II. BIOLOGICAL DATA

A. ENVIRONMENTAL SETTING

The Natomas Basin is a low lying area in the Sacramento Valley, California, located east of the Sacramento River and north of its confluence with the American River, (see Figure 4, Aerial Photograph). The Plan Area encompasses 53,537 acres within the Natomas Basin, of which 16,881 acres lie in Sutter County and 36,656 acres lie in Sacramento County (see Figure 2, Land Use Agencies "Permit Areas" and Affected Jurisdictions). Of the 36,656 acres within the Natomas Basin, 23,820 acres lie within the jurisdiction of unincorporated Sacramento County and 12,836 acres lie within the City of Sacramento. The Natomas Basin is defined as the area, inside the peripheral levees, and extends to the toe of the levee on the Basin side of boundary levees.

Prior to modern reclamation efforts, drainage off the western slopes of the Sierra Nevada produced regular flooding and created the Natomas Basin as an area of highly fertile, alluvial soils. This early condition is reflected in Figure 5, 1908 Land Cover, which shows the large American Lakes, a large extent of riparian scrub-shrub (e.g., willows), and a large expanse of dry farmed open plain. Since 1914, land reclamation and reclamation facilities, canals, levees and pumping stations have allowed over 80% of the Basin to be converted to agricultural production. A high proportion of the soils in the Natomas Basin are underlain by impervious clay, which creates the poor drainage conditions favoring irrigated rice farming, which became prevalent in the 1940s.

Today, the predominant crops produced in the Natomas Basin are rice, corn, grain, tomatoes and pasture lands. The overall topography of the Basin remains a shallow bowl, but the irregular small-scale topographic features of the original landscape have largely been eliminated by agriculture. See Figure 6, Current Topography. The drainage pattern of the Basin has been altered so that runoff is pumped into the surrounding canals and the Sacramento River at several places. Even with pumping, portions of the area are subject to shallow flooding from rain falling in the Basin that cannot be conveyed quickly enough to external drainage systems. See Figure 7, Flood Prone Areas.

Natural and uncultivated vegetation types are interspersed throughout the agricultural areas of Natomas Basin. See Figures 9 - 11, Habitat Types Maps (1993 - 2001). Natural vegetation is found primarily along irrigation canals, drainage ditches, pastures, and uncultivated fields. Borders of canals and ditches often have narrow strips of emergent vegetation (cattails and bulrushes) or wooded riparian areas. The presence of these water conveyance systems, operated by Natomas Mutual and RD 1000 among the mosaic of agricultural fields and riparian areas, provide important nesting, feeding, and migration corridor habitat for a variety of wildlife species inhabiting the Basin.

B. HABITAT DISTRIBUTION

To assist in the analysis of expected habitat changes, standard categories of existing land uses and a GIS database were developed to provide a framework for predicting future land area assigned to each of these categories. The year 1997 is the initial year in which land use characteristics are considered because the previous take permits were approved in 1997. Additional information available since 1997 and field data gathered in 2001 were used to supplement and update the 1997 data. This updated information is referred to in this report as the "HCP baseline" and is referred to as the 2001 Land Use or Habitat Acreage Inventory. The primary steps in developing the land use database are presented below.

(1) Digital aerial photos were obtained from the U.S. Geological Survey and assembled into a mosaic containing surrounding levees, providing a total area of 53,537 acres.

(2) A land use classification system was developed, focusing on the habitat information necessary for this specific analysis. Eighteen land use categories were developed, which are described in Table II-1.

(3) Land use data from the Department of Water Resources (DWR) was added to the GIS database, and the DWR categories were translated to match the eighteen land use categories developed for the project.

(4) The resulting land use map was modified to a limited extent based on field data collected by May & Associates. This resulted in a greater level of detail (a one-acre minimum polygon) and a more accurate map. Jurisdictional boundaries were added to the GIS database. Because lands in agricultural production and, in particular, rice cultivation, is in flux within developing areas in the City of Sacramento and within the MAP HCP area, the acreages shown for agricultural and rice production do not reflect all lands removed from agricultural production since 1997. In particular, the acreage depicting rice production within the MAP HCP area reflects rice lands as of the 1997 baseline. Since 1997, no lands within the MAP HCP have been in rice production.

Following the completion of the baseline scenario described above, the last step in the development of the database was to develop a future land use scenario corresponding to buildout conditions in the Natomas Basin. This buildout condition includes the planned land development activities of the City and Sutter County, and also includes the development of the Metro Air Park project in unincorporated Sacramento County. Although Sacramento County is not a participant, the NBHCP includes the 1,983 acres comprising the MAP area within the 17,500 acres of Planned Development addressed under the NBHCP.

This analysis has divided land within the Natomas Basin into eighteen land use classifications. Acreage for each land use class were calculated in 1997 and are presented in Table II-1 below. There are a total of 53,537 acres in the Basin with over 65% of the

acreage in rice or non-rice crops. A small portion, less than 4%, of the acreage is within the Metro Air Park area.

TABLE II – 1
LAND CLASSIFICATIONS IN THE NATOMAS BASIN - 1997 (ACRES)

Land Use Class[a]	City of Sacramento	Metro Air Park	Other Sacramento County	Sutter County	TOTAL
Airport	18	0	1,512	21	1,551
Alfalfa	0	0	137	234	371
Canals	129	0	308	66	503
Grassland	454	0	293	138	886
Highways	450	0	414	571	1,435
Idle	838	50	480	94	1,464
Non-rice Crops	4,905	325	8,591	2,866	16,686
Oak groves	15	2	70	11	98
Orchard	13	0	169	0	182
Other	148	0	305	15	468
Pasture	35	22	261	355	674
Ponds and seasonally wet areas	7	4	75	10	96
Rice	987	1,541	8,427	11,737	22,693
Riparian	24	0	93	6	124
Ruderal	1,429	6	261	274	1,970
Rural residential	49	10	170	148	377
Tree groves	36	23	39	8	106
Urban	3,298	0	229	327	3,854
TOTAL	**12,836**	**1,983**	**21,836**	**16,881**	**53,537**

Source: Habitat and land Use Assessment Database (CH2MHill, 2001)

a. See definition of Land Use Classes below.

b. The Canal land use category includes only Class I canals and drains, the largest canals and drains that are digitized as area features in the GIS database. Class II, III, and IV canals and drains are not included in this table because they are linear features in the GIS database. For a detailed description of canals and drains, both as area and linear features, see Tables II-2 and II-3.

Note: Urban uses noted herein reflect 2001 conditions. Agricultural cover types reflect 1997 uses. Since 1997, all rice production within Metro Air Park has been discontinued.

Definitions of Land Use Classes

Airport	Lands within the ownership boundary for the Sacramento International Airport, including all land use types (e.g., facilities, runways, open lands and farmlands adjacent to runways) within boundary. Does not include airport buffer lands (e.g., south of I-5). Also includes the former Natomas Air Park and several small rural airstrips (one in Sacramento County and two in Sutter County).
Alfalfa	Based on a subset of the DWR "Pasture" land use category that includes alfalfa production, as estimated for the 1997 baseline. Includes known alfalfa fields along Garden Highway in Sutter County.
Canals	The largest (Class I) canals and drains (including adjacent maintenance roads) in the Natomas Basin, primarily the ones already digitized for the DWR land use maps. Includes the East Drain, West Drain, Main Drain, North Drain, and the Central Main Canal. Does not include smaller canals and drains, which are recorded in the project database as linear features.
Grassland	Based on DWR "Native Vegetation" land use category with additional information provided by May & Associates field data and aerial photo interpretation, as estimated for the 1997 baseline. Includes known uncultivated grasslands, primarily along the eastern border of the Natomas Basin.
Highways	Includes Interstates 5 and 80, S.R. 99/70, and interchanges, including all areas within medians.
Idle	Based on DWR "Idle" land use category - agricultural lands temporarily out of production.
Non-Rice Crops	Based on the DWR land use categories of "Grain and Hay Crops", "Field Crops," and "Tilled Lands." In the Natomas Basin, this category includes primarily wheat, corn, safflower, and tomatoes.
Oak Groves	Includes several isolated pockets of mature oak trees east of Garden Highway.
Orchard	Based on the DWR land use categories of "Deciduous Fruits/Nuts" and "Citrus and Subtropical". In the Natomas Basin, this includes primarily pear, peach, and walnut orchards adjacent to Garden Highway.
Other	Miscellaneous land uses not captured by other land use categories. Includes Teal Bend Golf Course, the wastewater plant at Sacramento International Airport, and several utility substations.

Pasture	Based on DWR "Pasture" land use category, including primarily irrigated pasture in the Natomas Basin.
Ponds/Wet Areas	Wetland/marsh areas including the area around the North Drain (near RD 1000 Pumping Plant #2) and several isolated locations throughout the Natomas Basin. Based on DWR's "Water Surface" land use category and some "Riparian Vegetation" categories, with additional information provided by May & Associates data and aerial photo interpretation.
Rice	Based on DWR's "Rice" land use category.
Riparian	Based on DWR's primary "Riparian" category, with additional information provided by May & Associates data. Includes cottonwood/willow areas along primary canals and drains, including the Fisherman's Lake area.
Ruderal	Includes former agricultural lands that are no longer in production, primarily due to proximity to urbanized areas (e.g., surrounding Arco Arena). Includes DWR's "Barren" and "Vacant" land use categories. Ruderal lands typically consist of non-native grasses, and most are occasionally tilled for fire control.
Rural Residential	Includes farmhouses and farm equipment yards. Includes DWR's "Semi-Agricultural" land use category, with additional information provided by aerial photo interpretation.
Tree Groves	Includes non-riparian stands of trees other than mature oaks. Based on DWR's "Native Vegetation" land use category, with additional information by May & Associates data and aerial photo interpretation.
Urban	Urbanized areas. Primarily in the City of Sacramento, but also including unincorporated areas along El Centro Road in Sacramento County and Pacific Avenue in Sutter County.

The system of canals and drains owned and maintained by RD 1000 and Natomas Mutual has been analyzed based on data obtained from RD 1000 and Natomas Mutual and field data collected by May & Associates. The canals and drains were divided into four categories: Class I (the Canal land use category including the primary drainage system), Class II (large), Class III (medium), and Class IV (small). The following Tables II-2 and II-3 show the number of miles and acres of canals and drains in the Natomas Basin by jurisdiction for the year 1997, as updated by CH2MHill in 2001.

TABLE II – 2
CANALS AND DRAINS IN THE NATOMAS BASIN – 2001 (MILES)

Canal Type	City of Sacramento	Metro Air Park	Other Sacramento County	Sutter County	Total

Canal Type	City of Sacramento	Metro Air Park	Other Sacramento County	Sutter County	Total
Class I	13.9	1.4	13.6	7.1	36.0
Class II	4.0	4.0	18.0	24.5	50.5
Class III	15.1	3.5	50.5	28.5	97.6
Class IV	5.1	4.1	31.4	22.3	62.9
TOTAL	**38.1**	**11.6**	**114.9**	**82.4**	**246.9**

Source:CH2M Hill, September 2001.

TABLE II – 3
CANALS AND DRAINS IN THE NATOMAS BASIN - 2001 (ACRES)

Canal Type	City of Sacramento	Metro Air Park	Other Sacramento County	Sutter County	Total
Class I	129	0	308	66	503
Class II[a]	32	32	144	196	404
Class III[a]	90	21	301	170	582
Class IV[a]	23	19	145	103	289
TOTAL	**275**	**72**	**898**	**534**	**1,779**

Source:CH2M Hill, September 2001.

a Class II, III, and IV canals and drains are linear features in the GIS database. Conversion to area features required using a standard width for each canal type, which was determined to be 65.9, 49.2, and 38.0 feet for Class II, III, and IV canals, respectively, based on information from Natomas Mutual. These standard widths include adjacent upland areas (e.g., maintenance roads) in addition to channel width.

b Class 1 canal acreage located within Metro Air Park is shown under Other Sacramento County.

C. COVERED SPECIES

The NBHCP provides for the conservation of 22 wildlife and plant species that either exist or may exist within the Natomas Basin. Two of the Covered Species, Swainson's hawk and giant garter snake have influenced the structure of the NBHCP for the following reasons: (1) both species are prominent within and surrounding the Natomas Basin; (2) both are listed as state threatened species and the giant garter snake is also a federal listed threatened species; and (3) as a wetland species (giant garter snake) and upland foraging species (Swainson's hawk), the habitat necessary to support the two species provides to varying extent the habitat types utilized during some or all of the life cycles of the remaining Covered Species.

While giant garter snake (GGS) and the Swainson's hawk are known to occur

widely throughout the Natomas Basin, at least 10 of the remaining Covered Species are also known to or likely to occur within the Basin in limited areas or during certain periods of the year. Take of Covered Species other than the hawk and snake may occur as a result of Authorized Development by the Land Use Permittees or the Water Agencies Covered Activities, or as a result of management activities carried out by TNBC. Some species either do not occur widely in the Natomas Basin, or may become established more widely in the future. If Covered Species that are currently infrequent visitors should increase usage of the Natomas Basin, then TNBC in consultation with the NBHCP TAC, would consider modifying reserve management strategies to better accommodate and support the increasing populations of such Covered Species.

Six of the seven covered birds species are migratory (Aleutian Canada goose, bank swallow, burrowing owl, Swainson's hawk, tricolored blackbird, white-faced ibis), and one is resident (loggerhead shrike). Four of the covered bird species are currently known to breed in the Basin (Swainson's hawk, burrowing owl, tricolored blackbird, loggerhead shrike). Two species, whitefaced ibis and bank swallow, could potentially nest in the Basin if suitable nesting habitat becomes available. The remaining animal and plant species are year-round residents of their habitats.

Generally, species using the Natomas Basin occur in three general habitat associations.

Wetland associated species, upland associated species and vernal pool associated species.

Wetland Associated Species. Several species use marsh and wet areas as well as vernal pool areas. These species may also require upland areas that are associated with wet areas. These associated wetland species covered by the NBHCP include:

Giant garter snake
Aleutian Canada goose
Tricolored blackbird
White faced ibis
Northwestern pond turtle
California tiger salamander
Western spadefoot toad
Delta tule pea
Sanford's arrowhead

Giant garter snake prefers marshlands which are extremely limited in the Natomas Basin. As a result this species has adapted to use rice fields and canals. The NBHCP through development of managed marsh reserves and preservation of rice reserves will provide managed habitat to support the needs of this species and associated upland species.

