat that offers a sufficient abundance of aphids in addition to flowers for the nectar-feeding adults (Gilbert 1986; MacLeod 1999; Sutherland et al. 1999; Colley & Luna 2000). Bee fly larvae are, depending on species, parasites of larvae various insects, including solitary bees and wasps, beetles, moths, grasshoppers, and other flies (Marshall 2006). Larvae of other pollinating flies are predatory, saprophytic, or parasitic, depending on the species (Kearns 2001).

<u>Beetles</u>
The larval food of beetles is extremely variable depending on the species, and is too numerous to list here. The best strategy for attracting or retaining native beetle pollinators is to provide a variety of native plant species that will serve as food for herbivorous beetle larvae, as well as attract a variety of insects that will benefit insectivorous beetle larvae. However, specific requirements of immature stages should be identified when planning to protect the habitat of sensitive species. For example, larvae of the endangered molestan blister beetle (*Lytta molesta*) feed on the provisions and immature stages of ground nesting native bees in or near dried vernal pools (Selander 1960, Halstead & Haines 1992). Therefore, it is important to consider both native plant and bee species associated with their vernal pool habitat when designing a conservation strategy for this beetle.

Key Points

- *There are approximately 4,000 species of native bees in North America; most are solitary nesting.*

- *Nest sites are a key component of bee habitat.*
- *Around 70% of bees nest in the ground, excavating shallow tunnels in patches of bare soil.*
- *Around 30% of bees nest in cavities in old trees or plant stems.*
- *Bumble bees require a small cavity such as an abandoned rodent hole.*
- *Butterflies lay eggs on particular plants that their caterpillars eat.*
- *The egg laying needs of flies and beetles are more diverse, and vary between species.*

2.2 FLIGHT RANGE

How far a pollinator can fly is an important consideration for restoration and management of pollinator habitat. The foraging distance of a bee limits its capacity to move between nesting and foraging habitat. The limitation of foraging distance may be most important for bees. Most insects, including butterflies, flies, and beetles, find egg laying and feeding sites as they move across the landscape. Bees, on the other hand have a fixed location for their nest, collecting pollen and nectar from nearby habitat, and transporting it to that nest. Their nesting success is therefore dependent on the availability of resources within their flight range (Williams & Kremen 2007).

The ideal is to have nesting and forage resources in the same habitat patch, but bees are able to adapt to landscapes in which nesting and forage resources are separated (Cane 2001; Westrich 1996). How far apart habitat patches should be is defined by how far bees can fly on a foraging trip. In general, bigger bees can fly further than smaller bees. Reviewing the literature on sixteen European solitary bee species, Gathman & Tscharntke (2002) found that solitary wild bees generally have maximum foraging ranges between 150 and 600 meters, with the distance correlating positively with body length. They also found that foraging trip duration (6 to 28 minutes) correlated with body length. Foraging flights of bumble bees on a farm in Britain were tracked using harmonic radar by Osborne et al. (1999). In an arable landscape that included woodlands and hedgerows, the bumble bees' outward tracks averaged 275 meters in length, with a maximum recorded of 631 meters, however some flights went further, beyond the range of the radar. More recent work (Greenleaf et al. 2007) established that the best predictor for the foraging range of a bee was a measurement of body size, specifically the distance between the wing bases (intertegular span). However, they also recognize that the theoretical range and actual range differ. The actual foraging range is influenced by landscape factors, such as the density and distribution of flowers and how easy it is to cross other habitats.

The study by Gathmann and Tscharntke (2002) also investigated the distance bees travel between forage and nest sites; they found that the highest probability of a nest site being used was when the nest was less than 260 meters from a species' food plant. Kohler et al. (2008) found similar results for bees and hoverflies in the Netherlands, where both bees and hoverflies were primarily observed no further than 200 meters from their habitat. Considering flight distances does place some limits on how habitat is located in the landscape, but also means it does not need to be in one place. Taken together, a diversity of flowering crops, wild plants on field margins, and plants up to a half mile away on adjacent land can provide the sequentially blooming supply of flowers necessary to support resident populations of pollinators (Winfree et al. 2008)

Key Points

- *Foraging and nesting habitat needs to be within the flight range of a bee.*
- *The flight range of a bee relates directly to body size: larger bees can fly further than small ones.*
- *Most solitary wild bees have maximum foraging ranges between 150 and 600 meters*
- *Habitat patches should be no more than 600 meters from the crop*
    - *Shorter distances—250 to 300 meters— are optimal*
- *Foraging ranges are strongly influenced by the landscape structure.*

2.3 LANDSCAPE STRUCTURE

The work of Greenleaf et al. (2007) highlighted the influence of landscape structure on the flight range of bees, and thus their actual foraging distance. This influence of environmental condition is reinforced by research into how landscape structure influences the species richness of bees in fragmented grassland (Steffan-Dewenter 2003). The author concluded that the species richness of solitary bees at the study sites depended on the landscape structure (habitat area and connectivity) within 250 meters of the site, but that the abundance of honey bees, which have a much longer foraging distance, was influenced by the landscape structure within 3000 meters. In reviewing nearly two dozen studies that investigated crop pollination services and isolation from natural habitat, Ricketts et al. (2008) showed that visitation rates by native bees to crops declined rapidly as the distance from natural habitat increased. On average, visitation rates were at 50% of their maximum at 668 meters from habitat.

It is also likely that the scale of agriculture itself influences the presence and abundance of bees in the crop. Holzschuh et al. (2006) found that bee diversity was greater in organic wheat fields than conventional fields, due to the presence of more flowers. However, the difference between the farming methods was less pronounced in landscapes that had more habitat patches. This is corroborated by work by Winfree et al (2008) conducted in the border of New Jersey and Pennsylvania. In the study region, wild bees made the majority of visits to the four focal crops (watermelon, muskmelon, tomato, and pepper). Crop visitation by bees was not related to farming method (organic or conventional) but was most influenced by the presence of habitat in the landscape surrounding the fields. This landscape has high hetereogeneity with woodlands and other habitat widely dispersed. The woodland cover was 8 – 60% of the landscape within 2 kilometers of the field, which is comparable with the percentage of natural habitat in Yolo County (0 – 62%). The difference is the distance from the field to the nearest woodland. In this study area in New Jersey/Pennsylvania it was no greater than 343 meters, in Yolo County the maximum is 5980 meters. The heterogenous landscape of New Jersey/Pennsylvania, habitat is within the foraging distance of many bees.

Investigating the offspring production and survival of blue orchard bees (*Osmia lignaria*), Williams and Kremen (2007) concluded that the presence or absence of seminatural habitat had a dramatic effect on nesting and that connectivity between habitats is "critical for offspring production." The value of the surrounding landscape for bees depends on degree of habitat specialization of the bees, i.e., if bees have particular needs that are not met by landscape, it doesn't help them (Steffan-Dewenter 2003).

The influence of a mass-flowering crop on bumble bee populations has been studied in Germany. The research compared bumble bee diversity and abundance in agricultural regions growing oil seed rape (*Brassica napus*) and in regions without. Early colony growth of bumble bees was faster where the mass-flowering crop was a resource (Westphal et al 2003), but by the end of the season there was no difference in reproductive success between colonies in areas with the mass-flowering crop and areas without (Westphal et al 2009). Bumble bee colonies have a long season and require foraging resources all season to support them. The mass-flowering crop gave a short-lived abundance of foraging that could not be sustained by alternative sources in the landscape.

In modeling the optimal landscape design to provide crop pollination, Brosi et al (2008) created a framework for habitat creation in agricultural landscapes. The authors suggest that for bees with large foraging distances habitat should be placed in the center of the farm so that the bees are retained on the farm. Bees with short foraging distances require more of the farm to be habitat and for the habitat patches to be more evenly scattered across the farm. The best strategy may be to have a few larger habitat patches with smaller patches across the farm. These may be placed in low-fertility areas of the farm within foraging distance of crops. The authors do not address the size of habitat.

The suggestion that habitat can be in small patches is supported by the finding of Tscharntke et al (2002). They demonstrated that the fragmentation of habitat across an agricultural landscape significantly affects the number of butterfly species. Ten hectares of habitat in many small fragments can support more species of butterflies than the same size of habitat in one or two large patches. The authors concluded that a larger number of small habitat fragments can contain a wider range of conditions than a couple of large patches. However, Krauss et al (2009) found that size of the habitat and the diversity of flowers, not the age of the habitat, most strongly influenced the species richness of bees.

The impact of landscape change differs between bee species and is influenced by life history and habitat requirement. Ricketts et al. (2008) found that declines in visitation rates to flowers were steeper for social bees than solitary bees in the tropics, which was inconsistent with the findings of Steffan-Dewenter et al. (2006) studying bees in temperate grasslands. Social bees in the tropics are mainly stingless bees, which require cavities in mature trees, a feature that is generally missing from agricultural landscapes. Social bees in temperate regions are mainly bumble bees and halictids, which nest in the ground or under grass. These features often can be found in farmland.

Key Points

- *Species richness of solitary bees depends on the landscape structure (habitat area and connectivity) within 250 meters of the location.*
- *Abundance of honey bees influenced by the landscape structure within 3000 meters.*
- *Crop visitation by bees is not related to farming method (organic or conventional) but to the presence of habitat in the landscape surrounding the fields. Although organic farms often have more habitat available due to the lack of herbicide use.*
- *Presence or absence of seminatural habitat has a dramatic effect on nesting and connectivity between habitats is critical for offspring production.*

- *Early colony growth of bumble bees was faster where a mass-flowering crop was a resource but there is no difference in reproductive success between colonies in areas with a mass-flowering crop and areas without.*
- *Data suggests a larger habitat patch surrounded by smaller patches across the farm is more beneficial for pollinators than all smaller patches.*
- *There is not enough data to provide concrete prescriptions for the size or special arrangement of the habitat needed to support native bees.*
- *Recommendations need to be made at the site scale as quality (both nesting and floral resources) of habitat is extremely variable across the landscape.*

2.4 GENERALISTS OR SPECIALISTS?

When managing habitat for pollinators it is important to determine if there are any habitat specialists present. Generalists are considered species of pollinators that can easily find forage resources from a wide diversity of plant sources. Specialists are those species that use limited sources of nectar and pollen. Bees, for example, are usually defined as generalist or specialist based on the range of flowers from which they collect pollen (Michener 2000).

Some studies have found that management techniques that emphasize the broad habitat requirements of pollinators may preferentially select for generalist species, while ignoring the more specific and perhaps less standard requirements of specialist species (Swengel 1996, 1998; Winfree et al. 2007a). Unfortunately, there's no single management plan that can provide ideal habitat for all pollinator taxa. Instead, the conservation priority of specific pollinators in the management area should be considered, and since most generalist species can adapt to a broader range of habitat, specialist species are often higher priority.

Key points

- *Habitat specialists such as vernal pool obligate bees need directed management plans for the species/species groups.*
- *Land management should be tailored to specialist species when they are present.*

2.5 THREATS TO NATIVE POLLINATORS

There are many threats to native pollinators, including the loss, degradation, and fragmentation of habitat; introduced species; habitat disruption from grazing, mowing, and fire; the use of pesticides (herbicides and insecticides); and diseases and parasites (Kearns et al. 1998; Spira 2001; Steffan-Dewenter & Westphal 2008). A discussion of each of these threats follows.

Habitat loss, degradation, and fragmentation

In a synthesis of literature about impacts of human disturbances on bees, Winfree et al. (2009) identified habitat loss and fragmentation as the most significant factor in declines of abundance and species richness of bees. Factors causing habitat loss and fragmentation include increasing urbanization, expansion of intensive agriculture, invasive plants, and climate change. These reduce, degrade, and/or eliminate pollinator habitat. In some cases, however, the impact of urban and agricultural expansion can be reduced by providing alternative food resources and nesting sites for bees and other pollinators (Kremen et al. 2002b; McFrederick & LeBuhn 2006; Holzschuh et al. 2008; Rundlof et al. 2008b; Winfree et al. 2008).

Habitat loss, degradation, and fragmentation are linked to declines in pollinator diversity and abundance (Frankie et al. 1990; Allen-Wardell et al. 1998) that is followed by a reduction in pollination services (Kremen et al. 2002a). They also can cause decreased population size and/or low population densities of pollinator species (Kearns et al. 1998; Spira 2001) or changes in pollinator community composition (Brosi et al. 2008; Ricketts et al. 2008; Krauss et al. 2009). Diversity and reproduction of native flowering plants may also be affected by decreases in pollinator species diversity and population size (Jennersten 1988; Kearns et al. 1998; Spira 2001). The causes of pollinator declines are often difficult to identify, but are likely due to a combination of factors that include isolation time, isolation distance, size of the fragment, and the surrounding environment (Rathke & Jules 1993).

If habitat becomes fragmented and the distance between patches is greater than the foraging range of pollinators, patches too small to support their own pollinators will suffer from lack of pollination services (Kearns et al. 1998). Williams & Kremen (2007) found that in an agricultural landscape, increasing distance to natural habitat in conventional farms was correlated with decreased reproductive success in wild bees. Small scale experimental fragmentation of alpine meadows in Switzerland altered foraging behavior of bumble bees, with bees visiting the fragments 53.7% less than the control plots (Goverde et al. 2002). Because bumble bees tend to return to foraging sites, habitat fragmentation can result in repeated visits to specific fragments, which potentially limits the genetic diversity of the plant community due to a lack of pollen transfer between fragments (Osborne & Williams 2001). In tropical regions, habitat fragmentation impacts social bees more than solitary bees (Ricketts et al. 2008; Winfree et al. 2009), but in temperate areas solitary bees are more affected (Winfree et al. 2009; Krauss et al. 2009). This is due to differences in life history, especially nest site requirements, of stingless bees, the dominant social bee of the tropics, and bumble bees found in temperate regions.

Key Points

- *Habitat loss and fragmentation is considered to be the most significant threat to bees throughout most of Yolo County.*
- *Solitary and social bees respond differently to habitat fragmentation.*

Introduced plant species

Aside from comparisons of abundance and diversity between sites with nonnative and native plants, there are few studies of the direct effects of nonnative plants on native insects. Introduced nonnative plants compete with native plants for resources as well as alter habitat composition, and some cause significant reductions in the abundance and diversity of pollinators and other herbivorous insects (Samways et al. 1996; Kearns et al. 1998; Spira 2001; Memmott & Wasser 2002; Hopwood 2008; Zuefle et al. 2008,; Burghardt et al. 2009; Wu et al. 2009). There is also evidence that native pollinator insects prefer native plants (Hopwood 2008; Burghardt et al. 2009; Wu et al. 2009), even though many native insects will feed on nonnative plants when few natives are available (Zuefle et al. 2008; Burghardt et al. 2009; Wu et al. 2009).

Key Points

- *Introduced plants alter the habitat composition and can cause reduction in pollinator diversity.*
- *This is a serious threat to pollinators in natural habitat in Yolo County.*

Habitat disruption from grazing, mowing, and fire

The impacts of grazing, mowing, and fire are mixed. They can have damaging impacts on pollinators but when carefully managed, they can be beneficial. Historically, there were sufficient areas in various stages of succession to support populations of habitat specific pollinators. However, now that many of these areas exist only as fragments in larger agricultural or otherwise intensively managed landscapes, and consideration of pollinators is needed to ensure healthy populations.

<u>Grazing</u>

Grazing in natural areas and rangelands is a common practice throughout the United States. If not managed appropriately, the ecological impact of grazing can be severe (Bilotta et al. 2007). Livestock grazing can greatly alter the structure, diversity, and growth habits of the vegetation community, which in turn can affect the associated insect community (Kruess & Tscharntke 2002a). Grazing during periods when floral resources are already scarce (e.g., mid summer) may result in insufficient forage available for pollinators such as bumble bees which, in some areas, forage into late September (Carvell 2002). For example, Hatfield & LeBuhn (2007) found that uncontrolled sheep grazing in mountain meadows in the Sierra Nevada removed enough flowering plants to eliminate bumble bees from some study sites. Likewise, grazing during spring when butterfly larvae are active on hostplants can result in larval mortality or remove important vegetation and nectar resources (Smallidge & Leopold 1997).

Ways that grazing can harm pollinator habitat include: destruction of potential nest sites, destruction of existing nests and contents, direct trampling of adult bees, and removal of food resources (Sugden 1985). Studies of livestock grazing on bees also suggest that increased intensity of livestock grazing negatively affects the species richness of bees (Morris 1967; Sugden 1985; Carvell 2002; Vazquez & Simberloff 2003). In Arizona, Debano (2006) conducted one of the few studies that focused explicitly on the impacts of domestic livestock grazing on invertebrate communities in an area that had not been grazed historically. The results clearly show that invertebrate species richness, abundance, and diversity were all greater in the ungrazed sites. The author suggested that since insects in the Southwest had not evolved in the presence of buffalo or another large ungulate, adaptations to grazing pressure had not developed, making them more susceptible to the presence of cattle.

Though only limited research has been done on the impacts of grazing on pollinators in the United States, there is a considerable body of work from other countries on which we can draw. In Argentina, researchers compared insect communities in grazed and ungrazed areas and found that insect diversity, abundance, richness, and biomass were all lowest in intensively grazed areas (Cagnolo et al. 2002). In Australia, Hutchinson & King (1980) studied the impact of sheep grazing on sixteen groups of large invertebrates, and found that for most of them, including butterflies, moths, and flies, abundance and biomass decreased as grazing intensity increased. In a study of four different grazing regimes in Germany that varied from continuously intensively grazed areas to long-term ungrazed grassland, Kruess & Tscharntke (2002a, 2002b) found that the diversity of the invertebrate assemblage decreased as grazing intensity increased. This included pollinators such as butterflies and ground nesting bees. These findings are similar to Balmer & Erhardt (2000) who found that old fallow fields in Switzerland that had not been grazed harbored many more rare and specialist species of butterflies than managed pastures or early fallow land, most likely due to the reduction of nectar resources in grazed pastures.

In a study that directly addressed the usage of light grazing as a method of avoiding succession of grassland into forest, Schtickzelle et al. (2007) investigated the effect on the bog fritillary butterfly (*Proclossiana eunomia*) of the introduction of cattle into a wet meadow system. The study area was monitored for eleven years prior to cattle introduction and four years afterwards with a series of ungrazed controls. The negative effects light grazing had on the butterfly were significant. The butterfly visited grazed areas far less than ungrazed areas, and butterfly emergence in grazed areas was 74% less than in ungrazed areas. These effects are largely attributable to changes in vegetation structure, loss of preferred forage sources, and a decline of the hostplant in grazed plots.

Grazing is not necessarily harmful to a natural area. Many parts of the world have experienced grazing pressure from both domesticated and wild animals for millennia and the indigenous flora and fauna is adapted to grazing. Even in areas where grazing is not historically found, light levels of rotational grazing can have positive effects on maintaining an open, herbaceous-dominated plant community that is capable of supporting a wide diversity of butterflies and other pollinators (Smallidge & Leopold 1997).

Some research suggests that grazing can be beneficial for insect communities, especially by managing invasive plants and succession. Cattle grazing has successfully been used to control invasive plant species on degraded habitat of the Bay checkerspot butterfly (*Euphydryas editha bayensis*) (Weiss 1999). (It must be noted that this is a very site-specific case as the invasive plants were successfully colonizing the site because of excessive nitrogen deposition from automobile exhaust due to its proximity to a large urban area.)

Grazing does need to be carefully planned and implemented to be effective. A Swiss study found that while grazing was an effective management tool for limiting succession, responses to grazing varied greatly among butterfly species (Wettstein & Schmid 1999). The authors suggest that any management regime be attentive to historical and species-specific characteristics of the site, and that a diversity of management techniques be used on a regional scale in order to preserve the greatest diversity of insect pollinator habitat.

Grazing can be a valuable tool for limiting shrub and tree succession, providing structural diversity, encouraging the growth of nectar rich plants, and creating potential nesting habitat. However grazing is usually only beneficial at low to moderate levels and when the site is grazed for a short period followed by ample recovery time—and when it has been planned to suit the local site conditions.

Key Points

- *Grazing can have significant impacts on the habitat quality for bees through the* *destruction of nest sites and removal of forage plants.*

- *Grazing can greatly alters the structure, diversity, and growth habits of the vegetation community.*
- *Grazing can be used to maintain open, forb-dominated plant communities that support a diversity of pollinator insects, but only if the correct combination of timing, intensity of stocking rate are found.*
- *The threat of grazing to pollinators is most severe in grasslands and oak woodlands.*
- *At the most severely impacted sites, cattle should be excluded from the area to allow the habitat time to repair.*
- *Keep grazing periods short, with recovery periods for the habitat relatively long.*
- *Generally grazing that is of short intensity and duration in the fall (when there is less competition for floral resources with pollinators) is best.*

<u>Mowing</u>

Mowing is often used in place of grazing where site access and topography permit equipment access. Like grazing, mowing can alter grassland succession and species composition by suppressing growth of woody vegetation (Forrester et al. 2005). Mowing can have a significant impact on insects through direct mortality, particularly for egg and larval stages that cannot avoid the mower (Di Giulio et al. 2001). Mowing also creates a sward of uniform height and may destroy topographical features such as grass tussocks (Morris 2000) when care is not taken to avoid these features or the mower height is too low. Such features provide structural diversity to the habitat and offer potential nesting sites for pollinator insects such as bumble bees. In addition to direct mortality and structural changes, mowing can result in a sudden removal of almost all floral resources for foraging pollinators; therefore it should not be conducted when flowers are in bloom.

Key Points

- *Mowing has significant impacts on the habitat quality.*
- *Mowing will create a sward of uniform height and remove flowering resources.*
- *Mowing can be used to control shrubs and trees to maintain open conditions.*
- *No more than a third of habitat should be mown in one year.*
- *In Yolo County road edges may be an important resource for pollinators. Mowing management could be adapted to the maximum benefit of pollinators.*

<u>Fire</u>

Fire has played an important role in many native ecosystems, and controlled burns are an increasingly common management tool. Effects of fire management on arthropod communities are highly variable. If used appropriately, fire benefits many insect communities through the restoration and maintenance of suitable habitat (Huntzinger 2003; Hartley et al. 2007). Other studies have found a negative or mixed response of invertebrates to fire (e.g., Harper et al. 2000; Ne'eman et al. 2000; Moretti et al. 2006).

In Midwestern U.S. prairie systems, fire as a management tool is based on the supposition that prairie species are adapted to wildfires, and thus can cope with regular burns (e.g., Harper et al. 2000; Swengel 2001; Panzer 2002; Hartley et al. 2007). This is dependent, however, on there being adequate unburned adjacent areas that can provide sources of colonizers into the burned habitat. In small fragments where populations are more isolated, prescribed burning can have much more deleterious effects on the population due to a lack of colonizing capacity. For example, Harper et al. (2000) found that overall arthropod species richness decreased in burned prairie sites, as well as the abundance of all but one of the species measured. Their results suggest that burning a small habitat fragment in its entirety could risk extirpating some species because of limited recolonization from adjacent habitat. A study in Israel compared fruit set and bee visitation to four native plants in an unburned area with those in an area burned five to seven years previously (Ne'eman et al. 2000). They found that fruit set was much lower for the native plants in the burned area than in the adjacent unburned area. The authors ascribe this difference to the loss of pollinators, particularly solitary bees, due to the burn, either directly because of mortality during the fire or indirectly due to a reduction in nectar-rich flowers in the area post-fire. Furthermore, Moretti et al. (2006) found that it can take seventeen to twenty-four years for insect communities in burned areas in southern Switzerland to recover to pre-burn composition.

Fire can have serious impacts on population levels and unless there are adequate refuges from the fire or adjacent habitat, recolonization of a burned site may not be feasible. Timing of burns is also critical and should not be carried out when target pollinators are in a larval or critical foraging stage. Habitat patches should not be burned completely, but rather a mosaic of burned and unburned areas is ideal.

Key Points

- *Fire has played an important role in maintaining many native ecosystems.*
- *Bee populations are significantly lower in years following a burn.*
- *It can take two decades for insect communities to recover from a burn.*
- *Impacts of burning can be reduced if areas of habitat are left unburned.*
- *Fires should not burn more than 1/3 of habitat in any given year.*
- *A program of rotational burning where small sections are burnt every few years will ensure adequate colonization potential for pollinators.*
- *As a fire moves through an area it may leave small patches unburned. These skips should be left intact as potential micro-refuges.*
- *Not all sites within the same complex should be burned.*
- *Care must be taken to avoid actions that could degrade habitat and kill individual pollinators as a result of heavy equipment use or people trampling meadows.*

Pesticides

The use of pesticides, including insecticides and herbicides, is detrimental to a healthy community of pollinators. Insecticides not only kill pollinators (Johansen 1977), but sub-lethal doses can affect their foraging and nesting behaviors (Thompson 2003; Decourtye et al. 2004; Desneux et al. 2007), often preventing pollination. Herbicides can kill plants that pollinators depend on when crops are not in bloom, thus reducing the amount of foraging and egg-laying resources available (Kremen et al. 2002; Tscharntke et al. 2005).

In general, while pesticide labels may list hazards to honey bees, potential dangers to native bees and other pollinators are often not listed. For example, many native bees are much smaller in size than honey bees and are affected by lower doses. Pollinator larvae can also be negatively affected by consuming food contaminated with pesticides (Johansen & Mayer 1990; MacKenzie

1993; Abbott et al. 2008). In agricultural areas, field margins are increasingly cultivated (Dover et al. 1990; O'Toole 1993), and the use of pesticides in these areas can result in loss of native vegetation, fewer nesting areas, and overall loss of diversity and habitat structure, all of which impact bees and other pollinators.

Herbicides

Herbicides can kill plants that pollinators depend on, thus reducing the amount of foraging and egg-laying resources available (Kremen et al. 2002a; Tscharntke et al. 2005; Smallidge & Leopold 1997). Just as pollinators can influence the vegetation community, changes in vegetation can have an impact on pollinators (Kearns & Inouye 1997). A pollinator community requires consistent sources of nectar, pollen, and nesting material during those times adults are active. The broadcast application of a non-selective herbicide can indiscriminately reduce floral resources, hostplants, or nesting habitat (Smallidge & Leopold 1997). Such a reduction in resources can cause a decline in pollinator reproductive success and/or survival rates.

Moreby and Southway (1999) found that invertebrate abundance (notably species of Diptera and Heteroptera) was consistently higher in unsprayed plots than in plots that received a single autumn application of herbicides. Taylor et al. (2006) showed that herbicide applications in field margins reduced the number of arthropods (including Lepidoptera larvae) that were food sources for pheasant and partridge chicks. In a meta-analysis of twenty-three studies, Frampton and Dorne (2007) found that restricting herbicide inputs in the margins of crops benefited arthropod populations, including adult and larval Lepidoptera.

Other studies have addressed herbicide use and its effects on pollinators in general. In a review suggesting that pollinators are useful bioindicators, Kevan (1999) found that herbicides reduced Asteraceae and Lamiaceae flowers in France, contributing to a decline in bumble bee populations. Kevan (1999) also finds that herbicide applications have reduced the reproductive success of blueberry pollinators by limiting alternative food sources that can sustain the insects when the blueberries are not in bloom. Kearns et al. (1998) state "herbicide use affects pollinators by reducing the availability of nectar plants. In some circumstances, herbicides appear to have a greater effect than insecticides on wild bee populations … Some of these bee populations show massive declines due to the lack of suitable nesting sites and alternative food plants." In contrast, Russell et al. (2005) and Forrester et al. (2005) both found that the use of selective herbicide when combined with mechanical removal of shrubs and small trees was an effective method of maintaining power line corridors as effective pollinator habitat. In both studies, however, non-selective broadcast herbicides were prohibited as they not only suppressed management target plants, but important nectar resources as well.

While the majority of the effects herbicides have on pollinators are mediated through changes in vegetation, there is evidence that some herbicides such as paraquat, the organic arsenicals, and phenoxy materials can have lethal effects in bees, either through direct application or exposure by feeding (Johansen & Mayer 1990). There is also the potential for sub-lethal effects such as a decreased ability to fly and an increase in flower handling time. For example, hormonal herbicides alter the chemistry of plant secretions such as nectar which in turn may cause harmful effects to pollinators foraging on that contaminated nectar. Ingestion of herbicides by other insects, such as species of Coleoptera and Lepidoptera, has varying effects depending on the species, life stage of the species, and the chemical (Brown 1987; Kegal 1989; Kjaer and Elmegaard 1996; Kjaer and Heimbach 2001; Kutlesa and Caveney 2001; Russell and Schultz 2009). For example, in a laboratory study, Russell and Schultz (2009) showed that sethoxydim and fluazifop-p-butyl herbicides both reduce development time of Puget blue (*Plebejus icarioides blackmorei*) butterflies from the date of treatment to eclosure, and reduce survival, pupal weight, and wing size of cabbage white butterflies. A similar study by Kutlesa and Caveney (2001) found that glufosinate-ammonium is highly toxic to larvae of the Brazilian skipper (*Calpodes ethlius*).

Key Points

- *Herbicides kill plants on which pollinators depend for foraging or egg laying.*
- *Some herbicides can be lethal to bees by direct application or exposure during foraging.*
- *In crop fields, limiting herbicide applications in field margins benefits insect populations in field borders and adjacent habitats.*
- *During vegetation management, treat only the minimum area necessary for the control of weeds. Take care to minimize overspray to habitat around the weeds.*

Insecticides

Insecticides are widely used on agricultural lands and in natural areas throughout the United States to control both native and non-native species. In rangelands, native grasshoppers are targeted with a variety of pesticides (Alston & Tepedino 2000). In addition overspray and drift of agricultural insecticides can affect non-target organisms in field borders (Çilgi & Jepson 1994).

There are two general categories of effects that native pollinators may experience as a result of coming into contact with insecticides or insecticide residues, lethal and sub-lethal.

Lethal effects are most easily recognized: the dosage is sufficient to result in near immediate mortality of the insect. While there are reports of native pollinator die-offs in non-laboratory conditions, many such poisonings are assumed to go unreported because the bees are unmanaged and do not gather in large aggregations (Thompson & Hunt 1999). Low fecundity rates mean it can take many years for a native pollinator population to recover from a large reduction. For example, native bees in laboratory conditions were found to produce 15 – 20 offspring per year (Tepedino 1979). In a natural setting this number is expected to be less due to competition, predation and parasites (Kearns & Inouye 1997). Lethal effects on honey bees are often the primary focus of regulatory procedures for assessing the safety of a new insecticide for pollinators despite the enormous diversity of bees, butterflies, and other pollinating insects that may have a wide variation in their response to the same insecticide (Abramson et al. 2004; Morandin et al. 2005; Abbott et al. 2008). As a result, a pesticide that has been deemed safe for honey bees when used according to the bee label may not be safe for native bees or other pollinators.

Sub-lethal effects refer to a suite of impacts that may inhibit or degrade pollinator function and/or life history, possibly across multiple generations (Desneux et al. 2007). Sub-lethal effects are often difficult to measure and little work has been done to thoroughly investigate their significance in native pollinator populations (Alston & Tepedino 2000). Existing studies show sub-lethal effects impact native pollinator communities in many ways. These include a decrease in forage efficiency, decline of reproductive success and fitness, increase in immunological disorders, and a decrease in learning ability (Decourtye et al. 2004, 2005; Desneux et al. 2007; Morandin et al. 2005; Thomson 2003). Despite the long-term repercussions that these symptoms may have on an ecosystem few pesticides are tested for sub-lethal effects prior to regulatory approval.

One of the most robust case studies of ecosystem effects of insecticide use details the effects of forestry insecticides on pollinators, illustrating how the use of fenitrothion to control spruce budworm in Canadian forests devastated native bee populations. As summarized in Kevan (1999) and Kevan and Plowright (1989), the reduction of native pollinators due to fenitrothion caused a series of effects to ripple through the ecosystem. Similar effects were discussed by Alston and Tepedino (2000) for the application of broad spectrum insecticides in rangelands to control grasshoppers. The insecticides used, due to their high toxicity, are not permitted on blooming crops being visited by bees yet they were allowed to be sprayed on rangelands while native pollinators were foraging on wildflowers. The grasshopper spraying campaigns (generally from mid-April to late May) coincide with the flowering period of several endemic rangeland plants that grow among the grasses, a number of which are listed as endangered or threatened. This time period also overlaps the period of emergence and active foraging of many native bee species (Kearns & Inouye 1997). The usage of broadband insecticides in wild areas may potentially result in a number of ecosystem shifts due to pollinator limitation. These include "changes in future vegetation patterns via plant competition, reduction in seed banks, and influences on the animals dependent upon plants for food" (Alston & Tepedino 2000).

Key Points

- *Insecticides can be lethal to bees or have sublethal effects such as reducing foraging efficiency or reproductive success.*
- *A pesticide that has been deemed safe for honey bees may not be safe for native bees, even when applied according to label requirements.*
- *Pesticides not allowed on blooming crops due to high toxicity may be allowed to be used on rangeland while pollinators forage.*
- *Pesticide impacts are most severe within the agricultural matrix although spraying for mosquitoes or other insects may impact pollinators in a wide range of landscapes.*

Disease and parasites

Effects of pathogens and parasites on honey bees are well documented but there is less known about the impact on native pollinators (Kevan 1999).

The most studied group of native bees are bumble bees. In 2007, the National Research Council stated that a major cause of decline in several native bumble bees appears to be recently introduced nonnative fungal and protozoan parasites, including *Nosema bombi* and *Crithidia bombi*. A recent status review of three bumble bee species from both the eastern and western U.S. found that their decline is most likely caused by introduced diseases from commercial bee rearing and movement (Evans et al. 2008). These pests were probably introduced in the early 1990s when colonies of North American bumble bees were taken to Europe for rearing and then reimported to the U.S. for commercial greenhouse pollination. These pathogens were likely spread to wild populations of bumble bees in the late 1990s as commercial bumble bees were transported throughout the U.S. for pollination of greenhouse tomatoes and a variety of other crops. Commercially reared bees frequently harbor pathogens and their escape from greenhouses can lead to infections in native species (Colla et al. 2006; Otterstatter and Thomson 2008).

Currently, commercial bumble bee rearing facilities in North America breed just one species, the common eastern bumble bee (*Bombus impatiens*). These facilities are in Michigan. California state regulations only allow their importation into the state for use in glasshouses. Open-field pollination by these colonies is illegal. Limiting commercially reared colonies to glasshouses provides some control over the spread of pathogens. California regulations require the use of queen excluders on glasshouse bumble bee colonies to prevent the escape of queens and the possibility of them becoming established in the wild. Using colonies in glasshouses also protects them from vandalism and much accidental damage, two ways in which the bees can escape from the colony boxes.

Key Points

- *Diseases and parasites of native bees are less well studied than those of honey bees.*
- *Bumble bee populations have experienced serious declines, probably due to pathogens spread by commercially reared bumble bee colonies.*
- *Commercially reared bumble bees are used in glasshouses and should not be used for open-field pollination.*

Table 2: Summary of threats to pollinators in different landscapes of Yolo County

Landscape	Threats
Agriculture	1. Habitat loss and fragmentation 2. Pesticide use 3. Grazing, mowing, and fire 4. Disease and parasites from non-native commercially reared bees
Grassland	1. Habitat loss and fragmentation 2. Invasive exotic plants 3. Pesticide use 4. Grazing, mowing, and fire 5. Disease and parasites from non-native commercially reared bees used in agricultural areas
Woodland	1. Fragmentation by both agricultural and urban development 2. Over grazing in the understory 3. Fire, especially when fire suppression allows a build up in fuel loads and increased tree densities 4. Disease and parasites from non-native commercially reared bees used in agricultural areas
Shrubland & Scrub	1. Commercial livestock grazing 2. Burning, mowing and pesticides 3. Habitat fragmentation 4. Disease and parasites from non-native commercially reared bees used in agricultural areas
Riparian & Wetland	1. Livestock grazing in and near riparian and wetland areas can significantly damage stream banks and wetlands 2. Invasive species; management methods can cause further damage to pollinator populations if not used carefully 3. Pesticides are a significant threat, especially in areas with intensive agriculture 4. Disease and parasites from non-native commercially reared bees used in agricultural areas 5. Conversion of vernal pool landscapes to agriculture (primarily rice fields) and urban areas
Urban & Barren	1. Habitat loss and fragmentation are the most significant threats to pollinators 2. Invasive species 3. Use of pesticides.

SECTION 3
HABITAT CONSERVATION AND RESTORATION

This section focuses on pollinators in the Yolo County landscapes described on the Yolo Natural Heritage Program website, with special emphasis on wetland, grassland, and agricultural habitat types. For each landscape, we describe 1) how to recognize pollinator habitat, 2) potential threats to pollinators, and 3) actions to reduce or mitigate threats.

3.1 AGRICULTURE

Agricultural land is the predominant landscape type in Yolo County, covering 347,900 acres of the valley. Crops include over 138,000 acres of pasture, grain and hay, nearly 113,300 acres of field/truck/nursery/berry crops, over 45,000 acres of rice, 36,300 acres of fruit, nut, and citrus orchards, and 15,000 acres of vineyards. Agriculture is very important to Yolo County, contributing well over a billion dollars to its economy (Yolo County 2007 Agricultural Crop Report). Processing tomatoes is the most valuable crop in Yolo County ($100,012,325 in 2007). Field-grown tomatoes are generally considered to be self-pollinating (Delaplane & Meyer 2000; Greenleaf & Kremen 2006a), but a number of native bees visit the flowers and contribute to pollination (Greenleaf & Kremen 2006a). Other crops in Yolo County that rely on insect pollinators for all or some of their pollination include sunflower (seed crop: $9,355,318; field crop: $10,590,093), almonds ($28,914,985), miscellaneous melons and vegetables ($12,220,033), and organic crops ($19,475,512). Many studies show that native bees are more effective pollinators or can enhance pollination by honey bees in many crops, including tomatoes (Greenleaf & Kremen 2006a, Hogendoorn et al. 2006), watermelon (Kremen et al. 2002b), squash (Shuler et al. 2005), raspberries (Willmer et al. 1994), hybrid sunflower (Greenleaf & Kremen 2006b), and cherries (Bosch et al. 2006). In Yolo County, native pollinators can provide complete pollination for some crops in fields that offer proximity to sufficient natural habitat (Kremen et al. 2002b, Kremen et al. 2004).

Published research—much of it conducted in Yolo County—identifies ways in which native bees benefit pollination (e.g., Greenleaf & Kremen 2006a, b; Winfree et al 2008) and connects the presence of native bees to the proximity of natural habitat (e.g., Kremen et al 2004; Williams & Kremen 2007), but generally does not discuss the size of habitat required, nor the ratio of foraging habitat to nesting habitat. Kremen et al (2004) demonstrated that the pollen deposition by native bees in watermelon crops in California’s Central Valley was significantly related to the proportion of riparian or upland habitat in the landscape. The authors estimated that complete pollination of watermelon by native bees could be achieved if at least 40% of the land within 2.4 kilometers (1½ miles) of the field or at least 30% of the land within 1.2 kilometers (¾ mile) of the field is habitat. They suggested that 10% of the landscape as habitat might be feasible if areas such as field margins, trackways, equipment areas, and ditchsides were enhanced.

Modeling of landscapes for their capacity to support bees by Lonsdorf et al (2009) can predict the relative abundance and richness of native pollinators in the landscape. This modeling does take into account an estimate of nest and floral resources provided by each habitat type. For each land parcel, the authors estimate the proportion of the parcel that is habitat and what type of nesting resources that habitat offers (cavity, ground). While this offers an estimate of the current nesting habitat (and from that a prediction of the pollinator abundance in a land parcel), it does not say how much of the habitat should be nesting to provide adequate pollination. The model cannot predict bee abundance over time (i.e., population fluctuations) or the pollination benefit (crop yield).

I. Recognizing pollinator habitat

Many growers may already have habitat for native pollinators on or near their land. Having semi-natural or natural habitat available significantly increases pollinator populations (Kremen et al. 2004, Williams & Kremen 2007). Marginal lands such as field edges, hedgerows, sub-irrigated areas, and drainage ditches mimic natural early successional habitat and can offer both nesting and foraging sites (Carvell 2002). Woodlots, conservation areas, utility easements, farm roads, and other untilled areas may also contain good habitat. Often, poor quality soils, unfit for crops, may be useful as pollinator habitat (Morandin and Winston 2006).

II. Potential threats to pollinators

The principal threats to pollinators in agricultural areas of Yolo County are:

1. Habitat loss and fragmentation,
2. Pesticide use,
3. Mowing, grazing, and burning, and
4. Disease and parasites.

Habitat loss including agricultural intensification is thought to be a primary cause of pollinator decline (Winfree et al. 2009). In Yolo County agricultural areas often lack the habitat resources necessary for native pollinators to exist because of intensive land use practices that are detrimental to pollinators (Kremen et al. 2002b; Kremen et al. 2004). Agricultural practices that harm pollinators include leaving no area of the farm uncultivated, treatment of field margins with herbicides and pesticides, and extensive cultivated regions where crops are large distances from natural habitat. Large scale cultivation in Yolo County has reduced pollinator habitat and increased the distance pollinators must travel between foraging and nesting resources (Kremen et al. 2002b; Kremen et al. 2004).

Pesticide use in intensively cropped agricultural areas is always a concern for pollinator populations. Pesticides applied to crops or fields in which bees are foraging, as well as drift over field margins and adjacent natural areas can have both lethal and sublethal impacts.

Mowing, grazing, and burning are common agricultural land management practices and are significant threats to pollinators. Use of these practices in field margins, along roads and adjacent to ditches have reduced pollinator habitat in the county (personal observation).

If open-field pollination by commercially reared bumble bees imported from east of the Rockies, native bumble bee populations may be put at greater risk through the spread of disease or pathogens.

III. Actions to reduce or mitigate threats

<u>A. Protect existing pollinator habitat</u>

The first priority in the Yolo County agricultural landscape should be to identify and protect existing pollinator habitat. When assessing pollen and nectar resources, it is important to look at all of the potential plant resources on and around a landowner or farmer's property, and which plants are heavily visited by bees and other pollinators. These plants include insect-pollinated crops, as well as the flowers – even "weeds" – in buffer areas, forest edges, hedgerows, roadsides, natural areas, fallowed fields, and other vegetated areas. Insect-pollinated crops may supply abundant forage for short periods of time, and such flowering crops should be factored into an overall farm plan if a grower is interested in supporting wild pollinators (Banaszak 1992). However, for pollinators to be most productive, nectar and pollen resources are needed outside the period of crop bloom.

As long as a plant is not a noxious weed species that should be removed or controlled, producers might consider allowing some of the native or nonnative forbs that are currently present onsite to bloom prior to their crop bloom, mow them during crop bloom, and then let them bloom again afterward. For example, dandelions, clover, and other nonnative plants are often good pollinator plants (Free 1968, Mosquin 1971). Growers may also allow some unharvested salad and cabbage crops to bolt. In addition to pollinators, the predators and parasitoids of pests are attracted to the flowers of arugula, chervil, chicory, mustards and other greens, supporting pest management.

When evaluating existing plant communities on the margins of cropland, a special effort should be made to conserve very early and very late blooming plants. Early-flowering plants provide an important food source for bees emerging from hibernation, and late-flowering plants help bumble bees build up their energy reserves before entering winter dormancy (Pywell et al. 2005).

<u>B. Habitat restoration</u>

Landowners intending to increase their pollinator populations may need to do more than simply curtail or alter current management practices that negatively impact pollinators or existing foraging or nesting sites. High quality foraging habitat may be limited, so action may be needed to increase the available foraging habitat and include a range of plants that bloom and provide abundant sources of pollen and nectar throughout spring, summer, and fall. Such habitat can take the form of designated pollinator meadows ("bee pastures"), demonstration gardens, orchard understory plantings, hedgerows and windbreaks with flowering trees and shrubs, riparian and rangeland re-vegetation efforts, flowering cover crops and green manures, and countless other similar efforts.

Where possible, planting local native plants is preferred for their ease of establishment, greater wildlife value, and their evolutionary mutualism with native pollinators (Kearns et al. 1998). Nonnative plants may be suitable, however on disturbed sites, for specialty uses such as cover cropping, and where native plants are not available. Mixtures of native and nonnative plants are also possible, as long as nonnative species are naturalized and not invasive.

Providing pollinator habitat in large cultivated regions of Yolo County will reduce the distance pollinators must travel to find suitable food and nesting resources. If managed properly, these habitat patches will not only protect native pollinators from population declines, but will also help maintain their crop pollination services (Kremen et al. 2002a). Plans to enhance existing habitat or develop new habitat for pollinators should include considerations for both forage and nesting resources. Establishing a diverse mix of plant species will ensure available floral resources through the foraging season of pollinator insects, as well as resources for larval butterflies, moths, and other foliage feeders. The size of restored habitat patches should be at least one-half acre area in size, with two acres or more providing even greater benefits (Morandin & Winston 2006; Kremen et al. 2004).

C. Protect Ground Nesting Bees

In order to protect nest sites of ground-nesting bees, avoid tilling (Shuler et al. 2005) and flood-irrigating (Vaughan et al. 2007) areas of bare, or partially bare ground that may be occupied by nesting bees. Grazing such areas can also disturb ground nests (Gess & Gess 1993; Vinson et al. 1993). Similarly, using fumigants like Chloropicrin for the control of soilborne crop pathogens (such as *Verticillium* wilt), or covering large areas with plastic mulch could be detrimental to ground nesting bees.

Weed control alternatives to tillage include the use of selective crop herbicides, flame weeders, and hooded sprayers for between row herbicide applications.

D. Protect Tunnel-Nesting Bees

Tunnel-nesting bees will make their homes in the abandoned tunnels of wood-boring beetles and the pithy centers of many woody plant stems. Allowing snags and dead trees to stand, as long as they do not pose a risk to property or people, and protecting shrubs with pithy or hollow stems, such as elderberry, blackberry, and box elder, will go a long way towards supporting these solitary bees.

E. Management considerations of pesticides

Given the risk of harm to pollinators the use of pesticides should be greatly reduced. Farmers who encourage native plants for pollinator habitat will inevitably be providing habitat that also will host many beneficial insects that help control pests naturally, and may come to depend less on pesticides. Studies show that organic crops support a higher abundance and diversity of pollinators than areas under conventional management, primarily because of the greater flower abundance in field margins that results from less disturbance and herbicide use (Kremen et al. 2002b; Belfrage et al. 2005; Holzschuh et al. 2008; Rundlof et al. 2008a, 2008b). In some of these cases, native pollinators provide most or all of the pollination services (Kremen et al. 2002b). When pesticide applications are necessary, they should be applied when pollinators are the least active: either in fall or winter months, or at night. Applications can also be scaled to target specific areas and avoid field margins and other areas of pollinator habitat.

F. Management considerations of mowing, grazing and burning

Only a portion of pollinator habitat should be burned, mowed, grazed, or hayed at any one time in order to protect overwintering pollinators and foraging larvae and adults (Black et al. 2008). This will allow for recolonization of the disturbed area from nearby undisturbed refugia, an important factor in the recovery of pollinator populations after disturbance (Hartley et al. 2007). In order to maximize foraging and egg-laying opportunities, maintenance activities should be avoided while plants are in flower (Smallidge & Leopold 1997).

[For more information on habitat restoration for pollinators in agricultural landscapes please see Vaughan and Black (2006) the NRCS technical Note: Pollinator Biology and Habitat in CA.]

IV. Conservation principles for agricultural landscapes

Pollinators are an essential part of Yolo County's agricultural landscape. Several major crops, including sunflowers, almonds, melons, and vegetables, require pollination for full harvests. In the west of the county, the Capay Valley retains many habitat features and is close to shrublands and woodlands in the hills above. However, much of the agricultural area is stripped of habitat, leaving riparian areas as the principal habitat type. There are also areas of wetlands and vernal pools. In these regions, conservation efforts should have a dual focus: protecting and retaining any pollinator habitat that remains, and creating or restoring habitat. Marginal areas like roadsides, ditches, field margins and fencerows, even barren lands have potential as pollinator habitat. Hedgerows rich in flowering shrubs and forbs can be planted and ditchsides restored with wide swathes of flowering plants. These linear habitats can connect with riparian areas and larger habitat patches to create a network of pollinator habitat across farmland.

The principal threats to pollinators in agricultural areas of Yolo County are habitat loss and fragmentation, pesticide use, mowing, grazing, and burning, and disease and parasites.

To maintain pollinator (especially native bee) populations within the agricultural landscape:

- Identify and protect existing pollinator habitat:
  - Areas of natural or seminatural habitat such as riparian areas, wetlands, species-rich grasslands, and vegetated roadside verges.
  - Areas supporting flowers such as buffer areas, forest edges, hedgerows, roadsides, ditchsides, and fallowed fields.
  - Potential bee nesting sites such as areas of untilled bare soil, snags, and pithy-stemmed shrubs.
- Create or restore habitat:
  - Such habitat can take the form of hedgerows, pollinator meadows ("bee pastures"), orchard understory plantings, riparian and rangeland re-vegetation, and flowering cover crops.
  - Have at least three plants blooming in each season (spring, summer, and fall).
  - Use native plants wherever possible.
  - Nonnative plants may be suitable on disturbed sites and for specialty uses such as cover cropping.
  - Include bee nest sites in habitat patches.
  - Restored patches should be a half-acre or more in size.
  - If crop pollination is the focus habitat patches should be no more than 600 meters from the crop (or from each other); shorter distances—250 to 300 meters—would be optimal.
  - Create linear habitats along roads and tracks, ditches, and field margins to increase connectivity across the landscape.
- Pesticide use should be minimized, especially adjacent to natural areas or known pollinator habitat:
  - Pesticides should not be applied when bees are actively foraging on flowers.
  - IPM principals should be followed when planning pest management.
  - If possible applications should be done in fall or winter, or at night.
  - Select the formulation and application method that will minimize overspray or drift into pollinator habitat.

- Reduce spraying near field margins.
- Grazing, mowing, or the use of fire should be carefully planned in any pollinator habitat.
- Imported bumble bee colonies must be fitted with queen excluders and only used in glasshouses.
- Commercially reared bumble bees should not be used for open-field pollination.

3.2 GRASSLAND

Grassland is the second largest landscape type in Yolo County, and consists of over 93,000 acres of annual grasslands and serpentine habitat. Grasslands are scattered throughout the county, but the majority are located in the western half. The vernal pool complex is also a type of grassland, but will be discussed under the wetlands landscape section. Grassland is a valuable landscape because natural grassland habitat is often in close proximity to agricultural land in Yolo County, it can provide a reservoir of pollinators that provide additional pollination services to crops. The role that adjacent natural habitat plays in providing crop pollination services is increasingly well understood. Proximity to natural or semi-natural non-agricultural land is often an important predictor of pollinator diversity in cropland (Haughton et al. 2003; Bergman et al. 2004; Kim et al. 2006; Kremen et al. 2004; Morandin & Winston 2006; Hendrickx et al. 2007). Natural areas near to farms can also be important sources of pollinators that can recolonize agricultural areas that lost native pollinators due to a pesticide treatment or temporary habitat loss (Öckinger & Smith 2007).

I. Recognizing pollinator habitat
A diverse native grassland comprising of a variety of native grasses and forbs will provide habitat for native pollinators. Solitary ground nesting bees are likely the most common pollinators in grassland but flies, beetles, and butterflies are also likely prevalent. Most of North America's native bee species (about 70%) are ground nesters. These bees usually need direct access to the soil surface (Potts et al. 2005) to excavate and access their nests, which may sometimes be in huge aggregations of hundreds or thousands of nests. Ground-nesting bees seldom nest in rich soils, so poor quality sandy or loamy soils may provide fine sites. Bumble bees are also found in grasslands. They nest in small cavities, such as abandoned rodent nests under grass tussocks or in the ground (Kearns & Thompson 2001).

