Appendix H

Biological Resources Technical Memo,
prepared by CH2MHill,
dated February 25, 2002.

Final Report

Natomas Basin Habitat Conservation Plan Impacts to Proposed Covered Species

Prepared for

City of Sacramento and Sutter County

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SECTION 1.0

Introduction

The proposed Natomas Basin Habitat Conservation Plan (HCP) has been developed to provide and implement a conservation strategy to minimize impacts of planned land development and water facility operations and maintenance (O&M) in the Natomas Basin. The HCP conservation measures apply to 22 special-status species ("covered species") in the Natomas Basin. The effects to the covered species from these planned activities and from ongoing and future water agencies' O&M activities are addressed in this report.

On the basis of the HCP that was previously prepared in 1997, the City of Sacramento (City) received incidental take authorization from the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) in December 1997. Environmental review under the National Environmental Policy Act and the California Environmental Quality Act was conducted by the USFWS and the City, respectively. In August 2000, parts of a legal challenge to the validity of the USFWS's action to issue an incidental take permit to the City were upheld by the U.S. District Court for the Eastern District of California (Court), which issued a Memorandum of Opinion and Order (Opinion) on the plaintiffs' claims.[1] In addition, in the interim since the 1997 HCP, Sutter County, Reclamation District No. 1000 (RD 1000), and the Natomas Central Mutual Water Company (Natomas Mutual) have joined the HCP process as applicants.[2]

The City, Sutter County, RD 1000, and Natomas Mutual are preparing an HCP for the Natomas Basin that includes new and updated information and addresses the issues raised in the Court's Opinion. In addition, the HCP being prepared is incorporating measures applicable to the parties that joined process subsequent to 1997. This technical memorandum (TM) presents the expected impacts to the covered species in the Natomas Basin resulting from implementation of the HCP. The analysis in this TM is based on the proposed HCP dated January 14, 2002, with the exception that four species (American peregrine falcon, greater sandhill crane, Conservancy fairy shrimp, and longhorn fairy shrimp) were subsequently removed from the list of covered species proposed in the January 14, 2002 draft.

The TM is presented in the following sections:

Section 1.	Introduction
Section 2.	Proposed Natomas Basin Habitat Conservation Plan
Section 3.	Methods
Section 4.	Plan Area Acreage
Section 5.	Species Assessment
Section 6	References

[1] *National Wildlife Federation, et al. v. Secretary of the Interior Bruce Babbitt*, August 15, 2000.

[2] Sutter County, RD 1000, and Natomas Mutual joined the HCP process subsequent to the Court Opinion on the prior HCP. The HCP addresses Sutter County's land development plans for the southern part of the county. It also includes Natomas Mutual's and RD 1000's O&M activities for the water facilities under their separate management.

SECTION 2.0

Proposed Natomas Basin HCP

This section presents an overview of the purpose of the HCP and summarizes its key measures to provide a context for the analysis conducted in this report. The conservation measures assessed in this report are contained in the January 14, 2002 HCP.

2.1 Purpose of the Proposed Natomas Basin HCP

The purpose of the HCP, as described in Section 1.A. of the HCP, is to promote biological conservation in conjunction with economic and urban development within the Natomas Basin (Figure 2-1). The HCP would establish a multi-species conservation program to mitigate the expected loss of habitat values and incidental take of covered species that could result from urban development, O&M of canal and drain systems, and certain agricultural activities associated with the management of the habitat reserves established under the HCP. The goal of the HCP is to preserve, restore, and enhance habitat values and maintain viable populations of species found in Natomas Basin while allowing covered activities to proceed. The covered species are presented in Table 2-1.

2.2 Summary of Provisions

Implementation of the HCP would result in the establishment and management of permanent habitat reserves. The HCP also requires minimization measures during urban development activities and for the O&M activities of RD 1000 and Natomas Mutual for the canals and drains under their administration. Key provisions of the HCP are summarized in the following subsections.

2.2.1 Habitat Reserves

The HCP would establish a comprehensive program for the preservation and protection of habitat for threatened and endangered species potentially present in the Natomas Basin. The acquisition of lands or conservation easements for the purpose of creating and managing permanent habitat reserves would be the primary mechanism for mitigating impacts to listed species. The HCP describes a method of funding the land acquisition and the general restoration and management goals for the acquired lands. It identifies the Natomas Basin Conservancy (Conservancy) as the "plan operator" to implement the plan.

The primary component of the HCP's conservation strategy for funding habitat reserve acquisition would be the use of mitigation fees to set aside 0.5 acres of habitat land for each gross acre of development that occurs in the Natomas Basin. Land development would result in 17,500 acres in the Natomas Basin being converted to urban and associated uses, in addition to the existing urban uses as of December 1997. Thus, under the 0.5-to-1 mitigation ratio, approximately 8,750 acres of land would be acquired by the Conservancy (or conservation easement purchased) as habitat reserves. Habitat reserves would be managed by the Conservancy and would consist of managed marsh habitats, upland habitats, rice

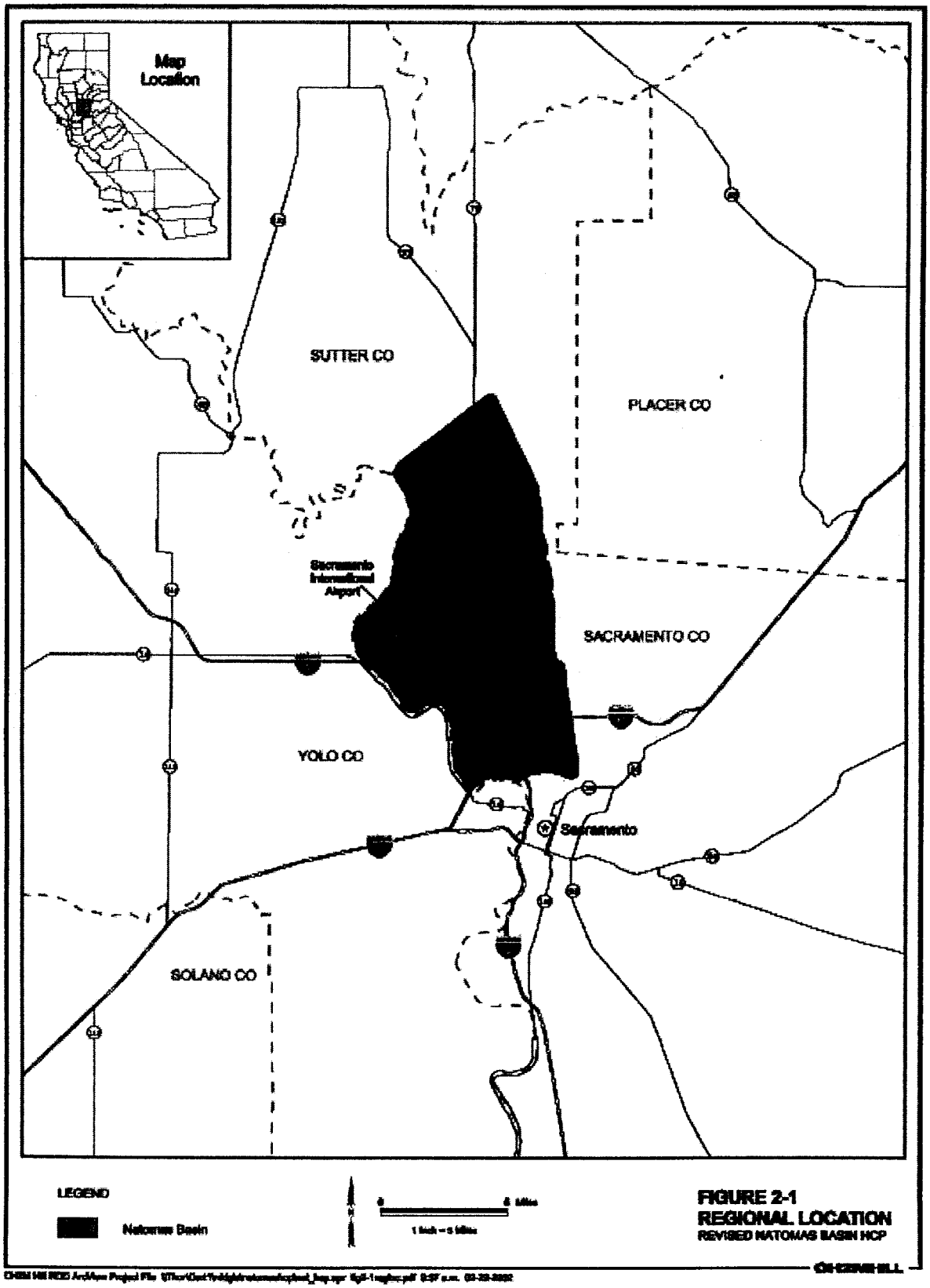
Map Location
SUTTER CO
PLACER CO
Sacramento International Airport
SACRAMENTO CO
YOLO CO
Sacramento
SOLANO CO
LEGEND
Natomas Basin
1 inch = 5 miles
FIGURE 2-1
REGIONAL LOCATION
REVISED NATOMAS BASIN HCP

TABLE 2-1
Proposed HCP Covered Species

Habitat and Species	Federal Status	State Status
Wetland Associated Species		
Aleutian Canada goose *Branta canadensis leucopareia*	Species of Concern (recently delisted)	NA
Swainson's hawk *Buteo swainsoni*	NA	Threatened
giant garter snake *Thamnophis gigas*	Threatened	Threatened
white-faced ibis *Plegadis chihi*	Species of Concern	Species of Special Concern
bank swallow *Riparia riparia*	NA	Threatened
tricolored blackbird *Agelaius tricolor*	Species of Concern	Species of Special Concern
northwestern pond turtle *Clemmys marmorata marmorata*	Species of Concern	Species of Special Concern
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Threatened	NA
delta tule pea *Lathyrus jepsonii* ssp.*jepsonii*	Species of Concern	NA
Sanford's arrowhead *Sagittaria sanfordii*	Species of Concern	NA
Upland Associated Species		
Swainson's hawk *Buteo swainsoni*	NA	Threatened
tricolored blackbird *Agelaius tricolor*	Species of Concern	Species of Special Concern
loggerhead shrike *Lanius ludovicianus*	Species of Concern	Species of Special Concern
burrowing owl *Athene cunicularia*	Species of Concern	Species of Special Concern
Vernal Pool Associated Species		
vernal pool fairy shrimp *Branchinecta lynchi*	Threatened	NA
vernal pool tadpole shrimp *Lepidurus packardi*	Endangered	NA
midvalley fairy shrimp *Branchinecta mesovallensis*	NA	NA
California tiger salamander *Ambystoma californiense*	Candidate	Candidate Protected Amphibian
western spadefoot toad *Scaphiopus hammondii*	Species of Concern	Protected Amphibian
Colusa grass *Neostapfia colusana*	Threatened	NA

TABLE 2-1
Proposed HCP Covered Species

Habitat and Species	Federal Status	State Status
Boggs Lake hedge-hyssop *Gratiaola heterosepala*	NA	Endangered
Sacramento Orcutt grass *Orcuttia viscida*	Endangered	Endangered
slender Orcutt grass *Orcuttia tenuis*	Threatened	Endangered
legenere *Legenere limosa*	Species of Concern	NA

Source: Natomas Basin Habitat Conservation Plan, January 2002.
NA The status is not applicable to this species

fields (which would typically be leased to rice farmers), and associated buffers and infrastructure. The HCP does not specify any particular land area for acquisition as habitat reserves because many factors, including the quality and availability of parcels and the willingness of owners to sell, could affect the land areas ultimately purchased. Rather, the HCP relies on a detailed, science-based acquisition criteria, and land purchases are subject to review by a Technical Advisory Committee that includes representatives from the USFWS and CDFG. Additional information about the proposed system of habitat reserves is in Section IV.C of the HCP.

2.2.2 O&M Activities Conducted by RD 1000 and Natomas Mutual

RD 1000's and Natomas Mutual's primary O&M efforts focus on keeping the canal systems under their administration functioning in a manner that maximizes the timely movement of irrigation water for agricultural purposes and ensures drainage of agricultural water and storm flows from lands within the Natomas Basin. RD 1000 and Natomas Mutual carry out these activities to provide water and drainage for agricultural production, and to minimize potential damage to property from flooding. Specific measures to be implemented by RD 1000 and Natomas Mutual are described in Section V.B of the HCP, and include the following measures:

- Restrictions on the extent of canal and ditch maintenance operations that could occur in any calendar year
- Restrictions on the timing of canal and ditch maintenance operations
- Restrictions on the de-watering and filling of canals and drains
- Detailed measures for control of weedy vegetation (e.g., restrictions on mowing, aquatic and other herbicide use, burning), traffic, and rodents
- A program for educating staff regarding awareness of potential for O&M activities to impact giant garter snakes
- Provisions to allow emergency activities

2.2.3 Take Avoidance

In addition to the summarized measures that are intended to address incidental take of covered species, the HCP also includes measures to minimize the potential for incidental take to occur during covered activities (i.e., land development, O&M of canals and drains). These minimization measures include canal/drain dewatering and seasonal grading restrictions for giant garter snakes, and nest site protection and replacement measures for Swainson's hawks. These and other minimization measures are described throughout Section V of the HCP.

SECTION 3.0

Methods

The objective of the analysis in this report is to identify impacts to covered species in the Natomas Basin as a result of expected land use changes (i.e., planned land development of 17,500 acres; a habitat reserve system of 8,750 acres). This section describes the methods for the development of the land use/habitat categories used to demonstrate the changes in Natomas Basin acreage in Section 4 and the species assessment in Section 5 of this report. The methods presented below were discussed and approved by the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) team at various meetings conducted in support of the preparation of the HCP and the EIR/EIS.[3]

To assist in the analysis of expected habitat changes, standard categories of existing land uses and a Geographic Information System (GIS) database were developed to provide a framework for predicting future land areas 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 then. Additional information available since 1997 and field data gathered in 2001 were used to supplement and update the 1997 data. In this report, this updated scenario is referred to as the baseline. The primary steps in developing the land use database are presented below.

- Digital aerial photos were obtained from the U.S. Geological Survey and assembled into a mosaic containing the entire Natomas Basin. The boundary of the Basin was set at the toe of the surrounding levees, providing a total area of 53,537 acres.
- 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 3-1.
- Land use data from the Department of Water Resources (DWR) were added to the GIS database, and the DWR categories were translated to match the eighteen land use categories developed for the project.
- The resulting land use map was modified 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.

An additional component of the GIS database is the system of canals and drains owned and maintained by RD 1000 and Natomas Mutual. Existing digital information on the canals and drains was obtained from RD 1000 and Natomas Mutual and added to the database as linear features. Based on the 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

[3] The HCP EIR/EIS team consists of representatives from the City, Sutter County, USFWS, CDFG, RD 1000, and Natomas Mutual. The meetings at which the methodology was discussed and agreed upon occurred in Spring 2001.

TABLE 3-1
Description of Land Use/Habitat Categories

Category	Description
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 HCP 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 HCP baseline. Includes known uncultivated grasslands, primarily along the eastern border of the Natomas Basin.
Highways	Includes I-5, I-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 and Seasonally Wet Areas	Wetland/marsh areas including Pritchard's Lake 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 as a result of their 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.

drainage system), Class II (large), Class III (medium), and Class IV (small). Following the completion of the baseline scenario described above, the last step in the development of the database was to create a future land use scenario corresponding to buildout conditions in the Natomas Basin. This buildout conditions include the planned land development activities of the City and Sutter County, and the development of the Metro Air Park project in unincorporated Sacramento County. Although Sacramento County is not an applicant, the HCP includes Metro Air Park in the 17,500 acres of planned development to be included in the HCP. A separate HCP application has been filed for the 1,983-acre Metro Air Park property (Metro Air Park Property Owners' Association, 2001).

SECTION 4.0

Plan Area Acreage

On the basis of the methodology described in Section 3.0, the acreage assignments for the land use classes and other features, by jurisdiction, are presented in this section. Table 4-1 shows the acreage of land use classes for the areas that would be covered by the conservation measures of the proposed HCP. Tables 4-2 and 4-3 show the miles and acres, respectively, of canals and drains, by jurisdiction. Table 4-4 shows the total HCP baseline acreage by land use class and jurisdiction, and the expected future acreage in the basin as a result of urban development. Tables 4-5 and 4-6 show the miles and acres, respectively, of canals and drains for the HCP baseline, changes in the miles and acres of canals and drains in each jurisdiction, and the expected future condition for the basin as a result of urban development.

TABLE 4-1
Land Uses in the Natomas Basin by Jurisdiction (acres)

Land Use Class	City of Sacramento[a]	Metro Air Park	Other Sacramento County	Sutter County	Total
Airport	18	0	1,512	21	1,551
Alfalfa	0	0	137	234	371
Canals[b]	129	0	308	66	503
Grassland	454	0	293	138	886
Highways	450	0	414	571	1,435
Idle	839	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**

TABLE 4-1
Land Uses in the Natomas Basin by Jurisdiction (acres)

Land Use Class	City of Sacramento[a]	Metro Air Park	Other Sacramento County	Sutter County	Total

[a] City lands include the unincorporated panhandle area proposed for annexation.

[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.

TABLE 4-2
Canals and Drains in the Natomas Basin by Jurisdiction (miles)

Canal Type	City of Sacramento	Metro Air Park	Other Sacramento County	Sutter County	Total
Class I	12.9	0	15.0	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	**37.1**	**11.6**	**114.9**	**82.3**	**247.0**

TABLE 4-3
Canals and Drains in the Natomas Basin by Jurisdiction (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	**274**	**72**	**898**	**535**	**1,778**

[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.

TABLE 4-4
Land Use Acreage in the Natomas Basin Under the HCP Baseline and Future Conditions (acres)

Habitat Class	HCP Baseline	Change from Development – City of Sacramento	Change from Development – Metro Air Park	Change from Development – Sutter County	Total Change from Development	Future Condition[a]
Airport	1,551	(18)	0	(21)	(39)	1,513
Alfalfa	371	0	0	0	0	371
Canals	503	0	0	0	0	503
Grassland	886	(427)	0	(134)	(560)	325
Highways	1,435	0	0	0	0	1,435
Idle	1,464	(675)	(50)	(8)	(733)	731
Non-rice crops	16,686	(4,663)	(325)	(1,529)	(6,517)	10,169
Oak groves	98	(6)	(2)	0	(8)	89
Orchard	182	(13)	0	0	(13)	169
Other	468	(31)	0	0	(31)	437
Pasture	674	(23)	(22)	(101)	(147)	527
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Rice	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Riparian	124	(24)	0	0	(24)	100
Ruderal	1,970	(1,137)	(6)	(88)	(1,231)	739
Rural residential	377	(46)	(10)	0	(56)	321
Tree groves	106	(10)	(23)	0	(33)	73
Urban	3,854	8,050	1,983	7,467	17,500	21,354
Total	**53,537**	**0**	**0**	**0**	**0**	**53,537**

[a] Does not include the effects associated with the creation of habitat reserves.
(#) Decrease in age
Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

TABLE 4-5
Canals and Drains in the Natomas Basin by Jurisdiction (miles)

Canal Type	HCP Baseline	Change from Development - City of Sacramento	Change from Development - Metro Air Park	Change from Development - Sutter County	Total Change from Development	Future Condition
Class I	35.9	0	0	0	0	35.9
Class II	50.5	(3.6)	(4.0)	(13.9)	(21.5)	29.0
Class III	97.6	(12.1)	(3.5)	(9.8)	(25.5)	72.1
Class IV	62.8	(3.6)	(4.1)	(9.9)	(17.5)	45.3
Total	**246.8**	**(19.3)**	**(11.6)**	**(33.6)**	**(64.5)**	**182.3**

(#) Decrease in age
Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

TABLE 4-6
Canals and Drains in the Natomas Basin by Jurisdiction (acres)[a]

Canal Type	HCP Baseline	Change from Development - City of Sacramento	Change from Development – Metro Air Park	Change from Development - Sutter County	Total Change from Development	Future Condition
Class I	503	0	0	0	0	494
Class II	404	(29)	(32)	(111)	(172)	232
Class III	582	(72)	(21)	(59)	(152)	430
Class IV	289	(16)	(19)	(45)	(80)	209
Total	**1,778**	**(117)**	**(72)**	**(215)**	**(404)**	**1,365**

[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.
(#) Decrease in age
Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

SECTION 5.0

Species Assessment

The impacts of implementing the HCP on species proposed for coverage under the HCP are described in this section. The assessment includes a species description that summarizes the habitat needs of each of the species considered in the analysis, and an impact evaluation that describes the expected response of the species to changed habitat conditions with implementation of the HCP. Three categories of potential impacts have been identified: (1) effects of overall changes in habitat within the Natomas Basin; (2) direct effects during construction activities; and (3) ongoing effects of O&M activities of canal and drainage systems conducted by Natomas Mutual and RD 1000 as well as effects of O&M activities conducted by the Conservancy in managing the habitat reserves.