Aleutian Canada goose is a winter visitor to the Natomas Basin and forages and rests in the area, but is not known to breed in the basin. Although, there are no known occurrences of the Aleutian Canada goose in the NBHCP Plan area, the NBHCP

includes policies to support resting and foraging for this species in the reserve system areas. Thus, preservation of the rice landscape included in the mitigation plan will also support winter foraging and resting areas for the Aleutian Canada goose.

White faced ibis uses rice fields, ditches and other wet areas for foraging and prefers extensive marsh areas for nesting. Because there is so little native marsh in the Natomas Basin, there are no known nesting sites of the white faced ibis in the plan area. Creation of new managed marsh mitigation lands and the wetland reserve management policies have been designed to all support species such as the white faced ibis.

Tricolored blackbird uses marshes, rice fields and meadows for foraging and nesting. Again because of the limited amount of native marsh remaining in the Plan Area, breeding populations of this species have declined over the last several decades. The managed marsh reserves which include both marshes and upland areas (for foraging) will also benefit this species.

Northwestern pond turtle, California tiger salamander and western spadefoot toad are all species that use wetland areas with associated uplands as habitat. The pond turtle prefers marshlands and other slow moving waters, but also uses upland areas for basking, egg laying and overwintering. This habitat is similar to the requirements for the giant garter snake and the reserve management requirements for managed marsh. Similarly, western spadefoot toad requires shallow seasonal wetlands for breeding. Finally, the California tiger salamander is an aquatic breeder and therefore requires ponds, marsh or other shallow or slow moving waters for breeding. The juvenile and adult salamanders utilize upland grass areas for habitat once metamorphosis has occurred. Thus, all three of these species require marsh or wetland areas with associated uplands. These species will benefit by the substantial increase in managed marsh habitat under the 0.5 to 1 mitigation ratio. Vernal pool avoidance policies included in the NBHCP will further protect habitat for these species.

Delta tule pea and Sanford's arrowhead, two plant species, are associated with wetland and marsh areas. Neither species have known occurrences in the NBHCP Plan Area largely because of the lack of marsh and wetlands remaining in the area. Thus, under the NBHCP managed marsh management strategies, these species will also benefit from the increase in marsh reserves provided by the NBHCP.

Vernal Pool Associated Species. Related to marsh habitat enhancement strategies are avoidance and minimization strategies to protect vernal pool associated species. Vernal pool species are the most difficult to develop mitigation for since none of the vernal pool covered species are known to be present in the Natomas Basin. There are however, limited vernal pools on the eastern edge of the Natomas Basin which may support these species. The NBHCP includes USFWS survey protocols and mitigation through 1) avoidance and on-site preservation or 2) payment into a USFWS Mitigation Bank. Covered species which may use vernal pool habitat include: Midvalley fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, Boggs Lake hedge-hyssop, Colusa grass, legenere, Sacramento orcutt grass, and slender orcutt grass.

Upland Associated Species. Nearly all covered bird and animal species (with the

exception of certain VP species) need some upland areas for basking, hibernaculae, cover or foraging. Upland areas of the reserve system will be designed to support foraging and/or perching habitats for the Swainson's hawk, loggerhead shrike, tricolored blackbird and bank swallow. Burrowing owl may also use upland areas, as well as the upland portions of marsh and rice levees for burrows. As noted above, although the *California Tiger Salamander* is an aquatic breeder, this species also uses upland areas during advanced juvenile and adult stages. Thus, the reserve management strategies seek to provide an upland habitats to support a variety of upland associated species. Each Site Specific Management Plan prepared for reserves, will consider the potential for the reserve to optimally support multiple upland species. Additionally each upland reserve Site Specific Management Plan will also address vegetation needs such as nesting trees for upland covered species.

1. Species Potentially Affected by Covered Activities

a. General Distribution/NDDB Records

Early in the NBHCP process, the USFWS provided a list of species with the potential to occur in the Natomas Basin. This list was eventually modified to develop the Covered Species list shown in Table I-1. To offset the potential impacts of habitat loss on these species, the goal of the NBHCP is to mitigate on a habitat protection basis. The NBHCP specifically focuses on impacts and mitigation requirements for two listed species known to occur extensively in the NBHCP area -- the federally and state listed giant garter snake (GGS), associated primarily with wetland habitats, and the state listed Swainson's hawk, associated primarily with upland habitat. Although the federally listed vernal pool species shown in Table I-1 are addressed in this Plan and are included under the incidental take permits under defined circumstances, take of these species is expected to be limited because the Natomas Basin no longer contains large intact vernal pool grassland complexes and isolated vernal pool habitats may occur within areas that are to be developed but is expected to be relatively small in extent and amount (see Section IV.C.54.). Thus, protection of wetland and upland habitats described under the NBHCP for the giant garter snake, Swainson's hawk, and listed vernal pool species is expected to provide significant levels of protection for each of the other species associated with these habitats, as shown in Table I-1.

The NBHCP emphasizes conservation of the overall ecosystem of the Natomas Basin by maintaining and enhancing a combination of wetland and upland habitat values, and by ensuring that all the species shown in Table I-1 are protected by the provisions of the Plan. It is expected that the measures described in the Plan will provide benefits for both those species that are listed under the ESA and CESA and for other unlisted species, some of which may become listed in the future. As explained in Chapter I, the Section 10(a)(1)(B) and Section 2081 permits issued in association with the NBHCP will apply to all species listed in Table I-1.

A search of the California Natural Diversity Data Base (NDDB) was conducted August 3, 2000, to determine known occurrences of listed or candidate species within the Natomas Basin. Although the NDDB may not contain all records of sightings within an area, it is the most consistent published source of information available. NDDB

records are not localized as to parcel; rather, sightings in a fairly large radius are shown as one record. Thus, the NDDB shows the general distribution of species. NDDB occurrence records were used to determine which listed, candidate, or other species were likely to occur in the Basin and to estimate their distribution. The giant garter snake and Swainson's hawk are discussed in Section II.C.2 and II.C.3 below, respectively. Other Covered Species that are currently known within the Plan Area or have the potential to occur there are discussed below in Section C.4.

Species occurrences in the Plan Area known from Giant Garter Snake and Swainson's Hawk reports and other species' records are shown in Figure 12, Giant Garter Snake Records; Figure 13, Swainson's Hawk Records; and Figure 14, Other Species Records. Figure 12 reflects published information and illustrates the occurrence of giant garter snakes throughout the Basin. Unpublished records (George Hansen, pers. comm.) also confirm the widespread distribution of the giant garter snake in the Natomas Basin. Figure 13 reflects published information from the 2001 Annual Report prepared by the Swainson's Hawk Technical Advisory Council. However, the vast majority of the Basin is private land and has not been systematically surveyed for all Covered Species. The species with the most documented occurrences in the Basin are the giant garter snake and Swainson's hawk. As stated above, these species are the main focus of mitigation efforts under the Plan.

b. Fish Species Not Covered by the Plan

The following listed fish species -- Spring and Winter run chinook salmon, steelhead, delta smelt, and Sacramento splittail -- will not be covered by the Plan and its associated Section 10(a)(1)(B) and Section 2081 permits. Those fish species will not be covered by the Plan because the effects of water intake entrainment from the Sacramento River will be addressed and analyzed through a separate Section 7 consultation with NMFS. In anticipation of that separate permit, Natomas Mutual is working with federal and state agencies to design fish screens to minimize the take of riverine species. The fish screens are expected to be completed in 2003 or later.

The utilization of distinct permits processes is indicative of the fact that those fish species and terrestrial species (e.g., the giant garter snake) depend upon different, and sometimes conflicting, habitat resources. For example, existing diversions from the Sacramento River create Spring, Summer, and early Fall water on which existing giant garter snake populations depend. At the same time, existing diversions create a risk for those fish species. However, the principal conservation methods to be used by the Plan for wetland habitats do not require more water than is currently used to grow rice on the same land area. Therefore, establishment of the Plan will not increase the dependence on external water supplies or increase the amount of future water diversions, which would affect these fish species.

2. Giant Garter Snake (*Thamnophis gigas*)

a. Species Description and Taxonomy

The giant garter snake is one of the largest garter snakes of the genus

Thamnophis, with a total length up to 4.5 feet or greater. The garter snake in the Sacramento Valley and Delta regions has a dorsal ground color often dark brown to olive or nearly black, a complete dorsal strip varying in color from dull yellow to bright orange, and sometimes orange on the ventral surfaces as well (Hansen 1992). The giant garter snake was formerly listed as a sub-species of *Thamnophis elegans* but was elevated to a full species status as *T. gigas*. Since *T. gigas* is adapted to a different ecological habitat than other subspecies of either *T. elegans* or *T. couchii*, *T. gigas* is largely isolated from its related species and sub-species. The following description of the life history of the giant garter snake is taken from reports written by John Brode and George Hansen (see References section, Chapter VIII, and other personal communications).

The giant garter snake is listed as a threatened species under the Federal Endangered Species Act and the California Endangered Species Act. The giant garter snake is an endemic species of wetlands in the Central Valley of California. Historically, giant garter snakes were found from the vicinity of Butte County southward to Bakersfield in Kern County. Today, populations of the giant garter snake are found in the Sacramento Valley and in isolated pockets of the San Joaquin Valley.

b. Activity Cycle/Behavior

In the Basin, the GGS annual cycle and habitat utilization generally occur in the following pattern. By the end of October, GGS begin entering their winter retreats in rodent burrows excavated in channel and canal banks, rubble piles, and other upland sites. After emergence from winter retreats, which occurs by late March or early April, GGS utilize canals with water that persists through the summer months. Many of the canals contain adequate emergent aquatic vegetation and steep, vegetated banks that provide cover and an abundant food supply of small fish, tadpoles and frogs. However, current canal maintenance practices have rendered many of the major canals in the basin unusable. Rice fields are also utilized by GGS, with this seasonal use beginning after rice growth is sufficiently high to provide cover. Following pre-harvest rice field draining, GGS move out of rice fields and re-enter canals where they often find prey stranded in pools of water left behind from the flooding of the rice fields. After the fields have been drained, the GGS returns to its winter retreat.

Seasonal

Adult and juvenile giant garter snakes emerge from their winter retreats in late March or early April and bask on elevated ground at overwintering sites. They are active from the time of emergence to the end of October, with surface activity concentrated from April to October.

Daily

Hansen and Brode (1992b) describe the daily activity of the GGS to generally include "emergence from burrows in the bank after sunrise; basking to warm its body to activity temperatures during cool weather or cool early mornings; and foraging or courting activity throughout the remainder of the day. GGS were observed several times after sunset during hot weather, usually lying motionless on warm pavement or

dirt roads." Giant garter snakes will move distances of five miles over the course of a few days, and have been documented to move as much as one mile in a single day. Typically, the GGS moves between zero and thirty meters in a day. They may use stretches of unvegetated canals as dispersal corridors; however, they typically do not remain in such canals long because without cover they are vulnerable to predation.

Reproduction

Giant garter snakes have been observed mating on vegetated canal banks or on stands of emergent vegetation from April to May. After breeding, the males and females separate and continue feeding. Gravid females continue to feed through the summer. Females give birth about 120 days after breeding (e.g. breeding in April and bearing young in August). Females three years of age and older can begin to reproduce. Clutch size for young snakes is usually small, however, with 8 to 10 young. Clutch size increases with age of female, reaching as high as 50 young for a 10 to 12 year old female (4 to 5 feet in length). Females can probably clutch each year, but reproductive success may depend on whether they recover their body weight after they bear.

c. Habitat Components/Requirements

The giant garter snake inhabits agricultural wetlands and other waterways, such as irrigation and drainage canals, rice lands, marshes, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley. This species prefers freshwater marshes and low gradient streams, and has adapted to drainage canals and irrigation ditches for habitat. This species is the most aquatic of the garter snakes in California. Habitats currently known to support giant garter snakes include Gilsizer Slough, Badger Creek, and Colusa National Wildlife Refuge, Sacramento National Wildlife Refuge, Delevan National Wildlife Refuge, Sutter National Wildlife Refuge, and Gray Lodge Wildlife Area.

The agricultural and flood control activities of the 20th century have greatly reduced the habitat for the giant garter snake. Uncontrolled seasonal flooding of the Sacramento Valley historically provided expansive areas of giant garter snake habitat. As a result of habitat loss and fragmentation, declining populations and continuing threats to the remaining populations, the giant garter snake was listed as a threatened species by the State of California in 1971 and a federally threatened species in 1993.

Components

Generally, the habitat components most important to giant garter snake survival are: (1) water, including permanent water that persists through the summer months; (2) emergent aquatic vegetation and steep, vegetated banks for cover; and (3) an abundant food supply (Glenn Wylie, BRD, pers. comm.). Other important components are adjacent upland areas with small mammal burrows or other suitable winter retreats, upland habitat with grassy banks for refuge from flood and openings in the vegetation for basking, and habitat diversity. The giant garter snake occurs in a combination of permanent and seasonal freshwater habitats and conducts most of its activities within the immediate vicinity of water. Giant garter snakes usually occur within a few feet of

water (i.e., within escape distance) and are often found between the water level and the top of adjacent banks or embankments.

Seasonal and Permanent Marsh

As the name implies, a seasonal marsh is flooded seasonally to accomplish a variety of purposes, including benefits to wildlife and vegetation management. The time of year when a seasonal marsh is flooded depends on the wildlife species being targeted (e.g., winter for waterfowl). Permanent marshes retain water year round. Giant garter snakes are known to use a variety of seasonal and permanent marsh habitats. Recent telemetry studies have shown the GGS prefer permanent marshes or canals with permanent marsh-like conditions. Native marsh habitats are nearly non-existent in the Natomas Basin and constitute less than 0.2% of the Natomas Basin. As such, the giant garter snake populations have overtime, adapted to the inundated (flooded) rice fields and related irrigation ditches in the Natomas Basin.

Rice Fields

Giant garter snakes are known to utilize rice fields for some of their habitat needs (Brode and Hansen 1992), along with associated features of the Natomas Basin rice growing landscape, including the canals, ditches, and drains of the Basin's water conveyance systems, the higher ground of levees and railroad embankments, and sloughs and marshes. Gravid female garter snakes, for example, have been observed to utilize maturing rice fields and to remain in the rice fields to feed after parturition; neonate garter snakes have also been observed feeding in rice fields (Hansen, pers. comm.). In studies conducted by the U.S.G.S. Biological Resources Division (BRD), 50% of radio-telemetered giant garter snakes have been observed in rice fields, especially along the edges of the fields, and when the rice plants are high enough to provide sufficient cover (Glenn Wylie, pers. comm.).