II. Potential threats to pollinators
The principal threats to pollinators in grasslands of Yolo County are:
1. Loss and fragmentation of grassland,
2. Exotic invasive species can reduce floral diversity,
3. Overgrazing, mowing, and burning, and
4. Pesticide use.

III. Actions to reduce or mitigate threats
A. Protect existing pollinator habitat
Protecting intact species-rich grassland habitats will provide resources for pollinators. Protecting existing nesting sites is also important. For instance, patches of rough undisturbed grass in which rodents can nest will create future nest sites for bumble bees (McFrederick & LeBuhn 2006). Management should be carefully planned and applied to minimize impacts on these species.

B. Habitat restoration

Removal of invasive species and restoration with native grasses and forbs will benefit pollinators. Emphasis should be placed on restoration to historic condition not on pollinator plants specifically. Nesting needs of ground nesting bees and bumble bees should be taken into consideration during restoration (also wood nesting bees if there is an appropriate place to include shrubs).

C. Management considerations of pesticides

Herbicide and insecticide applications in grasslands can be useful in controlling invasive species, but should be planned and carefully managed to avoid negative effects on native pollinators and other species. Targeted spraying should be used instead of broadcast spraying whenever possible, to avoid affecting pollinator species. Areas that are in bloom or have high densities of native pollinators should be avoided, or sprayed at times when the pollinators are not active, such as late fall, winter, and early spring. Timing applications to minimize spray drift is also important, and includes spraying on calm days with low temperatures.

[See Black et al. 2007 for more information.]

D. Management considerations of mowing, grazing and burning

Only a portion of pollinator habitat should be burned, mowed, grazed, or hayed at any one time in order to protect pollinators (Black et al. 2008). This will allow for recolonization of the disturbed area from nearby undisturbed refugia, an important factor in the recovery of pollinator populations after disturbance (Hartley et al. 2007). In order to maximize foraging and egg-laying opportunities, maintenance activities should be avoided while plants are in flower (Smallidge & Leopold 1997).

Mowing is an effective tool at limiting succession of shrubs and trees in grasslands (Forrester et al. 2005) and can be used in areas where other management options such as grazing or prescribed burning are impractical. With careful attention to timing and scale, mowing can be a successful management tool for insuring the long-term stability of pollinator populations and the plants and animals that depend on them. Mowing should not be conducted while flowers are in bloom, to avoid affecting pollinators both through direct mortality from the mower, and through the loss of their food source. Ideally, mowing should be done in the fall and winter to reduce effects on pollinators (Munguira & Thomas 1992). If mowing during spring and summer is necessary to control target weed species, mowing some patches and leaving others is the best method to reduce impacts on pollinators.

Grazing management should be adjusted as needed to maintain the majority of floral resources in an area throughout the seasons. The most effective time to graze varies depending on the site, but should be limited to times of low or no pollinator activity. Moderate levels of rotational grazing minimize negative impacts on pollinators and other native species.

In grassland regions, fire suppression can lead to invasion and maturation of shrubs and trees and an increase in invasive plant species. Eventually, continued succession results in the degradation and loss of the grasslands (Schultz & Crone 1998; Panzer 2003). Prescribed burning is therefore a useful tool for restoring and maintaining grassland habitat. Precautions for avoiding impacts on pollinators include only burning small sections of grassland, and rotating burned areas over several years, to allow sufficient time for the habitat to recover and pollinators to recolonize the burned sites.

[See Black et al. 2007 for more information on mowing, grazing and fire management.]

IV. Conservation principles for grasslands
The native grasslands in Yolo County could provide a valuable source of pollinators; a diverse native grassland comprising a variety of grasses and forbs will provide habitat for pollinators. As with agricultural areas, conservation should have a dual focus, protecting existing areas of good habitat and restoring degraded areas.

The principal threats to pollinators in grasslands of Yolo County are the loss and fragmentation of grassland; invasive species reducing floral diversity; overgrazing, mowing, and burning; and pesticide use.

To maintain pollinator (especially native bee) populations within the grassland landscape:

- Identify and protect existing pollinator habitat:
    - Areas of natural or seminatural grassland that support a diverse native flora.
    - Potential bee nesting sites such as areas of bare soil, snags, and pithy-stemmed shrubs.
- Restore degraded grasslands and create new grasslands:
    - Control and remove invasive weeds
    - Use native forbs to enhance diversity of grasslands.
- Use grazing, mowing, or fire carefully to avoid harming pollinators:
    - Treat only part of the area in one year.
    - Leave areas untreated as refugia for pollinators.
    - Time grazing to avoid periods of major bloom.
    - Rotate grazing to allow all patches to bloom.
    - Do not mow while flowers are in bloom.
    - Burning can be used to suppress shrubs and trees.
    - Allow habitat to recover fully between burns.
- Reduce spraying on grasslands and protected from drift from adjacent fields:
    - Pesticides that are not allowed on blooming crops may be allowed on grassland, despite the fact that they are no less damaging to bees.

3.3 WOODLAND AND FOREST

Woodlands and forests are primarily found in western Yolo County, and include several oak alliances, as well as foothill pine, knobcone pine, eucalyptus, cypress, and juniper alliances.
The open forest and woodland in Yolo County can provide significant habitat for pollinators. If managed properly they can provide a resource for nearby agricultural crops.

Oak woodlands, when relatively intact, contain a diverse flora interacting with a diverse pollinator fauna (Dobson 1993). In a study on the Greek Island of Lesvos, oak woodlands, pine forests and managed olive groves had the highest diversity of bees and oak woodlands had the highest levels of pollination from generalist species. In recent times, California's oak woodlands have experienced profound changes that have led to significant fragmentation of these habitats. These changes involve various combinations of grazing, conversion to agriculture, altered fire regimes, and fragmentation due to development. Although our understanding of the effects of fragmentation on vertebrate species in oak woodlands is increasing, we know very little about the effect of these changes on invertebrate communities (Block and Morrision 1998; Knapp et al. 2001). Recent work on solitary bees in oak woodlands suggests that there is a decrease in species diversity and number of species in habitats dominated by vineyards (LeBuhn, in prep) but other work showed little influence of this habitat fragmentation on bumble bees (LeBuhn and Fenter 2008).

I. Recognizing pollinator habitat

A diverse set of native plants in the understory of forests and woodlands can provide habitat for a variety of native bees. These will include ground nesting solitary bees. These bees usually need direct access to the soil surface (Potts et al. 2005) to excavate and access their nests. Ground nesting bees seldom nest in rich soils, so poor quality sandy or loamy soils may provide fine sites. Bumble bees are also found in forests and woodlands. They nest in small cavities, such as abandoned rodent nests under grass tussocks or in the ground (Kearns & Thompson 2001). Tunnel nesting bees will make their homes in the abandoned tunnels of wood-boring beetles in both conifers and a variety of deciduous trees and in the pithy centers of many woody plant stems.

II. Potential threats to pollinators

The principal threats to pollinators in woodlands of Yolo County are:

1. Fragmentation by both agricultural and urban development,
2. Over grazing in the understory is a significant threat to pollinators (personal observation), and
3. Fire also poses a threat, especially when fire suppression allows a build up in fuel loads and increased tree densities (Huntzinger 2003), both of which can lead to hotter and more widespread wildfires.

III. Actions to reduce or mitigate threats

<u>A. Protect existing pollinator habitat</u>

Providing a diverse understory of native grasses and native flowering forbs will provide significant habitat for a variety of native pollinators. Leaving patches of rough undisturbed grass in which rodents can nest will create future nest sites for bumble bees (McFrederick & LeBuhn 2006). Allowing snags and dead trees to stand, as long as they do not pose a risk to property or people, and protecting shrubs with pithy or hollow stems, such as elderberry, blackberry, and box elder, will go a long way towards supporting bees.

<u>B. Habitat restoration</u>

Removal of invasive species and restoration with native grasses forbs and shrubs will benefit pollinators. Emphasis should be placed on restoration to historic condition not on pollinator plants specifically. Nesting needs of ground nesting bees and bumble bees should be taken into consideration when restoring this habitat. Snags and other resources should be left for wood nesting bees.

C. Management considerations of pesticides

As in the other landscape types of Yolo County, herbicides are beneficial for invasive plant control, but should be used carefully to avoid harming native pollinators. The use of pesticides, particularly of insecticides, should be limited to small areas or applied at times when pollinators are inactive.

D. Grazing and fire

Only a portion of pollinator habitat should be burned, mowed, grazed, or hayed at any one time in order to protect pollinators (Black et al. 2008). This will allow for recolonization of the disturbed area from nearby undisturbed refugia, an important factor in the recovery of pollinator populations after disturbance (Hartley et al. 2007). In order to maximize foraging and egg-laying opportunities, maintenance activities should be avoided while plants are in flower (Smallidge & Leopold 1997).

Grazing management should be adjusted as needed to maintain the majority of floral resources in an area throughout the seasons. The most effective time to graze varies depending on the site, but should be limited to times of low or no pollinator activity. Moderate levels of rotational grazing minimize negative impacts on pollinators and other native species.

Fire is an important natural disturbance in the Yolo County forest and woodland landscape. Prescribed fire can help maintain these forest and woodland ecosystems, and if conducted regularly, can control the buildup of fuel loads and increased tree densities, as well as reduce the intensity and frequency of uncontrolled wildfires (Huntzinger 2003). Huntzinger (2003) evaluated adult butterfly species diversity in three types of prescribed burn treatments (forest burns, fuel breaks, and riparian burns) in formerly fire-suppressed forests in the Rogue River National Forest and Yosemite National Park. Butterfly species were higher in each of the treatments compared to the controls, with two to three times more species in forest burns, thirteen times more species in fuel breaks, and two times more species in riparian burns (Huntzinger 2003). However, several studies indicate that pollinators are negatively affected by fire (Harper et al. 2000; Swengel 2001; Potts et al. 2003). As with all potentially harmful management activities, care must be taken when using prescribed fire.

[See Black et al. 2007 for more information on grazing and fire management.]

IV. Conservation principles for woodland and forest

The open woodlands and forests of Yolo County can provide significant habitat for pollinators. The diversity of ground conditions combined with mixed ages of trees provides a rich nesting resource suited to ground-, wood-, and cavity-nesting bees. In addition, the ground flora can offer abundant flowers for foraging. These habitats are largely restricted to the hills and mountains in the west of the county, so any pollinator benefit to agricultural land is limited to farms in the Capay Valley and those close to the eastern fringe of the uplands.

The principal threats to pollinators in woodland and forest of Yolo County are fragmentation by both agricultural and urban development, overgrazing in the understory, and fire.

To maintain pollinator (especially native bee) populations within woodlands and forests:

- Reduce or prevent fragmentation of woodland and forest areas.
- Grazing should be adjusted to reduce the impact on flowering plants:
  - The best time to graze varies with the site but should be limited to periods of low pollinator activity.
  - Establish exclosures and rotate grazing to allow recovery of the vegetation community.
- Control invasive species.
- Fire is an important natural disturbance and prescribed fire can be used to manage the habitat:
  - Burn only small areas at one time.
  - Do not burn the same area more frequently than five years.
  - During burns, leave skips as refugia from which pollinators can recolonize.
- If pesticides are required for pest management:
  - Do not apply to significant patches of foraging flowers.
  - Do not apply while pollinators are active.
  - Choose least toxic option, such as pheromone traps.
- Habitat restoration should be done with native species only.

3.4 Shrubland and Scrub

Shrubland and scrub habitats are primarily located in western Yolo County and include various chamise and mixed chaparral alliances. In studies by Kremen et al. (2004), a common factor influencing native bee distribution appears to be areas of nearby natural habitat, particularly, in their study chaparral and oak woodland. Shrubland and scrub habitat offers a variety of flowering plants and nesting sites and can be very valuable habitat for native pollinators. Surveys of pollinators in different California plant communities show that the chaparral community has the largest diversity of bees per unit area (Moldenke 1976, as cited in Dobson 1993). Dobson (1993) recorded 73 bee species from six families visiting 11 shrub species in a Napa County, CA shrubland habitat, with *Ceanothus* sp. attracting the greatest diversity of bees.

I. Recognizing pollinator habitat

Bees are the most significant pollinators in chaparral communities (Moldenke 1976, as cited in Dobson 1993). Shrubland and scrub habitat provides the variety of dead, woody vegetation necessary for bees that nest in twigs and holes in shrubs and trees. The ground also provides good nesting habitat, in comparison to frequently disturbed soil in agricultural and urban areas. Flowering shrubs are the principle food source of bees in this habitat although some bees did visit other plants with low frequency (Dobson 1993). Most chaparral shrub species are self incompatible and depend on insects for pollination (Keeley and Keeley 1988, as cited in Dobson 1993). In mature chaparral flowering shrubs compromise the major food source for bees although herbaceous plants growing in shrub openings or adjacent habitats appear to play a role in maintaining populations of certain bee species (Dobson 1993).

II. Potential threats to pollinators

The principal threats to pollinators in shrubland and scrub of Yolo County are:

1. Commercial livestock grazing is common in this landscape type,

2. Burning, mowing and pesticides, and
3. Habitat fragmentation from conversion of the land to agriculture and urban areas.

III. Actions to reduce or mitigate threats

A. Protect existing pollinator habitat

Existing pollinator habitat should be identified and protected to help maintain native pollinator species and help supplement nearby agricultural and urban areas, as well as to protect threatened and endangered plant and animal species. Management should be carefully planned and applied to minimize impacts on these species.

B. Habitat enhancement and restoration

The value of the shrubland and scrub landscape, both to pollinator survival and as a source of pollinators for other landscapes, makes the enhancement and restoration of habitat important in pollinator conservation in Yolo County. In areas where habitat enhancement or restoration is planned, management practices such as pesticide use and grazing should be carefully managed.

C. Management considerations of pesticides

Insecticides should be avoided if at all possible, and herbicides should be applied at times and scales to minimize harmful effects on pollinators.

E. Management considerations of grazing and fire

Low to moderate levels of grazing can help maintain shrubland and scrub habitat. Some studies indicate that grazing has a beneficial effect on pollinator species (Smallidge & Leopold 1997; Vulliamy et al. 2006). However, if not managed carefully, livestock can severely damage the nests of ground nesting bees, as well as destroy floral and foliage resources of pollinators such as bees and butterflies (Kruess & Tscharntke 2002b; Debano 2006; Hatfield & LeBuhn 2007). Grazing should be limited to times when pollinators are not actively foraging or nesting, and should be rotated through areas in sufficient time intervals to allow recovery of grazed areas.

Fire is an important natural disturbance in the shrubland and scrub landscape. Prescribed burning can prevent the spread of large wildfires. A balanced plan for fire management should include reducing excess fuel loads and controlling vegetative succession, while allowing time between burns for the recovery of plant and wildlife populations.

[See Black et al. 2007 for more information on grazing and fire management.]

IV. Conservation principles for shrubland and scrub

Shrubland may support the richest and most diverse community of bees in Yolo County. Surveys done elsewhere in California identified chaparral as the plant community with the largest diversity of bees. Shrublands provide a diversity of nesting sites (twigs, stems, bare ground) as well as an abundance of flowering shrubs and forbs. Disturbance from fire is important to maintain the open conditions and diverse plant community. Like the woodlands and forest, shrublands are restricted to the western part of the county. Scrub habitat close to farms provides pollinators for crops.

The principal threats to pollinators in shrublands and scrub of Yolo County are commercial livestock grazing, burning, mowing, and pesticides, and habitat fragmentation.

To maintain pollinator (especially native bee) populations within shrublands and scrub:

- Protect existing shrublands and scrub to avoid loss or fragmentation.
- Manage grazing to avoid over grazing and damage to floral resources:
    - Keep grazing at low to moderate levels.
    - Establish exclosures and rotate grazing to allow recovery of grazed areas.
    - Avoid grazing when pollinators are active.
- Prescribed burning can lessen the chance of catastrophic wildfire by reducing the fuel load as well as control vegetation succession:
    - Burning should be done in small units to ensure that areas of scrub remain unburned.
    - During burns, leave skips as refugia from which pollinators can recolonize.
- If pesticides are required for pest management:
    - Do not apply to significant patches of foraging flowers.
    - Do not apply while pollinators are active.
    - Choose least toxic option, such as pheromone traps.

3.5 RIPARIAN AND WETLAND

Riparian and wetland habitat in Yolo County consists of fresh emergent wetland, saline emergent wetland, valley foothill riparian, alkali sink, and vernal pool complex.

Vernal pools

Vernal pools support many threatened and endangered species, and are of primary concern for restoration and conservation in this landscape. Areas that are seasonally flooded, such as the vernal pool complex, offer rich food and nesting resources for pollinators and other wildlife. The vernal pools of California provide critical habitat for a relatively large number of threatened and endangered species, many of which are quite specialized (Keeler-Wolf et al. 1998). The vernal pool region of Solano, Yolo, and Colusa counties hosts 16 sensitive plant species and 7 sensitive animal species (Keeler-Wolf et al. 1998). Several native solitary bee species are specialist pollen foragers on endemic vernal pool plants (Thorp & Leong 1995; Thorp & Leong 1998; Thorp 2007). Some species of vernal pool plants, many of which are threatened or endangered, are solely dependent upon specialized solitary bees for pollination (Thorp & Leong 1995).

For vernal pools in particular, many plants have bees that are specialists on that plant and have life cycles very closely associated with the host plant. Some vernal pool plants and their associated pollinators are listed in Table 2 below.

Many of the bees listed in Table 2 are oligolectic, i.e., they collect pollen from a limited range of flowers, and thus have a close association with the plants. Emergence and flight period of these bees is tightly synchronized with the bloom period of their host flower (Thorp 2007). Most of these species nest in upland areas next to the pools (rarely as far as 100 meters from the host plants) and some nest even closer in pool margins. At least one—a *Panurginus* associated with

Downingia—nests in the bottom of dried up pools. Females tend to forage in a single patch of flowers and nest near to their natal nest.

Table 3: Vernal pool plants and their flower visitors

Vernal pool plant	Specialist bee(s)	Other insect visitors
Blennosperma (stickyseed)	*Andrena blennospermatis*	Generalist visitors, including empidid and syrphid flies
Lasthenia (goldfields)	Six *Andrena* spp. (*puthua*, *submoesta*, *baeriae*, *duboisi*, *lativentris*, *leucomystax*)	Generalist bees and other visitors
Limnanthes (meadowfoam)	*Andrena puvlerea* *Panurgnius occidentalis*	
Downingia (calicoflower)	*Panurginus* sp.	Small sweat bees (Halictidae), and *Bombus vosnesenskii* (which buzzes flowers to gather pollen but doesn't pollinate)

(Pollinator information is from Thorp & Leong 1995 and Thorp 2007. Common plant names are from USDA-NRCS PLANTS database; accessed 10/12/09.)

In addition to nesting close to their host plants, these bees have limited ability to disperse to new sites. Thorp & Leong (1995) report a study conducted in a newly constructed vernal pool in which *Blennosperma* plants had been introduced. Over a period of two growing seasons, no specialist bees (*Andrena blennospermatis*) visited flowers of *Blennosperma*, though the blooms were visited by generalist sweat bees (*Halictus*) and empidid and syrphid flies.

For these specialist bees, protection of the existing vernal pool habitat, including upland areas, is the key to conservation (Thorp & Leong 1995, Thorp 2007). Do not excavate new pools in upland areas. The surrounding agricultural land provides little opportunity for ground nests (Lonsdorf et al 2009), and it is unlikely that flowering crops will contribute to conservation of these specialist bees.

The presence of flowering crops is likely to offer more foraging resources to the generalist visitors of vernal pool flowers. Unfortunately, there is little specific information published about these generalist insects which makes it difficult to assess the benefit that could accrue from crop flowers. Commercial crops of meadowfoam (*L. alba*) use honey bees and the blue orchard bee for pollination (Thorp 2007). It can be assumed that these bees must have some benefit as pollinators of vernal pool populations of *Limnanthes*. However, this is not true for all vernal pool flowers. Thorp (2007) also reports that *Downingia* growing in gardens rarely sets seeds, indicating that the generalist flower visitors are not effective.

The larvae of endangered molestan blister beetles (*Lytta molesta*) feed on the provisions and immature stages of ground nesting native bees, while the adults are flower feeders and potential pollinators (Selander 1960; Halstead & Haines 1992), and have only been collected on vernal pool vegetation, although records are limited. Conservation of native plant and bee species associated with vernal pools should be central to the conservation of this blister beetle, and will potentially benefit other plant and animal species as well.

Key Points

- *Important pollinators of vernal pool plants are mainly specialist, ground-nesting bees.*
- *These bees have a very close association with the plants, including life cycles synchronized with bloom of flowers, pollen collection from flowers, and nesting sites close to flower patches.*
- *These bees probably will not forage on crop flowers.*
- *Generalist pollinators such as bumble bees may use crops, but are not efficient pollinators of vernal pool plants.*
- *Conservation of vernal pool pollinators is best served by focusing on protecting existing vernal pools and the surrounding upland areas.*
- *There is not enough research on these systems to provide a proportion or ratio of pollinator habitat for rare plants.*
- *Generally the larger the upland area the more beneficial of pollinators.*

Riparian areas

The importance of riparian areas as pollinator habitat has been underscored by several studies, each of which identified the proximity of riparian areas as an important influence on the availability of native bees as crop pollinators (Kremen et al. 2002a, 2002b; Kremen et al. 2004) or influencing the reproduction of bees nesting on farms (Williams & Kremen 2007). Lonsdorf et al (2009) identify riparian as offering floral resources in spring but not summer. During this season, the main contribution of riparian zones may be in offering nest sites. Maximizing plant diversity along riparian corridors will result in more pollinators and other terrestrial insects to feed fish in the streams. In the agricultural areas of Yolo County, riparian areas may be the only significant areas of habitat.

I. Recognizing pollinator habitat

Most species of bees that rely on vernal pool habitat are solitary ground nesters. Most of these species nest in uplands close to vernal pools, while some species nest in the margins and sometimes the bottoms of evaporated vernal pools (Thorp & Leong 1995; Thorp 2007). Some of these species are also known to nest in stream banks (Saul-Gershenz et al. 2004). These bees have short flight ranges usually less than half a mile and are therefore often restricted to only a few vernal pools (Thorp & Leong 1995). Some species such as bumble bees also use vernal plants and may fly long distances from their nest to forage on vernal pool flowers (Thorp personal communication), underscoring the importance of landscape-wide conservation of pollinators.

II. Potential threats to pollinators

The principal threats to pollinators in riparian areas and wetlands of Yolo County are:

1. Habitat loss (vernal pools, in particular),
2. Grazing in or near riparian and wetland areas,
3. Pesticide use, and

4. Invasive exotic plants.

Livestock grazing in and near riparian and wetland areas can significantly damage stream banks and wetlands, affecting native species associated with this landscape type. Saunders and Fausch (2007) found that reduction of grazing intensity increased invertebrate inputs into streams which in turn increased trout biomass by more than 100%. Overgrazing can also reduce or eliminate plant species, and in habitat such as vernal pools, this can lead to the extirpation or extinction of specialized plants and animals.

Invasive species also threaten pollinators and other native species in these habitats, and management methods can cause further damage to pollinator populations if not used carefully.

Pesticides are a significant threat to native pollinators and other species in or near riparian areas and wetlands, especially in areas with intensive agriculture, where pesticides can build up in the water system, directly and indirectly affecting pollinators and their food plants.

Conversion of the landscape to agriculture (primarily rice fields) and urban areas has led to a significant loss of vernal pool habitat, which not only threatens pollinators, but other native species as well.

III. Actions to reduce or mitigate threats

A. Protect existing pollinator habitat

As in other landscapes, the first priority in pollinator conservation is to identify and protect existing pollinator habitat. This is especially important for the vernal pool complex, which is severely threatened by fragmentation and habitat loss, and is home to many species that are threatened or endangered in California.

B. Habitat restoration and conservation

Restoring and protecting vernal pool habitat and other sensitive riparian and wetlands areas is critically important for the survival of many threatened and endangered species in Yolo County. Vernal pools that are primarily impacted by overgrazing have the highest potential for habitat restoration, while restoration of agricultural areas such as rice fields is possible but not as feasible (Keeler-Wolf et al. 1998). Restoration of riparian and wetland habitat should include reintroduction of native plants associated with each site. As stated in the assessment of vernal pools in California done by Keeler-Wolf et al. (1998), conservation efforts should focus on the entire vernal pool complex, which includes the pools and their associated uplands, as well as considerations for both the wet and dry phases of the pools. Several native solitary bees are specialist pollinators of vernal pool plants, and have certain requirements that should be incorporated in conservation strategies for vernal pools. These bees primarily nest in uplands near vernal pools, although some species have been found nesting in the bottom of evaporated pools (Thorp 2007). These bees also have short foraging ranges and are therefore limited in how far they can travel to find forage plants (Gathmann & Tscharntke 2002, Thorp 2007). Restoration and conservation of vernal pools should also take into consideration the significant variation in the plant and animal species composition between individual pools (Keeler-Wolf et al. 1998). Management of riparian and wetland areas should use low-impact, targeted practices, and avoid grazing and pesticides.

C. Management considerations of pesticides

Pesticides should be used as little as possible in riparian and wetland areas to avoid compounding negative effects on plants and animals from the buildup of chemicals in the water system. Because so many threatened and endangered plant and animal species are associated with vernal pools, particular care should be taken when pesticide applications are necessary.

D. Management considerations of grazing and fire

Although grazing can be a beneficial disturbance, riparian and wetland areas are extremely sensitive to it and any grazing should be carefully managed. Grazing in wetlands can cause destruction of vegetation through trampling and consumption, high nutrient additions from manure that can alter plant composition in the wetlands, negatively impacting native plant and animal species, including pollinators, trampling nests of ground nesting bees and consuming and trampling foliage feeding larvae of pollinators such as butterflies and moths. But some studies have shown that some grazing can be beneficial to vernal pool habitats. One study on grazing of vernal pools in California (Marty 2005) showed that continuous grazing from October to June resulted in the highest cover of native plants compared to either no grazing or grazing for shorter periods. Grazing also affected the number of days for which the pools held water, which in turn influenced whether or not vernal pool flowers could complete their life cycle.

When burning is prescribed for areas with vernal pools, it should be carefully timed to avoid the key weeks when specialist bee species are active and threatened flower species are blooming. Other wetlands and riparian areas have longer bloom periods and corresponding pollinator activity, so burns in these areas should be timed to avoid these periods.

[See Black et al. 2008 for more information on grazing and fire management.]

IV. Conservation principles for riparian and wetland areas

This habitat category in Yolo County consists of a variety of wetland types, as well as riparian zones flanking many watercourses. This category also includes vernal pools, which support many threatened and endangered species, and are of primary concern for restoration and conservation. In the eastern part of the county, where the landscape is dominated by agriculture, riparian and wetland areas may be the only significant areas of seminatural habitat. As such, they form an important resource for pollinators and should be at the center of conservation efforts. In addition to the flowers and nesting opportunities they hold, riparian areas cross land holdings and ownership boundaries and provide valuable corridors. Pollinator habitat created in hedgerows or along ditchsides and field margins should connect with riparian areas to create a network of habitat.

The principal threats to pollinators in riparian areas and wetlands of Yolo County are habitat loss (vernal pools, in particular), grazing in or near riparian and wetland areas, pesticide use in adjacent fields, and invasive exotic plants.

To maintain pollinator (especially native bee) populations within riparian and wetland:

- Protect existing areas from habitat loss or fragmentation:
  - This is particularly important for vernal pools.
- Enhance current habitat or create new habitat:

    - Use native plants.
- Monitor and control invasive species.
- Manage grazing to avoid over grazing and damage to floral resources:
    - Keep grazing at low levels to reduce trampling and consumption.
- Pesticide use in riparian and wetland areas should be avoided:
    - Monitor pesticide use in adjacent fields.
    - Reduce spraying along field margins close to riparian zones.

For vernal pools in particular:
- Protect existing vernal pool habitat, including upland areas.
- Do not excavate new pools in upland areas.
- Carefully managed grazing may help maintain native plant communities and retain longer flooding periods.
- Avoid pesticide drift or overspray from adjacent crops.
- A buffer of 500 feet around the pools should be adequate to protect the specialist bees.
- A wider buffer (1 kilometer) should be used for aerial spraying of insecticides especially during the active flight period of the specialist bees (which coincides with bloom of the plants).

3.6 URBAN AND BARREN

Developed land in Yolo County is defined as urban. All other areas of unvegetated or vacant land are defined as barren, and include gravel bars, sand bars, and rock outcroppings. Major highways and associated verges are also included. Urban and barren areas are distributed throughout the county.

Pollinators are essential in urban areas for fruit and vegetable production of home and market gardeners, as well as for ensuring the continuation of flowering plants in gardens and parks, and the production of seeds for birds (Cane 2005). The need for pollinators in other urban and barren landscapes such as roadsides includes contributions to crops, especially in Yolo County where a majority of the county is agricultural land.

I. Recognizing pollinator habitat
Natural barren land such as gravel and sand bars can provide nesting sites to native bees. It has been demonstrated that some barren lands, particularly those due to human activities such as quarrying, can offer valuable habitat for pollinators (Benes et al. 2003; Krauss et al. 2009). Roadsides can also offer valuable habitat to pollinators if managed carefully and restored with native plants (Hopwood 2008). Roadside habitat is especially important for pollinators in areas of intensive agriculture with very little available habitat (Hopwood 2008). Urban gardens and parks also provide important habitat for pollinators in a fragmented landscape, and can serve as pollinator reservoirs if managed properly (e.g., McIntyre & Hostetler 2001; Tommasi et al. 2004; Wojcik et al. 2008). Studies of arthropods in Phoenix, Arizona indicate that while bees and other arthropods are often abundant in urban settings, the abundance and community composition differs depending on urban land use, such as residential and industrial use (McIntyre et al. 2001, Faeth et al. 2005). Ground-nesting bees are often more sensitive to urbanization because of

degraded nesting habitat, compared to cavity-nesting bees that can adapt to nesting in cavities in houses, fences, and woody landscape vegetation (Cane et al. 2006).

II. Potential threats to pollinators

The principal threats to pollinators in urban and barren areas of Yolo County are:

1. Habitat loss and fragmentation are the most significant threats to pollinators,
2. Invasive species, and
3. Use of pesticides. According to some studies more types of pesticides are detected in urban streams than in agricultural streams (Bortleson and Davis 1997) and more pounds of pesticides were applied in urban than in agricultural areas (Tetra Tech Incorporated, 1988) but urban use of pesticides are hard to track and no one has completed any analysis for Yolo County (http://agis.ucdavis.edu/pur/pdf/FlintPUR.pdf).

III. Actions to reduce or mitigate threats

A. Protect existing pollinator habitat

Existing pollinator habitat should be identified and protected to help maintain native pollinator species and provide patches of habitat in a highly fragmented and disturbed landscape. Management should be carefully planned and applied to minimize impacts on these species.

B. Habitat restoration

Restoration of roadside vegetation to native grasses can provide low-maintenance ground cover (Booze-Daniels et al. 2000; O'Dell et al. 2007). A survey of such restoration in Yolo County found that establishing native perennial grasses along roads was highly successful, with the grasses persisting under minimal maintenance for over ten years (O'Dell et al. 2007). Native broadleaf plants such as lupine and California poppy also colonized the restored roadsides (O'Dell et al. 2007), making these strips of land even more suitable for pollinator habitat. Restoration in urban areas should include establishing native flowering herbaceous plants and providing nesting materials for bees, as well as reducing pesticide use, to encourage bees and other insect pollinators to colonize parks, gardens, and other urban areas. Pavement, buildings, and turf eliminate habitat for ground nesting bees, as well as reduce the area available for flowering plants. If gardens and other potential habitat are too fragmented and widely spaced, they may not be able to support many pollinator species due to flight range restrictions.

C. Management considerations of pesticides

Pesticides are frequently used in urban areas, both to control weeds and insect pests. Pesticide use should be significantly reduced to lower the threat to pollinators and their host plants.

D. Management considerations of mowing

Mowing is a common practice in urban areas, usually to maintain the height of grasses in parks and lawns. Mowing should be avoided in areas where bees are actively foraging or nesting, or can be conducted in the evening when pollinators are less active.

IV. Conservation principles for urban and barren areas

This landscape category includes all developed land in Yolo County and any areas of unvegetated or vacant land, including gravel bars, sand bars, and rock outcroppings. Major highways and associated verges are also included. While these may not seem to be particularly attractive as pollinator habitat, the disturbed and marginal areas can be valuable as they often include a variety of flowering plants and range of ground conditions suited for bee nests. These areas are found throughout the county, offering small patches of habitat scattered across the landscape. In intensively cultivated agricultural areas, roadsides or abandoned land may be a significant habitat resource.

The principal threats to pollinators in urban and barren areas of Yolo County are habitat loss and fragmentation, invasive species, mowing, and the use of pesticides.

To maintain pollinator (especially native bee) populations within urban and barren areas:

- Identify and protect existing pollinator habitat:
  - Areas of natural or seminatural grassland that support a diverse native flora.
  - Species-rich hedgerows or scrub habitat.
  - Potential bee nesting sites such as areas of bare soil, snags, and pithy-stemmed shrubs.
- Restore degraded habitat (especially grasslands) and create new habitat patches:
  - Control and remove invasive weeds
  - Use native forbs and grasses to enhance diversity of grasslands.
  - Use flowering shrubs to create hedgerows.
  - In urban parks and gardens, flower borders, ecolawns, and ornamental plantings can be created that feature native plants.
- Use mowing carefully to avoid harming pollinators:
  - Mow only part of the area in one year.
  - Leave areas unmown as refugia for pollinators.
  - Time mowing to avoid periods of major bloom.
  - Allow habitat to recover fully between mowing.
- Reduce spraying on sites such as roadside verges and protect from drift from adjacent fields:
  - Pesticides that are not allowed on blooming crops may be allowed on verges, despite the fact that they are no less damaging to bees.

SECTION 5
RARE AND COVERED PLANTS

The issue with conserving the pollinators of rare plants is two-fold: often the pollinator of a particular plant is not known, and if it is, the biology and particular habitat needs of that pollinator may not be known.

A literature search for information about the pollination and pollinators of the covered plants in the Yolo HCP/NCCP yielded very little specific information. In some cases, for example, adobe-lily (*Fritillaria pluriflora*), pollinator information is only available for the genus or a different species, not the covered species itself. Given this it is difficult to make plant-specific suggestions or recommendations on management.

Table 4 (pages 50 – 54) summarizes what is known of the pollinators (or possible pollinators) of the covered plant species and their habitat needs.

There is limited published research on conserving pollinators related to rare plants. One exception is a paper by Sipes and Tepedino (1995) discussing the conservation of Ute lady's tresses (*Spiranthes diluvialis*), a rare orchid found in Colorado and Utah. The authors found that bumble bees were the most important pollinators, even though they visited for nectar only; the orchids' pollinaria were attached while the bees nectared. The authors recommended that management of the orchid must include consideration of bumble bees, particularly avoiding disturbance to habitat, protecting and retaining nest sites, providing flowers throughout bumble bee season (nectar and pollen when orchid not blooming, pollen while it is), and establishing an insecticide-free buffer during grasshopper control spraying. This last recommendation, obviously, is specific to the location of the orchid. Grasshopper control is likely not an issue for Yolo County, but pesticide use in the area adjacent to rare plants certainly is.

Key Points

- *Little is known about the pollinators of rare plants.*
- *Specific conservation strategies are hard to prepare without detailed information on the habitat needs of pollinators.*

Table 4. Yolo HCP/NCCP: Notes on pollinators of covered plant species

Plant	Likely pollinator	Source	Habitat notes
Adobe-lily, *Fritillaria pluriflora*	Bees	Krombein et al (1979) list *Fritillaria* as a pollen source for three spp. of Andrena. USFWS (2003) recovery plan for Gentner's fritillary mention *Lasioglossum* covered in pollen and "andrenid" bees visiting.	*Andrena* (mining bees): active in spring; solitary; excavates nests in sand or sandy loam; max foraging distance c. 300m. *Lasioglossum* (sweat bees): subsocial or solitary; excavates nests in sandy or silty loams; max foraging distance c. 150-200m.
Alkali milk-vetch, *Astragalus tener* var. *tener*	butterfly?, bees, moth?	Liston (1992) suggested butterflies due to flower morphology but there doesn't seem to be butterflies on the wing during bloom period. Also, *Astragalus* is generally pollinated by bees. Krombein et al (1979) list *Anthidium collectum*, *Hoplitis hypocrita*, and *Synhalonia tricinctella* as visitors to *A. tener*. Report on pollination of Lane Mountain milk-vetch prepared for Dept of Defense (2003) identified syrphid fly (*Eupeodes volucris*), *Anthophora* sp. (digger bees), and white-lined sphinx (*Hyles lineata*) as pollinators.	*Anthidium collectum* (carder bee): nests in abandoned burrows in the ground; lines cells with down from the leaves and stem of *Artemisia tridentata*; foraging distance likely to be 2-300m. *Hoplitis hypocrita*: nests in dead dry stems and also pre-existing tunnels in wood; likely foraging distance c. 200m. *Synhalonia tricinctella*: active in spring; solitary; ground nesting. *Anthophora* (digger bees): solitary; nests in loam or sandy loam soils; likely foraging distance 3-500m. Syrphid fly (*Eupeodes volucris*): larvae feed on aphids; adults drink nectar. White-lined sphinx (*Hyles lineata*): larvae feed on willow weed (*Epilobium*), four o'clock (*Mirabilis*), apple (*Malus*), evening primrose (*Oenothera*), elm (*Ulmus*), grape (*Vitis*), tomato (*Lycopersicon*), purslane (*Portulaca*), and fuschia.
Baker's navarretia, *Navarretia leucocephala* ssp. *bakeri*	Bees, bee flies, flower flies?	Grant (1965) lists many genera of bees visiting other species of *Navarretia*, also bee flies to two species and flower flies to one. The bee genera listed are *Andrena*, *Ancylandrena*, *Ashmeadiella*, *Anthophora*, *Exomalopsis*, *Osmia*, *Oreopasites*, and *Perdita*. Bee fly genera include *Anastoechus*, *Bombylius*,	See above for *Andrena* and *Anthophora*. *Ancylandrena*: similar to *Andrena* in nesting habitats and flight range. *Ashmeadiella*: solitary; different species nest in a variety

		Lepidanthrax, and *Lordotus*.	of substrates, including pre-existing tunnels in wood, spaces under rocks, and burrows in the ground; cells are lined with chewed leaf or petal pieces; foraging range unknown, but probably 3-500m. *Osmia* (mason bees, metallic leafcutter bees): solitary; most species nest in pre-existing tunnels in wood or crevices in rocks, divided with mud or chewed leaf pieces; likely foraging distance 150-600m. *Oreopasites*: cleptoparasites in nest of various species in the andrenid subfamily Panurginae. *Perdita*: solitary; nests in sandy soils, creating unlined cells; foraging range likely to be no more than 100m. Bee flies (Bombyliidae): egg laying needs vary between genera, but several, including *Bombylius*, lay eggs near ground-nesting bees; their larvae area external parasites of bee larvae.
Bent-flowered fiddleneck, *Amsinckia lunaris*	Bees, butterfly?	Krombein et al (1979) list numerous species from the following genera as pollen collectors from *Amsinckia*: *Andrena*, *Anthidium*, *Anthophora*, *Chelostoma*, *Duforea*, *Emphoropsis*, *Synhalonia*. Erhardt and Baker (1990) identify *A. lunaris* as an important nectar source for pipevine swallowtails.	See above for *Andrena*, *Anthophora*, and *Synhalonia*. *Anthidium* (carder bees): nests in pre-existing cavities in wood, rocks, walls, or in the ground; cells lined with down from the leaves and stem hairy plants; foraging distance likely to be 2-300m. *Chelostoma*: solitary; nests in abandoned beetle-tunnels in wood or hollow stems, divided into brood cells with soil or sand; likely foraging distance 150-300m. *Duforea*: solitary; nests in ground, lining cells with waxy substance. *Emphoropsis*: solitary; excavates nests in ground.
Brittlescale, *Atriplex depressa*	Wind	Freeman et al (2007): *Atriplex* are wind-pollinated, a feature common to most members of the Chenopodiaceae (goosefoot) family.	N/A
Colusa grass, *Neostapfia colusana*	Wind	Colusa grass is a member of the Poaceae. (USDA-PLANTS database; last accessed 10/16/09.) Grasses	N/A

		are all wind pollinated.	
Colusa layia, *Layia septentrionalis*	Bees?	Krombein et al (1979) list numerous species from the following genera as pollen collectors from *Layia*: *Colletes*, *Andrena*, *Nomadopsis*, *Perdita*, *Duforea*, *Augochlorella*, *Chelostoma*, *Osmia*, *Synhalonia*, and *Anthophora*	See above for *Andrena*, *Perdita*, *Duforea*, *Chelostoma*, *Osmia*, *Synhalonia*, and *Anthophora*. *Colletes* (polyester bees): solitary; excavates nests in sand or loamy sand, lines brood cells with cellophane-like material; likely foraging distance 3-400m. *Nomadopsis* (now a subgenus of *Calliopsis*): solitary; nests in sandy loam soils.
Delta tule pea, *Lathyrus jepsonii* var. *jepsonii*	Bees	No specific information. Nature Serve profile states "Zygomorphic flowers are probably adapted to bee pollination." Godt & Hamrick (1993) state that bumble bees are primary pollinator of *L. latifolius*.	N/A
Drymaria-like western flax, *Hesperolinon drymarioides*	small bees?, flies?	No specific information. Jepson manual (http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?4965,4966,4975; accessed 10/16/09) states that dwarf flax (*Hesperolinon*) is "Generally self-pollinated."	N/A
Ferris's milk-vetch, *Astragalus tener* var. *ferrisiae*	Bees	Liston (1992) suggested butterflies due to flower morphology but there doesn't seem to be butterflies on the wing during bloom period. Also, *Astragalus* is generally pollinated by bees. Krombein et al (1979) list *Anthidium collectum*, *Hoplitis hypocrita*, and *Synhalonia tricinctella* as visitors to *A. tener*. Report on pollination of Lane Mountain milk-vetch prepared for the U.S. Army (Charis Professional Services Corp 2003) identified syrphid fly (*Eupeodes volucris*), *Anthophora* sp., and white-lined sphinx (*Hyles lineata*) as pollinators.	See above (alkali milk-vetch) for notes.
Hall's harmonia, *Harmonia hallii*	Insect?	No information. Flower structure suggests it is visited by insects, probably small bees and flies.	N/A
Heckard's pepper-grass, *Lepidium latipes* var.	Bees, syrphid flies?	No information on this species or subspecies.	N/A

heckardii		Robertson & Klemash (2003) recorded insects from 25 families visiting slickspot peppergrass (*Lepidium papilliferum*). Bees in the families Colletidae, Halictidae, Apidae, and Anthophoridae (now a subfamily of Apidae) were considered to be the most significant pollinators. Syrphid flies (Syrphidae) were also recorded carrying pollen.	
Mason's lilaeopsis, *Lilaeopsis masonii*	Reproduction is primarily vegetative (ramets).	No information on this species. COSEWIC (2004) report on eastern lilaeopsis (*Lilaeopsis chinensis*) states: "Most plants are thought to arise from a rhizome through vegetative reproduction, which is thought to be the main means of reproduction necessary for maintaining populations. Self-pollination of flowers is also known to occur in a controlled environment, without artificial manipulation (Affolter 1985). Mechanisms of cross-pollination are not known."	N/A
Morrison's jewelflower, *Streptanthus morrisonii* spp. *morrisonii*	Bees, beefly	Krombein et al (1979) list many *Osmia* as visitors to *Streptanthus*, also *Anthidium* and *Dianthidium*. Dieringer (1991) says *Megachile comata* is effective pollinator of *S. bracteatus*.	See above for *Osmia* and *Anthidium*. *Dianthidium*: solitary; nests made of pebbles stuck together with resin, usually on the surface of a rock or twig; some species make nests in hollow twigs or under ground. *Megachile* (leafcutter bees): generally active in late-spring - summer; solitary; most species nest in pre-existing tunnels in wood, a few in loose soil; brood cells made from carefully cut leaf pieces; likely foraging distance 200-1000m.
Palmate-bracted bird's beak, *Cordylanthus palmatus*	Bees	Saul-Gershenz et al (2002): *Bombus vosnesenskii*, *Halictus tripartitus*, *Lasioglossum* sp.	See above for *Lasioglossum*. *Bombus vosnesenskii* (yellow-faced bumble bee): social, living in colonies of dozens of bees; nests in abandoned rodent nests under tussocky grass or in ground; colony founded in late winter by single female, grows through several generations during summer; workers active Feb - Oct; likely foraging distance 500-1500m. *Halictus* (sweat bee): solitary or subsocial; excavates nest

			in ground (sandy loam or loamy sand).
Rose mallow, *Hibiscus lasiocarpus*	Bees?	Krombein et al (1979) list *Melissodes agilis* as *Hibiscus* visitor with range to West Coast. *Melissodes bimaculata bimaculata* visits *H. lasiocarpus*, but is not found west of North Dakota. On the East Coast, *Ptilothrix bombiformis* and *Svastra atripes atrimitra* visit *Hibiscus*.	*Melissodes*: solitary; excavates nest in ground. *Ptilothrix*: solitary; excavates nests in sandy loam. *Svastra*: solitary; excavates nest in ground.
San Joaquin spearscale, *Atriplex joaquiniana*	Wind	Freeman et al (2007): *Atriplex* are wind-pollinated, a feature common to most members of the Chenopodiaceae (goosefoot) family.	N/A
Snow Mountain buckwheat, *Eriogonum nervulosum*	Bees, flies?	*Eriogonum* are widely recognized as important bee plants. Panjabi (2004) recorded bees (*Halictus*, *Lasioglossum*), flies (Bombylidae, Tachinidae), and wasps (*Eucceris*) visiting *Eriogonum brandegei* (Brandegee wild buckwheat).	See above for *Lasioglossum* and *Halictus*.
Solano grass, *Tuctoria mucronata*	Wind	Solano grass is a member of the Poaceae. (USDA-PLANTS database; last accessed 10/16/09.) Grasses are all wind pollinated.	N/A

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The Xerces Society
FOR INVERTEBRATE CONSERVATION

The Xerces Society for Invertebrate Conservation is a nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. Established in 1971, the Society is at the forefront of invertebrate protection worldwide, harnessing the knowledge of scientists and the enthusiasm of citi zens to implement conservation programs. Our work focuses on three principal issues: endangered species, healthy waters, and pollinator conservation.

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Cover photos
Main: pollinator habitat created on farmland in Yolo County; top left: yellow-face bumble bee approaching tomato flower; lower left: foraging sweat bee. (All photos by Mace Vaughan/Xerces Society.)

Appendix H
Cost Estimates and Assumptions

This cost model calculates implementation cost estimates through the permit term for the Yolo HCP/NCCP .
The model takes input from the conservation strategy (acres of land acquired and restored by natural community), develops assumptions to estimate cost factors, and generates costs per period and cumulative total costs over the permit term. The model also generates an estimate of annual average post-permit costs.

Title Page	
Legend	sources of cost factor assumptions
BLS_CPI_West	Consumer Price Index, West region, all urban consumers: used to bring original cost factors to current year dollars
1a Cost Summary	50-year permit term costs by major cost category, by 5 year period and for the complete permit term
1b Cost Summary (rounded)	
Tables 2 - 6	background source data and information
2 ProtectionRestorationJuly 2015	source data from ICF
3 Fee Title_Easement	allocation of reserve acquisition details by natural community and means of acquisition (for newly protected lands)
4 Restoration detail	detail on restoration acres
5 Species_ProtectRestore	cross-walk from natural community to species for use in monitoring estimates (source data from ICF)
6 PrePermitReserveSites	Table 1: Sites likely to be enrolled as pre-permit reserve lands
7a INPUT Schedule	assumptions on the timelines for reserve assembly and restoration, by natural community and other categories
7b Schedule Acres	INPUT schedule multiplied by acres by natural community and type
7c Schedule Parcels	INPUT schedule multiplied by rough estimate of parcels by natural community and type
8 Qualified Biologist Rate	assumption used in a number of cost estimates
9 Establish Reserve	cost to acquire conservation easements on newly protected lands and to enroll pre-permit reserve lands, including transaction costs and pre-acquisition surveys
10 RestoreNaturalCommunities	cost to acquire restoration land in fee title, cost of restoration, and cost to manage and monitor the restored land
11 Manage and Enhance	cost to manage the rest of the reserve, including management oversight, management plans, and enhancements for SWHA on newly protected and pre-permit reserve lands (includes costs for remedial measures to respond to changed circumstances)
12 MonitoringResearchScience	costs for natural community and species monitoring on newly protected and pre-permit reserve lands (all but restored lands), costs for YHC staff oversight of monitoring contractors, costs for research and Science and Technical Advisory Committee
13 Plan Administration	costs for adminstrative staff and overhead, costs for legal and financial services, GIS and database updates, insurance and occupancy
14 Local Partner Activities	costs for activities in Cache Creek and Putah Creek riparian corridors funded by Yolo County and the Solano County Water Agency
15 Contingency	additional cost allowance for these planning level estimates
16 Post Permit Costs Annual	estimated annual average post permit costs for relevant cost categories
17 Staffing Plan and Costs	staffing plan, per FTE staff salaries, benefits, and overhead assumptions

Legend (input assumption)	Source
	HEG/ICF 2014/2015/2017
	HEG/ICF earlier
	Yolo Land Trust
	Yolo Habitat Conservancy and other Yolo County Sources, i.e., Yolo RCD
	Local Partners: Yolo County Cache Creek Area Plan Program and Lower Putah Creek Coordinating Committee
	Other Plans
	Guesstimate/Placeholder
link to other cell(s) in workbook	
cost variable	Changing these cells will change the cost model output
plan input assumption	
Final Yolo HCP/NCCP	Indicates Conservation Strategy / Plan Status
Jan-18	Cost Model Date
2017	Enter year for constant dollar values

CPI-All Urban Consumers (Current Series)
Original Data Value

Series Id: CUUR0400SA0
Not Seasonally Adjusted
Series Title: All items in West urban, all urban consumers, not
Area: West urban
Item: All items
Base Period: 1982-84=100
Years: 2003 to 2017

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	HALF1	HALF2
2003	186.600	188.100	189.300	188.800	188.500	188.100	188.400	189.200	189.600	189.400	188.500	188.300	188.600	188.200	188.900
2004	189.400	190.800	192.200	192.300	193.400	193.300	192.900	193.000	193.800	195.000	195.100	194.200	193.000	191.900	194.000
2005	194.500	195.700	197.100	198.600	198.800	198.000	198.600	199.600	201.700	202.600	201.400	200.000	198.900	197.100	200.700
2006	201.700	202.700	203.800	205.300	206.900	206.400	206.700	207.500	207.800	207.100	206.300	206.200	205.700	204.500	206.900
2007	207.790	208.995	210.778	212.036	213.063	212.680	212.542	212.406	212.920	213.917	214.904	214.733	212.230	210.890	213.570
2008	215.739	216.339	218.533	219.437	221.009	223.040	223.867	222.823	222.132	221.034	217.113	214.685	219.646	219.016	220.276
2009	215.923	217.095	217.357	217.910	218.567	219.865	219.484	219.884	220.294	220.447	219.728	219.307	218.822	217.786	219.857
2010	219.989	220.179	220.809	221.202	221.417	221.147	221.331	221.523	221.384	221.708	221.671	222.081	221.203	220.790	221.616
2011	223.149	224.431	226.558	227.837	228.516	228.075	227.805	228.222	229.147	229.195	228.771	228.117	227.485	226.428	228.543
2012	228.980	229.995	232.039	232.561	233.053	232.701	231.893	233.001	234.083	234.966	233.206	232.029	232.376	231.555	233.196
2013	232.759	234.595	235.511	235.488	235.979	236.227	236.341	236.591	237.146	237.000	236.153	236.096	235.824	235.093	236.555
2014	236.707	237.614	239.092	239.808	241.350	241.616	241.850	241.660	241.920	241.650	240.220	239.095	240.215	239.365	241.066
2015	238.318	239.748	241.690	242.302	244.227	244.332	245.040	244.737	244.257	244.341	243.749	243.434	243.015	241.770	244.260
2016	244.600	244.821	245.404	246.589	247.855	248.228	248.375	248.498	249.234	249.897	249.448	249.516	247.705	246.250	249.161
2017	250.814	252.252	252.949	253.806	254.380	254.469	254.708	255.282	256.504					253.112	

percent increase in costs	**5.93%**	CPI index factor	**0.9439853**	to convert 2014 to 2017 dollars
percent increase in costs	**4.71%**	CPI index factor	**0.9549886**	to convert 2015 to 2017 dollars

percent increase in costs	**27.94%**	CPI index factor	**0.7816276**	to convert 2005 to 2017 dollars
percent increase in costs	**15.85%**	CPI index factor	**0.8631543**	to convert 2008 to 2017 dollars

Source: Bureau of Labor Statistics Generated on: October 19, 2017 (06:56:42 PM)

Table 1a

Yolo HCP / NCCP Cost Summary by Cost Category, 50-year Permit Term

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

	Permit Period (years)												
Cost Category[1]	**Start up**	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**	**Average Annual Cost**
Establish Reserve System, except restored lands[2]	$0	$24,530,797	$24,269,919	$24,269,919	$24,269,919	$24,269,919	$24,269,919	$24,269,919	$24,099,364	$24,125,907	$0	**$218,375,581**	$4,367,512
Restore Natural Communities[3]	$0	$7,737,635	$7,944,333	$8,085,991	$8,203,701	$8,292,292	$8,398,028	$8,551,660	$8,693,317	$1,073,392	$1,169,184	**$68,149,534**	$1,362,991
Manage and Enhance Easement & Pre-Permit Reserve Lands[4]	$0	$1,404,523	$1,477,700	$1,351,945	$1,417,306	$1,365,305	$1,430,666	$1,497,179	$1,562,540	$1,633,823	$1,326,820	**$14,467,808**	$289,356
Monitoring, Research & Scientific Review, except restored lands[4]	$0	$1,239,811	$1,414,650	$1,642,457	$1,688,871	$1,916,677	$1,952,840	$2,180,647	$2,408,453	$2,375,395	$1,982,088	**$18,801,889**	$376,038
Plan Administration	$0	$3,590,264	$3,598,296	$3,453,661	$3,461,566	$3,566,931	$3,428,648	$3,436,553	$3,346,998	$3,208,841	$3,053,066	**$34,144,826**	$682,897
Local Partner Activities in Riparian Corridors	$0	$2,151,975	$2,151,975	$2,151,975	$2,151,975	$2,151,975	$2,151,975	$2,151,975	$2,151,975	$2,151,975	$2,151,975	**$21,519,750**	$430,395
Contingency	$0	$3,266,983	$3,287,169	$3,297,077	$3,320,816	$3,357,792	$3,364,690	$3,410,275	$3,444,802	$3,224,680	$753,116	**$30,727,401**	$614,548
Total	**$0**	**$43,921,988**	**$44,144,043**	**$44,253,025**	**$44,514,154**	**$44,920,891**	**$44,996,766**	**$45,498,208**	**$45,707,451**	**$37,794,014**	**$10,436,249**	**$406,186,789**	**$8,123,736**

Notes:

[1] Includes permit term implementation costs only; does not include additional costs of plan preparation and endowment.