- **Effects from Changes in Habitat.** This component of the analysis discusses the viability of each species in the Natomas Basin given expected future habitat conditions. This portion of the analysis, therefore, addresses the effectiveness of the HCP measures in mitigating the loss of habitat resulting from planned urban development. Habitat changes and the effectiveness of the HCP measures are evaluated for land use jurisdictions individually and collectively.
- **Construction Effects.** This component of the analysis discusses potential impacts to each species during construction for urban development and for creation of habitat on the Conservancy reserves. The analysis, therefore, addresses the effectiveness of the HCP measures in avoiding and minimizing take (mortality) associated with construction.
- **O&M Effects.** This component of the analysis discusses potential impacts to each species during O&M activities by RD 1000 and Natomas Mutual required to maintain the canal and drains, and by the Conservancy during O&M (including farming operations) on the habitat reserves. This analysis, therefore, addresses the effectiveness of the HCP measures in avoiding and minimizing take (mortality) associated with O&M.

Based on the evaluations of the effect of habitat changes, construction activities, and O&M activities, overall effects of the HCP on the species persistence in the Natomas Basin are assessed assuming that all of the four potential permittees (City, Sutter County, Natomas Mutual, and RD 1000) participate in the HCP.

5.1 Giant Garter Snake (*Thamnophis gigas*)

5.1.1 Species Description

The giant garter snake is listed as Threatened under both 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 giant garter snake are found in the Sacramento Valley and in isolated pockets of the San Joaquin Valley.

The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, irrigation and drainage canals, riceland, and adjacent uplands in the Central Valley. Essential habitat components consist of: (1) adequate water during the snake's active season (early spring through mid-fall) to provide adequate permanent water to maintain dense populations of food organisms; (2) emergent, herbaceous wetland vegetation such as cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation upland habitats for cover and refuge from flood waters during the snake's inactive season in winter (Hansen, 1988; 1993; Hansen and Brode, 1980; Brode and Hansen, 1992). The giant garter snake feeds on aquatic prey, including small fish and frogs, carp, mosquitofish, bullfrogs, and treefrogs.

In the Natomas Basin, giant garter snakes begin entering their winter retreats in rodent burrows excavated in channel and canal banks, rubble piles, and other upland sites by the end of October. After emergence from winter retreats (late March or early April), giant garter snakes use canals with water that persists through the summer months. These canals could contain adequate emergent aquatic vegetation and steep, vegetated banks that provide cover, and a food supply. Rice fields are also used by giant garter snakes after rice growth is sufficiently high to provide cover. Following pre-harvest rice field draining, giant garter snakes move out of rice fields and re-enter canals, where they feed on the high concentration of prey species that washout from the rice fields into the canals. Following the heavy feeding, they enter winter retreats.

Giant garter snakes are known to use rice fields and associated features of the Natomas Basin's rice-growing landscape for some of their habitat needs (Brode and Hansen, 1992), including the canals, ditches, and drains of the Basin's water conveyance systems, the higher ground of levees, and sloughs and marshes. Giant garter snakes use constructed waterways, such as those of the Natomas Basin's water conveyance system. The irrigation canals and drainage ditches, together with their associated levees and adjacent embankments, are important components of giant garter snake habitat in the Basin. Irrigation canals can provide all the habitat components described above and create dispersal corridors allowing garter snakes to move from one area to another in search of mates, new territories, and summer habitat. In a radio-telemetry study of giant garter snakes in the Elverta area of the Natomas Basin, from 40 to 90 percent of the occurrences of snakes were in irrigation canals and ditches (Wylie and Cassaza, 2000). Snakes used canals and ditches to a greater degree in the spring but reduced use in the summer when rice fields were flooded. Hansen and Brode (1992) also provide data illustrating use of water conveyance structures by giant garter snakes. 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 important for genetic interchange and ability to find summer habitat.

Previous surveys and other historical information indicate a fairly widespread distribution of giant garter snakes within the Natomas Basin. Virtually all these sightings are from areas where rice is grown. Within these areas, they are strongly associated with the rice fields themselves and the associated ditch/drain components of the water conveyance system. On this basis, a surrogate for estimating the amount of giant garter snake habitat in the

Natomas Basin is the acreage of rice fields in the basin and ditch/drain habitat embedded in the rice landscape. These are estimated at approximately 23,000 acres of rice fields and 250 miles of ditches and drains in the Basin based on 1997 data. A 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's canals within the Basin.

5.1.2 Environmental Effects

Effects of Changes in Habitat

Potential habitat for the giant garter snake in the Natomas Basin currently consists of rice fields, irrigation canals/ditches, ponds and seasonally wet areas, and uplands adjacent to these habitat types. Wetland habitats are used by snakes during the summer months for foraging and cover. During winter, snakes use upland areas for hibernation. Upland areas that snakes use for overwintering are always in close proximity to wetland-type habitats, typically within 100 feet but up to 820 feet (Hansen, 1988, cited in USFWS 1999a; Wylie et al., 1997).

The amount of rice fields, irrigation canals/ditches, ponds and seasonally wet areas is used to represent total habitat for giant garter snake (both marsh and upland habitat) in the Natomas Basin. For rice and ponds and seasonally wet areas, the GIS did not distinguish small-scale features such as rice checks, berms and road embankments that could provide upland habitat. Rather, these features were incorporated into the overall habitat designation so that the acreage estimates for rice and ponds and seasonally wet areas encompassed both marsh and upland areas. The acreage estimates for canals/ditches also included both the wetted portion of the canal and the adjacent embankments that could provide upland habitat for giant garter snake.

Based on the GIS, the Natomas Basin supports about 24,567 acres of potential habitat (marsh and upland combined) for giant garter snakes, consisting of rice fields, irrigation canals/ditches, and ponds and seasonally wet areas. Only a portion of this acreage would be expected to be used by giant garter snakes. Giant garter snakes appear to be an edge-associated species, concentrating their activities at wetland/upland interfaces (Wylie and Casazza, 2000). In rice fields, snakes primarily use edges along the field perimeter or along check structures (Wylie and Casazza, 2000). The future acreage of rice shown in Table 5-1, however, would not all serve as giant garter snake habitat because they associate with the edges of rice fields.

Although about 45 percent of the Natomas Basin provides potential habitat for the giant garter snake, that habitat consists almost entirely of rice fields and irrigation canals/ditches. Rice fields are intensively managed monocultures that are highly altered from the natural marsh conditions in which the giant garter snake evolved. Native marsh habitats are virtually absent from the Natomas Basin, occurring on only about 97 acres (about 0.2 percent) of the basin.

Urban development under the HCP would reduce giant garter snake habitat in the Natomas Basin by about 8,512 acres. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for giant garter snakes and the changes in acreage from

TABLE 5-1
Change in Potential Habitat for Giant Garter Snake (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Rice	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**24,567**	**(1,094)**	**(1,617)**	**(5,802)**	**(8,512)**	**16,055**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

implementing the HCP are presented in Table 5-1. Portions of Sacramento County and Sutter County outside of the urban development areas would not be affected by urban development permitted under the HCP and are assumed to continue to provide habitat for snakes as rice fields or in managed marsh in the habitat reserve system created under the HCP. Under the planned development scenario, habitat for the giant garter snake would be lost on the fringes of the basin (i.e., City of Sacramento and the Industrial-Commercial Reserve) with an extensive area in the middle and northwestern portion remaining as habitat predominantly as rice or managed marsh.

About 16,055 acres of potential habitat for giant garter snakes would remain in the Natomas Basin (assuming no change in land use in Sacramento County other than at MAP), a reduction of 8,512 acres from the existing level of 24,567 acres. With HCP implementation, permanent habitat reserves would be created consisting of 4,375 acres of rice and 2,187.5 acres of managed marsh. The rice within the reserves would most likely be derived from existing rice fields. Thus, 4,375 of the 14,606 acres of rice projected in the basin under the future condition would be incorporated into the reserve system. The 2,187.5 acres of managed marsh could be created from existing rice fields or lands that do not currently provide habitat for giant garter snake. If all of the managed marsh was derived from rice, the net reduction in the acreage of habitat for giant garter snake would be the 8,512 acres attributable to urban development. If all of the managed marsh component of the habitat reserves was created from non-habitat, then the net reduction habitat for giant garter snake would be about 6,324.5 acres.

The land use analysis shows a reduction of 8,512 acres in land use types used by the giant garter snake in the Natomas Basin; however, the acreage of habitat loss probably would be less than this amount because giant garter snakes predominantly use field edges. Managed marsh habitat would be created with implementation of the HCP. The conceptual designs for 1,296 acres of reserve lands already acquired include creating marsh habitat with a high degree of edge habitat (Natomas Basin Conservancy, 2000). Because of the large amount of edge in the managed marsh, the managed marsh would provide a greater amount of useable habitat than an equivalent acreage of rice.

Although rice provides important habitat for giant garter snakes, the managed-marsh habitat reserves created under the HCP are expected to provide greater quality habitat

(on an acre-for-acre basis) than acreage cultivated for rice. Some of the limitations of rice in providing habitat for giant garter snake are described below.

- Rice fields do not provide habitat for giant garter snakes until late spring when the rice plants have grown enough to provide cover and prey levels have developed. Use of rice fields by giant garter snakes is relatively low until summer when the rice plants are established (Wylie and Casazza, 2000).
- Rice fields typically are drained in September, and habitat for snakes can become limited to canals and drains during the last weeks of their active period (Wylie and Casazza, 2000).[4]
- Agricultural practices (tilling, grading, and harvesting) and canal maintenance practices in support of agriculture can directly kill or injure snakes (Leidy, 1992).
- Rice fields are periodically rotated to other crops or fallowed and, therefore, do not provide stable, reliable habitat over time. Furthermore, fluctuations in the amount and distribution of rice could affect the distribution, survival, and reproductive success of giant garter snake.

The managed marsh would be designed and managed specifically to provide optimal habitat conditions for giant garter snake and avoid these limitations. Design features/management practices of managed marsh habitat that would benefit giant garter snakes include:

- A high amount of wetland/upland edge habitat to maximize the amount of useable habitat.
- Potholes (i.e., areas of deeper water) to provide habitat in late summer/fall after the rice fields have been drained
- A water management regime that provides habitat throughout the snakes' active period.
- Year-round wetland habitat to maintain prey populations and avoid a delay in development of prey populations in the spring when snakes emerge from hibernation.
- Integration of upland habitat with marsh habitat such that snakes are not exposed to hazards such as crossing roads when they move into overwintering habitats
- Absence of mortality sources associated with rice production (e.g., canal maintenance activities, pesticide use)

Finally, the creation of marsh and upland habitat in the reserves would emphasize restoration to a natural marsh ecosystem. The habitat reserves would replace rice, an artificial, intensively managed monoculture, with a native ecosystem characterized by a complex structure and high habitat diversity. With the recreation of the native ecosystem, the habitat reserves would provide the natural habitat conditions under which the giant

[4] There is some uncertainty over whether the timing of draining rice fields is beneficial or detrimental. It has been suggested that the timing of rice field dewatering benefits snakes by concentrating prey in the ditches such that snakes can feed heavily prior to entering hibernation (City of Sacramento et al., 2001).

garter snake evolved. As noted above, natural marsh habitat is nearly absent from the Natomas Basin, consisting of only about 97 acres. Under the HCP, marsh habitat acreage would be increased by over 20 times. Wylie and Casazza (2000) found that giant garter snakes at Fisherman's Lake seldom ventured into surrounding rice fields. These observations indicate that snakes were able to find adequate resources (e.g., prey, basking sites, cover, overwintering habitat) in Fisherman's Lake to support themselves. Wylie and Casazza (2000) suggested that created marsh, such as would be created under the HCP, similarly could fulfill these habitat requirements for snakes.

The rice fields in the reserve system also could provide higher habitat quality than the rice fields that would be lost to urban development. Rice in the reserve system would be managed using snake-friendly techniques, including:

- Maintenance of rice checks, berms, and other water control structures in as natural a state as practicable by limiting mowing or herbicide treatment
- Maintenance of prey species (e.g., mosquito fish) in or near the rice fields through appropriate management
- Other measures, as appropriate

Specific measures for managing rice fields in the reserve system would be determined by the Technical Advisory Committee.

In addition to the direct removal of habitat, urban development can indirectly impact snakes through increased predation and vehicle strikes as follows.

- Free-ranging domestic cats often are introduced to an area by the establishment of residential areas. Residential development close to areas inhabited by snakes can lead to increased predation by cats. While predation by cats on giant garter snakes is believed to occur, its impact on snake populations has not been determined.
- Mortality to snakes from vehicle strikes also has been reported (Leidy, 1992). Snakes could experience increased mortality from increased motor vehicle activity associated with urbanization.

Under the HCP, habitat reserves would be located at least 800 feet from urban areas and areas designated for urban development in applicable plan (unless a smaller distance is approved by CDFG and USFWS on a case-by-case basis) and a buffer at least 30 feet wide established within the reserve between marsh habitat and roadways. By locating habitat for snakes away from urban areas and creating a buffer between snake habitat and roads, death or injury to snakes from vehicle strikes, as well as predation by cats could be reduced although not eliminated.

In summary, implementation of the HCP is expected to result in a net loss of habitat for giant garter snake in the Natomas Basin. The reduction in habitat value, however, is expected to be less than the acreage reduction because:

- Snakes primarily use the edges of rice fields, not the entire rice field. Because snakes would not use all the acreage identified as rice habitat, the actual amount of giant garter

snake habitat in the Natomas Basin is not directly correlated to the changes in land use acreages that resulted from the land use analysis

- Managed marsh habitat would provide more habitat for snakes than rice fields on an acre-for-acre basis because of the larger amount edge habitat
- Managed marsh habitat would be designed to accommodate year-round habitat requirements, as previously described
- Rice in the reserve system would be managed to provide better habitat quality than existing rice fields.

Effects of Construction Activities

Urban development and the construction of habitat reserves is anticipated to affect habitat for the giant garter snake as described above. Giant garter snakes also could be killed or injured during construction by vehicle strikes on roads, crushing beneath heavy construction equipment, or entombment in their winter retreats. Death or injury to snakes has been reported because of vehicle strikes on roads (Leidy, 1992) and excavation from winter retreats (Wylie and Casazza, 2000). The HCP includes measures to avoid and minimize direct loss of giant garter snakes from construction (Section V). Both the Conservancy and individual developers would implement the following measures to avoid and minimize the potential to take snakes during construction activities.

- **Timing restrictions:** No grading, excavating or filling activities will take place within 30 feet of existing giant garter snake habitat between October 1 and May 1, unless approved by CDFG. By conducting earth-moving activities during the summer months when snakes are active, it is expected that snakes in the construction area will be able to avoid construction equipment such that direct injury or mortality would be avoided. Further, snakes will not be in their winter retreats where they are vulnerable to injury during earth-moving activities.
- **Dewatering requirements:** Dewatering of existing habitat will begin after November 1, but no later than April 1 of the following year. All water must be removed from existing habitat by April 15, or as soon thereafter as weather permits, and the habitat will be kept dry without any standing water for 15 consecutive days after April 15 and prior to excavating or filling the dewatered habitat. By dewatering habitat between November 1 and April 1, snakes would not be attracted to construction zones when they emerge from their winter retreats. If habitat must be dewatered after April 15, it must remain dry for 15 consecutive days prior to excavating or filling the habitat. Snakes have been found to leave habitat within a few days of dewatering (USFWS, 1999a). By waiting for 15 days after dewatering, it reasonable to expect that any snakes would have left the construction zone prior to the start of construction activities and injury to snakes would be avoided.

In combination, these measures would minimize direct injury and mortality to giant garter snakes.

Effects of O&M Activities

Water Agencies

Canals and ditches provide important habitat for giant garter snakes in the Natomas Basin. In Wylie and Casazza's (2000) radio-telemetry study, about half of the snake locations during the summer were in rice and half were in ditches. In the spring (before the rice fields had developed), however, the majority of snake locations were in ditches. During the spring and fall, ditches can be the only habitat available to snakes in rice producing areas (Wylie and Casazza 2000). In addition to providing habitat, ditches could be important in maintaining population connectivity.

RD 1000 and Natomas Mutual are responsible for maintaining and operating the ditches and canals in the Natomas Basin. The quality of ditches as habitat for snakes can be influenced by operation and maintenance practices that affect the amount of vegetation, the presence of water in the ditches, and the availability of burrows in canal banks that snake's can use for escape or as winter retreats. Further, giant garter snakes can be killed or injured by maintenance equipment, such as mowers and construction equipment used for sediment removal and bank resloping (Leidy, 1992).

Under the HCP, RD 1000 and Natomas Mutual would implement practices to avoid and minimize adverse effects to giant garter snakes from their operation and maintenance activities. These measures include:

- **Restrictions on timing of management activities.** Where giant garter snakes are known to exist, maintenance activities (excluding vegetation control, road maintenance, and rodent control) will be restricted to after May 1 and before October 1 in any calendar year. By conducting in-channel maintenance activities during the summer when the snakes are active, it is expected that snakes will be able to avoid equipment and thereby avoid injury. Further, the potential for snakes to be killed or injured in their winter retreats by ditch cleaning (e.g., sediment removal) would be avoided.

- **Dewatering of ditches/canals identified for maintenance.** Dewatering two weeks prior to construction removes an essential element (aquatic features) of giant garter snake habitat. Snakes have been found to leave dewatered habitat within a few days of dewatering such that it is reasonable to expect that snakes would leave the construction area in search of more suitable habitat and would not reenter the construction area.

- **Restrictions on management intensity.** RD 1000 and Natomas Mutual will limit canal and ditch maintenance activities (excluding vegetation control, road maintenance, and rodent control) during any calendar year to not more than ten percent (10%), of the total miles of canals and ditches within each Water Agencies' respective service area. Vegetation control would be limited to one side of the ditch per year. Fitch (1940, cited in Leidy, 1992) noted that the banks of ditches where he was searching for snakes were usually overgrown with tules, willows and weeds making it difficult to see snakes. Later, Hansen (1980, cited in Leidy, 1992) reported that canals cleared of vegetation were rarely used by snakes, while ditches supporting tules and willows appeared to be good habitat. Thus, vegetation that potentially provides habitat for snakes would be retained on one side of the ditch and the ditch could continue to provide cover for snakes following maintenance activities.

- Management of vegetation control measures in giant garter snake habitat. Burning would be restricted to October 1 through April 30, when snakes are active and would be expected to leave areas treated through burning. When mowing for weed control, vegetation would be retained at least 6 inches tall. By keeping mower blades at least 6 inches high, the blades would not contact snakes on the banks.

Natomas Basin Conservancy

Some of the activities conducted by the conservancy to manage the habitat reserves have the potential to kill or injure giant garter snakes. For example, the conservancy conducts ditch and canal maintenance activities similar to those conducted by RD 1000 and Natomas Mutual to maintain appropriate water delivery and drainage from rice and managed marsh units. The conservancy will implement take avoidance measures to minimize potential take that may occur during on reserve lands (e.g., road kills, take during construction of managed marsh wetlands, etc.). To accomplish this, the conservancy will, where applicable, ensure that all take avoidance measures described in Chapter V (e.g., dewatering of irrigation ditches owned by the conservancy) are implemented during management of reserve lands. The Conservancy also will ensure that all such take avoidance measures as are necessary and appropriate are included in reserve management plans, as well as additional measures determined to be necessary during the development of management plans.

In managing rice fields on the habitat reserves, the conservancy will implement Best Management Practices (BMPs) to enhance habitat values and minimize the potential for injury to snakes. The BMP's include guidelines related to vegetation management (including weed management, treatment of crop stubble through burning, and disking and use of herbicides), and maintenance of those ditches that are owned by the conservancy (time of maintenance, alternating bank maintenance on an annual basis). These practices would have similar beneficial effects for snakes as described for the water agencies.

Overall Effects on Giant Garter Snake

The current distribution and abundance of the giant garter snake is considerably reduced from former times (FR 58:54053). The population reduction and range restriction has been largely attributed to conversion and loss of wetland habitat in the Central Valley. Loss of habitat is considered the primary threat to the persistence of giant garter snake and the primary factor limiting the abundance and distribution of the population (USFWS, 1999a).

Within suitable wetland habitat, the factors determining the population size and distribution of giant garter snake are poorly understood. Prey availability can influence the total population size as well as reproductive success. Whether prey availability drops to levels that limit the population, however, has not been determined. Hypothesized or documented sources of mortality include predation, dormant season flooding, road kill, mechanical injury, pest control, collection and vandalism, disease and parasites, and toxic substances (Leidy, 1992). The relative importance of these sources of mortality in determining the size, distribution, and trend of the population remains uncertain.

The Natomas Basin is located within the American Basin population area of the giant garter snake which, when combined with the Colusa Basin and Sutter Basin, represents the largest extant population of giant garter snakes. Giant garter snakes have been reported in the

American Basin since the 1970s (Leidy, 1992). Recent investigations of giant garter snakes in the Natomas Basin found a wide range of size classes (Wylie and Cassaza, 2000). The range of size classes suggests that the population is reproducing, juveniles are being recruited into the population, and adults are surviving to older age classes.

Implementation of the HCP is expected to result in a net loss of habitat for giant garter snake. Despite a net loss of habitat, implementation of the HCP would encourage the persistence of giant garter snakes in the Natomas Basin for several reasons. First, the loss of habitat is expected to be less than the average loss predicted using the GIS because: (1) the acreage of rice that is used by snakes is likely overestimated; and (2) the managed marsh habitat would be designed to provide a large amount of edge habitat. Second, the quality of both the managed marsh and rice in the reserve system would be greater than the affected habitat. This greater quality habitat could support a larger population of snakes as a result of better habitat conditions (e.g., more prey) or reduced mortality (e.g., fewer road kills). Third, the habitat reserves would provide habitat that is stable in location, amount, availability, and quality within and among years over the long term, thereby providing conditions conducive to supporting a stable population of giant garter. Fourth, management actions undertaken by RD 1000 and Natomas Mutual would minimize the potential for death or injury of snakes and, more importantly, improve the availability and stability of habitat for snakes in the canal and ditch system over the long term by allowing suitable habitat conditions to persist in the canals and ditches. This habitat would have the dual benefit of providing additional habitat for snakes and travel corridors to maintain population connectivity.