Giant garter snake seasonal activity associated with rice cultivation typically occurs as follows:

Spring:	Rice is planted and the fields are flooded with several inches of water. Prey species (e.g., small fish and frogs) migrate into rice fields from ditches and drains that retain water year round and where they overwinter, eventually attracting giant garter snakes into the fields.
Summer:	Once the rice plants are high enough to provide cover, giant garter snakes use the rice fields to feed and bear their young (see above). They will use the fields so long as there is sufficient water and quantities of prey.
Late Summer /Fall:	The water is drained from the rice fields and garter snakes move off the fields to other adjacent habitats. The rice is harvested. At this time female garter snakes have just borne young and need food to regain their body weight. Prey species that were in the rice fields

now concentrate in the ditches and drains, where the snakes can find a ready food source.

Winter: Giant garter snakes enter a dormant period inside winter retreats (e.g., small mammal burrows). While the rice fields lie fallow, many are intentionally flooded in Winter to be used by migrating waterfowl.

Irrigation Canals/Drainage Ditches

Giant garter snakes adapt well to man-made waterways as represented by the Natomas Basin's water conveyance system. In fact, the Basin's irrigation canals and drainage ditches, together with their associated levees and adjacent embankments, are probably an essential component of giant garter snake habitat in the Basin. Irrigation canals provide not only an essential habitat area potentially containing all the habitat components described above, but also create dispersal corridors allowing garter snakes to move from one area to another in search of mates, new territories, summer habitat, etc. Irrigation ditches and canals constituted 50% of all habitat use by giant garter snakes radio-telemetered by the BRD at Gilsizer Slough, which is outside of the Natomas Basin (Glenn Wylie, pers. comm.). Hansen and Brode (1992b) also provide data illustrating extensive use of water conveyance structures by giant garter snakes.

The relationships of rice fields, irrigation ditches, and canals to each other, as well as their relative importance as habitat for the giant garter snake, are not fully understood. Giant garter snakes have been found in some areas where rice is not grown and the number of irrigation structures is low (e.g., Badger Creek in southern Sacramento County). However, it appears that giant garter snakes are usually not found in agricultural areas where rice is not the predominant crop (Brode and Hansen 1992). Irrigation ditches and drains appear to provide valuable giant garter snake habitat as long as they have: (1) enough water during the active summer season to supply food and cover (minimum April - July; optimum March - October); (2) grassy banks for basking; (3) emergent vegetation for cover during the active season (March - October); and (4) nearby high ground or uplands that provide cover and refuge from flood waters during the dormant season (October - March) (Brode and Hansen 1992).

In rice farming areas, giant garter snakes are most often found in older ditches with steep sides. V-shaped ditches with sloped sides are more difficult for the snake to maneuver in when trying to reach water or escape predators. However, GGS also avoid capture by being near vegetative cover, burrows, and cracks in the ground.

Giant garter snakes move around to find suitable habitat as conditions in the rice fields, marshes, and canals and ditches change, especially during the dry summer months. Thus, connectivity between canals and ditches in different areas and between these systems and other habitat types is extremely important for genetic interchange and ability to find summer habitat.

Vegetation

Cover species adjacent to aquatic habitats include mustard (*Brassica geniculata*) and milk thistle (*Silybum marianum*). Hansen and Brode (1992a) found habitat used by garter snakes to include common tules (*Scirpus acutus*), cattails (*Typha* sp.), or grasses "which grew in continuous stands or isolated patches at or below the high water line." Vegetation on the berms was dominated by mustard, milk thistle, star thistle (*Centaurea* sp.), saltgrass (*Distichlis spicata*), and smartweed (*Polygonum* sp.). The report notes, "Vegetation was present either as growing green stands or as dry tangles throughout the year and provided shelter for the GGS and protection from predators." The plant species may not be as important as the structure; dense cover is preferred. Garter snakes can bask on vegetation or in small open areas. Vegetation impenetrable to humans or predatory birds is important in protecting giant garter snakes from capture and predation.

Basking Sites

Basking occurs on banks of canals and levees, on broken down tules in the water, in branches of willows or saltbush over water, on the ground at water's edge in concealing vegetation, and on dead snags. Juveniles may bask on floating mats of vegetation. Basking may be an important aid to digestion, gestation, healing, and warming the body.

Basking sites need to be open to sunlight (not beneath heavy riparian vegetation) but ideally should have sufficient cover to escape from predators and allow for thermoregulation. Preferred basking sites are located adjacent to escape cover, including water or vegetation.

Food

The giant garter snake specializes in aquatic prey, including small fish and frogs, carp, mosquitofish, bullfrogs and treefrogs.

Refuge/Winter Retreats

Giant garter snakes take refuge from heat and predators in ground squirrel holes, gopher burrows, or suitable vegetation (e.g., beneath dense bushes, emergent vegetation, or piles or mats of broken down vegetation). Winter retreats used by the snakes include small mammal burrows on the sides of levees, ditches and drains, railroad embankments, and other upland habitats, as well as man-made structures, such as piles of large rocks or rip rap. Close proximity of overwintering sites to aquatic summer habitats is preferred; however, giant garter snakes have been found overwintering up to 200 yards from the shoreline of summer habitat (Hansen and Brode 1992a). Burrows, vegetation, and other shelter from predators enhance the suitability of overwintering sites. It is also helpful if winter retreats are above winter flood levels and if the snakes have access to upland retreats during runoff or flooding.

d. GGS Numbers, Distribution, and Ecology in the NBHCP Area

Current Numbers/Baseline

Currently, the U.S. Fish and Wildlife Service recognizes 13 separate populations of giant garter snakes within the State of California. Each population is isolated without protected dispersion corridors to link to adjacent population groups. The Natomas Basin contains the largest single element of the American Basin's population of the giant garter snake that has been studied.

Previous surveys and other historical information indicate a fairly widespread distribution of giant garter snakes within the Natomas Basin (Figure 12, Giant Garter Snake Records). Virtually all these Natomas sightings are from areas where rice is grown. Within these areas they are strongly associated with the rice fields themselves and the associated canal/drain components of the water conveyance system. On this basis, a reasonable surrogate variable for estimating the total amount of giant garter snake habitat in the Natomas Basin is the amount of rice fields in the Basin and canal/drain habitat embedded in the rice landscape. These are estimated at 22,692 acres of rice fields and about 247 miles of canals and drains in the Basin. A BRD study conducted from 1998 to 1999 recorded 277 individual giant garter snakes in the Natomas Basin (Wylie and Casazza, 2000). Giant garter snakes were found in a network of ditches and rice field habitats, including several occurrences in Fisherman's Lake and other RD 1000 canals within the Basin. The most recent giant garter snake survey information (Wylie, 2001) showed that fewer giant garter snakes were captured relative to previous years, but this does not necessarily mean that the giant garter snake population in the Natomas Basin is in decline (USFWS, 2002)

However, there is expected to be considerable patchiness in giant garter snake distribution, even within the rice-growing regions of the Basin, and field surveys, to some extent, have supported this expectation (Brode and Hansen 1992). Where garter snakes do occur, as many as 10 snakes have been observed per linear mile of ditch or drain during walk-through surveys under optimal conditions (Hansen, pers. comm.). However, there are significant limitations in the capability of visual survey methods to estimate actual snake population densities, because giant garter snakes spend the majority of their time resting in burrows, beneath dense vegetation or under objects, and because they often do not move as observers approach. Consequently, visual surveys may underestimate actual abundance, perhaps by an order of magnitude.

The 2002 NDDB records show 168 giant garter snake occurrences in California. Of these, 38 of these occurrence records were in the Natomas Basin. The U.S. Geological Survey, Biological Resources Division (USGS, BRD) also conducts surveys of the giant garter snake. As noted above, BRD surveys conducted from 1998 to 1999 recorded 277 individual giant garter snakes in the Natomas Basin. Note that not all occurrences from the BRD are officially included in the NDDB.

Within Sutter County, this species has been located at: (1) Riego Road 0.5 miles west of Highway 99; (2) within a canal on the northern side of Howsley Road 0.8 miles east of El Centro

Boulevard west of Pleasant Grove; (3) within a canal on the west side of El Centro Boulevard 0.4 miles north of Sankey Road; (4) north of drainage canal at Riego Road 0.7 miles east of Powerline Road; (5) just south of the Natomas Cross Canal 1.6 miles west of Highway 99 2.5 miles northeast of Verona; (6) within the Natomas Basin 1.8 kilometers north northwest of the intersection between Sankey Road and El Centro Road; and (7) within a canal 1.2 kilometers east of the crossing between the north main canal and Riego Road. Within Sacramento County, occurrences have been noted near Sacramento International Airport, Fisherman's Lake area and other canal areas.

U.S. Geological Survey Study

Studies currently being undertaken by the U.S. Geological Survey, Biological Resources Division (BRD) can contribute to the understanding of the ecological requirements of the giant garter snake and may suggest appropriate census methods (see Biological Monitoring section, Section VI.E). The BRD is currently studying the giant garter snake on state and National Wildlife Refuge lands north of the Natomas Basin, and is developing protocols for further studies and future study areas.

Giant garter snake data being developed as part of the BRD studies will begin to establish population baseline information. The BRD proposal for giant garter snake includes focused studies, inventories, and genetic studies. The stated objectives of the study include: (1) development of appropriate population census techniques; (2) determination of giant garter snake habitat use; (3) estimation of life history and population parameters; (4) study of response of the giant garter snake population to experimental management (e.g. natural marsh vs. rice fields); and (5) establishment of a GIS data base for giant garter snake habitat (Glenn Wylie, BRD, pers. comm.).

The BRD is currently using mark-recapture studies to establish baseline density estimates and monitor population trends of the GGS. At present, no radio tracking is being conducted. Under the Adaptive Management provisions of the Plan, BRD study results available in the future could form part of the basis for modification or revision of NBHCP conservation practices, thus allowing the most up-to-date information on giant garter snakes to be used throughout the 50-year life of the permits.

3. Swainson's Hawk (*Buteo swainsoni*)

a. Species Description

Swainson's hawk is state listed as a threatened species. Historically, it nested throughout lowland California; however, the current Swainson's hawk nesting distribution is limited to the Mojave Desert, northeastern California, the Central Valley, and a few isolated locations in the Owens Valley (California Department of Fish and Game 1992b, 1994). The Swainson's hawk typically occurs in California only during the breeding season (March through September) and winters outside of the U.S. in Mexico and South America.

The species was once thought to winter exclusively in Argentina; however, recent telemetry studies (satellite radio) have shown the species to winter in Mexico, with additional detections in Central America and South America. The Central Valley population migrates only as far south as Central Mexico (Estep 2001). Additionally, thirty (30) individual hawks have been wintering in the Delta for several years (Estep 2001) and there are records of small numbers of Swainson's hawks wintering in southern Florida and Texas.

Historically, as many as 17,000 Swainson's hawk pairs may have nested in California (California Department of Fish and Game 1992b, 1994). Currently, an estimated 700 to 1,000 Swainson's hawk pairs nest in the state. This appears to represent a decline of more than 94% in California's historical nesting population (Bloom 1980, California Department of Fish and Game 1989). Currently, there are 882 known extant nesting site occurrences in California (Estep 2001). The Central Valley supports an estimated 600 to 900 of the remaining breeding pairs. The overall Swainson's hawk population is considered to be declining (California Department of Fish and Game 1992b, 1994). However, the Central Valley's breeding population has remained stable over the past 10 years (Estep 2001).

The Swainson's hawk (*Buteo swainsoni*) is a medium sized buteo (25-35 ounces). There are three primary color phases (plumage morphs) of the Swainson's hawk, including : a light-morph, dark-morph, and rufous-morph. Additionally, this hawk species can be an intermediate morph, with variations of the three primary morphs (Estep 2001).

The dark-morph hawks differ from the light-morph in that they are entirely brown with a light patch under the tail. The trailing edges of the wing are slightly lighter in color than the leading edges. The dark phase of the Swainson's hawk represents 35% of the Northern California population. Both the dark and light morphs can have white undertail coverts.

The third variation is a rufous-morph, which is characterized by a lighter color of brown with rusty barrings on the underparts.

The Swainson's hawk soars with its wings held above the horizontal in a dihedral or "v" shape. When perched, the species' wings are slightly pointed and extend to or beyond the tail feathers.

b. Activity Cycle/Behavior

Swainson's hawks begin to arrive in the Central Valley from wintering grounds in Mexico, Central America and South America in March to breed and raise their young. The species typically roosts and migrates in groups. Territories are usually established by April with incubation and brooding occurring through June. The earliest fledging of young occurs in July and the young remain with the parents for approximately one month following fledging or until the southern migration in early fall. Recent telemetry studies have shown that some fledglings leave the nesting area and their parents to join a juvenile group or remain alone before the fall migration (Estep 2001).

Swainson's hawks are opportunistic foragers, flushing prey (rodents, insects and some birds) from fields, pastures and grasslands adjacent to their nests. In the Central Valley, their primary diet consists of small rodents, including the *Microtus californicus*, or meadow mice. During the summer months, the hawks consume large quantities of insects (Estep). Males provision females while they incubate the eggs. Later, both parents feed the young.

c. Habitat Associations/Requirements

Swainson's hawks prefer large nesting trees with a panoramic view of their foraging grounds. Foraging habitats, open fields and grasslands, need to be within flying distance (maximum observed is 18 miles) and adequate to support the high densities of microtine rodent populations and birds upon which they feed. During the breeding season, Swainson's hawks require suitable foraging habitat in association with suitable nesting habitat (California Department of Fish and Game 1992, 1994). Swainson's hawk nesting preference is for large valley oaks (*Quercus lobata),* cottonwoods (*Populus fremontii*), or willow (*Salix goodingii*). In the interior of the Natomas Basin, the species will often nest in smaller trees due to the lack of large trees (Estep 2001).