[2] Reserve assembly is assumed to occur at an even pace throughout the first 45 years of Plan implementation. Actual reserve assembly may differ in order to meet the rough proportionality standard or due to other factors.

[3] Includes costs of fee title acquisition of land on which restoration activity occurs, costs to restore, as well as on-going management and monitoring of restored lands.

[4] Management and monitoring on restored lands is included in the Restore Natural Communities line item.

Table 1b

Yolo HCP / NCCP Cost Summary by Cost Category, 50-year Permit Term (rounded to thousands)

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

	Permit Period (years)											
Cost Category[1]	**Start up**	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**	**Average Annual Cost**
Establish Reserve System, except restored lands[2]	$0	$24,531,000	$24,270,000	$24,270,000	$24,270,000	$24,270,000	$24,270,000	$24,270,000	$24,099,000	$24,126,000	$0	**$218,376,000**	$4,367,520
Restore Natural Communities[3]	$0	$7,738,000	$7,944,000	$8,086,000	$8,204,000	$8,292,000	$8,398,000	$8,552,000	$8,693,000	$1,073,000	$1,169,000	**$68,150,000**	$1,363,000
Manage and Enhance Easement & Pre-Permit Reserve Lands[4]	$0	$1,405,000	$1,478,000	$1,352,000	$1,417,000	$1,365,000	$1,431,000	$1,497,000	$1,563,000	$1,634,000	$1,327,000	**$14,468,000**	$289,360
Monitoring, Research & Scientific Review, except restored lands[4]	$0	$1,240,000	$1,415,000	$1,642,000	$1,689,000	$1,917,000	$1,953,000	$2,181,000	$2,408,000	$2,375,000	$1,982,000	**$18,802,000**	$376,040
Plan Administration	$0	$3,590,000	$3,598,000	$3,454,000	$3,462,000	$3,567,000	$3,429,000	$3,437,000	$3,347,000	$3,209,000	$3,053,000	**$34,145,000**	$682,900
Local Partner Activities in Riparian Corridors	$0	$2,152,000	$2,152,000	$2,152,000	$2,152,000	$2,152,000	$2,152,000	$2,152,000	$2,152,000	$2,152,000	$2,152,000	**$21,520,000**	$430,400
Contingency	$0	$3,267,000	$3,287,000	$3,297,000	$3,321,000	$3,358,000	$3,365,000	$3,410,000	$3,445,000	$3,225,000	$753,000	**$30,727,000**	$614,540
Total	**$0**	**$43,922,000**	**$44,144,000**	**$44,253,000**	**$44,514,000**	**$44,921,000**	**$44,997,000**	**$45,498,000**	**$45,707,000**	**$37,794,000**	**$10,436,000**	**$406,187,000**	**$8,124,000**

Notes:

[1] Includes permit term implementation costs only; does not include additional costs of plan preparation and endowment.

[2] Reserve assembly is assumed to occur at an even pace throughout the first 45 years of Plan implementation. Actual reserve assembly may differ in order to meet the rough proportionality standard or due to other factors.

[3] Includes costs of fee title acquisition of land on which restoration activity occurs, costs to restore, as well as on-going management and monitoring of restored lands.

[4] Management and monitoring on restored lands is included in the Restore Natural Communities line item.

Table 2

Yolo HCP/NCCP - Protection and Restoration by Natural Community

Final Yolo HCP/NCCP

Natural Community	Vegetation / Land Cover Detail	Crop Type	HCP/NCCP New Protection Requirement	Acres Restored	
Cultivated lands					
Agriculture: wetland	Rice	Rice	2,800		
Agriculture: non-wetland			14,362		
Grassland			4,430		
Serpentine			0		
Chamise			0		
Mixed chaparral			0		
Blue oak and foothill pine			0		
Blue oak woodland	Blue oak alliance		10		
Closed-cone pine-cypress			0		
Montane hardwood			0		
Valley oak woodland	Valley oak alliance		20		
Alkali prairie	Alkali sink		34		
Vernal pool complex	Vernal pool complex		0		
Fresh emergent wetland			500	88	
Valley foothill riparian			1,600	608	includes 20 acres independent of effect
Lacustrine and riverine	Open water		600	260	includes 24 acres independent of effect
Bank swallow	*not technically a natural semi natural comm.*		*50*		
Total natural and seminatural communities + bank swallow			**24,406**	**956**	
		pre-permit reserve lands	**8,000**		
		restored (additive)	*956*		
			33,362		

Source: Table 5-4, *Natural Community Benefits and Net Effects;* Table 6-1(b), *Reserve System Land Types* ; and Table 6-3 *Biological Goals and Objectives and Applicable Conservation Measures and Monitoring*

Table 3
Yolo HCP/NCCP - Fee Title and Easement Acquisition Input
Final Yolo HCP/NCCP

	A	B	C	D = A+B	E = C+D		
Natural Community	**Newly Protected Lands Commitment (Table 5-4 and Table 6-2(a))**	**Additional Acquisition to Ensure Commitment of Sensitive Habitats[1]**	**Additional Fee Title Acquisition (for restoration)**	**New Easement Acquisition**	**Total Acres Acquired**	minimum patch size (6.4.1.4.1; Table 6-5)	number of parcels acquired (rough estimate)
Cultivated lands							
Agriculture - rice	2,800		-	2,800	2,800	160	18
Agriculture - non-rice	14,362		741	14,362	15,103	160	94
Grassland[2]	4,364		215	4,364	4,579	400	50
Blue oak woodland	10		-	10	10		1
Valley oak woodland	20			20	20		1
Alkali prairie and upland grassland[2]	100			100	100		1
Fresh emergent wetland	500	25	-	525	525	160	3
Valley foothill riparian	1,600	80	-	1,680	1,680	25	67
Lacustrine and riverine	600	30	-	630	630	160	4
Other - Barren							
Bank swallow habitat	50		-	50	50		
Total newly protected lands[3]	**24,406**	**135**	**956**	**24,541**	**25,497**		**239**
			[incl as CM2 cost]				

Assumptions/Notes:

Percent increase in acres acquired	5%				
Number of transactions/parcels acquired		**10**	**230**	**240**	(rounded)

1. Because of parcel size boundaries and limitations regarding available acquisitions from willing sellers, land acquisition to meet the small acreage targets for sensitive habitats will most likely be greater than the underlying newly protected lands commitment. For the purpose of the cost analysis, the Conservancy assumes that 5 percent more acreage for sensitive habitats will be acquired to meet the sensitive habitat targets exactly.

2. The acres of newly protected grassland to be acquired is reduced from the 4,430 acres shown in Table 2 Protection and Restoration by Natural Community because 66 acres of associated upland grassland at Woodland Regional Park is acquired and managed as part of the alkali prairie reserve lands. The 66 acres of upland grassland are added to the 34 acres of alkali prairie for a total of 100 acres of alkali prairie and upland grassland natural community for the purposes of the acquisition cost and management cost analysis.

3. The newly protected lands commitment includes 276 acres of reclaimed mining land held in fee title by Yolo County and committed to the reserve, with the addition of habitat conservation easements, as newly protected lands. The sites are part of the Cache Creek Area Plan and include the following (with acres possibly under easement noted):

Corell	39
Millsap	15
Capay Open Space	10
Wild Wings	12
Rodgers	30
Granite Esparto Trail Corridor	115
Syar Upland	25
CEMEX Snyder Lakes	30
Total acres possibly under easement	**276**

Table 4
Yolo HCP/NCCP - Restoration Detail
Final Yolo HCP/NCCP

Natural communities	Restored from: Cultivated lands (non-rice)	Grassland	Total
Restored to:			
Fresh emergent wetland			88
Valley foothill riparian			608
Lacustrine and riverine			260
Total	**741**	**215**	**956**

Table 5

Yolo HCP/NCCP - Acres by species and habitat type for use in monitoring cost estimates

Final Yolo HCP/NCCP

Species	Unit	Habitat Type that is monitored annually	NEWLY PROTECTED LANDS Table 5-7 10/1/2015 Acres of protection	 Acres of restoration	PRE-PERMIT RESERVE LANDS (illustrative for the purposes of planning level estimates) GIS analysis provided by ICF 7/14/2015 + acres in sites 7 - 23
Valley elderberry longhorn beetle	acres	Valley foothill riparian	1,600	531	105
California tiger salamander	acres				
Upland dispersal		Annual grassland	2,000	-	222
Aquatic breeding	acres	Lacustrine & riverine	36	36	35
Western pond turtle	acres	Grassland, fresh emergent wetland, lacustrine	2,400	369	42
Giant garter snake	acres				
Rice			2,800	-	1,000
Aquatic		Annual grassland	420	109	18
Freshwater emergent wetland			500	76	-
Active upland		Grassland	1,160	-	18
Overwintering upland		Other uplands	2,315	-	39
Swainson's hawk	acres				
Nesting		Riparian	1,600	598	184
Foraging		Grassland/cultivated lands	18,792	-	5,635
White-tailed kite	acres				
Nesting		Riparian	1,600	598	184
Foraging		Grassland/cultivated lands	18,797	-	2,843
Western yellow-billed cuckoo	acres	Valley foothill riparian	500	100	112
Western burrowing owl	acres	Cultivated lands, grassland	5,500	-	763
Least Bell's vireo	acres	Valley foothill riparian	600	80	83
Bank swallow	acres	Barren	50	-	-
Tricolored blackbird	acres				
Nesting		Wetland	200	86	-
Foraging		Grassland/cultivated lands	16,610	-	2,033
Palmate-bracted bird's beak	acres	Alkali prairie	34	-	55

VELB Assumptions Monitoring is different than that which would be done for valley riparian community (i.e., percent canopy, structural diversity).

Table 6
Yolo Habitat Conservancy
Local Cost Share Sources and Potential Approaches
Source: June 26, 2015 memorandum "Yolo HCP / NCCP Local Cost Share Source Assessment", as revised January 2018 by Yolo Habitat Conservancy staff
Pre-Permit Reserve Lands

Number	Site	Managing agency	Acres	Actions needed to qualify as pre-permit reserve lands	Factors determining on-going cost estimates
Type 1: Baseline public and easement lands					
1	River Ranch - VELB Conservation Bank - Phase 2	Wildlands/Wildlife Heritage Foundation	35.5	Baseline public and easement lands with endowments:No additional actions: to be enrolled as is	Sites have endowments or agricultural income to cover management and some monitoring costs. Species monitoring required for all but the mitigation banks (Sites 1 - 6)
2	River Ranch - VELB Conservation Bank - Phase 3	Wildlands/Wildlife Heritage Foundation	99.7		
3	Teal Ridge - Ridge Cut Farms Mitigation Bank	Wildlands	185.9		
4	Pope Ranch - Giant Garter Snake	Wildlands	391.0		
5	River Ranch - VELB Conservation Bank - Phase 1	Wildlands/Wildlife Heritage Foundation	76.0		
6	River Ranch - Wetlands Mitigation Bank	Wildlands/Wildlife Heritage Foundation	113.4		
7	Grasslands Regional Park - Burrowing Owl Mitigation	County of Yolo/City of Davis	33.0		
8	Conaway - Giant Garter Snake	American West Conservation	1,000.0		
9	Conaway - Swainson's Hawk	American West Conservation	1,000.0		
10	Conaway - Tri-colored Blackbird	American West Conservation	224.2		
11	SWHA Mitigation - Bogle	Yolo Land Trust	76.0	Baseline public and easement lands with endowments: Need management plan to qualify	
12	SWHA Mitigation - Chickahominy Creek 1	Yolo Habitat Conservancy	148.9		
13	SWHA Mitigation - Lara West	Yolo Land Trust	83.1		
14	SWHA Mitigation - Lara East	Yolo Land Trust	41.0		
15	SWHA Mitigation - Los Rios	Yolo Land Trust	80.2		
16	SWHA Mitigation - Schmid	Yolo Land Trust	80.2		
17	SWHA Mitigation - Tule Ranch	Yolo Land Trust	143.4		
18	SWHA Mitigation - Virgin	Yolo Habitat Conservancy	347.0		
19	SWHA - Kerr	Yolo Land Trust	87.3		
20	SWHA Mitigation - Chickahominy Creek 4		160.7		
21	SWHA Mitigation - Chickahominy Creek 5		161.1		
22	SWHA Mitigation - Tule Ranch Area II		289.6		
23	Yolo Bypass Wildlife Area		TBD		
24	Gateway Preserve - City of Woodland SWHA mitigation	Wildlife Heritage Foundation	74.8	Baseline public and easement lands consistent with the conservation strategy that are missing endowments and/or management plans: Need easement modifications, management plan and/or endowment to qualify	
25	River Ranch - SWHA Mitigation - Caltrans 70 - DeSilva Gates	Wildlife Heritage Foundation	72.0		
26	River Ranch - SWHA Mitigation - Yolo 286 - Yolo County HCP/JPA	Wildlands	221.1		
27	River Ranch - SWHA Mitigation - Yolo other	Wildlife Heritage Foundation	54.0		
28	Los Rios North	Yolo Land Trust	778.0		
29	Pope Ranch North - Swainson's Hawk Preserve 2	Wildlands	108.6		
30	Heidrick - Swainson's Hawk	Yolo Land Trust	216.3		
31	Pope Ranch North - Swainson's Hawk Preserve 1	Wildlands	107.0		
32	Spring Lake - Merritt Ranch	Yolo Land Trust	641.0		
33	Notch Farm		39.9		
34	Alforex Seeds LLC		45.0		

Pre-permit reserve land, by natural community (illustrative for the purposes of planning level estimates)

Natural community (Table 6-2(b)	All sites (acres)
Cultivated lands (rice)	1,775
Cultivated lands (non-rice)	3,649
Grassland	335
Alkali prairie	140
Fresh emergent wetland	750
Other land cover types	1,351
Total	**8,000**

Natural community (ICF GIS analysis, adapted 1/2018 to new list with all but mitigation banks)	Illustrative for all but Sites 1 - 10 (acres)
Cultivated lands (rice)	-
Cultivated lands (non-rice)	3,649
Grassland	254
Alkali prairie	55
Vernal pool complex	27
Fresh emergent wetland	-
Valley foothill riparian	153
Lacustrine and riverine	41
Other land cover types	599
Total	**4,778**

For species monitoring cost estimate

Sites 1 - 6 Mitigation Banks (no cost)	**902**

Table 6
Yolo Habitat Conservancy
Local Cost Share Sources and Potential Approaches
Source: June 26, 2015 memorandum "Yolo HCP / NCCP Local Cost Share Source Assessment", as revised January 2018 by Yolo Habitat Conservancy staff
Pre-Permit Reserve Lands

Type 2: Baseline public and easement lands that are held in fee title and have a habitat component

35	Davis Communications Facility	NPS/Yolo County	320.0	Baseline public and easement lands consistent with the conservation strategy that are missing endowments and/or management plans: Need easement modifications, management plan and/or endowment to qualify
36	Helvetia Oak Grove	County of Yolo	11.1	
37	Howatt/Clayton Ranch	City of Davis	769.4	
38	Los Rios South	City of Davis	252.0	
39	South Fork Preserve	City of Davis	191.3	
40	Wildhorse Ag Buffer	City of Davis	40.3	
41	Davis Municipal Golf Course Expansion	City of Davis	24.5	
42	Davis Wetland Demonstration	City of Davis	419.6	
43	Elkhorn Regional Park	County of Yolo	49.0	
44	Guesisosi Site	County of Yolo	14.4	
45	Jan T. Lowrey Cache Creek Nature Preserve	County of Yolo	119.0	
46	Knights Landing Fishing Access	County of Yolo	1.4	
		Subtotal acres Sites 1 - 10	**3,158.7**	
		Subtotal acres Sites 11 - 23	**1,698.5**	
		Subtotal acres Sites 1 - 23	**4,857.21**	
23	**Site count Sites 24 - 46**	**Subtotal acres Sites 24 - 46**	**4,569.7**	
		Average acres per site, Sites 24 - 46	**200**	
		Grand Total Types 1 & 2	**9,426.93**	

Table 7a
Reserve Acquisition and Restoration Schedules - Percent by Five-Year Period
Final Yolo HCP/NCCP

	Permit Period (years)											
	Start up	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	50 Year Total
CM1 Newly Protected Lands												
Natural community	Conservation Easement Acquisition Schedule											
Cultivated lands: rice	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Cultivated lands: non-rice	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Grassland	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Blue oak woodland	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Valley oak woodland	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Alkali prairie and upland grassland	*0%*	*100%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*100%*
Fresh emergent wetland	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Valley foothill riparian	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Lacustrine and riverine	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Other - Barren												
Bank swallow habitat	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Overall average	*0%*	*20%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*0%*	*100%*
Natural community	Fee Title Acquisition Schedule											
Cultivated lands: non-rice	*0%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*0%*	*0%*	*100%*
Grassland	*0%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*0%*	*0%*	*100%*
Overall average	*0%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*0%*	*0%*	*100%*
CM1 Pre-Permit Reserve Lands	Enrollment Schedule											
Sites 1-10 (as-is)	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Sites 11-23 (as-is)	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
From other sites	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
Overall average	*0%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*0%*	*100%*
CM2 Natural community	Restoration Schedule											
Fresh emergent wetland	*0%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*0%*	*0%*	*100%*
Valley foothill riparian	*0%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*0%*	*0%*	*100%*
Lacustrine and riverine	*0%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*13%*	*0%*	*0%*	*100%*

Assumptions:
All conservation easements acquired by year 45.
All fee title acquisitions and restoration projects complete by year 40.
Pre-permit reserve lands enrolled evenly over 50-year permit term

9	number of easement acquisition periods
8	number of fee title acquisition periods
9	number of pre-permit reserve acquisition periods

Table 7b
Reserve Acquisition and Restoration Schedules - Acres by Five-Year Period
Final Yolo HCP/NCCP

		Permit Period (years)										
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
CM1 Newly Protected Lands												
Natural community	Conservation Easement Acquisition (acres per period)											
Cultivated lands: rice	-	311	311	311	311	311	311	311	311	311	-	2,800
Cultivated lands: non-rice	-	1,596	1,596	1,596	1,596	1,596	1,596	1,596	1,596	1,596	-	14,362
Grassland	-	485	485	485	485	485	485	485	485	485	-	4,364
Blue oak woodland	-	1	1	1	1	1	1	1	1	1	-	10
Valley oak woodland	-	2	2	2	2	2	2	2	2	2	-	20
Alkali prairie and upland grassland	-	100	-	-	-	-	-	-	-	-	-	100
Fresh emergent wetland	-	58	58	58	58	58	58	58	58	58	-	525
Valley foothill riparian	-	187	187	187	187	187	187	187	187	187	-	1,680
Lacustrine and riverine	-	70	70	70	70	70	70	70	70	70	-	630
Other - Barren												
Bank swallow habitat	-	6	6	6	6	6	6	6	6	6	-	50
Total	**-**	**2,816**	**2,716**	**2,716**	**2,716**	**2,716**	**2,716**	**2,716**	**2,716**	**2,716**	**-**	**24,541**
Number of transactions	*-*	*26*	*26*	*26*	*26*	*26*	*26*	*26*	*26*	*26*	*-*	*230*
Natural community	Fee Title Acquisition for Restoration (acres per period)											
Cultivated lands: non-rice	-	93	93	93	93	93	93	93	93	-	-	741
Grassland	-	27	27	27	27	27	27	27	27	-	-	215
Total	**-**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**-**	**-**	**956**
Number of transactions	*-*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*-*	*-*	*10*
CM1 Pre-permit Reserve Lands	Enrollment (acres per period)											
Sites 1-10 (as-is)	-	351	351	351	351	351	351	351	351	351	-	3,159
Sites 11-23 (as-is)	-	189	189	189	189	189	189	189	189	189	-	1,698
From other sites	-	349	349	349	349	349	349	349	349	349	-	3,143
Total	**-**	**889**	**889**	**889**	**889**	**889**	**889**	**889**	**889**	**889**	**-**	**8,000**
Number of transactions Sites 1 - 10	*-*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*-*	*10*
Number of transactions Sites 11 - 23	*-*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*-*	*10*
Number of transactions from other sites	*-*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*-*	*18*
CM2 Natural community	Restoration (acres per period)											
Fresh emergent wetland	-	11	11	11	11	11	11	11	11	-	-	88
Valley foothill riparian	-	76	76	76	76	76	76	76	76	-	-	608
Lacustrine and riverine	-	33	33	33	33	33	33	33	33	-	-	260
Total	**-**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**-**	**-**	**956**

Cumulative Total Newly Protected Lands by Natural Community

Natural community	**Start up**	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
Cultivated lands: rice	-	311	622	933	1,244	1,556	1,867	2,178	2,489	2,800	2,800	2,800
Cultivated lands: non-rice	-	1,596	3,192	4,787	6,383	7,979	9,575	11,170	12,766	14,362	14,362	14,362
Grassland	-	485	970	1,455	1,940	2,424	2,909	3,394	3,879	4,364	4,364	4,364
Blue oak woodland	-	1	2	3	4	6	7	8	9	10	10	10
Valley oak woodland	-	2	4	7	9	11	13	16	18	20	20	20
Alkali prairie and upland grassland	-	100	100	100	100	100	100	100	100	100	100	100
Fresh emergent wetland	-	69	139	208	277	347	416	485	555	613	613	613
Valley foothill riparian	-	263	525	788	1,051	1,313	1,576	1,839	2,101	2,288	2,288	2,288
Lacustrine and riverine	-	103	205	308	410	513	615	718	820	890	890	890
Other - Barren												
Bank swallow habitat	-	6	11	17	22	28	33	39	44	50	50	50
Total	**-**	**2,935**	**5,770**	**8,606**	**11,441**	**14,276**	**17,111**	**19,946**	**22,781**	**25,497**	**25,497**	**25,497**

Table 7c
Reserve Acquisition and Restoration Schedules - Parcels by Five-Year Period
Final Yolo HCP/NCCP

	Permit Period (years)											
	Start up	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	50 Year Total
CM1 Newly Protected Lands												
Natural community	**Conservation Easement Acquisition (parcels per period)**											
Cultivated lands: rice	-	2	2	2	2	2	2	2	2	2	-	18
Cultivated lands: non-rice	-	10	10	10	10	10	10	10	10	10	-	89
Grassland	-	5	5	5	5	5	5	5	5	5	-	48
Blue oak woodland	-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	-	1
Valley oak woodland	-	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	-	1
Alkali prairie and upland grassland	-	1.00	-	-	-	-	-	-	-	-	-	1
Fresh emergent wetland	-	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	-	3
Valley foothill riparian	-	7.44	7.44	7.44	7.44	7.44	7.44	7.44	7.44	7.44	-	67
Lacustrine and riverine	-	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	-	4
Other - Barren												
Bank swallow habitat	-	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**27**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**-**	**232**
Number of transactions	-	*26*	*26*	*26*	*26*	*26*	*26*	*26*	*26*	*26*	-	*230*
Natural community	**Fee Title Acquisition for Restoration (parcels per period)**											
Cultivated lands: non-rice	-	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	-	-	5
Grassland	-	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	-	-	2
Total	**-**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**-**	**-**	**7**
Number of transactions	-	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	-	-	*10*
CM1 Pre-permit Reserve Lands	**Enrollment (acres per period)**											
Sites 1-10 (as-is)	-	351	351	351	351	351	351	351	351	351	-	3,159
Sites 11-23 (as-is)	-	189	189	189	189	189	189	189	189	189	-	1,698
From other sites	-	349	349	349	349	349	349	349	349	349	-	3,143
Total	**-**	**889**	**889**	**889**	**889**	**889**	**889**	**889**	**889**	**889**	**-**	**8,000**
Number of transactions Sites 1 - 10	-	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	-	*10*
Number of transactions Sites 11 - 23	-	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	-	*10*
Number of transactions from other sites	-	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	-	*18*
Total parcels enrolled	**-**	**32**	**31**	**31**	**31**	**31**	**31**	**31**	**31**	**32**	**-**	
Total parcels enrolled, cumulative	**-**	**32**	**63**	**94**	**125**	**156**	**187**	**218**	**249**	**281**	**281**	

Table 8
Qualified biologist rate assumption

Base cost per hour	$169	$ per hour
Direct expenses (meals) per day	$15	$ per day
Travel	**$54**	$ per day
assuming	100	miles
and	$0.535	$ per mile
Hours per day	8	hours per day
Total cost per hour including travel	**$178**	$ per hour

Assumptions:
Sr. Consultant II billing rate; assumes all work will be conducted from a local office (no per diem needed).

Table 9
Establish Reserve System

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Reserve Assembly Cost	**Permit Period (years)**											
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
YHC real estate acquisition specialist (staff & overhead)	$0	$341,108	$341,108	$341,108	$341,108	$341,108	$341,108	$341,108	$170,554	$170,554	$0	**$2,728,867**
Acquire conservation easements on newly protected lands	$0	$21,080,539	$20,826,319	$20,826,319	$20,826,319	$20,826,319	$20,826,319	$20,826,319	$20,826,319	$20,826,319	$0	**$187,691,089**
Enroll pre-permit reserve lands as-is	$0	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$60,000	$0	**$300,000**
Enroll other pre-permit reserve lands	$0	$924,677	$924,677	$924,677	$924,677	$924,677	$924,677	$924,677	$924,677	$924,677	$0	**$8,322,097**
Pre-acquisition surveys on newly protected lands	$0	$195,441	$188,782	$188,782	$188,782	$188,782	$188,782	$188,782	$188,782	$180,825	$0	**$1,697,742**
Transaction costs - newly protected lands	$0	$1,916,667	$1,916,667	$1,916,667	$1,916,667	$1,916,667	$1,916,667	$1,916,667	$1,916,667	$1,916,667	$0	**$17,250,000**
Transaction costs - pre-permit reserve lands	$0	$42,365	$42,365	$42,365	$42,365	$42,365	$42,365	$42,365	$42,365	$46,865	$0	**$385,785**
Total	**$0**	**$24,530,797**	**$24,269,919**	**$24,269,919**	**$24,269,919**	**$24,269,919**	**$24,269,919**	**$24,269,919**	**$24,099,364**	**$24,125,907**	**$0**	**$218,375,581**
Acquire conservation easements on newly protected lands - detail by natural community, appearing as one line item above in reserve assembly cost summary table												
Cultivated lands: rice	$0	$2,613,333	$2,613,333	$2,613,333	$2,613,333	$2,613,333	$2,613,333	$2,613,333	$2,613,333	$2,613,333	$0	**$23,520,000**
Cultivated lands: non-rice	$0	$17,090,780	$17,090,780	$17,090,780	$17,090,780	$17,090,780	$17,090,780	$17,090,780	$17,090,780	$17,090,780	$0	**$153,817,020**
Grassland	$0	$916,406	$916,406	$916,406	$916,406	$916,406	$916,406	$916,406	$916,406	$916,406	$0	**$8,247,658**
Blue oak woodland	$0	$706	$706	$706	$706	$706	$706	$706	$706	$706	$0	**$6,354**
Valley oak woodland	$0	$1,412	$1,412	$1,412	$1,412	$1,412	$1,412	$1,412	$1,412	$1,412	$0	**$12,708**
Alkali prairie and upland grassland	$0	$254,220	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$254,220**
Fresh emergent wetland	$0	$37,065	$37,065	$37,065	$37,065	$37,065	$37,065	$37,065	$37,065	$37,065	$0	**$333,585**
Valley foothill riparian	$0	$118,608	$118,608	$118,608	$118,608	$118,608	$118,608	$118,608	$118,608	$118,608	$0	**$1,067,472**
Lacustrine and riverine	$0	$44,478	$44,478	$44,478	$44,478	$44,478	$44,478	$44,478	$44,478	$44,478	$0	**$400,302**
Bank swallow habitat	$0	$3,530	$3,530	$3,530	$3,530	$3,530	$3,530	$3,530	$3,530	$3,530	$0	**$31,770**
	$0	**$21,080,539**	**$20,826,319**	**$20,826,319**	**$20,826,319**	**$20,826,319**	**$20,826,319**	**$20,826,319**	**$20,826,319**	**$20,826,319**	**$0**	**$187,691,089**

YHC oversight and management - real estate acquisition specialist

100%	percent of Real Estate Specialist time and associated overhead allocated to Establish Reserve; Real Estate Specialist assumed at 0.5 FTE years 1-35 and 0.25 FTE years 36 - 50. Although the Executive Director and other staff and contractors will spend time on reserve acquisition tasks those costs are captured in Plan Administration. See 13 Plan Administration.

Table 9
Establish Reserve System

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Acquisition cost factors by natural community for newly protected lands

Per acre, fee title (2017)

$14,000	cultivated agriculture: rice
$2,648	annual grassland, large parcels > 160 acres in Dunnigan Hills planning unit
$4,237	annual grassland and alkali prairie, in the Valley, assuming small parcels 50 - 160 acres that have homesite value
$1,059	blue oak woodland
$1,059	valley oak woodland
$1,059	fresh emergent wetland
$1,059	valley foothill riparian
$1,059	lacustrine and riverine
$1,059	bank swallow habitat

Per acre, cost of easement restricting conversion to orchard/vineyard (2017)

$10,200	cultivated agriculture: non-rice
5%	additional cost to reflect price for easement encumbrances, i.e., access for monitoring and various prohibitions

Assumptions/Notes:

The fee title values are used to support the cost of acquiring conservation easements. The YHC will not acquire land in fee title except in the case of cultivated agriculture (non-rice) and grassland parcels acquired for restoration (see Table 5).

These cost factors are solely for the purposes of developing planning level estimates of the reserve assembly component of implementation costs. Actual land costs may vary significantly around this average, depending on parcel-specific factors.

Actual costs will be determined by qualified appraisals of each potential acquisition site.

The following sources informed these cost factors: *Trends in Agricultural Land and Lease Values (2014 and 2017 Annual Reports)* , California and Nevada, American Society of Farm Managers and Rural Appraisers (ASFMRA), California; Scott Stone, California Agricultural Properties, Inc.; and Ron Garland, MAI, SRA.

The easement acquisition cost for all other cultivated agricultural lands except rice is estimated based on the differential in value between orchard/vineyard land ($24,250 per acre) and irrigated cropland ($17,600 per acre)or field crop land ($10,500 per acre). Calculation of midpoint value for an easement restricting conversion to orchards or vineyards: [$24,250 - $17,600 = $6,650; $24,250 - $10,500 = $13,750; the midpoint of $6,650 and $13,750 is $10,200]

The range of ASFMRA 2017 values for rice is $9,500 - $15,500 with a mid-point of $12,500. Values at the high end of the range are justified in the area served by RD 108 (Colusa Basin).

The cost factor assumption reflects a mix of values across this range.

60%	easement percent of fee title acquisition cost for rice
68%	percent of annual grassland acquired in Dunnigan Hills (Planning Unit 5) **Table 6-2(a)**
32%	percent of annual grassland acquired elsewhere in the plan area, assuming in smaller scattered parcels in the Valley

The approximately $1,000 value for all other land covers assumes no grazing or farming value.

60%	Easement percent of fee title acquisition cost, grassland and all other non-agricultural natural communities

The acquisition cost for all other cultivated agricultural lands except rice is estimated based on the differential in value between orchard land and irrigated cropland/field crop land.

Orchard and vineyard values are the key factor in the current agricultural land market in Yolo County. The Yolo HCP/NCCP conservation easement, similar to the Swainson's Hawk easement, would restrict conversion to orchards and vineyards, allowing all other agricultural use.

For planning purposes at this time, given the current spike in agricultural land prices and the predominance of investor-fueled demand based on expectations of high orchard/vineyard values, it is reasonable to use this differential as an estimate of the price the YHC would have to offer for conservation easements on the majority of the newly protected lands. In these market conditions, the cost for easement acquisition is essentially the same as the cost for fee title acquisition.

Table 9
Establish Reserve System

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Transaction costs (appraisal, preliminary title report, legal description, boundary surveys, negotiating easement terms, perhaps Phase 1 site assessment, and site-specific management plan)

Assumptions/Notes:

Newly protected lands will require a full suite of transaction costs.

Newly protected lands will require site-specific management plans, based on reserve unit management plan guidelines.

$45,000	per transaction for newly protected lands
$30,000	per transaction for site-specific management plans

Cost to enroll pre-permit reserve lands

Assumptions/Notes:

Sites 1-23 of the pre-permit reserve lands have existing in-perpetuity conservation easements and endowments or agricultural income to support management and monitoring in perpetuity. Relatively minor updates to easements are assumed covered in Plan Administration staff and legal services costs.

Of these sites, Sites 1 - 10 have management plans in place; Sites 11 - 23 will require a Swainson's Hawk Management Plan and site-specific management plans to be enrolled as pre-permit reserve lands.

The balance of the pre-permit reserve lands would come from among other sites that are protected under conservation easements or held in fee title by YHC member agencies but would require easement modifications to be added to the Yolo HCP/NCCP reserve. These costs are likely to vary based on the specifics of the property.

$0	cost per acre to enroll pre-permit reserve lands from Sites 1 - 10
$30,000	per site cost for SWHA and site-specific management plans for Sites 11 - 23
$2,648	cost per acre to enroll other pre-permit reserve lands

Transaction costs for pre-permit reserve lands

Assumptions/Notes:

Costs would be substantially lower for pre-permit reserves, consisting of research of existing documents and preparing modifications as needed.

Some sites would require more intensive easement acquisition services to be conducted under contract or by YHC staff/legal services.

5%	percent of per transaction cost for newly protected lands required to enroll Sites 1 - 23 pre-permit reserve lands
$2,250	per transaction to enroll Sites 1 - 23 pre-permit reserve lands
15%	percent of per transaction cost for newly protected lands required to enroll all other pre-permit reserve lands
$6,750	per transaction to enroll all other pre-permit reserve lands
50%	percent of the other pre-permit reserve sites requiring easement acquisition/modification services
$24,365	cost per site for easement acquisition services, based on CNLM contract for easement acquisition services (if have to contract out; otherwise do this in house with Plan Administration staff)
	includes identifying appraisers, review of title report, drafting easement and management plan, conducting PAR analysis

Pre-acquisition assessment and evaluation (contractor cost)

Assumptions/Notes:

Covers costs to verify biological resources in the field to determine the degree to which they are suitable for achieving Yolo HCP/NCCP biological goals and objectives.

Includes evaluation of infrastructure and other site conditions.

The work will be completed by qualified biologists and includes field work, data collection, and report writing.

Land cover type surveys include surveys for federal and state jurisdictional waters, and submitting of a report to the USACE and obtaining a verification.

Covered wildlife surveys include surveys at a protocol level.

160	acres, assumed average parcel size
24	hours per parcel for land cover type and habitat assessment surveys
24	hours per parcel for covered species surveys
1.25	due diligence premium to account for land surveyed but not acquired.
0.38	average hours per acre, with due diligence premium
$67	average cost per acre, with due diligence premium
$10,654	average cost per 160 acre parcel, with due diligence premium
$178	hourly cost for biologist

Table 10
Restore Natural Communities

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Cost to restore natural communities (acquisition, restoration, management & monitoring)	**Permit Period (years)**											
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
YHC oversight and management (staff & overhead)	$0	$53,066	$106,132	$106,132	$106,132	$53,066	$53,066	$53,066	$53,066	$0	$0	**$583,729**
Acquire fee title interest for restoration	$0	$1,363,881	$1,363,881	$1,363,881	$1,363,881	$1,363,881	$1,363,881	$1,363,881	$1,363,881	$0	$0	**$10,911,046**
Pre acquisition surveys	$0	$7,957	$7,957	$7,957	$7,957	$7,957	$7,957	$7,957	$7,957	$0	$0	**$63,656**
Transaction cost	$0	$93,750	$93,750	$93,750	$93,750	$93,750	$93,750	$93,750	$93,750	$0	$0	**$750,000**
Site improvements	$0	$92,949	$92,949	$92,949	$92,949	$92,949	$92,949	$92,949	$92,949	$0	$0	**$743,588**
Cost to restore fresh emergent wetlands	$0	$485,029	$485,029	$485,029	$485,029	$485,029	$485,029	$485,029	$485,029	$0	$0	**$3,880,231**
Cost to restore valley foothill riparian	$0	$4,048,885	$4,048,885	$4,048,885	$4,048,885	$4,048,885	$4,048,885	$4,048,885	$4,048,885	$0	$0	**$32,391,081**
Cost to restore lacustrine and riverine	$0	$958,181	$958,181	$958,181	$958,181	$958,181	$958,181	$958,181	$958,181	$0	$0	**$7,665,449**
Environmental compliance for restoration projects	$0	$164,763	$164,763	$164,763	$164,763	$164,763	$164,763	$164,763	$164,763	$0	$0	**$1,318,103**
Water management for restored GGS habitat	$0	$15,031	$30,063	$45,094	$60,125	$75,156	$90,188	$105,219	$120,250	$120,250	$120,250	**$781,625**
Other management cost on fee title restored lands	$0	$26,665	$53,330	$79,995	$106,660	$133,325	$159,990	$186,655	$213,320	$213,320	$213,320	**$1,386,580**
Remedial measures	$0	$4,170	$8,339	$12,509	$16,679	$20,848	$25,018	$29,187	$33,357	$33,357	$33,357	**$216,821**
Species monitoring - restored lands	$0	$423,309	$531,075	$626,867	$698,711	$794,502	$854,372	$962,138	$1,057,930	$706,465	$802,257	**$7,457,625**
Total	**$0**	**$7,737,635**	**$7,944,333**	**$8,085,991**	**$8,203,701**	**$8,292,292**	**$8,398,028**	**$8,551,660**	**$8,693,317**	**$1,073,392**	**$1,169,184**	**$68,149,534**

YHC oversight and management

33%	percent of Restoration/Reserve Project Manager time allocated to Restoration, until restoration projects are complete in year 40.

Acquisition cost factors by natural community

Per acre, fee title (2017)

$13,500	cultivated agriculture: non-rice
$4,237	annual grassland, assuming small parcels 50 - 160 acres that have homesite value

Assumptions/Notes:

These cost factors are solely for the purposes of developing planning level estimates of the reserve assembly component of implementation costs. Actual land costs vary signficantly around this average, depending on parcel-specific factors.

Actual costs will be determined by qualified appraisals of each potential acquisition site.

The mid-point of the range for Class I & II irrigated vegetable crop soils in ASFMRA 2017 is $17,600 per acre; the midpoint for Class II & III field crop soils is $10,500 per acre.

Weighting these two values by the percentage of Yolo County Crop land in irrigated vegetable crops vs. field crops (per the 2016 Yolo County Crop Report) results in a weighted average of $13,200 per acre which is rounded up to $13,500 per acre.

The use of the weighted average approach to value is justified based on the greater likelihood of finding willing sellers among those owning land of lower value soil types with more constraints on use or properties subject to flooding.

Transaction costs (appraisal, preliminary title report, legal description, boundary surveys, negotiating easement terms, Phase 1 site assessment, and site-specific management plan)

$45,000	per transaction for newly protected lands
$30,000	per transaction for site-specific management plans

Pre-acquisition survey and evaluation (contractor cost)

Assumptions/Notes:

Covers costs to verify biological resources in the field to determine the degree to which they are suitable for achieving Yolo HCP/NCCP biological goals and objectives.

Includes evaluation of infrastructure and other site conditions.

The work will be completed by Qualified Biologists and includes field work, data collection, and report writing.

Land cover type surveys include surveys for federal and state jurisdictional waters, and submitting of a report to the USACE and obtaining a verification.

Covered wildlife surveys include surveys at a protocol level.

160	acres, assumed average parcel size
24	hours per parcel for land cover type and habitat assessment surveys
24	hours per parcel for covered species surveys
1.25	due diligence premium to account for land surveyed but not acquired.
0.38	average hours per acre, with due diligence premium
$67	average cost per acre, with due diligence premium
$10,654	average cost per 160 acre parcel, with due diligence premium
$178	hourly cost for biologist

Table 10
Restore Natural Communities

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Site improvements on land acquired in fee title for restoration

Assumptions/Notes:

Covers building demolition and stabilization, road removal/repair, gate repair/replacement, signage, fencing, and other security measures.

Includes labor and necessary materials.

Fencing

10,560	linear feet, parcel perimeter, quarter section of 160 acres (0.5 miles wide by 0.5 miles long)
100%	percent of existing fence that needs repair/replacement at acquisition
$8.47	cost per linear foot for fence repair/replacement
$559	cost of fence repair/replacement per parcel acre

Components of other site improvement cost, per parcel (assume 160 acre average)

$1,589	demolition/stabilization of old facilities
$26,483	road removal/repair
$4,237	gate repair replacement
$1,059	signage
$1,589	other security
$218	cost of other site improvements per parcel acre

Cost per acre for restoration by natural community type

	Fresh Emergent Wetland (wetlands only)	Valley Foothill Riparian	Lacustrine & Riverine
Pre-construction restoration planning surveys	$426	$426	$237
Bid assistance	$191	$169	$127
Plans, specifications, and engineering	$4,767	$4,237	$3,178
Construction activity	$19,068	$16,949	$12,712
Construction biological monitoring	$379	$379	$379
Construction oversight	$953	$847	$636
Post-construction restoration monitoring & maintenance	$14,301	$25,424	$9,534
Total per acre, before contingency	**$40,085**	**$48,432**	**$26,802**
Restoration contingency	$4,009	$4,843	$2,680
Total per acre, including contingency	**$44,094**	**$53,275**	**$29,482**

Assumptions/Notes:

Pre-construction planning surveys include, as needed: site selection, wetland delineation, detailed habitat mapping and species surveys, soil or geomorphological sampling and mapping. Planning surveys for restoration sites are more intensive and site-specific than planning surveys under "Reserve Management".

Plan, specification, and engineering work, bid assistance, and restoration oversight will be conducted in the 5-year period in which restoration takes place. The estimate of restoration costs is a planning tool to assess the level of effort required to perform the work. Actual restoration costs will vary from the above estimates because of competitive bidding, negotiations with the client, or fluctuations in market prices.

Construction activity cost for fresh emergent wetland is the cost per acre for project sites that include wetland restoration as well as associated uplands.

Construction monitoring includes, as needed: on-site biologist conducting training for construction personnel regarding avoidance and minimization measures, verification during construction of implementation of avoidance/minimization measures, identification and translocation of covered species.

Construction oversight includes managing the overall construction of the restoration project to ensure that plans are constructed as designed.

Post-construction restoration monitoring and maintenance is a 5 - 10 year period of staff monitoring and contractor remediation following construction, to ensure successful implementation. Work includes including plant replacement, irrigation maintenance, weed control, erosion control, and repair of any substandard work.

Table 10
Restore Natural Communities

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status		
Jan-18	Cost Model date		
2017	constant dollars		

Detail may not add to total due to independent rounding.

Restoration planning surveys	Hours per acre	75	assumed average parcel size
for fresh emergent wetland	**2.40**	180	total hours per parcel for field work and reporting
for valley foothill riparian	**2.40**	180	total hours per parcel for field work and reporting
for lacustrine/riverine	**1.33**	100	total hours per parcel for field work and reporting
Construction monitoring for sensitive species and habitats, all land covers	**2.13**	160	total hours per parcel for construction monitoring, one month of oversight, 40 hours per week
Bid assistance all land covers	1.0%	of construction cost, all land covers	
Plans, specifications, and engineering, all land covers	25%	of construction cost, all land covers	
Construction oversight, all land covers	5%	of construction cost, all land covers	
Restoration contingency	10%		
Post-construction restoration monitoring & maintenance cost as percent of total construction costs			
All wetland land covers	15%		
Years of post-construction monitoring & maintenance following installation of restoration project			
Emergent wetland, riverine, and lacustrine	5	coincides with 5-year period in which restoration occurs	
Valley foothill riparian	10	coincides with 5-year period in which restoration occurs and 5 years thereafter	

Environmental compliance for restoration projects

Assumptions/Notes:

Covers costs to comply with environmental laws and regulations such as the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), Clean Water Act (CWA), and National Historic Preservation Act (NHPA), as well as California Department of Fish and Game Section 1602 Streambed Alteration permitting, and other permits and approvals such as County grading, road encroachment or other permitting requirements.

Not all projects would require the same level of effort; some projects would be covered by general permits.

Costs include all permit and application fees.

3.0%	percent of restoration cost budgeted for various environmental compliance reporting and permit and application fees

Natural community management and enhancement - 6.4.3.5.3 and 6.4.3.5.5

Newly Protected Lands:

Assumptions/Notes:

Active reserve land management is limited to the acres acquired in fee title for the purpose of habitat restoration.

Active reserve land management activities include: signage installation and repair, trash/debris removal, and vegetation and pest management, including invasive species control.

Labor is contracted and vehicles and equipment are rented. Supervision provided by YHC staff.

Costs to manage water in restored GGS habitat estimated as a separate line item.

$53	annualized cost per acre to manage valley foothill riparian acres, including costs for labor, supplies, equipment and vehicles
$30	annualized cost per acre to manage fresh emergent wetland, lacustrine and riverine acres, including costs for labor, supplies, equipment and vehicles
$130	annualized cost per acre to manage water supply in aquatic habitat for giant garter snake.
	Includes water supply cost, electricity, well and pump maintenance/repair, berm and flashboard maintenance and repair.

Sources: On-going task and cost analyses prepared in 2005 and 2008 for mitigation banks in Yolo County, updated to 2017 dollars.

185	acres of restored aquatic habitat flooded for GGS, complete reserve system (**Table 5 -7**)

Remedial measures to address changed circumstances (7.7.1)

Assumptions/Notes:

Covers costs associated with responses to adaptive management findings as well as costs for restoration or maintenance of reserve areas in response to other changed circumstances such as new species listings, climate change, wildfire, nonnative invasive species or disease, flooding, drought, or earthquakes.

Remedial measures for restored lands are included as a restoration cost.