Finally, lands west of Fisherman's Lake would be protected and RD 1000 would prepare a management plan for the lake to maintain or improve its habitat value for species covered by the HCP. In addition, RD1000 will prepare a management plan for Fisherman's Lake that addresses the maintenance and enhancement of its habitat value for giant garter snakes and other species covered by the HCP. Fisherman's Lake is a well-documented area for giant garter snakes. Wylie and Casazza (2000) found that snakes using Fisherman's Lake remained within the lake, and did not exploit surrounding ricelands. They suggest that Fisherman's Lake provided a stable habitat so that snakes rarely needed to leave to fulfill their life requisites. With maintenance of lands around Fisherman's Lake and management to maintain its habitat value, this known population of snakes would be protected. Creation of managed marsh habitat under the HCP would result in additional "stable" habitats, and in combination with Fisherman's Lake and remaining rice fields, encourage the persistence of giant garter snakes in the Natomas Basin.

A primary goal of the HCP is to ensure connectivity between individual reserves, and connectivity between reserves and surrounding agricultural lands. Connections can be provided along land, through water and through air to enable the necessary mobility of species within their ranges. The primary opportunity for connectivity among reserves is the system of channels maintained and operated by RD 1000 and Natomas Mutual. These water agencies have noted that the elimination of existing channels would generally only occur in response to urban development. RD 1000 and Natomas Mutual would manage ditches and canals in a manner the would allow and encourage continued use by snakes.

With regard to basin-wide connectivity, RD 1000 identified key drainage channels within the Basin that would be retained regardless of urban development (see Figure 17 of the

Natomas Basin HCP). With the exception of one property in the northeastern portion of the basin, all of the existing Conservancy lands are interconnected by drainage channels that would remain despite urban development. In addition to these drainage channels, canals and ditches would remain in areas continuing to be in agricultural production. Because snakes readily and routinely use canals and ditches in the Natomas Basin (Wylie and Cassaza, 2000), the canal and drainage systems would provide for movement of snakes among the habitat reserves, thereby minimizing the potential occurrence of adverse effects resulting from small and isolated populations.

Under the HCP, it is reasonable to expect that the creation and management of habitat reserves that support 6,562 acres of habitat for giant garters snake would provide similar or better overall habitat value to that of the 8,512 acres of potential habitat consisting predominantly of rice that would be lost to urban development. Thus, impacts to giant garter snake attributable to the 17,500 acres of urban development covered by the HCP are expected to be mitigated adequately. The conservation strategy of the HCP mitigates the impacts to giant garter snakes from the planned development and is an important component in maintaining giant garters snakes in the Natomas Basin.

5.2 Northwestern Pond Turtle (*Clemmys marmorata marmorata*)

5.2.1 Species Description

The northwestern pond turtle is considered a Species of Concern by USFWS and is a state Species of Special Concern. The turtle is uncommon to common in suitable aquatic habitat throughout California, west of the Sierra-Cascade crest. Western pond turtles are active all year where climates are warm but are known to hibernate in cold climes. This species is typically associated with permanent or nearly permanent water in a wide variety of habitat types including permanent ponds, lakes, streams, irrigation ditches, or permanent pools along intermittent streams. Primarily omnivorous, the western pond turtle feeds on aquatic plant material, including pond lilies, beetles and a variety of aquatic invertebrates as well as fish, frogs, and carrion (Stebbins, 1972; Nussbaum et al., 1983). Western pond turtles require basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. Hibernation in colder areas occurs underwater in bottom mud. Breeding occurs in large slow-moving streams; eggs are deposited in nests constructed in sandy banks. Western 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 from water (Holland and Bury, 1992). Hatchling and adult turtles have the potential to overwinter in upland sites (Q.C. Holland, pers. comm.).

The western 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

western pond turtle's range that support moderate to large viable populations of the northwestern pond turtle are considered threatened (57 FR 45761-45762, October 5, 1992).

There are 117 known occurrences of northwestern pond turtle in California one of which is considered extirpated (CDFG, 2001). Of these, 13 known occurrences are in Sacramento County and 2 are in Sutter County. During habitat mapping surveys (March 2001), many pond turtles were observed along the Natomas Main Drain, suggesting that the Natomas Basin supports a limited northwestern pond turtle population. No systematic surveys for pond turtles in the Natomas Basin have been conducted to date. Pond turtles have been reported on some of the Conservancy's lands.

The canals throughout the Natomas Basin are considered suitable aquatic habitat for pond turtles. Currently, there are about 250 miles of canals and ditches in the Natomas Basin. Fisherman's Lake in the southwestern portion of the Basin 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 occurs along many of the canals and aquatic habitats.

5.2.2 Environmental Effects

Effects of Changes in Habitat

Western pond turtles are highly aquatic and are closely associated with wetland and aquatic habitats. In the Natomas Basin, potential habitat consists of canals, rice, ponds and seasonally wet areas, and riparian. Turtles use upland areas for hibernation and for nesting. Upland areas used by turtles typically are close to aquatic habitats but can be as far as 1,300 feet from water.

The amount of rice fields, irrigation canals/ditches, ponds and seasonally wet areas, and rice is used to represent total habitat for western pond turtle (both marsh and upland habitat) in the Natomas Basin. For rice and ponds and seasonally wet areas, the GIS did not distinguish small-scale features such as rice checks, berms and road embankments that could provide upland habitat. Rather, these features were incorporated into the overall habitat designation such that the acreage estimates for rice and ponds and seasonally wet areas encompassed both marsh and upland areas. The acreage estimates for canals/ditches also included both the wetted portion of the canal and the adjacent embankments that could provide upland habitat for turtles. The classes of canals and drains (from Tables 4-2 and 4-3) that provide potential habitat for northwestern pond turtle and the changes in acreage from implementing the HCP are presented in Table 4-8. Based on the habitat and land use assessment conducted for this analysis, the Natomas Basin supports about 24,691 acres of habitat (marsh and upland combined) for pond turtles (Table 5-2).

TABLE 5-2
Change in Potential Habitat for Northwestern Pond Turtle (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Rice	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Riparian	124	(24)	0	0	(24)	100
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**24,691**	**(1,118)**	**(1,617)**	**(5,802)**	**(8,536)**	**16,155**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Under the HCP, potential habitat for western pond turtle would decline by about 8,536 acres as a result of planned urban development. This reduction in habitat would predominantly consist of rice fields, although about 404 acres would be canals. No change in riparian habitat would occur because the 24 acres of riparian habitat predicted to be lost in the City of Sacramento occurs along Fisherman's Lake. Under the Settlement Agreement and as part of the HCP, lands immediately adjacent to Fisherman's Lake would not be developed. The riparian habitat adjacent to Fisherman's Lake, thus, would be retained.

About 16,155 acres of potential habitat for western pond turtles would remain in the Natomas Basin (assuming no change in land use in Sacramento County other than at MAP and no loss of riparian in the City as described above), a reduction of 88,536 acres from the existing level of 24,691 acres. Under the HCP, permanent habitat reserves would be created consisting of 4,375 acres of rice and 2,187.5 acres of managed marsh. The rice within the reserves would most likely consist of existing rice fields. Thus, 4,375 of the 14,606 acres of rice projected in the basin under the future condition would be incorporated into the reserve system. The 2,187.5 acres of managed marsh could be created from existing rice fields or lands that do not currently provide habitat for western pond turtle. If all of the managed marsh was derived from rice, the net reduction in the acreage of habitat for western pond turtle would be the 8,536 acres attributable to urban development. If all of the managed marsh component of the habitat reserves was created from non-habitat, then the net reduction habitat for western pond turtle would be about 6,348.5 acres.

The 2,187.5 acres of upland habitat in the habitat reserves could be equally important to supporting pond turtles on the habitat reserves than the managed marsh. Pond turtles require upland sites for overwintering and nesting. The availability and suitability of nesting habitat could be contributing to poor recruitment in western pond turtle populations (Jennings and Hayes 1994). The habitat reserves would provide this critical element in the maintenance of pond turtle populations.

In addition to reducing habitat availability, urban development in areas adjacent to areas inhabited by pond turtles can indirectly impact this species. Free-ranging domestic cats are often introduced to an area by the establishment of residential areas. Residential development close to areas inhabited by turtles can lead to increased predation by cats.

While predation by cats on western pond turtles has not been specifically identified as a concern, predation by other terrestrial predators (e.g., non-native red fox and raccoons) has been noted (Jennings and Hayes, 1994). Mortality to turtles from vehicles also is possible and turtles could experience increased mortality from increased motor vehicle activity associated with urbanization. Under the HCP, habitat reserves would be located at least 800 feet from urban areas and areas designated for urban development in applicable plan (unless a smaller distance is approved by CDFG and USFWS on a case-by-case basis) and a buffer at least 30 feet wide established within the reserve between marsh habitat and roadways. By locating habitat reserves away from urban areas, the potential for death or injury to turtles from vehicle strikes, as well as predation by cats could be reduced although not eliminated.

Despite the net reduction in the total amount of potential habitat, the HCP likely would improve habitat conditions for western pond turtles through the creation and protection of marsh complexes on the habitat reserves. Rice fields provide poor habitat quality for western pond turtles, as they are intensively managed monocultures with little structural or biological diversity. In particular, an abundance of basking sites (a key element of pond turtle aquatic habitat) is lacking in rice fields. Beneficial components of the habitat reserves include:

- Long-term certainty of habitat availability. Created marsh habitat would be protected in perpetuity.
- Higher quality habitat than rice. Created marsh habitat would provide all essential habitat elements for northwestern pond turtle (e.g., basking sites, cover, and prey availability).
- Nearby suitable and undisturbed nesting and overwintering habitat.
- Provision of large areas of contiguous, suitable habitat.
- Reduced exposure to agricultural practices. Current agricultural practices involve the routine use of pesticides and fertilizers as well as exposure to heavy farm machinery (e.g., disking or harvesting). The created marsh would not be subject to this type of maintenance and rice would be managed using wildlife-friendly techniques.
- The Conservancy would consult with pond turtle experts during implementation of the HCP to identify management actions to further improve habitat quality for pond turtles.

Lastly, under the Settlement Agreement and HCP, lands adjacent to Fisherman's Lake would be protected and RD 1000 would prepare a management plan for Fisherman's Lake to maintain and/or improve its habitat value for species covered by the HCP. Fisherman's Lake is known to be inhabited by pond turtles. With acquisition of the buffer lands adjacent to the lake and beneficial management practices implemented by RD 1000, the probability of this population persisting would be improved.

Effects of Construction Activities

Urban development and the construction of habitat reserves is anticipated to reduce the amount of habitat for western pond turtle in the Natomas Basin as described above. Pond turtles could be killed or injured during the construction by vehicle strikes on roads,

crushing beneath heavy construction equipment, or entombment in their winter retreats. Measures in the HCP to avoid and minimize these types of direct impacts to giant garter snakes also would benefit pond turtles because of their similar habitat requirements and life history traits. The avoidance measures for giant garter snakes would have similar beneficial effects to pond turtles.

Effects of O&M Activities

Water Agencies

Operation and maintenance activities by RD 1000 and Natomas Mutual could affect western pond turtles because these activities typically focus on canals and drains that provide suitable habitat for this species. Pond turtles could be killed or injured by construction equipment used for sediment removal. O&M activities also could result in the removal of bank and emergent vegetation, important components of cover for the northwestern pond turtle.

Under the HCP, RD 1000 and Natomas Mutual would implement measures to avoid and minimize potential impacts of O&M activities on giant garter snake. Pond turtles have similar seasonal activity patterns and habitat requirements as giant garter snakes. The effects of the water agencies' O&M activities (including implementation of the avoidance and minimization measures of HCP) on pond turtles would be the same as described for giant garter snakes.

Natomas Basin Conservancy

Some of the activities conducted by the Conservancy to manage the habitat reserves have the potential to kill or injure pond turtles. For example, the Conservancy conducts ditch and canal maintenance activities similar to those conducted by RD 1000 and Natomas Mutual to maintain appropriate water delivery and drainage from rice and managed marsh units.The Conservancy will implement take avoidance measures to minimize potential take that may occur during on reserve lands (e.g., road kills, take during construction of managed marsh wetlands, etc.). To accomplish this, the Conservancy will, where applicable, ensure that all take avoidance measures described in Chapter V (e.g., dewatering of irrigation ditches owned by the Conservancy) are implemented during management of reserve lands.The Conservancy also will ensure that all such take avoidance measures as are necessary and appropriate are included in reserve management plans, as well as additional measures determined to be necessary during the development of management plans.

In managing rice fields on the habitat reserves the Conservancy will implement BMPs to enhance habitat values and minimize the potential for injury to pond turtles. The BMPs include guidelines related to vegetation management (including weed management, treatment of crop stubble through burning, and disking and use of herbicides), and maintenance of those ditches that are owned by the Conservancy (time of maintenance, alternating bank maintenance on an annual basis). These practices would have similar effects for pond turtles as described for the water agencies.

Overall Effects on Northwestern Pond Turtle

Jennings and Hayes (1994) characterized western pond turtles as endangered from the Salinas River south along the California coast, and from the Mokelumne River south in inland portions of the state. In the remainder of the state, Jennings and Hayes (1994) considered the species to be threatened. Although loss of habitat has probably been the

primary cause of population reductions of this species, other factors threaten the persistence of pond turtles in remaining habitat. Pond turtles in many locales do not appear to be reproducing well as evidenced by populations increasingly dominated by adults (Jennings and Hayes, 1994). Potential contributors to their poor recruitment include predation on hatchlings and juveniles by bullfrogs and introduced fishes, competition with introduced fish, lack of suitable nesting habitat, and impacts to nesting habitat during egg incubation (e.g., agricultural practices, grazing) (Jennings and Hayes, 1994).

The current status of western pond turtle in the Natomas Basin and factors limiting the population are uncertain. Nevertheless, the HCP would be expected to improve the likelihood that pond turtles would persist in the Natomas Basin. The majority of the potential habitat that would be lost to urban development would be rice. Rice provides poor quality aquatic habitat for western pond turtle and suitable nesting and overwintering habitats might not be available near many rice fields. The habitat reserves created under the HCP would provide high-quality aquatic habitat interspersed with and in close proximity to upland habitat suitable for nesting and overwintering. As part of the HCP, the Conservancy would work with experts on pond turtles to improve and maintain habitat for pond turtles. Through these consultations, the Conservancy will be able to avoid or minimize factors that are believed to reduce recruitment. Pond turtles are known to occur on some of the Conservancy's lands. If successfully-reproducing populations of pond turtles can be established and/or maintained on the habitat reserves, it would substantially benefit this species given its poor recruitment success elsewhere in its range and potentially in the Natomas Basin.

The habitat reserves would improve the likelihood that successfully-reproducing populations of turtles will be supported in the Basin. In addition, areas currently known to be inhabited by ponds turtles (East Main Drain and Fisherman's Lake) will remain under the HCP. Under the HCP, lands adjacent to Fisherman's Lake would be managed by the Conservancy for habitat values. Under the Settlement Agreement, RD 1000 will prepare a management plan for Fisherman's Lake to maintain its habitat values for covered species. The East Main Drain would not be affected by urban development. If turtles are currently reproducing in these areas, they could persist under the HCP.

5.3 White-faced Ibis (*Plegadis chihi*)

5.3.1 Species Description

The white-faced ibis is considered a Species of Concern by the USFWS and is a state Species of Special Concern. The white-faced ibis is found in the Sacramento area during its migration. This species forages in fresh emergent wetland, shallow flooded pond margins, and muddy ground of wet meadows and irrigated, or flooded, pastures and croplands. The white-faced ibis requires extensive marshes for nesting (Zeiner et al., 1990). Large tule stands surrounded by open water provide high-quality nesting habitat for this species. The white-faced ibis typically nests in dense tule and cattail stands, but would sometimes nest in trees with other colonial-nesting species (Eckert, 1981). The white-faced ibis winters mainly in San Joaquin Valley and Imperial Valley, but is recorded widely as a transient (Zeiner et al., 1990). The largest breeding colonies in the Central Valley have been reported

from the Mendota Wildlife Area and the Colusa National Wildlife Refuge. 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. White-faced ibis populations have declined in California, probably due to habitat deterioration or removal.

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 the City of Woodland. No suitable nesting habitat occurs in the Natomas Basin for white-faced ibis, although suitable winter foraging habitat (i.e., rice, alfalfa, and other agricultural fields) exists in the Natomas Basin for this species. In the Sacramento Valley, wintering ibis were very rare in the 1970s 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 are now common winter visitors to the Natomas Basin, but are not known to breed in the basin.

5.3.2 Environmental Effects

Effects of Changes in Habitat

White-faced ibis winter in the Natomas Basin. Potential foraging habitat includes alfalfa, rice, canals, and ponds and seasonally wet areas. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for white-faced ibis and the changes in acreage from implementing the HCP are presented in Table 5-3. The Natomas Basin supports about 25,000 acres of these habitats (Table 5-3).

TABLE 5-3
Change in Potential Habitat for White-faced Ibis (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Alfalfa	371	0	0	0	0	371
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Rice	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**24,938**	**(1,094)**	**(1,617)**	**(5,802)**	**(8,512)**	**16,426**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Under the HCP, urban development would convert about 8,512 acres of potential habitat for white-faced ibis to non-habitat. Most of the reduction in potential habitat would be rice. As explained for giant garter snakes, the characteristics and management of rice can limit its value to wildlife. For white-faced ibis (which currently occur in the Natomas Basin during winter), only flooded rice fields in the winter provide habitat; fields that are not flooded provide little or no value. White-faced ibis are associated with emergent wetland habitats,

particularly for nesting. Native marsh habitat has been largely eliminated from the Natomas Basin. While they are able to exploit flooded rice fields and other agricultural field types (e.g., alfalfa) as wintering habitat, these habitats are not suitable for nesting.

The reduction in potential foraging habitat would be at least partially offset by creation and long-term protection of marsh and upland habitat in the reserves. Under the HCP, 8,750 acres of permanent habitat reserves would be created consisting of 4,375 acres of rice, 2,187.5 acres of managed marsh, and 2,187.5 acres of upland habitat. All of this habitat could be used by white-faced ibis. There would still be a net loss of habitat for white-faced ibis in the Natomas Basin, but it is expected that the habitat in the reserves would be of higher quality than the rice fields and canals converted to urban development. Marsh and upland habitat in the habitat reserves would be managed to restore native marsh/upland habitat and to promote wildlife habitat values.

White-faced ibis are more flexible in their use of foraging habitat than nesting habitat and probably are not limited by foraging habitat availability in winter. Under the HCP, foraging habitat would remain abundant in the Natomas Basin (about 16,500 acres plus 8,570 acres in the habitat reserves) and in agricultural areas adjacent to the basin. As a result, the decline in foraging habitat would not be expected to adversely affect ibis using the Natomas Basin. Further, with their long-term protection and management for habitat that is stable in quality and location, the reserves would support continued foraging by white-faced ibis in the Natomas Basin.

White-faced ibis are known to nest in the Central Valley but have not been reported to nest in the Natomas Basin. Managed marsh habitat on the habitat reserves could attract white-faced ibis to nest. White-faced ibis typically nest in large emergent wetlands with minimal disturbance. These types of conditions would be created in the habitat reserves and could result in the establishment of additional nesting colonies.

Effects of Construction Activities

Construction activities would be required for urban development and for habitat creation/restoration actions for the habitat reserves. These activities have little potential to adversely affect white-faced ibis. This species is not known to nest in the Natomas Basin, but rather uses the basin for foraging during the winter. Potential effects would be limited to displacement of birds foraging or roosting on a field during the initial phases of construction when fields are graded. Because grading typically is done in the spring and summer and ibis occur in the basin in winter, no adverse effects to foraging or roosting birds are expected during construction activities.

White-faced ibis could nest in the Natomas Basin in the future and disturbance or displacement of nesting birds could occur from construction for urban development on nearby properties or habitat creation. Because habitat reserves are to be located at least 800 feet away from urban development or areas designated for urban development unless an exception is granted, the potential for this type of impact would be minimized. Finally, under the HCP, surveys would be conducted prior to construction activities. If white-faced ibis occur, disturbance would be avoidance during the nesting season to the maximum extent possible. Similarly, the Conservancy would avoid disturbance to white-faced ibis nest

sites during reserve management and enhancement activities to the maximum extent practicable.