The area required for foraging depends on the season and crop cycle, as the species' foraging ranges depend on the dynamics of the agricultural system and how it affects prey abundance and availability. Swainson's hawks highly active foraging behavior may result in birds traveling as far as 18 miles from a nesting site (Estep 1989). Swainson's hawks have been observed foraging behind farm machinery (moving harvester blade or disc) and capturing rodents exposed by ground disturbance (Estep 1989). Swainson's hawk foraging ranges during the breeding season have been estimated to be 1,000 acres to almost 7,000 acres (Bechard 1982, Estep 1989, Johnsgard 1990).

Suitable cover types for foraging habitats include, in order of suitability: (1) native grassland; (2) agriculture soon after discing; (3) alfalfa and other hay crops;(4) fallow fields; (5) lightly grazed pasture; (6) combinations of hay, grain, and row crops; (7) rice fields prior to flooding and after draining; and (8) heavily grazed pasture. Unsuitable cover types for foraging habitat include vineyards, mature orchards, cotton, thistle in fallow fields and any crop where prey are unavailable due to high vegetation height and density, as well as flooded rice fields. Recent observations by CDFG indicate that rice farming lands are also used by Swainson's hawks for foraging, particularly where there is vegetation at the perimeter of the fields (Dave Zezulak, pers. comm.). While generally considered less than suitable habitat for Swainson's hawk, rice fields do provide for invertebrate production, water and refugia (levees) for upland species, and forage before and after flooding.

d. Numbers, Distribution and Ecology in the NBHCP Area

Swainson's hawk nesting in the Natomas Basin occurs primarily in along the western boundary of the Basin (Figure 13). Most nest sites are located along the Sacramento River where large trees are available. The most recent survey of the Natomas Basin vicinity (SHTAC, 2001) shows 35 nest sites along the Sacramento River (22 on the east side and 13 on the west side). The 35 nest sites located along the river are all outside the Natomas Basin as defined by the

NBHCP. Twenty-seven nest sites are located within the Basin, for a total of 62 nest sites in or immediately adjacent to the Natomas Basin. Two of these sites are considered abandoned because the nest trees have been removed.

In 2000, the Swainson's Hawk Technical Advisory Committee monitored 24 known nesting sites in the Basin, 17 of which were used in 2000. Of these, 10 successfully nested in 2000 (i.e., reared young to fledgling), producing a total of 20 fledglings (SHTAC, 2001). Of the 27 territories in the Basin, 19 were used in 2001, producing 16 fledglings.

Although nest sites are not found exclusively in riparian habitat, more than 87 percent of the known nest sites in the Central Valley are within riparian systems (Estep, 1984; Schlorff and Bloom, 1984). This is primarily a function of tree availability and not a preference for large riparian stands or the presence of other components of a riparian forest. Swainson's hawks also nest in mature roadside trees, isolated individual trees in agricultural fields, small groves of oaks, and trees around farm houses (CDFG, 1992, 1994).

The Sacramento River location affords the hawk relatively easy access to foraging uplands on either side of the river including substantial open space and reserve lands located in Yolo County. Relative to the Natomas Basin HCP area specifically, information indicates that nesting sites and foraging activity occur throughout the Basin (Estep 2001), again depending on the presence of suitable trees in proximity to upland foraging areas. As such, part of the NBHCP Conservation Strategy is to both preserve to the extent practicable habitat within the Swainson's Hawk Zone adjacent to the Sacramento River and also to enhance and expand Swainson's hawk habitat through provision of suitable trees and groves in proximity to upland foraging reserves.

It should be noted that for management purposes, an active nest site is considered a nest site that has been used by a nesting pair to lay and incubate eggs, regardless of success of that nesting attempt. Swainson's hawks show a high degree of nest fidelity and generally return to the same area in which they nested previously. They will investigate several nest sites within this "territory," and settle on one nest dependent on local disturbances, surrounding habitat variables, the proximity of other nesting raptors (i.e., great horned owls, redtail hawks, etc.), and nest condition, although this selection mechanism is not well understood. Some pairs may repair several nests before settling in on one nest site. In the case of juvenile birds, they may build and/or repair a nest and then leave without laying eggs. Therefore, in any given year, and any given area depending on nest site availability, many of the available nest sites may not be used. Generally, in the Natomas Basin, one in every three nest sites are used each year, based on annual surveys of successfully nesting Swainson's hawks (T. Roscoe, pers. comm.).

4. Other Covered Species Which May Occur in the NBHCP Area

Additional listed, candidate, or other species may potentially occur in the Natomas Basin based on the following criteria: (1) habitat utilized by the species occurs in the Basin; (2) the Basin is within the known range of the species; or (3) the Basin is within the flyway of and contains suitable winter habitat for migrating birds. Brief descriptions of these species and their habitats are included below.

a. Birds, Mammals, Invertebrates

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

The Valley Elderberry Longhorn Beetle (VELB) is a federally listed Threatened species. The VELB is a cerambycid beetle in the coleoptera family. The male VELB has a dark pattern of the elytra reduced to four oblong spots, and the basal segments of the antennae are usually covered with pale hairs (Barr 1991). The beetle is totally dependent on elderberry shrubs, using both *Sambucus mexicana* and *S. caerulea*. Elderberry shrubs are a common component of the remaining riparian forests and adjacent upland habitats in the Central Valley. The beetle has a two-year life cycle. Adults lay their eggs on elderberry bushes. The emerging larvae bore into and feed upon the stems of the plant. The beetle emerges as an adult during the flowering period of the plant, usually late March through June. The adults feed upon the elderberry flowers, reproduce, and die. The NDDB records sightings of VELB in or adjacent to the study area (Figure 14, Other Species Records). The USFWS general compensation guidelines for the VELB are described in Appendix C and Section VII.B.3.

Species Description and Taxonomy

Valley elderberry longhorn beetle (VELB) is a distinctive black and red-orange beetle with long antennae. Full-grown beetles are ¾ of an inch long (2 centimeters). Females are typically larger than males, and both have bright red to orange color on their wings. The forewings of the females are dark metallic green with reddish trim, the male's forewings may be similar, or may be red-black with dark green spots.

Distribution

VELB has probably always been rare and of limited abundance (U.S. Fish and Wildlife Service 1984). Information on the historical distribution and abundance of VELB is scarce. The substantial reduction in Central Valley riparian vegetation in the last 150 years suggests that the beetle's range has contracted and that remaining populations are discontinuous (U.S. Fish and Wildlife Service 1984).

The VELB's range extends from Redding at the northern end of the Central Valley south to the Bakersfield area (Barr 1991). Along the eastern edge of the species' range, adult beetles have been found in the foothills of the Sierra Nevada at elevations up to 2,200 feet (676.8 m), and beetle exit holes have been located on elderberry plants at elevations up to 2,940 feet (896.3 m). Along the western edge of the species' range, adult beetles have been found on the eastern slope of the Coast Range at elevations up to 500 feet (152.4 m), and beetle exit holes have been detected on elderberry plants at elevations up to 730 feet (222.6 m) (Barr 1991).

Habitat Associations/Requirements

VELB is closely associated with blue elderberry, an obligate host for beetle larvae. The presence of exit holes in elderberry stems indicates previous VELB habitat use. Exit holes are cylindrical and approximately 0.25 inch (0.6 cm) in diameter. Exit holes can be found on stems

that are 1-8 inches (2.5-20.3 cm) in diameter. The holes may be located on the stems from a few inches above the ground to about 9-10 feet (2.7-3.0 m) above the ground (Barr 1991).

Numbers, Distribution, and Ecology in the NBHCP Area

The known range of the VELB is limited to the Central Valley of California (USFWS, 1999). The USFWS designated critical habitat for the VELB, located along the American River Parkway in two places, upstream of the S.R. 160 overcrossing and in the Goethe Park area. In addition, the Recovery Plan designates the area along the American River, east of Nimbus Dam, as essential habitat, as well as an area along Putah Creek ink Solano County (USFWS, 1984).

Currently, there are approximately 168 known occurrences of VELB in California. All 168 known occurrences are presumed extant. Sutter County supports seven of these occurrences and Sacramento County supports 20 of these occurrences. There are several NDDB occurrences of VELB along the Sacramento River on the western and southern edge of the Natomas Basin. Sutter County VELB occurrences are spread throughout the County and are often associated with major rivers and waterways. In Sacramento County, habitat is located along the American River Parkway in two places, upstream of the S.R. 160 overcrossing and in the Goethe Park area.

There are no known occurrences of VELB in the Plan Area (NDDB 2001). Although the historical abundance of VELB is unknown, extensive loss of riparian habitat and, to a lesser extent, upland habitats in the Central Valley during the past 150 years has reduced the amount of habitat available to the species, and likely decreased and fragmented the species' range (USFWS, 1984). Loss of riparian habitat is attributable to flood control projects (e.g., levee construction, stream and river channelization, placement of riprap), land reclamation, and urban development. Additional factors affecting the VELB include grazing practices, herbicide spraying, and predation by nonnative species. There is, however, suitable VELB habitat (i.e., elderberry shrubs) along the western and southern borders of the NBHCP area (i.e., in riparian areas associated with the Sacramento and American Rivers). Small patches of suitable habitat also exist along the East Drainage Canal, West Drainage Canal, and Main Drainage Canal (City of Sacramento Department of Utilities and Jones & Stokes Associates 1996). Isolated elderberry shrubs or patches of shrubs also occur in several oak groves and old farm residences.

Tricolored Blackbird *(Agelaius tricolor)*

The tricolored blackbird is considered a Species of Concern by USFWS and is a state Species of Special Concern (California Department of Fish and Game 1992). Tricolored blackbird (Agelaius tricolor) is a medium sized blackbird that is distinguished from other blackbirds by its distinctive white-tipped red shoulder patches on mature males. This species is commonly found in large flocks, foraging in marshes, rice fields, and wet meadows. Females show varying amounts of red on the shoulders, and their plumage is sooty brown and streaked overall. The species nests in large colonies in marshes, silage and grain fields, and blackberries.

Status and Distribution

The species is largely endemic to California, with smaller populations in Baja California, Nevada, Oregon, and Washington (DeHaven 2000). During the breeding season, tricolored blackbirds occur in the Central Valley, the low foothills of the Sierra Nevada and Coast Range from Shasta County south to Kern County, along the coast from Sonoma County south to the Mexican border, and on the Plateau (Grinnell and Miller 1944, Beedy et al., 1991). Band recoveries from this species indicate that some wintering individuals travel nomadically along the entire length of the Central Valley, into the San Francisco Bay and Sacramento-San Joaquin Delta area, up to the northern and eastern plateau region of California, and into southern Oregon (DeHaven et al., 1975). Tricolored blackbirds continue to breed throughout their historic range, although populations have declined within this range (McCaskie et al., 1979).

Habitat Associations/Requirements

The tricolored blackbird is generally considered a marsh species, nesting primarily in tule (*Scirpus* spp.) and cattail (*Typha* spp.) marsh habitats. High quality nesting substrates tend to occur in conjunction with one of three Central Valley managed wetland types, including: permanent; semi-permanent; or seasonal wetland (DeHaven 2000). With the reduction of wetland habitats in California, an increasing percentage of tricolored blackbirds have recently been found nesting in nonmarsh habitats, such as blackberry (*Rubus* spp.) brambles, thistle (*Cirsium* spp.) stands, and nettle (*Urtica* spp.) stands (Beedy et. al 1991). Proximity to suitable foraging habitat such as flooded fields, grassy fields, and pond margins is an important factor in nest site selection (Grinnell and Miller 1944). In the San Joaquin Valley, the remaining breeding population is currently associated with large dairy operations. These colonies are using the dairies' grain fields for nesting. In the Central Valley, the cattail marshes have had a universally low reproductive success, due to the large predator populations of Black-crowned Night Herons. Such cattail marshes include refuges and those associated with rice fields. In general, vineyards and orchards provide low habitat value for the tricolored blackbird, due to the lack of adequate nesting substrate and limited foraging area (DeHaven 2000).

Tricolored blackbirds nest in small to large colonies (up to 50,000 individuals). They often return to the same nesting areas in subsequent years, but will occasionally relocate their breeding colonies if suitable habitat is available elsewhere. Nests are built in close proximity in dense emergent vegetation bordering open water. Dense nesting colonies of tricolored blackbirds are highly susceptible to disturbance. The tricolored blackbird breeds in large colonies near fresh water, preferably in emergent wetland with tall, dense cattails or tules, but also in thickets of willow, blackberry, and wild rose. Ideal breeding habitat for the tricolored blackbird includes two elements: (1) dense nesting substrate (i.e., blackberry or aquatic emergent vegetation), which provides protection from predators; and, (2) a large supply of insects within proximity to nests and occurring at the time of fledging (DeHaven 2000).

Tricolored blackbirds forage in large flocks and may travel up to 4 miles (6.4 km) from nest or roost sites to forage. Tricolored blackbirds forage on ground in croplands, grassy fields, flooded land, and along edges of ponds (Zeiner et al., 1990). In the Central Valley, foraging

habitat consists primarily of pastures and certain types of agricultural fields. Tricolored blackbirds eat mostly insects and selection of colony sites is primarily a function of proximity to concentrated insect food supplies (e.g., grasshoppers [*Orthoptera*], beetles and weevils [*Coleoptera*]) (Beedy et al., 1991). In winter, tricolored blackbirds often leave the immediate vicinity of their nesting colonies and concentrate in huge roosts in marsh habitat (Grinnell and Miller 1944).

Numbers, Distribution, and Ecology in the NBHCP Area

Historically, the nesting population of the tricolored blackbird was in the millions. Between the 1930s and 1970s the population declined by approximately 50 percent. This decline is thought to be a result of habitat conversion from pasture lands and hay crops to vineyards and orchards. The 1970s tricolored blackbird population included 41 nesting colonies and 133,000 birds (DeHaven 2000). A survey conducted by Ted Beedy and Bill Hamilton in 1997 found approximately 230,000 breeding tricolored blackbirds in California. A follow-up survey conducted in 1999 found fewer than 95,000 breeding individuals in California (Thomas Reid Associates 2000). The current population in the Central Valley is approximately 79,325. This includes 13 colonies that were located in the surveys conducted by DeHaven and Hamilton in 2000. The DeHaven/Hamilton surveys indicated that the general range and major breeding areas of the tricolored blackbird in the Central Valley had remained largely unchanged since the 1930s when J.A. Neff conducted surveys of the population (DeHaven 2000).