10%	percent of all management costs on restored lands budgeted for remedial measures on the reserve lands

Table 10
Restore Natural Communities

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Species biological monitoring on restored lands - 6.5.3.2

2.0	survey crew: number of qualified biologist contractors per survey visit, all surveys
$178	qualified biologist hourly rate, including meals and travel for 8 hour day

			Baseline Surveys					Status and Trends Monitoring				ANNUAL TOTALS	
Species	Restored Acres Monitored for Species	Acres Restored every Five Years (Per "Input Schedule")	Survey Days for Survey Crew (Annually, per parcel)	Data Summary/ Reporting for Survey Crew (Annually, per parcel)	Number of Years to Establish Baseline, per parcel	Person Hours Needed to Establish Baseline, per parcel	Total Person Hours Needed to Establish the Baseline over the Permit Term	Survey Recurrence After Baseline (Years)	Total Person Hours for Every Recurring Survey	Total Surveys Needed for the Permit Term	Total Person Hours for Trends Surveys	Average Number of Monitoring Days per Year	Total person hours per year (8 hour days)
Valley elderberry longhorn beetle	531	66	5	2	5	560	4,480	5	112	45	5,040	16	190
California tiger salamander													
Upland dispersal	-	-				-	-		-	-	-	-	-
Aquatic breeding	36	5	2	1	5	240	1,920	3	48	31	1,488	6	68
Western pond turtle													
Aquatic	369	46	3	1	5	320	2,560	7	64	67	4,288	11	137
Upland dispersal	-	-				-	-		-	-	-	-	-
Giant garter snake													
Rice	-	-				-	-		-	-	-	-	-
Aquatic	109	14	3	1	5	320	2,560	5	64	45	2,880	9	109
Freshwater emergent wetland	76	10	3	1	5	320	2,560	5	64	45	2,880	9	109
Active upland	-	-				-	-		-	-	-	-	-
Overwintering upland	-	-				-	-		-	-	-	-	-
Swainson's hawk													
Nesting	598	75	3	1	3	192	1,536	5	64	45	2,880	7	88
Foraging (covered in cultivated lands monitoring cost)	-	-				-	-		-	-	-	-	-
White-tailed kite													
Nesting	598	75				-	-		-	-	-	-	-
Foraging (covered in cultivated lands monitoring cost)	-	-				-	-		-	-	-	-	-
Western yellow-billed cuckoo	100	13	2	2	3	192	1,536	3	64	31	1,984	6	70
Western burrowing owl	-	-				-	-		-	-	-	-	-
Least Bell's vireo	80	10				-	-		-	-	-	-	-
Bank swallow	-	-				-	-		-	-	-	-	-
Tricolored blackbird													
Nesting	86	11	2	1	5	240	1,920	3	48	31	1,488	6	68
Foraging (covered in cultivated lands monitoring cost)	-	-				-	-		-	-	-	-	-

total person hours for baseline surveys, per period in which restoration occurs	**2,384**	total person hours for recurring surveys, per permit term	**22,928**
number of periods for baseline surveys	8	total contractor cost for recurring surveys, per permit term	**$4,071,153**

Table 11
Manage and Enhance the Reserve System

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Cost for management planning and on-going management and enhancement of the reserve system	Permit Period (years)											
	Start up	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	50 Year Total
YHC oversight and management (staff & overhead)	$0	$302,659	$410,399	$410,399	$410,399	$302,659	$302,659	$302,659	$302,659	$306,995	$306,995	**$3,358,482**
Reserve unit management plans	$0	$317,800	$323,098	$148,309	$148,309	$148,309	$148,309	$148,309	$148,309	$148,309	$148,309	**$1,827,370**
Invasive species control program	$0	$105,934	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$105,934**
Management cost on pre-permit lands/existing endowments	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Management cost on other pre-permit reserve lands	$0	$45,396	$90,792	$136,187	$181,583	$226,979	$272,375	$317,771	$363,166	$408,562	$408,562	**$2,451,373**
Management cost for alkali prairie reserve lands	$0	$106,000	$106,000	$106,000	$106,000	$106,000	$106,000	$106,000	$106,000	$106,000	$106,000	**$1,060,000**
Cost to establish hedgerows on newly protected cultivated lands	$0	$143,620	$143,620	$143,620	$143,620	$143,620	$143,620	$143,620	$143,620	$143,620	$0	**$1,292,580**
Cost manage hedgerows on newly protected cultivated lands	$0	$11,183	$22,365	$33,548	$44,730	$55,913	$67,095	$78,278	$89,460	$100,643	$100,643	**$603,857**
Cost to establish hedgerows on pre-permit reserve cultivated lands	$0	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$36,490	$0	**$328,410**
Cost manage hedgerows on pre-permit reserve cultivated lands	$0	$2,841	$5,682	$8,524	$11,365	$14,206	$17,047	$19,888	$22,729	$25,571	$25,571	**$153,424**
Planting nest trees on newly protected cultivated lands	$0	$72,936	$72,936	$72,936	$72,936	$72,936	$72,936	$72,936	$72,936	$72,936	$0	**$656,424**
Planting nest trees on pre-permit reserve cultivated lands	$0	$18,531	$18,531	$18,531	$18,531	$18,531	$18,531	$18,531	$18,531	$18,531	$0	**$166,780**
Western burrowing owl enhancements on grassland preserves	$0	$7,517	$7,517	$8,563	$8,563	$9,610	$9,610	$10,657	$10,657	$11,703	$4,187	**$88,583**
Remedial measures	$0	$117,091	$123,743	$112,311	$118,253	$113,525	$119,467	$125,514	$131,456	$137,936	$110,027	**$1,209,322**
Remedial measures to address regional loss of SWHA foraging habitat	$0	$116,527	$116,527	$116,527	$116,527	$116,527	$116,527	$116,527	$116,527	$116,527	$116,527	**$1,165,270**
Total	**$0**	**$1,404,523**	**$1,477,700**	**$1,351,945**	**$1,417,306**	**$1,365,305**	**$1,430,666**	**$1,497,179**	**$1,562,540**	**$1,633,823**	**$1,326,820**	**$14,467,808**

YHC oversight and management

Assumptions/Notes:

Includes costs associated with the adaptive management decision-making process.

25%	percent of Senior Environmental Scientist time allocated to Reserve Management
67%	percent of Restoration/Reserve Project Manager time allocated to Reserve Management until restoration projects are complete in year 40
100%	percent of Restoration/Reserve Project Manager time allocated to Reserve Management after year 40

Reserve management plans - 6.4.3.3 (prepared/updated by contractors)

Assumptions/Notes:

One for each of 7 reserve management units. Initial cost and periodic updates during permit term. Includes costs for a management plan that incorporates existing protected lands in reserve management units.

Management plans will address actions under 5.4.3.4.2 Management and Enhancement of Connectivity, identifying measures, strategies, and implementing responsibilities.

Management plans will cover newly protected lands and pre-permit reserve lands enrolled in the reserve.

Site-specific management plans will be prepared based on guidelines in reserve unit management plans. The costs are included in the reserve assembly cost category.

Baseline ecological surveys are covered as a monitoring cost.

$79,450	initial cost for reserve management plan, per reserve management unit. Four completed in first 5-year period. Three completed in second 5-year period.
$21,187	cost per reserve management unit to update the management plan every 5 years

Invasive species control program - 6.4.3.4.1 (prepared by contractors/updated by staff)

$105,934	initial cost incurred during first 5-year period. Subsequently updated by staff; included as a Plan Administration cost.

Pollinator strategy - 6.4.3.4.3

This is largely a coordination and communication effort that will be the responsibility of Plan Administration staff.

Table 11

Manage and Enhance the Reserve System

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Natural community management and enhancement - 6.4.3.5

Newly protected lands:

Assumptions/Notes:

Active reserve land management is limited to the acres acquired in fee title for the purpose of habitat restoration.
Active reserve land management activities include: fencing, gate, and signage installation and repair; trash/debris removal; and vegetation and pest management, including invasive species control.
Labor is contracted and vehicles and equipment are rented. Supervision provided by YHC staff.
Costs to manage water in restored GGS habitat estimated as a separate line item.
All other newly protected lands in the reserve are assumed acquired by means of conservation easements. The landowner retains responsibility for management, according to the terms of the easement.
Management and enhancement activities would not incur significant environmental compliance costs. Any environmental compliance costs for these management activities are covered in Plan Administration.

Pre-permit reserve lands:

Assumptions/Notes:

Many of the pre-permit reserve acres that will be enrolled have existing endowments and/or agricultural income that cover reserve management costs.
Management and enhancement activities would not incur significant environmental compliance costs. Any environmental complicance costs for these management activities are covered in Plan Administration.
Other pre-permit reserve lands do not have existing endowments or income to support these activities and enrollment will be contingent on upgraded and standardized management to provide a cohesive reserve system.

4,857	acres in pre-permit reserve lands that have endowments or agricultural income (Sites 1 - 23)
$0	annualized cost to YHC to manage these pre-permit reserve lands
3,143	acres in pre-permit reserve lands that are enrolled that do not have existing endowments or agricultural income or may require enhanced HCP/NCCP management
$26	annualized cost per acre to YHC to manage these pre-permit reserve lands (NOMINAL PLACEHOLDER ESTIMATE)

Alkali prairie - 6.4.3.5.4:

Assumptions/Notes:

The YHC will manage alkali prairie habitat and associated uplands for covered and other native species by improving hydrologic conditions and reducing adverse effects of nonnative plants and human activities.
Note that cost factor includes monitoring as well as reserve management activities.

100	acres of alkali prairie reserve at Woodland Regional Park: 34 acres alkali prairie habitat plus 66 acres of upland grassland
$212	cost per acre for management/monitoring activities on alkali prairie and associated uplands; based on Alkali Grasslands Preserve Management Plan, 12/30/2014

Enhance Swainson's hawk foraging and nesting habitat on cultivated lands reserve lands - 6.4.3.6.1

Assumptions/Notes:

Cultivated reserve lands will be enhanced by providing uncultivated habitat strips adjacent to cultivated fields.
There will be some opportunity cost as a result of the loss of productive land, and there might be some longer-term higher costs associated with on-going management practices, compared to a situation without hedgerows.
These longer-term effects are likely to be relatively small, however. Offsetting economic benefits may include enhanced weed control, soil erosion control, and increased beneficial insect activity.
Hedgerows would be established at parcel edges along existing roads, canals, or drainage ditches.

This cost estimate is for a hedgerow native grasses, forbs, shrubs and trees for purposes of demarcation as well as nesting habitat. A less intensive hedgerow of largely native perennial grassland with a limted number of trees would be less costly.
The cost estimates include site analysis and design, site preparation, installation, and three years of maintenance to ensure establishment.

160	average easement parcel size (quarter section)
2,640	hedgerow length, assuming along one perimeter edge
20	hedgerow width
1.21	hedgerow area in acres, per parcel
$11,865	cost per hedgerow acre to plan, prepare, and install a hedgerow and maintain the hedgerow for three years.
$14,400	hedgerow cost per easement parcel
$185	cost per hedgerow acre for perpetual maintenance
$224	cost of perpetual maintenance per easement parcel
14,362	newly protected non-rice cultivated lands in the reserve system
3,649	acres of pre-permit reserve lands that are non-rice cultivated lands

Table 11

Manage and Enhance the Reserve System

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Plant Swainson's hawk nest trees - 6.4.3.6.1

Assumptions/Notes:

YHC will establish native trees within the cultivated lands reserve system at a density of at least 1 tree per 10 acres (protected existing trees count towards the density requirement).

Associated surveying and monitoring costs are covered in the Monitoring and Research cost category.

14,362	newly protected non-rice cultivated lands in the reserve system
3,649	acres of pre-permit reserve lands that are non-rice cultivated lands
18,011	total non-rice cultivated lands in the reserve system
1,801	total nest trees at 1 per 10 acres
(34)	credit for existing protected nest trees (**6.3.4.6.3)**
1,767	net new nest trees to be established in the cultivated lands reserve system
50%	percent of net new nest trees included in hedgerow cost
705	net new nest trees on newly protected lands (based on percent of total cultivated reserve acres that are newly protected)
179	net new nest trees on pre-permit reserve lands (based on percent of total cultivated reserve acres that are pre-permit reserve sites)
$847	cost per tree including planting, fertilizer, irrigation, and three years of maintenance to establish
10%	replacement allowance to ensure success of tree planting

Enhancements for the western burrowing owl - 6.4.3.5.2

Assumptions/Notes:

YHC will enhance grassland preserves to encourage occupancy by burrowing owls. Enhancements include artificial nest boxes and debris piles

3,000	acres of grassland habitat
2	nest boxes per 100 acres of grassland habitat
60	total number of nest boxes installed
$333	cost per nest box, initial installation, including materials, labor, and equipment
$157	cost per nest box, replacement every 10 years, including materials, labor and equipment
1	debris piles per 200 acres of grassland habitat
15	total number of debris piles
$3,178	cost per debris pile, materials (labor and equipment included in nest box installation cost). No replacement required.

Remedial measures to address changed circumstances (7.7.1)

Assumptions/Notes:

Covers costs associated with responses to adaptive management findings as well as costs for restoration or maintenance of reserve areas in response to other changed circumstances such as new species listings, climate change, wildfire, nonnative invasive species or disease, flooding, drought, or earthquakes.

Remedial measures for restored lands are included as a restoration cost.

10%	percent of all other reserve management costs budgeted for remedial measures on these reserve lands

Remedial measures for regional loss of Swainson's hawk habitat

Assumptions/Notes:

Covers costs to implement a menu of activities to address the potential regional loss of Swainson's hawk foraging habitat below identified thresholds. Could fund additional enhancements, land acquisition, or incentives to discourage crop conversions.

$116,527	anticipated cost per 5-year period, including plan preparation at about $100,000

Table 12

Species and Natural Community Monitoring, Research, and Scientific Review

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Cost for biological monitoring and adaptive management studies	**Permit Period (years)**											
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
Natural community monitoring - newly protected lands	$0	$70,315	$113,462	$156,610	$156,610	$199,758	$199,758	$242,906	$286,053	$286,053	$258,886	**$1,970,411**
Natural community monitoring - pre-permit reserve lands	$0	$46,877	$74,576	$102,276	$102,276	$129,976	$129,976	$157,676	$185,375	$185,375	$166,199	**$1,280,581**
Species monitoring - newly protected lands	$0	$357,966	$470,729	$583,492	$655,250	$768,013	$829,520	$942,282	$1,055,045	$1,126,803	$881,600	**$7,670,700**
Species monitoring - pre-permit reserve lands	$0	$145,956	$190,153	$234,349	$261,972	$306,168	$333,791	$377,987	$422,183	$449,806	$348,046	**$3,070,411**
YHC oversight and management (staff & overhead)	$0	$389,836	$389,836	$389,836	$389,836	$389,836	$389,836	$389,836	$389,836	$292,377	$292,377	**$3,703,444**
Research	$0	$158,901	$105,934	$105,934	$52,967	$52,967	$0	$0	$0	$0	$0	**$476,703**
Science advisors	$0	$69,960	$69,960	$69,960	$69,960	$69,960	$69,960	$69,960	$69,960	$34,980	$34,980	**$629,640**
Total	**$0**	**$1,239,811**	**$1,414,650**	**$1,642,457**	**$1,688,871**	**$1,916,677**	**$1,952,840**	**$2,180,647**	**$2,408,453**	**$2,375,395**	**$1,982,088**	**$18,801,889**

Assumptions/Notes:

Costs to conduct biological monitoring to evaluate the effectiveness of the conservation strategy over time and to conduct targeted studies to inform adaptive management efforts.

YHC staff will conduct long-term landscape level monitoring, including updating GIS/aerials and analyzing status and trends at the landscape level at least every 5 years.

YHC staff will plan, coordinate, and report on the monitoring categories described below.

Contractors will conduct the field monitoring and data analysis.

Monitoring tasks consists of baseline surveys, data analysis and reporting within 3 years of reserve site acquisition, followed by periodic status and trends surveys, data analysis, and reporting for the duration of the permit term.

Species monitoring on restored lands is included as a Habitat Restoration cost.

Compliance monitoring to track the status of HCP/NCCP implementation is covered as a Plan Administration cost.

Pre-construction surveys are assumed to occur prior to construction of covered activites on the reserve system, and costs are estimated as a component of those restoration and management costs.

Construction monitoring is assumed to occur periodically during construction of covered activities and conservation measures, and costs are estimated as a component of those restoration and management costs.

50%	percent of Senior Environmental Scientist time allocated to Monitoring & Research
1.5	survey crew: number of qualified biologist contractors per survey visit, all surveys
$178	qualified biologist hourly rate, including meals and travel for 8 hour day

Table 12

Species and Natural Community Monitoring, Research, and Scientific Review

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Natural community biological monitoring on newly protected lands - 6.5.3.2

			Baseline Surveys					**Status and Trends Surveys**				**ANNUAL TOTALS**	
Natural Communities	Newly Protected Lands by Natural Community	Acres Acquired every Five Years (Per "Input Schedule")	Survey Days for Survey Crew (Annually, per parcel)	Data Summary/ Reporting for Survey Crew (Annually, per parcel)	Number of Years to Establish Baseline, per parcel	Person Hours Needed to Establish Baseline, per parcel	Total Person Hours Needed to Establish the Baseline over the Permit Term	Survey Recurrence After Baseline (Years)	Total Person Hours for Every Recurring Survey	Total Surveys Needed for the Permit Term	Total Person Hours for Trends Surveys	Average Number of Monitoring Days per Year	Total person hours per year (8 hour days)
Cultivated lands: wetland (rice)	2,800	311	**0.50**	**0.25**	**2.00**	18	162	**3**	9	31	279	1	9
Cultivated lands: non-wetland	14,362	1,596	**2.00**	**1.50**	**1.00**	42	378	**3**	42	31	1,302	3	34
Grassland	4,364	485	**2.00**	**1.00**	**3.00**	108	972	**3**	36	31	1,116	3	42
Blue oak woodland	10	1	**0.50**	**0.50**	**1.00**	12	108	**3**	12	31	372	1	10
Valley oak woodland	20	2	**0.50**	**0.50**	**1.00**	12	108	**3**	12	31	372	1	10
Alkali prairie (covered in management cost factor)	100	11	-	-	-	-	-	-	-	-	-	-	-
Fresh emergent wetland	500	56	**2.00**	**1.00**	**2.00**	72	648	**3**	36	31	1,116	3	35
Valley foothill riparian	1,600	178	**3.00**	**2.00**	**1.00**	60	540	**3**	60	31	1,860	4	48
Lacustrine and riverine	600	67	**1.50**	**1.50**	**2.00**	72	648	**3**	36	31	1,116	3	35

total person hours for baseline surveys, per period in which acquisition occurs	**396**
number of periods for baseline surveys	9
total person hours for trends surveys, permit term	**7,533**
total contractor cost for trends surveys, permit term	**$1,337,578**

Natural community biological monitoring on pre-permit reserve lands - 6.5.3.2

Assumptions/Notes:

Some of the pre-permit reserve acres that will be enrolled have existing endowments and/or agricultural income that cover natural community and species biological monitoring costs.

Other pre-permit reserve lands do not have existing endowments or income to support these activities and enrollment will be contingent on upgraded and standardized monitoring to provide a cohesive reserve system.

3,159	acres in pre-permit reserve lands that have endowments or agricultural income that are presumed to cover natural community monitoring (Sites 1 - 10)
$0	annualized cost to YHC to monitor natural communities on these pre-permit reserve lands
4,841	acres in pre-permit reserve lands that are enrolled that do not have existing endowments or agricultural income or that may require enhanced NCP/NCCP monitoring

Natural community biological monitoring on pre-permit reserve lands without endowments or income (illustrative for the purposes of planning level estimates)

			Baseline Surveys					**Status and Trends Surveys**				**ANNUAL TOTALS**	
Natural Communities	Pre-permit Reserve Lands (other sites besides 1 - 10) by Natural Community	Acres Acquired every Five Years (Per "Input Schedule")	Survey Days for Survey Crew (Annually, per parcel)	Data Summary/ Reporting for Survey Crew (Annually, per parcel)	Number of Years to Establish Baseline, per parcel	Person Hours Needed to Establish Baseline, per parcel	Total Person Hours Needed to Establish the Baseline over the Permit Term	Survey Recurrence After Baseline (Years)	Total Person Hours for Every Recurring Survey	Total Surveys Needed for the Permit Term	Total Person Hours for Trends Surveys	Average Number of Monitoring Days per Year	Total person hours per year (8 hour days)
Cultivated lands: wetland (rice)	-	-	-	-	-	-	-	-	-	-	-	-	-
Cultivated lands: non-wetland	3,649	405	**1.00**	**1.50**	**1.00**	30	270	**3**	30	31	930	2	24
Grassland	254	28	**1.00**	**1.00**	**3.00**	72	648	**3**	24	31	744	2	28
Alkali prairie (covered by existing endowment)	55	6	-	-	-	-	-	-	-	-	-	-	-
Vernal pool complex	27	3	**1.00**	**1.00**	**2.00**	48	432	**3**	24	31	744	2	24
Fresh emergent wetland	-	-	-	-	-	-	-	-	-	-	-	-	-
Valley foothill riparian	153	17	**1.50**	**2.00**	**1.00**	42	378	**3**	42	31	1,302	3	34
Lacustrine and riverine	41	5	**1.50**	**1.50**	**2.00**	72	648	**3**	36	31	1,116	3	35

total person hours for baseline surveys, per period in which acquisition occurs	**264**
number of periods for baseline surveys	9
total person hours for trends surveys, permit term	**4,836**
total contractor cost for trends surveys, permit term	**$858,692**

Table 12

Species and Natural Community Monitoring, Research, and Scientific Review

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Species Biological Monitoring on Newly Protected Lands - 6.5.3.2

			Baseline Surveys					**Status and Trends Monitoring**				**ANNUAL TOTALS**	
Species	Newly Protected Lands Monitored for Species	Acres Acquired every Five Years (Per "Input Schedule")	Survey Days for Survey Crew (Annually, per parcel)	Data Summary/ Reporting for Survey Crew (Annually, per parcel)	Number of Years to Establish Baseline, per parcel	Person Hours Needed to Establish Baseline, per parcel	Total Person Hours Needed to Establish the Baseline over the Permit Term	Survey Recurrence After Baseline (Years)	Total Person Hours for Every Recurring Survey	Total Surveys Needed for the Permit Term	Total Person Hours for Trends Surveys	Average Number of Monitoring Days per Year	Total person hours per year (8 hour days)
Valley elderberry longhorn beetle	1,600	178	3.0	2.0	3.0	180	1,620	5	60	45	2,700	7	86
California tiger salamander													
Upland dispersal	2,000	222	-	-	-	-	-	-	-	-	-	-	-
Aquatic Breeding	36	4	3.0	2.0	3.0	180	1,620	3	60	31	1,860	6	70
Western pond turtle													
Aquatic	2,400	267	8.0	2.0	1.0	120	1,080	3	120	31	3,720	8	96
Upland dispersal	-	-	-	-	-	-	-	-	-	-	-	-	-
Giant garter snake													
Rice	2,800	311	4.0	3.0	5.0	420	3,780	5	84	45	3,780	13	151
Aquatic	420	47	2.0	1.0	5.0	180	1,620	5	36	45	1,620	5	65
Freshwater emergent wetland	500	56	2.0	1.0	5.0	180	1,620	5	36	45	1,620	5	65
Active upland	1,160	129	-	-	-	-	-	-	-	-	-	-	-
Overwintering upland	2,315	257	-	-	-	-	-	-	-	-	-	-	-
Swainson's hawk													
Nesting	1,600	178	3.0	1.0	3.0	144	1,296	5	48	45	2,160	6	69
Foraging (covered in cultivated lands monitoring cost)	18,792	2,088	-	-	-	-	-	-	-	-	-	-	-
White-tailed kite													
Nesting (covered in Swainson's hawk nesting cost)	1,600	178	-	-	-	-	-	-	-	-	-	-	-
Foraging (covered in cultivated lands monitoring cost)	18,797	2,089	-	-	-	-	-	-	-	-	-	-	-
Western yellow-billed cuckoo	500	56	3.0	2.0	3.0	180	1,620	3	60	31	1,860	6	70
Western burrowing owl	5,500	611	3.0	2.0	3.0	180	1,620	5	60	45	2,700	7	86
Least Bell's vireo	600	67	-			-	-		-	-	-	-	-
Bank swallow	50	6	2.0	2.0	3.0	144	1,296	4	48	40	1,920	5	64
Tricolored blackbird													
Nesting	200	22	2.0	1.0	3.0	108	972	3	36	31	1,116	3	42
Foraging (covered in cultivated lands monitoring cost)	16,610	1,846	-	-	-	-	-	-	-	-	-	-	-
Palmate-bracted bird's beak (covered in mngmt cost factor)	34		-	-	-	-		-	-				

Total person hours for baseline surveys, per period in which acquisition occurs	**2,016**	Total person hours for recurring surveys, per permit term	**25,056**
number of periods for baseline surveys	9	Total contractor cost for recurring surveys, per permit term	**$4,449,006**

Table 12

Species and Natural Community Monitoring, Research, and Scientific Review

Final Yolo HCP/NCCP Conservation Strategy / Plan Status
Jan-18 Cost Model date
2017 constant dollars

Detail may not add to total due to independent rounding.

Species biological monitoring on pre-permit reserve lands - 6.5.3.2

Assumptions/Notes:

Some of the pre-permit reserve acres that will be enrolled have existing endowments and/or agricultural income that cover natural community and species biological monitoring costs.

This cost analysis assumes only the six mitigation bank sites have sufficient endowment revenue to cover species monitoring. All other pre-permit reserve sites will need species monitoring.

Other pre-permit reserve lands do not have existing endowments or income to support these activities and enrollment will be contingent on upgraded and standardized monitoring to provide a cohesive reserve system.

Species biological monitoring on pre-permit reserve lands without endowments or income (illustrative for the purposes of planning level estimates)

			Baseline Surveys					Status and Trends Monitoring				ANNUAL TOTALS	
Species	Pre-permit Reserve Lands Monitored for Species	Acres Enrolled every Five Years (Per "Input Schedule")	Survey Days for Survey Crew (Annually, per parcel)	Data Summary/ Reporting for Survey Crew (Annually, per parcel)	Number of Years to Establish Baseline, per parcel	Person Hours Needed to Establish Baseline, per parcel	Total Person Hours Needed to Establish the Baseline over the Permit Term	Survey Recurrence After Baseline (Years)	Total Person Hours for Every Recurring Survey	Total Surveys Needed for the Permit Term	Total Person Hours for Trends Surveys	Average Number of Monitoring Days per Year	Total person hours per year (8 hour days)
Valley elderberry longhorn beetle	105	12	1.0	1	3	72	648	5	24	45	1,080	3	35
California tiger salamander													
Upland dispersal	222	25				-	-	-	-	-	-	-	-
Aquatic Breeding	35	4	1.5	1	3	90	810	3	30	31	930	3	35
Western pond turtle													
Aquatic	42	5	2.0	1	1	36	324	3	36	31	1,116	2	29
Upland dispersal	-	-	-	-	-	-	-	-	-	-	-	-	-
Giant garter snake													
Rice	1,000	111	2.0	3.0	5.0	300	2,700	5	60	45	2,700	9	108
Aquatic	18	2	0.5	1	5	90	810	5	18	45	810	3	32
Freshwater emergent wetland	-	-		-	-	-	-	-	-	-	-	-	-
Active upland	18	2	-	-	-	-	-	-	-	-	-	-	-
Overwintering upland	39	4	-	-	-	-	-	-	-	-	-	-	-
Swainson's hawk													
Nesting	184	20	1.0	1.0	3.0	72	648	5	24	45	1,080	3	35
Foraging (covered in cultivated lands monitoring cost)	5,635	626	-	-	-	-	-	-	-	-	-	-	-
White-tailed kite													
Nesting (covered in Swainson's hawk nesting cost)	-	-	-	-	-	-	-	-	-	-	-	-	-
Foraging (covered in cultivated lands monitoring cost)	-	-	-	-	-	-	-	-	-	-	-	-	-
Western yellow-billed cuckoo	112	12	1.0	0.5	3.0	54	486	3	18	31	558	2	21
Western burrowing owl	763	85	2.0	1.0	3.0	108	972	5	36	45	1,620	4	52
Least Bell's vireo	83	9	-	-	-	-	-	-	-	-	-	-	-
Bank swallow	-	-	-	-	-	-	-	-	-	-	-	-	-
Tricolored blackbird													
Nesting	-	-	-	-	-	-	-	-	-	-	-	-	-
Foraging (covered in cultivated lands monitoring cost)	-	-	-	-	-	-	-	-	-	-	-	-	-
Palmate-bracted bird's beak (covered by existing endowment)	55		-	-	-			-					

Total person hours for baseline surveys, per period in which acquisition occurs	**822**	Total person hours for recurring surveys, per permit term	**9,894**
number of periods for baseline surveys	9	Total contractor cost for recurring surveys, per permit term	**$1,756,803**

902	acres in pre-permit reserve lands that have endowments or agricultural income (Sites 1 - 6, Mitigation Banks)
$0	annualized cost to YHC to monitor these pre-permit reserve lands
7,099	acres in pre-permit reserve lands that are enrolled that do not have existing endowments or agricultural income or that may require enhanced NCP/NCCP monitoring

Table 12

Species and Natural Community Monitoring, Research, and Scientific Review

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Research - 6.5.3.3 and 6.5.4.2

Assumptions/Notes:

The YHC will conduct and/or fund studies to identify preferred methods for monitoring, pilot projects to evaluate management techniques, and directed studies to resolve uncertainties to improve management for systems and species.

The YHC may use graduate students, university researchers, or other scientists to conduct these studies.

Research activities are complete by year 25.

$158,901	per period cost for research studies, years 1 - 5
$105,934	per period cost for research studies, years 6 - 15
$52,967	per period cost for research studies, years 16 - 25

Science and Technical Advisory Committee (STAC) - 6.5.5.3

Assumptions/Notes:

Science advisors are scientists and resource management experts providing the YHC with science-based expert opinion and recommendations, "white papers", peer review and feedback regarding scientific aspects of plan implementation.

Average annual cost for STAC, Years 1-40	**$13,992**
Average annual cost for STAC, Years 41-50	**$6,996**
Number of members	**5**
Travel cost compensation per member per meeting (non chair)	**$106**
Travel cost compensation per member per meeting (chair)	**$159**
Number of meetings per year Years 1 - 40	**24**
Number of meetings per year Years 41 - 50	**12**

Table 13
Plan Administration

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Cost for administration and documentation of program compliance	Permit Period (years)											
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
Staff Salaries and Benefits	$0	$2,044,526	$2,044,526	$2,129,274	$2,129,274	$2,214,022	$2,086,902	$2,086,902	$2,002,154	$1,875,033	$1,747,913	**$20,360,525**
Services, Supplies	$0	$306,679	$306,679	$319,391	$319,391	$332,103	$313,035	$313,035	$300,323	$281,255	$262,187	**$3,054,079**
Legal Services	$0	$492,750	$492,750	$242,750	$242,750	$242,750	$242,750	$242,750	$242,750	$242,750	$242,750	**$2,927,500**
Financial Services	$0	$132,417	$132,417	$132,417	$132,417	$132,417	$132,417	$132,417	$132,417	$132,417	$132,417	**$1,324,170**
State Agency Staff Support	$0	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	**$2,500,000**
Advocacy/Public Outreach	$0	$211,870	$211,870	$211,870	$211,870	$211,870	$211,870	$211,870	$211,870	$211,870	$211,870	**$2,118,700**
Neighboring Landowner Protection Program	$0	$13,667	$13,667	$13,667	$13,667	$13,667	$13,667	$13,667	$13,667	$13,667	$0	**$123,000**
GIS/Database Updates	$0	$15,890	$15,890	$15,890	$15,890	$15,890	$15,890	$15,890	$15,890	$15,890	$15,890	**$158,900**
Insurance	$0	$26,485	$26,485	$26,485	$26,485	$26,485	$26,485	$26,485	$26,485	$26,485	$26,485	**$264,850**
Rent	$0	$78,000	$78,000	$78,000	$78,000	$78,000	$78,000	$78,000	$78,000	$78,000	$78,000	**$780,000**
Risk Management / Easement Defense	$0	$17,980	$26,013	$33,918	$41,823	$49,728	$57,633	$65,538	$73,443	$81,475	$85,555	**$533,103**
Total	**$0**	**$3,590,264**	**$3,598,296**	**$3,453,661**	**$3,461,566**	**$3,566,931**	**$3,428,648**	**$3,436,553**	**$3,346,998**	**$3,208,841**	**$3,053,066**	**$34,144,826**

See 17_Staffing Plan and Costs for description of staff responsibilities and detail on cost assumptions

Legal services

2,000	hours per period years 1-10
750	hours per period years after year 10
$200	hourly rate, for in-house counsel
250	hours per period for outside special counsel
$371	hourly rate, for outside special counsel

Financial services

$15,890	annual financial review/audit
$52,967	cost per period for annual adjustment of fees; 5-year review of costs and funding

State agency staff support

$50,000	annual cost for 0.25 FTE Environmental Scientist Specialist, includes overhead and benefits (average of Senior and non-Senior staff rates)

Advocacy/public outreach

$42,374	annual cost for advocacy/public outreach services

Neighboring landowner protection program

$123,000	total cost over the permit term to fund baseline surveys on property participating in the program

GIS and database updates

$15,890	cost per period to update GIS land cover layers with aerial photographs, satellite imagery and other relevant data sources

Liability insurance/director's and officers/professional liability insurance

$5,297	annual premium, per YHC budget is $2,500; multiply by 2

Occupancy

1,000	square feet of office space leased
$1.30	monthly rental rate, includes utilities (Loopnet, office rent listings in Woodland, December 2014) inflated to 2017 dollars
$15,600	annual rent

Risk management / Conservation easement defense

$2,600	Land Trust Alliance annual membership for operating budget $1,000,001 - $2,000,000
$900	Terrafirma one-time registration fee for enrolling parcels, based on number of parcels enrolled (25 - 49)
$63	Terrafirma annual premium per parcel enrolled, 2018 rate
$51	Terrafirma annual premium per parcel enrolled, with accreditation/risk management discount (save $11 + $1 per parcel enrolled)

Table 14

Costs associated with Local Partner activities

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Cost for Local Partner activities in riparian corridors	Permit Period (years)											
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
Activities in Cache Creek riparian corridor	$0	$1,108,315	$1,108,315	$1,108,315	$1,108,315	$1,108,315	$1,108,315	$1,108,315	$1,108,315	$1,108,315	$1,108,315	**$11,083,150**
Activities in Lower Putah Creek riparian corridor	$0	$1,043,660	$1,043,660	$1,043,660	$1,043,660	$1,043,660	$1,043,660	$1,043,660	$1,043,660	$1,043,660	$1,043,660	**$10,436,600**
Total	**$0**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$2,151,975**	**$21,519,750**

Assumptions/Notes:

See Yolo Habitat Conservancy, Local Cost Share Sources and Potential Approaches, Yolo HCP/NCCP Local Cost Share Source Assessment, June 26, 2015 (costs updated here to 2017 dollars)

These activities will contribute to the conservation of habitat for species to be protected by the Yolo HCP/NCCP.

CCRMP activities in the Cache Creek riparian corridor - 6.4.3.7.1

$53,927	Invasive species control
$12,880	Elderberry surveys
$50,262	Aerial survey
$29,121	Creek Walk (monitor invasive species, special status species habitat, etc.)
$12,353	Riparian vegetation mapping and analysis
$33,121	OHV creekwide enforcement and restoration
$29,999	Restoration and management of sites to be enrolled as newly protected lands (Millsap, Correll, and Capay Open Space Preserve)
$221,663	**Total annual cost**

SCWA activities in the Putah Creek riparian corridor - 6.4.3.7.2

$14,294	Invasive species control
$78,620	Wildlife monitoring and assessment throughout Putah Creek corridor
$23,037	Riparian and wetland restoration: supplies and materials
$57,178	Riparian and wetland restoration: portion of Streamkeeper position (≈ 40%)
$20,943	Riparian and wetland restoration: SCWA engineering and permitting support
$10,471	Native plant propagation
$4,189	equipment loan for HCP/NCCP activities
$208,732	**Total annual cost**

Table 15
Contingency

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

	Permit Period (years)											
	Start up	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**	**50 Year Total**
Reserve acquisition capital cost	$0	$23,492,046	$23,237,826	$23,237,826	$23,237,826	$23,237,826	$23,237,826	$23,237,826	$23,237,826	$21,810,996	$0	**$207,967,821**
Acquisition contingency	$0	$2,349,205	$2,323,783	$2,323,783	$2,323,783	$2,323,783	$2,323,783	$2,323,783	$2,323,783	$2,181,100	$0	**$20,796,782**
All other program costs, except restoration	$0	$9,177,781	$9,633,869	$9,732,944	$9,970,334	$10,340,095	$10,409,072	$10,864,928	$11,210,199	$10,435,808	$7,531,158	**$99,306,188**
General operating contingency	$0	$917,778	$963,387	$973,294	$997,033	$1,034,010	$1,040,907	$1,086,493	$1,121,020	$1,043,581	$753,116	**$9,930,619**
Total contingency fund	**$0**	**$3,266,983**	**$3,287,169**	**$3,297,077**	**$3,320,816**	**$3,357,792**	**$3,364,690**	**$3,410,275**	**$3,444,802**	**$3,224,680**	**$753,116**	**$30,727,401**

Assumptions / Notes:

Restoration contingency is included in restored lands costs.

No contingency factor is applied to the costs for local partner activities in riparian corridors.

10%	contingency factor for acquisition capital costs, including site improvements
10%	contingency factor for all other program costs, exclusive of acquisition capital and restoration costs and local partner activity costs

Table 16

Yolo HCP / NCCP Post-Permit Costs, Annual Average Costs in Perpetuity

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Detail may not add to total due to independent rounding.

Cost Category	Annual Average Cost	Assumptions:
Assemble reserve, except restored lands	$0	Reserve assembly complete in year 45
Restored lands, ongoing management	$50,250	75 percent of annual average level of effort in year 50 is maintained on average in perpetuity
Restored lands, ongoing species monitoring	$48,000	30 percent of annual average level of effort in year 50 is maintained on average in perpetuity
YHC reserve management staff and overhead	$30,500	50 percent of annual average level of effort in year 50 is maintained on average in perpetuity
Reserve unit management plans	$37,077	7 plans updated every 20 years, annualized cost
Other management costs	$64,000	50 percent of annual average level of effort in year 50 is maintained on average in perpetuity
Natural communities monitoring, rest of reserve	$0	not required after permit term
Species monitoring, rest of reserve	$61,500	25 percent of annual average level of effort in year 50 is maintained on average in perpetuity
Plan administration	$152,750	25 percent of annual average level of effort in year 50 is maintained on average in perpetuity
Local partner activities in riparian corridors	$0	not required
Contingency fund	$0	not required
Total	**$444,077**	
Percent of average annual cost, years 46 - 50	**21%**	

Table 17

Staffing Plan and Cost Factors

Final Yolo HCP/NCCP	Conservation Strategy / Plan Status
Jan-18	Cost Model date
2017	constant dollars

Responsibliities of program staff include the following:

Day-to-day management of the HCP/NCCP. This includes managing reserve acquisition, restoration, management and monitoring activities, reporting to the YHC Board and state and federal agencies.

HCP/NCCP annual compliance reporting to state and federal agencies, including setting up and maintaining GIS and other databases.

Coordination with other agencies and conservation programs on invasive species control programs (6.4.3.4.1)

Coordination and communication with Plan Area agricultural programs on pollinator strategy, including assistance to secure funding and related public outreach (6.4.3.4.3)

YHC staff responsibilities include monitoring to assess Cache Creek Resource Management Plan and Lower Putah Creek program progress towards meeting Yolo HCP/NCCP biological goals and objectives and benefitting covered species (6.4.3.7.1 and 6.4.3.7.2)

Supervision of specialized contractor services as well as labor for restoration projects and reserve management.

With Science and Technical Advisory Committee, specify targeted studies and review and direct the work of monitoring contractors.

With Science and Technical Advisory Committee, implement adaptive management in response to findings of monitoring activities and reports.

Staffing plan	**Permit period (years)**										
Staff category	**Start up**	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**	**41 - 45**	**46 - 50**
Executive Director	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Sr. Environmental Scientist, Specialist	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.75
Restoration/Reserve Project Manager	-	0.25	0.50	0.50	0.50	0.25	0.25	0.25	0.25	0.25	0.25
Data Analyst/GIS Specialist	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Real Estate Specialist	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.25	-
Planner/Grant Specialist	-	0.50	0.50	0.50	0.50	0.50	0.25	0.25	0.25	0.25	-
Accountant/Budget Analyst	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Administrative Support	-	0.50	0.50	0.75	0.75	1.00	1.00	1.00	0.75	0.50	0.50
Total FTE	**-**	**4.50**	**4.75**	**5.00**	**5.00**	**5.00**	**4.75**	**4.75**	**4.25**	**3.75**	**3.25**

50%	percent of Senior Environmental Scientist time allocated to Monitoring & Research
25%	percent of Senior Environmental Scientist time allocated to Reserve Management
33%	percent of Restoration/Reserve Project Manager time and associated overhead allocated to Restoration, until restoration projects are completed in year 40.
67%	percent of Restoration/Reserve Project Manager time and associated overhead allocated to Reserve Management through year 40
100%	percent of Restoration/Reserve Project Manager time and associated overhead allocated to Reserve Management after year 40
100%	percent of Real Estate Specialist time and associated overhead allocated to Establish Reserve

All other staff time allocated to Plan Administration.

Staff cost assumptions

Annual salary per FTE	
$127,121	Executive Director (Yolo County Cache Creek Area Plan, Manager of Natural Resources is $110,000 at the high end of the range)
$84,747	Sr. Environmental Scientist, Specialist (State of California , Senior Environmental Scientist, Specialist at high end of salary range)
$69,916	Restoration/Reserve Project Manager (Cache Creek Conservancy, Habitat Restoration Manager, job announcement 10/2014 (range $45K - 60K))
$79,450	Data Analysis and Management/GIS Specialist (Yolo County General Services/Information Technology, Senior Business Systems Analyst)
$74,154	Real Estate Specialist (Yolo County Assessor, Principal Appraiser)
$63,560	Planner/Grant Specialist (Yolo County Cache Creek Area Plan, Natural Resources Program Coordinator)
$58,264	Accountant/Budget Analysis (Yolo County General Services, Accountant)
$42,374	Administrative Support (Yolo County Planning and Public Works, Office Support Specialist)

Assumptions/Notes:

60%	Benefit multiplier applied to annual salary across all staff categories
15%	Services and supplies as percent of salaries and benefits, based on analysis of 2014/15 YHC budget

Appendix I

Funding Plan

Yolo HCP / NCCP
Appendix I: Funding Plan
FINAL
April 2018

The funding plan estimates reasonably anticipated revenues sources available to fund the Yolo HCP/NCCP. Those sources are compared to estimated costs for plan preparation, permit term implementation, and post-permit activities to demonstrate that the Yolo HCP/NCCP is fully funded. The funding plan also calculates the fair share of costs assigned to offset the impacts of covered activities, and the development impact fee necessary to fully fund those costs.

Contents

Table 1: Land Conversion & Mitigation (acres)

Community Types	Total Estimated and Allowable Permanent Loss[1]	Reserve Acres Needed to Mitigate One Acre of Loss[2]	Mitigation Share of Total Reserve
Formula	*a*	*b*	*c = a x b*
Cultivated (rice)	87	3.00	261
Cultivated (non-rice)	9,910	1.00	9,910
Grassland	1,734	1.50	2,601
Serpentine	-	NA	-
Chamise Chapparal	-	NA	-
Mixed Chaparral	-	NA	-
Blue Oak and Foothill Pine	-	NA	-
Blue Oak Woodland	3	3.00	9
Closed-Cone Pine-Cypress	-	NA	-
Montane Hardwood	-	NA	-
Valley Oak Woodland	-	NA	-
Alkali Prairie[3]	4	-	-
Vernal Pool Complex	-	NA	-
Fresh Emergent Wetland	88	2.00	176
Valley Foothill Riparian	588	2.00	1,176
Lacustrine and Riverine	236	2.00	472
Other Land Cover Types[4]	4,018	0.60	2,411
Total Land Cover Types Subject to HCP/NCCP Fees	**16,668**	**1.02**	**17,016**

Table 1: Land Conversion & Mitigation (acres)

Community Types	Total Estimated and Allowable Permanent Loss[1]	Reserve Acres Needed to Mitigate One Acre of Loss[2]	Mitigation Share of Total Reserve

[1] Amounts represent permanent maximum allowable loss under the permits issued for the Yolo HCP/NCCP. See Table 5-3, Loss of Natural Communities and Other Land Cover Types, and Table 5-4, Natural Community Benefits and Net Effects, and footnote 4.

[2] Factors represent mitigation ratios reasonably applicable at a regional scale in the context of the Yolo HCP/NCCP and do not represent a project-level analysis. Provided by ICF International (see sources). Mitigation factors for loss of wetland, riparian, and riverine land cover types does not include additional 1:1 mitigation funded by wetland fees.

[3] Alkali Prairie mitigation paid through land dedication of Woodland Regional Park by City of Woodland; see HCP/NCCP Chapter 6 for details.

[4] Includes orchards and vineyards (1,628 acres), pasture or truck/nursery (0 acres), Eucalyptus (141 acres), and semiagricultural/ incidental to agriculture (1,294 acres), Also includes those portions of the barren and developed land cover type that are (1) gravel and sand bars (38 acres), and (2) vegetated corridor that overlaps with Giant Garter Snake habitat (917 acres). These land cover types have conservation value by providing open space for connectivity, buffers around development, and habitat for covered species such as nesting opportunities for Swainson's hawk and white-tailed kite. See Chapter 2, Section 2.5, Other Land Cover Types, and Chapter 5, Section 5.6.7, Other Land Cover Types.

Sources: Yolo HCP/NCCP, Chapter 5, Table 5-3, Loss of Natural Communities and Other Land Cover Types, and Table 5-4, Natural Community Benefits and Net Effects; memorandum to P. Marchand, YHC Executive Director from Ellen Berryman, ICF International regarding Yolo HCP/NCCP mitigation ratios, June 15, 2015.

Table 2: Allocation of Plan Implementation Costs from Cost Model ($ 2017)

	Appendix H - Cost Model Source	Cost Allocation Method[1]	Newly Protected Lands (NPLs)	Pre-Permit Reserve Lands (PPRLs)	Subtotal Excluding Restored Lands	Restored/ Created Lands	Total
Allocation Factors							
Total Reserve (acres)	Table 2		24,406	8,000	32,406	956	33,362
Total Reserve		*Total*	*73%*	*24%*	97%	*3%*	*100%*
Reserve Excluding Restored		*Ex. Restored*	*75%*	*25%*	100%	*NA*	*100%*
Establish Reserve System							
Oversight & Management	Table 9	*Ex. Restored*	$ 2,046,650	$ 682,217	$ 2,728,867	$ -	$ 2,728,867
Acquire Newly Protected Lands	Tables 9, 10	*NA*	187,691,089	-	187,691,089	10,911,046	198,602,135
Enroll Pre-permit Reserve Lands	Table 9	*NA*	-	8,622,097	8,622,097	-	8,622,097
Pre-acquisition Surveys	Tables 9, 10	*NA*	1,697,742	-	1,697,742	63,656	1,761,398
Transaction Costs	Tables 9, 10	*NA*	17,250,000	385,785	17,635,785	750,000	18,385,785
Subtotal			$ 208,685,481	$ 9,690,099	$ 218,375,580	$ 11,724,702	$ 230,100,282
Manage and Enhance the Reserve System							
Oversight & Management	Tables 10, 11	*Ex. Restored*	$ 2,518,861	$ 839,621	$ 3,358,482	583,729	$ 3,942,211
Reserve Unit Mgt. Plans	Table 11	*Ex. Restored*	1,370,527	456,843	1,827,370	-	1,827,370
Invasive Species Control	Table 11	*Ex. Restored*	79,450	26,484	105,934	-	105,934
Management on PPRLs	Table 11	*NA*	-	2,451,373	2,451,373	-	2,451,373
Management on Alkali Prairie	Table 11	*NA*	1,060,000	-	1,060,000	-	1,060,000
Establish Hedgerows	Table 11	*NA*	1,292,580	328,410	1,620,990	-	1,620,990
Manage Hedgerows	Table 11	*NA*	603,857	153,424	757,281	-	757,281
Planting Nest Trees	Table 11	*NA*	656,424	166,780	823,204	-	823,204
Western Burrowing Owl	Table 11	*NA*	88,583	-	88,583	-	88,583
Remedial Measures	Tables 10, 11	*Ex. Restored*	906,991	302,331	1,209,322	216,821	1,426,143
Remedial (Swainson's Hawk)	Table 11	*NA*	1,165,270	-	1,165,270	-	1,165,270
Subtotal			$ 9,742,543	$ 4,725,266	$ 14,467,809	$ 800,550	$ 15,268,359
Special and Natural Community Monitoring, Research, and Scientific Review							
Natural Comm. Monitoring	Table 12	*NA*	$ 1,970,411	$ 1,280,581	$ 3,250,992	$ -	$ 3,250,992
Species Monitoring	Table 10, 12	*NA*	7,670,700	3,070,411	10,741,111	7,457,625	18,198,736
Oversight & Management	Table 12	*Ex. Restored*	2,777,583	925,861	3,703,444	-	3,703,444
Research	Table 12	*Ex. Restored*	357,527	119,176	476,703	-	476,703
Science Advisors	Table 12	*Ex. Restored*	472,230	157,410	629,640	-	629,640
Subtotal			$ 13,248,451	$ 5,553,439	$ 18,801,890	$ 7,457,625	$ 26,259,515
Other Restored/Created Wetland Costs							
Fresh Emergent Wetland	Table 10	*NA*	$ -	$ -	$ -	$ 3,880,231	$ 3,880,231

Table 2: Allocation of Plan Implementation Costs from Cost Model ($ 2017)

	Appendix H - Cost Model Source	Cost Allocation Method[1]	Newly Protected Lands (NPLs)	Pre-Permit Reserve Lands (PPRLs)	Subtotal Excluding Restored Lands	Restored/ Created Lands	Total
Valley Foothill Riparian	Table 10	*NA*	-	-	-	32,391,081	32,391,081
Lacustrine & Riverine	Table 10	*NA*	-	-	-	7,665,449	7,665,449
Site Improvements	Table 10	*NA*	-	-	-	743,588	743,588
Environmental Compliance	Table 10	*NA*	-	-	-	1,318,103	1,318,103
GG Snake Water Mgt.	Table 10	*NA*	-	-	-	781,625	781,625
Other Management Costs	Table 10	*NA*	-	-	-	1,386,580	1,386,580
Subtotal			$ -	$ -	$ -	$ 48,166,657	$ 48,166,657
Costs Associated with Local Partner Activities							
Cache Creek Area Plan	Table 14	*NA*	$ 11,083,150	$ -	$ 11,083,150	$ -	$ 11,083,150
Lower Putah Creek	Table 14	*NA*	10,436,600	-	10,436,600	-	10,436,600
Subtotal			$ 21,519,750	$ -	$ 21,519,750	$ -	$ 21,519,750
Other Costs							
Plan Administration	Table 13	*Total*	$ 24,925,723	$ 8,194,758	$ 33,120,481	$ 1,024,345	$ 34,144,826
Contingency	Table 15	*Ex. Restored*	23,045,551	7,681,850	30,727,401	-	30,727,401
Subtotal			$ 47,971,274	$ 15,876,608	$ 63,847,882	$ 1,024,345	$ 64,872,227
Total Permit Term Costs			**$ 301,167,499**	**$ 35,845,412**	**$ 337,012,911**	**$ 69,173,879**	**$ 406,186,790**

Note: This table allocates Plan costs between three reserve components: newly protected lands, pre-permit reserve lands, and restored lands.

[1] "NA" indicates that cost data was drawn directly from cost model results without need for further allocation. All costs for restored lands, except a share of Plan Administration costs, are drawn directly from the cost model. Where cost model does not provide sufficient detail to allocate costs, cost allocation based on reserve acreage share (see cost allocation factors at top of table).

Sources: Appendix H - Cost Model.

Table 3: Endowment Fund Cash Flow 50-Year Permit Term ($ 2017)

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	1	2	3	4	5	6	7	8	9	10
Opening Fund Balance	$ -	$ 113,000	$ 229,000	$ 349,000	$ 473,000	$ 601,000	$ 733,000	$ 870,000	$ 1,011,000	$ 1,157,000
Plan Contribution	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000
Interest Earnings[1]	2,000	5,000	9,000	13,000	17,000	21,000	26,000	30,000	35,000	39,000
Total Revenues	$ 113,000	$ 116,000	$ 120,000	$ 124,000	$ 128,000	$ 132,000	$ 137,000	$ 141,000	$ 146,000	$ 150,000
Post-Permit Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow	$ 113,000	$ 116,000	$ 120,000	$ 124,000	$ 128,000	$ 132,000	$ 137,000	$ 141,000	$ 146,000	$ 150,000
Closing Fund Balance	$ 113,000	$ 229,000	$ 349,000	$ 473,000	$ 601,000	$ 733,000	$ 870,000	$ 1,011,000	$ 1,157,000	$ 1,307,000

Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	11	12	13	14	15	16	17	18	19	20
Opening Fund Balance	$ 1,307,000	$ 1,462,000	$ 1,622,000	$ 1,788,000	$ 1,959,000	$ 2,135,000	$ 2,317,000	$ 2,505,000	$ 2,699,000	$ 2,900,000
Plan Contribution	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000
Investment Earnings[1]	44,000	49,000	55,000	60,000	65,000	71,000	77,000	83,000	90,000	96,000
Total Revenues	$ 155,000	$ 160,000	$ 166,000	$ 171,000	$ 176,000	$ 182,000	$ 188,000	$ 194,000	$ 201,000	$ 207,000
Post-Permit Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow	$ 155,000	$ 160,000	$ 166,000	$ 171,000	$ 176,000	$ 182,000	$ 188,000	$ 194,000	$ 201,000	$ 207,000
Closing Fund Balance	$ 1,462,000	$ 1,622,000	$ 1,788,000	$ 1,959,000	$ 2,135,000	$ 2,317,000	$ 2,505,000	$ 2,699,000	$ 2,900,000	$ 3,107,000

[1] Investment earnings estimated based (Opening Fund Balance + (Plan Contribution / 2)) x (Real return on investment). Real return on investment rate = 3.25%

Real return on investment rate based on 7.25% total return net of fees charged by individual investment fund managers, minus 3% for inflation, and minus 1% for investment management.