Effects of O&M Activities

Water Agencies

White-faced ibis could forage in canals and ditches, and O&M activities by RD 1000 and Natomas Mutual could displace ibis foraging in the drains. Avoidance and minimization measures for the giant garter snake would reduce the potential for O&M activities to affect ibis. These measures include:

- **Implementation of timing restrictions.** Canal and ditch maintenance primarily would be conducted during the summer. White-faced ibis currently are winter residents in the Natomas Basin. By conducting O&M activities during the summer, potential impacts to ibis would be avoided.
- **Dewatering of ditches/canals identified for maintenance.** By dewatering canals and ditches two weeks prior to construction, white-faced ibis would seek foraging opportunities in other locations and therefore would not be in the vicinity when maintenance/construction activities are conducted.
- **Restrictions on management intensity.** RD 1000 and Natomas Mutual will limit canal and ditch maintenance activities (excluding vegetation control, road maintenance, and rodent control) during any calendar year to not more than ten percent (10%), of the total miles of canals and ditches within each Water Agencies' respective service area. Vegetation control would be limited to one side of the ditch per year. Thus, vegetation that potentially provides habitat for white-faced ibis would be retained on one side of the ditch and the ditch could continue to provide habitat for white-faced ibis.

Natomas Basin Conservancy

Use of the Natomas Basin by white-faced ibis currently consists of wintering and migrating birds. At least over the short-term, white-faced ibis would be expected to use the habitat reserves only for foraging and potentially roosting during the winter or migration. Management actions could temporarily displace foraging birds, but this minor displacement would not have adverse effects on white-faced ibis as these birds are typically very mobile in their use of foraging habitat during winter and migration.

In the event that white-faced ibis nest on Conservancy lands in the future, management activities could disturb and displace nesting birds. If ibis are found to nest on the habitat reserves, the Conservancy would avoid disturbing nesting birds during O&M activities.

Overall Effects on White-faced Ibis

Breeding white-faced ibis populations declined in distribution and abundance during the 1960s and 1970s, especially in the western U.S. (Ryder and Manry, 1994; Shuford et al., 1996). The primary reason for the decline of the white-faced ibis as a nesting species in California was the loss of extensive marsh habitats (Remsen, 1978; Shuford et al., 1996). Pesticides also are believed to have contributed to population declines in the 1960s and 1970s. Since the 1980s, however, there has been an increase in western white-faced ibis populations as a result of improved nesting habitat management, increased planting of alfalfa, and a ban on DDT and other pesticide use in the early 1970s. In California, the winter

TABLE 5-4
Change in Potential Habitat for Tricolored Blackbird (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Total Nesting	**1,998**	**(148)**	**(76)**	**(225)**	**(449)**	**1,549**
Foraging Habitat Only						
Alfalfa	371	0	0	0	0	371
Non-rice Crops	16,686	(4,663)	(325)	(1,529)	(6,517)	10,169
Grassland	886	(427)	0	(134)	(560)	325
Pasture	674	(23)	(22)	(101)	(147)	527
Rice	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Total Foraging	**41,310**	**(6,083)**	**(1,888)**	**(7,341)**	**(15,311)**	**25,998**

(#) decrease in acreage
Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

The projected loss of potential nesting habitat would be offset by creation of 2,187.5 acres of managed marsh in the habitat reserves. The habitat on the reserves would be designed and managed to promote marsh habitat values. The managed marsh would support emergent marsh vegetation including cattails and tules that provide optimal nesting habitat for tricolored blackbird. The habitat reserves also consist of large blocks that would allow development of large areas of marsh vegetation that are preferred by tricolored blackbirds. Tricolored blackbird would benefit from the substantial increase in high quality nesting habitat under the HCP.

In addition to reducing habitat availability, urban development in areas adjacent to areas inhabited by tricolored blackbirds can indirectly impact this species. Free-ranging domestic cats are often introduced to an area by the establishment of residential areas. Tricolored blackbirds are believed to be vulnerable to nest destruction by mammalian predators (Bent, 1958) and residential development close to areas inhabited by tricolored blackbirds could lead to increased predation by cats. Under the HCP, habitat reserves would be located at least 800 feet from urban areas and areas designated for urban development in applicable plan (unless a smaller distance is approved by CDFG and USFWS on a case-by-case basis) and a buffer at least 30 feet wide established within the reserve between marsh habitat and roadways. By locating habitat reserves away from urban areas, the potential for predation by cats could be reduced although not eliminated.

The total amount of potential foraging habitat would decline in the Natomas Basin by about 15,311 acres. This large reduction in potential foraging habitat reflects the catholic foraging habits of tricolored blackbirds. In the Natomas Basin and elsewhere the occurrence and distribution of tricolored blackbird is probably determined by the availability of suitable nesting habitat rather than foraging habitat. Given the current abundance of foraging habitat, but scarcity of nesting habitat in the Natomas Basin, the population size and distribution of tricolored blackbird likely are limited by the availability and distribution of nesting habitat rather than foraging habitat. With about 25,998 acres of foraging habitat remaining in the basin and their ability to use a wide diversity of foraging, the reduction in foraging habitat would not be expected to adversely impact tricolored blackbirds.

Effects of Construction Activities

Construction activities for urban development or associated with habitat creation on the habitat reserves has the potential to disturb nesting birds or directly destroy nests if birds were nesting in vegetation removed for construction. For construction associated with urban development, under the HCP, preconstruction surveys would be conducted. If tricolored blackbirds are found, disturbance to nesting colonies would be avoidance during the nesting season to the maximum extent possible. Similarly, the Conservancy would avoid disturbance to tricolored blackbirds nest sites during reserve management and enhancement activities to the maximum extent practicable.

Effects of O&M Activities

Water Agencies

The water agencies would implement measures to avoid and minimize the effects of their maintenance activities on giant garter snakes. These measures could have some minor benefits to tricolored blackbird. Specifically, the water agencies would limit some of their maintenance activities to 10 percent of the canal and ditch systems annually and where vegetation control is conducted only one side of the canal would be treated annually. These measures would contribute to maintaining vegetation along the canals and ditches that could provide some nesting opportunities for tricolored blackbirds.

O&M effects on tricolored blackbirds are expected to be rare. Canals and drains that would be affected by O&M activities support only limited habitat potentially suitable for tricolored blackbird and this species is rare in the Natomas Basin. As such, they are unlikely to occur in areas where O&M activities are conducted.

Natomas Basin Conservancy

A colony of tricolored blackbirds currently occurs on the Betts-Kismat-Silva property that is part of the Conservancy habitat reserve system. It is likely that tricolored blackbird colonies will become established on other the Conservancy lands as managed marshes develop. Management activities on the habitat reserves supporting tricolored blackbirds have the potential to disturb nesting birds or directly destroy nests if vegetation supporting nesting birds is removed during the nesting season. Under the HCP, the Conservancy would avoid conducting management activities that would disturb nesting tricolored blackbirds between April to July or while birds are present.

Overall Effects on Tricolored Blackbirds

The HCP is expected to benefit tricolored blackbirds. Loss of marsh habitat has been the primary factor in the decline in tricolored blackbird (Kaufman 1996; DeHaven et al., 1975). A major component of the HCP is the creation and protection of marsh habitat. With the limited amount of marsh habitat currently in the basin, the habitat reserves would substantially increase the amount of nesting habitat available to tricolored blackbirds. One colony of tricolored blackbirds is already protected on Conservancy lands. With the creation of marsh habitat, additional colonies likely would establish on the habitat reserves and contribute to increasing the size and distribution of tricolored blackbird in California.

5.5 Swainson's Hawk (*Buteo swainsoni*)

5.5.1 Species Description

The Swainson's hawk is listed as a Threatened species under the state Endangered Species Act. Historically, this species nested throughout lowland California. The current Swainson's hawk nesting distribution, however, is limited to extreme northeastern California, the Central Valley, and a few isolated locations in the Owens Valley (CDFG, 1992, 1994). The Swainson's hawk occurs in California only during the breeding season (March through September) and winters in Mexico and South America.

Swainson's hawks begin arriving in the Central Valley from wintering grounds in March to breed and raise their young. The earliest fledging of young occurs in July and the young remain with the parents until the southern migration in early fall. Swainson's hawk nesting preference is for large valley oaks (*Quercus lobata*), cottonwoods (*Populus fremontii*), or willow (*Salix goodingii*).

Swainson's hawks are opportunistic feeders, flushing prey (birds, rodents and some insects) from fields, pastures and grasslands adjacent to their nests. 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 large enough to support the high densities of microtine rodent populations and birds upon which they feed.

Swainson's hawks have been observed foraging following farm machinery (moving harvester blade or disc) and capturing rodents exposed by ground disturbance (Estep, 1989). Suitable cover types for foraging habitats include, in order of suitability: (1) native grassland; (2) agricultural fields 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. Flooded rice fields were formerly thought to be unsuited for foraging, but recent observations indicate that its system of levees and checks is used by Swainson's hawks (Dave Zezulak, CDFG, pers. comm.) 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.

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).

Swainson's hawk nesting in the Natomas Basin occurs primarily in the western portion of the basin (Figure 5-1). Most nest sites are located along the Sacramento River where large trees are available. The most recent survey of the Natomas Basin (SHTAC 2001) shows 35 nest sites along the Sacramento River (22 on the east side and 13 on the west side). Twenty-seven nest sites are located elsewhere in 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, of which 17 were used in 2000. Of these, only 10 successfully nested in 2000 (i.e., reared young to fledging), producing a total of 20 fledglings (SHTAC, 2000). During 2001 surveys, two new territories were found in the interior of the Natomas Basin and a third new site was found adjacent to the East Main Drainage Canal (SHTAC, 2001). Of the 27 territories in the Basin, 19 were used in 2001.

5.5.2 Environmental Effects

Effects of Changes in Habitat

The Natomas Basin supports both nesting and foraging habitat for Swainson's hawks. For nesting, Swainson's hawks typically use riparian forest habitats where large trees are available, but can use isolated trees or groves of trees outside of riparian zones (SHTAC, 2000). Of the existing land use types in the Natomas Basin (see Section 4.0) Riparian, Oak Groves, and Tree Groves are considered potential nesting habitat for Swainson's hawk. Based on these land use types, the area covered by the HCP supports about 328 acres of nesting habitat for Swainson's hawk. This acreage does not include riparian habitat along the Sacramento River on the westside of the levees, which is outside of the HCP area.

Foraging habitat for Swainson's hawk consists of alfalfa, grasslands, pasture and certain row crops such as tomatoes and sugar beets. Lands designated as "idle" and "ruderal" also provide foraging opportunities for Swainson's hawk. Although Swainson's hawks have been observed to forage along the margins of rice fields when the fields are flooded, rice provides relatively little habitat for Swainson's hawk; therefore, this habitat type is not considered as foraging habitat in this analysis. Based on this characterization, the Natomas Basin supports about 22,051 acres of foraging habitat for Swainson's hawk. The habitat classes (from Tables 4-3 and 4-4) that provide potential nesting and foraging habitat for Swainson's hawk and the changes in acreage from implementing the HCP are presented in Table 5-5.

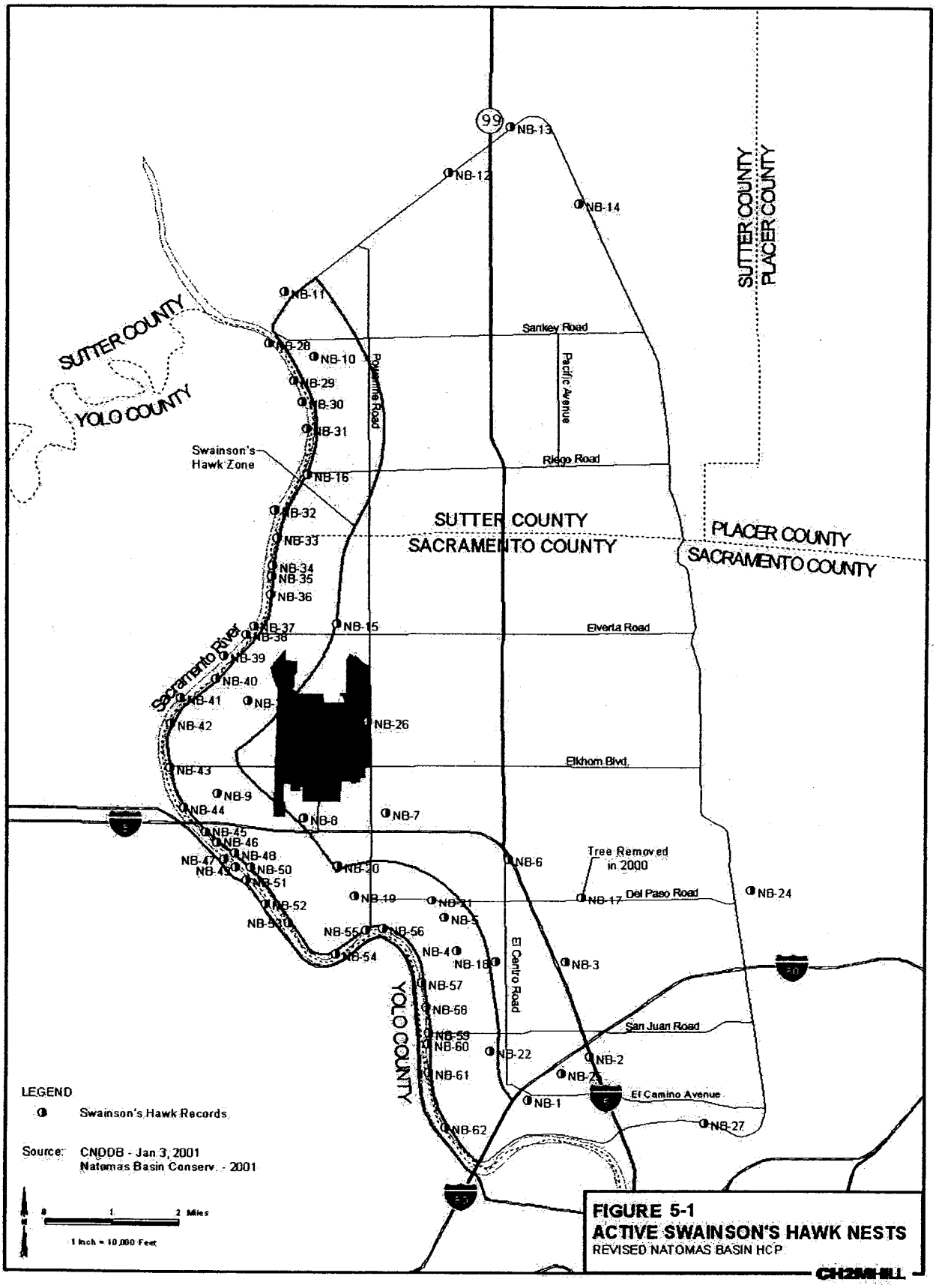

FIGURE 5-1
ACTIVE SWAINSON'S HAWK NESTS
REVISED NATOMAS BASIN HCP

TABLE 5-5
Change in Potential Habitat for Swainson's Hawk (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Nesting Habitat						
Riparian	124	(24)	0	0	(24)	100
Oak Groves	98	(6)	(2)	0	(8)	89
Tree Groves	106	(10)	(23)	0	(33)	73
Total Nesting	**328**	**(40)**	**(25)**	**0**	**(65)**	**263**
Foraging Habitat						
Alfalfa	371	0	0	0	0	371
Idle	1,464	(675)	(50)	(8)	(733)	731
Non-rice Crops	16,686	(4,663)	(325)	(1,529)	(6,517)	10,169
Grassland	886	(427)	0	(134)	(560)	325
Pasture	674	(23)	(22)	(101)	(147)	527
Ruderal	1,970	(1,137)	(6)	(88)	(1,231)	739
Total Foraging	**22,051**	**(6,925)**	**(403)**	**(1,860)**	**(9,188)**	**12,862**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

The land use analysis indicates that urban development could reduce potential nesting habitat by 65 acres. The change in the amount of nesting habitat, however, would be substantially less than this amount, and occupied nesting habitat could increase under the HCP. Loss of 8 acres of oak groves is attributable to three isolated groves in the Willow Creek area of the City of Sacramento and one 2-acre oak grove on the Metro Air Park property. The 24 acres of riparian lands are primarily located along the east side of Fisherman's Lake. This area is not designated as exempt from paying HCP fees, and therefore is included in the calculation of areas to be developed. This riparian habitat, however, would not be developed because of the open space buffer to be created in this area under the HCP. A small area of riparian habitat is also located near the northbound I-5 offramp to Del Paso Road. Loss of 33 acres of tree groves is primarily associated with a 21-acre grove in the Metro Air Park property. A 6-acre tree grove has been incorporated into the landscape features of the River View Oaks office complex, and a 1.5-acre tree grove will be preserved as part of the Whitter Ranch historic farm. Three remaining groves totaling approximately 4.5 acres are located as follows: one near the recently annexed City area near where I-80 crosses the Sacramento River, one west of I-5 near the proposed South Loop Road overpass, one in the City's proposed annexation area immediately south of Elkhorn Boulevard, and one in the Sutter County Industrial-Commercial Reserve north of Sankey Road. These four parcels were assumed to be lost to urban development.

None of the Riparian habitat, Oak Groves or Tree Groves that could be lost because of urban development contain Swainson's hawk nest sites. Thus, the projected habitat change would

not directly affect the existing Swainson's hawk population in the Natomas Basin. The HCP also includes measures to protect these and other existing habitat areas that could be used by Swainson's hawks for nesting in the future. The HCP requires:

- Avoiding removal of known nest trees if practicable
- Preserving valley oaks wherever possible
- Preserving and restoring riparian habitat, particularly at Fisherman's Lake (See Section V.5.b of the HCP)

These measures would contribute to maintaining existing nesting opportunities for Swainson's hawks.

The HCP also includes measures to increase nesting opportunities for Swainson's hawks over the 50 year project life. Specifically,

- Riparian trees would be planted on the Conservancy lands.
- Fifteen saplings would be planted for every Swainson's hawk nest tree impacted by development.
- The City would plant 60 sapling trees within 14 months of approval of the HCP.
- A tree planting program would be implemented to plant trees throughout the Basin (See Section V.5.b of the HCP).

It is estimated that four territories could be impacted by development in the City. To reduce the temporal effects associated with the potential loss of these territories, the City would advance funding to plant 60 sapling trees within 14 months of approval of the HCP; thus accelerating development of alternate nest sites to those expected to be impacted by development. The tree planting program and incorporation of riparian trees into the Conservancy's habitat reserves would be particularly beneficial because they could facilitate an increase in the number of territories. Portions of the Natomas Basin, particularly the east, support foraging habitat but provide few nesting opportunities. As a result, the available foraging habitat could be underused. The tree planting program and incorporation of riparian trees on the habitat reserves could create nesting opportunities in areas with limited nesting habitat but that have adequate foraging habitat and overall increase the nesting population of hawks in the basin.

In addition to these measures, the HCP recognizes the importance of nesting habitat along the Sacramento River and at Fisherman's Lake. Under the HCP, a goal of "no net loss" of nesting habitat would be established for the Swainson's hawk zone and no development in the Swainson's hawk zone would be permitted by under the HCP.[5] Lands would be protected around Fisherman's Lake and RD 1000 would prepare a management plan for Fisherman's Lake to maintain and/or improve its habitat value for species covered by the HCP. This area supports four Swainson's hawks' nest sites (SHTAC, 2000). With these

[5] The "Swanson's hawk zone" is defined as a corridor beginning at the Sacramento River levee, extending eastward for 1 mile, and running from the intersection of the Sacramento River and Natomas Cross Canal in the north of the Natomas Basin to the intersection of the Sacramento River and the American River in the south. For purposes of this assessment, the Swainson's hawk zone is considered to include those Swainson's hawk nest trees that are outside of but immediately adjacent to the Natomas Basin, along the Sacramento River.

measures, the known nesting sites territories associated with Fisherman's Lake would be protected and additional ones could be created with restoration of riparian habitat in this area. In combination, all of measures would act to avoid or minimize the loss of occupied and potential nesting habitat while providing additional nesting opportunities over the 50 year project life.

Potential foraging habitat for Swainson's hawk could be reduced by about 9,188 acres (a 42 percent reduction) in the Natomas Basin as a result of urban development. About 12,862 acres of potential foraging habitat would remain in the Natomas Basin. Loss of foraging habitat has the potential to indirectly impact Swainson's hawks. Under the HCP, 2,187.5 acres would be dedicated to upland habitat in permanent habitat reserves. This upland habitat could consist of existing foraging habitat for Swainson's hawk or could be created from lands that do not currently provide foraging opportunities for Swainson's hawks. If all of the upland habitat component of the habitat reserves consisted of protection of existing habitat, the net reduction in foraging habitat would be the 9,188 acres attributable to urban development. If all of the upland habitat component of the habitat reserves was created from non-habitat, then the net reduction in foraging habitat for Swainson's hawk would be about 7000.5 acres (a 32 percent reduction).

The importance of suitable foraging habitat to Swainson's hawk is influenced by its proximity to nest sites. Swainson's hawks have been found to forage up to 18 miles from nest sites, but most foraging occurs much closer to nest sites. Foraging habitat located closer to nest sites is considered to be more important than foraging habitat at greater distances. The CDFG considers habitat within 1.0 mile of the nest site as more valuable foraging habitat than habitat at greater distances. The acreage of foraging habitat for Swainson's hawk within 1 mile of nest sites is presented in Table 5-6. Of the 22,051 acres that provide potential foraging habitat for Swainson's hawk in the Natomas Basin, about 12,446 acres are within 1 mile of a known nest site.