There have been nine documented occurrences (seven extant, two extirpated) in Sutter County. The two extirpated occurrences are located slightly northwest of the confluence of the Sacramento River and the Feather River, northwest of the Basin. Tricolored blackbirds were located 0.2 mile below the Sacramento/Sutter County line, west of Natomas Drain Levee Road.

Tricolored blackbirds currently nest in the Natomas Basin. The Natomas District colony resides on a 330-acre parcel in the Basin that was recently acquired by the Natomas Basin Conservancy (Betts-Kismat-Silva reserve in the eastern edge of the Natomas Basin. The population of this nesting colony has increased in recent years (Roberts, pers. comm.). This colony of tricolored blackbirds includes approximately 4,000 nesting birds, which have located their nests in five scattered clumps of blackberry bushes near irrigated pastureland (DeHaven 2000).

Significance of NBHCP Area to Species

The large amount of irrigated pastureland mixed with dense, healthy blackberry bushes in the Natomas Basin could be expected to make it an attractive breeding habitat for the tricolored blackbird. Additionally, the area includes pastures that are moderately grazed by livestock and flooded during the bird's nesting times. The moderate grazing, which creates optimal foraging (vegetative) levels of alfalfa and hay, in combination with the large insect population enhance the birds' ability to feed (DeHaven 2000).

The Plan Area also supports scattered copses of emergent marsh vegetation mostly within agricultural ditches that may potentially provide nesting habitat for the species, although it is not

currently known to be utilized. However, the tricolored blackbird is an occasional visitor and actively forages in the Plan Area. Emergent marsh is the preferred nesting habitat for the species; however, because of the paucity of this habitat in the Plan Area the species has sought alternative nesting sites in agricultural fields. Unfortunately, as mentioned above this can result in significant mortality of eggs and young birds. Additionally, some of the farming practices such as those employed in the area are not compatible with tricolored blackbird breeding patterns.

The Natomas District colony is thriving in current conditions. However, the long range concern is the ability of the 330-acre parcel to carry a breeding colony of tricolored blackbird because of the urbanizing area to the north (DeHaven 2000).

Aleutian Canada Goose *(Branta canadensis leucopareia).*

The Aleutian Canada goose was delisted by the USFWS on March 20, 2001 (FR 66:15643), and is considered a federal Species of Concern that is still protected by the Migratory Bird Treaty Act. The goose is a small stocky goose with a black head and neck, and a distinctive white "chin strap". The Aleutian Canada goose is distinguished from the other smaller subspecies of Canada goose by its slightly larger size, paler breast, and broader white neck ring. This species favors wetlands, grasslands, and cultivated fields near water.

The Aleutian Canada goose will be monitored for a period of five years by USFWS. If evidence acquired during this monitoring period shows that endangered or threatened status should be reinstated to prevent a significant risk to the subspecies, the Service may use the emergency listing authority provided by the Act to do so. At the end of the five-year monitoring period, the Service will decide if relisting, continued monitoring, or an end to monitoring is appropriate.

Distribution

The Aleutian Canada goose nests in the western Aleutian Islands and traditionally occurs during migration along coastal Oregon and in Del Norte and Humboldt Counties in northern California. Aleutian Canada geese generally winter in two localized areas in central California: one is near Modesto and Los Banos and the other is near Colusa. These areas support pasture, corn, wheat, and rice crops.

Wintering Aleutian Canada geese are a large migratory waterfowl species that typically spend summer in northern portions of the United States, Canada, and Alaska, and overwinter in warmer climates in southern Oregon and California.

Habitat Associations/Requirements

Wintering Aleutian Canada geese forage in agricultural fields supporting pasture, wheat, and rice crops. They prefer to forage in short-cropped, dry and irrigated pastureland and cornfields . Foraging geese have also been observed in marshes, rice stubble, and freshly sprouted wheat and barley fields. Wintering Aleutian Canada geese observed near Modesto during 1975-1980, fed in flood-irrigated pastures composed primarily of grasses and clovers

when they first arrived in the San Joaquin Valley. Wintering Aleutian Canada geese roost in large ponds, flooded fields, and rice checks. In the San Joaquin Valley, they are known to roost on artificially impounded waters such as farm ponds, sewage ponds (e.g., the Modesto oxidation ponds), and duck club ponds.

Numbers, Distribution, and Ecology in the NBHCP Area

Currently, there are 13 known occurrences of wintering Aleutian Canada geese in California (NDDB 2001). All 13 of these occurrences are presumed extant. Of these 13 occurrences, four occur in Sutter County. These occurrences are all located in agricultural fields around the Sutter County/Colusa County line, north of the NBHCP area. There are no known occurrences in the Plan Area. However, Aleutian Canada geese likely stop in the Natomas Basin for brief periods during migration to and from their traditional wintering areas.

The Aleutian Canada goose winters in the Sacramento Valley and is an occasional winter visitor in the NBHCP area. Approximately 40,000 acres of suitable winter foraging habitat (e.g., row crops, especially rice) occurs in the NBHCP area (Thomas Reid Associates 2000).

White-faced Ibis *(Plegadis chihi)*

This species is considered a Species of Concern by USFWS and is a state Species of Special Concern (California Department of Fish and Game 1992a). This species is a slender, gregarious long-legged wader with a very long and slender downward curved bill. The breeding adult's plumage is glossed with green or purple on the head and under parts, making the bird look dark at a distance. It is distinguished from the glossy ibis by its reddish bill, red eye, all red legs, and a white feathered border around its red facial skin. This species is found in shallows and mudflats in both fresh and brackish areas. The species has declined in California probably as a result of loss or deterioration of extensive marshes in the Central Valley, which are required for nesting.

Distribution

The white-faced ibis occur in two disjunct populations, one largely in western North America and the other in central and southern South America. The largest North American breeding colonies of white faced ibis occur in Utah (Great Salt Lake), Nevada (Carson River Basin), Oregon (Harney Basin), and coastal Texas and Louisiana. The largest breeding colonies in the Central Valley have been reported from the Mendota Wildlife Area and the Colusa National Wildlife Refuge.

Currently, the white-faced ibis winters primarily in the San Joaquin and Imperial Valley but is recorded widely in California as a transient (Zeiner *et al.*, 1990a). The wintering population concentrates near Los Banos in Merced County (McCaskie *et al.*, 1979). Historically, the white-faced ibis was a locally common summer resident in California and its breeding distribution was centered in the San Joaquin Valley. Currently, there are seven known occurrences of nesting areas (rookeries) of the white-faced ibis in California. All seven of these occurrences are presumed extant. There are no occurrences of nesting white-faced ibis in the

Natomas Basin (NDDB 2000). The nearest known nesting habitat for the white-faced ibis is in Yolo County, north of the City of Woodland.

Habitat Associations/Requirements

The white-faced ibis requires extensive marshes for nesting (Zeiner et al., 1990a). Large tule stands surrounded by open water provide high-quality nesting habitat for the species. The white-faced ibis typically nests in dense tule and cattail stands, but will sometimes nest in trees with other colonial-nesting species (Eckert 1981, U.S. Fish and Wildlife Service 1985c). Habitat used for nesting ranges from 1.3 acres to 600 acres (0.5 ha to 242.8 ha) (U.S. Fish and Wildlife Service 1985e).

This species forages in fresh emergent wetland, shallow flooded pond margins, and muddy ground of wet meadows and irrigated, or flooded, pastures and croplands. Ibis eat primarily invertebrates such as earthworms, insects, and crustaceans. They also eat small fish, amphibians, and reptiles. White-faced ibis probably roost in dense emergent vegetation (Zeiner *et al.*, 1990a).

Numbers, Distribution, and Ecology in the NBHCP Area

There are seven known occurrences (rookeries) in California (CDFG 2001). There are no known nesting occurrences in Sutter or Sacramento Counties. The nearest known nesting occurrence is in Yolo County, north of Woodland. The white-faced ibis is a rare visitor to the Natomas Basin, found in the Sacramento area during its migration. No suitable nesting habitat occurs in the Natomas Basin for ibis, although approximately 24,900 acres of suitable winter habitat (i.e., rice, alfalfa, and other agricultural fields) exists in the Natomas Basin for ibis (Thomas Reid Associates 2000 and CH2MHill, 2001).

In the Sacramento Valley, wintering ibis were very rare in the 1970's with the highest counts numbering only 11 birds in 1978 and 1979. In 1996, Hickey and Shufford estimated that a minimum of 10,000 to 11,000 ibis were in the Sacramento Valley (Thomas Reid Associates 2000). White-faced ibis is now a common winter visitor to the Natomas Basin, but are not known to breed in the Basin.

Loggerhead Shrike *(Lanius ludovicianus)*

This species is a state Species of Special Concern (California Department of Fish and Game 1992a). It was designated as a Category 2 candidate for federal listing as threatened or endangered throughout its range in 1991. However, on November 15, 1994, the USFWS eliminated all subspecies of the shrike, except the migrant loggerhead shrike of the central, eastern, and southern United States, from the federal candidate list. The USFWS determined that populations of the other loggerhead shrike subspecies, including populations of the subspecies that occur in California, were more abundant or widespread than previously thought and were not subject to any identifiable threat (59 FR 58992, November 15, 1994). Therefore, no loggerhead shrike subspecies that occur in California are candidates for federal listing.

The loggerhead shrike (*Lanius ludovicianus*) is a small bird of fields and grasslands that hunts from lookout perches such as fence posts or tree limbs, using the lookout to spot, then swoop down on insects, rodents, snakes, or smaller birds. This species lacks talons, and instead impales its prey on thorns or barbed wire. The loggerhead shrike is bluish-gray on the back and head, and white on its under parts. The species has a broad black mask that extends from across the eye to the top of the beak. Its beak is black and short, with a slight curve. This species is distinguished from the more common northern shrike because of its smaller size, darker coloration, larger mask, and smaller, less hooked beak.

Distribution

The loggerhead shrike is a widespread breeding species in North America. It occurs from the southern Canadian provinces south across most of the United States and into Mexico (American Ornithologists Union 1957). The shrike is a resident species throughout the lowlands and foothills of California (Grinnell and Miller 1944).

Shrike populations have declined over much of the United States, especially in the central and eastern portions of the country. Shrike populations in the western United States declined slightly between 1955 and 1979 but currently appear to be stable.

Habitat Associations/Requirements

The loggerhead shrike occurs in grasslands, agricultural lands, open shrublands, and woodlands (Bent 1950). It prefers areas with perch sites (Zeiner et al., 1990). A study conducted in Illinois reported that shrikes were most abundant near pastures, hedgerows, cornfields, and rural residential areas (Smith and Kruse 1992). Shrikes nest in low trees, dense shrubs, and vines. They feed on insects, small reptiles, and small mammals (e.g., mice). This species requently skewers prey on thorns, sharp twigs, barbed wire, or forces prey into a confined area.

Numbers, Distribution, and Ecology in the NBHCP Area

The loggerhead shrike is common throughout most of lowland California (California Department of Fish and Game 1990). This species is observed regularly throughout Natomas Basin (Thomas Reid Associates 2000). Suitable nesting and foraging habitat is common throughout the Basin. Several shrikes were observed on or near the Metro Air Park project site during a site reconnaissance conducted on March 23, 2000 (Thomas Reid Associates 2000), and three shrikes were observed along the eastern portion of the Plan Area during NBHCP habitat mapping surveys in 2001.

Burrowing Owl *(Athene cunicularia hypugea)*

Burrowing owls are not listed under either the federal Endangered Species Act or the California Endangered Species Act. However, burrowing owls are considered a Species of Concern by the USFWS, and a Species of Special Concern by CDFG. The western burrowing owl is a small raptor. It is distinguished from other small owls by its long legs. The adult is brown to buff in color, with numerous whitish spots and barring on the back and under parts.

Juveniles are buff colored below. Western burrowing owls nest in single pairs or small colonies. This species is considered a year-round resident. It is possible that burrowing owls in northern California have some local migratory behavior, but little information is known about the migration habitats of the northern California population (Haug, et al., 1993). The species utilizes the burrows of ground-dwelling species, such as California ground squirrel, or artificial structures (e.g., culverts) for nesting. It is also found in grass, forb and open shrub stages of pinyon-juniper and ponderosa pine habitats. It uses rodent or other burrows for roosting and nesting cover. Reduction of prey base, including ground squirrels, has contributed to the decline of this species. The CDFG's mitigation guidelines for the burrowing owl are shown in Appendix D.

Distribution

The burrowing owl is a year-long resident of open, dry grassland and desert habitats throughout the California deserts, Central Valley, and coastal areas. It is fairly uncommon along the coast north of Marin County, and rare east of the crest of the Sierra Nevada. Additional populations are reported from the Imperial Valley, Modoc Plateau, and Great Basin region. Fragmentation or elimination of much of the historic habitat of this species, and population declines have been noted throughout its range.

Habitat Associations/Requirements

This species is associated with open lands including grasslands, rolling hills, desert floors, and open bare ground characterized by low-lying vegetation. As noted, the species utilizes rodent burrows, especially California ground squirrel burrows, or artificial structures (e.g., culverts) for nest sites (subterranean nester), and favors elevated places such as berms, levees, road and rail beds where it can overlook open lands.

Numbers, Distribution, and Ecology in the NBHCP Area

There are 370 known occurrences in California (NDDB 2001). Three hundred of these occurrences are considered extant. Eighteen occurrences are known in Sacramento County, and 17 of these occurrences are considered extant. Three occurrences are recorded in the Natomas Basin, with another three known burrowing owl sites on the Conservancy's Betts-Kismat-Silva property. One occurrence is known in Sutter County. This occurrence is also considered extant (NDDB 2001).

Burrowing owls occur in low numbers in the NBHCP area, but no systematic surveys have been conducted in the Plan Area. One burrowing owl was observed near a burrow on the Metro Air Park project site in March 2000. The owl was observed along Powerline Road between Elverta Road and Elkhorn Boulevard on a canal bank (Thomas Reid Associates 2000). Burrowing owls also occur at the Sacramento International Airport. During NBHCP habitat mapping surveys, three pairs of burrowing owls were observed along a water conveyance canal in the eastern portion of the Plan Area. Burrowing owls also have been observed northeast of the intersection of San Juan and El Centro Roads and west of East Levee Road on the south side of Elkhorn Boulevard (NDDB 2001).