Sources: Chapter 8, Table 8-5, *Yolo HCP/NCCP Post-Permit Costs, Annual Average Costs in Perpetuity*; National Fish and Wildlife Federation (for real return on investment rate).

Table 4: Endowment Fund Cash Flow 50-Year Permit Term ($ 2017) (continued)

Year	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
	21	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*
Opening Fund Balance	$ 3,107,000	$ 3,321,000	$ 3,542,000	$ 3,770,000	$ 4,005,000	$ 4,248,000	$ 4,499,000	$ 4,758,000	$ 5,025,000	$ 5,301,000
Plan Contribution	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000
Investment Earnings[1]	103,000	110,000	117,000	124,000	132,000	140,000	148,000	156,000	165,000	174,000
Total Revenues	$ 214,000	$ 221,000	$ 228,000	$ 235,000	$ 243,000	$ 251,000	$ 259,000	$ 267,000	$ 276,000	$ 285,000
Post-Permit Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow	$ 214,000	$ 221,000	$ 228,000	$ 235,000	$ 243,000	$ 251,000	$ 259,000	$ 267,000	$ 276,000	$ 285,000
Closing Fund Balance	$ 3,321,000	$ 3,542,000	$ 3,770,000	$ 4,005,000	$ 4,248,000	$ 4,499,000	$ 4,758,000	$ 5,025,000	$ 5,301,000	$ 5,586,000

Year	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
	31	*32*	*33*	*34*	*35*	*36*	*37*	*38*	*39*	*40*
Opening Fund Balance	$ 5,586,000	$ 5,880,000	$ 6,184,000	$ 6,498,000	$ 6,822,000	$ 7,157,000	$ 7,502,000	$ 7,859,000	$ 8,227,000	$ 8,607,000
Plan Contribution	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000
Investment Earnings[1]	183,000	193,000	203,000	213,000	224,000	234,000	246,000	257,000	269,000	282,000
Total Revenues	$ 294,000	$ 304,000	$ 314,000	$ 324,000	$ 335,000	$ 345,000	$ 357,000	$ 368,000	$ 380,000	$ 393,000
Post-Permit Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow	$ 294,000	$ 304,000	$ 314,000	$ 324,000	$ 335,000	$ 345,000	$ 357,000	$ 368,000	$ 380,000	$ 393,000
Closing Fund Balance	$ 5,880,000	$ 6,184,000	$ 6,498,000	$ 6,822,000	$ 7,157,000	$ 7,502,000	$ 7,859,000	$ 8,227,000	$ 8,607,000	$ 9,000,000

[1] Investment earnings estimated based (Opening Fund Balance + (Plan Contribution / 2)) x (Real return on investment). Real return on investment rate = 3.25%

Real return on investment rate based on 7.25% total return net of fees charged by individual investment fund managers, minus 3% for inflation, and minus 1% for investment management.

Sources: Chapter 8, Table 8-5, *Yolo HCP/NCCP Post-Permit Costs, Annual Average Costs in Perpetuity*; National Fish and Wildlife Federation (for real return on investment rate).

Table 4: Endowment Fund Cash Flow 50-Year Permit Term ($ 2017) (continued)

Year	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
	41	*42*	*43*	*44*	*45*	*46*	*47*	*48*	*49*	*50*
Opening Fund Balance	$ 9,000,000	$ 9,405,000	$ 9,823,000	$ 10,255,000	$ 10,701,000	$ 11,162,000	$ 11,638,000	$ 12,129,000	$ 12,636,000	$ 13,159,000
Plan Contribution	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000	$ 111,000
Investment Earnings[1]	294,000	307,000	321,000	335,000	350,000	365,000	380,000	396,000	412,000	429,000
Total Revenues	$ 405,000	$ 418,000	$ 432,000	$ 446,000	$ 461,000	$ 476,000	$ 491,000	$ 507,000	$ 523,000	$ 540,000
Post-Permit Costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow	$ 405,000	$ 418,000	$ 432,000	$ 446,000	$ 461,000	$ 476,000	$ 491,000	$ 507,000	$ 523,000	$ 540,000
Closing Fund Balance	$ 9,405,000	$ 9,823,000	$ 10,255,000	$ 10,701,000	$ 11,162,000	$ 11,638,000	$ 12,129,000	$ 12,636,000	$ 13,159,000	$ 13,699,000

	Total	Ongoing
	Year 1 - 50	*51+*
Opening Fund Balance	$ -	$ 13,699,000
Plan Contribution	**$ 5,550,000**	$ -
Investment Earnings[1]	**$ 8,149,000**	445,000
Total Revenues	**$ 13,699,000**	$ 445,000
Post-Permit Costs	$ -	$444,077
Net Cash Flow	$ 13,699,000	$ 923
Closing Fund Balance	$ 13,699,000	$ 13,699,923

[1] Investment earnings estimated based (Opening Fund Balance + (Plan Contribution / 2)) x (Real return on investment). Real return on investment rate = 3.25%

Real return on investment rate based on 7.25% total return net of fees charged by individual investment fund managers, minus 3% for inflation, and minus 1% for investment management.

Sources: Chapter 8, Table 8-5, *Yolo HCP/NCCP Post-Permit Costs, Annual Average Costs in Perpetuity*; National Fish and Wildlife Federation (for real return on investment rate).

Table 4: Plan Preparation Cost

FY 2003-04 to FY 2011-12	
Total Costs	$ 5,864,000
State & Federal Grant Funding	(2,283,000)
Net Local Funding[1]	$ 3,581,000
FY 2012-13 Net Local Funding (actual)	670,000
FY 2013-14 Net Local Funding (actual)	164,900
FY 2014-15 Net Local Funding (actual)	164,900
FY 2015-16 Net Local Funding (actual)	164,900
FY 2016-17 Net Local Funding (actual)	164,900
FY 2017-18 Net Local Funding (estimated)	164,900
Net Costs To Be Reimbursed	$ 5,075,500

[1] "Net Local Funding" through FY 2011-12 was provided by the Swainson's Hawk Mitigation Trust Account (held by the Yolo Habitat Conservancy) from mitigation fee revenues generated prior to Plan adoption. Reimbursement of this amount will be returned to that account for mitigation of impacts that occurred prior to Plan adoption.

Sources: Yolo Habitat Conservancy.

Table 5: Average Cost per Reserve Acre Including Endowment Contribution & Plan Preparation Costs ($ 2017)

	Cost Allocation Method	Newly Protected Lands	Pre-Permit Reserve Lands	Restored Lands	Total
Allocation Factors					
Total Reserve (acres)		24,406	8,000	956	33,362
Total Reserve	*Total Acres*	*73%*	*24%*	*3%*	*100%*
Total Reserve Excluding Endowed (acres)		24,406	3,143	956	28,505
Non-endowed Reserve	*Non-endowed Acres*	*86%*	*11%*	*3%*	*100%*
Total Plan Costs Including Endowment Contribution & Plan Preparation Costs					
Plan Implementation from Cost Model	*See Table 2*	$ 301,167,499	$ 35,845,412	$ 69,173,879	$ 406,186,790
Endowment Contribution	*Non-endowed Acres*	4,773,000	610,500	166,500	5,550,000
Plan Preparation	*Total Acres*	3,705,115	1,218,120	152,265	5,075,500
Total Cost		$ 309,645,614	$ 37,674,032	$ 69,492,644	$ 416,812,290
Total Reserve Acres		24,406	8,000	956	33,362
Average Cost Per Acre		**$ 12,687**	**$ 4,709**	**$ 72,691**	**$ 12,494**

Note: Endowment and plan preparation costs are not included in the cost model (Appendix H) and are calculated separately in this Appendix I.

Sources: Appendix I - Funding Model, Tables 2, 3, and 4.

Table 6: Land Cover Fee ($ 2017)

	Total
Mitigation Cost Share in Acres[1]	17,016
Cost per Acre[2]	$ 12,687
Mitigation Cost Share	$ 215,881,992
Land Conversion (acres)	16,668
Land Cover Fee per Acre of Land Conversion	**$ 12,952**

[1] Excludes acquisition of restored lands that are funded separately by wetland fees.

[2] Cost per acre based on total costs and total acres for newly acquired lands, the reserve component that is applicable to mitigation of land conversion impacts. Pre-permit reserve lands are part of the Plan's conservation commitment (see Chapter 6, Table 6-1(b)).

Sources: Appendix I - Funding Model, Tables 1 and 5.

Table 7: Wetland Fee ($ 2017)

	Cost Allocation Method	Fresh Emergent Wetland	Valley Foothill Riparian	Lacustrine & Riverine	Total
Allocation Factors					
Restored Lands (acres)		88	608	260	956
All Aquatic Lands	*All Aquatic*	*9%*	*64%*	*27%*	*100%*
Fresh Emergent Wetland and Lacustrine & Riverine Only	*FE&LR Only*	*25%*	*NA*	*75%*	*100%*
Allocation of Restoration Costs					
Cost Model					
Acquire Newly Protected Lands (fee title interest)	*All Aquatic*	981,994	6,983,070	2,945,982	$ 10,911,046
Pre-acquisition Surveys	*All Aquatic*	5,729	40,740	17,187	63,656
Transaction Costs	*All Aquatic*	67,500	480,000	202,500	750,000
Oversight & Management	*All Aquatic*	$ 52,536	$ 373,586	$ 157,607	583,729
Remedial Measures	*All Aquatic*	19,514	138,765	58,542	216,821
Species Monitoring - Restored Lands	*All Aquatic*	671,186	4,772,880	2,013,559	7,457,625
Fresh Emergent Wetland Restoration	*See Table 2*	3,880,231	-	-	3,880,231
Valley Foothill Riparian Restoration	*See Table 2*	-	32,391,081	-	32,391,081
Lacustrine & Riverine Restoration	*See Table 2*	-	-	7,665,449	7,665,449
Site Improvements	*All Aquatic*	66,923	475,896	200,769	743,588
Environmental Compliance	*All Aquatic*	118,629	843,586	355,888	1,318,103
Giant Garter Snake Water Management	*FE&LR Only*	195,406	NA	586,219	781,625
Other Management Costs	*All Aquatic*	124,792	887,411	374,377	1,386,580
Plan Administration	*All Aquatic*	92,191	655,581	276,573	1,024,345
Subtotal		$ 6,276,631	$ 48,042,596	$ 14,854,652	$ 69,173,879
Other Plan Costs					
Endowment Contribution	*All Aquatic*	$ 14,985	$ 106,560	$ 44,955	$ 166,500
Plan Preparation	*All Aquatic*	13,704	97,449	41,112	152,265
Subtotal		$ 28,689	$ 204,009	$ 86,067	$ 318,765
Total Restoration Costs		$ 6,305,320	$ 48,246,605	$ 14,940,719	$ 69,492,644
Wetland Fee					
Total Restoration Costs		$ 6,305,320	$ 48,246,605	$ 14,940,719	$ 69,492,644
Wetland Fee per Acre of Wetland Impact (1:1 ratio)		**$ 71,651**	**$ 79,353**	**$ 57,464**	
Land Conversion		88	588	236	912
Wetland Fee Revenue		$ 6,305,288	$ 46,659,564	$ 13,561,504	66,526,356

Sources: Chapter 6, Table 6-8; Appendix I - Funding Model, Tables 2 and 5.

Table 8: Average Costs per Reserve Acre ($ 2017)

			Source
Newly Protected Lands Acquisition			
Acquire Conservation Easements on Newly Protected Lands		$ 187,691,089	Appendix H - Cost Model, Table 9
Pre-acquisition Surveys		1,697,742	Appendix H - Cost Model, Table 9
Transaction Costs		17,250,000	Appendix H - Cost Model, Table 9
Total		$ 206,638,831	Calculation
Newly Protected Lands (acres)		24,406	Ch. 6, Table 6-1(b)
Average Cost per Acre		**$ 8,467**	Calculation
Restored/Created Lands - Costs Eligible for State & Federal Funding	**Valley Foothill Riparian**	**Lacustrine & Riverine**	
Total Restoration Costs	$ 48,246,605	$ 14,940,719	Appendix I - Table 7
Costs Not Eligible for State & Federal Funding			
Oversight & Management	$ 373,586	$ 157,607	Appendix I - Table 7
Plan Administration	655,581	276,573	Appendix I - Table 7
Endowment Contribution	106,560	44,955	Appendix I - Table 7
Plan Preparation	97,449	41,112	Appendix I - Table 7
Subtotal	1,233,176	520,247	Appendix I - Table 7
Net Costs Eligible for State & Federal Funding	$ 47,013,429	$ 14,420,472	Calculation
Restored/Created Lands (acres)	608	260	Ch. 6, Table 6-8
Net Cost per Acre	**$ 77,325**	**$ 55,463**	Calculation
Agricultural easement value w/out row crop requirement, allows orchards/vineyards			
Agricultural easement cost (non-rice) with requirement to maintain as row crops		$ 10,200	Appendix H - Cost Model, Table 9
Easement value associated with restriction on conversion to orchards/vineyards		7,000	Estimate by HCP/NCCP Team
Net easement value without row crop requirement, allows orchards/vineyards		**$ 3,200**	Calculation

Note: The purpose of this table is to provide per acre acquisition cost estimates for use in Tabled 9 and 10.

Table 9: Local Funding Sources (50-Year Permit Term) ($ 2017)

	Assumptions		50-Year Total	2015 1	2016 2	2063 49	2064 50
City of Davis - Open Space Program							
Reserve acquisition (nominal $)[1]	$ 200,000	per year	$ 10,000,000	200,000	200,000	200,000	200,000
Reserve acquisition cost (real $)[2]	3.0%	discount factor	$ 5,146,000	194,175	188,519	46,990	45,621
Reserve acquisition (acres)[3]	$ 8,467	per acre	608	23	22	6	5
Yolo County Cache Creek Area Plan - Gravel Mining Fee							
Conservation Activities under the Cache Creek Resource Management Plan / Cache Creek Improvement Program (real $)[4]	$ 221,663	per year	$ 11,083,000	221,663	221,663	221,663	221,663
Net Gains Lands							
Reserve acquisition (acres)[5]	276	acres	276	5.5	5.5	5.5	6.5
Value of habitat conservation easement donated by County (real $)[6]	$ 10,200	per acre	$ 2,815,000	56,100	56,100	56,100	66,300
Reclaimed Agricultural Lands							
Reserve acquisition (acres)[7]	865	acres	865	17.3	17.3	17.3	17.3
Value of agricultural conservation easement provided by gravel companies (real $)[7]	$ 3,200	per acre	$ 2,768,000	55,360	55,360	55,360	55,360
Total CCRMP Funding			$ 16,666,000				
Solano County Water Agency / Lower Putah Creek Coordinating Committee							
Conservation activities (real $)[4]	$ 208,732	per year	$ 10,437,000	208,732	208,732	208,732	208,732
Foundations & Non-profit Organizations							
Revenue acquisition cost (real $)[8]	$ 200,000	per year	$ 10,000,000	200,000	200,000	200,000	200,000
Reserve acquisition (acres)[3]	$ 8,467	per acre	1,200	24	24	24	24

Table 9: Local Funding Sources (50-Year Permit Term) ($ 2017)

	Assumptions	50-Year Total	2015 1	2016 2	2063 49	2064 50

[1] City of Davis funding for reserve assembly not identified separately in the cost model. This local funding would offset reserve assembly and possibly other Plan costs. Non-binding funding commitment expressed in nominal dollars (not adjusted for inflation) so amount is discounted based on anticipated inflation to be consistent with the funding model (real $ 2017). See Chapter 8, Sec. 8.4.2.1, City of Davis, for further detail on the City's commitment.

[2] Reflects estimate inflation in total Yolo HCP/NCCP costs. Estimated by Urban Economics based on historical rates.

[3] Cost per acre based on weighted average easement acquisition for newly-protected lands (see in this appendix, Table 9, *Average Acquisition Cost per Reserve Acre*).

[4] Funding for these Cache Creek and Lower Putah Creek ongoing activities that contribute to achievement of Yolo HCP/NCCP objectives. Activities are in addition to other Plan activities and therefore identified separately in the cost model (see Appendix H - Cost Model, Table 14, *Costs associated with Local Partner activities*). Costs updated for inflation from original 2015 estimates. See Cache Creek and Lower Putah Creek sections of Chapter 8, Sec. 8.4.1, *Local Funding*, for further explanation of activities.

[5] Yolo County voluntary commitment for CCRMP contribution to Yolo HCP/NCCP reserve. See Chapter 8, Sec. 8.4.2.2 *Cache Creek Resources Management Plan* for further detail.

[6] Cost per acre based on value of easement acquisition (see in this appendix, Table 9, *Average Acquisition Cost per Reserve Acre*).

[7] The CCAP requires gravel mining companies to reclaim previously mined lands to agricultural uses with an agricultural lands conservation easement. Easement does not restrict conversion to orchards and vineyards so the value of this local funding contribution is based on this less-restrictive agricultural easement (see in this appendix, Table 9, *Average Acquisition Cost per Reserve Acre*). The Conservancy will incur additional costs, not represented here but included in the cost model, working with land owners to add an additional layer of protection for covered species habitat on these reclaimed lands, e.g. preventing conversion to orchards and vineyards, so that these lands can qualify for inclusion in the reserve.

[8] See Chapter 8, Sec. 8.4.2.4, *Foundations and Other Non-profit Organizations* for further detail.

Sources: Yolo Habitat Conservancy Local Cost Share Sources and Potential Approaches, memorandum to USFWS and CDFW staff from P. Marchand, YHC Executive Director, and Chris Alford, Alford Environmental, June 26, 2015; Appendix H - Cost Model, Table 14; Resources Law Group; Appendix I - Funding Model, Table 8.

Table 10: State and Federal Funding ($ 2017)

			Source
Newly Protected Lands - Acquisition Costs Only			
Conservation Lands (acres)	8,231		Ch. 6, Table 6-1(b)
Average Cost per Acre	$ 8,467		App. I, Table 8
Total Acquisition Funding		$ 69,691,877	Calculation
Restored/Created Lands - Acquisition and Restoration/Creation Costs			
Valley Foothill Riparian			
Conservation Commitment (acres)	20		Ch. 6, Table 6-8
Average Cost per Acre	$ 77,325		App. I, Table 8
Funding Commitment	$ 1,546,500		Calculation
Lacustrine & Riverine			
Conservation Commitment (acres)	24		Ch. 6, Table 6-8
Average Cost per Acre	$ 55,463		App. I, Table 8
Funding Commitment	$ 1,331,112		Calculation
Total Restored/Created Lands Funding		$ 2,877,612	Calculation
State & Federal Funding Commitment		**$ 72,569,489**	Calculation

Table 11: Operating Fund Interest Income ($ 2017)

Total Mitigation Fee Funding[1]	$	282,408,000
Permit Term (years)		50
Average Annual Funding (50-year permit term)	$	5,648,000
Exclude Reserve Assembly Costs[2]		45%
Average Fund Balance	$	2,542,000
Interest Rate[3]		1.01%
Annual Interest Income	$	26,000
Permit Term (years)		50
Total Interest Income	**$**	**1,300,000**

[1] Operating fund balance estimate only includes mitigation fee funding because substantially all other funds likely to be grants for land acquisition received as reimbursement for prior expenditures or local funding credited to Plan but managed by a separate agency.

[2] To be conservative in estimating interest revenue, assumes average fund balance equals one year of costs excluding reserve assembly costs, i.e. assume land acquisition funds are expended as soon as they are available. Estimated based on total reserve assembly costs (Table 3) as a percent of total Plan costs including endowment and plan reimbursement (Table 6).

[3] Based on most recently available 10-year average annual return from the California Pooled Money Investment Fund managed by the California State Treasurer's Office

Sources: California State Treasurer's Office; Appendix I - Funding Model, Tables 3, 6, and 13.

Table 12: Total Plan Costs and Endowment Fund Balance ($ 2017)

			Appendix I Funding Model Source
Total Plan Costs Including Endowment Fund Balance, Year 50			
Plan Implementation from Cost Model	$ 406,187,000		Table 2
Contribution to Endowment Fund Balance[1]	5,550,000		Table 3
Plan Preparation	5,076,000		Table 4
Total Cost Before Endowment Fund Investment Income		$ 416,813,000	Calculation
Endowment Fund Investment Income to Year 50[2]		8,149,000	Table 3
Total Plan Costs Including Endowment Fund Balance, Year 50		**$ 424,962,000**	Calculation
Endowment Fund Balance, Year 50			
Contribution to Endowment Fund Balance[1]	$ 5,550,000		Table 3
Endowment Fund Investment Income to Year 50[2]	8,149,000		Table 3
Total Endowment Fund Balance, Year 50		**$ 13,699,000**	Calculation

Note: The components of total plan costs and the endowment fund balance are presented in this table to document the source of the total amounts shown in the following table, Table 13, *Funding Plan.*

[1] The contribution to the endowment fund balance is the amount of funding needed from other revenues generated by the Plan (primarily land cover fees) to fully fund the endowment by Year 50.

[2] Endowment fund investment income that helps build the endowment fund balance prior to Year 50 was not included in prior tables as a cost because it represents the estimated return on investment generated by endowment fund contributions as the fund balance grows from Year 1 through 50. In this appendix Table 13, *Funding Plan*, the total endowment fund balance in Year 50 is shown as a cost, and the investment income component is shown as a revenue that partially offsets this cost.

Table 13: Funding Plan ($ 2017)

Yolo HCP/NCCP Funding, Costs & Net Revenue				**Appendix I Funding Model Source**
Yolo HCP/NCCP Funding				
Mitigation Funding				
Land Cover Fee	$ 215,882,000		50.8%	Table 6
Wetland Fees	66,526,000		15.7%	Table 7
Temporary Effect Fee[1]	-		<1%	NA
Subtotal Mitigation Funding[2]		$ 282,408,000	66.5%	Calculation
Conservation Funding				
Local Sources				
Davis Open Space Program[3]	$ 5,146,000		1.2%	Table 9
Cache Creek Area Plan	16,666,000		3.9%	Table 9
Lower Putah Creek	10,437,000		2.5%	Table 9
Foundations & Non-profit Organizations	10,000,000		2.4%	Table 9
Subtotal Local Sources		42,249,000	9.9%	Calculation
State & Federal Sources[4]		72,569,000	17.1%	Table 10
Other Local, State & Federal Sources		18,287,000	4.3%	Estimate
Subtotal Conservation Funding		$ 133,105,000	31.3%	Calculation
Other Funding				
Endowment Fund Investment Income	$ 8,149,000		1.9%	Table 3
Operational Fund Interest Income	1,300,000		<1%	Table 11
Subtotal Other Funding		9,449,000	2.2%	Calculation
Total Yolo HCP/NCCP Funding		**$ 424,962,000**	**100.0%**	Calculation
Yolo HCP/NCCP Costs				
Plan Implementation (50-Yr. Permit Term)	$ 406,187,000		95.6%	Table 2
Endowment Fund Balance, Yr. 50	13,699,000		3.2%	Table 3
Plan Preparation	5,076,000		1.2%	Table 4
Total Yolo HCP/NCCP Costs		**424,962,000**	**100.0%**	Table 12
Yolo HCP/NCCP Net Revenue				
Surplus / (Deficit)		$ -	0.0%	Calculation

Table 13: Funding Plan ($ 2017)

Yolo HCP/NCCP Funding, Costs & Net Revenue	Appendix I Funding Model Source

[1] Temporary effects and consequent fee revenue are likely to be quite small relative to permanent effects, and any estimates likely to be speculative, so temporary effects fee revenue is not estimated for purposes of the funding plan. Any such revenue will be credited to the development fee obligation at each five-year adjustment of the funding plan and fee levels adjusted accordingly (see section 8.4.1.6 *Adjustment of Development Fees*).

[2] Mitigation funding represents more than the fair share amount shown in this appendix in Table 2, *Mitigation Fair Share of Total Reserve*, because mitigation must fund newly protected lands that have a higher average per acre cost than pre-permit reserve lands (see in this appendix, Table 6, *Average Cost per Reserve Acre Including Endowment Contribution & Plan Preparation Cost*).

[3] The City of Davis funding objective is $10 million over 50 years in nominal dollars (not adjusted for inflation). The amount shown here is based on $200,000 per year, discounted for inflation over the permit term. The actual amount of funding adjusted for inflation will vary, depending on the timing of acquisitions and inflation rates.

[4] State and federal funding sources equal the amount necessary to fully fund the conservation share of total Plan costs after deducting anticipated local conservation funding sources.

Appendix J
State and Federal Funding

Memorandum

Date:	October 9, 2015
To:	Petrea Marchand, Yolo Habitat Conservancy
From:	David Zippin, ICF International
Subject:	Estimated State and Federal Funding for First 10 Years of Yolo Habitat Conservation Plan/Natural Community Conservation Plan

Introduction

The Yolo Habitat Conservation Plan/Natural Community Conservation Plan (Yolo HCP/NCCP, or Plan), like all NCCPs, will rely on a substantial amount of funding from state and federal sources to support the portion of the conservation strategy that will exceed mitigation requirements. These state and federal funding sources will be matched with similarly substantial local funding to support conservation of the covered species. To approve the Plan, the U.S. Fish and Wildlife Service must find that funding is "assured". Similarly, the California Department of Fish and Wildlife must find that the Plan "ensures adequate funding to carry out the conservation measures identified in the plan"[1]. To facilitate these federal and state findings and help to justify the level of state and federal funding commitments, ICF conducted an assessment of likely state and federal funding for the Plan. This memo provides a summary of the funding sources likely to be available to the Yolo HCP/NCCP through both federal and state grants during the first 10 years of Plan implementation.

Methods

The time period for the analysis of 10 years was selected because it represents a reasonable time horizon over which current state and federal funding sources are likely to last. For example, state grants funded by propositions such as Proposition 1 passed in 2014 are expected to last 8-10 years, perhaps more. Any projections of state and federal funding beyond 10 years would be more speculative. Funding sources lasting 10 years or more are expected to be replaced by new funding sources such as new open space or water bonds. However, the scope and funding stream of these future sources are unknown and cannot be predicted with any certainty. In our experience, the first 10 years of Plan implementation are critical to overall plan success because they set the tone for the level of external funding provided to a plan for land acquisition, the most expensive element of most NCCPs.

[1] California Fish and Game Code Sect. 2820(a)(10).

There are a variety of potential sources available now or soon to be available for both federal and state funding for regional HCPs and NCCPs. These potential sources, along with their expected duration, are listed in Table 1.

ICF estimated the potential maximum annual award for each funding source. In some cases, these maximum awards are disclosed by the funding entity. For those funding sources for which the annual maximum award amount is variable, ICF set the maximum annual award as the average award for that source based on historic grant awards in California over the last 5-10 years (the time period depended on the data available for each funding source). For those funding sources that are new (and therefore have no history on which to base award assumptions), ICF made reasonable assumptions as to the maximum annual award based on our knowledge of the programs and how competitive the Yolo HCP/NCCP is expected to be for these awards.

In order to bound the expected average annual funding amount from each source, ICF developed both an "optimistic" scenario and a "pessimistic" scenario for each source. Under the optimistic or best case scenario for each funding source, ICF assumed that the Yolo HCP/NCCP would be awarded larger grants with a greater degree of frequency over the first 10 years of Plan implementation. Under the pessimistic scenario, ICF assumed that grant awards would be less frequent and typically of lower amounts. Table 1 provides both the estimated average annual funding under each scenario, as well as the total estimated funding over the first 10 years of Plan implementation under each scenario. Additional detail regarding the specific assumptions used for each funding source is also provided in the "Rationale and Assumptions" column in Table 1.

The total amount anticipated under each scenario was then calculated and compared against the funds needed to fulfill the estimated federal/state cost share for the Yolo HCP/NCCP over the first 10 years of Plan implementation. The total estimated federal/state cost share of $86,274,000 over the permit term was assumed to be needed for the first 45 years of the 50-year permit term because the majority of this state/federal funding would be used to support land acquisition. All land for the Reserve System must be acquired by year 45 of the Plan.

ICF believes this analysis to be conservative for the following reasons:

- In most cases, we used the average grant award amount as the basis for future awards. The Yolo HCP/NCCP could easily secure awards that are greater than the average amount due to its large scale, multi-species nature, and status as a new NCCP (new NCCPs may be more successful with grants than established, older NCCPs).

- Historic grants are not inflation adjusted. That is, grants awarded in the past are not converted to today's dollars. Therefore, historic averages of grant awards are lower than actual amounts in today's dollars. This underestimates slightly the grant amounts the Yolo HCP/NCCP could be awarded in the future.

- This analysis is focused on the largest funding sources that target land acquisition; there are smaller grant sources that are not included in Table 1. For example, many restoration or habitat enhancement grants are excluded because they tend to be small dollar amounts (i.e., < $100,000). However, if the Yolo HCP/NCCP were to be awarded several of these smaller grants a year, this could add materially to the total (e.g., another $0.5 to 1 million over 10 years).

- ICF only included funding sources available today or about to be available in 2016; however, new funding sources will certainly arise in the first 10 years of the Plan. For example, another statewide parks and open space or water bond may be passed, either of which could support land acquisition and restoration projects for NCCPs.

Conclusions

Using the methods described above, ICF concludes the following:

- Under the optimistic scenario, the Yolo HCP/NCCP has a reasonable chance of securing an estimated $40.4 million in state/federal funds in the first 10 years of Plan implementation. This would equate to over twice the state/federal funds needed to implement the Plan in the first 10 years ($19.2 million)
- Under the pessimistic scenario, the Yolo HCP/NCCP may come up short by an estimated $3.6 million (19%) on the 10-year need of state/federal funding ($19.2 million). The pessimistic scenario assumes that all of the potential funding sources are awarded much less frequently and at reduced amounts during the entire first 10 years of Plan implementation. ICF views this scenario as highly unlikely based on past experience and the expected competitiveness of this Plan.
- Actual grant awards for the Yolo HCP/NCCP are likely to fall somewhere in between the optimistic and pessimistic scenarios; however, they will likely be closer to the optimistic result because new plans often outcompete established plans. As a result, ICF concludes that meeting the estimated need of $19.2 million in state and federal funding in 10 years is feasible given the funding sources known today. If new sources arise (which is likely), the likelihood of achieving this goal would improve even further.

Table 1. Optimistic and Pessimistic Estimates of State and Federal Funding for First 10 Years of Yolo HCP/NCCP Based on Known Funding

Potential Funding Source	Expected Duration (Up to 10 Years)	Max. Possible Annual Funding	Expected Average Annual Funding		Total Expected Funding Over First 10 Years of Plan		Rationale and Assumptions
			Optimistic Scenario	Pessimistic Scenario	Optimistic Scenario	Pessimistic Scenario	
Federal							
Endangered Species Act Section 6 Grant (HCP Land Acquisition)	10	$2,000,000	$1,333,333	$500,000	$13,333,333	$5,000,000	Since 2002, an average of $20 million has been allocated to plans in California (or about 45% of national funding). Since 2012, this average has dropped to a stable $15 million annually. The funding cap for this grant currently limits awards to $2.0 million. The optimistic scenario assumes the maximum available grant in two of every three years. The pessimistic scenario assumes a $1.0 million grant every other year.
Endangered Species Act Section 6 Grant (Recovery Land Acquisition)	10	$1,200,000	$197,000	$118,200	$1,970,000	$1,182,000	This funding is targeted towards the conservation of federally-listed species - the California Tiger Salamander and the Giant Garter Snake are the best candidates under this Plan. From 2010-2014, California received 16 awards with an average size of $591,000 each. There is no maximum award, but the largest award to California during this time period was $1.2 million (assumed as the maximum award amount for the purposes of this analysis). The optimistic scenario assumes one grant every 3 years of average size. The pessimistic scenario assumes one grant every 5 years of average size.
Central Valley Project Improvement Act Habitat Restoration Program	10	$570,000	$198,750	$88,333	$1,987,500	$ 883,333	From 2009-2013, this program awarded an average of $863,000 annually to projects for land acquisition in the Central Valley. The average award size was $265,000; the largest award of $570,000 was assumed to be the maximum award amount for this analysis. This same amount is assumed to be available annually for 10 years. This program is prioritizing support for approved regional HCPs and NCCPs, so the chances of award for this Plan are high. The optimistic scenario assumes 1.5 times the average award every other year. The pessimistic scenario assumes an average award every 3 years.

Potential Funding Source	Expected Duration (Up to 10 Years)	Max. Possible Annual Funding	Expected Average Annual Funding		Total Expected Funding Over First 10 Years of Plan		Rationale and Assumptions
			Optimistic Scenario	Pessimistic Scenario	Optimistic Scenario	Pessimistic Scenario	
Land and Water Conservation Fund	10	$2,300,000	$109,000	$27,250	$1,090,000	$272,500	This is a nationally competitive grant process. From 2000 to 2012, California received an average of $1.09 million annually for land acquisition to support parks and open space. The maximum grant award during this period was $2.3 million. There is an average of only two awards per year in the state. The optimistic scenario assumes an average award once every 5 years. The pessimistic scenario assumes 50% of an average award once every 10 years.
North American Wetlands Conservation Act Grant Program	10	Unknown	$155,875	$44,536	$1,558,750	$445,357	This program grants approximately 100 awards annually. Fiscal year 2014 funding for this program was $31,175,000, or equal to an average of $311,750 per award. Other sources can double this available funding. The optimistic scenario assumes 2 times the average award every 4 years. The pessimistic scenario assumes an average award every 7 years.
Subtotal			**$1,993,958**	**$778,319**	**$19,939,583**	**$7,783,190**	
State							
2014 Prop. 1 to the California Department of Fish and Wildlife for Watershed Restoration and Delta Water Quality and Ecosystem Restoration	10	None	$1,000,000	$500,000	$10,000,000	$5,000,000	This is the allocation to the California Department of Fish and Wildlife for two grant programs under Proposition 1 (Water Quality, Supply, and Infrastructure Improvement Act of 2014). One program focuses on land acquisition within the Sacrament-San Joaquin Delta. $34.1 million is available under both programs in Fiscal Year 2015/2016. ($372,500,000 will be available in total over the life of the proposition). Therefore, similar amounts are expected in the future. The optimistic scenario assumes an average of $1.0 million per year. The pessimistic scenario assumes $0.5 million per year for the same duration. There is a high likelihood of funding for the Yolo HCP/NCCP because it will be competitive for both grant programs.
Proposition 1 to Wildlife Conservation Board for Delta NCCPs	1	N/A	-	-	$5,000,000	$2,500,000	This is the allocation to the Wildlife Conservation Board for implementation of NCCPs in the Delta. The optimistic scenario assumes a one-time award of $5.0 million. The pessimistic scenario assumes a one-time award of $2.5 million (50%).

Potential Funding Source	Expected Duration (Up to 10 Years)	Max. Possible Annual Funding	Expected Average Annual Funding		Total Expected Funding Over First 10 Years of Plan		Rationale and Assumptions
			Optimistic Scenario	Pessimistic Scenario	Optimistic Scenario	Pessimistic Scenario	
Oak Woodlands Conservation Act of 2001 and Rangelands, Grazing Land and Grassland Protection Program (both administered by the Wildlife Conservation Board)	10	Unknown	-	-	$5,000,000	-	The original bond funding under this act is nearly expended; however, there is a new source of funds from cap and trade revenue from the Resources Agency. The optimistic scenario assumes grants to this Plan of $5 million over a 10-year time period. The pessimistic scenario assumes no funding due to a high degree of uncertainty.
Monitoring programs conducted by state that support HCP/NCCP	10	N/A	$50,000	$25,000	$500,000	$250,000	Species and ecosystem monitoring programs like the Ecosystem Restoration Program could support the HCP/NCCP. The optimistic scenario assumes a modest amount of support of $50,000 per year; the pessimistic scenario assumes $25,000 per year.
Subtotal			**$1,050,000**	**$525,000**	**$20,500,000**	**$7,750,000**	
TOTAL			**$3,043,958**	**$1,303,319**	**$40,439,583**	**$15,533,190**	
Yolo HCP/NCCP Need in 10 years	10		$1,917,200	$1,917,200	$19,172,000	$19,172,000	This assumes a state/federal cost share of 23%, or $86,274,000 over 45 years to account for the need to complete land acquisition during this timeframe.
Difference ($)			**$1,126,758**	**-$613,881**	**$21,267,583**	**-$3,638,810**	
Difference (%)					111%	-19%	

Notes:

Average annual funding estimates are based on historic averages not adjusted to inflation, so are therefore conservative as projections of potential future funding.

Appendix K
Conservation Easement Template

YOLO HABITAT CONSERVATION PLAN/NATURAL COMMUNITY CONSERVATION PLAN

Conservation Easement TEMPLATE

Draft Version 3.3

December 20, 2017

General Notes to Reviewers

The following notes are intended to guide interested parties in their review of the Yolo HCP/NCCP Conservation Easement Template.

1. **Easement language.** This conservation easement template is intended for use on lands the Yolo Habitat Conservancy will enroll in the Yolo HCP/NCCP reserve system. Easement language shown as orange text in this template is specific to conservation easements that include actively cultivated agricultural lands. The establishment of conservation easements on private lands under the Yolo HCP/NCCP will provide the combined benefits of conservation for covered species and continued viable use of rangelands and certain cultivated agricultural lands in the Plan Area that provide habitat value for covered species. For conservation easements that do not contain any actively cultivated agricultural lands, omit text provided in orange.

   The Yolo Habitat Conservancy expects language provided in the easement template may be modified to address site-specific conditions. In cases where variations in the easement language are anticipated to occur in the form of replacement language or additional language due to somewhat common conditions, acceptable variations to the primary text will be provided in grey text surrounded by brackets, like this: [*replace* "Yolo County Natural Community Conservation Plan Joint Powers Agency, a California Joint Powers Agency" *with the full legal name of Easement Holder if the Yolo County Natural Community Conservation Plan Joint Powers Agency is not the Easement Holder*]

   Some sections of the easement will require the insertion of easement-specific text. This includes items such as dates, property information, or specific easement conditions. Text that identifies information that is needed is provided in green text within brackets, like this: *[insert date]*.

   Some portions of the easement refer to items described in greater detail in the Yolo HCP/NCCP. In cases where this occurs, references to where additional information can be found within the Yolo HCP/NCCP are provided for reference in purple text within brackets, like this: *{a complete list of covered species is found in Table 1-1 of the Yolo HCP/NCCP}*. Similarly, blue text within brackets is included in some portions of the easement template to provide additional information for those developing or reviewing a draft conservation easement that uses this template. Bracketed text should be deleted prior to the finalization of any conservation easement.

2. **Privately-Owned Lands.** This template is prepared for use on privately-owned lands. Some provisions may have to be modified for publicly-owned lands, including but not limited to lands that the Yolo Habitat Conservancy (or another public entity) acquires in fee title. For example, in an easement covering publicly-owned lands, the easement may include references to provisions of an accompanying Management Plan that allow compatible recreational uses and public access.

3. **Conservation Values.** The intent of the conservation easement is to protect and preserve Yolo HCP/NCCP covered species and the natural communities and land cover types that provide functional habitat for these species within the Easement Area, including the agricultural uses that support these Conservation Values. The twelve Yolo HCP/NCCP covered species are:

palmate-bracted bird's beak, valley elderberry longhorn beetle, California tiger salamander, Western pond turtle, giant garter snake, Swainson's hawk, white-tailed kite, western yellow-billed cuckoo, western burrowing owl, least bell's vireo, bank swallow, and tricolored blackbird. The general land cover types and natural community types that may qualify as functional habitat (depending on additional factors such as size, location, quality, etc.) are: cultivated lands, grassland, valley foothill riparian, alkali prairie, fresh emergent wetland, lacustrine and riverine. The specific qualifying crop types and natural community vegetation types are listed in Table 2-1 of the Yolo HCP/NCCP. The conservation objectives associated with the covered species and their associated functional habitats are described in section 6.3 of the Yolo HCP/NCCP.

4. **Management Plan; Relationship to Conservation Easement.** This template anticipates the concurrent preparation of a site-specific management plan for this Easement Area. For each easement property, the final Conservation Easement and Management Plan ***will work together*** to specify (among other things) the allowed, restricted, and prohibited uses and activities. The Conservation Easement will generally include terms that will apply ***permanently*** to uses and activities on the easement property, while the Management Plan will contain terms relating to agriculture and other uses that may--with the consent of the landowner, the Yolo Habitat Conservancy, and state and federal wildlife agencies--***vary over time*** due to changing conditions. Additionally, the site's Management Plan may contain terms relating to recreational uses, public access, and other uses and activities that are of interest to an individual landowner at the landowner's request as long as the uses are determined to be compatible with the Conservation Values of the property.

   Many of the prohibitions stated as "generally prohibited" in this template —may be allowed, or allowed under certain conditions in the Management Plan, through mutual consent of the Landowner, Conservancy, and wildlife agencies on a case-by-case basis depending on site-specific conditions, landowner preferences and operations, and species and habitat needs. An example of this is the repair, removal, and placement of fencing, particularly for properties with irrigated pasture or other agricultural uses that require occasional changes in fencing. These activities are generally allowed in the Management Plan for purposes of reasonable and customary agricultural management, and for security in connection with the protection of Conservation Values and reserved uses of the Easement Area.

   The Yolo Habitat Conservancy recognizes that changes (e.g., in agricultural practices and technologies, weather cycles, natural resource management technologies, conservation practices) may dictate changes in the management of the Easement Area, consistent with the purposes of this Conservation Easement and the Yolo HCP/NCCP. The Management Plan may be revised from time to time only with the written approval of both the Landowner and the Yolo Habitat Conservancy (and Easement Holder in situations in which the Yolo Habitat Conservancy is not the Easement Holder), so long as the revisions are consistent with the applicable reserve unit management plan(s). Any requested changes that are not consistent with the applicable reserve unit management plan(s) must also receive approval from California Department of Fish and Wildlife and U.S. Fish and Wildlife Service. A full and complete copy of the current Management Plan, including any such revisions, shall be kept on file at the offices of the Yolo Habitat Conservancy.

5. **Easement Holder.** This template assumes the Yolo Habitat Conservancy or a qualified conservation organization {see Section 7.5.5.2 for description of necessary qualifications} will hold the conservation easement. The primary easement holder language assumes the Yolo Habitat Conservancy is the easement holder and alternative language is included in bracketed grey text for insertion in conservation easements that will be held by another qualified conservation organization. An organization other than the Yolo Habitat Conservancy must be the easement holder in situations in which the Yolo Habitat Conservancy holds the land in fee title.

6. **Monitoring.** The Yolo Habitat Conservancy (or other authorized easement holder) will conduct monitoring activities, at a minimum of once a year, to assure compliance with the terms of the Conservation Easement and will conduct these activities in a manner that interferes as little as possible with the landowner's use and enjoyment of the property.

RECORDING REQUESTED BY AND
WHEN RECORDED MAIL TO:

Easement Holder
Easement Holder's Address
Attention:______________________

Exempt from recording fees (Cal. Gov. Code § _____)

Space Above Line for Recorder's Use Only

DEED OF CONSERVATION EASEMENT AND PERMANENT RESTRICTIONS ON USE

THIS DEED OF CONSERVATION EASEMENT AND PERMANENT RESTRICTIONS ON USE (the **"Conservation Easement"**) is made this ______ day of _________________, 20__, by *[insert full legal name of landowner(s)]* (**"Landowner"**), in favor of and the Yolo County Natural Community Conservation Plan Joint Powers Agency, a California Joint Powers Agency (**"Easement Holder"** or "**Yolo Habitat Conservancy"**) [*replace* **"**Yolo County Natural Community Conservation Plan Joint Powers Agency, a California Joint Powers Agency" *with **full legal** name of Easement Holder AND delete* "Yolo Habitat Conservancy" IF *the Yolo Habitat Conservancy is not the Easement Holder*]. Landowner and Easement Holder are also referred to herein individually as a **"Party"** and collectively as the **"Parties."**

RECITALS

A. Landowner is the owner in fee simple of certain real property containing approximately [*insert acres*] acres, located in the County of Yolo, State of California, designated Assessor's Parcel Number(s) [*insert* APNs]. Said real property is more particularly described and depicted in **Exhibit A** attached hereto and incorporated herein by this reference (the **"Easement Area"**). [*If easement is a portion of the property then replace* **"Easement Area"** *above with* **"Property"** *and add the following sentence:* Landowner intends to grant a Conservation Easement over __ acres of the Property, as described and depicted in **Exhibit A.1** (the "**Easement Area"**).]

B. The Easement Area possesses wildlife and habitat values of great importance to Easement Holder, the people of the State of California and the people of the United States. The Easement Area will provide high quality habitat for [*list appropriate covered species {a complete list of covered species is found in Table 1-1 of the Yolo HCP/NCCP}*] and contains [*list functional habitat land cover types present in the Easement Area {this includes the land cover type(s) present on the site that provide habitat for the identified covered species and are included in Table 2-1 of the Yolo HCP/NCCP within the cultivated land category and/or natural communities land categories (e.g., cultivated rice lands, pasture, riparian) along with the habitat function that the identified land cover type provides (e.g., foraging, nesting, aquatic, upland habitat)}*]. Individually and collectively, these wildlife and habitat values comprise the "**Conservation Values**" of the Easement Area. The status of the Conservation Values, including the agricultural uses that support these Conservation Values, as well as other uses and improvements within the Easement Area at the time of the execution of the Conservation Easement are described in the **"Baseline Documentation Report"**. Both Parties acknowledge, as described in **Exhibit C** attached hereto and incorporated herein by reference, that each has received a copy of the Baseline Conditions Report, and that it accurately represents the Easement Area as of the date of the Conservation Easement.

C. This Conservation Easement is being executed and delivered to satisfy certain habitat conservation requirements set forth in the following documents (collectively, the **"Yolo HCP/NCCP Instruments"**):

a. The Yolo Habitat Conservation Plan/Natural Communities Conservation Plan (**"Yolo HCP/NCCP"**), dated ________, prepared by County of Yolo (**"County"**), City of Davis (**"Davis"**), City of West Sacramento (**"West Sacramento"**), City of Winters (**"Winters"**), and City of Woodland (**"Woodland"**), and approved by the United States Fish and Wildlife Service (**"USFWS"**) under Section 10 of the federal Endangered Species Act of 1973 (16 U.S.C. Section 1531 *et seq.*, as it may be amended from time to time) (**"ESA"**), and by the California Department of Fish and Wildlife (**"CDFW"**) under the California Natural Community Conservation Planning Act (California Fish and Game Code Section 2800 *et seq.*, as it may be amended from time to time) (**"NCCPA"**); and

b. Implementing Agreement for the Yolo HCP/NCCP (the **"Implementing Agreement"**), dated _______________, by and among USFWS and CDFW (collectively, the **"Wildlife Agencies"**), the Yolo Habitat Conservancy, County, Davis, West Sacramento, Winters, and Woodland (collectively, the Yolo Habitat Conservancy, County, Davis, West Sacramento, Winters, and Woodland, are referred to herein as **"Permittees"**); and

c. The federal incidental take permit issued by USFWS to Permittees for the Yolo HCP/NCCP pursuant to Section 10 of ESA; and

d. The state NCCP permit issued by CDFW to Permittees for the Yolo HCP/NCCP pursuant to the NCCPA.

D. The State of California recognizes the public importance and validity of conservation easements by enactment of California Civil Code Section 815 *et seq.*

E. CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants and the habitat necessary for biologically sustainable populations of those species pursuant to Fish and Game Code Section 1802. CDFW is authorized to hold easements for these purposes pursuant to Civil Code Section 815.3, Fish and Game Code Section 1348, and other provisions of California law.

F. USFWS is an agency of the United States Department of the Interior and is authorized by Federal law to be a third party beneficiary of the Conservation Easement and to administer the federal Endangered Species Act, 16 U.S.C. § 1531, et seq. ("ESA"), the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-666c, and the Fish and Wildlife Act of 1956, 16 U.S.C. § 742(f), et seq.

G. The Easement Holder is a California joint powers agency, and authorized to hold conservation easements pursuant to, among other provisions of law, California Civil Code Section 815.3. [*If Easement Holder is not the Yolo Habitat Conservancy then replace the text in this section with the following text:* The Easement Holder is authorized to hold this conservation easement pursuant to California Civil Code Section 815.3 and Government Code Section 65965. Specifically, the Easement Holder is (i) a tax-exempt nonprofit organization qualified under Section 501(c)(3) of the Internal Revenue Code of 1986 as amended, and qualified to do business in California; (ii) a "qualified organization" as defined in section 170(h)(3) of the Internal Revenue Code; and(iii) an organization which has as its primary and principal purpose and activity the protection and preservation of natural lands or resources in its natural, scenic, agricultural, forested, or open-space condition or use.]

H. The Yolo Habitat Conservancy serves as the **"Implementing Entity"** of the Yolo HCP/NCCP, and as such, is responsible for overseeing implementation of the Yolo HCP/NCCP Instruments, including carrying out planning and design, habitat restoration, monitoring, adaptive management programs, and periodic coordination with the Wildlife Agencies. The Yolo HCP/NCCP Instruments confer separate rights and obligations on the Implementing Entity that will survive any future transfer of the Conservation Easement.

I. Following recordation of this Conservation Easement, the Easement Area will be incorporated into the Reserve System (as such term is defined in the Yolo HCP/NCCP {see Chapter 6 of the Yolo HCP/NCCP}) (**"Reserve System"**) and will count toward the land acquisition requirements set forth in the Yolo HCP/NCCP.

J. The Yolo Habitat Conservancy has developed a management plan, known as "[*insert title for management plan – typically this includes the site name*]," that applies to the Easement Area (the **"Management Plan"**) incorporated herein by reference. The Management Plan has been developed in accordance with the applicable requirements of the Yolo HCP/NCCP Instruments [and *[identify any applicable Reserve Unit Management Plans]*]. The Management Plan also includes provisions that preserve and maintain the productive agricultural use of the Easement Area to the fullest extent such use is compatible with the preservation of its Conservation Values.

The Management Plan, as may be amended from time to time. Landowner and Easement Holder recognize that changes (e.g., in agricultural practices and technologies, weather cycles, natural resource management technologies, conservation practices) may dictate changes in the management of the Easement Area, consistent with the purposes of this Conservation Easement and the Yolo HCP/NCCP Instruments. The Management Plan may be revised from time to time only with the written approval of both the Landowner and Easement Holder, so long as the revisions are consistent with the requirements of the Yolo HCP/NCCP Instruments *[and [identify* *applicable Reserve Unit Management Plans]]* *{See Yolo HCP/NCCP Section 6.4.3.3}*. The final, approved copy of the Management Plan, and any amendments thereto approved by the Parties, shall be kept on file at the Yolo Habitat Conservancy.