TABLE 5-6
Change in Foraging Habitat Within 1 Mile of Swainson's Hawk Nest Sites (acres)

Habitat Class	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Alfalfa	280	0	0	0	0	280
Grassland	51	(21)	0	0	(21)	30
Idle	619	(264)	(47)	0	(311)	308
Non-rice Crops	9,698	(2,523)	(232)	(159)	(2,915)	6,784
Pasture	353	(3)	(20)	0	(23)	330
Ruderal	1,444	(868)	(6)	(5)	(879)	565
Total	**12,446**	**(3,679)**	**(305)**	**(165)**	**(4,149)**	**8,297**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Most of the nest sites in and immediately adjacent to the Natomas Basin are within the Swainson's Hawk Zone along the Sacramento River. In addition to these nest sites, the Natomas Cross Canal supports several nest sites. Based on the location of planned urban

development, conversion of potential foraging habitat to urban uses would generally occur at distances of greater than 1.0 mile from nest sites. Of the 12,446 acres of foraging habitat within 1 mile of a nest site, urban development is predicted to convert 4,149 acres of foraging habitat. More than half this acreage would consist of non-rice crops. With implementation of the HCP, 2,187.5 acres would be acquired and protected and upland habitat created or enhanced as foraging habitat for Swainson's hawk. If upland habitat for the reserves is created from areas that currently do not provide foraging habitat, up to 2,187.5 acres of additional foraging habitat could be created in the basin under the HCP. The Conservancy would set as a top priority the acquisition of upland reserve sites in the Swainson's hawk zone. Following approval of the HCP, Sutter County would initiate a general plan amendment process to redesignate the portion of the IRC in the Swainson's hawk zone as agriculture. This redesignation would provide additional assurance that foraging habitat would be maintained for Swainson's hawks.

The net reduction would be at least partially, if not entirely, offset by the greater quality of upland habitat in the habitat reserves. The predominant habitat that would be lost would be non-rice crops. Non-rice crops (e.g., row crops) are used less (Estep, 1989; Babcock, 1995) and considered poorer quality foraging habitat for Swainson's hawk than native grasslands, alfalfa, and pasture. Upland habitat in the reserves would be alfalfa or native grassland and would be managed specifically to provide foraging habitat for Swainson's hawk. Further, the upland habitat in the reserves would be available throughout the entire period of time that the hawks are in the basin and would be stable in amount and location over the long term. In agricultural fields, Swainson's hawks often concentrate foraging in agricultural fields during or immediately following harvest (Estep, 1989). When the fields are not being harvested, prey in agricultural habitats might not be accessible to Swainson's hawks such that the effective amount of habitat is less than indicated by the total acreage. Crop types also fluctuate in the Natomas Basin and could shift over time to crops that are less favorable to Swainson's hawks for foraging. The habitat reserves would provide certainty of the amount, quality and location of foraging habitat.

Within the habitat reserves, upland habitat would be managed specifically to produce prey for Swainson's hawks. In addition to the upland habitat in the reserves, Swainson's hawks could use portions of the managed marsh and at times rice fields. To provide overwintering habitat for giant garter snakes, managed marshes would include upland areas. These areas also would provide foraging opportunities for Swainson's hawks. Some of the managed marshes would be seasonal and would not be inundated during the late spring and summer. When not flooded, seasonal marshes could be used by Swainson's hawks if the marshes are colonized by small mammals. Similarly, rice fields could provide foraging opportunities for hawks for a couple months each year when they are dry. Under the HCP, 10 percent of the rice on the habitat reserves would be fallowed each year which would further provide potential foraging opportunities. Collectively, the habitat reserves effectively would provide greater of foraging opportunities than suggested by the upland component alone, although a the specific amount of foraging habitat available in any given year cannot be quantified.

Importantly, the Conservancy would monitor future proposed development in the Swainson's hawk zone, where the majority of known Swainson's hawk nest sites are located. Based on existing general plans, development in this zone is expected to be limited

over the term of the HCP. If urban development does occur, however, reserve lands established as mitigation for that development would, likewise, be located within the Swainson's hawk zone. In addition, the Conservancy would set as a top priority the acquisition of upland reserve sites in the Swainson's hawk zone (via easement or land purchase), irrespective of any specific development proposals in this area. These actions would help maintain foraging habitat in proximity to a majority of the nesting sites and mitigate losses in the amount of potential foraging habitat in the basin.

Effects of Construction Activities

Urban development and the construction of habitat reserves have the potential to displace and or disturb nesting Swainson's hawks. Nest disturbance from the operation of heavy construction equipment and continued presence of activity near nest sites could cause Swainson's hawks to abandon a nesting attempt or interfere with incubation and feeding of young in a way that reduces nesting success.

The HCP includes measures to avoid and minimize the potential for impacts to Swainson's hawks from construction associated with urban development and for the habitat reserves (Section V). These measures include:

- Pre-construction surveys to determine whether any Swainson's hawk nest sites occur on or within 1/2 mile of the lands designated for development.
- Timing restrictions for construction activity if an occupied Swainson's hawk nest is identified (i.e., defer construction activities until after the nesting season) and then, if unavoidable, the nest tree may be destroyed during the non-nesting season.
- An onsite biological monitor (CDFG-approved raptor biologist) would be assigned to the project if construction or other project-related activities that could cause nest abandonment or forced fledging are proposed within the 1/4 mile buffer zone.

In combination, these measures would help ensure that nest sites are identified prior to the start of construction and that actions are taken to minimize or avoid adverse effects to the birds during the nesting season.

Effects of O&M Activities

Water Agencies

O&M activities by RD 1000 and Natomas Mutual could affect Swainson's hawks during their breeding season. Isolated trees along the canal and ditch system support nesting by Swainson's hawks. Nesting birds could be affected by noise from maintenance equipment such as mowers and construction equipment used for sediment removal as well as human activity in the vicinity of an occupied nest. Swainson's hawks that nest in trees along irrigation canals and ditches have selected and used these trees coincident with the on-going activities. Swainson's hawks that nest in trees on irrigation canals and ditches have successfully fledge young (SFTAC, 2001). Thus, no adverse effects to Swainson's haws are anticipated as a result of on-going O&M activities.

O&M activities by RD 1000 and Natomas Mutual also have the potential to indirectly affect Swainson's hawks through vegetation control and rodent control practices along the ditches and canals. Canal banks can provide foraging opportunities for Swainson's hawk. O&M

practices can influence the quality of canal banks as foraging opportunities for Swainson's hawk through effects on vegetation and directly through rodent control. Under the HCP, the water agencies would implement best management practices on maintain vegetative cover on the ditches and canals to provide food and protection for prey species (Section V). The water agencies also would limit rodent control measures to those necessary to maintain structurally sound flood control levees.

Natomas Basin Conservancy

The Conservancy would manage the habitat reserves to provide nesting and foraging habitat for Swainson's hawk. Thus, the Conservancy's operations and maintenance activities overall would have beneficial effects on Swainson's hawk. For example, under the HCP, the Conservancy would manage upland habitats on the reserves to support mice and insects to support a prey base for the hawks. If Swainson's hawks nest on the habitat reserves, O&M activities would have the potential to disturb nesting birds. Under the HCP the Conservancy would implement take avoidance measures to minimize potential take that could occur during habitat enhancement and management activities on reserve lands. the Conservancy would ensure that all such take avoidance measures as are necessary and appropriate are included in reserve management plans, as well as additional measures determined to be necessary during the development of management plans.

Overall Effects on Swainson's Hawk

Swainson's hawks once were one of the most common raptors in California. The breeding population in California has been estimated at about 10 percent of its historic level (Bloom, 1980). The substantial reduction in riparian forest and oak woodland habitat that Swainson's hawks use for nesting has been considered the primary cause of this species decline in California. Conversion of grassland to agricultural and urban also could have contributed to declines although, the hawks have adapted to using some types of agricultural fields for foraging. It is uncertain if the availability and quality of foraging habitat is currently a limiting factor for Swainson's hawk in the Natomas Basin.

Currently, there are 892 known Swainson's hawk nesting site occurrences in California. Three of these occurrences have been extirpated, and seven reported nest sites have not been relocated. Of the remaining 882 known occurrences presumed extant, 141 are reported in Sacramento County, and 53 are reported from Sutter County (CDFG, 2001). The most recent survey of the Natomas Basin (SHTAC, 2001) shows 35 nest sites along the Sacramento River (22 on the east side and 13 on the west side) and 27 nest sites located elsewhere in the basin, for a total of 62 nest sites in or immediately adjacent to the Natomas Basin. Two of the sites in the basin are considered abandoned.

Not including the two abandoned territories, seven of the known nest sites are within the approved development areas of the HCP. Five of these sites are located within the City and two are within Metro Air Park. Except for one of the sites, all were used in 2001. These seven nest sites have the greatest potential to be affected by covered activities, which could result in the direct loss of nesting habitat at these sites if removal of nest trees is not be avoided or the territories could be abandoned because of the indirect effects of reduced foraging habitat around the nest site. If the nest trees are retained, three of the territories in the City (NB-1, NB-2, and NB-25) would probably remain viable because of the large amount of foraging habitat available within about 0.25 mile between the City's western edge and the

Sacramento River. The remaining two territories in the City (NB-3 and NB-25) would be surrounded by urban development and would be 0.5 to 1.0 mile from alternative foraging habitat. These territories could be abandoned. There are territories in the Natomas Basin, however, that are surrounded by urban development and are more than one mile from suitable foraging habitat but that have successfully fledged young. Thus, these territories could remain occupied if the nest tree is retained. One of the territories in the Metro Air Park area is within about 0.25 mile of foraging habitat that would not be developed and therefore would not be expected to be lost because of reduced foraging habitat at Metro Air Park. The second nest site at Metro Air Park (NB-26) was a new site in 2001. Fallowing of rice fields in the Metro Air Park property in the last few years could have facilitated establishment of this territory. Little alternative foraging habitat is available near this nest site and it could be abandoned with development of Metro Air Park.

Overall, three territories are considered at risk to be abandoned. Although these sites have the greatest potential of those in the basin to be affected by urban development it is uncertain if they would be abandoned. Nevertheless, the HCP includes actions to offset a potential loss of territories, specifically the creation of additional nest sites at the habitat reserves, implementation of the tree planting program, and restoration of riparian habitat. A short-term reduction in the number of territories could occur prior to the development of alternate nest sites but over the long term the HCP would encourage the establishment of new territories as long as nesting habitat and not foraging habitat is the primary limiting factor.

Urban development could reduce the amount of foraging habitat available within the Natomas Basin as a whole. However, few territories likely would be abandoned a result of the projected reduction in foraging habitat acreage for the following reasons:

- Loss of potential foraging habitat would primarily occur away from nest sites where it is less valuable to nesting Swainson's hawks
- Maintenance of foraging habitat with the Swainson's hawk zone would be a focus of the HCP and most of the nest sites are located in this zone
- Upland reserves would be managed to provide better quality foraging habitat for Swainson's hawk than is provided in agricultural fields
- Foraging habitat is probably not currently limiting because of the large amount of agricultural fields available in and around the Natomas Basin and the ability for Swainson's hawks to forage over large distances

Lastly, upland reserve sites in the Swainson's hawk zone would be acquired with habitat contiguity as a primary consideration. The acquisitions by the Conservancy would ensure that substantial amounts of Swainson's hawk habitat would be maintained in close proximity to occupied nesting habitat. In addition acquisition would ensure that upland habitats would be selected using a strategy that maximizes the Conservancy's ability to maintain Swainson's hawks in the basin (i.e., upland habitats would not be randomly selected for the reserve system, either inside the zone or outside). For these reasons, the reduction in foraging habitat is not expected to result in the loss of territories associated with nest trees located outside of the areas proposed for development.

5.6 Aleutian Canada Goose (*Branta canadensis leucopareia*)

5.6.1 Species Description

The Aleutian Canada goose was delisted by the USFWS on March 20, 2001 (FR 66:15643), and is considered a federal Species of Concern because of ongoing monitoring activities pursuant to the delisting. The Aleutian Canada goose is a subspecies of the Canada goose, characterized by its smaller size and a distinctive white ring at the base of its black neck. The primary winter habitat for the goose's largest population segment is the Central Valley, and most of this population can be found by mid-December in the Modesto area (FR 66:15643). Foraging habitat consists of pasture, flooded rice fields, and harvested fields (USFWS, 1991). In addition, large ponds, flooded fields, and rice checks provide roosting habitat for the wintering geese (USFWS, 1991).

Currently, there are 13 known occurrences of wintering Aleutian Canada geese in California (CDFG, 2001). Of these 13 occurrences, 4 occur in Sutter County. These occurrences are all located in agricultural fields around the Sutter County/Colusa County line, north of the HCP area. There are no known occurrences in the HCP area. Aleutian Canada geese, however, likely stop in the Natomas Basin for brief periods during migration to and from their traditional wintering areas.

Additional information about the Aleutian Canada goose can be found in the HCP (Section II.C.4.a.), in the *Federal Register* notice that delists the species (FR 66:15643; March 20, 2001), and in the USFWS's Recovery Plan for the species (USFWS, 1991).

5.6.2 Environmental Effects

Effects of Changes in Habitat

Aleutian Canada geese do not breed or winter in the Natomas Basin, but could use habitats in the Natomas Basin as a migratory stopover while migrating between breeding grounds in Alaska and wintering grounds in the San Joaquin Valley. Pasture, rice fields, and other croplands is the Natomas Basin could be used by migrating geese for foraging or roosting. Currently, much of the Natomas Basin (40,053 acres) could be used by Aleutian Canada geese. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for the Aleutian Canada goose and the changes in acreage from implementing the HCP are presented in Table 5-7. It is important to note that only a portion of the areas designated as "non-rice crops" constitute potential habitat for the Aleutian Canada goose. Only grain crops such as corn and wheat would likely be used by Aleutian Canada geese; non-grain crops such as tomatoes do not provide habitat. As such, the amount of habitat for Aleutian Canada geese is overestimated in Table 5-7.

TABLE 5-7
Change in Potential Habitat for Aleutian Canada Goose (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Non-rice crops	16,686	(4,663)	(325)	(1,529)	(6,517)	10,169
Pasture	674	(23)	(22)	(101)	(147)	527

TABLE 5-7
Change in Potential Habitat for Aleutian Canada Goose (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Rice (roosting and foraging)	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Total	**40,053**	**(5,656)**	**(1,888)**	**(7,207)**	**(14,751)**	**25,302**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Under the HCP, the total amount of potential habitat for the Aleutian Canada goose would be reduced by about 14,750 acres because of urban development. With urban development of 17,5000 acres, an estimated 25,302 acres of potential habitat for Aleutian Canada geese would remain in the Basin. The basin would continue to provide for use by migrating geese given this abundance of potential habitat.

This net reduction in potential habitat for the Aleutian Canada goose is unlikely to result in take of individual geese or affect the viability of the species. Potential habitat would remain abundant in the basin and agricultural areas are present and abundant both north and south of the basin. State and federal refuges also are distributed along the Central Valley and are managed to provide wintering and stopover habitat for ducks and geese. Further, the Aleutian Canada goose was listed as threatened because of threats on the species' breeding grounds in Alaska; the availability of migratory habitat has not been identified as a limiting factor for this species. Thus, projected changes in the amount of habitat in the Natomas Basin potentially used by Aleutian Canada geese would not be expected to affect the species' population. In the event that use of the Natomas Basin by Aleutian Canada geese increases in the future, the Conservancy would to use applicable Service-approved recovery or management plans to implement any additional conservation measures deemed appropriate.

The net loss of potential habitat would be at least partially offset by creation and protection of the habitat reserves. All of the habitats on the 8,750 acres in the reserve system would provide potential habitat for Aleutian Canada geese in perpetuity. The system of reserves would provide a mosaic of wetland, upland and agricultural habitats, all of which could be used by Aleutian Canada goose. The reserves would be protected in perpetuity, thereby providing certainty of the availability of stopover habitat for Aleutian Canada geese over the long-term. The stability and quality of habitat provided by the proposed system of permanent reserves would help ensure that Aleutian Canada geese could continue to use the Natomas Basin as a stopover area on their migration.

Effects of Construction Activities

Construction activities associated with urban development or creation of habitat would not be expected to adversely affect Aleutian Canada geese. Potential effects would be limited to displacement of birds foraging or roosting on a field during the initial phases of construction when fields are graded. Aleutian Canada geese only occur in the basin for brief periods during migration and in small numbers during migration such that the potential for construction activities to coincide with the presence of Aleutian Canada geese is minimal.

Effects of O&M Activities

Water Agencies

O&M activities by RD 1000 and Natomas Mutual are unlikely to affect the Aleutian Canada goose. These activities would be focused on canals and drains, which do not provide suitable habitat for this species. Further, the Natomas Basin is of limited importance to the Aleutian Canada goose, and the species is highly mobile during potential stopover periods in the Natomas Basin.

Natomas Basin Conservancy

Ongoing maintenance of the habitat reserves would be unlikely to affect the Aleutian Canada goose. Potential effects would be limited to displacement of birds foraging or roosting on a field. Potential disturbance would be of limited scope and short duration. Also, Aleutian Canada geese only occur in the basin for brief periods during migration and in small numbers during migration such that the Conservancy could schedule O&M activities to avoid disturbance. If hunting is allowed on the reserves, CDFG requirements would be followed. Hunting would not be allowed if it conflicted with the species' ongoing recovery.

Overall Effects on Aleutian Canada Goose

Aleutian Canada geese use the Natomas Basin to a limited degree during their seasonal migrations. Potential habitat is expected to remain abundant under the HCP. This species is not believed to be limited by wintering habitat such that the reduction in the potential in the Natomas Basin would not be expected to have any effects on the population. The habitat reserves under the HCP would provide high-quality habitat that is stable in amount and location in perpetuity. The long-term availability of this habitat could be beneficial to the Aleutian Canada goose if future development in the Central Valley substantially reduces other wintering and migratory habitat.

5.7 Burrowing Owl (*Athene cunicularia*)

5.7.1 Species Description

Burrowing owls are considered a Species of Concern by the USFWS, and a Species of Special Concern by CDFG. Burrowing owls are small, long-legged birds of open terrain that use vacated animal burrows (e.g. ground squirrel burrows) or artificial structures (e.g., culverts) for nesting and shelter. Generally, foraging habitat consists primarily of open grasslands and grass/shrub lands where prey species (e.g., insects and small mammals) are readily available. The species is often found in roadsides and other disturbed areas inhabited by ground squirrels and with few visual obstructions. Little scientific information is available for the local burrowing owl population (e.g. home range information and wintering versus resident status), but suitable habitat in the Natomas Basin likely consists of areas with small mammal burrows and nearby foraging areas.

Burrowing owls are neotropical migrants that occur throughout the western United States, including portions of northern Mexico and southern Canada. The species is also locally distributed throughout suitable habitat in the Caribbean, and in Central and South America (Haug, et al., 1993). California appears to have a non-migratory population (primarily in the

Imperial Valley), and is also a wintering ground for burrowing owls from other regions. Burrowing owls in Northern California are probably migratory, but little information is known about the migration habitats of the Northern California population (Haug, et al., 1993). The burrowing owl population is known to be in decline throughout its range because of various factors including habitat destruction (e.g., agricultural practices and land development), vehicle collisions, and predation. In California, and in the Natomas Basin specifically, urbanization is likely a key threat to this species.

There are 370 known burrowing owl occurrences in California (CDFG, 2001). Three hundred of these occurrences are considered extant. Eighteen occurrences are known in Sacramento County, of which 17 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 (CDFG, 2001).

Burrowing owls are a permanent resident in California, but additional wintering owls also occur in the state. Burrowing owls occur in low numbers in the HCP 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 HCP 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 (CDFG, 2001).

5.7.2 Environmental Effects

Effects of Changes in Habitat

Burrowing owls are associated with open grassland habitats. They are dependent on burrowing mammals particularly ground squirrels to excavate burrows and thus, their occurrence and distribution is linked to these mammals. In the Natomas Basin, grasslands and pastures provide nesting and foraging habitat for burrowing owl. Burrowing owls also could forage in alfalfa but nesting would not be expected because of routine disturbance caused by harvesting. Burrowing mammals often create burrows in road and canal embankments and burrowing owls can be found nesting in these areas. For this analysis, grassland, pasture and alfalfa are considered habitat for burrowing owl. Based on this definition, the Natomas Basin supports about 1,931 acres of potential habitat for burrowing owl. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for burrowing owl and the changes in acreage from implementing the HCP are presented in Table 5-8.

TABLE 5-8
Change in Potential Habitat for Burrowing Owl (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Alfalfa	371	0	0	0	0	371
Grassland	886	(427)	0	(134)	(560)	325
Pasture	674	(23)	(22)	(101)	(147)	527
Total	**1,931**	**(450)**	**(22)**	**(235)**	**(707)**	**1,223**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Under the HCP, urban development would impact about 700 acres of potential habitat for burrowing owl. Most of the habitat that would be lost would be grassland and pasture in the northern portion of the City's "panhandle" annexation area and the northeastern portion of Sutter County's Industrial-Commercial Reserve. This habitat loss would be offset by the upland mitigation strategy.

The upland mitigation strategy of the HCP is to create and maintain optimum nesting and foraging habitat for Swainson's hawk. Upland foraging habitat for Swainson's hawk includes open grassland and pasture areas and field crops (e.g., alfalfa) that are also suitable habitat for burrowing owl. Thus, the 2,187.5 acres of upland habitat in the reserves would be suitable for both burrowing owl and Swainson's hawk. Uplands associated with the wetland reserves could provide additional habitat.