The Natomas Basin supports approximately 247 miles of canals and ditches and associated adjacent agricultural fields. The levees and upper banks of canals and ditches are potential burrowing owl nesting habitat. Canal and ditch maintenance activities often make these areas unsuitable burrowing owls nesting habitat; therefore, owls usually nest along canals with limited maintenance activities. Other suitable habitat includes grasslands or fields that are rarely disced (although they may be mowed), such as local airports.

Bank Swallow (*Riparia riparia*)

The bank swallow is listed as a Threatened species within the California Endangered Species Act and is not listed under the Federal Endangered Species Act. Breeding colonies of this species are provided some additional protective status under state Fish and Game Code and the federal Migratory Bird Treaty Act. Bank swallow (*Riparia riparia*) is a slender bird with long, pointed wings known from rivers and streams. An adept aerialist, the species darts to catch flying insects, usually above water. The species is distinguished from other swallows and swifts by its brownish gray breast band, often extending in a line down the middle of the breast. It has light gray under parts that contrast with its darker brownish gray wings. The species nests in colonies, excavating burrows in steep riverbank cliffs, gravel beds, and highway cuts.

Distribution

Historically, bank swallows nested on coastal bluffs in southern California and riverbanks throughout the Central Valley and northern California; however, the state's nesting population of bank swallow is currently concentrated on the banks of Central Valley streams. Approximately 75 percent of the current breeding population occurs along banks fo the Sacramento and Feather rivers. Other colonies persist along the central coast from Monterey to San Mateo Counties, and northeastern California in Shasta, Siskiyou, Lassen, Plumas and Modoc Counties (Remson, 1978). There are very few known breeding colonies of this species in California, with the primary breeding area described as the banks of the Sacramento River, from Shasta County south to Contra Costa County. The range of this species is estimated to be reduced by as much as 50% since 1900 (California Department of Fish and Game 1992b). Formerly more common as a breeder in California, the estimated breeding population of 16,000 in 1986 was reduced to about 4,500 pairs by 1990 as a result of flood control and levees stabilization projects throughout its range. Now, only approximately 110-120 colonies remain within the state.

About 50-60 colonies remain along the middle Sacramento River and 15-25 colonies occur along lower Feather River where the rivers meander still in a mostly natural state. Other well known breeding colonies include Shasta Valley and the Klamath River Basin in Siskiyou County; in Fall River in Shasta County; the Modoc Plateau and in the Basin Ranges region of Modoc and Lassen County, near Alturas in Modoc County, and near Termo and Honey Lake in Lassen County. There are no known breeding colonies remaining in southern California.

Habitat Associations/Requirements

The bank swallow occurs in California during the breeding season (May through July) and winters in South America. Bank swallows begin arriving in the Central Valley from

wintering grounds in South America in early March to breed and raise their young. Numbers decline in July and August as nesting colonies are abandoned and migration begins. Colonies are vacant by early August and some migrants could be observed through early- to mid-September. Bank swallows are rarely seen in California during the winter. During migration, bank swallows mingle with other swallow species, foraging for insects over water in open lowland habitats, especially favoring lakes and rivers.

This species is a colony nester and nests primarily in riparian and other lowland habitats west of the desert. This species requires vertical banks/cliffs with fine-textured/sandy soils to dig a nesting hole near streams, rivers, lakes, and oceans. The bank swallow uses holes dug in cliffs and river banks for cover; logs, shoreline vegetation, and telephone wires are also used for roosting. Bank swallows tend to return to these colonial nests year after year.

The bank swallow breeds from early May through July. Breeding occurs from about sea level to as high as 6,900 feet. Pairs usually nest colonially in groups of 10 to 1,500 although most colonies have 100-200 nesting pairs. Bank swallows forage by hawking insects during long, gliding flights. Foraging occurs primarily over open riparian areas, but also over grassland, shrubland, and savannah habitats during the breeding season. Bank swallows feed on a wide variety of aerial and terrestrial soft-bodied insects, including flies, bees, and beetles.

Numbers, Distribution, and Ecology in the NBHCP Area

There are 171 known bank swallow occurrences in California (NDDB 2001). One of these occurrences is extirpated. There are 35 bank swallow occurrences (all presumed extant) in Sutter County and seven occurrences in Sacramento County (all presumed extant). Although there is no suitable nesting habitat in the Natomas Basin, bank swallows from nearby nesting colonies have the potential to forage in the Basin, and foraging could also occur during migration to nesting sites north of the Basin.

Northwestern Pond Turtle (*Clemmys marmorata marmorata*)

The northwestern pond turtle is considered a Species of Concern by USFWS and is a state Species of Special Concern (California Department of Fish and Game 1992a). Northwestern pond turtle is a medium sized aquatic turtle that forages on plants, insects, worms, small fish, and carrion. The species is distinguished by its low, roundish olive to dark-brown carapace, with a network of faint spots, lines or dashes of dark brown to black that radiate from the center of the shields. This species is a thoroughly aquatic species of ponds, marshes, rivers, and streams that favors low emergent aquatic vegetation for cover, and logs or mud banks for basking.

Distribution

The northwestern pond turtle occurs in suitable aquatic habitats west of the crest of the Sierra Nevada in California and in parts of Oregon, Washington, and Mexico (Stebbins 1985, Zeiner et al., 1988). The northwestern subspecies is generally found from San Francisco Bay north to the Columbia River drainage in Oregon and Washington (57 FR 45761-45762, October

5, 1992). The northwestern pond turtle still occupies most of its historic range. However, populations are declining throughout the range (Holland and Bury 1992) and local populations, particularly of the southwestern subspecies, have been extirpated from many areas within this range (57 FR 45762, October 5, 1992). The few remaining areas in the northwestern pond turtle's range that support moderate to large viable populations of the northwestern pond turtle are considered at risk (57 FR 45761-45762, October 5, 1992).

Habitat Associations/Requirements

The northwestern pond turtle is generally associated with permanent or nearly permanent wetlands in a wide variety of environments, including permanent ponds, lakes, streams, irrigation ditches, or permanent pools along intermittent streams, up to 6,000 feet (1,829.3 m) elevation (Zeiner et al., 1988) . Hatchlings and juveniles require more specialized habitats than adults (57 FR 45761-45762, October 5, 1992). The northwestern pond turtle occurs in quiet waters of lowland ponds, marshes, lakes, and reservoirs, and in streams with deep pools. Rocks, logs, open mud banks, and streamside vegetation provide escape cover and basking sites (Stebbins 1972).

Northwestern pond turtles are highly aquatic but leave the water for basking and egg-laying. Egg-laying may occur along sandy wetland margins or at upland locations as far as 1,300 feet (396.3 m) from water (Holland and Bury 1992). Hatchling and adult turtles may overwinter in upland sites. Northwestern pond turtles feed primarily on small aquatic invertebrates (57 FR 45761-45762 October 5, 1992).

Numbers, Distribution, and Ecology in the NBHCP Area

There are 117 known occurrences of northwestern pond turtle in California, and one of the occurrences is considered extirpated (NDDB 2001). There are 13 known pond turtle occurrences in Sacramento County that are presumed extant and 2 known pond turtle occurrences in Sutter County that are presumed extant. The canals throughout the Natomas Basin are considered suitable aquatic habitats for pond turtles. Currently, there are about 247 miles of canals and ditches in the NBHCP area (see Table II-2). Fisherman's Lake in the southwestern portion of the NBHCP area is high quality aquatic habitat for pond turtles. Because most of the Basin is developed agricultural land or commercial/residential development, many of the potential breeding habitats have been eliminated. Despite this, potential breeding habitat probably occurs along many of the canals and aquatic habitats. Therefore, the Natomas Basin probably supports a limited pond turtle population; however, no systematic surveys have been conducted. During the NBHCP habitat mapping surveys, many pond turtles were observed along the Natomas Main Drainage Canal during March 2001.

California Tiger Salamander (*Ambystoma californiense*)

The California tiger salamander is a federal Candidate species and a state Species of Special Concern. California tiger salamander is a large, stocky salamander with small eyes, a broad rounded snout and tubercles on the undersides of the front and hind feet. The species is distinguished from other salamanders by its distinctive coloration consisting of spots or bars of

white, cream or yellow on a black background. This species frequents slow-moving waters of swales, ponds and shallow lakes.

Distribution

Historically, the species is likely to have occurred in grassland habitats throughout much of the state. Habitat conversion for agricultural and urban land uses has substantially reduced the species' range and number of breeding populations. Bullfrogs and nonnative fishes have also reduced population numbers of this species. Both bullfrogs and nonnative fish prey on California tiger salamander larvae and have been reported to eliminate larval salamander populations from breeding sites, such as stock ponds.

Currently, the California tiger salamander occurs in the Central Valley and Sierra Nevada foothills from Yolo County south to Tulare County, and into the coastal valleys and adjacent coastal foothills from Sonoma County south to Santa Barbara County (Zeiner et. al 1994). Isolated populations are reported from Grey Lodge Wildlife Area in Butte County, and from Grass Lake in Siskiyou County. Although populations of California tiger salamander have declined, the species continues to breed in a relatively large number of locations within its range (59 FR 18353-18354, April 18, 1994).

Activity Cycle/Behavior

Adults spend much time underground. Adult California tiger salamanders are found under objects such as boards, rocks, brush or other wood debris or in rodent burrows near water. During late winter (December to late February in the Central Valley) the adults emerge to breed at night, traveling to nearby ponds, temporary pools (including vernal pools), and swales during or immediately after rain events. Larvae grow rapidly; metamorphosis begins in late spring or early summer and is followed by the dispersal of juveniles from their natal ponds into terrestrial upland habitat. There they spend the dry season in burrows or crevices and emerge again with the first autumn rains to return to the breeding pond.

Habitat Associations/Requirements

California tiger salamanders inhabit valley and foothill grasslands and open woodlands usually within 1 mile (1.6 km) of water (Brode, pers. comms.). Tiger salamanders breed in reservoirs, ponds, vernal pools, small lakes, and slow-flowing streams that do not support predatory fish (Stebbins 1972, Zeiner et al., 1988). Adult salamanders migrate from upland habitats to aquatic breeding sites during the first major rainfall events of the fall and early winter. Adults return to upland habitats after breeding. Juveniles disperse from aquatic breeding sites to habitats after metamorphosis. California tiger salamanders may not reproduce during years of low rainfall (Jennings et al., 1994).

Numbers, Distribution, and Ecology in the NBHCP Area

There are 465 known tiger salamander occurrences in California (NDDB 2001). All of these occurrences are presumed extant (NDDB 2001). There are four occurrences in Sacramento

County and one occurrence in Sutter County; however, none of these occurrences are in the Plan Area. The nearest known tiger salamander occurrences are in northern Yolo County near Dunnigan and near Rancho Seco in southeastern Sacramento County. Vernal pools occur along the eastern edge of the Natomas Basin. These pools are considered potential, but marginal tiger salamander breeding habitat, based on their disturbed condition and limited extent in the study area. Tiger salamanders are not likely to occur in the Plan Area.

Western Spadefoot Toad (*Scaphiopus hammondii*)

The western spadefoot toad is a California Species of Special Concern, and is a fully protected amphibian pursuant to regulations promulgated by the Fish and Game Commission (*Id.*, § 41). Western spadefoot toad is a smallish dusty green to gray toad often with four irregular, light-colored stripes on its back. Its underside is whitish and unmarked, and the species has a wedge-shaped glossy black spade on each hind foot. Its call is described as a hoarse, snore-like rasping sound.

Distribution

The range of this species includes the Central Valley and adjacent foothills, and the area spanning the southern Coast Ranges to northern Baja California, extending from sea level to about 4,500 feet in elevation. Its primary habitat is grasslands, but it is also occasionally found in valley-foothill, hardwood woodlands.

Habitat Associations/Requirements

This species occurs in shallow, seasonal wetlands (which are essential for breeding and egg-laying) in valley and foothill grasslands, open chaparral, and pine woodlands below 3,000 feet in elevation. This species is associated with seasonal wetlands and other temporarily ponded areas in low-lying grasslands, fields, washes, river floodplains, alluvial fans, alkali lakes and playas, but is also found in adjacent foothill and mountain habitats. Western spadefoot toads prefer slow-moving waters such as pools and plunge pools of small creeks, and short grasses with sandy or gravelly soils.

Numbers, Distribution, and Ecology in the NBHCP Area

There are 173 known western spadefoot occurrences in California, and only one of them is considered extirpated (NDDB 2001). There are five spadefoot toad occurrences in Sacramento County and none in Sutter County. All of the Sacramento County spadefoot toad occurrences are considered extant. There are no records of western spadefoot toads in the Natomas Basin (NDDB 2001). The nearest known occurrences are in Placer County at Fiddyment and Phillip Roads (about 6 miles east of the Plan Area) and at Mather Field in central Sacramento County. Some suitable spadefoot toad breeding habitat (i.e., vernal pools) occurs along the far eastern edge of the Natomas Basin, however, there are no records for this species in the Plan Area to date. Based on the lack of occurrence records, the marginal suitability of the vernal pool habitat, and the distance to the nearest occurrence of the species, overall potential for occurrence for this species within the NBHCP study area is considered low.

Vernal Pool Shrimp

The following species of vernal pool shrimp are restricted to vernal pools in the State of California and are in danger of extinction as a result of loss of habitat from urban development, agricultural conversion, and random extinction by virtue of the isolated nature of remaining habitat. None of the species is known to occur in riverine waters, marine waters, or other permanent bodies of water. They are ecologically dependent on seasonal fluctuations in their habitat, such as absence or presence of water during specific times of the year, duration of inundation, and other environmental factors including specific salinity, conductivity, dissolved solids, and pH levels. Water chemistry is one of the most important factors in determining the distribution of fairy shrimp and tadpole shrimp. Fairy shrimp are well-adapted to the flood/drought cycle found in California vernal pools. However, they have developed no defenses against predation and are consumed readily by migrating waterfowl and various aquatic invertebrates. Fairy shrimp will not persist if their vernal pools become connected to bodies of water which support fish. The species listed below are sporadic in their distribution, often inhabiting only one or a few pools in otherwise more widespread vernal pool complexes. Each of the following species may occur in the NBHCP area during the life of the Permits.

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

The vernal pool fairy shrimp is a federally listed threatened species. The vernal pool fairy shrimp is a small (<1 inch) freshwater crustacean belonging to the order of fairy shrimp (*Anostraca*). Like all other fairy shrimp, the males of vernal pool fairy shrimp have enlarged second antennae used for clasping the female during mating.