AGREEMENT

NOW, THEREFORE, in consideration of the above and mutual covenants, terms, conditions and restrictions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and pursuant to the laws of the State of California, including California Civil Code Section 815 *et seq*., Landowner hereby voluntarily grants and conveys to Easement Holder, its successors and assigns, a conservation easement forever in, on, over and across the Easement Area, subject to the terms and conditions set forth herein, restricting in perpetuity the uses which may be made of the Easement Area, and the Parties agree as follows:

1. **Purposes**. The purposes of this Conservation Easement are to ensure the Easement Area will be retained forever in its *[insert the following terms as appropriate for the specific site: natural, restored, enhanced, and/or agricultural or otherwise functional habitat]* condition as contemplated by the Yolo HCP/NCCP and the site-specific Management Plan, and to prevent any use of the Easement Area that will impair or interfere with the Conservation Values of the Easement Area. Landowner intends that this Conservation Easement will confine the use of the Easement Area to such activities that are consistent with the purposes set forth herein. The Parties agree that the protection of the Conservation Values may be achieved through the continuation of existing compatible agricultural and other uses [*replace reference to continued existing compatible agricultural uses with the following text for sites that consist entirely of natural lands types:* "by maintaining the Easement Area in its natural or existing condition (not precluding future enhancement or restoration)"] on the Easement Area provided that the uses preserve the Easement Area's covered species and their associated functional habitats as described in the Baseline Documentation Report and consistent with the terms and conditions of this Conservation Easement and the Management Plan.

2. **Reserved Rights.** Landowner reserves to itself, and to its personal representatives, heirs, successors, and assigns, all rights accruing from Landowner's ownership of the Easement Area, including the right to engage in or permit or invite others to engage in agricultural activities, including lawful and routine agricultural and ranching practices, so long as such activities are consistent with the purposes of this Conservation Easement, as set forth above in Section 1, and the Management Plan.

[(a) **Development Envelope.** *In situations where the site has, or there is an interest in retaining the right to have, a residence or other area where buildings and other improvements are allowed, a Development Envelope can be designated within the Easement Area. The area within the Development Envelope is subject to the provisions of the Conservation Easement except where explicitly stated otherwise and allowable uses within the Development Envelope cannot interfere with the protection or enhancement of the Conservation Values on the portions of the Easement Area that are not included in the Development Envelope. Lands within*

Development Envelope areas do not count towards the goals and objectives of the Yolo HCP/NCCP conservation strategy.]

3. **Rights of Easement Holder**. To accomplish the purposes of this Conservation Easement, Landowner hereby grants and conveys the following rights to Easement Holder:

(a) To preserve and protect the Conservation Values of the Easement Area**;**

(b) [*In situations where the Parties agree to conduct restoration or enhancement activities on the site as a condition of the easement the following language will be inserted:* To restore or enhance the Conservation Values with the consent of the Landowner in accordance with the Management Plan and the terms and conditions of this Conservation Easement;]

(c) To enter upon the Easement Area at reasonable times to monitor compliance with and otherwise enforce the terms of this Conservation Easement or to carry out, at Easement Holder's sole cost and expense, scientific research and management and monitoring requirements applicable to the Easement Area that are set forth in the Management Plan and in Yolo HCP/NCCP Chapters 6 and 7, provided that Easement Holder shall not unreasonably interfere with Landowner's allowed uses and quiet enjoyment of the Easement Area. Except where there is an imminent threat to the Easement Area or its Conservation Values, Easement Holder and its employees, contractors or agents will only enter the Easement Area at reasonable times and with at least forty-eight (48) hours advance notice to Landowner. The Landowner may waive these requirements in whole or in part by written notice to Easement Holder;

(d) To prevent any activity on or use of the Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features of the Easement Area that may be damaged by any act, failure to act, or any use or activity that is inconsistent with the purposes of this Conservation Easement;

(e) To require that all mineral, air, and water rights that Easement Holder deems necessary to preserve and protect the Conservation Values of the Easement Area shall remain a part of and be put to beneficial use upon the Easement Area, consistent with the purposes of this Conservation Easement; and

(f) All present and future development rights and wind power rights appurtenant to, allocated, implied, reserved or inherent in the Easement Area; such rights are hereby terminated and extinguished, and may not be used on or transferred to any portion of the Property, nor any other property adjacent or otherwise.

4. **Prohibited Uses**. Any activity on or use of the Easement Area that adversely affects the purpose of this Conservation Easement, as set forth in Section 1, above, is prohibited

except as may be otherwise expressly provided in this Conservation Easement or in the Management Plan. Without limiting the generality of the foregoing, the Landowner, Landowner's personal representatives, heirs, successors, assigns, employees, agents, lessees, licensees and invitees are expressly prohibited from doing or allowing any of the following uses and activities on the Easement Area, unless, and then only to the extent that, a generally prohibited activity set forth below is a management practice, lawful and routine agricultural practice, or other activity that does not impair the Conservation Values of the Easement Area and is allowed in the Management Plan.

[*Note to Landowners:* Many of the following uses—while described herein as "generally prohibited"—may often be allowed in the Management Plan through mutual consent of the Landowner, Conservancy, and Wildlife Agencies in the Management Plan on a case-by-case basis depending on site-specific conditions, landowner preferences and operations, and species and habitat needs. Section 4 of the Management Plan Template provides examples of how uses can be authorized on an individual basis, ***particularly for properties that will remain in active agricultural use***. The terms of the Management Plan can also be modified over time (with the mutual consent of the Parties) to reflect changes in the Landowner's needs that do not adversely affect the Conservation Values.

This Conservation Easement Template represents only a starting point for consideration of the following uses. In unusual circumstances, in addition to the following restrictions, it may be appropriate to include restrictions beyond those set forth below. Additionally, this Section may require modification to address public access and recreation uses to the extent contemplated by the Landowner or required in the Easement Area under the Management Plan.]

(a) Unseasonal watering activities that promote the establishment of invasive species that act as predators of covered species, impair the habitat quality of the site for covered species, or otherwise impair the Conservation Values of the site;

(b) Use of fertilizers, pesticides, biocides, herbicides or other chemicals except as allowable under applicable law and as provided in the Management Plan in connection with the agricultural use of the Easement Area or other activities or uses that are authorized or reserved hereunder. Under no circumstance are rodenticides allowed to be used within the Easement Area unless specifically authorized in writing by the Easement Holder and the Wildlife Agencies due to unforeseen or exceptional circumstance, such as proclamation of a local state of emergency;

(c) Use of heavy equipment, off-road vehicles, or other motorized vehicles, except on existing roadways or use of equipment or vehicles as required to conduct any management practice, lawful and routine agricultural practice, or other activity as provided for in the Management Plan. The long-term storage of wrecked, dismantled, or inoperative nonagricultural vehicles and industrial or commercial equipment [except within the Development Envelope] is prohibited;

(d) Except as set forth in the Management Plan [or within the Development Envelope], any construction, reconstruction, relocation or placement of any road, building, billboard, or sign, or any other structure or improvement of any kind, or altering the surface or general topography of the Easement Area without written approval by the Easement Holder and Wildlife Agencies [*Note to landowners: The repair, removal, and placement of fencing, particularly for properties with irrigated pasture or other agricultural uses that require occasional changes in fencing are generally allowed in the Management Plan for purposes of reasonable, lawful, and routine agricultural practices, and for the security in connection with the protection of Conservation Values and reserved uses of the Easement Area. The relocation of formal and informal access roads may also need to be addressed in the Management Plan on some properties*];

(e) Vineyards, orchards, nurseries, intensive livestock use (e.g., dairy, feedlot), and other agricultural uses except as allowed in the Management Plan [*Note to landowners: The specific agricultural practices identified above are prohibited for all conservation easements. This does not preclude a landowner from having fruit trees or vines within a designated development envelope area, as are common around a home site. For easements that include active agricultural lands at the time the easement is established, the existing agricultural uses that support the Conservation Values of the site will be allowed in the Management Plan. For example, if the site includes rice fields that provide habitat for giant garter snake, agricultural use of the site as needed to maintain the rice fields that provide habitat to giant garter snake will be allowed uses in the Management Plan*];

(f) Commercial, industrial, residential, or other institutional uses [except within the Development Envelope];

(g) Depositing or accumulation of soil, trash, ashes, refuse, waste, bio-solids or any other materials, except in connection with lawful and routine agricultural practices (e.g., tilling, soil amendments, laser leveling) and other uses that do not impair the Conservation Values of the Easement Area and are allowed in the Management Plan;

(h) Planting, introduction, or dispersal of invasive plant or animal species;

(i) Filling, dumping, excavating, draining, dredging, mining, drilling, removing, or exploring for or extracting minerals, loam, soil, sands, gravel, rocks, or other material on or below the surface of the Easement Area, or granting or authorizing any surface entry for any exploring for or extracting minerals. This provision is not intended to prohibit lawful and routine agricultural practices (e.g., tilling, soil amendments, laser leveling) and other uses that are associated with site management activities, do not impair the Conservation

Values of the Easement Area, and are allowed in the Management Plan. [***Note:*** If mineral rights are separately owned (i.e., have previously been severed from the surface estate) ***and*** the Landowner is unable to acquire those rights despite reasonable, documented efforts, the Yolo Habitat Conservancy may consider modifying this provision; any modification must be authorized in writing by the Wildlife Agencies. The Yolo Habitat Conservancy will review factors such as (i) the likelihood such rights will be exercised in the future {The process that the Yolo Habitat Conservancy will follow to determine the potential risk that a severed mineral right will be exercised is described in Section 7.5.12 of the Yolo HCP/NCCP} , (ii) the covered species that utilize the Easement Area (i.e., whether they can easily avoid disturbed areas, as in the case of raptors), (iii) whether a right of surface entry exists, and (iv) whether disturbance of the Easement Area can be confined to a small (e.g., 1 acre) footprint and otherwise limited so that it does not adversely affect the Conservation Values. The Yolo Habitat Conservancy and Wildlife Agencies have sole discretion to reject a proposed Conservation Easement if an acceptable arrangement on severed mineral rights cannot be reached.];

(j) Removing, destroying, or cutting of trees, shrubs, or other vegetation except as allowed in the Management Plan;

(k) Manipulating, impounding, or altering any water course, body of water, or water circulation on the Easement Area, and activities or uses detrimental to water quality, including but not limited to degradation or pollution of any surface or subsurface waters, except as needed to conduct a management practice, lawful and routine agricultural practice, or other activity that does not impair the Conservation Values of the Easement Area and is allowed in the Management Plan; and *[Note to landowners: The management and maintenance of canals, ponds, and other artificial water features as needed to maintain cultivated lands and other site conditions that support the Conservation Values of the site are allowed as described in the Management Plan.]*

(l) Without the prior written consent of Easement Holder, which Easement Holder may reasonably withhold or condition, transferring, encumbering, selling, leasing or otherwise separating the mineral, air or water rights for the Easement Area; changing the place or purpose of use of the water rights; abandoning or allowing the abandonment of, by action or inaction, any water or water rights, ditch or ditch rights, spring rights, reservoir or storage rights, wells, ground water rights or other rights in and to the use of water historically used on or otherwise appurtenant to the Easement Area, including but not limited to: (i) riparian water rights; (ii) appropriative water rights; (iii) rights to waters which are secured under contract with any irrigation or water district, to the extent such waters are customarily applied to the Easement Area; and (iv) any water from wells that are in existence or may be constructed in the future on the Easement Area. In determining whether to consent to a short-term transfer (i.e. a transfer of water from the Property for a period of not more than one year as defined by California law) or other change relating to water rights under this subsection (k), the Easement Holder shall evaluate whether the transfer will, during the transfer period, preclude the Landowner from maintaining the Conservation Values, for the covered species that the Easement Area is managed to benefit at the time of the proposed transfer. This determination shall be subject to approval by the Wildlife Agencies and the Yolo Habitat Conservancy.

(m) All Subdivisions, including but not limited to the Subdivision of rangeland, open space, and other types of land not used for the active cultivation of crops. The fee transfer of less than the entire Easement Area is also prohibited to the extent such a transfer would constitute a subdivision of land under California law, including but not limited to the Subdivision Map Act.

(n) Any activity or use that may violate or fail to comply with relevant federal, state, or local laws, regulations, or policies applicable to Landowner, the Easement Area, or the activity or use in question.

(o) *[Insert additional prohibitions as appropriate for the particular Property and its Conservation Values.]*

5. **Unlawful Entry.** Landowner shall undertake all reasonable actions to prevent the unlawful entry and trespass on the Easement Area by persons whose uses or activities may degrade or harm the Conservation Values or are otherwise inconsistent with the purposes of this Conservation Easement. Reasonable actions to prevent trespass and related activities may include, but are not limited to, posting "No Trespassing" signs, constructing barriers and gates, and good faith efforts to exclude any person who is not a designated representative of Landowner, Easement Holder, or others with lawful access rights. In addition, Landowner shall undertake all necessary actions to perfect the rights of Easement Holder under Section 3 of this Conservation Easement.

6. **Easement Holder's Remedies.** If Easement Holder or any Third-Party Beneficiary (as defined in **Section 6(d)** below) determines there is a violation of the terms of this Conservation Easement or that such violation is threatened, written notice of such violation and a demand for corrective action sufficient to cure the violation shall be given to Landowner, with a copy provided to Easement Holder and each other Third-Party Beneficiary. The notice of violation shall specify the measures the Landowner must take to cure the violation. If Landowner fails to cure the violation within thirty (30) days after receipt of written notice and demand from Easement Holder or any Third-Party Beneficiary, as applicable; or if the cure reasonably requires more than thirty (30) days to complete and Landowner fails to begin the cure within such thirty (30) day period; or Landowner fails to continue diligently to complete the cure, Easement Holder or any Third-Party Beneficiary may bring an action at law or in equity in a court of competent jurisdiction to enforce the terms of this Conservation Easement, to recover any damages to which Easement Holder and the Third-Party Beneficiaries may be entitled for violation of the terms of this Conservation Easement or for any injury to the Conservation Values, to enjoin the violation, *ex parte* as

necessary, by temporary or permanent injunction without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies, or for legal or other equitable relief, including, but not limited to, the restoration of the Easement Area to the condition in which it existed prior to any such violation or injury, or to otherwise enforce this Conservation Easement. Without limiting Landowner's liability therefor, any damages recovered may be applied to the cost of undertaking any corrective action on the Easement Area at the election of the party receiving such damages.

If Easement Holder in its sole discretion, determines that circumstances require immediate action to prevent or mitigate damage to the Conservation Values, Easement Holder and/or any Third-Party Beneficiary may pursue its remedies under this section without prior notice to Landowner or without waiting for the period provided for cure to expire. The rights of Easement Holder and the Third-Party Beneficiaries under this section apply equally to actual or threatened violations of the terms of this Conservation Easement. Landowner agrees that Easement Holder’s and Third-Party Beneficiaries’ remedies at law for any violation of the terms of this Conservation Easement are inadequate and that Easement Holder and/or any Third-Party Beneficiary shall be entitled to the injunctive relief described in this section, both prohibitive and mandatory, in addition to such other relief to which Easement Holder and the Third-Party Beneficiaries may be entitled, including specific performance of the terms of this Conservation Easement, without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies. Remedies described in this section shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity, including but not limited to, the remedies set forth in California Civil Code Section 815, *et seq*. The failure of Easement Holder or any Third-Party Beneficiary to discover a violation or to take immediate legal action in response to such action shall not bar such party from taking legal action at a later time.

If at any time in the future Landowner or any subsequent transferee uses or threatens to use the Property for purposes inconsistent with this Conservation Easement then, despite the provisions of Civil Code section 815.7, the California Attorney General, any person and any entity with a justiciable interest in the preservation of this Conservation Easement has standing as an interested party in any proceeding affecting this Conservation Easement.

(a) **Costs of Enforcement.** Any reasonable costs incurred by the Easement Holder or any Third-Party Beneficiary, where it is the prevailing party, in enforcing the terms of this Conservation Easement against the Landowner, including, but not limited to, costs of suit and attorneys' and experts' fees, and any costs of restoration necessitated by Landowner's negligence or breach of this Conservation Easement shall be borne by Landowner. In any action where an agency of the United States is a party, the right to recover fees and costs shall be governed by federal law.

(b) **Enforcement Discretion.** Enforcement of the terms of this Conservation Easement against Landowner shall be at the respective discretion of Easement Holder and each of the Third-Party Beneficiaries, and any forbearance by any such party to exercise its rights under this Conservation Easement in the event of any breach of any term of this Conservation Easement shall not be deemed or construed to be a waiver by such party of such term or of any subsequent breach of the same or any other term of this Conservation

Easement or of any of such party's rights under this Conservation Easement. No delay or omission by Easement Holder or any Third-Party Beneficiary in the exercise of any right or remedy upon any breach shall impair such right or remedy or be construed as a waiver.

(c) **Acts Beyond Landowner's Control.** Nothing contained in this Conservation Easement shall be construed to entitle Easement Holder or any Third-Party Beneficiary to bring any action against Landowner for any injury to or change in the Property resulting from (i) any natural cause beyond Landowner 's control, including, without limitation, fire not caused by Landowner, flood, storm, and earth movement, or any prudent action taken by Landowner under emergency conditions to prevent, abate, or mitigate significant injury to the Property resulting from such causes; or (ii) acts by Easement Holder or any Third-Party Beneficiary or employees of Easement Holder or any Third-Party Beneficiary; or (iii) acts by persons that entered the Easement Area unlawfully or by trespass whose activities degrade or harm the Conservation Values of the Easement Area or whose activities are otherwise inconsistent with this Conservation Easement where Landowner has undertaken all reasonable actions to prevent such activities *[for public agency-owned lands include the following language:* or (iii) acts by persons that entered the Easement Area lawfully or unlawfully whose activities degrade or harm the Conservation Values of the Easement Area or whose activities are otherwise inconsistent with this Conservation Easement where Landowner has undertaken all reasonable actions to discourage or prevent such activities].

(d) **Third Party Beneficiary Rights**. The parties intend for Yolo Habitat Conservancy (during any such period, if any, that Yolo Habitat Conservancy does not also constitute Easement Holder), USFWS and CDFW (collectively, **"Third-Party Beneficiaries"**) to be third-party beneficiaries of this Conservation Easement. All rights and remedies conveyed to Easement Holder under this Conservation Easement shall extend to and are enforceable by each of the Third-Party Beneficiaries in accordance with the terms hereof. Landowner and Easement Holder acknowledge that, as Third-Party Beneficiaries of this Conservation Easement, the Third-Party Beneficiaries shall have the same rights of access to the Easement Area granted to Easement Holder in **Section 3** above, and with rights to enforce all of the provisions of this Conservation Easement. If at any time in the future Landowner uses, allows the use, or threatens to use or allow use of, the Easement Area for any purpose that is inconsistent with or in violation of this Conservation Easement then, despite the provisions of California Civil Code Section 815.7, the California Attorney General and each Third-Party Beneficiary has standing as an interested party in any proceeding affecting the Conservation Easement.

These rights are in addition to, and do not limit, the Grantee's obligations under federal, state, and local laws and regulations relating to the protection of biological resources and the environment. In addition, if the Wildlife Agencies reasonably determines that the Easement Area is not being held, monitored, or stewarded for conservation purposes in the manner specified in this Conservation Easement, the Yolo HCP/NCCP Instruments, or the Management Plan, the Conservation Easement shall revert to the State of California or another entity as described in California Government Code Section 65967(e), and subject to approval as set forth therein.

7. **Public Access.** Nothing contained in this Conservation Easement gives or grants to the public an independent right to enter upon or use the Easement Area or any portion thereof. Nor shall this Conservation Easement extinguish any existing public right to enter upon or use the Easement Area, provided said right is disclosed to the Easement Holder and documented in the Management Plan and/or an exhibit to this Conservation Easement.

8. **Costs and Liabilities.** Except for those specific obligations to be undertaken by Easement Holder under Section 3 above, or in the Management Plan, Landowner shall retain all responsibilities and shall bear all costs and liabilities of any kind related to Landowner's ownership, operation, upkeep, management, and maintenance activities on and relating to the Easement Area as well as the Easement Area itself. Landowner agrees that neither the Easement Holder nor Third Party Beneficiaries shall have any duty or responsibility for the operation, upkeep, or maintenance of the Easement Area, the monitoring of hazardous conditions thereon, or the protection of Landowner, the public or any third parties from risks relating to conditions on the Easement Area. Landowner shall remain responsible for obtaining any applicable governmental permits and approvals for any activity or use allowed on the Easement Area under this Conservation Easement, and Landowner shall undertake all allowed activities and uses of the Easement Area in accordance with all applicable federal, state, local and administrative agency statutes, ordinances, rules, regulations, orders and requirements. Landowner shall pay before delinquency all taxes, assessments, fees, and charges of whatever description levied on or assessed against the Easement Area by competent authority (collectively **"taxes"**), including any taxes imposed upon, or incurred as a result of, this Conservation Easement, and shall furnish Easement Holder with satisfactory evidence of payment upon request. Landowner shall keep the Easement Area free from any liens, including those arising out of any obligations incurred by such Party for any labor or materials furnished or alleged to have been furnished to or for such Party at or for use on the Easement Area.

9. **Indemnification.**

[redacted]**Indemnification by Landowner.** Landowner shall hold harmless, protect and indemnify Easement Holder and the Third-Party Beneficiaries, and their respective members, directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each a **"Landowner Indemnified Party"** and, collectively, the **"Landowner Indemnified Parties"**) from and against any and all liabilities, penalties, costs, losses, damages, expenses (including, without limitation, reasonable attorneys' and experts' fees and costs), causes of action, claims, demands, orders, liens or judgments (each a **"Claim"** and, collectively, **"Claims"**), arising from or in any way connected with: (i) injury to or the death of any person, or physical damage to any Easement Area, resulting from any act, omission, condition, or other matter related to or occurring on or about the Easement Area, regardless of cause, except that this indemnification shall be inapplicable to Landowner Indemnified Parties with respect to any Claim due solely to the negligence of Landowner Indemnified parties; (ii) the obligations specified in Sections 5 and 8 [*verify the Section numbers listed here refer to "Unlawful Entry" and "Costs and Liabilities" sections*]; and (iii) the existence or administration of this Conservation Easement. If any action or proceeding is brought against any of the Landowner Indemnified Parties by reason of any such Claim, Landowner shall, at the election of and upon written notice from Landowner Indemnified Parties, defend such action or proceeding by counsel reasonably acceptable to the Landowner Indemnified Parties or reimburse Landowner Indemnified Parties for all charges incurred for services of the California Attorney General in defending the action or proceeding.

(b) **Indemnification by Easement Holder.** Easement Holder shall hold harmless, protect, and indemnify Landowner and the Third-Party Beneficiaries, and their respective members, directors, officers, employees, agents, contractors, and representatives and the heirs, personal representatives, successors and assigns of each of them (each, an **"Easement Holder Indemnified Party,"** and collectively, the **"Easement Holder Indemnified Parties"**) from and against any and all Claims arising from or in any way connected with: (a) the activities of Easement Holder on the Easement Area, including without limitation the Easement Holder's performance of management and monitoring activities set forth in the Management Plan; (b) breach by Easement Holder of any provision of this Conservation Easement; (c) any injury to or the death of any person, or physical damage to any Easement Area occurring on or about the Easement Area resulting from any act, omission, condition, or other matter related to, an activity on, or use of, the Easement Area by Easement Holder, including without limitation, those performed under the Management Plan, unless due solely to the negligence or willful misconduct of the Easement Holder Indemnified Party; and (d) any violation of, or failure to comply with, any state, federal or local law, regulation or requirement, by Easement Holder in any way affecting, involving or relating to the Easement Area. If any action or proceeding is brought against any of the Easement Holder Indemnified Parties by reason of any such Claim, Easement Holder shall, at the election of and upon written notice from Landowner, defend such action or proceeding by counsel reasonably acceptable to the Easement Holder Indemnified Party. *[**Note:** If CDFW is the easement holder, this provision must be revised to reflect that indemnification is legally possible only pursuant to Government Code § 14662.5.]*

10. **Extinguishment.** This Conservation Easement constitutes a property right. It is the Parties' intention that the terms and conditions of this Conservation Easement shall be carried out in perpetuity. Liberal construction is expressly required for purposes of effectuating the Conservation Easement in perpetuity, notwithstanding economic hardship or changed conditions of any kind. If circumstances arise in the future that render the purposes of this Conservation Easement impossible to accomplish, this Conservation Easement can only be terminated or extinguished, in whole or in part, by judicial proceedings in a court of competent jurisdiction. In addition, no such extinguishment shall affect the value of Yolo Habitat Conservancy's interest in the Easement Area, and if the Easement Area, or any interest therein, is sold, exchanged or taken by power of eminent domain after such extinguishment, the Yolo Habitat Conservancy shall be entitled to receive the fair market value of the Conservation Easement at the time of such extinguishment. If such extinguishment occurs with respect to fewer than all acres of the Easement Area, the amounts described above shall be calculated based on the actual number of acres subject to extinguishment.

11. **Condemnation.** Pursuant to Code of Civil Procedure § 1240.055, this Conservation Easement is "property appropriated to public use," as used in Article 6 (commencing with Section 1240.510) and Article 7 (commencing with Section 1240.610 of Chapter 3 of Title 7 of the Code of Civil Procedure). A person authorized to acquire property for public use by eminent domain shall seek to acquire the Property, if at all, only as provided in Code of Civil Procedure § 1240.055. CDFW is a public entity that imposed conditions of approval on a project that were satisfied, in whole or part, by the creation of this Conservation Easement. If any person seeks to acquire the Property for public use, Grantee shall provide notice to CDFW and comply with all obligations of the holder of a conservation easement under Code of Civil Procedure § 1240.055. If the Conservation Easement is condemned, the net proceeds from condemnation of the Conservation Easement interest shall be used in compliance with Government Code § 65966(j).

12. **Transfer of Conservation Easement.** This Conservation Easement may be assigned or transferred by Easement Holder upon written approval of the Third-Party Beneficiaries which approval shall not be unreasonably withheld or delayed; provided, that Easement Holder shall give the Third-Party Beneficiaries and landowner at least sixty (60) calendar days prior written notice of the proposed assignment or transfer. Easement Holder may transfer its rights under this Conservation Easement only to an entity or organization: (a) authorized to acquire and hold conservation easements pursuant to California law, including Civil Code Section 815.3 and California Government Code Section 65967(c) (and any successor or other provisions applicable at the time of the proposed transfer), or the laws of the United States; and (b) otherwise reasonably acceptable to the Third-Party Beneficiaries. Easement Holder shall require the transferee to record the conveyance in the Official Records of the County where the Easement Area is located. The failure of Easement Holder to perform any act provided in this section shall not impair the validity of this Conservation Easement or limit its enforcement in any way. Any transfer under this section shall be subject to the requirements of **Section 16** below.

13. **Transfer of Easement Area.** Landowner agrees to incorporate the terms of this Conservation Easement by reference in any deed or other legal instrument by which Landowner divests itself of any interest in all or any portion of the Easement Area, including, without limitation, a leasehold interest. For all transfers except routine and customary agricultural leases, Landowner further agrees to give written notice to Easement Holder and the Third-Party Beneficiaries of the intent to transfer any interest at least thirty (30) calendar days prior to the date of such transfer. Easement Holder and the Third-Party Beneficiaries shall have the right to prevent subsequent transfers in which prospective subsequent claimants or transferees are not given actual notice of the covenants, terms, conditions and restrictions of this Conservation Easement. The failure of Landowner to perform any act provided in this section shall not impair the validity of this Conservation Easement or limit its enforceability in any way. Any successor in interest or lessor of Landowner, by acceptance of a deed, lease, or other document purporting to convey an interest in the Easement Area, shall be deemed to have consented to, reaffirmed and agreed to be bound by all of the terms, covenants, restrictions, and conditions of this Conservation Easement.

14. **Notices.** Any notice, demand, request, consent, approval, or communication that Landowner, Easement Holder, or any Third-Party Beneficiary desires or is required to give to the others shall be in writing and be served personally or sent by recognized overnight courier that guarantees next-day delivery or by first class mail, postage fully prepaid, addressed as follows:

To Landowner: *Name*
Address
City, State
Attn:

To Easement Holder: *Name*
Address
City, State
Attn:

To Yolo Habitat Conservancy
Address
City, State
Attn:

To USFWS: United States Fish and Wildlife Service
Address
City, State
Attn:

To CDFW: California Department of Fish and Wildlife
Address
City, State
Attn:

With a copy to: California Department of Fish and Wildlife
Office of the General Counsel
1416 Ninth Street, 12th Floor
Sacramento, California 95814-2090
Attn: General Counsel

or to such other address as a party shall designate by written notice to the others. Notice shall be deemed effective upon delivery in the case of personal delivery or delivery by overnight courier or, in the case of delivery by first class mail, five (5) calendar days after deposit into the United States mail.

15. **Amendment.** This Conservation Easement may not be amended, modified or otherwise changed in any manner, except by a written amendment executed by the Landowner and the Easement Holder, or their successors in interest, in their sole discretion. Any such amendment shall be subject to the prior written consent of the Third-Party Beneficiaries. Any amendment that is not made in strict accordance with the consent and other requirements of this Section shall be void and without effect. Any such amendment shall be consistent with the purposes of the

Conservation Easement and shall not affect the perpetual duration of the Conservation Easement. Any such amendment must refer to this Conservation Easement by reference to its recordation data, and must be recorded in the Official Records of the County where the Easement Area is located.

16. **Merger.** The doctrine of merger shall not operate to extinguish the Conservation Easement if the Conservation Easement and the Easement Area become vested in the same party. If, despite this intent, the doctrine of merger applies to extinguish the Conservation Easement then, a replacement conservation easement, with a new Easement Holder identified by the Yolo Habitat Conservancy and approved by the Third-Party Beneficiaries, containing the same protections embodied in this Conservation Easement shall be recorded against the Easement Area.

17. **No Hazardous Materials Liability.** Landowner represents and warrants that Landowner has no knowledge or notice of any Hazardous Materials (as defined below) or underground storage tanks existing, generated, treated, stored, used, released, disposed of, deposited or abandoned in, on, under, or from the Easement Area, or transported to or from or affecting the Easement Area [except as disclosed in the Report]. *[Insert site-specific conditions, if applicable.]* Landowner further represents, warrants and covenants that activities upon and use of the Easement Area by Landowner, its agents, employees, invitees and contractors shall comply with all Environmental Laws (as defined below) in using the Easement Area and that Landowner shall keep the Easement Area free of any material environmental defect, including, without limitation, contamination from Hazardous Materials (as defined below). Without limiting the obligations of Landowner under this Conservation Easement, including Section 10, Landowner hereby releases and agrees to indemnify, protect and hold harmless the Landowner Indemnified Parties (as defined in **Section 9(a)**) from and against any and all Claims (as defined in **Section 9(a)**) arising from or connected with any Hazardous Materials or underground storage tanks present, alleged to be present, released in, from, or about or otherwise associated with the Easement Area at any time, except any Hazardous Materials placed, disposed or released by Landowner Indemnified Parties, or their employees or agents. This release and indemnification includes, without limitation, Claims for (a) injury to or death of any person or physical damage to any Easement Area; and (b) the violation or alleged violation of, or other failure to comply with, any Environmental Laws (as defined below). If any action or proceeding is brought against any of the Landowner Indemnified Parties by reason of any such Claim, Landowner shall, at the election of and upon written notice, defend such action or proceeding by counsel reasonably acceptable to the Landowner Indemnified Party including reimbursing CDFW for all charges incurred for services of the California Attorney General in defending the action or proceeding.

Despite any contrary provision of this Conservation Easement, the parties do not intend this Conservation Easement to be, and this Conservation Easement shall not be, construed such that it creates in or gives to Easement Holder or the Third-Party Beneficiaries any of the following:

(a) The obligations or liability of an "Landowner" or "operator," as those terms are defined and used in Environmental Laws (as defined below), including, without limitation, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. Section 9601 et seq.; hereinafter, "CERCLA"); or

(b) The obligations or liabilities of a person described in 42 U.S.C. Section 9607(a)(3) or (4); or

(c) The obligations of a responsible person under any applicable Environmental Laws; or

(d) The right to investigate and remediate any Hazardous Materials associated with the Easement Area; or

(e) Any control over Landowner's ability to investigate, remove, remediate or otherwise clean up any Hazardous Materials associated with the Easement Area.

The term **"Hazardous Materials"** includes, without limitation, (a) material that is flammable, explosive or radioactive; (b) petroleum products, including by-products and fractions thereof; and (c) hazardous materials, hazardous wastes, hazardous or toxic substances, or related materials defined in CERCLA, the Resource Conservation and Recovery Act of 1976 (42 U.S.C. Section 6901 et seq.; hereinafter **"RCRA"**); the Hazardous Materials Transportation Act (49 U.S.C. Section 6901 et seq.; hereinafter **"HTA"**); the Hazardous Waste Control Law (California Health & Safety Code Section 25100 et seq.; hereinafter **"HCL"**); the Carpenter-Presley-Tanner Hazardous Substance Account Act (California Health & Safety Code Section 25300 et seq.; hereinafter **"HAS"**), and in the regulations adopted and publications promulgated pursuant to them, or any other applicable Environmental Laws now in effect or enacted after the date of this Conservation Easement.

The term **"Environmental Laws"** includes, without limitation, CERCLA, RCRA, HTA, HCL, HSA, and any other federal, state, local or administrative agency statute, code, ordinance, rule, regulation, order or requirement relating to pollution, protection of human health or safety, the environment or Hazardous Materials.

18. **Representations and Warranties.** Landowner hereby makes the following representations and warranties for the benefit of Easement Holder and the Third-Party Beneficiaries:

(a) **Authority.** Landowner has good and sufficient title to the Easement Area including all appurtenances thereto, including, without limitation, all minerals and mineral rights [*for situations where mineral rights have been severed add the following*: "except as noted on **Exhibit C ("Title Encumbrances")** for severed mineral rights covered by Section 4(i), above"] and all water and water rights, and Landowner has full right and authority to enter into this Conservation Easement and convey the Conservation Easement to Easement Holder. There are no monetary liens and encumbrances recorded against the Easement Area except as expressly identified in **Exhibit C**, that may conflict or are otherwise inconsistent with this Conservation Easement and which have not been expressly subordinated to this Conservation Easement by a written Subordination Agreement approved by Easement Holder and the Wildlife Agencies. All deeds of trust and mortgages recorded against the Easement Area, or any portion thereof, are and shall continue to be subordinated to this Conservation Easement; documentation of such subordinations are contained in Exhibit C.

(b) **Compliance with Laws.** Landowner has not received notice of, and has no knowledge of, any material violation of any federal, state, county or other governmental or quasi-governmental statute, ordinance, regulation, law or administrative or judicial order with respect to the Easement Area *[except as disclosed in the Report]*. *[Insert site specific conditions, if applicable.]*

(c) **No Litigation.** There is no action, suit or proceeding which is pending or threatened against the Easement Area or any portion thereof relating to or arising out of the ownership or use of the Easement Area, or any portion thereof, in any court or in any federal, state, county, or municipal department, commission, board, bureau, agency or other governmental instrumentality.

19. **General Provisions.**

(a) **Controlling Law.** The interpretation and performance of this Conservation Easement shall be governed by the laws of the State of California, disregarding the conflicts of law principles of such state, and by applicable federal law.

(b) **Liberal Construction.** Despite any general rule of construction to the contrary, this Conservation Easement shall be liberally construed to accomplish the purposes of this Conservation Easement and the policy and purpose of Civil Code section 815, *et seq.* If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purposes of this Conservation Easement that would render the provision valid shall be favored over any interpretation that would render it invalid. It is the intent of this Conservation Easement to preserve the condition of the Easement Area and each of the Conservation Values protected herein, notwithstanding economic or other hardship or changes in circumstances or conditions. The provisions of this Conservation Easement shall be liberally construed to effectuate the purposes of the Conservation Easement and to allow Landowner's use and enjoyment of the Easement Area to the extent consistent with such purposes. Liberal construction is expressly required for purposes of effectuating this Conservation Easement in perpetuity, notwithstanding changed conditions of any kind. The Conservation Easement created by this Conservation Easement is the intended best and most productive use of the Easement Area. No remedy or election given by any provision in this Conservation Easement shall be deemed exclusive unless so indicated, but it shall, wherever possible, be cumulative with all other remedies at law or in equity. The parties acknowledge that each party and its counsel have had the opportunity to review and revise this Conservation Easement and that no rule of construction that ambiguities are to be resolved against the drafting party shall be employed in the interpretation of this Conservation Easement.

(c) **Severability.** If a court of competent jurisdiction voids or invalidates on its face any provision of this Conservation Easement, such action shall not affect the remainder of this Conservation Easement. If a court of competent jurisdiction voids or invalidates the application of any provision of this Conservation Easement to a person or circumstance, such action shall not affect the application of the provision to other persons or circumstances.

(d) **Entire Agreement.** This instrument sets forth the entire agreement of the parties with respect to this Conservation Easement and supersedes all prior discussions, negotiations, understandings, or agreements relating to this Conservation Easement. No alteration or variation of this instrument shall be valid or binding unless contained in an amendment in accordance with **Section 15**.

(e) **No Forfeiture.** Nothing contained herein will result in a forfeiture or reversion of Landowner's title in any respect.

(f) **Successors.** The covenants, terms, conditions, and restrictions of this Conservation Easement shall be binding upon, and inure to the benefit of, the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall constitute a servitude running in perpetuity with the Easement Area.

(g) **Termination of Rights and Obligations.** A party's rights and obligations under this Conservation Easement terminate upon a valid transfer of the party's interest in the Conservation Easement in accordance with the terms and provisions hereof, except that liability for acts or omissions or breaches occurring prior to transfer shall survive transfer.

(h) **Captions.** The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon its construction or interpretation.

(i) **Additional Easements.** Landowner shall not grant any additional easements, rights of way or other interests in the Property (other than a security interest that is expressly subordinated to this Conservation Easement), or grant, transfer, or otherwise abandon or relinquish (each a “Transfer”) any mineral, air, or water right or agreement relating to the Property, without first obtaining the written consent of Easement Holder and the Third-Party Beneficiaries. Easement Holder and the Third-Party Beneficiaries may withhold such consent if it determines that the proposed interest or transfer is inconsistent with the purposes of this Conservation Easement or may impair or interfere with the Conservation Values. This section shall not prohibit transfer of a fee or leasehold interest in the Property that is subject to this Conservation Easement and complies with **Section 13**. Landowner shall provide a certified copy of any recorded or unrecorded grant or Transfer document to Easement Holder and Third-Party Beneficiaries.

(j) **Recording.** Easement Holder shall record this Conservation Easement in the Official Records of the county where the Easement Area is located, and may re-record it at any time as Easement Holder deems necessary to preserve its rights hereunder.

(k) **Counterparts.** The parties may execute this Conservation Easement in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

(l) **Exhibits.** The following Exhibit(s) referenced in this Conservation Easement are attached to and incorporated by reference in this Conservation Easement:

Exhibit A – Legal Description and Map of the Easement Area

Exhibit B – Baseline Documentation Certification
Exhibit C –Title Encumbrances

IN WITNESS WHEREOF, Landowner and Easement Holder have executed this Conservation Easement the day and year first above written.

LANDOWNER:

____
Name:__________________________
Title:___________________________

EASEMENT HOLDER:
[Yolo County Habitat Conservation/Natural Communities Conservation Plan Joint Powers Agency]

By: ____________________________
Name:__________________________
Title:___________________________

Appendix L

Staff Report on Burrowing Owl Mitigation

Staff Report on Burrowing Owl Mitigation

State of California

Natural Resources Agency

Department of Fish and Game

March 7, 2012[1]

[1] This document replaces the Department of Fish and Game 1995 Staff Report On Burrowing Owl Mitigation.

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INTRODUCTION AND PURPOSE

Maintaining California's rich biological diversity is dependent on the conservation of species and their habitats. The California Department of Fish and Game (Department) has designated certain species as "species of special concern" when their population viability and survival is adversely affected by risk factors such as precipitous declines or other vulnerability factors (Shuford and Gardali 2008). Preliminary analyses of regional patterns for breeding populations of burrowing owls (*Athene cunicularia*) have detected declines both locally in their central and southern coastal breeding areas, and statewide where the species has experienced modest breeding range retraction (Gervais et al. 2008). In California, threat factors affecting burrowing owl populations include habitat loss, degradation and modification, and eradication of ground squirrels resulting in a loss of suitable burrows required by burrowing owls for nesting, protection from predators, and shelter (See Appendix A).

The Department recognized the need for a comprehensive conservation and mitigation strategy for burrowing owls, and in 1995 directed staff to prepare a report describing mitigation and survey recommendations. This report, "1995 Staff Report on Burrowing Owl Mitigation," (Staff Report) (CDFG 1995), contained Department-recommended burrowing owl and burrow survey techniques and mitigation measures intended to offset the loss of habitat and slow or reverse further decline of this species. Notwithstanding these measures, over the past 15+ years, burrowing owls have continued to decline in portions of their range (DeSante et al. 2007, Wilkerson and Siegel, 2010). The Department has determined that reversing declining population and range trends for burrowing owls will require implementation of more effective conservation actions, and evaluating the efficacy of the Department's existing recommended avoidance, minimization and mitigation approaches for burrowing owls.

The Department has identified three main actions that together will facilitate a more viable, coordinated, and concerted approach to conservation and mitigation for burrowing owls in California. These include:

1. Incorporating burrowing owl comprehensive conservation strategies into landscape-based planning efforts such as Natural Community Conservation Plans (NCCPs) and multi-species Habitat Conservation Plans (HCPs) that specifically address burrowing owls.
2. Developing and implementing a statewide conservation strategy (Burkett and Johnson, 2007) and local or regional conservation strategies for burrowing owls, including the development and implementation of a statewide burrowing owl survey and monitoring plan.
3. Developing more rigorous burrowing owl survey methods, working to improve the adequacy of impacts assessments; developing clear and effective avoidance and minimization measures; and developing mitigation measures to ensure impacts to the species are effectively addressed at the project, local, and/or regional level (the focus of this document).

This Report sets forth the Department's recommendations for implementing the third approach identified above by revising the 1995 Staff Report, drawing from the most relevant and current knowledge and expertise, and incorporating the best scientific information available pertaining to the species. It is designed to provide a compilation of the best available science for Department staff, biologists, planners, land managers, California Environmental Quality Act (CEQA) lead agencies, and the public to consider when assessing impacts of projects or other activities on burrowing owls.

This revised Staff Report takes into account the California Burrowing Owl Consortium's Survey Protocol and Mitigation Guidelines (CBOC 1993, 1997) and supersedes the survey, avoidance, minimization and mitigation recommendations in the 1995 Staff Report. Based on experiences gained from implementing the 1995 Staff Report, the Department believes revising that report is warranted. This document also includes general conservation goals and principles for developing mitigation measures for burrowing owls.

DEPARTMENT ROLE AND LEGAL AUTHORITIES

The mission of the Department is to manage California's diverse fish, wildlife and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. The Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitats necessary to maintain biologically sustainable populations of those species (Fish and Game Code (FGC) §1802). The Department, as trustee agency pursuant to CEQA (See CEQA Guidelines, §15386), has jurisdiction by law over natural resources, including fish and wildlife, affected by a project, as that term is defined in Section 21065 of the Public Resources Code. The Department exercises this authority by reviewing and commenting on environmental documents and making recommendations to avoid, minimize, and mitigate potential negative impacts to those resources held in trust for the people of California.

Field surveys designed to detect the presence of a particular species, habitat element, or natural community are one of the tools that can assist biologists in determining whether a species or habitat may be significantly impacted by land use changes or disturbance. The Department reviews field survey data as well as site-specific and regional information to evaluate whether a project's impacts may be significant. This document compiles the best available science for conducting habitat assessments and surveys, and includes considerations for developing measures to avoid impacts or mitigate unavoidable impacts.

CEQA

CEQA requires public agencies in California to analyze and disclose potential environmental impacts associated with a project that the agency will carry out, fund, or approve. Any potentially significant impact must be mitigated to the extent feasible. Project-specific CEQA mitigation is important for burrowing owls because most populations exist on privately owned parcels that, when proposed for development or other types of modification, may be subject to the environmental review requirements of CEQA.

Take

Take of individual burrowing owls and their nests is defined by FGC section 86, and prohibited by sections 3503, 3503.5 and 3513. Take is defined in FGC Section 86 as "hunt, pursue, catch, capture or kill, or attempt to hunt, pursue, catch, capture or kill."

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States and Canada, Japan, Mexico, and Russia for the protection of migratory birds, including the burrowing owl (50 C.F.R. § 10). The MBTA protects migratory bird nests from possession, sale, purchase, barter, transport, import and export, and collection. The other prohibitions of the MBTA - capture, pursue, hunt, and kill - are inapplicable to nests. The regulatory definition of take, as defined in Title 50 C.F.R. part 10.12, means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to hunt, shoot, wound, kill, trap, capture, or collect. Only the verb "collect" applies to nests. It is illegal to collect, possess, and by any means transfer possession of any migratory bird nest. The MBTA prohibits the destruction of a nest when it contains birds or eggs, and no possession shall occur during the destruction (see Fish and Wildlife Service, Migratory Bird Permit Memorandum, April 15, 2003). Certain exceptions to this prohibition are included in 50 C.F.R. section 21. Pursuant to Fish & Game Code section 3513, the Department enforces the Migratory Bird Treaty Act consistent with rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Treaty Act.

Regional Conservation Plans

Regional multiple species conservation plans offer long-term assurances for conservation of covered species at a landscape scale, in exchange for biologically appropriate levels of incidental take and/or habitat loss as defined in the approved plan. California's NCCP Act (FGC §2800 et seq.) governs such plans at the state level, and was designed to conserve species, natural communities, ecosystems, and ecological processes across a jurisdiction or a collection of jurisdictions. Complementary federal HCPs are governed by the Endangered Species Act (7 U.S.C. § 136, 16 U.S.C.§ 1531 et seq.) (ESA). Regional conservation plans (and certain other landscape-level conservation and management plans), may provide conservation for unlisted as well as listed species. Because the geographic scope of NCCPs and HCPs may span many hundreds of thousands of acres, these planning tools have the potential to play a significant role in conservation of burrowing owls, and grasslands and other habitats.

Fish and Game Commission Policies

There are a number of Fish and Game Commission policies (see FGC §2008) that can be applied to burrowing owl conservation. These include policies on: Raptors, Cooperation, Endangered and Threatened Species, Land Use Planning, Management and Utilization of Fish and Wildlife on Federal Lands, Management and Utilization of Fish and Wildlife on Private Lands, and Research.

GUIDING PRINCIPLES FOR CONSERVATION

Unless otherwise provided in a statewide, local, or regional conservation strategy, surveying and evaluating impacts to burrowing owls, as well as developing and implementing avoidance, minimization, and mitigation and conservation measures incorporate the following principles. These principles are a summary of Department staff expert opinion and were used to guide the preparation of this document.

1. Use the Precautionary Principle (Noss et al.1997), by which the alternative of increased conservation is deliberately chosen in order to buffer against incomplete knowledge of burrowing owl ecology and uncertainty about the consequences to burrowing owls of potential impacts, including those that are cumulative.
2. Employ basic conservation biology tenets and population-level approaches when determining what constitutes appropriate avoidance, minimization, and mitigation for impacts. Include mitigation effectiveness monitoring and reporting, and use an adaptive management loop to modify measures based on results.
3. Protect and conserve owls in wild, semi-natural, and agricultural habitats (conserve is defined at FGC §1802).
4. Protect and conserve natural nest burrows (or burrow surrogates) previously used by burrowing owls and sufficient foraging habitat and protect auxiliary "satellite" burrows that contribute to burrowing owl survivorship and natural behavior of owls.

CONSERVATION GOALS FOR THE BURROWING OWL IN CALIFORNIA

It is Department staff expert opinion that the following goals guide and contribute to the short and long-term conservation of burrowing owls in California:

1. Maintain size and distribution of extant burrowing owl populations (allowing for natural population fluctuations).
2. Increase geographic distribution of burrowing owls into formerly occupied historical range where burrowing owl habitat still exists, or where it can be created or enhanced, and where the reason for its local disappearance is no longer of concern.
3. Increase size of existing populations where possible and appropriate (for example, considering basic ecological principles such as carrying capacity, predator-prey relationships, and inter-specific relationships with other species at risk).
4. Protect and restore self-sustaining ecosystems or natural communities which can support burrowing owls at a landscape scale, and which will require minimal long-term management.
5. Minimize or prevent unnatural causes of burrowing owl population declines (e.g., nest burrow destruction, chemical control of rodent hosts and prey).
6. Augment/restore natural dynamics of burrowing owl populations including movement and genetic exchange among populations, such that the species does not require future listing and protection under the California Endangered Species Act (CESA) and/or the federal Endangered Species Act (ESA).
7. Engage stakeholders, including ranchers; farmers; military; tribes; local, state, and federal agencies; non-governmental organizations; and scientific research and education communities involved in burrowing owl protection and habitat management.

ACTIVITIES WITH THE POTENTIAL TO TAKE OR IMPACT BURROWING OWLS

The following activities are examples of activities that have the potential to take burrowing owls, their nests or eggs, or destroy or degrade burrowing owl habitat: grading, disking, cultivation, earthmoving, burrow blockage, heavy equipment compacting and crushing burrow tunnels, levee maintenance, flooding, burning and mowing (if burrows are impacted), and operating wind turbine collisions (collectively hereafter referred to as "projects" or "activities" whether carried out pursuant to CEQA or not). In addition, the following activities may have impacts to burrowing owl populations: eradication of host burrowers; changes in vegetation management (i.e. grazing); use of pesticides and rodenticides; destruction, conversion or degradation of nesting, foraging, over-wintering or other habitats; destruction of natural burrows and burrow surrogates; and disturbance which may result in harassment of owls at occupied burrows.

PROJECT IMPACT EVALUATIONS

The following three progressive steps are effective in evaluating whether projects will result in impacts to burrowing owls. The information gained from these steps will inform any subsequent avoidance, minimization and mitigation measures. The steps for project impact evaluations are: 1) habitat assessment, 2) surveys, and 3) impact assessment. Habitat assessments are conducted to evaluate the likelihood that a site supports burrowing owl. Burrowing owl surveys provide information needed to determine the potential effects of proposed projects and activities on burrowing owls, and to avoid take in accordance with FGC sections 86, 3503, and 3503.5. Impact assessments evaluate the extent to which burrowing owls and their habitat may be impacted, directly or indirectly, on and within a reasonable distance of a proposed CEQA project activity or non-CEQA project. These three site evaluation steps are discussed in detail below.

Biologist Qualifications

The current scientific literature indicates that only individuals meeting the following minimum qualifications should perform burrowing owl habitat assessments, surveys, and impact assessments:

1. Familiarity with the species and its local ecology;
2. Experience conducting habitat assessments and non-breeding and breeding season surveys, or experience with these surveys conducted under the direction of an experienced surveyor;
3. Familiarity with the appropriate state and federal statutes related to burrowing owls, scientific research, and conservation;
4. Experience with analyzing impacts of development on burrowing owls and their habitat.

Habitat Assessment Data Collection and Reporting

A habitat assessment is the first step in the evaluation process and will assist investigators in determining whether or not occupancy surveys are needed. Refer to Appendix B for a definition of burrowing owl habitat. Compile the detailed information described in Appendix C when conducting project scoping, conducting a habitat assessment site visit and preparing a habitat assessment report.