In addition to increasing the total amount of habitat for burrowing owls, habitat in the reserve system would provide better habitat conditions for burrowing owl than the habitat that would be lost. The HCP requires specific management requirements for burrowing owls on the proposed system of upland reserves. Key requirements include creating mounded areas suitable for burrowing owl nesting, enhancing prey populations, and avoiding disturbance during management activities.

In addition to reducing habitat availability, urban development in areas adjacent to burrowing owl colonies can indirectly impact this species. Free-ranging domestic cats are often introduced to an area by the establishment of residential areas. Residential development close to burrowing owl colonies could increase predation by cats. Nearby residential areas could also lead to harassment of owls by human. In a Florida study area, harassment of owls by children was a leading cause of nest failures by burrowing owls (Millsap and Bear 2000). Under the HCP, habitat reserves would be located at least 800 feet from urban areas and areas designated for urban development in applicable plan (unless a smaller distance is approved by CDFG and USFWS on a case-by-case basis) and human access would be controlled. With these provisions, predation by cats and harassment by human would be reduced although not necessarily eliminated.

Effects of Construction Activities

Burrowing owls could be directly affected by construction activities associated with urban development and habitat creation on the habitat reserves. Earth-moving activities can trap

or injure owls in their burrows. The HCP requires the following measures to avoid impacts to burrowing owls:

- Pre-construction surveys would be conducted prior to the initiation of grading or earth disturbing activities site to determine if any burrowing owls are using the site for foraging or nesting. If nest sites are found, the CDFG shall be contacted regarding suitable mitigation measures, which may include a 300 foot buffer from the nest site during the breeding season (March 15 - August 31), or a relocation effort for the burrowing owls. Results of the pre-construction survey would be submitted to the land use agency with jurisdiction over the site prior to commencement of construction activities.
- If future surveys reveal the presence of burrowing owls on the project site, the applicant/developer would prepare a plan for relocating the owls to a suitable site.

By following these measures, the potential for injury of or trapping owls in their burrows would be reduced. These measures also require relocation of owls and habitat protection if a colony is displaced by construction. With this requirement, there would be no net change in the number of colonies as a result of urban development.

On the habitat reserves, habitat creation would be designed and conducted so as to avoid impacts to burrowing owl colonies. For example, the habitat creation plan for the Betts-Kismat-Silva property maintains the existing burrowing owl colonies intact. If future land acquisitions support burrowing owl colonies, they would be similarly protected.

Effects of O&M Activities

Water Agencies

O&M activities conducted by RD 1000 and Natomas Mutual have the potential to affect burrowing owls directly and indirectly. Activities such as sediment removal have the potential to trap owls in their burrows. Because burrowing owls do not inhabit canal and ditch embankments to a large degree, however, impacts to the burrowing owl population are expected to be infrequent and to affect a small number of owls. Rodent control activities have the potential to indirectly affect burrowing owls. Burrowing owls are dependent on burrowing rodents to create burrows. Under the HCP, the water agencies would only conduct rodent control activities as necessary to maintain structurally sound flood control levees. While not avoiding this potential impact entirely, this measure would reduce the potential impacts of these activities on populations of burrowing mammals on which the burrowing owl depends.

Natomas Basin Conservancy

The Conservancy would avoid impacts to burrowing owls during management activities of the habitat reserves by following CDFG's Staff Report on Burrowing Owl Mitigation.

Overall Effects on Burrowing Owl

With the increased amount and quality of habitat for burrowing owls and long-term protection of habitat in the reserve system, the HCP would improve habitat conditions for burrowing owl in the Natomas Basin. Reserve acquisitions to date have included known burrowing owl populations (i.e., Betts-Kismat-Silva), and it is likely that burrowing owls would occur on future reserve lands such that the number of colonies is areas permanently protected would increase. The overall combination of the measures (i.e., pre-construction

surveys for covered species and their habitat); species-specific measures (e.g., avoidance of burrow sites during the breeding season both within development lands and reserve lands, species relocation); additional mitigation according to CDFG guidelines; and long-term protection, creation, and enhancement of upland habitat in the reserve system would be expected to at least maintain the existing population level of burrowing owl in the Natomas Basin and potentially increase it over time.

5.8 Bank Swallow (*Riparia riparia*)

5.8.1 Species Description

The bank swallow is state listed as a Threatened species under the California Endangered Species Act. 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 of 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 no known breeding colonies remaining in southern California.

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.

The bank swallow breeds from early May through July. Pairs usually nest colonially in groups of 10 to 1,500 although most colonies have 100-200 nesting pairs. Bank swallows require vertical banks or cliffs with fine-textured or sandy soils near streams, rivers, ponds, lakes, or the ocean for nesting. 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. The bank swallow uses holes dug in cliffs and river banks for cover; logs, shoreline vegetation, and telephone wires are also used for roosting.

There are 171 known bank swallow occurrences in California (CDFG, 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 Natomas Basin, and foraging could also occur during migration to nesting sites north of the Natomas Basin.

This species is a colonial 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. Breeding occurs from about sea

level to as high as 6,900 feet (Small, 1994). Bank swallows tend to return to these colonial nests year after year.

5.8.2 Environmental Effects

Effects of Changes in Habitat

Bank swallows nest in vertical riverbanks with friable soils. Waterways within the Natomas Basin are largely channelized canals and ditches that are designed to resist erosion and therefore do not support suitable nesting substrates for bank swallows. Bank swallows do not nest in the Natomas Basin and the expected changes in land use do not include the removal or creation of bank swallow nesting habitat.

Bank swallows prey on insects and can forage in variety of open habitats. However, typically they concentrate foraging in riparian areas, wetlands and open water habitats (e.g., canals, ponds, and seasonally wet areas) where insects tend to be abundant. Grasslands and other croplands also could be used. There are no bank swallow nesting colonies in the Natomas Basin but bank swallows from colonies outside of the Natomas Basin or migrating birds could forage in the basin.

Bank swallows could forage in almost any open habitat in the Natomas Basin. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for bank swallow and the changes in acreage from implementing the HCP are presented in Table 5-9. As summarized in Table 5-9, open habitats where bank swallows could forage would decline by about 15,760 acres under the HCP. This reduction in potential foraging habitat would not be expected to adversely affect bank swallows for several reasons. First, the abundance and distribution of bank swallows are determined by the availability and location of suitable nesting substrates rather than the availability of foraging habitat. Second, potential foraging habitat would remain abundant (about 27,547 acres) and, given the low level of use of the Natomas Basin by bank swallows, the habitat remaining in the basin with full implementation of the HCP would be sufficient to support the existing level of use. Also, bank swallows foraging in the Natomas Basin most likely come from nesting colonies on the Sacramento River and probably forage close to the river. The urban development contemplated under the HCP would occur away from Sacramento River and would not affect the areas likely receiving greatest use by bank swallows.

TABLE 5-9
Change in Potential Habitat for Bank Swallow (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Alfalfa	371	0	0	0	0	371
Grassland	886	(427)	0	(134)	(560)	325
Non-rice crops	16,686	(4,663)	(325)	(1,529)	(6,517)	10,169
Pasture	674	(23)	(22)	(101)	(147)	527
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Rice	22,693	(970)	(1,541)	(5,577)	(8,087)	14,606
Riparian	124	(24)	0	0	(24)	100

TABLE 5-9
Change in Potential Habitat for Bank Swallow (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**43,308**	**(6,231)**	**(1,964)**	**(7,566)**	**(15,760)**	**27,547**

(#) decrease in acreage
Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

To the extent that bank swallows use the Basin, the system of habitat reserves would be managed to provide a marsh ecosystem which would support a greater abundance and diversity of insects than agricultural fields. The creation of reserves could improve foraging opportunities for bank swallows. The habitat reserves also would be protected in perpetuity and provide habitat that is stable in quality and location. The Conservancy would manage the habitat reserves in accordance with applicable USFWS- or CDFG-approved bank swallow recovery or management plans. The HCP also contains management provisions to implement any additional conservation measures deemed appropriate if use of the Natomas Basin by this species increase in the future.

Effects of Construction Activities

No bank swallow nesting colonies are currently recorded in the Natomas Basin and such colonies are unlikely to occur because suitable nesting habitat (i.e., vertical banks with fine-textured soils) is absent. Accordingly, construction-related impacts are unlikely to occur. The HCP requires that surveys be conducted prior to the approval of urban development permit. In the event that a bank swallow nesting colony is found in a development area, impacts would be avoided during the nesting season. Similarly, in creating habitat on the habitat reserves, the Conservancy would avoid impacts during the nesting season if a nesting colony occurs on the habitat reserves.

Effects of O&M Activities

Water Agencies

O&M activities by RD 1000 and Natomas Mutual are unlikely to affect the bank swallow. These activities would be focused on canals and drains, which do not provide suitable nesting habitat for this species. O&M activities would not preclude or interfere with foraging by bank swallows.

Natomas Basin Conservancy

O&M activities by the Conservancy are unlikely to affect the bank swallows because suitable nesting habitat is not expected to occur on reserve lands. In the event that a bank swallow colony does occur on the habitat reserves, the Conservancy would avoid disturbance of colonies during the nesting season. Operation and maintenance activities would not preclude or interfere with foraging by bank swallows. If use of the Natomas Basin by bank swallows appreciably increased in the future, the Conservancy would implement additional conservation measures deemed appropriate based on applicable Service or CDFG approved bank swallow recovery or management plans, and/or the Adaptive Management provisions of the HCP.

Overall Effects on Bank Swallow

Bank swallows nest exclusively in high, steep, vertical banks typically formed on larger rivers through erosive processes. The primary contributor to this species' decline in California has probably been bank protection and flood control actions as well as flow diversions and regulations that have reduced erosive processes on Central Valley rivers. Because suitable nesting substrates do not occur in the Natomas Basin, the HCP would not affect (either positively or negatively) the species' primary limiting factor. As such, the HCP is not likely to affect this species.

5.9 Loggerhead Shrike (*Lanius ludovicianus*)

5.9.1 Species Description

The loggerhead shrike is a state Species of Special Concern. The loggerhead shrike 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). 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 frequently skewers prey on thorns, sharp twigs, barbed wire, or forces it into a crotch to feed on or to cache for storage (Zeiner et al., 1990).

The loggerhead shrike is common throughout most of lowland California. 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 Natomas Basin during habitat mapping surveys of the Basin in 2001.

5.9.2 Environmental Effects

Effects of Changes in Habitat

In the Natomas Basin, potential foraging habitat for the loggerhead shrike primarily consists of pasture, grasslands, ponds and seasonally wet areas, croplands, orchards, and ruderal habitats. Shrikes also could nest in trees or shrubs occurring in or along the margins of these habitats. Canals, riparian areas and oak and tree groves also provide nesting opportunities for this species. The habitat classes (from Tables 4-3 and 4-4) that would provide potential habitat for loggerhead shrike and the changes in acreage from implementing the HCP are presented in Table 5-10. Based on the GIS, the Natomas Basin supports about 23,300 acres of potential habitat for loggerhead shrike (Table 5-10).

Only a portion of the potential habitat would be used by loggerhead shrikes. This species occurs in close association with small trees and shrubs which it uses as perch sites from which foraging bouts are launched and as nest sites. Small trees and shrubs are not found in

the middle of the field; rather they occur sporadically along the margins of the fields. Telephone lines along the roads also are used. Because loggerhead shrikes forage by making short forays from perch sites, they would not use the inner portions of fields that occur at some distance from perch sites. Thus, loggerhead shrikes predominantly use the margins of fields and only areas where there are perch sites. Considering the entire acreage of agricultural fields as potential habitat for loggerhead shrike overestimates the amount of habitat available to this species in the Natomas Basin.

TABLE 5-10
Change in Potential Habitat for Loggerhead Shrike (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Alfalfa	371	0	0	0	0	371
Grassland	886	(427)	0	(134)	(560)	325
Non-rice crops	16,686	(4,663)	(325)	(1,529)	(6,517)	10,169
Oak Groves	98	(6)	(2)	0	(8)	89
Orchard	182	(13)	0	0	(13)	169
Pasture	674	(23)	(22)	(101)	(147)	527
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Riparian	124	(24)	0	0	(24)	100
Ruderal	1,970	(1,137)	(6)	(88)	(1,231)	739
Rural Residential	377	(46)	(10)	0	(56)	321
Tree Groves	106	(10)	(23)	0	(33)	73
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**23,348**	**(6,473)**	**(464)**	**(2,077)**	**(9,014)**	**14,332**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Based on the GIS, potential habitat for loggerhead shrike would decline by about 9,000 acres under the HCP because of urban development (Table 5-10). Most of the potential habitat that would be lost would be non-rice crops. Non-rice crops probably provide relatively poor habitat for loggerhead shrike because this species feeds predominantly on insects and intensive management of agricultural lands strives to reduce insect pests. Further, insecticides are used to control insect pests and insecticide use is believed to be contributing to declines in loggerhead shrike populations (Kaufman, 1996).

The habitat reserves would provide 2,187.5 acres of high quality habitat for loggerhead shrike in perpetuity. This habitat would be stable in quality and location and encourage the establishment and long-term persistence of a breeding population in the Natomas Basin. Specifically to attract and maintain loggerhead shrikes, the Conservancy would encourage development and maintenance of perching and nesting sites on habitat reserves. Riparian habitat and some of the managed marsh on the reserves could provide additional nesting opportunities and foraging perch sites. The mosaic of upland, riparian and marsh habitats

on the reserves would provide nesting opportunities in close proximity to foraging habitat and provide all essential habitat features for loggerhead shrikes.

In addition to reducing habitat availability, urban development near areas inhabited by shrikes can have indirect effects. Free-ranging domestic cats are often introduced to an area by the establishment of residential areas. Residential development close to areas inhabited by shrikes could lead to increased predation by cats. Under the HCP, habitat reserves would be located at least 800 feet from urban areas and areas designated for urban development in applicable plan (unless a smaller distance is approved by CDFG and USFWS on a case-by-case basis). By locating habitat reserves away from urban areas, predation by cats could be reduced although not eliminated.

Effects of Construction Activities

Construction activities associated with development or for habitat creation on the habitat reserves could disturb or displace loggerhead shrikes. Under the HCP, preconstruction surveys for loggerhead shrikes would be conducted prior to urban development. If loggerhead shrikes are found, disturbance would be avoided during the nesting season to the maximum extent possible. Construction activities adjacent to the habitat reserves could disturb shrikes nesting on the reserves. The potential for this impact is low because the habitat reserves would be located 800 feet from urban development or lands designated for urban development (unless a smaller distance is approved by CDFG and USFWS on a case-by-case basis). On the habitat reserves, the Conservancy similarly would avoid disturbance to loggerhead shrike nest sites during construction activities for habitat creation.

Effects of O&M Activities

Water Agencies

O&M effects on loggerhead shrike are expected to be rare or infrequent. Canals and drains that would be affected by O&M activities generally do not support suitable habitat for loggerhead shrike such that they are unlikely to occur in areas where O&M activities are conducted.

Natomas Basin Conservancy

On the habitat reserves, management activities by the Conservancy could disturb or displace loggerhead shrikes nesting on the reserve. Under the HCP, the Conservancy would avoid disturbance of loggerhead shrikes during the nesting season while conducting management activities to the maximum extent practicable.

Overall Effects on Loggerhead Shrike

The net reduction in agricultural fields under the HCP likely would reduce the total population of loggerhead shrikes in the Natomas Basin. With creation and protection of high quality habitat on the habitat reserves, loggerhead shrikes probably would continue to be supported in the basin albeit probably at a reduced population level than currently exists. The current size and distribution of the loggerhead shrike population in the Natomas Basin is uncertain as are the factors determining these population characteristics. Specific habitat requirements also have not been identified for loggerhead shrikes in the Central Valley. In the absence of this information, the ability of the habitat reserves to adequately mitigate the impacts of urban development is uncertain.

5.10 Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

5.10.1 Species Description

The Valley elderberry longhorn beetle (VELB) is listed as Threatened under the federal Endangered Species Act. The valley elderberry longhorn beetle is a distinctive black and red-orange beetle with long antennae. The USFWS's Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS, 1999b) describes its habitat needs as follows:

> The valley elderberry longhorn beetle is completely dependent on its host plant, elderberry (*Sambucus* species), which is a common component of the remaining riparian forests and adjacent upland habitats in the Central Valley. Use of the elderberry by the beetle, a wood borer, is rarely apparent. Frequently, the only evidence of the elderberry's use by the beetle is an exit hole created by the larva just prior to the pupal stage. The life cycle takes one or two years to complete. The animal spends most of its life in the larval stage, living within the stems of an elderberry plant. Adult emergence is from late March through June, about the same time as an elderberry produces flowers. The adult stage is short-lived.

The USFWS designated critical habitat for the VELB (50 CFR 17:95). Critical habitat is 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 in Solano County (USFWS, 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 (USFWS, 1984). The USFWS's Programmatic Formal Consultation Permitting Projects with Relatively Small Effects on the Valley Elderberry Longhorn Beetle within the Jurisdiction of the Sacramento Field Office, California (USFWS, 1996) describes population densities of the beetle as follows:

> Population densities of the beetle are probably naturally low (USFWS, 1984); and it has been suggested, based on the spatial distribution of occupied shrubs (Barr, 1991), that the beetle is a poor disperser. Low density and limited dispersal capability may cause the beetle to be vulnerable to the negative effects of the isolation of small subpopulations due to habitat fragmentation.

The California Natural Diversity Database lists 168 occurrences of the valley elderberry longhorn beetle in California; none is located in the Natomas Basin (CDFG, 2001). 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. The occurrences nearest the Plan area are located southeast of Knights Landing, in Yolo County between Road 116 A and Road 16. Other Sutter County VELB occurrences are spread throughout the county often associated with major rivers and waterways. In Sacramento County, critical 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 (CDFG, 2001). There is suitable VELB habitat (i.e., elderberry shrubs) along the western and southern borders of the HCP 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.

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 rip-rap), land reclamation, and urban development. Additional factors affecting the VELB include grazing practices, herbicide spraying, and predation by non-native species.

Additional information about the VELB can be found in the HCP (Section II.C.4.a.), in the Federal Register notice (45:52803; August 8, 1980) that lists the species as Threatened under the ESA (USFWS, 1980), and in the USFWS's Recovery Plan for the species (USFWS, 1984).

5.10.2 Environmental Effects

Effects of Changes in Habitat

Riparian habitat is most likely to support elderberry shrubs on which the VELB depends, although elderberry shrubs could be found in almost all of the land use categories in the Natomas Basin. As explained previously, no loss of riparian habitat would occur as a result of the HCP. However, individual or small groups of shrubs could occur in areas subject to urban development and could be removed.

Although urban development could result in the removal of some elderberry shrubs, habitat availability for VELB would not be expected to decline in the Natomas Basin for several reasons. First, if elderberry shrubs occurred in a development area, the shrubs would transplanted and additional seedlings planted in accordance with the USFWS Conservation Guidelines for Valley Elderberry Longhorn Beetle. As the seedlings developed, habitat for VELB would increase. Second, the riparian corridor along Fisherman's Lake which supports elderberry shrubs is expected to remain intact because of the lands to be protected adjacent to the lake under the HCP. Third, the General Plan Amendment proposed for the 1 mile buffer area in Sutter County along the Sacramento River would protect some riparian habitat potentially containing elderberry shrubs. Last, elderberry shrubs would be planted in the habitat reserves. Accordingly, overall habitat availability in the Natomas Basin would increase for the VELB and much of the habitat would be in areas protected in perpetuity.

Effects of Construction Activities

Although overall habitat availability for the VELB would improve, removal of individual elderberry shrubs (resulting in potential elderberry beetle mortality) could still occur.

Shrubs could be removed during construction associated with urban development or with habitat creation on the reserves. The practice of avoiding and/or mitigating impacts to elderberry shrubs in accordance with the Conservation Guidelines is common in the Central Valley, and would continue to be the required practice with implementation of the HCP. Potential impacts to the valley elderberry longhorn beetle during land development (i.e., City, Sutter County, Metro Air Park) are addressed in the HCP by requiring compliance with the USFWS's Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS, 1999b). Key aspects of the Conservation Guidelines include:

- Surveys for the beetles and elderberry host plants by a qualified biologist prior to construction.
- Avoidance of elderberry bushes with a 100-foot construction buffer area (may be reduced with the approval of the USFWS).
- Mitigation of elderberry bushes where avoidance is not possible. The preferred mitigation is to transplant mature elderberry bushes during their dormant season (when the beetles are in their larval stage in the interior or the plant) to permanent mitigation lands and to plant a specified number of seedlings; planting additional elderberry seedlings may be allowed when transplanting is not feasible.

Construction impacts also could occur during development of the habitat reserve system. Specific locations of all of the reserves are not identified and, therefore, it is not possible to determine the number of shrubs that could be affected by development of the habitat reserves. Reserve acquisitions to date have not included lands with existing elderberry shrubs, but it is possible that elderberry shrubs would be present on lands acquired in the future. If elderberry shrubs occur on habitat reserves, the Conservancy would strive to preserve the shrubs. If shrubs must be removed to develop habitat on the reserves, the Conservancy would mitigate in accordance with the Conservation Guidelines.