Distribution

Vernal pool fairy shrimp has one of the broadest distributions of the California endemic fairy shrimp species. It occurs most of the length of the Central Valley, from the Millville Plains and Stillwater Plains in Shasta County south to Pixley in Tulare County and the eastern margin of the central Coast Range from San Benito County south to Ventura County (Helm 1998, Eng et al., 1990, and Sugnet & Associates 1991). Disjunct populations occur on the Santa Rosa plateau and near Rancho Santa California in Riverside County. The species has recently been found within the Medford area of southern Oregon (Helm pers. comm.).

Habitat Associations/Requirements

This species is most often observed in vernal pools (79% of observations), although it is also observed in a variety of other natural and artificial habitats including seasonal wetlands, alkali pools, ephemeral drainages, stock ponds, roadside ditches, vernal swales, and rock outcrop vernal pools (Helm 1998). The species occurs on many geologic formations and land forms. Regardless of the landform, this species is most often found in small (less than 200 meter square) and shallow (5 centimeters deep) habitats, although it also can occur in large and deep vernal pools (Helm 1998).

Although the vernal pool fairy shrimp is found in different habitat types, it is not abundant in all of them. It often occurs with California *linderiella*, vernal pool tadpole shrimp, and occasionally with Conservancy fairy shrimp in the Vina Plains Preserve and is never the numerically dominant one (Eng et al., 1990).

Numbers, Distribution, and Ecology in the NBHCP Area

There are 270 reported extant occurrences of vernal pool fairy shrimp in California, 50 of which are reported from Sacramento County and one of which is reported from Sutter County (NDDB 2001). There are no vernal pool fairy shrimp occurrences in the NBHCP Plan Area, although there are several occurrences east of the Plan Area in Elverta and Rio Linda (NDDB 2001).

Potential vernal pool fairy shrimp habitat occurs in the vernal pools on the east side of the Plan Area. Additional potential habitat occurs in other seasonal wetlands in the Plan Area.

Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

The vernal pool tadpole shrimp is a federally listed Endangered species. The vernal pool tadpole shrimp is a small (<3 inches in length) aquatic crustacea within the tadpole shrimp order (*Notostraca*). The common name "tadpole shrimp" presumably addresses the general shape of the creature when viewed from above. The animal is covered by a plate-like carapace, with only the posterior portion of the animal being exposed. It can be discerned from other tadpole shrimp within California by the presence, shape, and ridges of the sub-anal plate.

Distribution

Vernal pool tadpole shrimp is one of the three most common large branchiopods occurring in the Central Valley (Helm 1998). The vernal pool tadpole shrimp is found in scattered localities in the Central Valley from Stillwater Plains and Millville Plains in Shasta County, south to Flying M Ranch, and west to San Luis National Wildlife Refuge in Merced County (Helm 1998, U.S. Fish and Wildlife Service 1992) South to Tulare County and from one single vernal pool complex on the San Francisco Bay National Wildlife Refuge in the City of Fremont (Alameda County) (U.S. Fish and Wildlife Service 1994b).

Habitat Associations/Requirements

It generally occurs in very small (i.e. 2 meters square) to very large (i.e. 356,253 meters square) vernal pools with a variety of depths and volumes of water during the wet cycle (Helm 1998). The species is associated with vernal pools on the following geomorphologic surfaces: alluvial fan, basin, basin rim, floodplain, marine terrace, high terrace, stream terrace, very high terrace, low terrace, and volcanic mudflow landforms (Helm 1998).

The vernal pool tadpole shrimp has been observed in stock ponds, vernal pools, pools in old alluvial soil in grass bottom swales or mud-bottomed pools, and other seasonal wetlands (Helm 1998).This species occurs with California *linderiella*, vernal pool fairy shrimp, and

Conservancy fairy shrimp (Helm 1998). Unlike many of the fairy shrimp eggs, the vernal pool tadpole shrimp eggs do not need to go through a freezing or drying period to hatch (Ahl 1991).

Numbers, Distribution, and Ecology in the NBHCP Area

There are 154 reported occurrences of vernal pool tadpole shrimp in California, one of which is considered extirpated (NDDB 2001). Of the total number of occurrences in California, a total of 54 extant occurrences are reported from Sacramento County, and 4 from Sutter County. There are no reported occurrences within the NBHCP Plan Area (NDDB 2001), although there are two nearby occurrences located southwest of the intersection of Sankey Road and Pleasant Grove Road, and one occurrence at the intersection of Pleasant Grove Road and Howsley Road. Suitable tadpole shrimp habitat occurs along the eastern edge of the Plan Area.

Midvalley Fairy Shrimp (*Branchinecta mesovallensis n.sp.*)

The midvalley fairy shrimp has no official state or federal listing, although it appears to meet the status of rare, threatened, or endangered under CEQA and an emergency petition for listing by USFWS is under review. The midvalley fairy shrimp is similar in morphology to the vernal pool fairy shrimp (Helm pers.comm.) and is also a freshwater crustacean belonging to the order of fairy shrimp (*Anostraca*). Like all other fairy shrimp, the males of midvalley fairy shrimp have enlarge second antennae used for clasping the female during mating.

Distribution

This species has been found in scattered localities in the middle portion of the Central Valley from Sacramento County to Fresno County (Helm 1998). Based on the species' limited distribution and sparse population size, it is likely to become a candidate for listing under the federal Endangered Species Act.

Habitat Associations/Requirements

This species occurs in grassland pools and intermound pools within mound-intermound topography. This species has been found inhabiting the most ephemeral of seasonal wetland types, presumably due to its ability of rapid maturity (Helm 1998). This species appears to be a vernal pool obligate species, as it was observed to occur in vernal pools 93% of the time, and in vernal swales only 7% of the time (Helm 1998). This species is associated with the smallest (less than 202 meters square) and most ephemeral (average ponding depths of 10 centimeters) vernal pools (Helm 1998).

Numbers, Distribution, and Ecology in the NBHCP Area

There are 14 known occurrences of midvalley fairy shrimp reported in California, all of which are considered extant. Of these occurrences, one is reported from Sacramento County, and no midvalley fairy shrimp are reported from Sutter County (NDDB 2001). No occurrences of midvalley fairy shrimp are reported from the NBHCP Plan Area, however, suitable seasonal wetland and vernal pool habitat occurs along the extreme eastern edge of the Plan Area.

b. Plants

Delta Tule Pea *(Lathyrus jepsonii var. jepsonii)*

The delta tule pea is considered rare, threatened or endangered in California and elsewhere (List 1B) by the California Native Plant Society (Skinner and Pavlik 1994), and is a federal Species of Concern (former federal candidate for listing). Delta tule pea is a biennial to perennial herbaceous species. Like other members of the pea family (*Fabaceae*), it has a largish brightly colored pink to lavender flower with a distinctive banner and keel. The species, like other peas has grasping tendrils and a climbing habitat, and can be seen climbing over the tops of tules, through riparian vegetation, and even onto grasses and shrubs in roadside ditches.

Distribution

Delta tule pea is found along the floodplain of rivers and sloughs in Contra Costa, Fresno, Lake, Lassen, Marin, Napa, Plumas, Sacramento, San Benito, Santa Clara, San Joaquin, and Solano Counties. Unlike the related wild sweet pea (*Lathyrus jepsonii var. californica*), delta tule pea is found at elevations below 98.4 feet (30 m).

Habitat Associations/Requirements

The species is associated with alluvial floodplain soils of deltas and major river systems. The species is most commonly associated with both brackish and freshwater marsh vegetation, but can root near the water and extend into riparian and upland areas such as roadside ditches. Associated species include tule (*Scirpus acutus var. occidentalis*), blackberry (*Rubus* spp.), and rushes (*Juncus* spp.).

Numbers, Distribution, and Ecology in the NBHCP Area

Delta tule pea is known primarily from the Sacramento-San Joaquin River Delta. Most known occurrences are recorded from Solano (39 records), Contra Costa (15), Sacramento (14), and San Joaquin (9) Counties (CalFlora, 2001). All Sacramento County occurrence records are from the Delta region, with the nearest reported occurrences in the Walnut Grove area (CDFG, 2001). Delta tule pea is not known to occur in Sutter County. Little information is known about the population status of the delta tule pea, but the species is considered by the California Native Plant Society to be threatened by agricultural practices, water diversions and erosion (Skinner and Pavlik, 1994). Currently, there are 115 known occurrences of Delta tule pea in California, 14 of which are reported from Sacramento County, and none are reported from Sutter County (NDDB 2001). All of the reported occurrences are considered extant. No occurrences of this species are known from the NBHCP area (NDDB 2001). The nearest reported occurrence are in the Walnut Grove area. Potential habitat occurs where riparian vegetation or emergent marsh vegetation exists in sloughs and marshes.

Sanford's Arrowhead *(Sagittaria sanfordii)*

Sanford's arrowhead is considered a Species of Concern by USFWS and rare and endangered (List lB) by the California Native Plant Society (Skinner and Pavlik 1994). Sanford's arrowhead is an aquatic perennial that is a member of the water-plantain family (*Alismitaceae*), and occurs under shallow-water conditions in freshwater marshes. Its leaves are long, linear, and three-angled or narrowly ovate. The inflorescence is generally borne on an emergent peduncle, and it displays three-petaled unisexual flowers at the nodes. The female flowers are borne at the lowest node and the male flowers occur at the higher nodes. The flowering period for Sanford's arrowhead is generally from May through August.

Distribution

Sanford's arrowhead is known primarily from the Central Valley, but has been found below 2,000 feet (609.8 m) elevation (Hickman 1993) in Butte, Del Norte, Fresno, Kern, Merced, Marin, Sacramento, Shasta, San Joaquin, and Tehama Counties. Although the species is distributed widely in California, it is uncommon. Historically, Sanford's arrowhead was also found in Orange and Ventura Counties, is now considered extirpated from these areas.

Habitat Associations/Requirements

Sanford's arrowhead is found in ponds, ditches, vernal pools, sloughs, and other slow-moving waterways. It is commonly associated with yellow water primrose (*Ludwigia repens*), barnyard grass (*Echinochloa crus-galli*), water plantain (*Alisma plantago-aquatica*), and cattails (*Typha* ssp.) (NDDB 2000).

Numbers, Distribution, and Ecology in the NBHCP Area

There are 65 known occurrences of Sanford's arrowhead in California, one of which is presumed extirpated (NDDB 2001). Of these known occurrences, 30 extant occurrences are reported from Sacramento County and none are reported from Sutter County. No occurrences of this species are known from the NBHCP Plan Area (NDDB 2001). In Sacramento County, several occurrences are reported along the American River Parkway along small oxbows and sloughs (CDFG, 2001). Sanford's arrowhead is an endemic species, but is considered by CNPS to be threatened by agricultural practices, water diversions and erosion (Skinner and Pavlik, 1994). The nearest reported occurrence is located along a slough connected to the American River, approximately 1.5 miles south of the study area. Potential habitat occurs where riparian vegetation or emergent marsh vegetation exists in sloughs, marshes, and unmaintained agricultural canals.

Boggs Lake Hedge-Hyssop *(Gratiaola heterosepala)*

The Boggs Lake hedge-hyssop is a State listed endangered species. Boggs Lake hedge-hyssop (*Gratiola heterosepala*) is a small, semi-aquatic, herbaceous annual. It is mostly glabrous (smooth) and a member of the figwort family (*Scophulareaceae*). The stems are erect and 1-5 inches (2.5-12.7 cm) long. The leaves are opposite and entire. The basal leaves are 0.2-1.0 inch

(0.5-2.5 cm) long, lanceolate, and slightly clasp the stem. The upper leaves are blunt or notched at the tip and are shorter and wider at the tip than at the base. The inflorescences are open and borne on stout stalks. The flowers are tubular and have five petals. The upper two petals are yellow and fused nearly to the tips. The lower three petals are white and separate. The flowering period for Boggs Lake hedge hyssop is generally from April through June.

Distribution

Boggs Lake hedge-hyssop is found in the following counties in California: Modoc, Lassen, Shasta, Tehama, Lake, Solano, Placer, Sacramento, Madera, and Fresno (Skinner and Pavlik 1994). Boggs Lake hedge-hyssop is found in five widely disjunct areas in California: Boggs Lake in Lake County, Rio Linda and Elk Grove in Sacramento County and near Roseville in Placer County, Big Table Mountain in Fresno County, Kennedy Table in Madera County, and near the Pit River in Shasta County (NDDB 2000). It has also been reported at one site in Lake County, Oregon (Skinner and Pavlik 1994).

Habitat Associations/Requirements

Boggs Lake hedge-hyssop occurs in shallow waters or moist clay (adobe) soils, in vernal pools, and along lake margins. Populations are usually composed of scattered individuals. May Consulting Services' file data indicate that Boggs Lake hedge-hyssop is often associated with bractless hedge-hyssop, coyote thistle, hairy clover-fern (*Marsilea vestita*) and slender orcutt grass (*Orcuttia tenuis*). At higher elevations, such as Boggs Lake in Lake County and near the Pit River in Shasta County, the species is found in close proximity to foothill woodland species, such as black oak (*Quercus kelloggii*) and foothill pine (*Pinus sambiana*), and northern juniper woodland species, respectively.

Numbers, Distribution, and Ecology in the NBHCP Area

Currently, there are 86 known occurrences of Boggs lake hedge-hyssop in California, one of which is presumed extirpated (NDDB 2001). Of the 85 extant occurrences, 10 are known from Sacramento County, and no occurrences known from Sutter County. There are no known occurrences of this species in the NBHCP area (NDDB 2001) although limited potentially suitable vernal pool habitat occurs along the far eastern boundary of the project area north of Del Paso Road. The closest known occurrences are from Rio Linda, approximately 2 miles east of the Plan Area.

Sacramento Orcutt Grass *(Orcuttia viscida)*

Sacramento orcutt grass is listed as Endangered by both the state and federal Endangered Species Acts and is considered rare, threatened, or endangered in California and elsewhere (List 1B) by the California Native Plant Society (Skinner and Pavlik 1994). Sacramento orcutt grass (*Orcuttia viscida*) is a gray-green annual grass species (Family: *Poaceae*) approximately 3 to 5 inches in height with one to several stems arising from the plant's base. The inflorescence is distinctively more densely packed than other species in the genus *Orcuttia*. As with other orcutt

grasses, Sacramento orcutt grass is covered with a sticky, viscid, and aromatic exudate when mature. The flowering period for this species is from May to July.