Surveys

Burrowing owl surveys are the second step of the evaluation process and the best available scientific literature recommends that they be conducted whenever burrowing owl habitat or sign (see Appendix B) is encountered on or adjacent to (within 150 meters) a project site

(Thomsen 1971, Martin 1973). Occupancy of burrowing owl habitat is confirmed at a site when at least one burrowing owl, or its sign at or near a burrow entrance, is observed within the last three years (Rich 1984). Burrowing owls are more detectable during the breeding season with detection probabilities being highest during the nestling stage (Conway et al. 2008). In California, the burrowing owl breeding season extends from 1 February to 31 August (Haug et al. 1993, Thompsen 1971) with some variances by geographic location and climatic conditions. Several researchers suggest three or more survey visits during daylight hours (Haug and Diduik 1993, CBOC 1997, Conway and Simon 2003) and recommend each visit occur at least three weeks apart during the peak of the breeding season, commonly accepted in California as between 15 April and 15 July (CBOC 1997). Conway and Simon (2003) and Conway et al. (2008) recommended conducting surveys during the day when most burrowing owls in a local area are in the laying and incubation period (so as not to miss early breeding attempts), during the nesting period, and in the late nestling period when most owls are spending time above ground.

Non-breeding season (1 September to 31 January) surveys may provide information on burrowing owl occupancy, but do not substitute for breeding season surveys because results are typically inconclusive. Burrowing owls are more difficult to detect during the non-breeding season and their seasonal residency status is difficult to ascertain. Burrowing owls detected during non-breeding season surveys may be year-round residents, young from the previous breeding season, pre-breeding territorial adults, winter residents, dispersing juveniles, migrants, transients or new colonizers. In addition, the numbers of owls and their pattern of distribution may differ during winter and breeding seasons. However, on rare occasions, non-breeding season surveys may be warranted (i.e., if the site is believed to be a wintering site only based on negative breeding season results). Refer to Appendix D for information on breeding season and non-breeding season survey methodologies.

Survey Reports

Adequate information about burrowing owls present in and adjacent to an area that will be disturbed by a project or activity will enable the Department, reviewing agencies and the public to effectively assess potential impacts and will guide the development of avoidance, minimization, and mitigation measures. The survey report includes but is not limited to a description of the proposed project or proposed activity, including the proposed project start and end dates, as well as a description of disturbances or other activities occurring on-site or nearby. Refer to Appendix D for details included in a survey report.

Impact Assessment

The third step in the evaluation process is the impact assessment. When surveys confirm occupied burrowing owl habitat in or adjoining the project area, there are a number of ways to assess a project's potential significant impacts to burrowing owls and their habitat. Richardson and Miller (1997) recommended monitoring raptor behavior prior to developing management recommendations and buffers to determine the extent to which individuals have been sensitized to human disturbance. Monitoring results will also provide detail necessary for developing site-specific measures. Postovit and Postovit (1987) recommended an analytical approach to mitigation planning: define the problem (impact), set goals (to guide mitigation development), evaluate and select mitigation methods, and monitor the results.

Define the problem. The impact assessment evaluates all factors that could affect burrowing owls. Postovit and Postovit (1987) recommend evaluating the following in assessing impacts to raptors and planning mitigation: type and extent of disturbance, duration and timing of disturbance, visibility of disturbance, sensitivity and ability to habituate, and influence of environmental factors. They suggest identifying and addressing all potential direct and indirect impacts to burrowing owls, regardless of whether or not the impacts will occur during the breeding season. Several examples are given for each impact category below; however, examples are not intended to be used exclusively.

Type and extent of the disturbance. The impact assessment describes the nature (source) and extent (scale) of potential project impacts on occupied, satellite and unoccupied burrows including acreage to be lost (temporary or permanent), fragmentation/edge being created, increased distance to other nesting and foraging habitat, and habitat degradation. Discuss any project activities that impact either breeding and/or non-breeding habitat which could affect owl home range size and spatial configuration, negatively affect onsite and offsite burrowing owl presence, increase energetic costs, lower reproductive success, increase vulnerability to predation, and/or decrease the chance of procuring a mate.

Duration and timing of the impact. The impact assessment describes the amount of time the burrowing owl habitat will be unavailable to burrowing owls (temporary or permanent) on the site and the effect of that loss on essential behaviors or life history requirements of burrowing owls, the overlap of project activities with breeding and/or non-breeding seasons (timing of nesting and/or non-breeding activities may vary with latitude and climatic conditions, which should be considered with the timeline of the project or activity), and any variance of the project activities in intensity, scale and proximity relative to burrowing owl occurrences.

Visibility and sensitivity. Some individual burrowing owls or pairs are more sensitive than others to specific stimuli and may habituate to ongoing visual or audible disturbance. Site-specific monitoring may provide clues to the burrowing owl's sensitivities. This type of assessment addresses the sensitivity of burrowing owls within their nesting area to humans on foot, and vehicular traffic. Other variables are whether the site is primarily in a rural versus urban setting, and whether any prior disturbance (e.g., human development or recreation) is known at the site.

Environmental factors. The impact assessment discusses any environmental factors that could be influenced or changed by the proposed activities including nest site availability, predators, prey availability, burrowing mammal presence and abundance, and threats from other extrinsic factors such as human disturbance, urban interface, feral animals, invasive species, disease or pesticides.

Significance of impacts. The impact assessment evaluates the potential loss of nesting burrows, satellite burrows, foraging habitat, dispersal and migration habitat, wintering habitat, and habitat linkages, including habitat supporting prey and host burrowers and other essential habitat attributes. This assessment determines if impacts to the species will result in significant impacts to the species locally, regionally and range-wide per CEQA Guidelines §15382 and Appendix G. The significance of the impact to habitat depends on the extent of habitat disturbed and length of time the habitat is unavailable (for example: minor – several days, medium – several weeks to months, high - breeding season affecting juvenile survival, or over winter affecting adult survival).

Cumulative effects. The cumulative effects assessment evaluates two consequences: 1) the project's proportional share of reasonably foreseeable impacts on burrowing owls and habitat caused by the project or in combination with other projects and local influences having impacts on burrowing owls and habitat, and 2) the effects on the regional owl population resulting from the project's impacts to burrowing owls and habitat.

Mitigation goals. Establishing goals will assist in planning mitigation and selecting measures that function at a desired level. Goals also provide a standard by which to measure mitigation success. Unless specifically provided for through other FGC Sections or through specific regulations, take, possession or destruction of individual burrowing owls, their nests and eggs is prohibited under FGC sections 3503, 3503.5 and 3513. Therefore, a required goal for all project activities is to avoid take of burrowing owls. Under CEQA, goals would consist of measures that would avoid, minimize and mitigate impacts to a less than significant level. For individual projects, mitigation must be roughly proportional to the level of impacts, including cumulative impacts, in accordance with the provisions of CEQA (CEQA Guidelines, §§ 15126.4(a)(4)(B), 15064, 15065, and 16355). In order for mitigation measures to be effective, they must be specific, enforceable, and feasible actions that will improve environmental conditions. As set forth in more detail in Appendix A, the current scientific literature supports the conclusion that mitigation for permanent habitat loss necessitates replacement with an equivalent or greater habitat area for breeding, foraging, wintering, dispersal, presence of burrows, burrow surrogates, presence of fossorial mammal dens, well drained soils, and abundant and available prey within close proximity to the burrow.

MITIGATION METHODS

The current scientific literature indicates that any site-specific avoidance or mitigation measures developed should incorporate the best practices presented below or other practices confirmed by experts and the Department. The Department is available to assist in the development of site-specific avoidance and mitigation measures.

Avoiding. A primary goal is to design and implement projects to seasonally and spatially avoid negative impacts and disturbances that could result in take of burrowing owls, nests, or eggs. Other avoidance measures may include but not be limited to:

- Avoid disturbing occupied burrows during the nesting period, from 1 February through 31 August.
- Avoid impacting burrows occupied during the non-breeding season by migratory or non-migratory resident burrowing owls.
- Avoid direct destruction of burrows through chaining (dragging a heavy chain over an area to remove shrubs), disking, cultivation, and urban, industrial, or agricultural development.
- Develop and implement a worker awareness program to increase the on-site worker's recognition of and commitment to burrowing owl protection.
- Place visible markers near burrows to ensure that farm equipment and other machinery does not collapse burrows.
- Do not fumigate, use treated bait or other means of poisoning nuisance animals in areas where burrowing owls are known or suspected to occur (e.g., sites observed with nesting

owls, designated use areas).
- Restrict the use of treated grain to poison mammals to the months of January and February.

Take avoidance (pre-construction) surveys. Take avoidance surveys are intended to detect the presence of burrowing owls on a project site at a fixed period in time and inform necessary take avoidance actions. Take avoidance surveys may detect changes in owl presence such as colonizing owls that have recently moved onto the site, migrating owls, resident burrowing owls changing burrow use, or young of the year that are still present and have not dispersed. Refer to Appendix D for take avoidance survey methodology.

Site surveillance. Burrowing owls may attempt to colonize or re-colonize an area that will be impacted; thus, the current scientific literature indicates a need for ongoing surveillance at the project site during project activities is recommended. The surveillance frequency/effort should be sufficient to detect burrowing owls if they return. Subsequent to their new occupancy or return to the site, take avoidance measures should assure with a high degree of certainty that take of owls will not occur.

Minimizing. If burrowing owls and their habitat can be protected in place on or adjacent to a project site, the use of buffer zones, visual screens or other measures while project activities are occurring can minimize disturbance impacts. Conduct site-specific monitoring to inform development of buffers (see Visibility and sensitivity above). The following general guidelines for implementing buffers should be adjusted to address site-specific conditions using the impact assessment approach described above. The CEQA lead agency and/or project proponent is encouraged to consult with the Department and other burrowing owl experts for assistance in developing site-specific buffer zones and visual screens.

Buffers. Holroyd et al. (2001) identified a need to standardize management and disturbance mitigation guidelines. For instance, guidelines for mitigating impacts by petroleum industries on burrowing owls and other prairie species (Scobie and Faminow, 2000) may be used as a template for future mitigation guidelines (Holroyd et al. 2001). Scobie and Faminow (2000) developed guidelines for activities around occupied burrowing owl nests recommending buffers around low, medium, and high disturbance activities, respectively (see below).

Recommended restricted activity dates and setback distances by level of disturbance for burrowing owls (Scobie and Faminow 2000).

Location	Time of Year	Level of Disturbance		
		Low	Med	High
Nesting sites	April 1-Aug 15	200 m*	500 m	500 m
Nesting sites	Aug 16-Oct 15	200 m	200 m	500 m
Nesting sites	Oct 16-Mar 31	50 m	100 m	500 m

* meters (m)

Based on existing vegetation, human development, and land uses in an area, resource managers may decide to allow human development or resource extraction closer to these area/sites than recommended above. However, if it is decided to allow activities closer than the setback distances recommended, a broad-scale, long-term, scientifically-rigorous monitoring program ensures that burrowing owls are not detrimentally affected by alternative approaches.

Other minimization measures include eliminating actions that reduce burrowing owl forage and burrowing surrogates (e.g. ground squirrel), or introduce/facilitate burrowing owl predators. Actions that could influence these factors include reducing livestock grazing rates and/or changing the timing or duration of grazing or vegetation management that could result in less suitable habitat.

Burrow exclusion and closure. Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls, or permanently exclude burrowing owls and close burrows after verifying burrows are empty by site monitoring and scoping. Exclusion in and of itself is not a take avoidance, minimization or mitigation method. Eviction of burrowing owls is a potentially significant impact under CEQA.

The long-term demographic consequences of these techniques have not been thoroughly evaluated, and the fate of evicted or excluded burrowing owls has not been systematically studied. Because burrowing owls are dependent on burrows at all times of the year for survival and/or reproduction, evicting them from nesting, roosting, and satellite burrows may lead to indirect impacts or take. Temporary or permanent closure of burrows may result in significant loss of burrows and habitat for reproduction and other life history requirements. Depending on the proximity and availability of alternate habitat, loss of access to burrows will likely result in varying levels of increased stress on burrowing owls and could depress reproduction, increase predation, increase energetic costs, and introduce risks posed by having to find and compete for available burrows. Therefore, exclusion and burrow closure are not recommended where they can be avoided. The current scientific literature indicates consideration of all possible avoidance and minimization measures before temporary or permanent exclusion and closure of burrows is implemented, in order to avoid take.

The results of a study by Trulio (1995) in California showed that burrowing owls passively displaced from their burrows were quickly attracted to adjacent artificial burrows at five of six passive relocation sites. The successful sites were all within 75 meters (m) of the destroyed burrow, a distance generally within a pair's territory. This researcher discouraged using passive relocation to artificial burrows as a mitigation measure for lost burrows without protection of adjacent foraging habitat. The study results indicated artificial burrows were used by evicted burrowing owls when they were approximately 50-100 m from the natural burrow (Thomsen 1971, Haug and Oliphant 1990). Locating artificial or natural burrows more than 100 m from the eviction burrow may greatly reduce the chances that new burrows will be used. Ideally, exclusion and burrow closure is employed only where there are adjacent natural burrows and non-impacted, sufficient habitat for burrowing owls to occupy with permanent protection mechanisms in place. Any new burrowing owl colonizing the project site after the CEQA document has been adopted may constitute changed circumstances that should be addressed in a re-circulated CEQA document.

The current scientific literature indicates that burrow exclusion should only be conducted by qualified biologists (meeting the Biologist's Qualifications above) during the non-breeding season, before breeding behavior is exhibited and after the burrow is confirmed empty by site surveillance and/or scoping. The literature also indicates that when temporary or permanent burrow exclusion and/or burrow closure is implemented, burrowing owls should not be excluded from burrows unless or until:

- A Burrowing Owl Exclusion Plan (see Appendix E) is developed and approved by the applicable local DFG office;
- Permanent loss of occupied burrow(s) and habitat is mitigated in accordance with the Mitigating Impacts sections below. Temporary exclusion is mitigated in accordance with the item #1 under Mitigating Impacts below.
- Site monitoring is conducted prior to, during, and after exclusion of burrowing owls from their burrows sufficient to ensure take is avoided. Conduct daily monitoring for one week to confirm young of the year have fledged if the exclusion will occur immediately after the end of the breeding season.
- Excluded burrowing owls are documented using artificial or natural burrows on an adjoining mitigation site (if able to confirm by band re-sight).

Translocation (Active relocation offsite >100 meters). At this time, there is little published information regarding the efficacy of translocating burrowing owls, and additional research is needed to determine subsequent survival and breeding success (Klute et al. 2003, Holroyd et al. 2001). Study results for translocation in Florida implied that hatching success may be decreased for populations of burrowing owls that undergo translocation (Nixon 2006). At this time, the Department is unable to authorize the capture and relocation of burrowing owls except within the context of scientific research (FGC §1002) or a NCCP conservation strategy.

Mitigating impacts. Habitat loss and degradation from rapid urbanization of farmland in the core areas of the Central and Imperial valleys is the greatest of many threats to burrowing owls in California (Shuford and Gardali, 2008). At a minimum, if burrowing owls have been documented to occupy burrows (see Definitions, Appendix B) at the project site in recent years, the current scientific literature supports the conclusion that the site should be considered occupied and mitigation should be required by the CEQA lead agency to address project-specific significant and cumulative impacts. Other site-specific and regionally significant and cumulative impacts may warrant mitigation. The current scientific literature indicates the following to be best practices. If these best practices cannot be implemented, the lead agency or lead investigator may consult with the Department to develop effective mitigation alternatives. The Department is also available to assist in the identification of suitable mitigation lands.

1. Where habitat will be temporarily disturbed, restore the disturbed area to pre-project condition including decompacting soil and revegetating. Permanent habitat protection may be warranted if there is the potential that the temporary impacts may render a nesting site (nesting burrow and satellite burrows) unsustainable or unavailable depending on the time frame, resulting in reduced survival or abandonment. For the latter potential impact, see the permanent impact measures below.
2. Mitigate for permanent impacts to nesting, occupied and satellite burrows and/or burrowing owl habitat such that the habitat acreage, number of burrows and burrowing owls impacted are replaced based on the information provided in Appendix A. Note: A

minimum habitat replacement recommendation is not provided here as it has been shown to serve as a default, replacing any site-specific analysis and discounting the wide variation in natal area, home range, foraging area, and other factors influencing burrowing owls and burrowing owl population persistence in a particular area.

3. Mitigate for permanent impacts to nesting, occupied and satellite burrows and burrowing owl habitat with (a) permanent conservation of similar vegetation communities (grassland, scrublands, desert, urban, and agriculture) to provide for burrowing owl nesting, foraging, wintering, and dispersal (i.e., during breeding and non-breeding seasons) comparable to or better than that of the impact area, and (b) sufficiently large acreage, and presence of fossorial mammals. The mitigation lands may require habitat enhancements including enhancement or expansion of burrows for breeding, shelter and dispersal opportunity, and removal or control of population stressors. If the mitigation lands are located adjacent to the impacted burrow site, ensure the nearest neighbor artificial or natural burrow clusters are at least within 210 meters (Fisher et al. 2007).
4. Permanently protect mitigation land through a conservation easement deeded to a non-profit conservation organization or public agency with a conservation mission, for the purpose of conserving burrowing owl habitat and prohibiting activities incompatible with burrowing owl use. If the project is located within the service area of a Department-approved burrowing owl conservation bank, the project proponent may purchase available burrowing owl conservation bank credits.
5. Develop and implement a mitigation land management plan to address long-term ecological sustainability and maintenance of the site for burrowing owls (see Management Plan and Artificial Burrow sections below, if applicable).
6. Fund the maintenance and management of mitigation land through the establishment of a long-term funding mechanism such as an endowment.
7. Habitat should not be altered or destroyed, and burrowing owls should not be excluded from burrows, until mitigation lands have been legally secured, are managed for the benefit of burrowing owls according to Department-approved management, monitoring and reporting plans, and the endowment or other long-term funding mechanism is in place or security is provided until these measures are completed.
8. Mitigation lands should be on, adjacent or proximate to the impact site where possible and where habitat is sufficient to support burrowing owls present.
9. Where there is insufficient habitat on, adjacent to, or near project sites where burrowing owls will be excluded, acquire mitigation lands with burrowing owl habitat away from the project site. The selection of mitigation lands should then focus on consolidating and enlarging conservation areas located outside of urban and planned growth areas, within foraging distance of other conserved lands. If mitigation lands are not available adjacent to other conserved lands, increase the mitigation land acreage requirement to ensure a selected site is of sufficient size. Offsite mitigation may not adequately offset the biological and habitat values impacted on a one to one basis. Consult with the Department when determining offsite mitigation acreages.
10. Evaluate and select suitable mitigation lands based on a comparison of the habitat attributes of the impacted and conserved lands, including but not limited to: type and structure of habitat being impacted or conserved; density of burrowing owls in impacted and conserved habitat; and significance of impacted or conserved habitat to the species range-wide. Mitigate for the highest quality burrowing owl habitat impacted first and foremost when identifying mitigation lands, even if a mitigation site is located outside of

a lead agency's jurisdictional boundary, particularly if the lead agency is a city or special district.

11. Select mitigation lands taking into account the potential human and wildlife conflicts or incompatibility, including but not limited to, human foot and vehicle traffic, and predation by cats, loose dogs and urban-adapted wildlife, and incompatible species management (i.e., snowy plover).
12. Where a burrowing owl population appears to be highly adapted to heavily altered habitats such as golf courses, airports, athletic fields, and business complexes, permanently protecting the land, augmenting the site with artificial burrows, and enhancing and maintaining those areas may enhance sustainability of the burrowing owl population onsite. Maintenance includes keeping lands grazed or mowed with weed-eaters or push mowers, free from trees and shrubs, and preventing excessive human and human-related disturbance (e.g., walking, jogging, off-road activity, dog-walking) and loose and feral pets (chasing and, presumably, preying upon owls) that make the environment uninhabitable for burrowing owls (Wesemann and Rowe 1985, Millsap and Bear 2000, Lincer and Bloom 2007). Items 4, 5 and 6 also still apply to this mitigation approach.
13. If there are no other feasible mitigation options available and a lead agency is willing to establish and oversee a Burrowing Owl Mitigation and Conservation Fund that funds on a competitive basis acquisition and permanent habitat conservation, the project proponent may participate in the lead agency's program.

Artificial burrows. Artificial burrows have been used to replace natural burrows either temporarily or long-term and their long-term success is unclear. Artificial burrows may be an effective addition to in-perpetuity habitat mitigation if they are augmenting natural burrows, the burrows are regularly maintained (i.e., no less than annual, with biennial maintenance recommended), and surrounding habitat patches are carefully maintained. There may be some circumstances, for example at airports, where squirrels will not be allowed to persist and create a dynamic burrow system, where artificial burrows may provide some support to an owl population.

Many variables may contribute to the successful use of artificial burrows by burrowing owls, including pre-existence of burrowing owls in the area, availability of food, predators, surrounding vegetation and proximity, number of natural burrows in proximity, type of materials used to build the burrow, size of the burrow and entrance, direction in which the burrow entrance is facing, slope of the entrance, number of burrow entrances per burrow, depth of the burrow, type and height of perches, and annual maintenance needs (Belthoff and King 2002, Smith et al. 2005, Barclay et al. 2011). Refer to Barclay (2008) and (2011) and to Johnson et al. 2010 (unpublished report) for guidance on installing artificial burrows including recommendations for placement, installation and maintenance.

Any long-term reliance on artificial burrows as natural burrow replacements must include semi-annual to annual cleaning and maintenance and/or replacement (Barclay et al. 2011, Smith and Conway 2005, Alexander et al. 2005) as an ongoing management practice. Alexander et al. (2005), in a study of the use of artificial burrows found that all of 20 artificial burrows needed some annual cleaning and maintenance. Burrows were either excavated by predators, blocked by soil or vegetation, or experienced substrate erosion forming a space beneath the tubing that prevented nestlings from re-entering the burrow.

Mitigation lands management plan. Develop a Mitigation Lands Management Plan for projects that require off-site or on-site mitigation habitat protection to ensure compliance with and effectiveness of identified management actions for the mitigation lands. A suggested outline and related vegetation management goals and monitoring success criteria can be found in Appendix E.

Mitigation Monitoring and Reporting

Verify the compliance with required mitigation measures, the accuracy of predictions, and ensure the effectiveness of all mitigation measures for burrowing owls by conducting follow-up monitoring, and implementing midcourse corrections, if necessary, to protect burrowing owls. Refer to CEQA Guidelines Section 15097 and the CEQA Guidelines for additional guidance on mitigation, monitoring and reporting. Monitoring is qualitatively different from site surveillance; monitoring normally has a specific purpose and its outputs and outcomes will usually allow a comparison with some baseline condition of the site before the mitigation (including avoidance and minimization) was undertaken. Ideally, monitoring should be based on the Before-After Control-Impact (BACI) principle (McDonald et al. 2000) that requires knowledge of the pre-mitigation state to provide a reference point for the state and change in state after the project and mitigation have been implemented.

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Appendix A. Burrowing Owl Natural History and Threats

Diet

Burrowing owl diet includes arthropods, small rodents, birds, amphibians, reptiles, and carrion (Haug et al. 1993).

Breeding

In California, the breeding season for the burrowing owl typically occurs between 1 February and 31 August although breeding in December has been documented (Thompson 1971, Gervais et al. 2008); breeding behavior includes nest site selection by the male, pair formation, copulation, egg laying, hatching, fledging, and post-fledging care of young by the parents. The peak of the breeding season occurs between 15 April and 15 July and is the period when most burrowing owls have active nests (eggs or young). The incubation period lasts 29 days (Coulombe 1971) and young fledge after 44 days (Haug et al. 1993). Note that the timing of nesting activities may vary with latitude and climatic conditions. Burrowing owls may change burrows several times during the breeding season, starting when nestlings are about three weeks old (Haug et al. 1993).

Dispersal

The following discussion is an excerpt from Gervais et al (2008):

> "The burrowing owl is often considered a sedentary species (e.g., Thomsen 1971). A large proportion of adults show strong fidelity to their nest site from year to year, especially where resident, as in Florida (74% for females, 83% for males; Millsap and Bear 1997). In California, nest-site fidelity rates were 32%–50% in a large grassland and 57% in an agricultural environment (Ronan 2002, Catlin 2004, Catlin et al. 2005). Differences in these rates among sites may reflect differences in nest predation rates (Catlin 2004, Catlin et al. 2005). Despite the high nest fidelity rates, dispersal distances may be considerable for both juveniles (natal dispersal) and adults (postbreeding dispersal), but this also varied with location (Catlin 2004, Rosier et al. 2006). Distances of 53 km to roughly 150 km have been observed in California for adult and natal dispersal, respectively (D. K. Rosenberg and J. A. Gervais, unpublished data), despite the difficulty in detecting movements beyond the immediate study area (Koenig et al. 1996)."

Habitat

The burrowing owl is a small, long-legged, ground-dwelling bird species, well-adapted to open, relatively flat expanses. In California, preferred habitat is generally typified by short, sparse vegetation with few shrubs, level to gentle topography and well-drained soils (Haug et al. 1993). Grassland, shrub steppe, and desert are naturally occurring habitat types used by the species. In addition, burrowing owls may occur in some agricultural areas, ruderal grassy fields, vacant lots and pastures if the vegetation structure is suitable and there are useable burrows and foraging habitat in proximity (Gervais et al 2008). Unique amongst North

American raptors, the burrowing owl requires underground burrows or other cavities for nesting during the breeding season and for roosting and cover, year round. Burrows used by the owls are usually dug by other species termed host burrowers. In California, California ground squirrel (*Spermophilus beecheyi*) and round-tailed ground squirrel (*Citellus tereticaudus*) burrows are frequently used by burrowing owls but they may use dens or holes dug by other fossorial species including badger (*Taxidea taxus*), coyote (*Canis latrans*), and fox (e.g., San Joaquin kit fox, *Vulpes macrotis mutica*; Ronan 2002). In some instances, owls have been known to excavate their own burrows (Thompson 1971, Barclay 2007). Natural rock cavities, debris piles, culverts, and pipes also are used for nesting and roosting (Rosenberg et al. 1998). Burrowing owls have been documented using artificial burrows for nesting and cover (Smith and Belthoff, 2003).

Foraging habitat. Foraging habitat is essential to burrowing owls. The following discussion is an excerpt from Gervais et al. (2008):

> "Useful as a rough guide to evaluating project impacts and appropriate mitigation for burrowing owls, adult male burrowing owls home ranges have been documented (calculated by minimum convex polygon) to comprise anywhere from 280 acres in intensively irrigated agroecosystems in Imperial Valley (Rosenberg and Haley 2004) to 450 acres in mixed agricultural lands at Lemoore Naval Air Station, CA (Gervais et al. 2003), to 600 acres in pasture in Saskatchewan, Canada (Haug and Oliphant 1990). But owl home ranges may be much larger, perhaps by an order of magnitude, in non-irrigated grasslands such as at Carrizo Plain, California (Gervais et al. 2008), based on telemetry studies and distribution of nests. Foraging occurs primarily within 600 m of their nests (within approximately 300 acres, based on a circle with a 600 m radius) during the breeding season."

Importance of burrows and adjacent habitat. Burrows and the associated surrounding habitat are essential ecological requisites for burrowing owls throughout the year and especially during the breeding season. During the non-breeding season, burrowing owls remain closely associated with burrows, as they continue to use them as refuge from predators, shelter from weather and roost sites. Resident populations will remain near the previous season's nest burrow at least some of the time (Coulombe 1971, Thomsen 1971, Botelho 1996, LaFever et al. 2008).

In a study by Lutz and Plumpton (1999) adult males and females nested in formerly used sites at similar rates (75% and 63%, respectively) (Lutz and Plumpton 1999). Burrow fidelity has been reported in some areas; however, more frequently, burrowing owls reuse traditional nesting areas without necessarily using the same burrow (Haug et al. 1993, Dechant et al. 1999). Burrow and nest sites are re-used at a higher rate if the burrowing owl has reproduced successfully during the previous year (Haug et al. 1993) and if the number of burrows isn't limiting nesting opportunity.

Burrowing owls may use "satellite" or non-nesting burrows, moving young at 10-14 days, presumably to reduce risk of predation (Desmond and Savidge 1998) and possibly to avoid nest parasites (Dechant et al. 1999). Successful nests in Nebraska had more active satellite burrows within 75 m of the nest burrow than unsuccessful nests (Desmond and Savidge

1999). Several studies have documented the number of satellite burrows used by young and adult burrowing owls during the breeding season as between one and 11 burrows with an average use of approximately five burrows (Thompsen 1984, Haug 1985, Haug and Oliphant 1990). Supporting the notion of selecting for nest sites near potential satellite burrows, Ronan (2002) found burrowing owl families would move away from a nest site if their satellite burrows were experimentally removed through blocking their entrance.

Habitat adjacent to burrows has been documented to be important to burrowing owls. Gervais et al. (2003) found that home range sizes of male burrowing owls during the nesting season were highly variable within but not between years. Their results also suggested that owls concentrate foraging efforts within 600 meters of the nest burrow, as was observed in Canada (Haug and Oliphant 1990) and southern California (Rosenberg and Haley 2004). James et al. (1997), reported habitat modification factors causing local burrowing owl declines included habitat fragmentation and loss of connectivity.

In conclusion, the best available science indicates that essential habitat for the burrowing owl in California must include suitable year-round habitat, primarily for breeding, foraging, wintering and dispersal habitat consisting of short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey within close proximity to the burrow.

Threats to Burrowing Owls in California

Habitat loss. Habitat loss, degradation, and fragmentation are the greatest threats to burrowing owls in California. According to DeSante et al. (2007), “the vast majority of burrowing owls [now] occur in the wide, flat lowland valleys and basins of the Imperial Valley and Great Central Valley [where] for the most part,...the highest rates of residential and commercial development in California are occurring.” Habitat loss from the State’s long history of urbanization in coastal counties has already resulted in either extirpation or drastic reduction of burrowing owl populations there (Gervais et al. 2008). Further, loss of agricultural and other open lands (such as grazed landscapes) also negatively affect owl populations. Because of their need for open habitat with low vegetation, burrowing owls are unlikely to persist in agricultural lands dominated by vineyards and orchards (Gervais et al. 2008).

Control of burrowing rodents. According to Klute et al. (2003), the elimination of burrowing rodents through control programs is a primary factor in the recent and historical decline of burrowing owl populations nationwide. In California, ground squirrel burrows are most often used by burrowing owls for nesting and cover; thus, ground squirrel control programs may affect owl numbers in local areas by eliminating a necessary resource.

Direct mortality. Burrowing owls suffer direct losses from a number of sources. Vehicle collisions are a significant source of mortality especially in the urban interface and where owls nest alongside roads (Haug et al. 1993, Gervais et al. 2008). Road and ditch maintenance, modification of water conveyance structures (Imperial Valley) and discing to control weeds in fallow fields may destroy burrows (Rosenberg and Haley 2004, Catlin and Rosenberg 2006) which may trap or crush owls. Wind turbines at Altamont Pass Wind Resource Area are known to cause direct burrowing owl mortality (Thelander et al. 2003). Exposure to pesticides may pose a threat to the species but is poorly understood (Klute et al. 2003, Gervais et al. 2008).

Appendix B. Definitions

Some key terms that appear in this document are defined below.

Adjacent habitat means burrowing owl habitat that abuts the area where habitat and burrows will be impacted and rendered non-suitable for occupancy.

Breeding (nesting) season begins as early as 1 February and continues through 31 August (Thomsen 1971, Zarn 1974). The timing of breeding activities may vary with latitude and climatic conditions. The breeding season includes pairing, egg-laying and incubation, and nestling and fledging stages.

Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls or permanently exclude burrowing owls and excavate and close burrows after confirming burrows are empty.

Burrowing owl habitat generally includes, but is not limited to, short or sparse vegetation (at least at some time of year), presence of burrows, burrow surrogates or presence of fossorial mammal dens, well-drained soils, and abundant and available prey.

Burrow surrogates include culverts, piles of concrete rubble, piles of soil, burrows created along soft banks of ditches and canals, pipes, and similar structures.

Civil twilight - Morning civil twilight begins when the geometric center of the sun is 6 degrees below the horizon (civil dawn) and ends at sunrise. Evening civil twilight begins at sunset and ends when the geometric center of the sun reaches 6 degrees below the horizon (civil dusk). During this period there is enough light from the sun that artificial sources of light may not be needed to carry on outdoor activities. This concept is sometimes enshrined in laws, for example, when drivers of automobiles must turn on their headlights (called lighting-up time in the UK); when pilots may exercise the rights to fly aircraft. Civil twilight can also be described as the limit at which twilight illumination is sufficient, under clear weather conditions, for terrestrial objects to be clearly distinguished; at the beginning of morning civil twilight, or end of evening civil twilight, the horizon is clearly defined and the brightest stars are visible under clear atmospheric conditions.

Conservation for burrowing owls may include but may not be limited to protecting remaining breeding pairs or providing for population expansion, protecting and enhancing breeding and essential habitat, and amending or augmenting land use plans to stabilize populations and other specific actions to avoid the need to list the species pursuant to California or federal Endangered Species Acts.

Contiguous means connected together so as to form an uninterrupted expanse in space.

Essential habitat includes nesting, foraging, wintering, and dispersal habitat.

Foraging habitat is habitat within the estimated home range of an occupied burrow, supports suitable prey base, and allows for effective hunting.

Host burrowers include ground squirrels, badgers, foxes, coyotes, gophers etc.

Locally significant species is a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or occurring in a unique habitat type.

Non-breeding season is the period of time when nesting activity is not occurring, generally September 1 through January 31, but may vary with latitude and climatic conditions.

Occupied site or occupancy means a site that is assumed occupied if at least one burrowing owl has been observed occupying a burrow within the last three years (Rich 1984). Occupancy of suitable burrowing owl habitat may also be indicated by owl sign including its molted feathers, cast pellets, prey remains, eggshell fragments, or excrement at or near a burrow entrance or perch site.

Other impacting activities may include but may not be limited to agricultural practices, vegetation management and fire control, pest management, conversion of habitat from rangeland or natural lands to more intensive agricultural uses that could result in "take". These impacting activities may not meet the definition of a project under CEQA.

Passive relocation is a technique of installing one-way doors in burrow openings to temporarily or permanently evict burrowing owls and prevent burrow re-occupation.

Peak of the breeding season is between 15 April and 15 July.

Sign includes its tracks, molted feathers, cast pellets (defined as 1-2" long brown to black regurgitated pellets consisting of non-digestible portions of the owls' diet, such as fur, bones, claws, beetle elytra, or feathers), prey remains, egg shell fragments, owl white wash, nest burrow decoration materials (e.g., paper, foil, plastic items, livestock or other animal manure, etc.), possible owl perches, or other items.

Appendix C. Habitat Assessment and Reporting Details

Habitat Assessment Data Collection and Reporting

Current scientific literature indicates that it would be most effective to gather the data in the manner described below when conducting project scoping, conducting a habitat assessment site visit and preparing a habitat assessment report:

1. Conduct at least one visit covering the entire potential project/activity area including areas that will be directly or indirectly impacted by the project. Survey adjoining areas within 150 m (Thomsen 1971, Martin 1973), or more where direct or indirect effects could potentially extend offsite. If lawful access cannot be achieved to adjacent areas, surveys can be performed with a spotting scope or other methods.
2. Prior to the site visit, compile relevant biological information for the site and surrounding area to provide a local and regional context.
3. Check all available sources for burrowing owl occurrence information regionally prior to a field inspection. The CNDDB and BIOS (see References cited) may be consulted for known occurrences of burrowing owls. Other sources of information include, but are not limited to, the Proceedings of the California Burrowing Owl Symposium (Barclay et al. 2007), county bird atlas projects, Breeding Bird Survey records, eBIRD (http://ebird.org), Gervais et al. (2008), local reports or experts, museum records, and other site-specific relevant information.
4. Identify vegetation and habitat types potentially supporting burrowing owls in the project area and vicinity.
5. Record and report on the following information:
   a. A full description of the proposed project, including but not limited to, expected work periods, daily work schedules, equipment used, activities performed (such as drilling, construction, excavation, etc.) and whether the expected activities will vary in location or intensity over the project's timeline;
   b. A regional setting map, showing the general project location relative to major roads and other recognizable features;
   c. A detailed map (preferably a USGS topo 7.5' quad base map) of the site and proposed project, including the footprint of proposed land and/or vegetation-altering activities, base map source, identifying topography, landscape features, a north arrow, bar scale, and legend;
   d. A written description of the biological setting, including location (Section, Township, Range, baseline and meridian), acreage, topography, soils, geographic and hydrologic characteristics, land use and management history on and adjoining the site (i.e., whether it is urban, semi-urban or rural; whether there is any evidence of past or current livestock grazing, mowing, disking, or other vegetation management activities);
   e. An analysis of any relevant, historical information concerning burrowing owl use or occupancy (breeding, foraging, over-wintering) on site or in the assessment area;
   f. Vegetation type and structure (using Sawyer et al. 2009), vegetation height, habitat types and features in the surrounding area plus a reasonably sized (as supported with logical justification) assessment area; (Note: use caution in discounting habitat based on grass height as it can be a temporary condition variable by season and conditions (such as current grazing regime) or may be distributed as a mosaic).

g. The presence of burrowing owl individuals or pairs or sign (see Appendix B);
h. The presence of suitable burrows and/or burrow surrogates (>11 cm in diameter (height and width) and >150 cm in depth) (Johnson et al. 2010), regardless of a lack of any burrowing owl sign and/or burrow surrogates; and burrowing owls and/or their sign that have recently or historically (within the last 3 years) been identified on or adjacent to the site.

Appendix D. Breeding and Non-breeding Season Surveys and Reports

Current scientific literature indicates that it is most effective to conduct breeding and non-breeding season surveys and report in the manner that follows:

Breeding Season Surveys

Number of visits and timing. Conduct 4 survey visits: 1) at least one site visit between 15 February and 15 April, and 2) a minimum of three survey visits, at least three weeks apart, between 15 April and 15 July, with at least one visit after 15 June. Note: many burrowing owl migrants are still present in southwestern California during mid-March, therefore, exercise caution in assuming breeding occupancy early in the breeding season.

Survey method. Rosenberg et al. (2007) confirmed walking line transects were most effective in smaller habitat patches. Conduct surveys in all portions of the project site that were identified in the Habitat Assessment and fit the description of habitat in Appendix A. Conduct surveys by walking straight-line transects spaced 7 m to 20 m apart, adjusting for vegetation height and density (Rosenberg et al. 2007). At the start of each transect and, at least, every 100 m, scan the entire visible project area for burrowing owls using binoculars. During walking surveys, record all potential burrows used by burrowing owls as determined by the presence of one or more burrowing owls, pellets, prey remains, whitewash, or decoration. Some burrowing owls may be detected by their calls, so observers should also listen for burrowing owls while conducting the survey.

Care should be taken to minimize disturbance near occupied burrows during all seasons and not to “flush” burrowing owls especially if predators are present to reduce any potential for needless energy expenditure or burrowing owl mortality. Burrowing owls may flush if approached by pedestrians within 50 m (Conway et al. 2003). If raptors or other predators are present that may suppress burrowing owl activity, return at another time or later date for a follow-up survey.

Check all burrowing owls detected for bands and/or color bands and report band combinations to the Bird Banding Laboratory (BBL). Some site-specific variations to survey methods discussed below may be developed in coordination with species experts and Department staff.

Weather conditions. Poor weather may affect the surveyor’s ability to detect burrowing owls, therefore, avoid conducting surveys when wind speed is >20 km/hr, and there is precipitation or dense fog. Surveys have greater detection probability if conducted when ambient temperatures are >20º C, <12 km/hr winds, and cloud cover is <75% (Conway et al. 2008).

Time of day. Daily timing of surveys varies according to the literature, latitude, and survey method. However, surveys between morning civil twilight and 10:00 AM and two hours before sunset until evening civil twilight provide the highest detection probabilities (Barclay pers. comm. 2012, Conway et al. 2008).

Alternate methods. If the project site is large enough to warrant an alternate method, consult current literature for generally accepted survey methods and consult with the Department on the proposed survey approach.

Additional breeding season site visits. Additional breeding season site visits may be necessary, especially if non-breeding season exclusion methods are contemplated. Detailed information, such as approximate home ranges of each individual or of family units, as well as foraging areas as related to the proposed project, will be important to document for evaluating impacts, planning avoidance measure implementation and for mitigation measure performance monitoring.

Adverse conditions may prevent investigators from determining presence or occupancy. Disease, predation, drought, high rainfall or site disturbance may preclude presence of burrowing owls in any given year. Any such conditions should be identified and discussed in the survey report. Visits to the site in more than one year may increase the likelihood of detection. Also, visits to adjacent known occupied habitat may help determine appropriate survey timing.

Given the high site fidelity shown by burrowing owls (see Appendix A, Importance of burrows), conducting surveys over several years may be necessary when project activities are ongoing, occur annually, or start and stop seasonally. (See Negative surveys).

Non-breeding Season Surveys

If conducting non-breeding season surveys, follow the methods described above for breeding season surveys, but conduct at least four (4) visits, spread evenly, throughout the non-breeding season. Burrowing owl experts and local Department staff are available to assist with interpreting results.

Negative Surveys

Adverse conditions may prevent investigators from documenting presence or occupancy. Disease, predation, drought, high rainfall or site disturbance may preclude presence of burrowing owl in any given year. Discuss such conditions in the Survey Report. Visits to the site in more than one year increase the likelihood of detection and failure to locate burrowing owls during one field season does not constitute evidence that the site is no longer occupied, particularly if adverse conditions influenced the survey results. Visits to other nearby known occupied sites can affirm whether the survey timing is appropriate.

Take Avoidance Surveys

Field experience from 1995 to present supports the conclusion that it would be effective to complete an initial take avoidance survey no less than 14 days prior to initiating ground disturbance activities using the recommended methods described in the Detection Surveys section above. Implementation of avoidance and minimization measures would be triggered by positive owl presence on the site where project activities will occur. The development of avoidance and minimization approaches would be informed by monitoring the burrowing owls.

Burrowing owls may re-colonize a site after only a few days. Time lapses between project activities trigger subsequent take avoidance surveys including but not limited to a final survey conducted within 24 hours prior to ground disturbance.

Survey Reports

Report on the survey methods used and results including the information described in the Summary Report and include the reports within the CEQA documentation:

1. Date, start and end time of surveys including weather conditions (ambient temperature, wind speed, percent cloud cover, precipitation and visibility);
2. Name(s) of surveyor(s) and qualifications;
3. A discussion of how the timing of the survey affected the comprehensiveness and detection probability;
4. A description of survey methods used including transect spacing, point count dispersal and duration, and any calls used;
5. A description and justification of the area surveyed relative to the project area;
6. A description that includes: number of owls or nesting pairs at each location (by nestlings, juveniles, adults, and those of an unknown age), number of burrows being used by owls, and burrowing owl sign at burrows. Include a description of individual markers, such as bands (numbers and colors), transmitters, or unique natural identifying features. If any owls are banded, request documentation from the BBL and bander to report on the details regarding the known history of the banded burrowing owl(s) (age, sex, origins, whether it was previously relocated) and provide with the report if available;
7. A description of the behavior of burrowing owls during the surveys, including feeding, resting, courtship, alarm, territorial defense, and those indicative of parents or juveniles;
8. A list of possible burrowing owl predators present and documentation of any evidence of predation of owls;
9. A detailed map (1:24,000 or closer to show details) showing locations of all burrowing owls, potential burrows, occupied burrows, areas of concentrated burrows, and burrowing owl sign. Locations documented by use of global positioning system (GPS) coordinates must include the datum in which they were collected. The map should include a title, north arrow, bar scale and legend;
10. Signed field forms, photos, etc., as appendices to the field survey report;
11. Recent color photographs of the proposed project or activity site; and
12. Original CNDDB Field Survey Forms should be sent directly to the Department's CNDDB office, and copies should be included in the environmental document as an appendix. (http://www.dfg.ca.gov/bdb/html/cnddb.html).

Appendix E. Example Components for Burrowing Owl Artificial Burrow and Exclusion Plans

Whereas the Department does not recommend exclusion and burrow closure, current scientific literature and experience from 1995 to present, indicate that the following example components for burrowing owl artificial burrow and exclusion plans, combined with consultation with the Department to further develop these plans, would be effective.

Artificial Burrow Location

If a burrow is confirmed occupied on-site, artificial burrow locations should be appropriately located and their use should be documented taking into consideration:

1. A brief description of the project and project site pre-construction;
2. The mitigation measures that will be implemented;
3. Potential conflicting site uses or encumbrances;
4. A comparison of the occupied burrow site(s) and the artificial burrow site(s) (e.g., vegetation, habitat types, fossorial species use in the area, and other features);
5. Artificial burrow(s) proximity to the project activities, roads and drainages;
6. Artificial burrow(s) proximity to other burrows and entrance exposure;
7. Photographs of the site of the occupied burrow(s) and the artificial burrows;
8. Map of the project area that identifies the burrow(s) to be excluded as well as the proposed sites for the artificial burrows;
9. A brief description of the artificial burrow design;
10. Description of the monitoring that will take place during and after project implementation including information that will be provided in a monitoring report.
11. A description of the frequency and type of burrow maintenance.

Exclusion Plan

An Exclusion Plan addresses the following including but not limited to:

1. Confirm by site surveillance that the burrow(s) is empty of burrowing owls and other species preceding burrow scoping;
2. Type of scope and appropriate timing of scoping to avoid impacts;
3. Occupancy factors to look for and what will guide determination of vacancy and excavation timing (one-way doors should be left in place 48 hours to ensure burrowing owls have left the burrow before excavation, visited twice daily and monitored for evidence that owls are inside and can't escape i.e., look for sign immediately inside the door).
4. How the burrow(s) will be excavated. Excavation using hand tools with refilling to prevent reoccupation is preferable whenever possible (may include using piping to stabilize the burrow to prevent collapsing until the entire burrow has been excavated and it can be determined that no owls reside inside the burrow);
5. Removal of other potential owl burrow surrogates or refugia on site;
6. Photographing the excavation and closure of the burrow to demonstrate success and sufficiency;

7. Monitoring of the site to evaluate success and, if needed, to implement remedial measures to prevent subsequent owl use to avoid take;
8. How the impacted site will continually be made inhospitable to burrowing owls and fossorial mammals (e.g., by allowing vegetation to grow tall, heavy disking, or immediate and continuous grading) until development is complete.

Appendix F. Mitigation Management Plan and Vegetation Management Goals

Mitigation Management Plan

A mitigation site management plan will help ensure the appropriate implementation and maintenance for the mitigation site and persistence of the burrowing owls on the site. For an example to review, refer to Rosenberg et al. (2009). The current scientific literature and field experience from 1995 to present indicate that an effective management plan includes the following:

1. Mitigation objectives;
2. Site selection factors (including a comparison of the attributes of the impacted and conserved lands) and baseline assessment;
3. Enhancement of the conserved lands (enhancement of reproductive capacity, enhancement of breeding areas and dispersal opportunities, and removal or control of population stressors);
4. Site protection method and prohibited uses;
5. Site manager roles and responsibilities;
6. Habitat management goals and objectives:
    a. Vegetation management goals,
        i. Vegetation management tools:
            1. Grazing
            2. Mowing
            3. Burning
            4. Other
    b. Management of ground squirrels and other fossorial mammals,
    c. Semi-annual and annual artificial burrow cleaning and maintenance,
    d. Non-natives control – weeds and wildlife,
    e. Trash removal;
7. Financial assurances:
    a. Property analysis record or other financial analysis to determine long-term management funding,
    b. Funding schedule;
8. Performance standards and success criteria;
9. Monitoring, surveys and adaptive management;
10. Maps;
11. Annual reports.

Vegetation Management Goals

- Manage vegetation height and density (especially in immediate proximity to burrows). Suitable vegetation structure varies across sites and vegetation types, but should generally be at the average effective vegetation height of 4.7 cm (Green and Anthony 1989) and <13 cm average effective vegetation height (MacCracken et al. 1985*a)*.
- Employ experimental prescribed fires (controlled, at a small scale) to manage vegetation structure;

- Vegetation reduction or ground disturbance timing, extent, and configuration should avoid take. While local ordinances may require fire prevention through vegetation management, activities like disking, mowing, and grading during the breeding season can result in take of burrowing owls and collapse of burrows, causing nest destruction. Consult the take avoidance surveys section above for pre-management avoidance survey recommendations;
- Promote natural prey distribution and abundance, especially in proximity to occupied burrows; and
- Promote self-sustaining populations of host burrowers by limiting or prohibiting lethal rodent control measures and by ensuring food availability for host burrowers through vegetation management.

Refer to Rosenberg et al. (2009) for a good discussion of managing grasslands for burrowing owls.

Mitigation Site Success Criteria

In order to evaluate the success of mitigation and management strategies for burrowing owls, monitoring is required that is specific to the burrowing owl management plan. Given limited resources, Barclay et al. (2011) suggests managers focus on accurately estimating annual adult owl populations rather than devoting time to estimating reproduction, which shows high annual variation and is difficult to accurately estimate. Therefore, the key objective will be to determine accurately the number of adult burrowing owls and pairs, and if the numbers are maintained. A frequency of 5-10 years for surveys to estimate population size may suffice if there are no changes in the management of the nesting and foraging habitat of the owls.

Effective monitoring and evaluation of off-site and on-site mitigation management success for burrowing owls includes (Barclay, pers. comm.):

- Site tenacity;
- Number of adult owls present and reproducing;
- Colonization by burrowing owls from elsewhere (by band re-sight);
- Evidence and causes of mortality;
- Changes in distribution; and
- Trends in stressors.

Appendix M

Yolo County Agricultural Practices

This appendix provides additional information on routine agricultural practices in Yolo County. The tables on the following pages summarize the farming practices and their seasonal timing that are associated with cultivation and harvest of the major crop types cultivated in the Plan Area. Section M-1 lists the agriculture-related activities on Reserve System lands. Other than pesticide use, the activities in Section M-1 are covered activities for lands in the Reserve System, as described in Chapter 3, *Covered Activities*. Section M-2 lists additional agriculture-related activities that may occur on lands enrolled in the Neighboring Landowner Protection Program as described in Section 3.5.6, *Neighboring Landowners Protection Program.*

Section M-1: Agricultural Activities with the Yolo HCP/NCCP Reserve System

Section M-1 lists the routine agriculture-related activities on Reserve System lands. Other than pesticide use, the activities in Section M-1 are covered agricultural activities for lands in the Reserve System, as described in Chapter 3, *Covered Activities*.