Effects of O&M Activities

Water Agencies

The existing system of canals and drains in the Natomas Basin is highly maintained, and therefore, is unlikely to contain mature elderberry shrubs that are potential habitat for the valley elderberry longhorn beetle. However, some areas under management by RD 1000 and Natomas Mutual (e.g., Fisherman's Lake, RD 1000 Pumping Plant No. 2) contain mature riparian habitat that could contain elderberry shrubs. Areas under the management of the water agencies that support mature riparian habitat necessarily are those areas in which the water agencies do not routinely conduct vegetation control. As a result, the water agencies' continued O&M activities are not likely to remove elderberry shrubs supporting or potentially supporting VELB. The potential for removal of elderberry shrubs of sufficient size to support VELB is limited to construction activities associated with facility replacement or restructuring of canals. The number of shrubs potentially impacted over the project duration by these activities and their suitability for VELB is unknown. Because of this uncertainty in combination with uncertainty regarding the current status of VELB both in the Natomas Basin and rangewide precludes a prediction of the effect of the water agencies' O&M activities on VELB.

Natomas Basin Conservancy

Some of the Conservancy's management actions on the reserves have the potential to remove elderberry shrubs. the Conservancy would implement measures to avoid and minimize take of VELB as a result of habitat management actions. the Conservancy would ensure that necessary and appropriate take avoidance measures are included in reserve management plans, as well as additional measures determined to be necessary during the development of management plans.

Overall Effects on Valley Elderberry Longhorn Beetle

With implementation of the avoidance and mitigation measures for construction and O&M activities, long-term protection of existing riparian habitat, and planting and protection of additional elderberry shrubs on the habitat reserves, implementation of the HCP would mitigate impacts of the covered activities and contribute to maintaining VELB in the Natomas Basin.

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

5.11.1 Species Description

The Delta tule pea is considered a Species of Concern by the USFWS, and is on List 1B of the California Native Plant Society (rare or endangered in California and elsewhere). Delta tule pea is a perennial herb that, like other members of the pea family, has a large, brightly colored pink to lavender flower with a distinctive banner and keel. The species, like other peas, has grasping tendrils and a climbing habit. Delta tule pea is most commonly associated with both brackish and freshwater marsh vegetation, but can root near the water and extend into adjacent riparian and upland areas.

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 Occurrence Database, 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 Pavlic, 1994 [Sixth Edition]).

5.11.2 Environmental Effects

Effects of Changes in Habitat

Potential habitat for the Delta tule pea is found in marsh areas. In the Natomas Basin, ponds and seasonally wet areas are the primary potential habitat although some ditches and canals could provide suitable conditions. Rice lands are not suitable for Delta tule pea because these lands are managed to discourage colonization by plants other than rice and are harvested annually. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for the Delta tule pea and the changes in acreage from implementing the HCP are presented in Table 5-11.

"Ponds and Seasonally Wet Areas" occur throughout the Natomas Basin as isolated units; the loss of 21 acres could occur in approximately six areas subject to urban development. Assuming that smaller canals and drains do not remain after development has occurred, about 404 acres of Class II, III, and IV canals and ditches would be removed in the three development areas. Some of these canals and ditches could provide suitable conditions for delta tule pea.

TABLE 5-11
Change in Potential Habitat for Delta Tule Pea (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**1,874**	**(124)**	**(76)**	**(225)**	**(425)**	**1,449**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

Under the HCP, a stable and natural marsh environment would be created on 2,187.5 acres, thereby replacing the loss of 425 acres of potential habitat from urban development. This restored marsh area would substantially increase potential habitat for the Delta tule pea. Because Delta tule pea is not known to occur in the Natomas Basin and the Natomas Basin is outside this species known range, the loss of potential habitat because of urban development and subsequent increase in potential habitat on the habitat reserves could have no effect on the species. The HCP, however, includes a measure for the Conservancy to consider introducing the Delta tule pea into suitable locations in the Natomas Basin. If pursued, these introductions would benefit the species by increasing the population size and distribution.

Effects of Construction Activities

Delta tule pea is not expected to be affected by construction because the Natomas Basin is outside of the primary range of the species, and the species is not known to occur in the Natomas Basin. It is possible that construction activities (e.g., urban development, habitat reserve development) could affect existing unknown occurrences of Delta tule pea or areas colonized by this species future. Under the HCP, surveys for covered species, including Delta tule pea would be conducted prior to construction activities. If Delta tule pea were identified in construction areas, they could be salvaged and transplanted per the requirements of the California Native Plant Protection Act if deemed necessary and appropriate by the USFWS and CDFG.

Effects of O&M Activities

Water Agencies

Maintenance of the canal and drain system in the Natomas Basin could affect potential habitat for the Delta tule pea and directly removed individuals. These potential effects are unlikely to occur because the Natomas Basin is outside of the primary range of the species,

and the species is not known to currently occur in the project area. If this species' range expanded and it colonized the canals and ditches in the Natomas Basin, O&M activities conducted by Natomas Mutual and RD 1000 could impact individual plants.

The HCP does not include specific requirements for O&M activities to address potential impacts to Delta tule pea. However, the likelihood that this species would occur in the canals or ditches during the project duration is low because of the routine sediment and vegetation control maintenance activities. Natomas Mutual and RD 1000 conduct regular operation and maintenance activities on the canals and ditches. These types of activities would continue under the HCP. If Delta tule pea occurs, it would have colonized and persisted in the drains or canals coincident with these on-going activities. Therefore, if Delta tule pea naturally colonizes the ditches and canals in the future, it would be expected to persist.

Natomas Basin Conservancy

Over the short-term, the Conservancy's management activities on the habitat reserves would not be expected to affect Delta tule pea because this species is not known to occur in the Natomas Basin. Delta tule pea could colonize portions of the habitat reserves in the future and/or the Conservancy could pursue introductions of this species under the HCP. If this species becomes established in the habitat reserves, the Conservancy would implement measures to avoid and minimize take of plants. To determine if this plant colonizes the habitat reserves, the Conservancy will monitor for this species on the habitat reserves.

Overall Effects on Delta Tule Pea

Because this species does not currently occur in the Natomas Basin, the HCP would not affect this species during the short-term. The species would benefit if it was successfully introduced into the Natomas Basin.

5.12 Sanford's Arrowhead (*Sagittaria sanfordii*)

5.12.1 Species Description

Sanford's arrowhead is considered a Species of Concern by the USFWS, and is on List 1B of the California Native Plant Society (rare or endangered in California and elsewhere). Sanford's arrowhead is an aquatic perennial that occurs under shallow-water conditions in freshwater marshes. Sanford's arrowhead is known primarily from the Central Valley, although the species has been found in other areas of California as well. Most known occurrences are recorded from Sacramento (30 records), Merced (11), Fresno (10), Butte (8), and Tehama (6) Counties (CalFlora Occurrence Database, 2001). In Sacramento County, several occurrences are reported along the American River Parkway along small oxbows and sloughs (CDFG, 2001). Sanford's arrowhead is not known to occur in Sutter County. No occurrences are reported in the Natomas Basin.

5.12.2 Environmental Effects

Effects of Changes in Habitat

Potential habitat for the Sanford's arrowhead is found in marsh areas. In the Natomas Basin, ponds and seasonally wet areas are the primary potential habitat although some ditches and

canals could provide suitable conditions. Rice lands are not suitable for Sanford's arrowhead because these lands are managed to discourage colonization by plants other than rice and are harvested annually. The habitat classes (from Tables 4-3 and 4-4) that provide potential habitat for Sanford's arrowhead and the changes in acreage from implementing the HCP are presented in Table 5-12.

TABLE 5-12
Change in Potential Habitat for Sanford's Arrowhead (acres)

Habitat Class[a]	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Ponds and seasonally wet areas	96	(7)	(4)	(10)	(21)	75
Canals (all)	1,778	(117)	(72)	(215)	(404)	1,374
Total	**1,874**	**(124)**	**(76)**	**(225)**	**(425)**	**1,449**

(#) decrease in acreage

Source: Habitat and Land Use Assessment Database (CH2M HILL, 2002).

"Ponds and Seasonally Wet Areas" occur throughout the Natomas Basin as isolated units, and the loss of 21 acres would occur in approximately six areas subject to urban development as a covered activity under the HCP. Assuming that canals and drains do not remain after development has occurred, about 404 acres of Class II, III, and IV canals and drains would be removed in the development areas, some of which could contain emergent marsh values suitable for Sanford's arrowhead.

Under the HCP, a stable and natural marsh environment would be created on 2,187.5 acres, thereby replacing the loss of 425 acres of potential habitat from urban development. This restored marsh area would substantially increase potential habitat for the Sanford's arrowhead. Because Sanford's arrowhead is not known to occur in the Natomas Basin, the loss of potential habitat because of urban development and subsequent increase in potential habitat on the habitat reserves could have no effect on the species. The HCP, however, includes a measure for the Conservancy to consider introducing the Sanford's arrowhead into suitable locations in the Natomas Basin. If pursued, these introductions would benefit the species by increasing the population size and distribution.

A stable marsh environment would be created as part of the habitat reserve system. This restored marsh area would substantially increase potential habitat for Sanford's arrowhead. Because Sanford's arrowhead is not known to occur in the Natomas Basin, the loss of habitat from covered activities is not anticipated to have an effect on the species. The HCP includes a measure for the Conservancy to consider introducing Sanford's arrowhead into suitable locations in the Natomas Basin, which would benefit the species by increasing its increased population size and distribution.

Effects of Construction Activities

Sanford's arrowhead is not expected to be affected by construction because the species is not believed to currently occur in the Natomas Basin. It is possible that construction activities (e.g., urban development, habitat reserve development) could affect existing unknown

occurrences of Sanford's arrowhead or areas colonized by this species future. Under the HCP, surveys for covered species, including Sanford's arrowhead would be conducted prior to construction activities. If Sanford arrowhead were identified in construction areas, they could be salvaged and transplanted per the requirements of the California Native Plant Protection Act if deemed necessary and appropriate by the USFWS and CDFG.

Effects of O&M Activities

Water Agencies

Maintenance of the canal and drain system in the Natomas Basin could affect individual of Sanford's arrowhead. The Natomas Basin is within the known range of Sanford's arrowhead, and this species could inhabit smaller canals and drains. The HCP does not include specific requirements for O&M activities to address potential impacts to Sanford's arrowhead. However, the likelihood that Sanford's arrowhead occur in the canals or ditches is low because of the routine sediment and vegetation control maintenance activities. Natomas Mutual and RD 1000 conduct regular operation and maintenance activities on the canals and ditches. These types of activities would continue under the HCP. If Sanford arrowhead occurs, it would have colonized and persisted in the drains or canals coincident with these on-going activities. Therefore, if Sanford's arrowhead currently occurs in the canals or ditches, it would be expected to persist.

Natomas Basin Conservancy

Over the short-term, the Conservancy's management activities on the habitat reserves would not be expected to affect Sanford's arrowhead because this species is not known to occur in the Natomas Basin. It could colonize portions of the habitat reserves in the future and/or the Conservancy could pursue introductions of this species under the HCP. If Sanford's arrowhead becomes established in the habitat reserves, the Conservancy would implement measures to avoid and minimize take of plants. To determine if this plant colonizes the habitat reserves, the Conservancy will monitor for this species on the habitat reserves.

Overall Effects on Sanford's Arrowhead

Because this species does not currently occur in the Natomas Basin, the HCP probably would not affect this species. The species would benefit if it was successfully introduced to suitable habitat in the Natomas Basin.

5.13 Vernal Pool Species

5.13.1 Species Description

Vernal pools represent important remnants of the natural landscape of the foothills and valley floor of the Central Valley. Resulting from a combination of surface topography (shallow, closed depressions) and soil condition (low permeability), vernal pools support numerous special-status species. Twelve species inhabiting vernal pools are identified in the HCP as potentially occurring in the Natomas Basin. These species include 5 plant species, 5 vernal pool shrimp species, and 2 amphibian species. Vernal pool acreage in the Natomas Basin is not known, and therefore is not specified in this section.

Boggs Lake Hedge-Hyssop (*Gratiola 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 plant 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 (CDFG, 2001). It has also been reported at one site in Lake County, Oregon (Skinner and Pavlik, 1994).

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 and 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, this 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. There are no known occurrences of this species in the Natomas Basin although limited potential suitable vernal pool habitat occurs along the far eastern boundary of the Basin north of Del Paso Road. This species has been identified in Rio Linda, approximately 2 miles east of the Natomas Basin (CDFG, 2001).

Sacramento Orcutt Grass (*Orcuttia viscida*) and Slender Orcutt Grass (*Orcuttia tenuis*)

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 CNPS (Skinner and Pavlik, 1994). Slender orcutt grass is listed as Threatened under the federal Endangered Species Act, Endangered under the state Endangered Species Act, and is considered rare and endangered (List 1B) by the CNPS (Skinner and Pavlik, 1994). These grasses (*Orcuttia viscida, O. tenuis*) are gray-green annual grass species typically occurring in medium to large vernal pools with relatively long inundation periods. These species are associated with very old alluvial surfaces (also referred to as high terrace land forms), such as historic flood plains 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*).

Sacramento orcutt grass has been identified at nine sites in Sacramento County; no known occurrences of this species in the Natomas Basin (CDFG, 2001). The closest known occurrences are reported in the vicinity of Kiefer Road in eastern Sacramento County, approximately 8 miles southeast of the Natomas Basin. Limited potential habitat for this species in the vernal pools along the eastern edge of the HCP area.

Slender orcutt grass is currently reported from 74 occurrences in California, of which 4 occurrences are reported extirpated and 3 others occurrences have not been relocated at previously reported locations (CDFG, 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 Natomas Basin (CDFG, 2001). The closest known occurrences are in eastern Sacramento County between Kiefer Road and Rancho Seco. In general, vernal pools in Natomas Basin lack the high terrace landforms with which this

species is associated. Therefore, the potential for this species to occur in the Natomas Basin is 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 CNPS (Skinner and Pavlik, 1994). Colusa grass is a low, tufted annual plant. 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; May Consulting, unpubl. record). 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).

There are currently 59 known occurrences of Colusa grass in California. Of these occurrences, 48 are presumed extant, 7 are considered extirpated, and an additional 4 occurrences have not been relocated at the 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 Natomas Basin (CDFG, 2001).

Legenere (*Legenere limosa*)

Legenere is considered a federal Species of Concern and rare and endangered (List 1B) by the CNPS (Skinner and Pavlik, 1994). Legenere is found below 500 feet elevation (Hickman, 1993) along lakeshores and in vernal pools, marshes, and other seasonally inundated habitats. Legenere is commonly associated with stipitate popcornflower, common spikerush (*Eleocharis macrostachya*), rayless goldfields (*Lasthenia glaberrima*), and coyote thistle (May Consulting unpubl. record).

Currently, there are 49 known occurrences of legenere in California. Of these, 18 are reported from Sacramento County, and none is reported from Sutter County. There are no reported occurrences in the Natomas Basin, although potentially suitable vernal pool habitat occurs along the far eastern boundary of the Natomas Basin north of Del Paso Road.

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 (less than 1 inch) freshwater crustacean belonging to the order of fairy shrimp (*Anostraca*). Vernal pool fairy shrimp has one of the broadest distributions of the California endemic fairy shrimp species. This species is most often observed in vernal pools (79 percent 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 land form, this species is most often found in small and shallow habitats, although it also can occur in large and deep vernal pools (Helm, 1998). Vernal pool fairy shrimp 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).

There are 270 reported 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 (CDFG, 2001). The reported occurrence in Sutter County is adjacent to the East Main Drain

in the Natomas Basin. There are also several occurrences east of the Natomas Basin in Elverta and Rio Linda (CDFG, 2001). California linderiella have been reported from two locations in the City of Sacramento's annexation area and in Sacramento County on the east side of the Natomas Basin. Because vernal pool fairy shrimp often are found in association with California linderiella, they could occur in these locations as well.

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 (less than 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. Vernal pool tadpole shrimp is one of the three most common large branchiopods occurring in the Central Valley (Helm, 1998). It generally occurs in very small to very large 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, flood plain, marine terrace, high terrace, stream terrace, very high terrace, low terrace, and volcanic mudflow land forms (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).

There are 154 reported occurrences of vernal pool tadpole shrimp in California, of which 54 occurrences are reported from Sacramento County, and 4 from Sutter County (CDFG, 2001). One of reported occurrences in Sutter County is adjacent to the East Main Drain in the Natomas Basin.

Midvalley Fairy Shrimp (*Branchinecta mesovallensis*)

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. 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*). This species occurs in grassland pools and intermound pools within mound-inter-mound 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 percent of the time, and in vernal swales only 7 percent of the time (Helm, 1998). This species is associated with the smallest and most ephemeral vernal pools (Helm, 1998).

There are 14 known occurrences of midvalley fairy shrimp reported in California, of which one is reported from Sacramento County. No occurrences of midvalley fairy shrimp are reported from Sutter County and the Natomas Basin; however, suitable seasonal wetland and vernal pool habitat occurs along the extreme eastern edge of the Natomas Basin.

5.13.2 Environmental Effects

Effects of Changes in Habitat

Only a few small areas of vernal pools are known to occur in the Natomas Basin on the eastern edge of the basin. Several locations supporting vernal pool species (some of which are covered by the HCP) occur in areas potentially subject to urban development under the HCP. In addition to these known locations, isolated seasonal wetlands could occur elsewhere in the Natomas Basin and could support vernal pool vegetation and special-status status vernal pool species.

Potential effects to vernal pool species consist of the direct loss of vernal pools because of construction as well as indirect effects. Urban development in areas surrounding vernal pools can change the hydrology of vernal pools which can change the suitability of the vernal pools for associated species. In addition, amphibians associated with vernal pools typically migrate between upland overwintering habitats and the breeding habitat of the vernal pool. Urban development around vernal pools can interfere with this movement and vehicular traffic can be a significant cause of mortality for some amphibians (e.g., tiger salamanders) during their movements between upland and aquatic habitats.

The HCP includes procedures to avoid, minimize and mitigate impacts to vernal pool species potentially resulting from development. Vernal pool resources within the City and the Sutter County Permit Areas would be identified prior to disturbance through pre-construction surveys and other biological investigations. Such resources would be discovered either through the early CEQA project review (required for general plan, specific plan, rezone, subdivision and other discretionary approvals of the Land Use Agencies) or during the pre-construction surveys required under the HCP. The following measures would be implemented by the Land Use Agencies prior to issuance of Urban Development Permits when public or private development projects are proposed for areas that may support wetlands and/or vernal pool species.

- If wetlands or potential wetlands are identified within the area of disturbance for a development project, then the project developer would obtain a verified delineation of jurisdictional waters of the U.S. from the U.S. Army Corps of Engineers (USCOE). If the USCOE determines the developer will conduct activities that would impact jurisdictional wetlands on the project site, the developer would obtain the necessary USCOE permits.
- If the USCOE determines there are jurisdictional wetlands on the project site and fill authorization is being requested pursuant to Section 404, prior to construction, the applicant shall obtain water quality certification/waiver of certification from the California Regional Water Quality Control Board under Section 401 of the Clean Water Act for the USCOE permit discussed above.
- If wetlands are determined to be jurisdictional and the Corps determines that listed species may be affected by the fill of wetlands, the Corps will consult with the Service under Section 7 of the ESA. Authorization for take and requirements for mitigation would be provided through a separate Section 7 consultation process and take authorization would not be granted to the Permittees under the HCP or the HCP Incidental Take Permits. However, the Land Use Agencies will require that a developer

subject to Section 404 and Section 7 adhere to the Section 7 consultation and the Corps permit as conditions of any Urban Development Permit.

If it is determined that wetland and/or vernal pool resources would be disturbed by a project, but that such resources do not involve jurisdictional wetlands, then take of vernal pool associated species would be covered under the HCP, subject to the following limitations and guidelines

- Where site investigations indicate vernal pool species may occur, and it has been determined that such resources do not involve jurisdictional wetlands, the developer would notify the Land Use Agency regarding the potential for impacts to vernal pool species. Such notification shall include biological data adequate to allow the Land Use Agency, and the USFWS and CDFG to determine the potential for impacts vernal pool species resulting from the proposed development.
- Following notification by the Land Use Agency, USWFS and CDFG would identify specific measures required to avoid, minimize and mitigate impacts to vernal pool species to be implemented prior to disturbance and in accordance with adopted standards or established guidelines.

With these measures, both direct (filling) and indirect (e.g., changes in hydrology) impacts to vernal pools and the associated species would be avoided or compensated.

As described previously, vernal pools would be protected under the HCP and therefore no adverse effects to vernal pool species would occur as a result of urban development or creation of habitat reserves. Depending on the specific characteristics of the upland and marsh habitat created in the habitat reserves, vernal pool species could be attracted to the habitat reserves. As part of the HCP, the Conservancy would periodically consult with experts to identify conservation opportunities for vernal pool species on the habitat reserves and thereby potentially establish additional populations of one or more of these species.

Effects of Construction Activities

Construction activities within the Natomas Basin are not likely to affect vernal pool species because no development is proposed in the few areas known to support vernal pool species. As an added assurance that impacts to vernal pool species would be avoided, prior to approval of Urban Development Permits, the involved Land Use Agency would require pre-construction surveys for vernal pool species. If the pre-construction surveys determine the presence of any of the covered species associated with vernal pools, the Land Use Agency would require the developer to consult with CDFG and/or USFWS to determine appropriate measures to avoid and minimize take of individuals.

Construction impacts also could occur during development of the habitat reserve system. Specific locations of the reserves are not identified and, therefore, it is not possible to determine if vernal pools or vernal pool species would be impacted. As part of the development of site-specific habitat creation and management plans, surveys to identify covered species currently or potentially supported by the specific parcel. If vernal pools or vernal pool species are found, impacts to these resource would be avoided during habitat creation and management activities and appropriate management activities pursued as necessary to retain resources values.

Effects of O&M Activities

Water Agencies

O&M activities are not likely to affect vernal pool species because suitable habitat for these species are restricted to vernal pools. These species are not expected to occur within water conveyance structures within RD1000's and Natomas Mutual's operations.

Natomas Basin Conservancy

As described above, habitat creation and management plans for the reserve system would be designed to protect vernal pool resources and associated covered species. If vernal pools species occur on the habitat reserves in the future, it is possible that some of the Conservancy's O&M activities could kill or injure individuals. The Conservancy will implement necessary and appropriate take avoidance measures included in reserve plans, as well as additional measures determined to be necessary during the development of management plans for the specific parcels.

Overall Effects on Vernal Pool Species

Currently, the Natomas Basin contains a minor amount of vernal pool habitat and use of the Natomas Basin by covered species appears to be very limited. The HCP includes measures to identify vernal pools or seasonal wetlands and avoid or mitigate impacts to vernal pools and associated species. One or more of the vernal pool species could benefit if the Conservancy was successful in attracting vernal pool species to the habitat reserves.

5.14 California Tiger Salamander (*Ambystoma californiense*)

5.14.1 Species Description

The California tiger salamander is a federal and state Candidate species. California tiger salamander 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.

California tiger salamanders inhabit valley and foothill grasslands and open woodlands usually within 1 mile of water (Brode and McGinnis, pers. comm.). Adults spend much of their 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. 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).

There are 465 known tiger salamander occurrences in California (CDFG, 2001). Of these, four occurrences are in Sacramento County and one occurrence is in Sutter County; however, none of these occurrences is in the Natomas Basin. The nearest known tiger salamander occurrences are in northern Yolo County near Dunnigan and near Rancho Seco in southeastern Sacramento County. Vernal pools along the eastern edge of the Natomas Basin are considered potential, but marginal tiger salamander breeding habitat; no tiger

salamanders have been reported in these pools. Ponds and seasonally wet areas elsewhere in the Natomas Basin also could be used by tiger salamanders, but the species has not been reported in the basin.

5.14.2 Environmental Effects

Effects of Changes in Habitat

Potential habitat for California tiger salamander in the Natomas Basin consists of vernal pools and other ponds and seasonally wet areas and upland areas surrounding these features. Only a few small areas of vernal pools are known to occur in the Natomas Basin on the eastern edge of the basin. In addition, 96 acres of ponds and seasonally wet areas occur as isolated units throughout the Natomas Basin and are potential habitat for California tiger salamander.

Potential effects of the HCP on habitat for tiger salamander consist of the direct loss of vernal pools, ponds, or other seasonally wet areas and because of construction as well as indirect effects. Under the HCP, 21 acres of ponds and seasonally wet areas could be directly affected by development which could reduce the availability of breeding habitat for tiger salamander. Urban development in areas surrounding aquatic habitat also can directly affect habitat for tiger salamander by eliminating upland areas where tiger salamanders seek refuge during the much of the year. Tiger salamanders migrate between upland habitats and aquatic breeding habitat and urban development around aquatic habitats that tiger salamanders use for breeding can interfere with this movement. In some areas, vehicular traffic can be a significant cause of mortality for California tiger salamander during their movements between upland and aquatic habitats.

The HCP includes procedures to avoid, minimize and mitigate impacts to vernal pools as described under Section 5.15. *Vernal Pool Species*. The measures for vernal pool also would provide protection for many other aquatic habitats that California tiger salamanders could use. As a result of the requirements for vernal pools, generally, and tiger salamander specifically, impacts to habitat for this species would be avoided or mitigated.

Depending on the specific characteristics of the upland and managed marsh habitat provided on the reserves, tiger salamanders could be attracted to the habitat reserves. As part of the HCP, the Conservancy would periodically consult with experts to identify conservation opportunities for California tiger salamander on the habitat reserves. Such opportunities could include establishment or creation of wetland and upland habitats suitable for tiger salamanders within the reserve system (e.g., stock ponds or "artificial" vernal pools) and, if appropriate, re-introduction of tiger salamanders into the Basin.

Effects of Construction Activities

Construction activities within the Natomas Basin are not likely to affect California tiger salamander because this species is not currently known to inhabit the Natomas Basin. It is possible that construction activities could affect existing unknown occurrence of tiger salamanders or areas colonized by this species in the future. Under the HCP, prior to approval of Urban Development Permits, the involved Land Use Agency would require pre-construction surveys for tiger salamanders. If the pre-construction surveys determine the presence of California tiger salamander, the Land Use Agency would require the

developer to consult with CDFG to determine appropriate measures to avoid and minimize take of individuals.

Construction impacts also could occur during development of the habitat reserve system. As part of the development of site-specific habitat creation and management plans, surveys to identify covered species currently or potentially supported by the specific parcel would be conducted. If tiger salamanders are found, impacts to individuals would be avoided during habitat creation and management activities, and appropriate management activities pursued as necessary to retain habitat values for this species.

Effects of O&M Activities

Water Agencies

This species is not known to occur in the Natomas Basin, and RD 1000's and Natomas Mutual's water conveyance facilities do not provide suitable habitat for this species. O&M activities, therefore, are not likely to affect California tiger salamander.

Natomas Basin Conservancy

If tiger salamanders occur on the habitat reserves in the future, it is possible that some of the Conservancy's O&M activities could kill or injure individuals. the Conservancy will implement necessary and appropriate measures to avoid take included in reserve plans, as well as additional measures determined to be necessary during the development of management plans for the specific parcels. Further, the Conservancy will consult experts periodically during implementation of the HCP to identify additional conservation opportunities for this species in the habitat reserve system.

Overall Effects on the California Tiger Salamander

Currently, the Natomas Basin is not known to support California tiger salamander and contains a minor amount of potential habitat. The HCP includes measures to identify vernal pools and seasonal wetlands and avoid or mitigate impacts to these potential habitats for tiger salamander. California tiger salamander could benefit if the Conservancy was successful in attracting individuals to the habitat reserves or if it re-introduced the species to the habitat reserves.

5.15 Western Spadefoot Toad (*Scaphiopus intermontanus*)

5.15.1 Species Description

The western spadefoot toad is a California Species of Special Concern. 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 flood plains, 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.

There are 173 known western spadefoot toad occurrences in California, of which five are in Sacramento County and none in Sutter County. There are no records of western spadefoot

toads in the Natomas Basin (CDFG, 2001). The nearest known occurrences are in Placer County at Fiddyment and Phillip Roads (about 6 miles east of the Natomas Basin) and at Mather Field in central Sacramento County. A few vernal pools that are suitable spadefoot toad breeding habitat occur along the far eastern edge of the Natomas Basin; however, there are no records for this species in this area to date. Ponds and seasonally wet areas elsewhere in the Natomas Basin also could be used by western spadefoot toad, but this species has not been reported in the basin.

5.15.2 Environmental Effects

Effects of Changes in Habitat

Potential habitat for western spadefoot toad in the Natomas Basin consists of vernal pools and other ponds and seasonally wet areas and upland areas surrounding these features. Only a few small areas of vernal pools are known to occur in the Natomas Basin on the eastern edge of the basin. In addition, 96 acres of ponds and seasonally wet areas occur as isolated units throughout the Natomas Basin and are potential habitat for western spadefoot toad.

Potential effects of the HCP on habitat for spadefoot toad consist of the direct loss of vernal pools, ponds, or other seasonally wet areas because of construction as well as indirect effects. Under the HCP, 21 acres of ponds and seasonally wet areas could be directly affected by development which could reduce the availability of breeding habitat for western spadefoot toad. Urban development in areas surrounding aquatic habitat also can directly affect habitat for spadefoot toad by eliminating upland areas where this species seeks refuge during the much of the year. Spadefoot toads move between upland habitats and aquatic breeding habitat and urban development around aquatic habitats that are used for breeding can interfere with this movement. Vehicular traffic can cause mortality of spadefoot toads during their movements between upland and aquatic habitats.

The HCP includes procedures to avoid, minimize and mitigate impacts to vernal pools as described under Section 5.15. *Vernal Pool Species*. The measures for vernal pool also would provide protection for other aquatic habitats that western spadefoot toad could use. As a result of the requirements for vernal pools, generally, and western spadefoot toad specifically, impacts to habitat for this species would be avoided or mitigated. Depending on the specific characteristics of the upland and managed marsh habitat provided in the reserves, spadefoot toads could be attracted to the habitat reserves. As part of the HCP, the Conservancy would periodically consult experts to identify conservation opportunities for western spadefoot toad on the habitat reserves.

Effects of Construction Activities

Construction activities within the Natomas Basin are not likely to affect western spadefoot toad because this species is not currently known to inhabit the Natomas Basin. It is possible that construction activities could affect existing unknown occurrence of spadefoot toads or areas colonized by this species in the future. Under the HCP, prior to approval of Urban Development Permits, the involved Land Use Agency would require pre-construction surveys for tiger salamanders. If the pre-construction surveys determine the presence of western spadefoot toad, the Land Use Agency would require the developer to consult with CDFG to determine appropriate measures to avoid and minimize take of individuals.

Construction impacts also could occur during development of the habitat reserve system. As part of the development of site-specific habitat creation and management plans, surveys to identify covered species currently or potentially supported by the specific parcel would be conducted. If western spadefoot toads were identified, impacts to individuals would be avoided during habitat creation and management activities, and appropriate management activities pursued as necessary to retain habitat values for this species.

Effects of O&M Activities

Water Agencies

This species is not known to occur in the Natomas Basin, and RD 1000's and Natomas Mutual's water conveyance facilities do not provide suitable habitat for this species. O&M activities, therefore, are not likely to affect western spadefoot toad.

Natomas Basin Conservancy

If western spadefoot toads occur on the habitat reserves in the future, it is possible that some of the Conservancy's O&M activities could kill or injure individuals. the Conservancy will implement necessary and appropriate measures to avoid take included in reserve plans, as well as additional measures determined to be necessary during the development of management plans for the specific parcels. Further, the Conservancy will consult experts periodically during implementation of the HCP to identify additional conservation opportunities for this species in the habitat reserve system.

Overall Effects on Western Spadefoot Toad

Currently, the Natomas Basin is not known to support western spadefoot toad and contains a minor amount of potential habitat. The HCP includes measures to identify vernal pools and seasonal wetlands and avoid or mitigate impacts to these potential habitats for spadefoot toad. The species could benefit if the Conservancy was successful in attracting individuals to the habitat reserves or if it introduced the species to the habitat reserves.

SECTION 6.0

References

Ahl, J.S.B. 1991. Factors affecting contributions of the tadpole shrimp, Lepiduris packardi to its over-summering egg reserves. Hydrobiologia 212:137-143.

American Ornithologist Union. 1957. Check-list of North American birds. 5th ed. Am. Ornithol. Union, Washington, D.C.

Babcock, K.W. 1995. Home range and habitat use of breeding Swainson's hawks in the Sacramento Valley of California. J. Raptor Res. 29(3):193-197.

Bent, A.C. 1950 Life histories of North American wagtails, shrikes, vireos and their allies. U.S. Natl. Mus. Bull. 197.

Barr, C.B. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle Desmocerus californicus dimorphus. U.S. Fish and Wildlife Service; Sacramento, California.

Beedy, E.C. and A. Hayworth. 1991. Breeding status, distribution, and habitat association of the tricolored blackbird (Agelaius tricolor), 1850-1989. (JSA 88-187). Prepared by Jones and Stokes Associates, Inc., Sacramento, California for the U.S. Fish and Wildlife Service, Sacramento, California.

Bent, A.C. 1958. Life histories of the North American blackbirds, orioles, tanagers, and allies. U.S. National Museum Bulletin 211: 1-549.

Bloom, Peter. 1980. The Status of the Swainson's Hawk in California, 1979.

Brode, John M. and George E. Hansen. January 1992. Status and Future Management of the Giant Garter Snake (Thamnophis gigas) Within the Southern American Basin, Sacramento and Sutter Counties, California. California Department of Fish and Game Inland Fisheries Division Endangered Species Project.

CalFlora Database. Online: Accessed August 10, 2001 and August 29, 2001.

California Department of Fish and Game (CDFG). 2001. California Natural Diversity Database.

CDFG. 1994. Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (Buteo swainsoni) in the Central Valley of California. Sacramento, California.

CDFG. 1992. 1991 annual report on the status of California state-listed threatened and endangered animals and plants. Sacramento, California.

City of Sacramento and Jones & Stokes Associates. 1996.

DeHaven, Richard L. U. S. Fish and Wildlife Service. June 2000. Breeding Tricolored Blackbirds in the Central Valley, California: A Quarter-Century Perspective

Dehaven, R.W., F.T. Crase, and P.P. Woronecki. 1975. Breeding status of the tricolored blackbird. California Fish and Game 61: 166-180.

Eckert, A.W. 1981. The wading birds of North America (north of Mexico). Doubleday and Company, Inc. Garden City, New York.

Eng, L.L., D. Belk, and C.H. Eriksen. 1990. California Anostraca: distribution, habitat and status. Journal of Crustacean Biology 10(2):247-277.

Estep, James A. 1989. Biology, Movements, and Habitat Relationships of the Swainson's Hawk in the Central Valley of California, 1986-87. California Department of Fish and Game, Nongame Bird and Mammal Section Report.

Estep, J.A. 1984. Diurnal raptor eyrie monitoring program. (Project W-65-R-1, Job No. ll-2.0). California Department of Fish and Game, Nongame Wildlife Investigations. Sacramento, California.

Fitch, H.S. 1940. A biogeographical study of the ordinoides Artenkreis of garter snakes (genus *Thamnophis*. University of California Publications in Zoology. 44:1-150.

Grinnell, J., and A.H. Miller. 1944. The distribution of the birds of California. Pac. Coast Avifauna No. 27.

Hansen, George E. 1988. Review of the status of giant garter snake and its supporting habitat during 1986-1987.

Hansen, G.E. 1993. Survey and analysis of the giant garter snake (Thamnophis couchii gigas), the western pond turtle (Clemmys marmorata), the California red-legged frog (Rana aurora draytoni), and the foothill yellow-legged frog (Rana boylei) in the Bear Creek Unit of the Merced County Streams Project, California. (Contract Purchase Order No. DACW05-92-P1766). Prepared for the U.S. Army Corps of Engineers, Sacramento, California.

Hansen, George E. and J.M. Brode. 1992. An Evaluation of the Time and Conditions Required for Newly Constructed Waterways to Become Suitable Habitat for the Giant Garter Snake (*Thamnophis gigas*). Unpubl. Rep. dated May 1992.

Hansen, G.E. and J.M. Brode. 1980. The status of the giant garter snake (Thamnophis couchii gigas) (Fitch). Inland Fisheries Endangered Species Program Special Publication 80-5. California Department of Fish and Game, Sacramento, California.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). *In* The Birds of North American, No. 61 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Helm, B.P. 1998. Biogeography of eight large brachiopods endemic to California. Pp. 124-139 In: Witham, C.W., E.T. Bauder, D. Belk, W.R. Ferren Jr., and R. Ornduff (editors), Ecology, conservation, and management of vernal pool ecosystems - proceeding from a 1996 conference. California Native Plant Society, Sacramento, California.

Hickman, James. 1993. The Jepson Manual Higher Plants of California. University of California Press.

Holland, D.C. and R.B. Bury. 1992. Status of the western pond turtle (Clemmys marmorata) in 1991. Prepared for presentation at the Western Section, Wildlife Society 1992 annual meeting on February 5-8, 1992 in San Diego, California.

Kaufman, K. 1996. Live of North American birds. Houghton Mifflin Company, Boston, MA.

James, A.H. 1977. Sandhill cranes breeding in Sierra Valley, California. West. Birds 8:159-160.

Jennings, M. R., M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. California Department of Fish and Game, Inland Fisheries Division. Rancho Cordova, CA.

Leidy, G.R. 1992. Ecology, Status and Management of the Giant Garter Snake (Thamnophis gigas). Prepared for Sutter Bay Associates and the North Natomas Landowners Association, Inc.

Metro Air Park Property Owners Association. 2000. Draft Habitat Conservation Plan for the Metro Air Park project in the Natomas Basin, Sacramento County, California. Prepared by Thomas Reid Associates, Palo Alto, California. November 2000.

Millsap, B. A. and C. Bear. 2000. Density and reproduction of burrowing owls along an urban gradient. Journal or Wildlife Management 64: 33-41.

McCaskie, G., P. De Benedictis, R. Erickson, and J. Morlan. 1979. Birds of northern California, an annotated field list. 2nd ed. Golden Gate Audubon Society, Berkeley.

Monk, G. 1981 California peregrine falcon reproductive outcome and management efforts in 1981. U.S. department of Interior, Fish and Wildlife Service, Sacramento, California. Endangered Species Report.

Natomas Basin Conservancy. 2000. Site-specific Management Plans for the Natomas Basin Conservancy's Mitigation Lands, Sacramento and Sutter Counties, California. Prepared by Wildlands, Inc., Citrus Heights, California for The Natomas Basin Conservancy, Sacramento, California. July.

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, ID.

Remson, J.V., Jr. 1978. Bird species of special concern in California. California Department of Fish and Game, Sacramento. Wild. Manage. Admin. Rep. No. 78-1.

Ryder, R.A. and D.E. Manry. 1994. White-faced ibis (*Plegadis chihi*) in The Birds of North America, no. 130, Poole, A and F. Gill, editors. Philadelphia, PA: The Academy of Natural Sciences.

Shuford, W.D., C.M. Hickey, R.J. Safran, and G.W. Page. 1996. A review of the status of the white-faced ibis in winter in California. Western Birds 27: 169-196.

Schlorff, R.W. and P.H. Bloom. 1984. Importance of riparian systems to nesting Swainson's hawks in the Central Valley of California. Pp. 612-618 In: R.E. Warner and K.M. Hendrix (editors), California riparian systems - ecology, conservation, and productive management. University of California Press, Berkeley, California.

Skinner, Mark W. and Bruce M. Pavlic. 1994. Inventory of Rare and Endangered Vascular Plants of California, Fifth Edition. California Native Plant Society. [Sixth Edition, electronic update.]

Small, Arnold. 1994. California Birds: Their Status and Distribution. Ibis Publishing Company. Vista, California.

Smith, E.L. and K.C. Kruse. 1992. The relationship between land-use and the distribution and abundance of loggerhead shrikes in south-central Illinois. J. Field Ornithol. 63:420-427.

Stebbins, R. C. 1972. California Amphibians and Reptiles. University of California Press. Berkeley, CA.

Stebbins, R. C. 1985. Western Reptiles and Amphibians, Second Edition. Peterson Field Guides No. 16. Houghton Mifflin Company, Boston, MA.

Stone, R.D., W.B. Davilla, D.W. Taylor, G.L. Clifton, and J.C. Stebbins. 1988. Status survey of the grass tribe Orcuttieae and *Chamaesyce hooverii* (Euphorbiacea) in the Central Valley of California. Biosystems Analysis, Inc. Tiburon, California. Prepared for the U.S. Fish and Wildlife Service, Endangered Species Office, Sacramento, California.

Swainson's Hawk Technical Advisory Committee (SHTAC). 2000. Nesting Swainson's hawks (Buteo swainsoni) in the Natomas basin Habitat Conservation Plan Area, 2000 annual survey results. Prepared for the Natomas Basin Conservancy. September, 2000.

Swainson's Hawk Technical Advisory Committee (SHTAC). 2001. Nesting Swainson's hawks (Buteo swainsoni) in the Natomas basin Habitat Conservation Plan Area, 2001 annual survey results. Prepared for the Natomas Basin Conservancy. September, 2001.

Thomas Reid Associates. 2000.

U.S. Fish and Wildlife Service (USFWS). 1999a. Draft Giant Garter Snake Recovery Plan. Portland, Oregon.

USFWS. 1999b. Conservation Guidelines for the Valley Elderberry Longhorn Beetle, Updated July 9, 1999.

USFWS. 1996. Valley elderberry longhorn beetle consultation with the U.S. Army Corps of Engineers. Sacramento, California.

USFWS. 1991. Aleutian Canada goose Recovery Plan. USFWS. Anchorage, Alaska.

USFWS. 1984. Recovery plan for the valley elderberry longhorn beetle. Endangered Species Program. Portland, Oregon.

USFWS. 1980. Listing the valley elderberry longhorn beetle as a threatened species with critical habitat. Federal Register 45: 52803-52807.

Wylie, G.D., and M.L. Casazza. 2000. Investigations of giant garter snakes in the Natomas Basin: 1998-1999. U.S. Geological Survey, Biological Resources Division.

Wylie, G. D., M. Cassaza, and J. K. Daugherty. 1997. 1996 Progress report for the giant garter snake study. Preliminary report, U.S. Geological Survey, Biological Resources Division.

Zeiner, D. C., W. F. Laudenslayer, and K. E. Mayer (compiling editors). 1988. California's wildlife. Volume I. Amphibians and Reptiles. California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game, Sacramento, CA.

Zeiner, D. C., W. F. Laudenslayer, K. E. Mayer, and M. White (compiling editors). 1990. California's wildlife. Volume II. Birds. California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game, Sacramento, CA.