Distribution

Sacramento orcutt grass has been identified at nine sites in Sacramento County; there are no known occurrences of this species in the Natomas Basin (NDDB, 2001). The closest known occurrences are reported in the vicinity of Kiefer Road in eastern Sacramento County, approximately eight miles southeast of the Natomas Basin.

Habitat Associations/Requirements

Sacramento orcutt grass typically occurs in medium to large vernal pools with relatively long inundation periods. The species is associated with very old alluvial surfaces (also referred to as high terrace landforms), such as historic floodplains of pre-historic rivers and creeks. Associated species include vernal pool endemic plants, such as common spikerush (*Eleocharis macrostachya*), rayless lasthenia (*Lasthenia glaberrima*), and coyote thistle (*Eryngium vaseyi*).

Numbers, Distribution, and Ecology in the NBHCP Area

Sacramento orcutt grass is known from only nine occurrences in California, all of which are reported from Sacramento County, one of which is presumed extirpated (NDDB 2001). There are no records of Sacramento orcutt grass in Sutter County, and no known occurrences of this species in the NBHCP area (NDDB 2001). The closest known occurrences are reported in the vicinity of Kiefer Road in eastern Sacramento County, approximately 8 miles southeast of the Plan Area. Limited potential habitat occurs in the vernal pools along the eastern edge of the Plan Area.

Slender Orcutt Grass *(Orcuttia tenuis)*

Slender orcutt grass is listed as Threatened under the federal Endangered Species Act and Endangered under the state Endangered Species Act, and is considered rare and endangered (List 1B) by the California Native Plant Society (CNPS) (Skinner and Pavlik 1994). Slender orcutt grass is a gray-green annual grass species (Family: *Poaceae*) approximately 3 to 5 inches in height. The stems of the species are slender, often branching from the upper nodes. The inflorescence is less densely packed than other species in the genus *Orcuttia*, but individual spikelets within the inflorescence are larger. As with other orcutt grasses, slender orcutt grass is covered with a sticky, viscid, and aromatic exudate when mature. The flowering period for this species is from May to July.

Distribution

Slender orcutt grass is currently recorded at 74 locations in Lake, Plumas, Sacramento, Shasta, Siskiyou and Tehama Counties (NDDB, 2001). Of these occurrences, two are reported from Sacramento County and no occurrences are reported from Sutter County. There are no

known occurrences of this species in the Natomas Basin (NDDB, 2001). The closest known occurrences are in eastern Sacramento County, between Kiefer Road and Rancho Seco.

Habitat Associations/Requirements

Slender orcutt grass typically occurs in medium to large vernal pools with relatively long inundation periods. The species is associated with very old alluvial surfaces (also referred to as high terrace landforms), such as historic floodplains of pre-historic rivers and creeks. Associated species include vernal pool endemic plants such as wire rush (*Eleocharis macrostachya*), rayless lasthenia (*Lasthenia glaberrima*), and coyote thistle (*Eryngium vaseyi*).

Numbers, Distribution, and Ecology in the NBHCP Area

Slender orcutt grass is currently reported from 74 occurrences in California, of which 4 occurrences are reported extirpated, and 3 other occurrences were not relocated at a previously reported location (NDDB 2001). Of the 70 extant occurrences, two are reported from Sacramento County, and no occurrences are reported from Sutter County. There are no known occurrences of this species in the NBHCP area (NDDB 2001). The closest known occurrences are in eastern Sacramento County between Kiefer Road and Rancho Seco. In general, vernal pools in Natomas Basin lack that particular high terrace landforms that are associated with the species, therefore, potential for occurrence within the Plan Area is considered low.

Colusa Grass (*Neostapfia colusana*)

Colusa grass is both a federally and state listed Endangered species. It is also considered rare and endangered (List lB) by the California Native Plant Society (Skinner and Pavlik 1994). The Colusa grass (*Neostapfia colusana*) is a low (2 to 3-inch or 7.6-to 30.5-cm) tufted annual. Typically, it has several stems that are decumbent (arching) at the base. The upper stem is erect and terminates in a dense cylinder inflorescence. The inflorescences have sheathing leaves that make them superficially resemble ears of corn and individual florets that are broadly fan-shaped. At maturity, Colusa grass, like the orcutt grasses, is covered with a sticky brownish exudate. The flowering period for Colusa grass is generally from May through July.

Distribution

Currently, Colusa grass is found in Merced, Solano, and Stanislaus Counties below 700 feet (213.4 m) elevation. It has been extirpated from Colusa County where it was originally discovered (Skinner and Pavlik 1994). The species' historical range was previously not much larger than is its current range. However, populations of Colusa grass were much more abundant historically than they are currently.

Habitat Associations/Requirements

Colusa grass is usually found in fairly monotypic stands in the drying beds of larger vernal pools, usually occurring in the deepest portions of the pools (Stone et al., 1988). It usually occurs in the deepest portions of the pools (May Consulting Services file information). When

Colusa grass is present, other vernal pool plants are often sparse or absent. When found with other species, Colusa grass is often associated with Hoover's spurge or orcutt grasses (*Orcuttia* sp.)(Stone et al., 1988).

Numbers, Distribution, and Ecology in the NBHCP Area

There are currently 59 known occurrences of Colusa grass in California. Of these 59 occurrences, 48 are presumed extant, 7 are considered extirpated, and an additional 4 occurrences have not been relocated at a previously reported location. Of the 48 extant occurrences, none are reported from Sacramento and Sutter Counties. There are no known occurrences of this species in the NBHCP area (NDDB 2001). Limited potential habitat occurs in the vernal pools along the eastern edge of the Plan Area.

Legenere *(Legenere limosa)*.

Legenere is considered a Species of Concern by USFWS and rare and endangered (List 1B) by the California Native Plant Society (Skinner and Pavlik 1994). Legenere (*Legenere limosa*) is an inconspicuous annual that is a member of the bellflower family (Campanulaceae). It is generally 4-6 inches (10.2-15.2 cm) tall but can attain heights of up to 12 inches (30.5 cm). It has erect lateral branches that are stiff and sometimes fleshy. The leaves are sessile, narrowly triangular entire, and early deciduous. The minute flowers are white and are absent on lower portions of the stem. The flowering period for legenere is generally from April through June.

Distribution

Legenere is found below 500 feet (152.4 m) elevation (Hickman 1993) in Lake, Napa, Placer, Sacramento, San Mateo, Solano, and Tehama Counties (Skinner and Pavlik 1994). Historically, it was also found in Sonoma and Stanislaus Counties but is now considered extirpated from these areas (Skinner and Pavlik 1994).

Habitat Associations/Requirements

Legenere is found along lakeshores and in vernal pools, marshes, and other seasonally inundated habitats. May Consulting Services' file data indicate that legenere is commonly associated with stipitate popcornflower, common spikerush (*Eleocharis macrostachya*), rayless goldfields (*Lasthenia glaberrima*), and coyote thistle.

Numbers, Distribution, and Ecology in the NBHCP Area

Currently, there are 49 known occurrences of legenere in California. Of these known occurrences, 6 have been extirpated and one occurrence has not been relocated at a previously known location. Of the 42 extant occurrences, 18 are reported from Sacramento County, and none are reported from Sutter County. There are no reported occurrences in the NBHCP area, although potentially suitable vernal pool habitat occurs along the far eastern boundary of the project area north of Del Paso Road.

D. SPECIES WHICH MAY OCCUR IN THE NBHCP AREA

Table II-4 provides a list of vertebrate wildlife species which may occur in specific habitat types in the Permit Areas. This information is provided for reference purposes only. These species are not considered Covered Species in this NBHCP or under the incidental take permits unless they are listed in Table I-1 of this NBHCP.

TABLE II – 4
VERTEBRATE WILDLIFE WHICH MAY OCCUR IN THE NATOMAS AREA BY HABITAT TYPE

OPEN WATER (including flooded rice fields)

MAMMALS

Muskrat	Beaver	River Otter

BIRDS

Pied-billed Grebe	Bald Eagle	Double-crested Cormorant
Canada Goose	Mallard	Pintail
Common Goldeneye	American Coot	Ruddy Duck
Wood Duck	Forster's Tern	California Gull
Whistling Swan	Snow Goose	Ross' Goose
Cinnamon Teal	American Wigeon	Kingfisher

REPTILES/AMPHIBIANS

Giant garter snake	Common garter snake	Bullfrog
Western Pond turtle		

FRESHWATER MARSH & MARGINS OF OPEN WATER

MAMMALS

Muskrat	Beaver	River otter
Harvest mouse	Shrews	Long-tailed weasel
Skunk	Ringtail	Various bats (forage over marshes)

BIRDS

Great Blue Heron	Yellowthroat	Green Heron
Marsh Wren	Black-crowned Night Heron	Killdeer
Belted Kingfisher	Black Phoebe	Black Tern
Yellow-headed Blackbird	Tricolored Blackbird	Red-winged Blackbird
Bewick's Wren	Song Sparrow	American Bittern
Purple Gallinule	Great Egret	Snowy Egret
Cattle Egret	American Avocet	Sora
Long-billed Curlew	Yellowlegs	Willet
Black-necked Stilt	Northern Harrier	

REPTILES/AMPHIBIANS

Giant garter snake	Common garter snake	Gopher snake
Bullfrog	Pacific tree frog	Western toad

RIPARIAN SCRUB-SHRUB

MAMMALS

Opossum	Shrews	Beaver
Long-tailed weasel	Skunk	Pocket gopher
Harvest mouse	Cottontail	California vole
Deer mouse	Black-tailed deer	Bats
River otter	Raccoon	

BIRDS

Great Blue Heron	Egret	Green Heron
Wood Duck	White-tailed Kite	Rufous-sided Towhee
Screech Owl	Tree Swallow	Black Phoebe
Bewick's Wren	Yellowthroat	Brown Towhee
Scrub Jay	Downy Woodpecker	Barn Owl
White-crowned Sparrow	Ringtail	

REPTILES/AMPHIBIANS

Common garter snake	Racer	Gopher snake
Common king snake	Alligator lizard	Pacific tree frog
Bullfrog		

VALLEY RIPARIAN FOREST

MAMMALS

Opossum	Shrews (several species)	Mole
Coyote	Gray fox	Gray squirrel
Pocket gopher	Wood rat	California ground squirrel
Cottontail	Black-tailed deer	Beaver
Long-tailed weasel	Harvest mouse	Deer mouse
Ring-tailed cat		

BIRDS

Screech Owl	Great-horned Owl	Anna's Hummingbird
Flicker	Scrub Jay	Tree Swallow
House Wren	Violet-green Swallow	Swainson's Hawk
Crow	Red-shouldered Hawk	Great blue Heron
Wood Duck	Turkey Vulture	White-tailed Kite
American Kestrel	Red-tailed Hawk	Bewick's Wren
Vireos (several species)	Warblers (several species)	Black-headed Grosbeak
Rufous-sided Towhee	Brown Towhee	Finches (several species)

Fox Sparrow	Titmouse	Western Tanager
Western Bluebird	Golden-crowned Sparrow	Woodpecker (several species)
Robin	Northern Oriole	

REPTILES/AMPHIBIANS

Common garter snake	Southern Alligator lizard	Western fence lizard
Pacific tree frog	Ring-necked snake	Gopher snake

VALLEY OAK WOODLAND

MAMMALS

Opossum	Shrew (several species)	Mole
Raccoon	Long-tailed weasel	Skunk
Gray fox	Coyote	Graysquirrel
California ground squirrel	Pocket gopher	Deer mouse
Black-tailed deer		

BIRDS

American Kestrel	Turkey Vulture	White-tailed Kite
Rough-legged Hawk	Swainson's Hawk	Mourning Dove
Great horned Owl	Barn Owl	Screech Owl
Anna's Hummingbird	Woodpecker (several species)	Ash-throated Flycatcher
Kingbird	Scrub Jay	Finches (several species)
Warblers (several species)	Western Bluebird	Western Tanager
Crow	Raven	Woodpecker (several species)
Robin	Meadowlark	Northern Oriole
Sharp-shinned Hawk	Yellow-billed Magpie	Lark Sparrow
White-crowned Sparrow		

REPTILES/AMPHIBIANS

Western fence lizard	Gilbert skink	Alligator lizard
King snake	Gopher snake	Western rattlesnake
Western toad	Pacific tree frog	CA slender salamander
Ring-necked snake	Racer	Common garter snake

GRASSLAND/SAVANNA

MAMMALS

Opossum	Mole	Skunk
Gray fox	Coyote	Bats (several species)
California ground squirrel	Pocket gopher	Harvest mouse
Deer mouse	California vole	Black-tailed hare
Black-tailed deer		

BIRDS

Turkey Vulture	American Kestrel	White-tailed Kite

Red-tailed Hawk	Swainson's Hawk	Golden Eagle
Short-eared Owl	Western Bluebird	Loggerhead Shrike
Yellow-billed Magpie	Crow	Great horned Owl
Raven	Kingbird	Northern Oriole
Finches (several species)	Horned Lark	Lark Sparrow
Golden-crowned Sparrow	White-crowned Sparrow	Brewer's Blackbird
Barn Owl		

REPTILES/AMPHIBIANS

Horned lizard	Western fence lizard	Common king snake
Gopher snake	Racer	Western toad
Alligator lizard	Common garter snake	Gilbert skink

GRASSLAND, LEVEE SIDES AND OLD FIELD

MAMMALS

Opossum	Mole	Skunk
Gray fox	Coyote	Bats (several species)
California ground squirrel	Pocket gopher	Harvest mouse
Deer mouse	California vole	Black-tailed hare
Black-tailed deer		

BIRDS

Turkey Vulture	American Kestrel	Red-tailed Hawk
Swainson's Hawk	Golden Eagle	Mourning Dove Acorn
Woodpecker	Western Bluebird	White-tailed Kite
Loggerhead Shrike	Yellow-billed Magpie	Crow
Raven	Kingbird	Northern Oriole
Finches (several species)	Horned Lark	Lark Sparrow
White-crowned Sparrow	Golden-crowned Sparrow	Brewer's Blackbird
Short-eared Owl	Great horned Owl	
Northern Harrier		

REPTILES/AMPHIBIANS

Horned lizard	Western fence lizard	Common king snake
Gopher snake	Racer	Western toad
Alligator lizard	Common garter snake	

Source: Cribbs & Associates