Crop Type: Alfalfa

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X		
	deep rip	X	X		
	shallow rip		X		
	grade	X	X		
	leveling	X	X		
	bedding	X	X		
	plowing		X		
Cultivation and planting					
	disc/harrow		X		
	drill/plug		X		X
	seeding		X		X
Fertilization					
	cover crop				
	ground app.	X	X		X
	air app.				
	water app.		X		
Irrigation					
	furrow[1]				

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	**Fall**	**Winter**	**Spring**
	flood	X	X		
	pressure (sprinkler/drip)		X		X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands in the reserve system if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species.)					
	herbicide	X	X	X	X
	insecticide	X			X
	fungicide				
	fumigants	X pre-replant	X pre-replant	X pre-replant	X pre-replant
Harvesting					
	cutting	X	X		X
	picking				
	digging				
	combining				
Pruning					
	hand				
	mechanical				
Residue Management					
	burning				
	grinding				
	chipping				
	chopping		X	X	X
	baling	X	X		X

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Crop Type: Field ("Row") Crops

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X	X when dry	X
	deep rip	X	X	X	
	shallow rip	X	X	X	X
	grade	X	X	X	X
	leveling	X	X	X	X
	bedding	X	X	X when dry	X
	plowing		X		
Cultivation and planting					
	disc/harrow	X	X sugar beets	X	X
	drill/plug	X	X sugar beets	X	X
	seeding	X	X	X	X
Fertilization					
	cover crop		X	X	X
	ground app.	X	X sugar beets		X
	air app.	X	X		X
	water app.	X	X		X
Irrigation					
	furrow	X	X		X
	flood	X sudan			X sudan
	pressure (sprinkler/drip)	X	X		X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands in the reserve system if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species)					
	herbicide	X	X	X beds	X
	insecticide	X	X		X
	fungicide	X	X sugar beets	X	X

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
	fumigants				
Harvesting					
	cutting	X	X		X
	picking	X	X		
	digging	X	X	X	
	combining	X	X		
Pruning					
	hand				
	mechanical				
Residue Management					
	burning	X	X		X
	grinding				
	chipping				
	chopping	X	X		X
	baling	X	X		
Other					
	discing	X	X	X	X

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Crop Type: Oat Hay ("Pasture") Crops

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X		
	deep rip				
	shallow rip	X			
	grade				
	leveling		X		
	bedding				
	plowing	X	X		
Cultivation and planting					
	disc/harrow	X	X		X
	drill/plug		X		
	seeding		X		
Fertilization					
	cover crop				X
	ground app.		X	X	X
	air app.		X	X	X
	water app.		X		X
Irrigation					
	furrow		X	X	X
	flood		X	X	X
	pressure (sprinkler/drip)		X	X	X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands in the reserve system if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species)					
	herbicide		X	X	X
	insecticide			X	X
	fungicide			X	X
	fumigants				

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	**Fall**	**Winter**	**Spring**
Harvesting					
	cutting				X
	picking				
	digging				
	combining				
Pruning					
	hand				
	mechanical[1]				
Residue Management					
	burning	X			X
	grinding				
	chipping				
	chopping				X
	baling				X

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Crop Type: Rice

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X	X	X
	deep rip	X			
	shallow rip	X	X	X	X
	grade	X	X	X	X
	leveling	X if fallow	X	X	X
	bedding				
	plowing		X		X
Cultivation and planting					
	disc/harrow		X		X
	drill/plug				X
	seeding	X early April, May and June			X
Fertilization					
	cover crop		X	X	
	ground app.	X early June			X
	air app.	X	X		X
	water app.				
Irrigation					
	furrow	X	X		
	flood	X	X	X	X
	pressure (sprinkler/drip)				
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands in the reserve system if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species)					
	herbicide	X	X tule on checks	X	X
	insecticide	X			X
	fungicide	X			X
	fumigants	X stem rot			

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	**Fall**	**Winter**	**Spring**
Harvesting					
	cutting				
	picking				
	digging				
	combining	X	X		
Pruning					
	hand				
	mechanical				
Residue Management					
	burning		X	X	
	grinding		X	X	X
	chipping				
	chopping		X	X	X
	baling		X		

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Crop Type: Tomatoes

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	Disc	X	X	X dry	X
	deep rip	X	X	X dry	X
	shallow rip[1]	X	X	X dry	X
	grade[1]	X	X	X dry	X
	Leveling	X	X	X dry	X
	Bedding	X	X	X dry	X
	plowing[1]		X		X
Cultivation and planting					
	disc/harrow[1]				X
Transplants	drill/plug	Early summer			X
	seeding[1]				X
Fertilization					
	cover crop[1]		X	X	
	ground app.	X			X
	air app.[1]	X			X
	water app.	X			X
Irrigation					
	furrow	X			X
	flood[1]				
	pressure (sprinkler/drip)	X			X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands in the reserve system if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species)					
	herbicide	X	X	X	X
	insecticide	X			X
	fungicide	X			X
	fumigants[1]				X

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Harvesting					
	cutting				
	picking	X	X Early fall		
	digging				
	combining				
Pruning					
	hand				
	mechanical				
Residue Management					
	burning				
	grinding				
	chipping				
	chopping		X		
	baling				

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Crop Type: Organic Vegetables, Melons, and Berries

Agricultural Activity	Practices	Seasonal Timing			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X	X when dry	X
	deep rip				
	shallow rip	X	X	X	X
	grade	X	X		X
	leveling	X	X		X
	bedding	X	X	X when dry	X
	plowing[1]		X		
Cultivation and planting					
	disc/harrow	X	X	X	X
	drill/plug	X	X	X	X
	seeding	X		X	X
Fertilization					
	cover crop	X	X	X	X
	ground app.	X	X	X	X
	air app.				
	water app.	X			X
Irrigation					
	furrow	X	X		X
	flood	X sudan			X sudan
	pressure (sprinkler/drip)	X sudan	X	X	
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands enrolled in the Neighboring Landowner Program if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species.)					
	herbicide				
	insecticide	X	X	X	X
	fungicide			X	
	fumigants				

Agricultural Activity	Practices	Seasonal Timing			
		Summer	Fall	Winter	Spring
Harvesting					
	cutting	X	X	X	X
	picking	X	X	X	X
	digging	X	X	X	X
Pruning					
	hand				
	mechanical				
Residue Management					
	burning				
	grinding				
	chipping				
	chopping	X	X	X	X
	baling		X		
Other					
	discing	X	X	X	X

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Section M-2: Additional Activities on Lands Enrolled in the Neighboring Landowners Protection Program

Section M-2 lists the additional routine agricultural practices on land enrolled in the Neighboring Landowner Protection Program. The activities in Sections M-1 and M-2 are covered agricultural activities for lands enrolled in the Neighboring Landowner Protection Program as described in Section 3.5.6.

Crop Type: Almonds

Agricultural Activity	Practices	Seasonal Timing[1] Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X	X	X
	deep rip	X	X	X	X
	shallow rip	X	X	X	X
	grade	X	X	X	X
	leveling	X	X	X	X
	bedding	X	X	X	X
	plowing				
Cultivation and planting					
	disc/harrow	X	X	X	X
	drill/plug				
	seeding				
Fertilization					
	cover crop	X	X	X	X
	ground app.	X	X	X	X
	air app.	X	X		X
	water app.	X			X
Irrigation					
	furrow	X	X	X	X
	flood		X	X	X
	pressure (sprinkler/drip)	X	X	X	X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands enrolled in the Neighboring Landowner Program if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species.)					

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
	herbicide	X	X	X	X
	insecticide	X	X	X	X
	fungicide	X		X	X
	fumigants		X	X	
Harvesting					
	cutting				
	picking	X	X		
	digging				
	combining				
Pruning					
	hand	X	X	X	X
	mechanical	X	X	X	X
Residue Management					
	burning	X	X	X	X
	grinding	X	X	X	X
	chipping	X	X	X	X
	chopping	X	X	X	X
	bailing				
Other					
	mowing	X	X	X	X

[1]Implementation of practice occurs at different times of year depending on conditions and management.

Crop Type: Deciduous Fruits

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X		X
	deep rip	X	X		X
	shallow rip	X	X		X
	grade	X	X		X
	leveling	X	X		X
	bedding				
	plowing				
Cultivation and planting					
	disc/harrow	X	X		X
	drill/plug				
	seeding[1]	X	X		X
Fertilization					
	cover crop		X	X	
	ground app.	X	X		X
	air app.	X			X
	water app.	X	X		X
Irrigation					
	furrow	X	X		X
	flood	X	X		X
	pressure (sprinkler/drip)	X	X		X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands enrolled in the Neighboring Landowner Program if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species.)					
	herbicide	X	X	X	X
	insecticide	X	X		X
	fungicide	X	X	X	X
	fumigants	X	X	X	X

Agricultural Activity	Practices	Seasonal Timing[1]			
		Summer	**Fall**	**Winter**	**Spring**
Harvesting					
	cutting				
	picking	X	Oct.		X
	digging				
	combining				
Pruning					
	hand	X	X	X	X
	mechanical	X	X	X	X
Residue Management					
	burning	X	X	X	X
	grinding	X	X	X	X
	chipping	X	X	X	X
	chopping	X	X	X	X
	baling				

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Crop Type: Walnuts

Agricultural Activity	Practices	Seasonal Timing			
		Summer	Fall	Winter	Spring
Ground Prep: Pre-planting and Post-harvesting					
	disc	X	X	X	X
	deep rip	X	X	X	
	shallow rip	X	X	X	
	grade	X	X	X	X
	leveling	X	X	X	X
	bedding tree-removal	X	X	X	X
	plowing	X	X		
	fumigating	X	X	X	X
Cultivation and planting					
	disc/harrow	X	X	X	X
	drill/plug/dig			X	X
	seeding				
Fertilization					
	cover crop	X	X	X	X
	ground app.	X	X	X	X
	air app.	X	X	X	X
	water app.	X	X	X	X
Irrigation					
	furrow	X	X	X	X
	flood	X	X	X	X
	pressure (sprinkler/drip)	X	X	X	X
	canal maintenance				
Spraying/pesticide use (although pesticides are allowed on cultivated lands enrolled in the Neighboring Landowner Program if necessary, pesticide use is not a Covered Activity under the Yolo HCP/NCCP, therefore pesticide use cannot result in take of state or federally listed species.)					
	herbicide	X	X	X	X
	insecticide by air	X	X	X	X
	fungicide by air			X	X
	fumigants		X	X	X

Agricultural Activity	Practices	Seasonal Timing			
		Summer	**Fall**	**Winter**	**Spring**
Harvesting					
	cutting				
	picking		X	X	
	digging				
	combining				
Pruning					
	hand	X	X	X	X
	mechanical	X	X	X	X
Residue Management					
	burning	X	X	X	X
	grinding	X	X	X	X
	chipping	X	X	X	X
	chopping	X	X	X	X
	Baling				

[1]Implementation of practice may occur at different times of year depending on conditions and management.

Appendix N
Fragmentation Effects

Yolo HCP/NCCP Indirect Effects Analysis 7/15/16

California tiger salamander

Proposed Methodology from Scope of Work: Assess the indirect effect of reduced suitability/value of potentially upland habitat when a potential breeding pond is removed. Identify potential California tiger salamander (CTS) breeding ponds that would be removed by covered activities. Provide for site specific knowledge of conditions and adjust accordingly. For example, the "vineyard pond" in the Dunnigan Hills Specific Plan area would not be included in the calculation because although it is mapped as potential CTS breeding habitat, it does not provide suitable habitat conditions. Similar, modelled habitat in the Yolo Bypass area where there are no know occurrences of the species would also not be included. Where potential breeding ponds are removed, calculate the acres of mapped upland habitat within 1.2 miles of the pond. Of this acreage, remove any land that is part of covered activities as loss of this acreage is already counted as part of the direct effects. Any remaining mapped upland habitat would be the acreage of indirect effect.

We will assess if there is any suitable upland habitat that is identified as being subject to this indirect effect, but is within 1.2 miles if another breeding pond that is preserved. If we run across this situation, we will discuss the best approach to adjusting the indirect effects analysis based on the site specific conditions.

Modified Approach: Focusing on 12 acres of aquatic habitat removed identified in HCP/NCCP. We identified potential upland habitat within 1.2 miles of these 12 acres and took out any portions that were already considered removed by covered activities. Of the remaining upland habitat, we identified areas that would still remain within 1.2 miles of another source of aquatic habitat. So, although one pond might be removed, upland habitat in the vicinity would still have another source of aquatic habitat available and would remain viable. Ultimately, what we identify are locations of upland habitat that would no longer be within 1.2 miles of any suitable aquatic habitat after the removal of the 12 acres from covered activities.

Results: With the removal of 12 acres of aquatic habitat, there would be approximately 3,600 acres of upland habitat within 1.2 miles of these water bodies that would no longer have access to these specific water bodies. However, there are multiple other locations in the vicinity that provide aquatic habitat for CTS. So, if the indirect effect is defined as upland habitat that no longer has any suitable aquatic habitat within 1.2 miles, then approximately 55 acres of upland CTS habitat would be subject to indirect effects.

Western pond turtle

Proposed Methodology from Scope of Work: Assess the indirect effect of reduced suitability/value of potential upland habitat when potential aquatic habitat is removed. The calculation of this indirect effect for western pond turtle (WPT) would follow the same general approach as described above for CTS. The maximum distance of upland habitat from aquatic habitat is identified as 1,640 feet in the HCP/NCCP habitat model; therefore, this is the distance from aquatic habitat where indirect effects will be calculated. The effects analysis will focus on complete losses of relatively isolated aquatic habitat (e.g., ponds). For linear aquatic habitat (streams, creeks) where only a small amount of the overall habitat will be removed or disturbed, indirect effects on upland habitat would not be calculated because there would still be aquatic habitat to continue supporting species populations in the immediate vicinity of suitable upland habitat.

Modified Approach: Taking into account other nearby aquatic habitat. Like the modified approach for CTS, we have refined the definition of indirect effects on upland habitat to consist of upland habitat that is no longer within 1,640 feet of <u>any</u> aquatic habitat after the estimated removal of relatively isolated aquatic habitat from covered activities.

Results: With the removal of relatively isolated portions of aquatic habitat from covered activities, there would be approximately 1,078 acres of upland habitat within 1,640 feet of these water bodies that would no longer have access to these specific water bodies. However, there are other water bodies in the vicinity of these locations that provide aquatic habitat for WPT. So, if the indirect effect is defined as upland habitat that no longer has <u>any</u> suitable aquatic habitat within 1,640 feet, then approximately 569 acres of upland WPT habitat would be subject to indirect effects.

Giant garter snake

Proposed Methodology from Scope of Work: <u>Assess the indirect effect of reduced suitability/value of potential upland habitat when potential aquatic habitat is removed.</u> The calculation of this indirect effect for giant garter snake (GGS) would follow the same general approach as described above for CTS. Suitable aquatic habitat is defined in the HCP/NCCP habitat model as the rice, aquatic, and freshwater emergent habitat categories. The maximum distance of upland habitat from aquatic habitat is identified as 200 feet for active season habitat and 800 feet for overwintering habitat. The effects analysis will focus on upland habitat that is no longer within 200 feet/800 feet of suitable aquatic habitat based on removal of aquatic habitat from covered activities.

Results:

- 68.7 acres of Active Season Upland Habitat within 200 feet of suitable aquatic habitat that is removed

- 194.8 Acres of Overwintering Habitat within 800 feet of suitable aquatic habitat that is removed

Swainson's hawk

Proposed Methodology from Scope of Work: <u>Asses the indirect effect of reduced suitability/value of potential nesting habitat when potential foraging habitat is removed.</u> Home ranges (calculated as minimum convex polygons) for 12 Swainson's hawks (SWHA) in the Central Valley, including six in Yolo County, averaged 27.6 square kilometers (km2)(10.7 square miles [mi2]) (Estep 1989). Therefore, a radius of about 3.27 miles would generally indicate the home range and foraging habitat required for successful nesting. Using this data, suitable nesting habitat, based on the HCP/NCCP habitat model will be buffered by 3.27 miles. Total currently available suitable foraging habitat within this buffer will be calculated, as well as the acreage removed by covered activities. The acres removed would be an indication of the indirect reduction in the suitability/value of nesting habitat resulting from the removal of foraging habitat within potential nest territories. This loss can be balanced against the preservation/restoration/enhancement of SWHA foraging habitat resulting from the HCP/NCCP.

Due to the size of the foraging buffer area (3.27 mile radius) and the disbursed nature of potential SWHA nesting habitat in the Plan Area, it is possible that the buffer area encompasses the whole County and there is no distinction between the indirect effect foraging habitat loss calculation and the countywide habitat loss calculated for the HCP/NCCP. If this is the case, then calculation of the indirect effect would not be needed.

Results:

Indirect Effects Analysis				*Data from HCP/NCCP*		
Category of Potential Foraging Habitat	Total Foraging Habitat Within 3.27 miles of nesting habitat	Foraging Habitat Within 3.27 miles of nesting habitat removed by covered activities	Percentage of Total Removed by Covered Activities	*Total Foraging Habitat in Plan Area (per Table 5-5 in Feb. 2016 HCP/NCCP)*	*Total Foraging Habitat Removed (per Table 5-5 in Feb. 2016 HCP/NCCP)*	*Percentage of Total Removed by Covered Activities*
Agricultural Foraging	213,900	9,101	4.25%	*214,078*	*9,399*	*4.4%*
Natural Foraging	77,948	593	0.76%	*79,336*	*1,407*	*1.8%*
Total	291,848	9,694	3.3%	*293,414*	*10,806*	*3.7%*

- Indirect effects analysis obtains results very similar to direct effect impact analysis in the HCP/NCCP. Indicates anticipated scenario that the foraging buffer is so large that it encompasses all, or almost all, foraging habitat in the County and there is no distinction between the indirect effect foraging habitat loss calculation and the countywide habitat loss calculated for the HCP/NCCP. Therefore, no result for indirect effects analysis.

White-tailed kite

Proposed Methodology from Scope of Work: Asses the indirect effect of reduced suitability/value of potential nesting habitat when potential foraging habitat is removed. The calculation of indirect effects for white-tailed kite (WTKI) would follow a similar methodology to that described above for SWHA. According to data from Appendix A in the HCP/NCCP, “White-tailed kites generally hunt from a central perch over areas as large as 3 square kilometers (km2) (Warner and Rudd 1975), but foraging usually occurs within 0.8 km from the nest during the breeding season” (Hawbecker 1942). Therefore, the indirect impact buffer for potential foraging habitat would be 0.5 miles (0.8 km) from potential nesting habitat.

Results:

Indirect Effects Analysis				*Data from HCP/NCCP*		
Category of Potential Foraging Habitat	Total Foraging Habitat Within 0.5 miles of nesting habitat	Foraging Habitat Within 0.5 miles of nesting habitat removed by covered activities	Percentage of Total Removed by Covered Activities	*Total Foraging Habitat in Plan Area (per Table 5-5 in Feb. 2016 HCP/NCCP)*	*Total Foraging Habitat Removed (per Table 5-5 in Feb. 2016 HCP/NCCP)*	*Percentage of Total Removed by Covered Activities*
Primary Foraging	97,464	2,057	2.1%	*101,758*	*2,609*	*2.6%*
Secondary Foraging	127,312	7,118	5.6%	*134,740*	*7,969*	*5.9%*
Total	224,776	9,175	4.1%	*236,498*	*10,578*	*4.5%*

- Indirect effects analysis obtains results very similar to direct effect impact analysis in the HCP/NCCP. Indicates anticipated scenario that the foraging buffer encompasses almost all foraging habitat in the County and there is no distinction between the indirect effect foraging habitat loss calculation and the countywide habitat loss calculated for the HCP/NCCP. Therefore, no result for indirect effects analysis.

Tricolored blackbird

Proposed Methodology from Scope of Work: Asses the indirect effect of reduced suitability/value of potential nesting habitat when potential foraging habitat is removed. Suggest following a similar methodology for calculating indirect impacts for tricolored blackbird (TCBB) as was described for SWHA and WTKI. Indirect impacts to nesting tricolored blackbirds would be calculated based on the acreage of potential foraging habitat removed by Covered Activities within 8 miles of modeled nesting habitat (8 miles is considered suitable foraging distance according to Appendix A in the HCP). Like for SWHA, due to the size of the foraging buffer area (8 mile radius) and the disbursed nature of potential TCBB nesting habitat in the Plan Area, it is possible that the buffer area encompasses the whole County and there is no distinction between the indirect effect foraging habitat loss calculation and the countywide habitat loss calculated for the HCP/NCCP. If this is the case, then calculation of the indirect effect would not be needed.

Results:

Indirect Effect Analysis			*Data from HCP/NCCP*		
Total Foraging Habitat Within 8 miles of nesting habitat	Foraging Habitat Within 8 miles of nesting habitat removed by covered activities	Percentage of Total Removed by Covered Activities	*Total Foraging Habitat in Plan Area (per Table 5-5 in Feb. 2016 HCP/NCCP)*	*Total Foraging Habitat Removed (per Table 5-5 in Feb. 2016 HCP/NCCP)*	*Percentage of Total Removed by Covered Activities*
261,065	7,845	3.0%	*261,133*	*8,942*	*3.4%*

- Indirect effects analysis obtains results very similar to direct effect impact analysis in the HCP/NCCP. Indicates anticipated scenario that the foraging buffer is so large that it encompasses almost all foraging habitat in the County and there is no distinction between the indirect effect foraging habitat loss calculation and the countywide habitat loss calculated for the HCP/NCCP. Therefore, no result for indirect effects analysis.

Appendix O
Giant Garter Snake Take Assessment

Memorandum

Date:	August 18, 2016
To:	Petrea Marchand, Yolo Habitat Conservancy
From:	Doug Leslie, ICF
Subject:	**Estimating Take of Individual Giant Gartersnakes (*Thamnophis gigas*) Resulting from Implementation of the Yolo HCP/NCCP**

Estimating "take" of giant gartersnakes (the number of individuals killed due to implementation of covered activities under the Yolo HCP/NCCP) is a difficult task and a number of approaches have been taken in the past. The majority of approaches use estimates of density (number of snakes per unit area) in various habitat types and multiply them by the number of acres of each habitat type predicted to be impacted. The accuracy and precision of the estimates of take are dependent on the accuracy of the estimates of density, and ignore differences among broad categories of habitat. It is imperative when estimating density to use estimates that rigorously account for imperfect detection, because giant gartersnakes (GGS) often reside in terrestrial habitats and are thus unavailable for capture. By using estimates that rigorously account for imperfect detection, it becomes unnecessary to produce separate estimates for take due to conversion of aquatic habitats and take due to conversion of associated uplands, unless uplands are impacted without impacting the associated wetland habitats.

We estimated take of GGS by multiplying the number of acres of habitat considered to be permanently impacted (Chapter 5, Table 5-5) by estimates of the density of GGS within that habitat type. We used estimates of GGS abundance (converted to density) that were rigorously estimated by accounting for imperfect detection at the time of trapping. Density estimates derived from trapping in aquatic habitat should account for imperfect detection results and snakes that are not seen or observed because they are either trap shy or not available for capture because they are in terrestrial habitats (including underground estivation sites).

For this analysis we specifically used estimates of abundance from the Natomas Basin Biological Effectiveness Monitoring Program (ICF International 2016) because these estimates are based on the latest estimation and analytical techniques, and provide a range of estimates that accounts for natural variation over time in abundance. They are also based on large sample sizes and are the most current estimates available.

We converted abundance into density by assuming an "area of influence" for each trap of 100 meters, similar to the analysis in Wylie et al (2010). At each trapping site, three transects of 50 traps each were deployed, with traps spaced 10 meters apart. Therefore, the area of influence for each set of three traplines was 15 hectares. Only one of the demographic monitoring sites from the Natomas data set was in rice. We used the highest and lowest estimates from the years 2011 - 2015 to provide a range of estimates for potential take of giant gartersnake in this habitat type. Three of the demographic monitoring sites from Natomas were in created fresh emergent marsh habitats. We used the highest and lowest estimates from these three sites (BKS, Lucich North, and Lucich South sites) over the period 2011 – 2015 to provide a range of estimates for potential take of giant gartersnake in this habitat type.

Because these estimates of take included individuals potentially occurring in adjacent upland terrestrial habitats, we did not produce separate estimates of take for conversion of these habitat categories (i.e. active season upland movement habitat or overwintering habitat, Chapter 5, Table 5-5).

However, we did produce a separate estimate of take for those situations in which upland terrestrial habitats (active season uplands only, because the probability of GGS being beyond this distance - while not zero - is too small to contribute significantly to the estimate of take) would be impacted without impacting the adjacent wetland or aquatic habitat. This estimate was produced by taking the acres of terrestrial habitat predicted to be impacted and multiplying by the density of GGS in adjacent aquatic habitat (i.e marsh or rice), which was then multiplied by the probability of GGS being in adjacent terrestrial habitats during the active season.

We estimated the density of GGS in adjacent uplands by taking the average of the high and low values for marsh and rice. We estimated the probability of GGS being in terrestrial habitats by taking the average of the probability of GGS being in terrestrial habitats for males and females in June, July, August, and September. These four months are the time period in which estimated take may occur because they constitute the official work window in GGS habitat. This time period occurs within the interval when GGS are typically most active (May 1 to October 1). We interpolated these values from Figure 3 in Halstead et al. (2015).

Although "aquatic" habitat is modelled as potential giant gartersnake habitat, conversion of this habitat type is unlikely to result in take of additional giant gartersnakes above the amount of take estimated for the other habitat types (i.e. rice, marsh, and associated uplands) because GGS typically do not occur in riverine or lacustrine habitats. Nevertheless, we produced an estimate of take for this habitat type by multiplying the number of acres to be converted by the density of GGS. We used the density estimate for seasonal wetlands from Wyllie et al (2010) to produce this estimate because this is the lowest density estimate available and density of GGS in aquatic habitat is likely to be very low relative to other habitat types.

These estimates all assume that impacts will occur during the GGS active season.

The estimates of abundance and density used in the analysis of take, as well as the estimates of take resulting from the permanent conversion of rice, fresh emergent marsh, aquatic, and Active Season Upland habitats not associated with conversion of adjacent wetlands habitats under the Yolo County HCP/NCCP, are provided in Table 1.

The resulting estimates should be considered as grossly overestimating the amount of take likely to occur. The density estimates on which the take estimates are based are biased high. Because GGS capture probabilities are so low, trapping is done in areas with the highest density of snakes and the highest probabilities of capture. Therefore, these estimates represent the highest densities of snakes and are not representative of the average density of snakes throughout the areas that will be impacted. In addition, an unknown proportion of the fresh emergent marsh habitat is actually seasonal marsh, meaning it is not flooded during the GGS summer active season. Seasonal wetlands such as these actually have the lowest densities of GGS of any habitat sampled by Wylie et al (2010), yet we used density estimates from permanently flooded emergent wetlands to produce the estimates of take. Depending on the proportion of emergent wetland predicted to be impacted comprised of winter rather than summer flooded marsh, the estimates of take are likely to be grossly overestimated. Finally, the estimates assume that no GGS will escape during construction or disturbance, even though avoidance and minimization measures have been incorporated into the Plan to ensure that take is minimized.

In addition to the high likelihood that potential take is grossly overestimated, there is large variation in the resulting estimates of take. This variation results from high variation in densities across both space and time in abundance. The high point estimate of take is more than double the low estimate. Therefore, these estimates should be considered indicative of the order of magnitude of potential take only.

We did not produce a separate estimate of take likely to result from temporary impacts because only 9 acres of habitat are predicted to be temporarily impacted. The take associated with temporary impacts to 9 acres would not appreciably add to the total estimate of take.

Table 1. Estimates of Abundance, Density, and Take of Giant Gartersnake (± Symmetric Posterior 95% Credible Interval) Resulting from the Permanent Conversion of Rice and Fresh Emergent Marsh Habitats under the Yolo County HCP/NCCP.

Habitat Type	Acres	Abundance	Density (ind/ha)	Take
Rice (Low)	87	16 (8-47)	1 (1-3)	38 (19-110)
Rice (High)	87	44 (28-75)	2 (2-5)	103 (66-176)
Fresh Emergent Marsh (Low)	76	70 (47-123)	5 (3-8)	144 (97-253)
Fresh Emergent Marsh (High)	76	264 (70-508)	18 (5-34)	542 (144-1,043)
Aquatic	109	29 (22-53)	0.83 (0.63-1.5)	37 (28-66)
Active Season Upland (Isolated)	73.8	N/A	6.6 (2.6-12.6)	133 (52-255)
Total (Low)				352 (196-684)
Total (High)				815 (290-1,540)

Literature Cited

Halstead, B. J., Skalos, S. M., Wylie, G. D., & Casazza, M. L. (2015). Terrestrial ecology of semi-aquatic giant gartersnakes (Thamnophis gigas). Herpetological Conservation and Biology, 10(2), 633–644.

ICF International. 2016. Biological Effectiveness Monitoring for the Natomas Basin Habitat Conservation Plan Area 2015 Annual Survey Results (Agency Version). Final. April. (ICF 00890.10.) Sacramento, CA. Prepared for the Natomas Basin Conservancy, Sacramento, CA.

Wylie, G. D., Casazza, M. L., Gregory, C. J., & Halstead, B. J. (2010). Abundance and Sexual Size Dimorphism of the Giant Gartersnake (Thamnophis gigas) in the Sacramento Valley of California. Journal of Herpetology, 44(1), 94–103. http://doi.org/10.1670/08-337.1

Appendix P
Management Plan Template

YOLO HABITAT CONSERVATION PLAN/NATURAL COMMUNITY CONSERVATION PLAN

Site-Specific Management Plan
TEMPLATE

DRAFT VERSION 3.1

May 2017 Version

This management plan template is a companion document to the Yolo HCP/NCCP conservation easement template and is intended to provide a general outline to assist in the development of site-specific management plans for properties included in the Yolo HCP/NCCP Reserve System.

General Notes to Reviewers

Site Management Plan; Relationship to Conservation Easement. This template anticipates the concurrent preparation of a Conservation Easement. The Conservation Easement outlines the primary prohibitions and restrictions that apply to the Conservation Easement Area while the Management Plan describes the primary activities that occur or are otherwise allowed to occur in the Easement Area in the future. As part of the implementation of the Yolo HCP/NCCP, the Yolo Habitat Conservancy will develop reserve unit management plans that outline management practices suitable for specific covered species and their associated habitat types. The reserve unit management plans will be used by the Conservancy to inform management and allowed uses described in management plans prepared for individual conservation easements. The Yolo Habitat Conservancy will work with each landowner to develop a site-specific management plan that is suitable to the specific conditions of the site and is mutually agreed upon by the landowner, the Yolo Habitat Conservancy, the California Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service.

The Yolo Habitat Conservancy recognizes that changes (e.g., in agricultural practices and technologies, weather cycles, natural resource management technologies, conservation practices) may dictate changes in the management of the Easement Area, consistent with the purposes of this Conservation Easement and the Yolo HCP/NCCP. The Management Plan may be revised from time to time only with the written approval of both the Landowner and the Yolo Habitat Conservancy (and Easement Holder in situations where the Yolo Habitat Conservancy is not the Easement Holder), so long as the revisions are consistent with the applicable Yolo HCP/NCCP Reserve Unit Management Plan(s). Any requested changes that are not consistent with the applicable Reserve Unit Management Plan(s) must also receive approval from California Department of Fish and Wildlife and U.S. Fish and Wildlife Service. A full and complete copy of the current Management Plan, including any such revisions, shall be kept on file at the offices of the Yolo Habitat Conservancy.

For each easement property, the final Conservation Easement and Management Plan ***will work together*** to specify (among other things) the allowed, restricted, and prohibited uses and activities. The Conservation Easement will generally include terms that will apply ***permanently*** to uses and activities on the easement property, while the Management Plan will contain terms relating to agriculture and other uses that may--with the consent of the landowner, Yolo Habitat Conservancy, and state and federal wildlife agencies--***vary over time*** due to changing conditions. Additionally, the site's Management Plan may contain terms relating to recreational uses, public access, and other uses and activities that are of interest to an individual landowner at the landowner's request as long as the uses are determined to be compatible with the conservation of the Conservation Values of the property.

Text Color Code Legend:
(Blue Bracketed Text) includes general notes to the reader intended to provide additional explanation.

[*Green Bracketed Text*] notes where site-specific information needs to be included. The description of the type of information is written within the brackets.

Acceptable variations to the primary text will be provided in grey text surrounded by brackets, like this: [*replace* "Yolo Habitat Conservancy" *with the* "Easement Holder" *if the Yolo Habitat Conservancy is not the Easement Holder*]

{Purple Bracketed Text} provides references to associated sections of the Yolo HCP/NCCP that may contain additional explanation or detail.

Table of Contents

1: INTRODUCTION

1.1 Purpose of Establishment

The Yolo Habitat Conservancy is currently implementing a Habitat Conservation Plan/Natural Community Conservation Plan (Yolo HCP/NCCP) and Local Conservation Strategy for Yolo County, California. The Yolo HCP/NCCP provides for the conservation of covered species[1] and protects regional biodiversity by protecting restoring, enhancing, and managing covered species habitat and important natural communities across Yolo County, including natural and agricultural landscapes that support covered species. As part of this program, the Yolo Habitat Conservancy acquires conservation easements on lands within Yolo County from willing landowners that include conservation and management conditions consistent with the biological goals and objectives of the Yolo HCP/NCCP.

A Conservation Easement has been established on an [*insert acreage of conservation easement*] acre portion of the [*insert name of site or sites*] property (Easement Area). The [*insert site name*] Conservation Easement (Conservation Easement) was filed with the Yolo County Recorder's Office on [*insert date*] and is identified as [*insert County Document code shown in top right corner of recorded easement document DOC-YEAR-restofcode-xx*]. This Management Plan was developed concurrently with the development of the Conservation Easement. Both the Conservation Easement and this Management Plan are intended to be consistent with the biological goals and objectives of the Yolo HCP/NCCP and to partially fulfill the Yolo HCP/NCCP conservation strategy.

The Conservation Values of the Easement Area are:

- *[Insert description of the Conservation Values as they are described in the Conservation Easement]*

The Easement Area contributes to the conservation strategy by:

{See Chapter 6 of the Yolo HCP/NCCP for the full description of the Yolo HCP/NCCP conservation strategy.} *[Insert a separate bullet here for each Yolo HCP/NCCP conservation strategy objective that is addressed* {See Table 6-3 of the Yolo HCP/NCCP}*. An example format for describing a conservation strategy objective is provided below.]*

- Maintaining [*insert acreage*] acres of [*insert habitat type (e.g., nesting, foraging, upland, aquatic)*] *for* [*insert covered species {a complete list of covered species is found in Table 1-1 of the Yolo HCP/NCCP}*] and [*insert land cover type providing the abovementioned habitat {this includes the land cover type(s) present on the site that provide habitat for the identified covered species and are included in Table 2-1 of the Yolo HCP/NCCP within the cultivated land category and natural communities land categories (e.g., cultivated rice lands, pasture, riparian) along with the habitat function that the identified land cover type provides (e.g., foraging, nesting, aquatic, upland habitat)}*].

[1] For a complete description of status, range, life history, threats, and modeled habitat for each covered species associated with the Yolo HCP/NCCP, see Appendix A of the Yolo HCP/NCCP Plan. Available: http://www.yoloconservationplan.org/

1.2 Purpose of Management Plan

The purpose of this Management Plan is to ensure the Easement Area is managed, monitored, and maintained in perpetuity for the covered species. This document includes a description of biological resources identified for protection and establishes specific guidelines, roles, and responsibilities for the management and monitoring of the Conservation Easement. It was developed concurrently with the development of the Conservation Easement. This Management Plan is a binding and enforceable agreement implemented in accordance with the requirements of the Yolo HCP/NCCP and the terms of the Conservation Easement covering the property.

1.3 Land Ownership, Management, and Monitoring Entities

The parties responsible for ensuring that the lands associated with the Conservation Easement are maintained in a manner consistent with the Conservation Easement are listed below. The Landowner is responsible for overseeing implementation of all management activities and site requirements of this Management Plan *[If the landowner wishes to formally designate all or a portion of this responsibility to another entity such as a Land Manager, lessee or an entity that the Landowner has willingly delegated the responsibility of all or portion of site management (crop management, habitat enhancement activities, etc.) then state so here and provide contact information below the Landowner contact information]*.

Landowner

The landowner owns fee title to the Easement Area and is responsible for managing it in a manner that is consistent with the Conservation Easement and this Management Plan. Contact information for the landowner is as follows:

Name: [*insert contact person and organization/entity where applicable*]

Contact Name: Delete if landowner is an individual

Address:

Phone number:

Email:

Conservation Easement Holder

The Conservation Easement holder is responsible for conducting, at minimum, annual compliance monitoring to ensure the Easement Area is managed and maintained in accordance with the Yolo HCP/NCCP, the Conservation Easement, and this Management Plan.

Name: [*Insert contact person and organization/entity*]

Contact Name:

Address:

Phone number:

Email:

[*In cases where the Yolo Habitat Conservancy* _is not_ *the Conservation Easement holder, a separate contact entry will be added for the Yolo Habitat Conservancy:*

Yolo Habitat Conservancy

The Yolo Habitat Conservancy oversees the implementation of the Yolo HCP/NCCP and is responsible for ensuring the activities within the Easement Area are consistent with the Yolo HCP/NCCP conservation strategy.

YHC representative contact name:

Address:

Phone number:

Email:]

2: Property Description

2.1 Location and Setting

The property is located at [*insert address or other location description*], in Yolo County, California. The Easement Area is shown on the general vicinity map (Figure 1), location map (Figure 2), and the site map (Figure 3). The general vicinity map shows the Easement Area in relation to cities, towns, or major roads, and other distinguishable landmarks. The location map shows the Easement Area and adjacent lands, and the site map shows the Easement Area and specific land management areas defined within the Conservation Easement.

Assessor's Parcel Number(s): [*insert APN(s)*]

U.S. Geological Survey 7.5-minute quadrangle: [*insert name of quad map*]

Township, Range, & Section: [*insert Township, Range, & Section*]

Figure 1: [*insert name of site*] vicinity map

Figure 2: [*insert name of site*] location map showing adjacent land uses as captured in aerial photography taken [*insert date of aerial photography*]

Figure 3: [*insert name of site*] site map showing specific land management areas as defined by the Conservation Easement

2.2 Historic and Current Land Use

[*Describe past and present land use including crop types, grazing practices and/or other significant land use activities as applicable. Describe all existing structures including roads, levees, fencing, and buildings, and whether they are located in the Easement Area or within a development envelope for sites that contain development envelopes.*]

2.3 Site Soils, Topography, and Hydrology

[Note any significant topographic features, soil conditions, hydrologic conditions associated with the site. Identify any significant hydrologic natural community types or land cover types (e.g., fresh emergent wetland, riverine, etc.) {as identified in Table 2-1 and further described in Section 2.4 of the Yolo HCP/NCCP}. Show the location of any hydrologic land cover types in Figure 3 if applicable. If the site is a cultivated agricultural lands site and present soil conditions restrict crop types that may be of interest – note as such]

2.4 Existing Easements

[*If there are existing encumbrances, include descriptions/locations of existing easements located on the property, their nature (buried pipeline, overhead power, ingress/egress, etc), authorized users (if known), access procedures, etc. Depict easements, rights of way, ingress, and egress routes in a map. If there are no existing encumbrances on the site, state so here – DO NOT DELETE THIS SECTION.]*

2.5 Adjacent Land Uses

[*Provide a description of the adjacent land uses at the time in which the Conservation Easement was established. These land uses may change over time; however, the description of the baseline conditions will give the manager some idea of the conditions present when the management plan was first developed and can bring to light areas that may be of management concern or items outside of the Easement Area that may support or compromise the integrity of the Conservation Values over time. Note any known conservation easements existing within a 2-mile radius of the property at the time in which the Conservation Easement was established, identify if any are part of the Yolo HCP/NCCP Reserve System, and show them in Figure 2.]*

3: Habitat and Species Descriptions

3.1 Conditions and Conservation Values of the Easement

[*Include a specific description of the Conservation Values of the site that includes a summary of their baseline condition. Include any applicable information about how the protection of this site fits in with protection of other adjacent sites or of specific natural community types that have been designated as important.]*

3.2 Summary of Enhancement Activities

[For sites where the Landowner has agreed to include a habitat enhancement component, include a summary of the enhancement effort and the intended outcome of the effort. This would include items such as: planting hedgerows to increase prey habitat, planting nest trees to provide additional nest habitat, creating and managing debris piles for birds and small mammals, installation of artificial burrows and perches for burrowing owls, seeding of native plant species, modification of crop type from a low habitat value crop to a high habitat value crop to increase forage value, invasive species removal, etc. Include the estimated time in which enhancements will reach mature/final desired status and what benefits those enhancements will have for covered species, other species, and the natural community at-large. Identify who is responsible for implementing the enhancement activities and who will be responsible for management over time.]

3.3 Yolo HCP/NCCP Covered Species

[*Describe all covered species that occur or may occur on the site {a complete list of covered species is found in Table 1-1 of the Yolo HCP/NCCP}.*]

4: MANAGEMENT

[This section describes both allowed and restricted management practices. Descriptions are provided below for conditions that are likely to apply to most sites. Additional management provisions will be added as applicable for specific species and land cover types. Once developed, Reserve Unit Management Plans will provide the provisions applicable to specific species habitats and land cover types.]

4.1 General Site Activities and Management

[This section summarizes general site management measures that are not specific to a land type. Activities that would be included in this section include items such as public access, fencing and gates, trash, signage, etc.]

4.1.1 Vehicle Use: *(Associated with Easement Section 4(c))*

Use of vehicles on existing roads is allowed. *[Describe vehicle use and access on other portions of the site that are allowed and/or restricted as part of ongoing site management activities.]*

4.1.2 Site Improvements: *(Associated with Easement Section 4(d))*

Construction, operation, or maintenance of buildings and facilities, that are not in existence at the time the conservation easement becomes effective, are prohibited except within any designated Development Envelope. This includes antennas, towers, and facilities for the generation and transmission of electrical power or telecommunications. The erection and maintenance of windmills, wind farms, wind generating facilities, or other facilities with exposed spinning blades are prohibited, <u>including</u> within the established Development Envelope. Electrical distribution and telecommunication facilities reasonably necessary in connection with agricultural and other authorized uses on the Property shall be allowed.

Solar power generation shall be allowed in quantities commensurate with power consumption on the Property and electrical distribution and telecommunication facilities reasonably necessary in connection with agricultural uses on the Property. Solar power generation facilities are to be located within the established Development Envelope areas. Solar panels placed directly adjacent to water pumps or similar agricultural equipment used to maintain the agricultural function of the site are allowed, so long as the disturbance area does not exceed 25 square feet in total size, and no more than one such solar panel facility exists for every 10 acres of real property within the Easement Area (areas within Development Envelopes are not subject to this size restriction).

Existing fencing may be repaired and new fences may be built anywhere on the property for purposes of reasonable and customary agricultural management, and for security in connection with authorized or reserved uses of the property. *[Describe any other site improvements (e.g., the construction, reconstruction, or relocation of signs, roads, temporary structures, etc) that are allowed within the Easement Area.]*

Paving or covering with other impervious material of any area that is presently unpaved is prohibited, except (1) land within the established Development Envelope (2) to comply with a specific governmental directive (e.g., written requirement in connection with a binding permit) regarding air quality laws, fire safety regulations, or other governmental regulations applicable to the Property. The use of gravel, crushed rock, or the lime treatment of soils is prohibited, except on (1) any roads that exist on the Property as of the date of the conservation easement, so long as said use does not expand the currently existing roads, or (2) any roads located wholly within the Development Envelope, so long as Grantor obtains Grantee's and Third Party Beneficiaries' prior written consent for the location of the same. Notwithstanding the foregoing, however, the application of lime to soils on the Property for the purpose of adjusting levels of soil pH to achieve optimal agricultural production is permitted.

4.1.3 Dumping and Waste: *(Associated with Easement Section 4(g)*

The dumping or accumulation of any kind of refuse or hazardous waste, other than the temporary storage of farm-related trash and refuse produced on the property prior to offsite disposal is prohibited. This shall not prevent the storage of agricultural chemicals, fertilizers, soil amendments, products, byproducts, and other materials for use on the Property, so long as it is done in accordance with all applicable government laws and regulations.

4.1.4 Mining: *(Associated with Easement Section 4(i)*

Mining is prohibited as set forth in the Conservation Easement.

4.1.5 Tree Removal or Cutting: *(Associated with Easement Section 4(j))*

The removal or cutting of trees on the site is prohibited except as reasonably necessary and/or prudent for: (1) fire breaks, (2) prevention or treatment of disease, or (3) removal of vegetation and debris which pose a health and safety hazard or a threat to standard agricultural operations. The cutting or removal of trees identified in (1) and (2), above, shall not occur during the Swainson's hawk nesting season (February 1 through October 1 of each calendar year, unless YHC representatives advise the landowner in writing that a different nesting season will apply based on published CDFW guidance regarding changed nesting practices). No standing tree shall be removed until YHC representatives verify at the landowner's request that the tree is not an active Swainson's hawk nest tree.

4.2 Agricultural Practices

[For applicable sites, this section will identify the specific locations in which agricultural activities occur and/or are allowed to occur, provide a general description of the agricultural practices within the defined areas, and any details regarding timing, duration, and/or quantity of practices. These items may include, but are not limited to, methods and/or timing of crop harvest under conditions where species are present, management of irrigation canals, etc. Below are examples of some topics that are applicable to this section:

4.2.1 Crops and Crop Management: *(Associated with Easement Section 4(e))*
[Describe types of crops typically planted on the site, typical rotation cycles, frequency of fallowing, etc., and identifies any crops that are prohibited based on the covered species associated with the site]

4.2.2 Herbicide, Pesticide, Biocide, and Other Chemical Use: *(Associated with Easement Section 4(b))*
[Describe chemical applications allowed as applicable to site management for cultivated lands.]

4.2.3 Soil Amendments: *(Associated with Easement Section 4(g))*
[If applicable, describe any applications of soil, compost, application of lime, or other soil amendments that are allowed as part of ongoing site management activities.]

4.2.4 Water Management: *(Associated with Easement Section 4(k))*
[Describe water source(s) used for cultivated lands, application methods for irrigating crops (flood, drip, etc), canal management, etc.]

4.2.5 Pest Management *(Associated with Easement Section 4(b))*
[Describe any pest management approaches used or otherwise allowed on the site, if applicable. Note that rodenticides use is prohibited on all easement sites.]

4.2.6 Cover Strips and Hedgerows
[Describe typical management of cover strips and/or hedgerows, if applicable.]

4.3 Natural Lands Practices

[For applicable sites, this section would summarize natural lands management practices, locations in which natural lands activities occur and/or are allowed to occur and details regarding timing, duration, and/or quantity of practices. These items may include, but are not limited to, methods and timing of invasive species management, specific allowable grazing practices, etc. Below are examples of some topics that are applicable to this section:

4.3.1 Vegetation Management: *(Associated with Easement Section 4(b))*
[Describe general vegetation management practices including management for both native species and invasive species. If applicable, describe any efforts to maintain, enhance, or restore nest trees or other vegetative

habitat features. Describe any herbicide applications allowed as applicable to invasive species management here.]

4.3.2 Soil Amendments: *(Associated with Easement Section 4(g))*

[If applicable, describe any applications of soil, compost, application of lime, or other soil amendments that are allowed as part of site enhancement or ongoing site management activities.]

4.3.3 Erosion Control:

[If applicable, describe erosion control management practices used on the site, including types of materials used, timing, and general location.]

4.3.4 Water Management: *(Associated with Easement Section 4(k))*

[Describe water source(s) and water features occurring on the site (e.g., slough, pond, wetland, etc) and their uses (e.g., for pasture, nest tree establishment, managed wetlands, livestock). Describe livestock access and exclusion from water features, application methods for distributing or applying water, canal management, protection of basking and aquatic breeding sites, etc. as applicable.]

4.3.5 Grazing Management:

[If applicable, describe any grazing that occurs on the site or is otherwise allowed to occur on the site. Include description of livestock watering sources]

4.3.6 Pest Management: *(Associated with Easement Section 4(b))*

[Describe any pest management approaches used or otherwise allowed on the site, if applicable. Note that rodenticides use is prohibited on all easement sites.]

4.3.7 Non-native predator control:

[Describe any non-native predator control approaches used or otherwise allowed on the site.]

[Additional sub-section categories will vary based on site-specific conditions and uses. Some examples of additional sub-section categories include: Erosion Control, Pond Management, Installation and Management of Artificial Nest Burrows, Basking Habitat Enhancement and Management]

4.3 Species-Specific Management Practices

[This section describes any management practices occurring in the easement area that are conducted to protect the conservation values of the site that are not already addressed in the sections above. Management practices described here are generally species-specific and will vary depending on the nature of the site and the Conservation Values identified in the Conservation Easement. Examples of management practices that may be included: managing debris piles for birds and small mammals, managing artificial burrows and perches for burrowing owls, protecting upland basking and overwintering sites, etc.]

4.5 Avoidance and Minimization Measures

[This section will list all of the Avoidance and Minimization Measures applicable to the site including: general AMMs, natural community specific AMMs, and covered species specific AMM {see Table 4-1 of the Yolo HCP/NCCP}]

5: MONITORING

5.1 Annual Monitoring

As required by the Yolo HCP/NCCP, sites that are part of the reserve system will be visited annually at a minimum by the Yolo Habitat Conservancy [*replace Yolo Habitat Conservancy with* "Conservation Easement Holder" *if the Conservation Easement Holder is not the Yolo Habitat Conservancy*], or its assigned representative. Monitoring activities are intended to achieve the following objectives:

- Ensure compliance with the site's Management Plan and Conservation Easement requirements;
- Measure the effectiveness of management activities in achieving the habitat and/or species conservation goals of the site's Management Plan and Conservation Easement; and
- Assess the status of covered and other native species, natural communities, and ecosystem processes on the site as a part of the overall Yolo HCP/NCCP monitoring program.

The Conservation Easement describes the limitations on access for these purposes.
[*Insert any language regarding specific timing of monitoring based on species or habitat factors (e.g., timing of species presence or a particular life stage*].

5.2 Actions Based on Monitoring

Results of monitoring will be used to ensure compliance with the Management Plan and to make recommendations with regard to:

- Habitat enhancement measures;
- Problems that need near-term or long-term attention (e.g., invasive species removal, fence repair); and
- Changes in the monitoring or management program.

Noncompliance with the Conservation Easement and/or Management Plan provisions will be addressed in accordance with the provisions of the Conservation Easement.

5.3 Other Yolo HCP/NCCP related monitoring

[Include any landscape-level types of monitoring that might not otherwise be incorporated into the site-specific annual monitoring– Things like covered species counts or invasive species monitoring that occurs across the Reserve. Provide any details regarding timing, location, and methods as agreed upon by both the Landowner and the Yolo Habitat Conservancy]

6: AMENDMENTS, TRANSFERS, AND NOTICES

6.1 Amendments to Management

It is recognized that future unforeseen circumstances may arise that warrant the review and modification of the terms of the Management Plan to achieve the management goals. Any of the participating parties may request a modification to this Management Plan as long as the requested change meets or exceeds the existing ability of Management Plan activities to meet the management objectives and preserves the habitat and conservation values of the property. Any changes to the terms outlined in this Management Plan will require agreement of the Landowner and the Conservation Easement Holder [*also include the Yolo Habitat Conservancy if they are not the Conservation Easement holder*]. Parties that have been identified as third-party entities in the Conservation Easement shall also be provided with notification and an opportunity to review and provide comments on any proposed amendments.

All proposed amendments shall be formalized in writing with the agreement of all parties as an update to this Management Plan. All modifications must be consistent with the requirements of the Yolo HCP/NCCP and the terms of the Conservation Easement.

6.2 Transfer of Responsibilities

Any subsequent landowner of the Conservation Easement area site assumes the responsibilities described in this Management Plan and as required in the Conservation Easement. The Conservation Easement holder [*and Yolo Habitat Conservancy– if Yolo Habitat Conservancy is not the easement holder*] shall be notified in writing of any transfer of land ownership or land management responsibilities under this Management Plan. Any transfer of responsibilities shall be incorporated into an updated version of this Management Plan and kept on file by all parties.

6.3 Notices

[This section is a place to insert contact information for Conservation Easement third-party entities or other entities that should receive notifications beyond those listed in Section 1.2. If this is not needed, this Section can be removed]

In addition to the entities named in Section 1.2, the following entities shall be provided with written notice of any proposed modifications to this Management Plan: