United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W2605
Sacramento, California 95825-1846

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June 24, 2003

Memorandum

To: Regional Director, Fish and Wildlife Service, Region 1, Portland Oregon

From: Field Office Supervisor, Sacramento Fish and Wildlife Office, Sacramento, California

Subject: Intra-Service Biological and Conference Opinion on Issuance of a Section 10(a)(1)(B) Incidental Take Permit to the City of Sacramento and Sutter County for Urban Development in the Natomas Basin, Sacramento and Sutter Counties, California.

This document transmits the biological/conference opinion of the U.S. Fish and Wildlife Service (Service), Sacramento Fish and Wildlife Office (SFWO), regarding the issuance of incidental take permits (ITP) to the City of Sacramento (City)(Applicant), Sutter County (Sutter) (Applicants or Proposed Permittees), and the Natomas Basin Conservancy (Conservancy) (Applicant) for implementation of the Natomas Basin Habitat Conservation Plan (NBHCP) pursuant to section 10(a)(1)(B) and section 10(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.)(Act), and in accordance with section 7 of the Act and their implementing regulations (50 CFR §402). The Service proposes to issue the ITPs to the City, Sutter, and the Conservancy for a period of 50 years.

The Applicants are requesting coverage under the ITPs for a total of twenty-two species (Covered Species). The ITPs would cover incidental take for one endangered animal species [vernal pool tadpole shrimp (*Lepidurus packardi*)], and three threatened animal species [giant garter snake (*Thamnophis gigas*)(snake), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)(beetle), and vernal pool fairy shrimp (*Branchinecta lynchi*)]. The ITPs would also authorize the incidental take of one animal species formerly listed as threatened [Aleutian Canada goose (*Branta canadensis leucopareia*)(goose)], which was de-listed on March 20, 2001, one proposed species [California tiger salamander (*Ambystoma californiense*)(salamander)], and nine currently unlisted animal species - Swainson's hawk (*Buteo swainsoni*)(hawk), white-faced ibis (*Plegadis chihi*)(ibis), bank swallow (*Riparia*

riparia)(swallow), tricolored blackbird (*Agelaius tricolor*)(blackbird), northwestern pond turtle (*Clemmys marmorata marmorata*) (turtle), loggerhead shrike (*Lanius ludovicianus*)(shrike), burrowing owl (*Athene cunicularia*)(owl), western spadefoot toad (*Spea hammondii*)(toad), and midvalley fairy shrimp (*Branchinecta mesovallensis*)-, should they become listed in the future during the term of the permits. The permits would become effective to authorize take of the currently unlisted Covered animal Species concurrent with their listing under the Act. One endangered plant species [Sacramento Orcutt grass (*Orcuttia viscida*)], two threatened plant species [Colusa grass (*Neostapfia colusana*) and slender Orcutt grass (*Orcuttia tenuis*)] and four currently unlisted plants [Boggs Lake hedge-hyssop (*Gratiola heterosepala*), delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), legenere (*Legenere limosa*), and Sanford's arrowhead (*Sagittaria sanfordii*)] would also be considered Covered Species and included on the Permits. Although take of plant species is not prohibited under the Act and therefore cannot be authorized under an incidental take permit, the plant species would be included on the permits in recognition of the conservation benefits provided to the species under the NBHCP. Assurances provided under the "No Surprises" rule at 50 C.F.R. 17.3, 17.22(b)(5) and 17.32(b)(5) would extend to all Covered Species.

The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, or possessing of migratory birds. The MBTA identifies a variety of prohibited actions including the taking of individual birds, young, feathers, eggs, nests, etc. Actions conducted under the NBHCP and NBHCP Implementation Agreement (NBHCP IA) will comply with the provisions of the MBTA with strict avoidance measures for actions affecting MBTA-Covered Species such as the goose, hawk, ibis, swallow, blackbird, shrike, and owl. There are currently no MBTA Covered Species that are listed under the Act and subject to a special purpose permit at this time. Should any of the MBTA Covered Species become listed under the Act during the life of the Permits, the incidental take permits would also constitute an MBTA special purpose permit for that species for a three year term as specified under 50 C.F.R. 13 and 50 C.F.R. 21 for MBTA special purpose permits subject to renewal by the City and Sutter County.

This biological opinion is based on information provided in the following documents: (1) the July 2002, draft NBHCP; (2) the August 2002, draft Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) and supporting technical analyses and reports; (3) the July 2002, draft NBHCP IA; (4) the *Site Specific Management Plans for the Natomas Basin Conservancy's Mitigation Lands*; (5) the April 2003, Final NBHCP, NBHCP IA, and EIR/EIS; (6) the November 1997, NBHCP; (7) the Natomas Basin Conservancy's Implementation Annual Reports; (8) the February 2000, lawsuit *(National Wildlife Federation, et al. v. Babbitt,* S-99-274 (E.D.Cal.) [*NWF v. Babbitt*]) filed against the Service's issuance of an Incidental Take Permit to the City for the 1997 NBHCP; (9) the August 15, 2000, Memorandum of Opinion and Order for *NWF v. Babbitt*; (10) the January 26, 2001, judgement declaring the City's ITP for the 1997 NBHCP invalid; (11) the May 10, 2001, Settlement Agreement for *NWF v. Babbitt*; (12) the May 13, 2003, resolutions adopted by the City (Resolution Numbers 2003- 289 and 290) and Sutter (Resolution Number 03-30) approving the NBHCP; (13) the June 10, 2003, resolution (Resolution Number 03-039) approved by Sutter making three changes to the NBHCP; (14) the

June 2003, Errata to the NBHCP; and (15) various other published and unpublished agency and academic literature and information in the Service's files.

CONSULTATION HISTORY

In 1994, the Sacramento Area Flood Control Agency (SAFCA) proposed a flood control project for the Natomas Basin (Basin) that required a Section 404 Clean Water Act permit from the U.S. Army Corps of Engineers (Corps). In order to comply with its responsibilities under the Act, the Corps consulted with the Service. In its March 11, 1994, biological opinion (Service File # 1-1-94-F-0013) for the project, the Service determined that the project would remove an obstacle to urbanization in the Basin and that such development would result in the take of federally-listed species. The Corps issued a Section 404 Permit for SAFCA's flood control project, conditional on the preparation of a habitat conservation plan (HCP) for the Basin. Following the Corps' action, the local land use agencies (City, Sutter, and Sacramento County), with additional participation by the water agencies (Reclamation District Number 1000 [RD 1000] and Natomas Central Mutual Water Company [Natomas Mutual]), began preparing an HCP. In 1997, the City submitted its application to the Service for an incidental take permit to authorize take of 26 Covered Species within its portion of the Natomas Basin based on the 1997 basin-wide Natomas Basin HCP. The other land use agencies did not apply for incidental take permits based on the NBHCP at that time.

The Service issued an ITP to the City in December 1997 based on the final NBHCP. Environmental review of the City's 1997 HCP under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) consisted of an Environmental Assessment/Finding of No Significant Impact prepared by the Service (Service, 1997a) and an Initial Study/Negative Declaration prepared by the City (City of Sacramento, 1996), respectively. In April 1998, the City began collecting habitat mitigation fees and issuing urban development permits under the 1997 NBHCP. These fees were transferred to the Conservancy, which was created by the City in October 1994 to serve as the Plan Operator.

The Conservancy is a private, not-for-profit public benefit corporation that acquires and manages the system of habitat reserves created under the 1997 NBHCP. In addition, it will acquire and manage the system of habitat reserves created under the proposed NBHCP, if approved. The Conservancy's efforts are guided by a Board of Directors, with members of the Board appointed by agencies receiving Permits under the NBHCP. The Conservancy's Board of Directors was appointed by the City's City Council in December 1998. The Board is assisted in its efforts by the Technical Advisory Committee (TAC), a group of experts representing the Service, California Department of Fish and Game (CDFG), and the Permittees. Habitat mitigation fees and mitigation lands have been/will be collected by the Permittee(s) and transferred to the Conservancy.

Sutter and Sacramento County informally submitted separate HCPs to the Service in October 1998. The Service suspended review of their HCPs because a lawsuit, discussed below, was

filed challenging the City's HCP and ITP. As of June 2003, Sacramento County has not submitted an HCP for unincorporated lands in the Basin.

Although Sacramento County is not one of the NBHCP's applicants, the Metro Air Park Property Owners Association (MAPPOA), a group of landowners, submitted a separate HCP designed to be compatible with the 1997 NBHCP for the Metro Air Park (MAP) in July 1999. MAP is a special planning area adjacent to Sacramento International Airport (Airport) in Sacramento County which has been approved by the County for industrial and commercial development. Metro Air Park comprises 1,983 acres of the 17,500 acres of planned urban development described in the NBHCP. The Service issued an ITP to MAPPOA on February 21, 2002.

RD 1000 and Natomas Mutual (Water Agencies) also participated in basin-wide habitat conservation planning efforts. On September 8, 1998, the Water Agencies submitted an incidental take permit application and draft implementation agreement based on the 1997 City of Sacramento implementation agreement. They also proposed to use the November 1997 NBHCP with additional revisions suggested by the Water Agencies. In November 2000, the Water Agencies submitted a revised HCP and IA to the Service and CDFG. In early 2001, they re-joined the City, Sutter, and the Conservancy in developing the draft revised NBHCP. The Water Agencies identified general conservation measures for operations, maintenance, and minor construction activities. A revised NOP/NOI noticing the involvement of the Water Agencies in the HCP process was published in local newspapers and in the *Federal Register* on August 18, 2001. Discussions among the Water Agencies, the other permit applicants and the Wildlife Agencies continued throughout 2001 and early 2002 regarding Water Agencies proposed conservation measures.

The Water Agencies provided additional detail regarding their covered activities, including a request for coverage for use of pesticides (e.g., aquatic herbicides, rodenticides) in accordance with label instructions, to the Service and CDFG. In late January and February 2002, the Service determined that it would take a substantial length of time to prepare and process adequate scientific information necessary to analyze the biological effects of each chemical on the Covered Species. Thus, the Land Use Agencies recommended that the NBHCP exclude chemical coverage for the Water Agencies but that the Water Agencies continue to be included in the NBHCP for the other covered activities (e.g., mechanical activities such as mowing and nonchemical channel maintenance activities). In February 2002, the Boards of Directors of both Water Agencies directed their staff and counsel to remain involved in the NBHCP and to seek 100 percent pesticide coverage within the NBHCP. The Water Agencies continue to be represented in the NBHCP as potential permittees in the event they chose at a future date to apply for ITPs for the activities (excluding pesticides) covered by the 2003 NBHCP and evaluated in its associated EIR/EIS.

In late May 2002, the Land Use Agencies contacted the Water Agencies to determine if RD 1000 would continue to serve as a lead agency for the EIR. On May 31, 2002, the Water Agencies

stated that they would not serve as a co-lead agency on the EIR because pesticide coverage was not addressed in the NBHCP and its associated EIR/EIS.

On June 5, 2002, the Water Agencies presented information to the Service on nine pesticides for which they had requested coverage. Given the Water Agencies decision in March 2002 to pursue 100 percent pesticide coverage, and because of the substantial period of time that would be required to analyze the impacts of various pesticides and rodenticides on the Covered Species proposed by the Water Agencies in their June 5, 2002, letter, these activities are not analyzed in the EIR/EIS for the proposed project. The EIR/EIS does analyze other covered activities requested by the Water Agencies prior to December 2001 (i.e., the activities presented in the NBHCP). Applications for incidental take permits were filed by the City, Sutter, and the Conservancy on August 1, 2002.

On August 26, 2002, the Service published a notice in the **Federal Register** (67 FR 54819) announcing the agency's receipt of applications for ITPs from the City, Sutter, and the Conservancy based on the NBHCP and the availability of a draft EIR/EIS for the applications. Comments were received from the public through December 5, 2002. On April 28, 2003, the Service announced the availability of the Final EIR/EIS and NBHCP in the **Federal Register** (68 FR 22410). The U.S. Environmental Protection Agency followed suit on May 2, 2003 (68 FR 23457).

On May 13, 2003, the City approved the Final NBHCP (Resolution Number 2003-290) and Final EIR (Resolution Number 2003-289), with three changes to the NBHCP and associated documents that will improve protections for Covered Species. Changes include:

1. No mitigation lands will be acquired in Area B. All NBHCP mitigation lands must be acquired in the Natomas Basin;

2. The City may exercise its discretion to require developer/land owners to dedicate mitigation land in lieu of the land acquisition component of the mitigation fees prior to issuance of an Urban Development Permit; and

3. Land owners within the Sutter's Permit Area will be notified annually if they have a Swainson's nest tree on their property. The notice will identify the nest tree and alert the owner to the specific mitigation measures prohibiting the owner from removing the nest tree. This measure requires the City to inform land owners of the NBHCP's avoidance, minimization, and mitigation measures regarding the removal of Swainson's Hawk nest trees (see Section V.A.5.b of the NBHCP).

Sutter approved the Final NBHCP (Resolution Number 03-030) on May 13, 2003. On June 10, 2003, Sutter approved a second resolution (Resolution Number 03-039) to modify the NBHCP and associated documents in order to establish consistency between Sutter's obligations and those of the City. Changes included in the second ordinance include:

1. No mitigation lands will be acquired in Area B. All NBHCP mitigation lands must be acquired in the Natomas Basin;

2. Sutter may exercise its discretion to require developer/land owners to dedicate mitigation land in lieu of the land acquisition component of the mitigation fees prior to issuance of an Urban Development Permit; and

3. Land owners within the Sutter's Permit Area will be notified annually if they have a Swainson's nest tree on their property. The notice will identify the nest tree and alert the owner to the specific mitigation measures prohibiting the owner from removing the nest tree. This measure requires Sutter to inform land owners of the NBHCP's avoidance, minimization, and mitigation measures regarding the removal of Swainson's Hawk nest trees (see Section V.A.5.b of the NBHCP).

Court Opinion

As mentioned above, the City received incidental take authorization from the Service in December 1997 based on the 1997 NBHCP. In February 2000, the National Wildlife Federation and other plaintiffs filed suit against the Service's issuance of the ITP to the City (*National Wildlife Federation, et al. v. Babbitt,* S-99-274 (E.D.Cal.) (*NWF v. Babbitt*). The lawsuit alleged issuance of the ITP violated Sections 7 and 10 of the Act. In addition, the plaintiffs asserted that the Service violated NEPA by preparing an Environmental Assessment rather than an EIS and had violated the Administrative Procedures Act.

On August 15, 2000, Judge David F. Levi issued a Memorandum of Opinion and Order. The Court held that the 1997 NBHCP in most respects satisfied the substantive requirements of the Act as set forth in Section 10(a)(2)(a). The Court also held that, with one exception, relative to whether the Plan "minimizes and mitigates" expected impacts to the maximum extent, the Findings and the Biological Opinion were adequate with respect to the 1997 NBHCP as a whole. The Court also rejected the plaintiff's claims that biological uncertainties associated with, among other things, the NBHCP's adaptive management provisions undermined the legal adequacy of the Plan as a whole and found that the Service's decisions were based upon the best available scientific and commercial evidence.

The Judge's Order found four deficiencies with respect to issuance of the City's Section 10(a)(1)(B) Incidental Take Permit: (1) the record did not support the Service's findings in support of the NBHCP and the Section 10(a)(1)(B) ITP that the NBHCP would minimize and mitigate impacts on Covered Species to the "maximum extent practicable"; (2) the record did not support the "No Jeopardy" findings contained in the Biological Opinion as it applied to issuance of the Section 10(a)(1)(B) ITP to the City; (3) the record did not support the Service's finding that the City would ensure adequate funding for the NBHCP as it applied to issuance of the Section 10(a)(1)(B) ITP; and (4) the Service's decision to not prepare an EIS for the NBHCP and Section 10(a)(1)(B) ITP was arbitrary and capricious.

Pursuant to a Settlement Agreement executed by the parties in the lawsuit (effective May 10, 2001), the Order was modified to allow incidental take protection for limited land development within the City, with the provision of specific mitigation requirements. Following the court's decision, the City, Sutter County and the Conservancy, initiated preparation of a revised NBHCP. That effort culminated in the 2003 NBHCP.

The issuance of ITPs to the City, Sutter, and the Conservancy, in conjunction with implementation of the revised NBHCP, is the subject of this biological opinion.

BIOLOGICAL OPINION

Description of the Proposed Action

Introduction

The NBHCP is a multi-jurisdictional, multi-species, 50-year plan intended to protect and conserve 22 "Covered Species" and other biological resources within the Natomas Basin in Sacramento and Sutter Counties. It is the conservation plan designed to support applications for federal ITPs under Section 10(a)(1)(B) of the Act, as well as applications for ITPs under State law pursuant to Section 2081(b) of the California Fish and Game Code. The NBHCP relies on total development in the Basin being limited to 17,500 acres (including the Metro Air Park development in Sacramento County ("MAP")). Its basic mitigation strategy is to protect and manage in perpetuity 0.5 acre of habitat for every one acre of development in the Natomas Basin allowed under adopted land use plans (Authorized Development). This is accomplished through payment of a mitigation fee by developers and land owners prior to issuance of urban development permits from the City, Sutter, or Sacramento County. Fees are required for development, regardless of the habitat quality of the land being developed. The NBHCP is described in greater detail below.

This NBHCP builds on the 1997 NBHCP, which was the basis for issuance of an ITP to the City of Sacramento. The 1997 NBHCP was updated and modified to address the deficiencies cited by the court in *NWF v. Babbitt*. The revised NBHCP also reflects participation by Sutter and the Conservancy, with possible participation by Natomas Mutual and RD 1000.

The purpose of the NBHCP is to promote biological conservation in conjunction with economic and urban development within the areas covered by the ITPs (Permit Areas). The NBHCP establishes a multi-species conservation program to minimize and mitigate the expected loss of habitat values and incidental take[1] of Covered Species that could result from urban development

[1]"Incidental take" as used in this opinion in reference to the Covered Species refers solely to covered animal species. Plant species are "covered" by the permits in recognition of the conservation measures incorporated into the NBHCP for them and, like covered animal species, receive assurances under the Service's "No Surprises" rule.

and certain activities associated with the Conservancy's management of its system of reserves established under the NBHCP. The intent of the NBHCP is to minimize incidental take of the Covered Species in the Permit Areas and to provide avoidance, minimization, and mitigation measures for the impacts of Covered Activities on the Covered Species and their habitat.

The NBHCP applies to the 53,537-acre area interior to the toes of the levees surrounding the Natomas Basin, located in the northern portion of Sacramento County and the southern portion of Sutter County (Figure 1). The Basin is bounded on the west by the Sacramento River levee, on the north by the Natomas Cross canal, on the east by the Natomas East Main Drainage Canal, and on the south by the American River levee (Figure 2). The Basin contains incorporated and unincorporated areas within the jurisdictions of the City, Sacramento County, and Sutter. The Sacramento International Airport is located in the Basin. The southern portion of the Basin is urbanized, but most of the Basin is used for agriculture. Certain conservation measures proposed by the applicants would apply outside the Basin. For example, measures proposed to minimize Swainson's hawk nest disturbance include all hawk nests within ½ mile of development; not just those nests located interior to the toes of the levees of the Basin.

The NBHCP serves as the operating conservation plan (OCP) for three proposed ITPs from the Service, pursuant to Section 10(a)(1)(B) of the Act. The three proposed permittees are: (1) the City; (2) Sutter; and (3) the Conservancy. The ITPs would cover 22 species. Such authorization is needed because the City and Sutter have approved land use plans which designate areas of the Basin which may provide for urban development. Urban development will impact Covered Species and the habitat which supports those species. Additionally, the Conservancy is seeking take authorization related to the acquisition, restoration, and management of a system of habitat reserves on behalf of the City and Sutter.

Overall biological goals and objectives of the NBHCP include:

1. Establish and manage in perpetuity a biologically sound and interconnected habitat reserve system that mitigates impacts on Covered Species resulting from Covered Activities and provides habitat for existing, and new viable populations of Covered Species.

2. Implement an adaptive management program that responds to changing circumstances affecting Covered Species and their habitats.

3. Maintain and operate flood control, irrigation and drainage facilities in a manner that minimizes take of Covered Species and promotes vegetative cover that enhances habitat values for Covered Species, consistent with the Water Agencies' legal obligations.

4. Preserve open space and habitat that may also benefit local, non-listed and transitory wildlife species not identified within the NBHCP.

5. Ensure that direct impacts of Authorized Development upon Covered Species are avoided or minimized to the maximum extent practicable.

6. Minimize conflicts between wildlife and human activities, including conflicts resulting from airplane traffic, roads and automobile traffic, predation by domestic animals, and harassment by people.

7. Ensure connectivity between Conservancy reserves to minimize habitat fragmentation and species isolation. Connections between reserves will generally take the form of common property boundaries between reserves, waterways (primarily irrigation and drainage channels) passing between reserves and/or an interlinking network of water supply channels or canals.

8. Within individual Conservancy reserves, provide a mosaic of habitats that support both wetland and upland species, and that are configured to support species that utilize both types of habitat. The Conservancy will develop each monitoring plan and will submit the plan for review by NBHCP TAC and approval by the Wildlife Agencies prior to implementation.

9. Implement monitoring programs with qualitative and/or quantitative monitoring methods to evaluate management objectives and strategies for the reserve system.

10. Increase the diversity and abundance of Covered Species on reserve lands.

11. Revise the reserve design and management based on the most current biological data.

In addition to the overall biological goals and objectives, the following wetland species habitat goals and objectives have been proposed:

1. Acquire, enhance and create a mosaic of wetland habitats with adjacent uplands and connecting corridors to provide breeding, wintering, foraging, and cover areas for wetland species in the Plan Area.

2. Provide habitat to maintain, attract and sustain viable populations of the Covered Species. The habitat areas should be configured to encompass natural species migration areas, minimize species isolation, and prevent future habitat fragmentation.

3. Document population trends of Covered Species through monitoring.

In addition to the overall biological goals and objectives, the following upland species habitat goals and objectives have been proposed:

1. Acquire, enhance and create a mosaic of upland habitat types for breeding, foraging, and cover for species dependent on upland habitats.

2. Ensure reserve land connectivity with travel corridors for upland-dependent species. The habitat areas should encompass grasslands, agricultural croplands, riparian habitats, and shelter and nesting habitat areas (fence rows, clusters of shrubs and small trees), as well as wetland areas to provide a year-round source of water for upland species. The upland areas should be configured to enhance natural species migration, minimize species isolation, and prevent future habitat fragmentation.

The City is seeking take coverage for impacts to Covered Species associated with a total of 8,050 acres of authorized development located within the City's proposed Permit Area (Figure 2). Approximately ten acres of the total 8,050 acres covered by the City's ITP are for drainage improvements to widen the West Drain outside of the City limits, in Sacramento County. The ten-acre area has already been disturbed in compliance with the 1997 HCP. The proposed ITP would extend take coverage for Covered Species within the City's Permit Area and would cover urban development, public projects and associated infrastructure.

Sutter's proposed ITP would authorize incidental take of Covered Species associated with urban development, public projects and associated infrastructure on 7,467 acres of land within Sutter's Industrial/Commercial Reserve area, which is located in the southeast portion of Sutter County within the Basin (Figure 2). Sutter County's authorized development would be located within the proposed Sutter Permit Area, except for infrastructure improvements in northern Sacramento County. There is currently one proposed Sutter County public facility project: drainage channel improvements to support the South Sutter County Specific Plan area. The proposed drainage improvements are located on land in Sacramento County outside the Sutter County Industrial/Commercial Reserve and involve expanding two existing RD 1000 drainage channels (East Drainage Canal and the Montna Drain) to accommodate additional storm water flows. These channels are located within Sacramento County immediately south of the Sutter-Sacramento County boundary (Figures 2 and 3). To the extent that these channels and their associated levees and access roads are expanded beyond the footprint of the existing facilities, Sutter will consider the expansion of these facilities as urban development subject to the provisions of the NBHCP. Such increases in the footprint of the drainage channels are considered part of Sutter's 7,467 acres of authorized development.

The ITP that the Conservancy is seeking is to cover activities related to the acquisition, establishment and management of the system of habitat reserves that will be created throughout the Natomas Basin, including the land bounding the Natomas Basin and extending to the edge of the water (i.e., Natomas Cross Canal, Natomas East Main Drain, and American River) immediately outside the Natomas Basin levees, and Area B (Figure 4). However, because the City and Sutter will not acquire NBHCP mitigation lands in Area B, the Conservancy will not acquire NBHCP mitigation lands in Area B and any permit issued to the Conservancy would be restricted to lands within the Natomas Basin. Within its Permit Area, the Conservancy is seeking incidental take coverage for managing reserves; preservation, creation, restoration, and enhancement activities; and monitoring the HCP's success in meeting its biological goals.

The City and Sutter will each be required to mitigate the impacts of their own Covered Activities. Therefore, because they have separate permits and are mitigating their impacts separately, if either one of the permits is revoked, other than the Permit issued to the Conservancy, the other Permits would remain in effect. This is consistent with the design of the NBHCP as a mitigation tool which can be used by the various Permittees to obtain the necessary ITPs needed to conduct otherwise lawful activities within each entity's respective jurisdictional boundaries. Although the mitigation strategy provided for under the NBHCP would mitigate for effects resulting from the Land Use Agencies' Covered Activities, because the percentage of uplands to wetlands differs between their respective Permit Areas, the NBHCP allows for the mitigation strategy provided for under the NBHCP to be reevaluated in the event either the City's or Sutter's Permits are terminated or revoked. The mitigation strategy would be reevaluated to ensure that the configuration of Conservancy reserves provided for under the NBHCP continues to adequately mitigate for the impacts of authorized development in the remaining jurisdiction(s) participating in the NBHCP. In the event that the Service determines pursuant to Section 7.6.1 of the NBHCP IA that the Conservancy has violated the terms of the NBHCP, the Permits or the NBHCP IA, such violation would be considered a failure by City and Sutter to implement their obligations of the Operating Conservation Program under the NBHCP. In the event the Service or CDFG make the determination set forth in Section 3.1.11(a) of the NBHCP IA, the City and Sutter's Permits would not be revoked or suspended, provided the City and/or Sutter implement corrective measures, within the period specified by the Service and/or CDFG, to remedy Conservancy's violation. Among the corrective measures the Service may require are: (1) replacing the Conservancy with another conservation entity qualified to serve as a Plan Operator; (2) transferring the Mitigation Lands to CDFG in accordance with Section 3.2.12 of this NBHCP IA; (3) implementation by the Conservancy of measures specified by the Service and/or CDFG as necessary to remediate the violation unless the Service or CDFG determine that continuation of the Permits would appreciably reduce the likelihood of the survival and recovery of a Covered Species in the wild or the Service or CDFG determine that the violation renders the City or Sutter unable to implement successfully the NBHCP; or (4) implementation by the City and/or Sutter of measures necessary to remediate the violation. Should the Service or CDFG determine that the City or Sutter has violated their separate obligations under the NBHCP, the Permits or this Agreement, such violation would not be attributed to the Conservancy nor would the Conservancy's Permits be affected, so long as the Conservancy continues to properly implement its obligations under the NBHCP with respect to the Mitigation Lands, including its obligations as the Plan Operator.

The effectiveness of the NBHCP's OCP to adequately minimize and mitigate the effects of take of the Covered Species due to authorized development depends on the City and Sutter confining development to their respective permit areas and limiting their combined total development to 15,517 acres. The OCP and the NBHCP's effects analysis account for a combined total of 17,500 acres of Planned Development occurring in the Basin (i.e., 15,517 acres within the City and Sutter County's Permit Areas and 1,983 acres of Metro Air Park development in Sacramento County). Because the NBHCP's OCP is based upon the City limiting total development to 8,050 acres within the City's Permit Area, approval by the City of future urban development beyond the 8,050 acres or outside of its Permit Area would constitute a significant departure from the

NBHCP's OCP and would trigger a reevaluation of the NBHCP, a new effects analysis, potential amendments and/or revisions to the NBHCP and ITPs, a separate conservation strategy and the need to obtain a new ITP by the Permittee for that additional development, and/or possible suspension or revocation of the City's ITP in the event the City were to violate such limitations without having completed the required reevaluation, amendments or revisions, or obtained a new permit. Similarly, approval by Sutter of development within the Basin beyond the authorized 7,467 acres or outside of the Sutter Permit Area would constitute a significant departure from the NBHCP's OCP and would trigger a reevaluation of the NBHCP, a new effects analysis, potential amendments and/or revisions to the NBHCP and ITP, a separate conservation strategy and the need to obtain a new ITP by the permittee for that additional development, and/or possible suspension or revocation of the Sutter's ITP in the event Sutter were to violate such limitations without having completed the required reevaluation, amendments or revisions, or obtained a new permit. Any additional urban development within the Basin that occurs outside of the City's and Sutter's Permit Areas, with the exception of the MAP development, also would constitute a significant departure from the NBHCP's OCP and would trigger a new effects analysis, a new conservation strategy, and require the issuance of a new ITP to the party proposing that additional urban development. So long as the City and Sutter limit urban development to their respective Permit Areas and continue to meet their respective obligations under the NBHCP, the OCP and associated Permits would remain valid for each Permittee's Covered Activities.

In February 2002, the Service and CDFG issued ITPs to MAPPOA for the MAP project. The MAP Permit covers 1,983 acres[2] of development in Sacramento County within the NBHCP Area. The effects of that biological opinion are incorporated into the effects analysis of this biological opinion. The MAP HCP and its IA provide for automatic revision of the MAP HCP to incorporate applicable provisions of the revised NBHCP upon approval of the NBHCP by Wildlife Agencies. Extension of applicable NBHCP provisions to MAP will be treated as a revision of the Plan and will not require a permit amendment.

Covered Species

Twenty-two species of plants and animals are addressed by the NBHCP (Table 1). Of those, seven are currently federally-listed as either threatened or endangered. They are: (1) vernal pool tadpole shrimp (endangered); (2) giant garter snake (threatened); (3) valley elderberry longhorn beetle (threatened); (4) vernal pool fairy shrimp (threatened); (5) Sacramento Orcutt grass (endangered); (6) Colusa grass (threatened); and (7) slender Orcutt grass (threatened). The Aleutian Canada goose was formerly listed as a federally-threatened species. Species addressed by the NBHCP that are not or have not been previously federally-listed include: (1) bank swallow; (2) burrowing owl; (3) loggerhead shrike; (4) Swainson's hawk; (5) tricolored blackbird; (6) white-faced ibis; (7) northwestern pond turtle; (8) California tiger salamander;

[2]The MAP Permit covers a total of 2,011 acres of development, including offsite improvements. Twenty-eight acres are located within the City's proposed Permit Area. Therefore, the net impacts attributed to MAP include 1,983 acres.

(9) western spadefoot toad; (10) midvalley fairy shrimp; (11) Boggs Lake hedge-hyssop; (12) delta tule pea; (13) legenere; and (14) Sanford's arrowhead.

Action Area Description

Action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate areas involved in the action (50 CFR 402.02). The proposed action's action area is located in the southern portion of the American Basin and covers the 53,537-acre Natomas Basin (Sacramento County = 36,656 acres, Sutter County = 16,881 acres). It is bounded on the north by the Natomas Cross Canal, on the west by the Sacramento River, on the south by the American River, and on the east by the Natomas East Main Drainage Canal (Figure 2). The Natomas Basin comprises the action area because it encompasses the proposed Permit Areas where the proposed action's effects on Covered Species will occur.

The Natomas Basin is currently divided into three major areas relative to the movement of obligate wetland and aquatic species: a northwestern zone situated north of Interstate 5 and west of Highways 70 and 99, a southwestern zone situated south of Interstate 5 and west of Highways 70 and 99, and an eastern zone located east of the Highways 70 and 99 (Brode and Hansen 1992) (see Figure 5). These roadways are effective barriers to the movements of aquatic species such as the snake. Hydrologic connections are incomplete at best, often consisting of lengthy culverts with little freeboard. These culverts, although not ideal, likely provide the only hydrologic connectivity between the Basin's three geographic areas. The western edge of the northwestern and southwestern zones is bordered by the Sacramento River, likely itself a barrier to the snake and other wetland dependent terrestrial species. The eastern zone is bordered on the east by the Natomas East Main Drainage Canal (a.k.a. Steelhead Creek) and further east, by increasingly less-suitable (upland and higher-gradient stream) habitat for the snake.

Prior to modern reclamation efforts, drainage off the western slopes of the Sierra Nevada Range produced regular flooding and created the Basin as an area of highly fertile, alluvial soils. This early condition was in the form of the large American Lakes, a large expanse of riparian scrub-shrub, and a large expanse of dry farmed open plain. Since, 1914 land reclamation and reclamation facilities, canals, levees, and pumping stations have caused over 80 percent of the Basin to be converted to agricultural production. A high proportion of the Natomas Basin's soils are underlain by impervious clay, which creates poor drainage conditions. These poor drainage conditions favor irrigated rice farming, which became prevalent in the 1900s.

The predominant crops presently produced in the Natomas Basin are rice, corn, sugar beets, grain, tomatoes, and pasture lands. The drainage pattern of the Basin has been altered so that runoff is pumped into the surrounding canals and the Sacramento River at several places. Even with pumping, portions of the Basin are subject to shallow flooding from rainfall that cannot be conveyed quickly enough to external drainage systems.

Natural and uncultivated vegetation types are interspersed throughout the agricultural areas of the Natomas Basin. Natural vegetation is found primarily along irrigation canals, drainage

ditches, pastures, and uncultivated fields. Borders of canals and ditches often have narrow strips of emergent vegetation or wooded riparian areas. Operated by Natomas Mutual and RD 1000, the presence of these water conveyance systems among the mosaic of agricultural fields and riparian areas provide nesting and feeding habitat and migration corridors for a variety of wildlife species inhabiting the Basin.

Implementation of the Proposed NBHCP

Funding

Funding for the acquisition, restoration and management of habitat reserves in perpetuity will be financed through the collection of mitigation fees for authorized development (in acres), as described in Chapter VI of the NBHCP. The number of acres of the authorized development site will be described in the Urban development permit (i.e., a grading permit, notice to proceed, or authorization to commence grading). The Urban development permit will delineate the boundary identifying the parcels or portions thereof to be disturbed by the authorized development project. A mitigation fee will be paid the developer of a particular development project to fund a half acre of mitigation land acquisition and associated habitat enhancement, management, endowment, administration, monitoring, etc. for each gross acre of authorized development. Lands developed prior to the 1997 NBHCP are not covered by the proposed permits or subject to the mitigation fee. The NBHCP Implementation Agreement (IA) for the City and Sutter include detailed maps (see section 4.3 and Exhibits B and C of the NBHCP IA) showing which land parcels are subject to the fee and which parcels are exempt from the fee due to prior development.

Open space remaining within the City's Permit Area such as schools, parks, etc. will count as areas requiring mitigation, unless the Service and CDFG approve the use of such areas as suitable for mitigation and such land is transferred in fee to the Conservancy or is encumbered by a conservation easement in favor of the Conservancy. Any open space land within the developed areas that is counted as mitigation land because the Service and CDFG approved it as mitigation land would be purchased for the Conservancy through the North Natomas Financing Plan - Land Acquisition Program (i.e., development impact fees will be increased to fund acquisition of the buffer area)(Land Acquisition Program). Fees in the Land Acquisition Program are separate from the NBHCP mitigation fee. The Land Acquisition Program funds public land (i.e., community centers, fire station sites, agricultural buffers, freeway buffer land, etc.) in the community plan area. The remaining components of the NBHCP mitigation fee (minus the land acquisition component) will be paid by the party (land owner, developer, etc.) proposing the land as mitigation. The Conservancy is not responsible for paying mitigation fees for enhancement and restoration activities on any of its reserve lands. Sutter has not designated any open space within its Permit Area and therefore, has not established a mechanism for acquiring open space as areas as mitigation.

Individual landowners may donate land to the Conservancy in lieu of payment of some or all of the acquisition component of the mitigation fee. Additionally, the City and Sutter may exercise

their discretion through resolutions approved by City Council (May 13, 2003, resolution number 2003-290) and Sutter Board of Supervisors (June 10, 2003, resolution number 03-039) to require developer/landowners to dedicate Mitigation Land in lieu of payment of the Land Acquisition Component of the Mitigation Fee prior to issuance of an Urban Development Permit. In such cases, the Conservancy, Service and CDFG will determine which lands are acceptable, considering location, proximity to urban uses and roads, and current condition. All land proposed to be transferred in lieu of payment of the land acquisition component of the mitigation fee must be approved by the Wildlife Agencies prior to acceptance by the Conservancy. The project proponent would be responsible for payment of the other components of the mitigation fee.

The Mitigation Fee is composed of the Land Acquisition Fee, Restoration and Enhancement Fee, Administration and Operations & Maintenance, Operations and Maintenance Endowment Fund, and Supplemental Endowment fund. The Land Acquisition Fee Component provides funding for habitat Mitigation Lands acquired by the Conservancy. The costs associated with land acquisition are the costs to acquire the land and transaction costs including legal costs. The fund also provides for a contingency in case land costs spike in any given year prior to updating the fee. Once all land is acquired in order to meet mitigation requirements, this fund will no longer be necessary. The Restoration and Enhancement Fee Component provides funding for restoring and enhancing Mitigation Lands acquired by the Conservancy. For example, the creation of managed marsh would be provided for by the revenues generated in the Restoration and Enhancement Fund. Once all land is acquired and subsequent restoration and enhancement occurs, this fund will no longer be necessary. The Administration and Operations & Maintenance Fund provides for the on-going operation and maintenance of the Mitigation Lands, including the costs to administer the funds collected from the Mitigation Fees. Revenues for this fund are comprised of Mitigation Fees (until all grading permits are issued), farming income, and hunting revenues. This fund is projected to exist in perpetuity. After year 45, as the finance model is currently structured, the Administration and Operations & Maintenance revenues are supplemented by interest earnings from the Operations & Maintenance Endowment Fund. The Operations & Maintenance Endowment Fund is structured as an endowment, such that fee revenue is accumulated as principal that will earn interest income over time. Under the most recent finance model, interest income would be utilized to subsidize funding for the Administration and Operations and Maintenance account after year 45. The Supplemental Endowment Fund was established to accumulate revenue to allow the Conservancy to purchase up to 200 acres of land in advance of all fees being paid or to supplement annual purchases in the case that land prices spike dramatically in any given year. A catch-up fee ordinance enacted by the City on April 3, 2001, (Ord. No. 2001-013) and to be enacted by Sutter will include this fee component. Additional information regarding funding for the NBHCP's conservation strategy is located in Chapter VI of the NBHCP.

The mitigation fee will be reviewed at least annually on or before March 1 of each calendar year the NBHCP is in effect. The mitigation fee shall be adjusted as necessary by the Land Use Agency Permittees to account for inflation or deflation using the Consumer Price Index (CPI) or another suitable index. The mitigation fee also will be reviewed at least annually on or before

March 1 of each calendar year the NBHCP is in effect and adjusted as necessary to reflect actual operation and land costs in the Basin. Fee adjustments will typically originate with a recommendation from the Conservancy to the Land Use Permittees, although any party may recommend such an adjustment. All adjustments to the mitigation fee within a particular local jurisdiction or jurisdictions must be approved by that affected jurisdiction or jurisdictions. Adjustments to the mitigation fee to account for inflation or deflation, or as necessary to maintain the 0.5-to-1 mitigation ratio and to meet ongoing management and monitoring costs, are provided for as part of the Plan's OCP and therefore, do not require amendment of the NBHCP or Permits.

The Conservancy will acquire and manage mitigation lands using the fees collected based on the number of acres approved for authorized development by both Land Use Agency Permittees. The failure of either jurisdiction to raise the mitigation fee in a timely manner and in an amount sufficient to fully implement the NBHCP could potentially compromise the ability of the Conservancy to carry out its responsibilities under the NBHCP. In that event, any shortfall in acquisition of mitigation lands or shortfall in funds available to cover the management and other plan implementation costs, shall be attributed solely to the Land Use Agency Permittee which has failed to adjust its mitigation fee as necessary to fully implement the NBHCP and may result in suspension or revocation of that jurisdiction's permits. However, because the NBHCP requires that a 200 acre cushion of mitigation lands be maintained prior to issuance of urban development permits by the City or Sutter for new authorized development, failure of either the City or Sutter to raise fees to a level adequate to fully fund the plan should never result in a deficit of mitigation lands (see "Phasing of Mitigation Land with Respect to Development" below). Should either the City's or Sutter's permits be terminated or revoked for failure to meet its funding or other obligations under the permits, each would remain obligated pursuant to 50 C.F.R. 17.22(b)(8) and 17.32(b)(8) to complete its mitigation obligations with respect to all authorized development approved by the jurisdiction prior to the revocation or other termination of its permits.

The mitigation fee is based, in part, on the funds necessary to assure the establishment of reserve blocks with 25 percent managed marsh habitat (described below). The Mitigation Fee may also be adjusted periodically at the request of the Service, CDFG or the Conservancy to account for NBHCP revisions, including revisions that: (1) increase up to a total of 75 percent, the percentage of Mitigation Lands converted to managed marsh, or (2) result from ongoing monitoring program results in the Plan Area, determined at the Mid-Point and Overall Program Reviews, or any future Service Giant Garter Snake Recovery Plan or CDFG Swainson's Hawk Recovery Plan (see Section VI.H of the NBHCP), or (3) based upon peer-reviewed scientific information provided such adjustments meet the requirements of Sections VI.E., Section VI.F. and Section VI.H of the NBHCP. The fee may also be increased as necessary to maintain land acquisitions at the 0.5-to-1 mitigation ratio and implement associated management (including restoration and enhancement), including changes identified through the Plan's adaptive management program, as appropriate to ensure the effectiveness of the OCP. Because the mitigation fee consists of individual components (e.g., land acquisition, restoration/ enhancement/monitoring, etc.), the fee may need to be raised with respect to specific fee

components periodically found to be deficient over the term of the permits. In other words, all components of the mitigation fee are subject to fee increases as necessary to ensure that the requirements of each individual component of the NBHCP are met. The Land Use Agencies have committed to adjust the fee as necessary for all additional monetary obligations that may be required to fully implement the land acquisition, ongoing or permanent management (including restoration and enhancement), monitoring, database maintenance, adaptive management, recovery plans, changed circumstances and any other requirements of the NBHCP and NBHCP IA, subject to the limitations described in Sections VI.E, VI.F, VI.H, and VI.K.1 of the NBHCP. Such fee increases are provided for under the Plan's OCP and therefore, do not trigger amendment of the Plan or Permits.

Phasing of Mitigation with Respect to Development

In order to help assure that adequate funding exists for implementation of the NBHCP, the Conservancy will establish and maintain a 200-acre cushion of mitigation lands prior to the approval of any new authorized development by the City of Sutter County. In order to accomplish this, no Urban Development Permits for Authorized Development shall be issued by the City or Sutter after September 30 of each calendar year until the Conservancy notifies the City and Sutter that it has acquired Mitigation Lands which equal the number of acres necessary to meet the mitigation requirement attached to all prior Urban Development Permits issued by the City and Sutter plus an additional 200 acres of Mitigation Land. Furthermore, no new Urban Development Permits will be issued the next calendar year until after the Conservancy notifies the City and Sutter that it has acquired Mitigation Lands which equal the number of acres necessary to meet the mitigation requirement attached to all prior Urban Development Permits issued by the City and Sutter plus an additional 200 acres of Mitigation Land.

Accounting of Mitigation Land

Each Land Use Agency shall collect the mitigation fee prior to issuance of an urban development permit (i.e., grading permit or notice to proceed) and promptly transfer the fees to the Conservancy, identifying by name, location and acreage, each project for which fees have been collected. The Conservancy shall record collection of fees from Land Use Agencies in chronological order, crediting the oldest project to have paid all required components of the mitigation fee with the mitigation lands the Conservancy acquired. Compliance with phasing of mitigation with respect to development must be satisfied with respect to the entire NBHCP Plan Area and not for individual Land Use Agency's Permit Areas. No Urban Development Permits for Authorized Development shall be issued after September 30 of each calendar year until the Conservancy has acquired Mitigation Lands which equal the number of acres necessary to cover the mitigation obligation attached to all prior Authorized Development under the NBHCP plus an additional 200 acres of Mitigation Lands. If the Conservancy falls behind on acquiring mitigation land (i.e., does not maintain the required 200-acre cushion, see above), then the Conservancy must notify all Land Use Agencies and the Conservancy may not accept additional mitigation fees until acquisition of mitigation land is in compliance with Section VI.C of the NBHCP. In addition, the Land Use Agencies shall not allow any development project to proceed

under the ITPs where the Conservancy has not accepted mitigation fees or mitigation lands for that development project. Development of lands for which mitigation fees have been accepted by the Conservancy, and which has met all other requirements of the NBHCP would be allowed to proceed under the ITPs.

The NBHCP requires that at least 25 percent of habitat mitigation lands be established as managed marsh. Therefore, the Conservancy will specify the acreage, location, and type of reserve land (i.e., rice land versus marsh), and the percentage of each with respect to the total lands acquired to date in its annual report. The 25% managed marsh requirement applies to the entire Natomas Basin collectively (i.e., to all Land Use Agency jurisdictions and Permit Areas), not to each Permit Area individually.

The Final NBHCP has been revised to eliminate a provision which would have allowed up to 20% of the mitigation lands to be acquired in Area B under certain conditions. However, as stated earlier, both the City and Sutter have decided (Sutter Resolution Number 03-039, City Resolution Number 2003-289) to not allow mitigation lands to be acquired in Area B; therefore, no mitigation lands may be acquired in Area B, and the NBHCP has been updated to reflect that modification.

The MAPHCP states that MAP will utilize the Conservancy for acquisition and management of habitat reserves. MAP will rely on the County of Sacramento to collect mitigation fees, and the County of Sacramento will convey these fees to the Conservancy. Additionally, the Conservancy will include information on MAP's urban development and associated habitat mitigation within its annual report. Fees collected by the Conservancy on behalf of Planned Development in the MAPHCP Permit Area shall be credited along with fees collected by both Land Use Permittees in chronological order, with the first project among MAP or either Land Use Permittee to have paid the mitigation fee credited with the habitat mitigation lands acquired by the Conservancy and credited to MAP's mitigation obligation.

As stated above, project proponents may elect to transfer mitigation lands in lieu of the mitigation land acquisition fee component of the mitigation fee or may be required to do so by the City and Sutter. In such cases, once the Conservancy, Service, and CDFG have approved transfer of the lands, and the other non-land acquisition portion of the mitigation fee has been paid by the project proponent, the project may proceed. The Conservancy will keep a record of the name, location, and acreage of the project and the mitigation lands transferred to the Conservancy on behalf of the project and include the information in its annual report.

Monitoring under the NBHCP

Two related but separate types of monitoring programs will be required under the NBHCP. First, Compliance Monitoring will document Permittee activities and ensure that NBHCP Permittees complete obligations as specified within the NBHCP. These obligations vary between Permittees, based upon their specific obligations. Second, a Biological Effectiveness Monitoring Plan will be implemented to measure the biological success of the NBHCP

Operating Conservation Program. The Biological Effectiveness Monitoring Plan will provide the biological data necessary to guide and direct the NBHCP OCP. Monitoring shall be performed for the duration of the Permit and in perpetuity per the terms of the Plan.

Compliance Monitoring

Compliance monitoring is verifying that the Permittees are carrying out the terms of the NBHCP, the NBHCP IA and the associated ITPs. The Conservancy will be the primary entity responsible for compiling, retaining, and making available to the Wildlife Agencies data on compliance with the provisions and obligations contained within the NBHCP and the associated NBHCP IA. The Land Use Agencies shall conduct compliance monitoring and report to the Conservancy on their compliance and the compliance of third parties operating under their control and their Permits with regard to their obligations under the NBHCP, including implementation of the NBHCP take avoidance, minimization, and mitigation measures. Compliance Monitoring will include the status of the implementation of the NBHCP terms and conditions (e.g., financial responsibilities and obligations, management responsibilities, and other aspects of the ITPs, NBHCP and NBHCP IA). At each Implementation Annual Meeting, the Conservancy will report to the other Permittees and Wildlife Agencies on the progress of the HCP conservation strategy. The Permittees' compliance with the NBHCP obligations will be reported within the Conservancy's annual report. Additional detail regarding Compliance Monitoring is located in Chapter VI of the NBHCP.

Biological Effectiveness Monitoring

Biological Effectiveness Monitoring will evaluate the effects of authorized development and other Covered Activities and will determine whether the effectiveness of the NBHCP's OCP is consistent with the assumptions and predictions made when the NBHCP was developed and approved. In other words, Biological Effectiveness Monitoring will evaluate if the NBHCP is achieving its biological goals and objectives. The Conservancy will be responsible for completing the Biological Effectiveness Monitoring and will publish the results in its annual report. In order to ensure consistent application of monitoring techniques both upon Conservancy reserves and throughout the Natomas Basin, the Conservancy shall prepare a comprehensive Biological Effectiveness Monitoring Plan (see Section VI.E.2 of the NBHCP for detailed information regarding the Biological Effectiveness Monitoring Plan).

In order to measure the effectiveness of meeting the biological goals and objectives, the Biological Effectiveness Monitoring Plan shall be designed to track population trends of the Covered Species and to evaluate the effectiveness of the mitigation land design, restoration and management in providing habitat and supporting the Covered Species. The monitoring plan shall track population trends on Conservancy reserves as well as at selected non-reserve sites within the Natomas Basin. Non-reserve sites will serve as controls to determine success of mitigation land design and management in supporting and increasing the abundance of Covered Species. Monitoring of non-reserve sites also may provide information to guide future acquisitions and to determine presence and/or use of corridors between reserves. Selection of

non-reserve sites to be monitored will be determined during preparation of the monitoring plan and may differ for the various Covered Species, depending on the management and information needs for those species.
The Biological Effectiveness Monitoring Plan is divided into two primary components: (1) a Basin-wide Biological Effectiveness Monitoring Program designed to evaluate the overall success of Covered Species within the Natomas Basin; and (2) Site Specific Biological Monitoring Programs designed to evaluate the success of Covered Species within Conservancy reserves. The Basin-wide Biological Effectiveness Monitoring Program will include limited monitoring of Covered Species at locations outside of Conservancy reserves, as well as periodic evaluations of Covered Species within the reserves. Site Specific Biological Monitoring Programs will be developed for each block of contiguous Conservancy reserves. The Site Specific Biological Monitoring Programs will be developed in conjunction with, and included within, the Site Specific Management Plans (SSMP) (discussed below) developed for each reserve. In combination, the Basin-wide Biological Effectiveness Monitoring Program and the Site Specific Biological Monitoring Programs constitute the Biological Effectiveness Monitoring Plan. Additional detail regarding Biological Effectiveness Monitoring is located in Chapter VI of the NBHCP.

The Conservancy, in consultation with the Technical Advisory Committee (TAC) and qualified species experts, will design or coordinate the design of Biological Effectiveness Monitoring Programs, both Basin-wide and Site Specific. The TAC is a group of experts representing the Wild life Agencies (CDFG and Service) and Permittees who provides advice and guidance to the Conservancy.

Management objectives for the reserve system, as described in detail in Sections I.C and VI.E.2-VI.E.4 of the NBHCP, will be used to determine whether qualitative or quantitative monitoring methods will be employed and what level of confidence in the results is required. All Biological Effectiveness Monitoring Programs will include thresholds, at which mitigation land management must be modified through the adaptive management process to assure success of the OCP. Preliminary management thresholds are provided in Section VI.F.1 of the NBHCP. Revised management thresholds will be incorporated within two years of issuance of the proposed Permits as part of the Biological Monitoring Programs. The NBHCP does not identify the specific activities to be conducted within the Biological Effectiveness Monitoring Programs. However, it does provide detailed direction for developing suitable Biological Effectiveness Monitoring Programs (see Section VI.E of the NBHCP). For example, the NBHCP Biological Effectiveness Monitoring Program shall include, but is not limited to, the following components and guidelines for monitoring activities:

1. Annual surveys of the Conservancy Permit Area (including Conservancy reserves and selected nonreserve area accessible to the Conservancy) to determine the status of the Swainson's hawk, including presence, density, and reproductive success.

2. Annual assessment of the status of giant garter snake populations within the Natomas Basin. Annual updates of information of locations of giant garter snakes within the Basin as well as other Covered Species.

3. Density and distribution sampling of Covered Species on Conservancy reserve lands every five years. The first five year sampling of Covered Species shall be completed within one year of issuance of Permits under the NBHCP, and subsequently every five years thereafter. Once a Covered Species is found to occupy a Conservancy reserve, yearly monitoring of that Covered Species on the reserve it occupies and any adjacent reserves, as appropriate, will be implemented.

4. The NBHCP Biological Monitoring Program shall specify the number of control locations within the Basin but outside of NBHCP Mitigation Lands that shall be monitored. These sites shall be monitored every year for Swainson's hawk and giant garter snake, and every five years to satisfy monitoring of species throughout the Conservancy's Permit Area other than Swainson's hawk and giant garter snake. Such sites shall be limited to a set of locations that, to the extent that such sites exist in the Basin and are physically accessible, collectively provide suitable habitat to support all Covered Species and shall allow the following:

    a. Determination of the comparative success of Covered Species on non-reserve sites versus on reserve sites.

    b. General documentation of Covered Species presence.

    c. Determination of whether the Mitigation Lands are supporting the general populations of Covered Species found within the Basin.

5. Annual assessment and identification of canals and ditches which provide snake habitat connectivity within and between reserves. This assessment shall be coordinated with the Water Agencies and the Wildlife Agencies. Additionally, the Wildlife Agencies and the Land Use Agencies will notify the Conservancy of any known applications under the Act or Section 404 of the Clean Water Act affecting canals.

6. Evaluations of the Operating Conservation Program and its progress toward its intended biological goals.

7. The Monitoring Program shall provide specific details on the following subjects:

    a. Monitoring methodologies and protocols to be implemented.

    b. Timing of monitoring efforts, including frequency and duration of monitoring efforts.

c. Locations of monitoring, and methodology used to select locations.

d. Personnel required.

e. Effort required and methods of documenting and determining monitoring effort.

f. Methods of analyses of monitoring data.

g. Information expected to be gained from monitoring.

h. Thresholds at which management must be modified to assure success of the conservation plan.

8. The Biological Effectiveness Monitoring Program shall establish a standardized format for annual monitoring and five-year monitoring conducted on behalf of the Conservancy.

Additional detail is provided for the formulation of site-specific management plans.

The Biological Effectiveness Monitoring Programs may require periodic revisions as new methods become available or if monitoring methods are not yielding the expected information. Therefore, the Biological Effectiveness Monitoring Programs and their effectiveness in measuring the success of the NBHCP's OCP will be reviewed at each Midpoint Review (discussed below). In addition, the Biological Effectiveness Monitoring Programs may be reviewed and changed in accordance with the NBHCP's Adaptive Management provisions (see Section VI.F of the NBHCP). In summary, the Conservancy will revise the Biological Effectiveness Monitoring Programs whenever review indicates revision is necessary to effectively monitor success in achieving the NBHCP's biological goals and objectives.

Adaptive Management

Adaptive management is a process that allows the NBHCP's OCP to be adjusted during the life of the Plan to ensure that the most up-to-date information is being utilized, and that the Plan's biological goals and objectives are being achieved. The strategy will define the feedback process and incorporate feedback loops that link implementation and monitoring to a decision-making process. Incorporating new monitoring information is necessary to effect changes in management to achieve the Plan's biological goals and objectives. As identified in the NBHCP, and as is common for a regional plan of long duration and covering multiple species, uncertainties regarding the NBHCP's OCP exist. Adaptive management will allow the OCP to respond to these uncertainties. For the purposes of the NBHCP, the following three adaptive management approaches will be used:

1. Regularly scheduled periodic evaluations of the NBHCP monitoring data, other new scientific information or future recovery plan recommendations by the Conservancy and/or the TAC and a determination linking the information to the Plan's success in implementation and achieving the biological goals and objectives

2. Identifying significant measurable threshold limits (discussed above) for each of the adaptive management objectives that will trigger proposals and solutions requiring a management change. And

3. Conducting a review at the Independent Mid-Point Reviews for Land Use Agencies (discussed below) and the Overall Program Review at 9,000 acres of development (discussed below).

These approaches will be used to evaluate the effectiveness of the established habitats on reserve lands and to implement adjustments to the OCP, as necessary, in order to achieve the biological goals and objectives of the Plan.

The Conservancy will use the annual reporting process to review the compliance and effectiveness monitoring in the adaptive management process. The Conservancy's report will include a summary of findings with specific management recommendations and direction, if applicable.

Adaptive management revisions will be made consistent with the NBHCP's *Amendments and Revision* section (see Section VI.F of the NBHCP). Changes to the NBHCP that are substantial in scope, and are beyond the scope of the adaptive management Program will require the amendment of the ITPs, and additional review and approval under the Act, California Endangered Species Act (CESA), CEQA and NEPA. A more thorough discussion is provided in the "Enforcement, Amendments and HCP Requirements" section below. The Conservancy shall keep a complete administrative record of all NBHCP revisions resulting from the Plan's adaptive management program.

The Conservancy will serve as the database manager for the NBHCP and shall be the central data repository of all scientific data collected through the NBHCP for the life of the permits. In this role, the Conservancy will be responsible for maintenance, management, analysis and distribution of data collected through NBHCP monitoring efforts, as well as serving as a repository for related work conducted by other entities within the Basin. In addition to monitoring data collected by the Conservancy and the other NBHCP Permittees, the database will include documents and reports on new species occurrence records from environmental documents, California Natural Diversity Database (CNDDB) entries and other sources as provided to the Conservancy. The Conservancy shall maintain the database in a form that allows the determination of success of the NBHCP in achieving the biological goals and objectives of the OCP. At a minimum, the database will document in tabular form in a standard spreadsheet program the following data: the numbers and specific locations of each species occurrence within each contiguous block of mitigation land; basinwide data documented on Swainson's hawk and giant garter snake such as population densities, reproductive successes, etc. collected through annual surveys, 5-year surveys, and other observational data; and, Covered Species data for each identified monitoring control site located outside of the mitigation lands. Exact data needs of the Biological Effectiveness Monitoring Program required to evaluate the success of the operating conservation plan in meeting the NBHCP biological goals and objectives will be decided by the Conservancy in consultation with the Service, CDFG, and the TAC. Maps identifying monitoring sites and the specific locations of species occurrences shall be maintained to document the locations of monitoring efforts and the locations for data collected through the NBHCP monitoring efforts. Mapping of monitoring data shall be of adequate detail to evaluate the success of restoration efforts within Conservancy reserves and shall allow comparison of year-to-year monitoring results and five-year monitoring results. Additionally, the Conservancy shall retain mapped information identifying the locations of all mitigation lands and all data reported by the Land Use Agency Permittees related to the location of development authorized under the NBHCP, thereby documenting development lands for which NBHCP fees and other mitigation measures have been satisfied.

Annual Report

The Conservancy shall compile and submit an annual report to the Service and CDFG detailing authorized development activities, habitat acquisition, management, and compliance and effectiveness monitoring activities throughout the Plan Area for the preceding year. The report will be due 120 calendar days from the last day of each calendar year, or portion of a calendar year, during which the Permit is in effect. Each Permittee will be responsible for providing the Conservancy with information in their possession necessary for compiling the annual report.

Program Adaptation for Recovery Plans

The NBHCP's adaptive management provisions allow for revisions to management strategies to incorporate new or modified management strategies, such as those which may be included in recovery plans or in response to monitoring results in the Plan Area or to new scientific information. The NBHCP will incorporate recommendations made pursuant to future recovery

plans where such changes are supported by monitoring results from the Plan Area or new scientific information and when such recommendations:

1. Relate to the physical management of mitigation lands.

2. Would improve the effectiveness of the NBHCP's OCP by identifying relevant new information, approaches, techniques, or species protection needs.

3. Can be implemented within the NBHCP Plan Area.

4. Fit within the overall intent, framework, are consistent with the NBHCP's biological goals and objectives and would not exceed the established mitigation ratio of the Plan. And

5. Will not substantially sacrifice habitat values for Covered Species that are not addressed by the Recovery Plan.

The greatest potential shift in conservation strategies anticipated to result from a future snake recovery plan is a transition from rice cultivation to managed marsh. The NBHCP establishes an initial habitat enhancement obligation for the snake (see snake conservation measures below) and allows adjustments to be made based on the adopted final snake recovery plan, monitoring conducted in the Plan Area, or in response to new scientific information. Any modifications to the NBHCP necessitated by a future snake recovery plan or by other future recovery plans approved for listed Covered Species, are considered a part of the Plan's adaptive management program and will not trigger an amendment to the Permits.

Results of any future CDFG Swainson's Hawk Recovery Plan may also suggest or result in the need for NBHCP modifications to management practices upon mitigation lands. Any changes to the NBHCP resulting from a Swainson's Hawk Recovery Plan are considered a part of the Plan's adaptive management program and will not trigger an amendment to the Permits.

NBHCP Overall Program Review at 9,000 acres of Development

The NBHCP establishes a comprehensive overall program review designed to evaluate the performance and effectiveness of the Plan, to be conducted when and if authorized development within the Basin allowed by the ITPs for the City, Sutter and MAP reaches a total of 9,000 acres (the "Overall Program Review"). This Overall Program Review will be triggered at the point urban development permits covering a total of 9,000 acres of development in the Natomas Basin have been issued by the Land Use Permittees and by Sacramento County for the Metro Air Park. During the review, up to, but not more than, an additional 3,000 acres of additional urban development may be approved. In other words, no more than a total of 12,000 acres of urban development shall be approved prior to completion of the Overall Program Review.

The Overall Program Review shall specifically address the following factors: (1) status and

population trends of the snake, hawk, and all other Covered Species within the NBHCP area, especially with respect to those biological factors that are directly affected by Covered Activities under the Plan; (2) status and effectiveness of the Plan's habitat reserve system, including its buffer and setback requirements; (3) the Plan's success in meeting the 2,500-acre and 400-acre minimum habitat block size requirements; (4) the status and effectiveness of the Plan's funding mechanisms; (5) the relative status and distribution of developed lands and reserve lands within each of the Land Use Agency jurisdictions (the City, Sutter, and MAP); (6) the success of the 25% managed marsh/50% rice/25% upland reserve system for supporting the Covered Species, and (7) compliance of the Water Agencies (RD1000 and Natomas Mutual) with approved canal and ditch maintenance practices (not covered under the ITPs).

The review shall be conducted through consultation among all affected Permittees, the Conservancy, the Service, and the CDFG, which shall be known collectively as the NBHCP Review Board. The Conservancy shall inform the other parties, in writing, when the 9,000-acre trigger for the overall program review has been reached and shall initiate and coordinate the review.

Results of the review shall consist of a written report presenting the conclusions of the Review Board. These conclusions shall address each of the factors described above. The report shall also present recommendations consisting of the following or of a combination thereof: (1) a recommendation that the NBHCP is functioning as intended and that no revisions to the Plan's measures, in addition to those originally set forth, are necessary; (2) a recommendation that the NBHCP is significantly in need of correction and the specific corrective measures that are needed; and (3) a recommendation as to whether such corrections should be treated as an NBHCP revision under the Plan's adaptive management provisions, or whether the corrections exceed the scope or intent of the adaptive management process and should be treated as an amendment of the Plan's associated Section 10(a)(1)(B) and Section 2081 Permits. Upon completion of the review, the Service and CDFG shall, depending on the results, either document in writing that the NBHCP is functioning as intended and that no Plan revisions or Permit amendments are necessary, or assist the Permittees in revising the NBHCP and, if necessary, amending their respective Permits, as needed. The Review Board's report shall be made available to the public for review and comment before written findings are made by the Service and CDFG. If it is determined that substantial revisions to the NBHCP need to be made through amendment of the Permits, all statutory and regulatory requirements including those regarding public notice and review under the Act, NEPA and CEQA shall be completed.

If the findings of an adopted final snake recovery plan and Overall Program Review, monitoring results from the Plan Area, or new scientific data indicate, the managed marsh component of mitigation lands may be increased to 75% within sites acquired subsequent to such review, results, determination or Recovery Plan adoption. Such increase would only be made following written notice from the Service, supported by documentation and technical analysis, demonstrating the need for an increased percentage of managed marsh.

Independent Mid-Point Reviews for Land Use Agencies

In addition to the NBHCP Overall Program Review, both the City and Sutter will conduct Independent Mid-Point Reviews as development occurs within each Land Use Agency's Permit Area. Thus, up to three program reviews (one overall and two independent reviews) may be completed, depending on the timing of development within the City and Sutter. The Independent Mid-Point Reviews conducted by the City of Sacramento and Sutter County shall address each of the factors noted for the 9,000 acre overall program review above, as well as the expanded evaluation of progress on the 2,500 acre preserve, and minimum preserve size (discussed below).

If the findings of any of the Independent Mid-Point Reviews, ongoing monitoring results from the Plan Area, new scientific data or an adopted final snake recovery plan so dictate, the managed marsh component of mitigation lands may be increased to 75% within sites acquired subsequent to such review, results, determination or Recovery Plan adoption. Such an increase would only be made following written notice from the Service, supported by documentation and technical analysis, documenting the need for an increased percentage of managed marsh.

The City's independent Mid-Point Review will begin once urban development permits for 4,000 acres of authorized development have been approved within the City's Permit Area and the review will be completed before the City has approved urban development permits for 5,500 acres of development under the NBHCP. As of December 31, 2003 the City had approved 4,324.1 acres of development within their Permit Area (City 2003a). On June 19, 2003, the City notified the Service that it would commence its Independent Mid-Point Review upon approval of the proposed ITP by the Service (if approved) and that it would complete the review before it issues a total of 5,500 acres of Urban Development Permits (City 2003b). Sutter will begin its Independent Mid-Point Review once Sutter has approved urban development permits for 3,500 acres of authorized development permits and will complete the Independent Mid-Point Review before Sutter approves urban development permits for 5,000 acres of development under the NBHCP.

Should the timing of the City of Sacramento's Independent Mid-Point Review, Sutter's Independent Mid-Point Review and/or the overall 9,000 acre program review coincide, then the affected Land Use Permittee(s) may request the program reviews be combined under a single evaluation. Such request shall be made to the Service and CDFG and may be granted at the discretion of the Service and CDFG. Any revisions to the NBHCP made as a result of either Independent Mid-Point Review shall apply to both Land Use Agencies (and MAPPOA), unless the change affects only a particular Permittee.

Unforeseen Circumstances/"No Surprises"/Changed Circumstances

"Unforeseen circumstances" is defined as changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Service at the time of the NBHCP's negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species (50 C.F.R. 17.3).

The “No Surprises” Rule states, in part, that when negotiating unforeseen circumstances, the Service will not require the commitment of additional land, water or financial compensation or other natural resources beyond the level otherwise agreed upon for the species covered by the conservation plan without the consent of the Permittee (63 FR 8859).

The assurances contained in the No Surprises rule apply only “where the conservation plan is being properly implemented, and apply only with respect to species adequately covered by the conservation plan.” For purposes of the No Surprises assurances, the term “operating conservation program” shall mean the specific conservation, mitigation, and management measures provided under the NBHCP to minimize and mitigate the impacts of incidental take of the Covered Species.

The NBHCP’s adaptive management provisions allow the NBHCP to be revised as a result of new recovery plans, new research into the Covered Species, and ongoing monitoring programs in the Plan Area. As a result, revisions may be made to the NBHCP's OCP, including reserve land management and enhancement, and monitoring of the Covered Species pursuant to the Plan’s adaptive management provisions, that may result in additional mitigation and costs, provided such revisions meet the requirements of Sections VI.E and VI.F of the NBHCP. Because such revisions and changes are provided for under the Plan, they are not subject to the restrictions on additional mitigation contained in the No Surprises Rule. The following elements of the plan are not subject to revision as part of the NBHCP’s adaptive management provisions or as a result of the overall or individual jurisdiction reviews: (1) the 0.5-to-1 mitigation ratio; (2) the 75% limit on the amount of reserve lands to be converted to managed marsh; and (3) any other change not currently described in or provided for under the adaptive management program, changed circumstances, or other elements of the NBHCP’s OCP that would increase the Plan's costs or restrictions on land otherwise available, including any such changes resulting from the 9,000-acre review Overall Review process or Independent Mid-Point Reviews.

Another category of circumstances under the federal "No Surprises" rule is "changed circumstances." This term is defined under the rule as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for (e.g., the listing of a new species, or a fire or other natural catastrophic event in areas prone to such events)" (50 C.F.R. 17.3). A number of possible changed circumstances are addressed in Chapter VI of the NBHCP. Examples include, but are not limited to: (1) listing of new species; (2) availability of new scientific information; (3) approval of new recovery plans; (4) problems in implementing the NBHCP; (5) fire or flood; (6) invasive species; (7) changes in water availability; and (8) non-participation by a Land Use Agency in the NBHCP.

Enforcement, Amendments, and HCP Requirements

The Service may suspend the ITP of a Permittee if that Permittee fails to implement the NBHCP in accordance with the terms and conditions of the ITP and as provided for under applicable regulations. Suspension or revocation of a Section 10(a)(1)(B) permit, in whole or in part, by the Service shall be in accordance with 50 CFR 13.27-29 and the NBHCP IA.

If one of the Land Use Agencies fails to obtain its Permits or has its Permits revoked for failure to comply with the NBHCP, the essential effect to the implementation of the NBHCP is that less authorized development is covered by the NBHCP. With regard to funding adequacy, the reduction in authorized development would result in a similar reduction in acres of mitigation land to be acquired, restored, managed, enhanced and administered as reserve lands in perpetuity. Therefore, the Conservancy would have to continue to implement the NBHCP as it applies to the reduced authorized development and the Covered Activities within the participating Land Use Permittees' Permit Areas. The NBHCP provides for adjustments to the mitigation fee to fund the acquisition, restoration, creation, enhancement and management of reserves on a 0.5 to 1.0 mitigation basis.

There are two types of changes which may be made to the NBHCP and/or the NBHCP Permits and/or its associated documents: (1) revisions; and (2) amendments. Any revisions or amendments shall be in accordance with all applicable legal requirements, including but not limited to the Act, NEPA, CESA, CEQA, and any other applicable state and federal laws and regulations. The Conservancy shall process all amendments and revisions to the NBHCP, circulating proposed changes to all parties and, if appropriate, approving the amendment or revision by action of the Conservancy's Board.

Revisions to the NBHCP are changes to the Plan provided for under the OCP, including adaptive management changes and mitigation fee adjustments. These revisions would not result in operations under the NBHCP that are significantly different from those analyzed in connection with the NBHCP as approved, or result in adverse impacts on the environment that are new or significantly different from those analyzed in connection with the NBHCP as approved. Revisions to the NBHCP may include, but are not limited to: (1) updating construction "windows" for the NBHCP Covered Species; (2) correction of any maps or exhibits to correct errors in mapping or to reflect previously approved changes in the ITPs or NBHCP; (3) establishing and amending preconstruction survey methodologies, including modifying timing of NBHCP preconstruction survey methodologies; (4) modifying existing or establishing new incidental take avoidance measures; (5) modifying reporting protocols for annual report s; (6) minor changes to survey, monitoring or reporting protocols; (7) revising reserve enhancement and management techniques; (8) establishing new reserve design criteria; (9) revising reserve enhancement or management practices in conjunction with SSMPs; (10) approving recreational or income-generating uses for the NBHCP reserves that are consistent with the biological goals and objectives of the NBHCP's OCP; (11) making annual adjustments to the NBHCP mitigation fee to keep pace with inflation, or as necessary to fully implement the NBHCP's OCP, including its adaptive management provisions and responses to changed

circumstances; (12) changes to the membership of the TAC which retains representation from the Wildlife Agencies; and (13) any other modifications to the NBHCP that are consistent with the biological goals of the NBHCP that the Service and CDFG have analyzed and agreed to and will not result in operations under the NBHCP that are significantly different from those analyzed in connection with the NBHCP, will not result in adverse impacts on the environment that are new or significantly different from those analyzed in connection with the NBHCP, or result in take not analyzed in connection with the NBHCP.

The party proposing a revision to the NBHCP shall circulate to the Conservancy, and the members of the TAC, the proposed revision along with an explanation of why the revision is necessary or desirable; and a description of why the party believes the effects of the proposed revision are more beneficial than or are not significantly different from those described in the NBHCP as originally adopted. The Conservancy shall be responsible for circulating all proposed revisions to the other Permittees for review, as appropriate. If the Conservancy, and the Service and CDFG representatives to the TAC agree to the proposed revision, and no other Permittee objects within the period prescribed by the Conservancy, the Conservancy shall process the revisions to the NBHCP, including, if appropriate, approving the revision by action of the Conservancy's Board. All adjustments to the mitigation fee shall also require approval by the City and Sutter prior to becoming effective within their respective jurisdictions.

If the Service or CDFG representative to the TAC objects that the proposed revision should be processed as an amendment to the NBHCP, the Conservancy may choose to submit the proposed revision to the Service and CDFG for review. If this happens, the Service and CDFG shall each respond in writing to a proposed revision within 60 calendar days of receipt of the request, provided that sufficient supporting documentation is included with the request. The responses shall either concur with the proposed revision or require that the proposed revision by processed as an amendment to the Plan and ITPs. If either the Service or CDFG require the proposed revision to be processed as an amendment, the agency shall include in their written response an explanation for its determination. If approved by the Service and CDFG, the revision shall become effective upon the Conservancy's receipt of the Service's and/or CDFG's approval.

Amendments to the NBHCP will require amendment of Section 10(a)(1)(B) Permits and /or the Section 2081(b) Permits, and may require amendment of the Implementation Agreement. Amendments may include any of the following types of changes to the NBHCP:

1. Proposed revisions required to be treated as Amendments.

2. The listing of a new species within the Plan Area which is not an NBHCP Covered Species but which may be affected by NBHCP Covered Activities and for which a Permittee seeks coverage under the Plan and ITPs.

3. Significant changes to the NBHCP which were not addressed in the NBHCP including, but not limited to:

a. Changes to the method for calculating compensation for incidental take, which would increase the levels of incidental take permitted for the NBHCP.

b. Changes to the mitigation fee, except as otherwise provided for in the NBHCP.

4. Changes to the Covered Activities which were not addressed in the NBHCP as originally adopted, and which otherwise do not meet the Revision provisions above.

5. Extending the term of the NBHCP Permits past the 50-year term.

6. Extension of the NBHCP Permit Area boundaries to allow development under the NBHCP within the City's or Sutter's portion of the Swainson's Hawk Zone beyond the City's designated 252 acres.

7. A proposal to increase the total authorized development permitted under the NBHCP beyond 15,517 acres (17,500 acres including MAP).

Following receipt of a complete application package for a proposed amendment to a Section 10(a)(1)(B) Permit, the Service shall publish a notice of the proposed amendment to the Section 10 (a) Permit in the Federal Register as required by the Act. The Service shall use its reasonable efforts to process the proposed amendment within 180 calendar days of publication, except where longer periods are required by law. The amendment of a Section 10(a) Permit shall be treated as an original permit application. Such applications typically will require submittal of a revised habitat conservation plan, a completed permit application form with appropriate fees, a revised Implementation Agreement, and preparation of an environmental review document prepared in accordance with NEPA.

Conservation Program of the Proposed NBHCP

Introduction

The NBHCP includes several tiers of conservation measures including: (1) creation of a system of habitat reserves as mitigation for the impacts of take of the Covered Species; (2) reserve restoration, enhancement and management measures to support each habitat type and Covered Species; (3) take avoidance and minimization measures to be implemented by the Land Use Agencies and the Conservancy for each species; and (4) an extensive compliance and effectiveness monitoring program to evaluate whether the plan is being implemented as approved and its biological goals and objectives are being met.

Overview of the Habitat Reserve System

The NBHCP includes the acquisition and creation of habitat reserves at a ratio 0.5 to 1. For each acre of land developed within the Plan Area, 0.5 acres of habitat will be restored/enhanced, and protected and managed. The 0.5:1 ratio is constant, regardless of habitat value of the lands lost to development. Therefore, a total of 8,750 acres of habitat will be protected if all of the 17,500 acres of land described in the NBHCP are developed. In addition to mitigation lands provided from the 0.5:1 mitigation ratio, 200 acres of uplands to be managed exclusively for the Swainson's hawk are being provided to mitigate for the loss of Swainson's hawk nest tree and foraging habitat as a result of the MAP project.

The NBHCP requires that habitat reserves include a variety of habitat types to support the various needs of the Covered Species. The initial requirement is for the reserve system to be comprised of 50% managed rice, 25% managed marsh habitat, and 25% upland habitat (Table 2). The NBHCP includes adaptive management provisions. If the Service determines that the 50% rice / 25% managed marsh habitat /25% upland habitat ratio does not adequately protect the snake, then the Service may require that the ratio be changed up to a total of 75% managed marsh habitat / 25% upland habitat in specific circumstances. In order to change the ratio, the Service must provide justification in the form of a written analysis based upon scientific evidence, monitoring results, or a snake recovery plan (when adopted) and meet the NBHCP's requirements. The analysis must illustrate that additional managed marsh is required to support the continuation of the snake in the Basin. The revised ratio would apply to reserves acquired and developed following issuance of the revised ratio. In other words, the revised ratio would not be retroactive.

The NBHCP also allows changing the habitat ratios (i.e., 25% marsh, 50% rice, 25% uplands) if it is determined insufficient Swainson's' foraging habitat is available. Such modifications would be applied prospectively to future Conservancy acquisitions and would not affect existing, improved Conservancy reserves (see NBHCP, Section IV.C.1.e).

As of December 4, 2002, the Conservancy had acquired approximately 2,803 acres. Of that acreage, the Conservancy planned to manage approximately 716 acres (25.5 percent) as marsh, 1,404 acres (50.0 percent) as rice, and 682.8 acres (24.4 percent) as uplands.

General Reserve System Policies

Buffers within the reserve lands. Buffers shall be established so that they are inside the reserve system (i.e., the buffers shall be part of, not outside of reserve lands) and shall count as mitigation land. Buffers between improved wetlands and surrounding land uses will extend from the outside edge of the reserve (i.e., levee toe or maintenance road) to the boundary edge of the improved wetland area. The width of the buffer and the management/uses of the buffer area shall be established at the time a Site Specific Management Plan (SSMP) is prepared for the particular reserve site. Typically, buffers will consist of native or ruderal vegetation and will vary between 9 and 23 m (30 and 75 ft.) in width, based on the compatibility of adjacent land uses. When

agricultural uses are incorporated within a reserve site, such agricultural uses (with appropriate production practices to protect wildlife) may serve as the buffer area. Other uses that may be appropriate within the buffer area include Conservancy access roads. Most buffer areas will provide suitable upland for species. For example, uplands bordering managed marsh reserves would serve as upland habitat for the snake, turtle, or other aquatic species whose habitat requirements include associated uplands. These uplands will also provide value to upland species such as the hawk.

The Conservancy may include buffers measuring less than 9.1 m (30 ft.) in width on reserve lands. In these instances, the decreased buffer widths must be specified in SSMPs, reviewed by the TAC, and approved by the Service and CDFG. Reduction of buffers may occur only where: (1) there is clear evidence that the buffer is unnecessary (e.g., the reserve site is adjacent to another reserve or similar natural habitat); (2) it is determined that buffers are not the best use of reserve land; and (3) the lack of buffers will not create conflicts with adjacent property owners (e.g., issues of vector control or other nuisance). Decisions about the need for buffers and buffer widths shall be included in the SSMPs for habitat reserves.

Connectivity. One of the primary goals of the NBHCP 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. One primary means of connection between water areas will be the drainage/irrigation canals within the Basin. The primary opportunity for connectivity between reserves is the system of channels maintained and operated by RD 1000 and Natomas Mutual.

The success of the snake in the Basin is dependent, in part, upon the maintenance of some of RD 1000's and Natomas Mutual's channels. Although the NBHCP anticipates that some of RD 1000's and Natomas Mutual's canals will be closed during the life of the ITPs, it also relies on the persistence of other canals to ensure the viability of some Covered Species in the Basin (see giant garter snake effects discussion below). Once Conservancy reserves have been acquired and key connectivity corridors identified, changes in water delivery and drainage operations affecting key channels must be considered by the Conservancy and appropriate actions taken to ensure connectivity is maintained between reserves. One of the mechanisms identified in the NBHCP to ensure viability of the reserve system is through moving reserve components. Other options, which may be used, if necessary, to maintain integrity of existing reserves, include memorandums of agreement, easements, and outright purchases of land, which would be designed to ensure connectivity for the snake between Conservancy reserves.

The NBHCP's Biological Monitoring Program (see NBHCP, Chapter VI) requires that an annual assessment be conducted to determine if connectivity exists within and between reserves. If it is determined that connectivity is being compromised, the Conservancy may use the above methods to reestablish connectivity. If this connectivity is not reestablished, the Wildlife Agencies may determine that the Conservancy is out of compliance with the terms and conditions of its Permits. Because the Conservancy is the Plan Operator, the consequence of this

may be that the City and/or Sutter are out of compliance with the terms and conditions of their Permits, which may lead to suspension or revocation of their Permits.

2,500-Acre/400-Acre minimum habitat block size requirements. The Conservancy will consolidate reserve acquisitions throughout the life of the Permits in order to build larger blocks of habitat reserve lands. Minimum requirements for reserve sizes are discussed below. The connectivity promoted through the required configurations of Conservancy acquisitions should reduce fragmentation and isolation of habitat reserves, thereby increasing the long-term viability of wildlife populations within the Basin.

In order to ensure adequately sized reserves that will support long-term viability of Covered Species, the NBHCP requires that by the end of the 50-year Permits, at least one habitat block within the reserve system will be a minimum of 2,500 acres. The remaining reserve lands must be in habitat blocks that are at least 400 acres in size. However, the Conservancy may acquire properties smaller than 400 acres in size in instances where the TAC determines that the biological resources merit such acquisitions. The basis for the 400-acre minimum block size and 2,500 acre reserve block size is: (1) large blocks minimize the "perimeter effect;" (2) large blocks promote biodiversity by allowing multiple species and niches to occupy the site; and (3) the 400 acre reserve size is considered in the NBHCP the minimum size necessary to allow the persistence of Covered Species.

Setbacks adjacent to reserve lands. Setback zones shall be considered by the Conservancy prior to the acquisition of reserve lands. The purpose of the setback requirement is to minimize the impacts between reserve lands and existing development or lands that are designated for urban development by one of the Land Use Agencies. The setback zone functions as a limitation on where reserve lands can be located. However, the reserve land setback zone does not affect the ability of each of the Land Use Agencies to approve development within the setback zone and adjacent to the boundaries of reserve lands. The setback criteria requires that mitigation lands acquired by the Conservancy or for which conservation easements are obtained shall, at the time of acquisition, be situated at least 244 m (800 ft.) from existing urban lands or lands that are designated for urban uses in an adopted general plan within the City or Sutter Permit Areas. Lands that are located within either the City or Sutter's Permit Area shall not be acquired or accepted as Conservancy Mitigation Lands without the prior review and approval by the decision making body of the Land Use Agency Permittee within which the proposed Mitigation Land is located, as well as Wildlife Agency approval. The NBHCP allows exceptions to the setback width requirement if: (1) the TAC, including its Service and CDFG representatives, concur unanimously in a decision to reduce the setback distance; or (2) if not unanimous, the Service and CDFG concur in writing that a reduction in the setback distance is necessary or appropriate.

Lands in the 800 foot setback zone between urban development and reserve areas will probably be in agriculture or another open-space or non-urban use. However, such lands will likely not be under the control of the Conservancy and will not count as mitigation land. The NBHCP specifically states that the setback standard is not intended to impose an obligation on the

Conservancy or the owners of the setback lands to manage those setback lands in any particular fashion.

Reserve Site Acquisition Criteria

Overall acquisition criteria. The Conservancy proposes to apply the following criteria when evaluating potential reserve acquisitions (see Section IV.C.2 of the NBHCP).

1. Habitat types within Conservancy reserves will generally be as follows: 25 percent managed marsh; 50 percent rice production; and, 25 percent upland habitat. These percentages apply on a Basin-wide basis and percentages within individual reserves may vary from the percentages described above.

2. Land must have legal water rights to an adequate water supply to serve the anticipated uses (wetland or upland) of the proposed reserve. This would normally mean rights to water from the Natomas Mutual (or its equivalent supplier if outside the Basin), but may solely include groundwater if a groundwater well or wells exist on the property and that such the well(s) can meet acceptable water quantity and quality needs.

3. Land must be capable of supporting appropriate agricultural cultivation in conjunction with either wetland or upland habitat reserve.

4. Land must be capable of either supporting or being improved to support various Covered Species associated with the anticipated type of habitat (wetland or upland) proposed for the potential reserve.

5. Upland- or wetland-specific criteria, as described in the following sections, must be applied as determined appropriate by the Conservancy and the TAC.

6. Land must be adequately removed from incompatible urban development or uses.

7. Habitat reserves will be established by the Conservancy in consultation with the TAC. Prior to purchase, all lands being considered for acquisition will be submitted to the Service and CDFG for review and concurrence. Such concurrence will be required before any land acquisitions are completed. However, formal Service and CDFG concurrence may be waived if: (a) the TAC, including the Service and CDFG representatives, unanimously concur with the proposed acquisition and if documentation of such concurrence is placed into the Conservancy's administrative record; or (b) the Conservancy's Board of Directors approves an action pursuant to this section in a regular, noticed meeting of the Board. In the latter example, following approval of the Conservancy's Board of Directors, the acquisition will be approved, unless the Service and CDFG deny the acquisition within 60 days of being notified in writing of the acquisition by the Conservancy.

Additional criteria for wetland and upland reserves are as follows:

Additional acquisition criteria specific to wetland habitat areas. The Conservancy proposes to use the following guidelines to identify lands for wetland reserve area (see Section IV.C.3 of the NBHCP):

1. Land has existing or potential wetland habitat values that currently support or can support, with necessary enhancement and restoration, the snake and other wetland associated Covered Species.

2. Land contains soils that can support rice farming or the type of managed marsh wetlands proposed in the NBHCP.

3. Blocks of reserve lands must be hydrologically connected to other blocks through irrigation and drainage systems or other systems to ensure connectivity and opportunity for travel by snakes between sections of the reserve system. To the extent practicable, reserve lands will also be near or adjacent to other protected habitat lands in order to increase the overall effectiveness and size of protected lands in the Basin for Covered Species.

4. Lands selected to provide for the NBHCP wetland habitat system shall be situated outside areas known to regularly receive deep flood waters (e.g., the Yolo and Sutter Bypasses). They shall also be situated so that they do not directly receive runoff from paved surfaces or inflow from urban storm water drainage systems.

Additional acquisition criteria specific to upland areas (see Section IV.C.4 of the NBHCP). The NBHCP's primary strategy to mitigate impacts to the hawk is to avoid development in the Swainson's Hawk Zone and to acquire upland habitat as mitigation lands inside the Swainson's Hawk Zone. The Swainson's Hawk Zone is an area of the Basin one mile in width that borders the Sacramento River. In order to maintain and promote hawk habitat values, Sutter will not obtain coverage under the NBHCP and ITPs, or grant urban development permit approvals for development on land within the Swainson's Hawk Zone. The City has limited its Permit Area within the Swainson's Hawk Zone to approximately 252 acres located within the North Natomas Community Plan that was designated for urban development in 1994 and will not grant development approvals within the Swainson's Hawk Zone beyond the previously designated 252 acres. Should either the City or Sutter seek to expand NBHCP coverage for development within the Swainson's Hawk Zone beyond that described above, granting of such coverage would require an amendment to the NBHCP and ITPs and would be subject to review and approval by the Service and CDFG in accordance with all applicable statutory and regulatory requirements.

In addition to lands located in the Swainson's Hawk Zone, land outside the zone can be made attractive for the hawk through appropriate habitat design, as specified in Sections IV.C.1.e, IV.C.4, and V.B.4 of the NBHCP and in consultation with the Conservancy's TAC. The goal of these strategies is to maintain optimum nesting and foraging habitat for the hawks nesting in the

zone by providing an abundant and available prey source. In order to optimize the use of the entire Basin by the hawk, the NBHCP also includes maintenance of nesting and foraging habitat for hawks nesting elsewhere in the Basin, as well as acquisition of reserve lands that benefit the other upland-associated species. Upland reserve acquisition criteria include (see Section IV.C.4 of the NBHCP):

1. The land contains known or potential hawk nest trees, or includes or is adjacent to suitable foraging habitat (e.g., agricultural croplands and grasslands).

2. The land is comprised of agricultural croplands or grasslands that, based on crop type or surveys, is expected to have a suitable hawk prey base and, preferably, have historically been used by hawks (as determined by the CNDDB or CDFG data and reports).

3. The land is or can be used to grow crops conducive to hawk foraging, including alfalfa and other hay crops, lightly grazed pasture, fallow fields, or summer harvested row crops. Cotton and other late harvest crops may not be grown.

4. If possible, the land contains appropriate areas for the establishment of riparian woodland habitat, or isolated groves in agricultural fields, for future use by the hawk. Trees which may be planted include valley oaks (*Quercus lobata*), cottonwoods (*Populus fremontii*), willows (*Salix goodingii*), sycamores (*Platanus* sp.), and California walnut (*Juglans californica*).

5. Contiguity of upland reserve sites will be maximized. The hawk conservation objectives in Chapter I of the NBHCP direct the Conservancy to focus acquisition of upland reserves in the Swainson's Hawk Zone. That objective, together with this provision, is intended to ensure that hawk habitat protected in reserves will not be excessively fragmented, either inside or outside of the Swainson's Hawk Zone, and that habitat contiguity will be a primary criteria under which upland reserve sites will be selected. However, the value of edge habitat with wetlands will be considered in reserve design.

6. The land supports or has the potential to support other Covered Species which utilize upland habitat.

Generally, priority for acquiring upland habitat is as follows (in descending priority order): (1) sites located within the Swainson's Hawk Zone; (2) sites that, in the judgement of the Conservancy and the TAC, would provide specific, important benefits to other upland-associated Covered Species (e.g., tricolored blackbird nesting colonies); (3) sites supporting hawk nests or foraging habitat outside the Swainson's Hawk Zone; (4) sites that would provide a good potential for enhancement of upland habitat values; and (5) any other site that would result in a benefit to any upland Covered Species.

Habitat Reserve Restoration and/or Enhancement Conservation Strategies

Preparation of Site Specific Management Plans for Each Reserve. The Conservancy will improve and manage reserves in a manner that will, to the maximum extent practicable, benefit all Covered Species. This shall be accomplished through preparation and implementation of SSMPs. The TAC will participate in the review of the management plans, and shall ensure that the management guidelines are incorporated into each management plan. The Wildlife Agencies (Service and CDFG) will approve all SSMPs. Each SSMP will specify: (1) management policies not otherwise prescribed by the NBHCP; (2) specific management activities, including establishment of suitable monitoring programs; (3) restoration and enhancement needs; and (4) reserve water management. The following design and management criteria shall be considered during the preparation, review and approval of SSMPs for Conservancy reserves:

1. Identification of Covered Species present/habitat requirements determination. An existing Conditions Biological Assessment of newly acquired Conservancy reserves will be conducted to determine the specific Covered Species the parcel currently supports or could potentially support. The results of this survey will be included in the SSMP for the subject Mitigation Land. The habitat type present or desired (e.g., wetlands or uplands) will also be a critical determination in establishing management policies. Management policies and activities will be oriented toward the species and habitats indicated or selected, and specific management policies established will be consistent with the needs of those species or habitats. Land parcels that are unsuitable for or are not expected to support any of the Covered Species will be eliminated from consideration through use of the mitigation site selection criteria described in Sections IV.C.2, C.3.b, and C.4.b of the NBHCP.

2. Access. The Conservancy will protect the Covered Species and their habitat by limiting and regulating public assess to Conservancy reserves. Reserves shall be patrolled to control prohibited and incompatible activities, including, but not limited to, dumping, off-road vehicle activity and trespass.

3. Appropriateness of hunting. Management plans will identify the level of hunting allowed, if any, and will include parcel-specific restrictions to protect the Covered Species during any hunting activities. No take of Covered Species as result of hunting will be covered under the permits.

4. Controlled/prohibited activities. Activities that would potentially conflict with mitigation goals or would endanger habitat resources will be described and controlled or prohibited as necessary. Examples of activities that will typically be prohibited include dumping, vandalism, unauthorized hunting and fishing, collection of plants or animals, and off-road vehicle use.

5. Avoidance of conflicts with the Sacramento International Airport. It is imperative that reserve lands in the vicinity of the Airport be managed to avoid the potential for aircraft/bird collisions and other potential conflicts with Airport operations. Reserve management plans will therefore be developed with these issues in mind. Draft

management plans for reserve lands in the vicinity of the Airport will be submitted to the Airport Facilities Manager to provide a reasonable opportunity for review and comment prior to approval by the Conservancy, Service, and CDFG.

6. Take avoidance. The Conservancy will implement take avoidance measures to minimize potential take that may occur during habitat creation, restoration, preservation, enhancement and management activities on reserve lands. To accomplish this, the Conservancy shall, where applicable, ensure that all take avoidance measures described in Chapter V of the NBHCP are implemented during preservation, restoration, creation, enhancement, management, and use of reserve lands. The Conservancy shall include all take avoidance and minimization measures it deems necessary and appropriate in SSMPs.

7. Habitat enhancements. Water bodies within habitat reserve units shall vary in size, depth and edge planting to provide varied habitat opportunities. Plantings of native trees, including valley oak, cottonwood, and willow shall generally be incorporated within each habitat reserve unit as determined feasible by the Conservancy and the TAC. Additional restoration activities that may be implemented on reserve lands include, but are not limited to, the following: (1) restoring natural drainage patterns/erosion control; (2) exotic/invasive plant control; and (3) domestic/feral animal control.

Habitat Management Conservation Strategies.

General Management Strategies: Consistent with the SSMP prepared for each reserve, management activities can include: (1) control of water supply and availability; (2) suitable agricultural practices (e.g., rice growing for the snake and production of other crops for the hawk); (3) grazing or mowing programs to eliminate weeds or control vegetation; (4) exotic species control; (5) erosion control; (6) enhancement of native plant communities; (7) habitat enhancement activities for the Covered Species (e.g., construction of artificial burrows for the owl; (8) predator control; (9) enhanced ditch and drain management for the ditches owned by the Conservancy on reserve lands; and (10) coordination of any research conducted within reserves with outside species experts and other individuals or groups. Management activities deemed beneficial for some Covered Species will be conducted so that they have a minimal adverse affect on other Covered Species.

Wetland Habitat Management Conservation Strategies: The following strategies are included in the NBHCP regarding conservation practices on wetland preserves:

1. Protection from flooding. The drainage regime for managed wetlands and rice fields in the reserve system will be designed to ensure that snake retreats are not inundated when water is drained from ditches, fields, canals or wetland areas. It is also desirable to locate upland habitats inside the wetland reserve system to avoid flooding of winter retreats.

2. Managed marsh design/management. Managed marsh wetlands, together with associated uplands, rice fields, and water conveyance ditches and canals, are expected to

form a mosaic of diverse wetland habitats in the wetland portion of the reserve system that will support giant garter snakes and other wetland associated species. Embedded within an agricultural landscape dominated by rice farming, managed marsh wetlands based on such biological principles should support the snake as well as many other Covered Species (e.g., white-faced ibis, tricolored blackbird, and northwestern pond turtle). Marsh design and management shall be developed by qualified restoration biologists as part of the SSMP development process. The SSMP will consider, but is not limited to: (1) summer dry-down of seasonal marsh; (2) availability of summer water either as pockets of deeper water that persist in the seasonal marsh or as permanent marsh, located near or adjacent to vegetated banks or suitable upland habitat; (3) open water channels in marsh habitat to provide movement corridors and foraging edge; (4) availability of abundant emergent vegetation and near shore habitat; (5) a good food supply; and (6) availability of diverse habitat elements.

3. Water regime. Seasonal managed marshes will be flooded by mid-April (if not flooded during the winter) so that water and prey are available when the snake emerges from winter retreats. Water will be maintained within the managed marsh through the period when rice fields dry down (approximately mid-August). This irrigation regime is intended to provide alternative habitat to the snake as rice fields are drained and concentrate prey species from rice fields into canals and managed marshes. It is considered advantageous to include within the NBHCP's wetland reserve system some areas of permanent marshes and sloughs interspersed with the seasonal marshes, rice fields, and uplands. This will increase the overall habitat diversity of the reserves for the snake as well as other Covered Species.

4. Upland component of managed marsh. While a portion of the terrestrial component of the managed marsh system will be designed to meet the buffer requirements of the NBHCP, the rest will be designed and managed to meet the needs of the snake and upland Covered Species. The typical proportion of upland habitats within the reserve system will be approximately 20 to 30 percent. Upland areas provide basking and resting sites, escape cover and winter retreats for the snake, as well as foraging and nesting areas for other Covered Species (e.g., loggerhead shrike, tricolored blackbird, burrowing owl, and hawk). Upland areas intended to provide upland habitat for the snake under the NBHCP may consist of dryland pasture, grasslands, levees, and any other land use approved by the TAC.

5. Water conveyance structures/edge. Marsh design should include edge habitat to provide foraging and movement corridors for the snake and other Covered Species. Edge can be created by providing open water channels within marsh to provide open water/emergent vegetation interface. Upland/aquatic habitat interface may also provide edge habitat where sufficient vegetation is present to provide cover for the snake.

6. Vegetation/cover. Vegetation in a managed marsh should support a diversity of wildlife. Plant species that currently occur in the emergent marsh habitat found in the Basin will

be included in the NBHCP's managed marsh wetlands. These include cattails (*Typha latifolia)*, tules (*Scirpus acutus),* rushes (*Juncus* sp.*)*, river bulrush (*S. fluvialtilis*), sedges (*Carex* spp.*, Cyperus* spp.*),* and vervain (*Verbena hastata).* Marsh edges and "islands" will be well-vegetated with plants that discourage the movement of the snake's predators (e.g., herons, egrets, rats, and domestic animals). Plant species such as wildrose (*Rosa* spp.) and thimbleberry (*Rubus parviflorus*) are relatively impenetrable to many predator species but not to the snake and serve as basking sites for the snake. The snake utilizes a variety of sites for escape cover and winter retreats, including small mammal burrows, thick vegetation such as wildrose and thimbleberry, and areas of jumbled rock such as rip rap, chunks of rock, or broken concrete. Management of wetland reserves under the NBHCP shall therefore include protection and/or construction of such types of snake cover and retreats as deemed appropriate by the TAC.

7. Access. Road kills are believed to be a significant snake mortality factor, especially for males (see Chapter II of the NBHCP). Consequently, new roads within reserve lands will be constructed to the minimum extent necessary to provide for the adequate maintenance of the marshes and other reserve lands. If roads already exist in an area acquired as a reserve, access to these roads will be restricted as necessary to protect the reserves from unnecessary disturbance, and as described in the SSMPs.

8. Water control structures. Managed marshes require a controlled source of good quality water at suitable depths, usually less than 0.9 m (3 ft.) (water depth is important to the establishment of appropriate vegetation). Management and enhancement of a managed marsh can be maximized through water control. A variety of water manipulation approaches will be utilized, including levees, stoplog and screwgate water control structures to regulate water flows and depths, and dewatering systems.

9. Mosquito control. Mosquito control programs operate throughout Natomas Basin. Generally, conventional mosquito control methods are compatible with garter snake habitat. Use of mosquito fish and low intensity pesticide applications would not directly threaten garter snakes or their habitat, and mosquito fish may actually serve as garter snake prey. However, mosquito control programs are more focused near urban areas, and the more intensive control methods there could harm giant garter snakes. If necessary, the Conservancy should work directly with Mosquito Abatement Districts to determine suitable methods to resolve mosquito problems near urban areas in a manner consistent with the management of giant garter snake wetland habitats established under the NBHCP. The Site Specific Management Plans prepared for each wetland site shall identify appropriate types of mosquito control and shall also be coordinated as necessary with the Mosquito Abatement Districts. Pesticide use is not a covered activity under the NBHCP and therefore, any mosquito control activities using pesticides would have to be constructed in a manner that does not result in take of Covered Species.

10. Other factors. Managed marshes must be kept clear of winter storm runoff coming directly from urban areas. In addition, preserves cannot be used for any additional

purposes such as flood control or directly receive storm water or other off-site drainage from urban development. Water quality must also be maintained in order to maintain wildlife productivity and preclude the outbreak of wildlife diseases.

Management of reserve rice lands for the snake. The NBHCP recognizes that continued rice farming in the Basin supports the snake and that maintaining rice farming on a significant portion of Conservancy reserve lands is an integral component of the overall conservation strategy. With respect to the selection of rice fields for inclusion in the reserve system and their subsequent management, the following criteria shall be applied:

1. Rice fields will generally be selected in areas that are either within or have connectivity to known snake populations or known occupied snake habitat.

2. Rice fields located in areas designated to receive winter flood waters will be avoided (e.g., the Yolo and Sutter Bypasses).

3. Rice fields in the reserve system will be managed to maximize snake compatibility. This includes maintenance of rice checks, berms, and other water control structures in as natural a state as practicable, maintenance of snake prey species (e.g., mosquito fish) in or near the rice fields through appropriate management, and other measures as appropriate. Management will also, to the extent compatible with snake conservation, be compatible with the needs of commercial rice production. Specific measures for managing rice fields will be determined by the Conservancy in consultation with the TAC and in the SSMPs.

Upland reserve management and conservation strategies. The upland habitat conservation strategy is intended to provide for the long-term protection of existing and potential upland habitat in the Basin that currently supports or could support the hawk and other upland Covered Species. In most cases, upland reserves established and managed for the hawk will also benefit other upland-associated Covered Species (e.g., the loggerhead shrike and burrowing owl). Consequently, selection of upland reserve sites will usually focus on the needs of the hawk, except in cases where, in the judgement of the Conservancy and the TAC, specific or important needs of other upland-associated species can be met at sites not selected primarily for hawks.

General Avoidance, Mitigation And Minimization Measures

Land Use Agencies' Conservation Measures. The Land Use Agencies have proposed to use the following conservation measures:

1. Pre-Construction Surveys. Not less than 30 days or more than six months prior to commencement of construction activities on a specific authorized development site in the NBHCP Area, a pre-construction survey of the site shall be conducted to determine the status and presence of, and likely impacts to, all Covered Species on the site. However, if the sole period for reliable detection of that species is between May 1 and December

31, pre-construction surveys for an individual species may be completed up to one year in advance. The applicant seeking to develop land will be responsible for contracting with Wildlife Agency-approved biological consultants to carry out the pre-construction surveys, and as necessary, to implement specific take minimization, and other conservation measures set forth in the NBHCP and approved by the Service and CDFG. The results of the pre-construction surveys and recommended take minimization measures shall be documented in a report and submitted to the Land Use Agency, Service, CDFG and the Conservancy. Based upon the survey results, the Land Use Agencies will identify applicable take avoidance and other site-specific conservation measures, consistent with the NBHCP, required to be carried out on the site. The approved pre-construction survey documents and list of conservation measures will be submitted by the developer of the authorized development project to the applicable Land Use Agency to demonstrate compliance with the NBHCP. Reconnaissance-level surveys should be conducted prior to species specific surveys to determine what habitats are present on a specific development site and what, if any, more intensive survey activities should be conducted to accurately determine the status of the Covered Species on the site. It shall be the obligation of the developer/landowner to complete such surveys and the Land Use Agency's responsibility to ensure the surveys are properly completed prior to disturbance of habitat. Surveys shall be conducted by Wildlife Agency-approved biologists (e.g., persons with suitable biological, botanical, or related expertise). Note: negative species-specific survey results generally do not obviate the requirement to implement minimization measures prescribed in the revised NBHCP where a pre-construction survey indicates that habitat for a particular listed species exists onsite.

2. Preservation of the area adjacent to Fisherman's Lake. According to the City's North Natomas Community Plan, there is a buffer area along Fisherman's Lake from Del Paso Road to El Centro Road on the City side of Fisherman's Lake, a portion of the West Drain. The exact width of the buffer area has not yet been determined but it will be at least 250 feet (from the City limits), based upon a June 2002, amendment to the North Natomas Financing Plan (C. Shearly, pers. Comm.). The east side of Fisherman's Lake is in the City and the west side is in the unincorporated portion of Sacramento County. Pursuant to the Settlement Agreement, the City has agreed to initiate a North Natomas Community Plan amendment to potentially widen the agricultural buffer along the City side of Fisherman's lake to 244 m (800 ft.).

   Fisherman's Lake, and the immediately adjacent areas are, and will continue to be, owned and managed by RD 1000. The City is creating a buffer along the east side of Fisherman's Lake and has amended the North Natomas Financing Plan to include the buffer area along Fisherman's Lake in the Land Acquisition Program. In the case of acquiring the buffer, the development impact fee is a public land acquisition program fee charged to all developers to fund the acquisition of public lands (i.e., land for community centers, fire stations, etc.). The Fisherman's Lake buffer is part of the public land acquisition program (C. Shearly, pers. comm.). The buffer area will likely be managed by the Conservancy.

3. General Measures to Minimize Take. In order to generally minimize the impacts of development on Covered Species, the City and Sutter shall impose the following requirements on authorized development when approving urban development permits within the Basin:

   a. Tree preservation. Valley oaks and other large trees should be preserved whenever possible. Stands of riparian trees used by hawks and other animals for nesting, particularly adjacent to Fisherman's Lake, will be preserved and restored.

   b. Native plants. The wildlife value of landscaped parks, buffers, and developed areas will be improved by planting trees and shrubs which are native to the Basin.

   c. Protect raptor nests. The raptor nesting season will be avoided when scheduling construction near nests. Specific avoidance criteria are set forth in the species-specific measures (discussed below).

   d. Protected plant/animal species, also referred to as "Special Status Species". Surveys for Covered Species will be conducted during the appropriate season.

Species-Specific Conservation Measures

Avoidance, Minimization, and Mitigation Measures for the Threatened Vernal Pool Fairy Shrimp, Endangered Vernal Pool Tadpole Shrimp, Threatened Colusa grass, Endangered Sacramento Orcutt grass, Threatened slender Orcutt grass, Midvalley Fairy Shrimp, Legenere, and Bogg's Lake Hedge-Hyssop.

Ten species associated with vernal pools or other seasonal wetlands are proposed for coverage under the NBHCP's ITPs, including three shrimp species, five plant species, and two amphibians. Only two of the ten vernal pool species covered by the NBHCP (vernal pool tadpole shrimp and vernal pool fairy shrimp) have been confirmed within the Basin.

Undisturbed areas of vernal pools within the Basin are few and relatively small. The primary purpose of including the vernal pool associated species within the NBHCP is to provide protection to the Conservancy with regard to the management of future wildlife reserves. The complex of wetland/upland habitat to be developed by the Conservancy may provide enhanced opportunities for the establishment and proliferation of vernal pool species. In the event vernal pool species do benefit from the Conservancy's efforts, it will be necessary to provide coverage to the Conservancy for activities that could result in incidental take of them. However, the Land Use Agencies (except MAPPOA) are also seeking coverage because suitable habitat for these species likely exists in their Permit Areas (except MAP).

The Land Use Agencies will employ the following measures to reduce take of the vernal pool fairy shrimp, vernal pool tadpole shrimp, and midvalley fairy shrimp, and to minimize and mitigate for the loss of Colusa grass, Sacramento Orcutt grass, slender Orcutt grass, legenere, and Bogg's Lake hedge-hyssop:

1. Prior to approval of an urban development permit, the involved Land Use Agency will require Wildlife Agency-approved pre-construction surveys. If the surveys determine that Covered vernal pool species are present, the Land Use Agency will require the developer to consult with the Service to determine appropriate measures to avoid and minimize take/loss of individuals. Procedures for reviewing projects that could affect vernal pools and vernal pool species are discussed below.

    a. General biological survey and information required. In the event a biological reconnaissance survey or the pre-construction survey identifies that vernal pool resources are on-site, a vernal pool species-specific biological assessment must be provided by the developer to the Land Use Agency to determine the type and abundance of species present. The species-specific biological assessment must address covered vernal pool plants (i.e., Sacramento Orcutt grass, slender Orcutt grass, Colusa grass, legenere, and Bogg's lake hedge-hyssop), crustaceans (i.e., vernal pool tadpole shrimp, vernal pool fairy shrimp, and midvalley fairy shrimp), and amphibians (i.e., California tiger salamander and western spadefoot toad). The vernal pool plant survey must be a Service-approved plant survey prepared by a Service-approved qualified field biologist and will list the methods of field analysis, condition of habitat, size and acreage of direct and indirect impact (as defined by seasonal inundation and hydric soils and other appropriate characteristics), and species present. The vernal pool crustacean survey will be in accordance with the Service's *Interim Survey Guidelines to Permittees for Recovery Permits under Section 10(a)(1)(A) of the Endangered Species Act for the Listed Vernal Pool Branchiopods* (April 19, 1996) or the most recent Service-approved survey guidelines for vernal pool species (see Appendix L of the NBHCP). The biological assessment must be submitted with the Urban Development Permit application and prior to approval of an Urban Development Permit by the Land Use Agency. If it is determined that wetland and/or vernal pool resources would be disturbed by a project, then take of vernal pool-associated Covered Species would be covered under the NBHCP, subject to the following limitation and guidelines:

        i. Where site investigations indicate vernal pool species may occur, the developer will notify the Land Use Agency regarding the potential for impacts to vernal pool species. Such notification will include biological data (see Section (a) above regarding biological information required) adequate to allow the Land Use Agency, and the Service and CDFG to determine the potential for impacts to vernal pool species resulting from the proposed development.

ii. Following notification by the Land Use Agency, the Service and CDFG will 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 (e.g., the Service's programmatic biological opinion for vernal pool species attached as Appendix G to the NBHCP). In some cases, the Service and CDFG may require complete avoidance of vernal pool species, such as where Covered Species such as slender Orcutt grass, Sacramento Orcutt grass, Colusa grass and/or vernal pool tadpole shrimp are found to be present. Such measures will be identified by the Service and CDFG within 30 days or as soon as possible thereafter of notification and submittal of biological data to the Wildlife Agencies by the Land Use Agency.

iii. The requirement by the Service to preserve a vernal pool within development would be based on identification of an intact vernal pool with minimal disturbance where the presence of one or more of the following species is recorded: slender Orcutt grass, Sacramento Orcutt grass, Colusa grass, or vernal pool tadpole shrimp. Prior to requiring on-site preservation of a vernal pool area, the Service will consider the suitability of the vernal pool as Conservancy Mitigation Lands. The Service will not require the vernal pool to be preserved unless it is appropriate as Conservancy mitigation lands. Such vernal pool areas, including any required buffer land dedication, will apply toward the Land Acquisition Fee component of the development project's NBHCP mitigation obligation.

b. Mitigation Strategies. Vernal pool resources (i.e., vernal pool fairy shrimp, vernal pool tadpole shrimp, midvalley fairy shrimp, Sacramento Orcutt grass, slender Orcutt grass, Colusa grass, legenere, and Bogg's Lake hedge-hyssop) identified through site specific investigations will be mitigated in one of three general approaches as described below. Strategies to minimize and mitigate the take of the California tiger salamander and western spadefoot toad will be conducted according to Sections V.A.5 and V.B.4 of the NBHCP.

i. Avoidance and preservation on-site as a means to minimize impacts. In the event the Service requires on-site preservation in accordance with Section a.3 of the NBHCP, on-site mitigation will be required. In the event the Service does not require on-site mitigation, a developer or private land owner may still propose to dedicate fee title or conservation easement for that portion of the property with vernal pool resources and an associated 250-foot buffer surrounding the vernal pool resource to the Conservancy. Acceptance of the offer to dedicate will be subject to review and approval by the Land Use Agency, the Conservancy's Board and the

Wildlife Agencies. The Conservancy's Board of Directors and the Wildlife Agencies will consider the location, connections, species present, condition of the proposed site to be dedicated, and may decide to accept the dedication in lieu of payment of the Land Acquisition Fee portion of the NBHCP Mitigation Fee for the affected acreage. The Conservancy's Board of Directors may accept or decline the offer based on the balance of habitat needs and the biological goals of the NBHCP. If the dedication is accepted, a reduction in the Land Acquisition Fee portion of the habitat Mitigation Fee will be granted the developer for the portion (calculated on an acreage basis) of the site permanently preserved by easement or dedication. However, habitat Mitigation Fees must be paid on the remaining developable acreage on the site, and all fees other than Land Acquisition Fees will be paid for all acres on the site. Additional conditions to preserve the biological integrity of the site (such as reasonable drainage conditions) may be imposed by the Land Use Agency in consultation with the Conservancy and the Conservancy's TAC. In the event the developer does not support on-site preservation or the Conservancy does not accept the offer to dedicate, then one of the following mitigation approaches will be employed.

ii. Construction period avoidance and relocation of vernal pool resources. No grading, development or modification of the vernal pool site or the buffer area extending 76.2 m (250 ft.) around the perimeter of the vernal pool site may occur during the vernal pool "wet" season, as determined by the Service. Protective fencing will be established around the perimeter of the vernal pool site and the buffer area during the vernal pool wet season. In consultation with Conservancy and the TAC, soils and cysts from the vernal pool may be relocated as soon as practicable during the dry season to a suitable Conservancy reserve or other reserve site, provided the relocation/recreation site is approved by Conservancy, TAC and the Service. If it is not practicable to relocate vernal pool resources, and/or the Conservancy and the TAC determine that the Conservancy does not have a suitable reserve site for relocation of resources, then the applicant will follow the mitigation approach outlined in Section (iii) below.

iii. Payment into a Service approved conservation bank. In the event all of the above approaches are not appropriate for the site, the Land Use Agency will require the developer to purchase credits from a Service-approved mitigation bank in accordance with the standards set forth in Table 3. The Service will determine the type and amount of credits to be purchased based on the impacts associated with the development.

In order to ensure that vernal pools and their associated species are adequately protected on reserve lands, the Conservancy will consult with the TAC and vernal pool crustacean experts

periodically during implementation of the NBHCP to determine what, if any, additional conservation opportunities for vernal pool fairy shrimp, vernal pool tadpole shrimp, midvalley fairy shrimp, Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, Boggs Lake hedge-hyssop, and legenere might exist within the proposed reserve system. Any conservation measures identified through this process will be incorporated, as appropriate, into the NBHCP's conservation program through its adaptive management provisions.

Threatened Giant Garter Snake Avoidance and Minimization Measures. The Land Use Agencies have proposed to employ or ensure that the following measures are followed to minimize and avoid the effects of the proposed action on the snake:

1. Within the Basin, all construction activity involving disturbance of habitat, such as site preparation and initial grading, will be restricted to the snake's active period (May 1 - September 30).

2. Pre-construction surveys for the snake, as well as other Covered Species, will be completed for all development projects by a qualified biologist who has been approved by the Service. If snake habitat is found within a specific site, the following additional measures will be implemented to minimize disturbance of habitat and harassment of the snake, unless that project is specifically exempted by the Service:

    a. Between April 15 and September 30, all irrigation ditches, canals, or other aquatic habitat will be completely dewatered, with no puddled water remaining, for at least 15 consecutive days prior to the excavation or filling in of the dewatered habitat. The dewatered habitat will be observed to ensure that it does not continue to support snake prey, which could attract snakes to the project site. If a site cannot be completely dewatered, snake prey items will be removed using netting or other salvage methods.

    b. No more than 24-hours prior to the start of construction activities (site preparation and/or grading), the project area will be surveyed for snakes. If construction activities stop on the project site for a period of two weeks or more, a new snake survey will be completed no more than 24-hours prior to the re-start of construction activities.

    c. Clearing will be confined to the minimal area necessary to facilitate construction activities. Giant garter snake habitat within or adjacent to the project as will be flagged as Environmentally Sensitive Areas and designated as avoided. This area will be avoided by all construction personnel.

    d. Construction personnel completing site preparation and grading operations will receive Service-approved environmental awareness training. This training instructs workers on how to identify the snake and its habitats and what to do if a

snake is encountered during construction activities. An on-site biological monitor will be designated during the training.

e. If a live snake is found during construction activities, the Service and the project's biological monitor will be immediately notified. The biological monitor, or his/her assignee, will halt construction in the vicinity of the snake. The snake will be monitored and allowed to leave the area on its own. The monitor will remain in the area for the remainder of the work day to make sure the snake is not harmed or, if it leaves the site, does not return. Escape routes for the snake should be determined in advance of construction and snakes should always be allowed to leave on their own. If a snake does not leave on its own within one working day, further consultation with the Service will be conducted.

f. Upon locating dead, injured or sick Covered Species, the Permittees or their designated agents will notify, within one working day, the Service's Division of Law Enforcement (2800 Cottage Way, Sacramento CA 95825) or the Sacramento Fish and Wildlife Office (2800 Cottage Way, Room W-2605, Sacramento, CA 95825, telephone 916 414-6600). Written notification to both offices will be made within three calendar days and will include the date, time, and location of the finding of a specimen and any other pertinent information.

g. Fill or construction debris may be used by the snake as an over-wintering site. Therefore, upon completion of construction activities, any temporary fill and/or construction debris will be removed from the site. If the material is located near undisturbed snake habitat and will be removed between October 1 and April 30, it will be inspected by a Wildlife Agency-approved biologist to ensure that snakes are not using it as hibernaculae.

h. No plastic, monofilament, jute, or similar erosion control matting that could entangle snakes will be placed on the project site when working within 200 feet of snake aquatic or rice habitat. Possible substitutes include coconut coir matting, tackified hydroseeding compounds, or other materials approved by the Wildlife Agencies.

i. Fences will be constructed along the shared boundary of urban development and the North Drainage Canal and the East Drainage Canal within Sutter's Permit Area, subject to the following guidelines:

1. A minimum of 30.5 m (100 ft.) will be provided from fence-to-fence and access to the canals will be limited by gates.

2. A snake deterrent will be placed along the fences on the North Drainage Canal and the East Drainage Canal (i.e., fence construction that restricts snake movement or an appropriate vegetative barrier either inside or

outside of the boundary fence). The design of the deterrent will be subject to approval by the Wildlife Agencies.

3. The specific fence/snake barrier design adjacent to a given development will be determined within Sutter County's review of the proposed development and the fence/barrier will be installed immediately after site grading is completed.

i. At the time of urban development along the North and East Drainage Canals, Sutter will consult with the Wildlife Agencies to determine design strategies that would enhance conditions for giant garter snake movement through the North and East Drainage Canals. Possible strategies may include expanded buffer areas and modified canal cross sections if such measures are, in the determination of Sutter and the Water Agencies, found to be feasible.

The Conservancy has proposed to employ the following measures to minimize and avoid the effects of the proposed action on the snake:

1. All construction activity involving disturbance of habitat, such as site preparation and initial grading, will be restricted to the snake's active period (May 1 - September 30).

2. Pre-construction surveys for the snake, as well as other Covered Species, will be completed for all development projects by a qualified biologist who has been approved by the Service. If snake habitat is found within a specific site, the following additional measures will be implemented to minimize disturbance of habitat and harassment of the snake, unless that project is specifically exempted by the Service:

a. Between April 15 and September 30, all irrigation ditches, canals, or other aquatic habitat will be completely dewatered, with no puddled water remaining, for at least 15 consecutive days prior to the excavation or filling in of the dewatered habitat. The dewatered habitat will be observed to ensure that it does not continue to support snake prey, which could attract snakes to the project site. If a site cannot be completely dewatered, snake prey items will be removed using netting or other salvage methods.

b. Construction activities within 200 feet from banks of giant garter snake aquatic habitat will be avoided to the extent feasible. Movement of heavy equipment will be confined to existing roadways to minimize habitat disturbance to the extent feasible.

c. No more than 24-hours prior to the start of construction activities (site preparation and/or grading), the project area will be surveyed for snakes. If construction activities stop on the project site for a period of two weeks or more, a new snake

survey will be completed no more than 24-hours prior to the re-start of construction activities.

d. Clearing will be confined to the minimal area necessary to facilitate construction activities. Snake habitat within or adjacent to the project will be flagged for avoidance. The avoidance area will be avoided by all construction personnel.

e. Construction personnel completing site preparation and grading operations will receive Service-approved environmental awareness training. This training instructs workers on how to identify the snake and its habitats and what to do if a snake is encountered during construction activities. An on-site biological monitor will be designated during the training.

f. If a live snake is found during construction activities, the Service and the project's biological monitor will be immediately notified. The biological monitor, or his/her assignee, will halt construction in the vicinity of the snake. The snake will be monitored and allowed to leave the area on its own. The monitor will remain in the area for the remainder of the work day to make sure the snake is not harmed or, if it leaves the site, does not return. Escape routes for the snake should be determined in advance of construction and snakes should always be allowed to leave on their own. If a snake does not leave on its own within one working day, further consultation with the Service will be conducted.

g. Upon locating dead, injured or sick Covered Species, the Conservancy or its designated agents will notify, within one working day, the Service's Division of Law Enforcement (2800 Cottage Way, Sacramento CA 95825) or the Sacramento Fish and Wildlife Office (2800 Cottage Way, Room W-2605, Sacramento, CA 95825, telephone 916 414-6600). Written notification to both offices will be made within three calendar days and will include the date, time, and location of the finding of a specimen and any other pertinent information.

h. Fill or construction debris may be used by the snake as an over-wintering site. Therefore, upon completion of construction activities, any temporary fill and/or construction debris will be removed from the site. If the material is located near undisturbed snake habitat and will be removed between October 1 and April 30, it will be inspected by a Wildlife Agency-approved biologist to ensure that snakes are not using it as hibernaculae.

i. No plastic, monofilament, jute, or similar erosion control matting that could entangle snakes will be placed on the project site when working within 200 feet of snake aquatic or rice habitat. Possible substitutes include coconut coir matting, tackified hydroseeding compounds, or other materials approved by the Wildlife Agencies.

Threatened Valley Elderberry Longhorn Beetle Avoidance and Minimization Measures.

The Land Use Agencies will require private developers and public infrastructure projects to comply with conservation practices for the beetle set forth in the Service's July 9, 1999, *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (Beetle Guidelines)(enclosed), which may be updated in the future. In addition, the Conservancy will follow the Beetle Guidelines. Any destruction or loss of elderberry shrub habitat will be mitigated according to the Beetle Guidelines. The Beetle Guidelines, or any revision or successor to the Beetle Guidelines approved by the Service, are incorporated as terms and conditions of the NBHCP.

Swainson's Hawk Avoidance and Minimization Measures.

In order to minimize the cumulative effects of the proposed action on the Swainson's hawk's foraging habitat, Sutter will not obtain coverage under the NBHCP and ITPs, nor will Sutter grant urban development permit approvals, for development on land within the one-mile wide Swainson's Hawk Zone. The City has limited its Permit Area within the Swainson's Hawk Zone to approximately 252 acres in the North Natomas Community Plan that was designated for urban development in 1994 and, likewise, will not grant development approvals within the Swainson's Hawk Zone beyond this designated 252 acres. Should either the City or Sutter seek to expand NBHCP coverage for development within the Swainson's Hawk Zone beyond that described above, granting of such coverage would require an amendment to the NBHCP and ITPs, which would be subject to review and approval by the Service and the CDFG in accordance with all applicable statutory and regulatory requirements. Approval of any Urban Development within the Swainson's Hawk Zone beyond that described above would constitute a significant departure from the Plan's OCP and would trigger a reevaluation of the City's and/or Sutter's ITPs and possible suspension or revocation of the City's and/or County's ITPs.

The Land Use Agencies will employ the following measures to minimize disturbance of the Swainson's hawk's nesting habitat:

1. Prior to the commencement of activities at any development site within the NBHCP area, a pre-construction survey will be completed by the site's developer to determine: (1) whether any hawk nest trees will be removed on-site; or (2) whether any active hawk nest sites occur on or within ½ mile of the development site. These surveys will be conducted by experienced hawk surveyors and according to the Swainson's Hawk Technical Advisory Committee's (May 31, 2000, enclosed) methodology or updated methodologies, as approved by the Service and CDFG.

2. If breeding hawks are identified, no new disturbances will occur within ½ mile of the active nest between March 15 and September 15, or until a Wildlife Agency-approved biologist, with concurrence by CDFG, has determined that the young have fledged or that the nest is no longer occupied. If the active nest site is located within 1/4 mile of existing urban development, the no new disturbance zone can be limited to 1/4 mile. Routine

disturbances such as agricultural activities, commuter traffic, and routine facility maintenance activities within ½ mile of an active nest will not be restricted.

3. Where disturbance of a hawk nest cannot be avoided, such disturbance will be deferred until after the nesting season (March 15 - September 15). If a nest tree must be removed, tree removal will only occur between September 15 and February 1.

4. If a Swainson's hawk nest tree must be removed and fledglings are present, the tree may not be removed until September 15 or until CDFG has determined that the young have fledged and are no longer dependent upon the nest tree.

5. If construction or other project related activities which may cause nest abandonment or forced fledgling are proposed within the 1/4 mile buffer zone, intensive monitoring (funded by the project sponsor) by a CDFG-approved raptor biologist will be required. Exact implementation of this measure will be based on specific information at the project site.

The Land Use Agencies will employ the following measures to prevent the loss of Swainson's hawk nest trees:

1. Valley oaks, tree groves, riparian habitat and other large trees will be preserved wherever possible. The City and Sutter will preserve and restore stands of riparian trees used by the hawk and other animals, particularly near Fisherman's Lake and elsewhere in the NBHCP Plan Area where large oak groves, tree groves and riparian habitat have been identified.

2. The raptor nesting season will be avoided when scheduling construction near nests in accordance with guidelines applicable guidelines published by the Wildlife Agencies or through consultation with the Wild life Agencies.

3. Annually, prior to the Swainson's hawk nesting season (March 15 to September 15) and until build out of their Authorized Development has occurred, the City and Sutter will notify each landowner of any property within the permit area(s) on which a Swainson's hawk nest tree is present, and will identify the nest tree, and alert the owner to the specific mitigation measures prohibiting the owner from removing the nest tree.

The Land Use Agencies will employ the following measures to mitigate the loss of Swainson's hawk nest trees:

1. The NBHCP will require 15 trees to be planted (5 gallon container size) within the habitat reserves for every hawk nesting tree anticipated to be impacted by authorized development. It will be the responsibility of each Land Use Agency approving development that will impact hawk nest trees to provide funding from the applicable developer for the purchase, planting, maintenance and monitoring of trees at the time of

approval of each authorized development project. The Conservancy will determine the appropriate cost for planting, maintenance and monitoring of trees.

2. The Land Use Agency approving a project that impacts an existing hawk nest tree will provide funding sufficient for monitoring survival of replacement trees (as described in item 1 above) for a period of five years. For every tree lost during the five-year monitoring period, a replacement tree will be planted immediately upon the detection of failure. Trees planted to replace trees lost will be monitored for an additional five-year period to ensure survival until the end of the monitoring period. A 100 percent success rate will be achieved. All necessary planting requirements and maintenance (i.e., fertilizing , irrigation) to ensure success will be provided. Trees must be irrigated for a minimum of the first five years after planting, and then gradually weaned off the irrigation in an approximate two-year period. If larger stock is planted, the number of years of irrigation must be increased accordingly. In addition, ten years after planting, a survey of the trees will be completed to assure 100 percent establishment success.

3. Of the replacement trees planted, a variety of native tree species will be planted to provide trees with differing growth rates, maturation, and life span. This will ensure that nesting habitat will be available quickly (5-10 years in the case of cottonwoods and willows), and in the long term (i.e., valley oaks, black walnut and sycamores), and minimize the temporal losses from impacts to trees within areas scheduled for development within the 50-year ITP life. Trees will be sited on reserves in proximity to hawk foraging areas and planted in clumps of three trees each. Planting stock will be at a minimum 5-gallon container stock for oak and walnut species.

4. In order to reduce temporal effects resulting from the loss of mature nest trees, mitigation planting will occur within 14 months of approval of the NBHCP and ITPs. The July 2002 draft NBHCP estimated that four nesting trees within the City are most likely to be affected by authorized development in the near term. Therefore, in order to reduce temporal impacts, the City will advance funding for 60 sapling trees of diverse, suitable species (different growing rates) to the Conservancy within the above referenced 14 months.

5. For each additional nesting tree removed by Land Use Agencies' Covered Activities, the Land Use Agency will fund and provide for the planting of 15 native sapling trees of suitable species with differing growth rates at suitable locations on Conservancy reserves. Funding for such plantings will be provided by the applicable Land Use Agency within 30 days of approving a Covered Activity that will impact a hawk nesting tree.

In the event that foraging opportunities, as identified in Table IV-2 of the NBHCP (i.e., foraging opportunities within Sutter and Sacramento County), are converted to urban uses without adequate provisions to maintain foraging habitat, such that the effectiveness of the NBHCP's OCP is potentially compromised, the City and Sutter would consider and the Conservancy, on behalf of the City and Sutter, would implement appropriate actions, including the following or

similar measures:

1. Modification of acquisition criteria (as defined in Sections IV.C.2.d and IV.C.4.b) to adjust for impacts to foraging habitat outside of reserves. This could include changes to increase the value of future upland reserve habitat acquisitions for the hawk. For example, the criteria could be changed to further maximize the acquisition of habitat reserves in close proximity to suitable foraging habitat while avoiding the habitat areas that have recently been converted to non-compatible uses.

2. Substitution of reserve sites that have not been restored and are impacted by substantial land use changes, with replacement reserve sites that would provide improved foraging habitat opportunities.

3. Modification of the percentages of the habitat types comprising Conservancy reserve sites. For example, the percentage of uplands in reserve sites could be increased. Such modifications would be applied prospectively to future Conservancy acquisitions and would not affect existing, improved Conservancy reserves.

4. Pursuit of outside funding sources, including private, state and Federal grants, to acquire, improve and manage additional Conservancy reserves that would maintain Basin foraging lands. The Conservancy would be responsible for preparing grant applications or undertaking other actions, as necessary, to secure these funds. Such programs would supplement the mitigation fee required by the NBHCP and would not be used to fund NBHCP mitigation obligations. Lack of outside funding would not preclude the City and Sutter County's obligation to implement appropriate action consistent with this provision and their respective obligations under the NBHCP.

The Conservancy will implement the following measures to further enhance habitat and to reduce the potential for take of upland Covered Species during improvement, operation and maintenance of Conservancy reserves:

1. The Conservancy, in conjunction with the Land Use Agencies, will monitor proposed development in the Swainson's Hawk Zone, where the majority of known hawk nest sites are currently located and, hence, much of the hawk nesting and foraging in the Basin occurs. Based upon existing general plans and the City's and Sutter's NBHCP Permit Areas, development in this zone is expected to be limited over the life of the NBHCP. However, if the NBHCP is amended and such development does occur, mitigation lands established for such development will, likewise, be located within the Swainson's Hawk Zone. In addition, the Conservancy will set as a top priority the acquisition of upland reserve sites in the Swainson's Hawk Zone. Further, any upland reserve lands established in the Swainson's Hawk Zone will, to the maximum extent possible, be managed to benefit all upland-associated Covered Species, though any management in this zone will be fully consistent with Swainson's hawk biology and needs.

2. To enhance the success of upland species, Conservancy reserves will include tree plantings of valley oaks, cottonwoods, various willow (including black willow), or other suitable species to recreate suitable nesting sites for the hawk over the life of the NBHCP. Such tree planting will be in reasonable proximity to upland foraging areas covered by the NBHCP, including agricultural areas managed by the Conservancy.

3. For rice fields operated by the Conservancy, production practices will be incorporated that increase habitat for Swainson's hawk. This includes allowing at least 10 percent of rice fields to fallow each year as well as allowing foraging before and after rice flooding.

4. Where possible, upland components of wetland reserves will be developed or restored such that upland Covered Species, including the hawk, also benefit from the habitat.

5. Best management practices to ensure availability of food sources for the hawk [including meadow voles (*Microtus californicus*) and insects] will be utilized. It is expected that improved agricultural practices, timing of water management (floodup and drawdown) on reserve lands, and the increase in edge or ecotone between upland and wetland habitats will greatly enhance upland habitat values for the hawk.

6. The Conservancy, in consultation with the TAC, will formulate specific plans for the acquisition of upland habitat reserve lands by applying the objectives and criteria described above, and consistent with the requirements described in Chapter IV of the NBHCP. Site-specific management plans for reserve sites providing hawk habitat will be developed as described in Chapter IV of the NBHCP.

7. Upland reserves will initially be designed to maintain existing hawk populations and, where possible, to increase such populations through the tree planting program. However, such reserves will be re-designed, as necessary, to meet hawk recovery plan goals, once a Swainson's Hawk recovery plan has been prepared and approved by CDFG.

8. Reserve design will use wildlife-friendly agricultural practices. For health and safety reasons, rodent control measures will be limited to that necessary to maintain structurally sound flood control levees within the Basin.

The Conservancy will implement the following measures to avoid, minimize, and mitigate Swainson's hawk nest disturbance:

1. Prior to the commencement of development activities at any reserve sites, a pre-construction survey will be completed by the Conservancy to determine whether any hawk nest trees will be removed on-site or whether active hawk nest sites occur on or within ½ mile of the development site. These surveys will be conducted according to the Swainson's Hawk Technical Advisory Committee's (May 31, 2000) methodology or updated methodologies, as approved by the SSMP, for the reserve site.

2. If an active hawk nest is identified, no new disturbances (e.g., heavy equipment operation associated with construction) will occur within ½ mile of the active nest site between March 15 and September 15. If the active site is located within 1/4 mile of existing urban development, the no new disturbance zone can be limited to 1/4 mile. Routine disturbances such as agricultural activities, commuter traffic and routine facility maintenance activities within ½ mile of an active nest site will not be restricted.

3. If practicable, disturbance or destruction of hawk nest sites will be entirely avoided by designing the project (including construction activities) to maintain the year-round integrity of the nest site.

4. If practicable, disturbance or destruction of the hawk's nest site will be avoided during the active nesting season through seasonal use or other restrictions that apply annually or as needed.

5. Where disturbance of a hawk nest cannot be avoided, such disturbance will be deferred until after the hawk's nesting season (March 15 - September 15). If any tree must be removed that has an active nest in the year the impact is to occur, the tree removal should

only occur between September 15 and February 1.

6. Disturbance should be avoided within ½ mile of an active nest between March 15 and August 15, or until fledglings are no longer dependent on nest tree habitat (which could be as late as September 15).

7. If a hawk nest tree is to be removed and fledglings are present, the tree may not be removed until September 15 or until CDFG has determined that the young have fledged and are no longer dependent upon the nest tree.

The Conservancy will plant replacement trees in upland reserve areas and where appropriate on the edges of wetland reserves. These trees may be contributed to the reserve as part of the Land Use Agencies' tree mitigation program or may be determined to be important to the habitat enhancement of objectives of the site. The replacement mitigation trees shall include a variety of native tree species with differing growth rates, maturation and life span. This will ensure that nesting habitat will be available quickly (5 to 10 years in the case of cottonwoods and willows) and in the long term (i.e., valley oaks, black walnut and sycamores). Trees shall be sited on reserves in proximity to hawk foraging areas.

Tricolored Blackbird Avoidance and Minimization Measures.

The Land Use Agencies will employ the following conservation measures to avoid, minimize, and mitigate the effects of the proposed action on the blackbird:

1. Prior to approval of an urban development permit, the involved Land Use Agency will require a pre-construction survey of potential breeding and nesting habitat for presence of breeding and nesting tricolored blackbirds.

2. If surveys determine tricolored blackbirds are present, the following measures will be implemented in accordance with the MBTA to avoid disturbance to active (occupied) nesting colonies during the nesting season: (1) a boundary will be marked by brightly colored construction fencing that establishes a boundary 152.4 m (500 ft.) from the active nest site; (2) no disturbance associated with authorized development will occur within the fenced area during the nesting season (April 1 - July 1); and (3) a Wildlife Agency-approved biologist, with concurrence of the Service, must determine young have fledged and nest sites are no longer active before the nest site may be disturbed.

The Conservancy will employ the following conservation measures on reserve lands to minimize the effects of the proposed action on the blackbird:

1. Foraging.

   a. As part of baseline species survey for each reserve and as part of the annual survey of reserves, any colonization by tricolored blackbirds will be recorded by location and if possible, with a population estimate and activity description.

   b. Where tricolored blackbirds have been observed in colonies (active nesting and foraging), the nesting area and a reasonable foraging area adjacent to the nesting area within the reserve will be identified and incorporated into the SSMP, or if necessary, accommodated through adaptive management of an existing developed reserve.

   c. In order to enhance wetland to upland edges of reserves to attract tricolored blackbirds, plantings of wild rose, tule and cattails will be incorporated in habitat reserve units where biologically appropriate.

   d. During the nesting season, disturbance of foraging areas adjacent to active nest sites or previously active nest sites on reserve lands will be avoided to the maximum extent possible. If nests are occupied, a reasonable buffer of foraging lands adjacent to the nest will be marked and protected on reserve lands.

2. Nesting

   a. Disturbance to tricolored blackbird nesting colonies will be strictly avoided within the nesting season (April 1 to July 1 or while birds are present) during Conservancy development and management activities undertaken on Conservancy property in wetland and upland reserve areas unless approved by the Service and CDFG. In accordance with the MBTA, disturbance to active (occupied) nesting colonies will be avoided during the nesting season. A boundary will be established (through a method determined by the Conservancy and in consultation with the TAC) to establish a boundary 152.4 m (500 ft.) from the active nest site on reserve lands. No disturbance associated with Conservancy reserve construction, such as major grading operations will occur within the designated 500 foot buffer of the reserve during the nesting season of April 1 to July 1 or while birds are present, unless a Wildlife Agency-approved biologist, with concurrence of the Service and CDFG, determines young have fledged and nest sites are no longer active. Routine disturbances such as agricultural activities and Conservancy reserve management within 152.4 m (500 ft.) of an active nest site are not restricted so long as no physical disturbance to the nest site occurs.

   b. During the nesting season, disturbance of foraging areas adjacent to active nest sites or previously active nest sites on reserve lands will be avoided to the maximum extent possible. If nests are occupied, a reasonable buffer of foraging

lands adjacent to the nest will be marked and protected on reserve lands if construction or major grading operations are occurring on the Reserve.

c. Plantings of wild rose, tule and cattails will be incorporated in habitat reserve units where biologically appropriate to enhance tricolored blackbird nesting habitat.

The NBHCP includes measures to avoid, minimize, and mitigate take of the snake. Because the tricolored blackbird shares some habitat similarities with the snake, these measures may also benefit the blackbird. Specific measures include: (1) timing restrictions; (2) dewatering requirements; and (3) and vegetation control management.

Aleutian Canada Goose Avoidance and Minimization Measures.

In order to avoid, minimize, and mitigate take of the proposed action on the goose, prior to approval of an urban development permit, the applicable Land Use Agency will require a pre-construction survey. If the survey determines geese are present, the Land Use Agency will require the developer to consult with the Service and CDFG to determine appropriate measures to avoid and minimize take of individuals. Such measures will be appropriate for the use (e.g., foraging, roosting, etc.) and activity of the species, since the goose is only seasonally present in the Basin.

In order to minimize the effects of the proposed action on the goose, the Conservancy will utilize applicable Service-approved goose recovery or management plans and the adaptive management provisions described in the NBHCP to implement any additional conservation measures deemed appropriate should use of the NBHCP Area by the goose appreciably increase at any time in the future.

White-faced Ibis Avoidance and Minimization Measures.

The following measures have been proposed by the Land Use Agencies to avoid, minimize, and mitigate take of the white-faced ibis:

1. Prior to approval of an urban development permit, the involved Land Use Agency will require a pre-construction survey.

2. If surveys determine the presence of active nest sites of white-faced ibis, disturbance by authorized development within 1/4 mile of nests will be avoided within the nesting season of May 15 through August 31, or until a Wildlife Agency-approved biologist, with concurrence of the Service, has determined that young have fledged or that the nest is no longer occupied.

In order to minimize the effects of the proposed action on the ibis, the Conservancy proposes to:

1. Utilize applicable Service-approved white-faced ibis recovery or management plans, and the adaptive management provisions described in the NBHCP to implement any additional conservation measures deemed appropriate should use of the Plan Area by the ibis appreciably increase at any time in the future.

2. Disturbance to white-faced ibis nesting colonies by Conservancy reserve construction activities will be strictly avoided within the nesting season (May 15 to August 31 or while birds are present, or until a Wildlife Agency-approved biologist, with concurrence of the Service and CDFG, has determined that young have fledged or that the nest is no longer occupied). During the nesting season, a foraging buffer 1/4 mile in width will be identified around any active nest site to ensure minimal disturbance to the nest and nearby foraging areas on reserve lands.

Loggerhead Shrike Avoidance and Minimization Measures.

The Land Use Agencies have proposed the following measures to avoid, minimize, and mitigate take of the loggerhead shrike:

1. Prior to approval of an urban development permit, the involved Land Use Agency will require a pre-construction survey.

2. If surveys identify an active loggerhead shrike nest that will be impacted by authorized development, the developer will install brightly colored construction fencing that establishes a boundary 30.5 m (100 ft.) from the active nest. No disturbance associated with authorized development will occur within the 100 foot fenced area during the nesting season (March 1 - July 31). A Wildlife Agency-approved biologist, with concurrence of the Service, must determine young have fledged or that the nest is no longer occupied prior to disturbance of the nest site.

The Conservancy has proposed the following measures to avoid, minimize, and mitigate take of loggerhead shrike:

1. The Conservancy will encourage and maintain loggerhead shrike perching and nesting sites to the maximum extent practicable on all Conservancy lands.

2. The Conservancy will avoid disturbance to loggerhead shrike nest sites and disturbance of the loggerhead shrike during nesting season during reserve management and enhancement activities to the maximum extent practicable, unless otherwise approved by the Conservancy and the TAC.

3. If the loggerhead shrike nests on a Conservancy reserve, the Conservancy will establish, identify and mark (through a method determined appropriate by the Conservancy and in consultation with the TAC) a buffer extending 30.5 m (100 ft.) from the active nest on reserve lands. No disturbance associated with Conservancy reserve construction, such as major grading activities, will occur within the 100 ft. marked area during the nesting season of March 1 through July 31, unless a Wildlife Agency-approved biologist, with concurrence of the Service and CDFG, determines young have fledged or that the nest is no longer occupied. Routine disturbances such as agricultural activities and Conservancy reserve management within 30.5 m (100 ft.) of an active nest site are not restricted so long as no physical disturbance to the nest site occurs.

Burrowing Owl Avoidance and Minimization Measures.

The Land Use Agencies have proposed the following measures to avoid, minimize, and mitigate take of the burrowing owl:

1. Prior to the initiation of grading or earth disturbing activities, the applicant/developer will hire a CDFG-approved biologist to perform a pre-construction survey of the site to determine if any burrowing owls are using the site for foraging or nesting. The pre-construction survey will be submitted to the Land Use Agency with jurisdiction over the site prior to the developer's commencement of construction activities and a mitigation program will be developed and agreed to by the Land Use Agency and developer prior to initiation of any physical disturbance on the site.

2. Occupied burrows will not be disturbed during nesting season (February 1 - August 31) unless a Wildlife Agency-approved biologist approved by CDFG verifies through non-invasive measures that either: (1) birds have not begun egg-laying and incubation; or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival.

3. If nest sites are found, the Service and CDFG will be contacted regarding suitable mitigation measures, which may include a 300 ft. buffer from the nest site during the breeding season (February 1 - August 31), or a relocation effort for the burrowing owls if the birds have not begun egg-laying and incubation, or the juveniles from the occupied burrows are foraging independently and are capable of independent survival. If on-site avoidance is required, the location of the buffer zone will be determined by a Wildlife Agency-approved biologist. The developer will mark the limit of the buffer zone with yellow caution tape, stakes, or temporary fencing. The buffer will be maintained throughout the construction period.

4. If relocation of the owls is approved for the site by the Service and CDFG, the developer will hire a Wildlife Agency-approved biologist to prepare a plan for relocating the owls to a suitable site. The relocation plan must include: (1) the location of the nest and owls

proposed for relocation; (2) the location of the proposed relocation site; (3) the number of owls involved and the time of year when the relocation is proposed to take place; (4) the name and credentials of the biologist who will be retained to supervise the relocation; (5) the proposed method of capture and transport for the owls to the new site; (6) a description of the site preparations at the relocation site (e.g., enhancement of existing burrows, creation of artificial burrows, one-time or long-term vegetation control, etc...); and (7) a description of efforts and funding support proposed to monitor the relocation.

Relocation options may include passive relocation to another area of the site not subject to disturbance through one way doors on burrow openings, or construction of artificial burrows in accordance with CDFG's October 17, 1995, *Staff Report on Burrowing Owl Mitigation* (Burrowing Owl Report) (attached as Appendix D to the NBHCP).

5. Where on-site avoidance is not possible, disturbance and/or destruction of burrows will be offset through development of suitable habitat on Conservancy upland reserves. Such habitat will include creation of new burrows with adequate foraging area (a minimum of 6.5 acres) or 300 ft. radii around the newly created burrows. Additional habitat design and mitigation measures are described in the Burrowing Owl Report.

The Conservancy has proposed the following measures to avoid, minimize, and mitigate take of the burrowing owl:

1. The Conservancy will avoid disturbance to active nest burrows during reserve management activities to the maximum extent practicable. Disturbance to nesting burrowing owl colonies will be strictly avoided within the nesting season or while birds are present, unless otherwise approved by the TAC. The Burrowing Owl Report will be utilized to the extent practicable to avoid active nests during reserve construction and management activities

2. The Conservancy will utilize applicable Service or CDFG-approved burrowing owl recovery or management plans, and the adaptive management provisions described in the NBHCP to implement any additional conservation measures deemed appropriate ,should use of the NBHCP Area by this species appreciably increase at any time in the future.

3. The Conservancy may be asked to create new burrowing owl habitat in upland reserve areas by creating new burrows or restoring old burrows in upland reserve areas, based on avoidance, minimization and mitigation measures applied by the Land Use Agency Permittees to proponents of authorized development (see NBHCP, Section V.A.5.h). New habitat will include adequate foraging area around the burrow and burrow design will be done in consultation with Wildlife Agency-approved biologists. Additional habitat design and mitigation measures are described in the Burrowing Owl Report.

Bank Swallow Avoidance and Minimization Measures.

The Land Use Agencies have proposed the following measures to avoid, minimize, and mitigate take of the bank swallow:

1. Disturbance to bank swallow nesting colonies will be avoided within the nesting season of May 1 through August 31 (or until a Wildlife Agency-approved biologist, with concurrence of the Service and CDFG, has determined that young have fledged or that the nest is no longer occupied) during all authorized development activities conducted in the Permit Areas.

2. If surveys identify an active bank swallow nesting colony that will be impacted by authorized development, the developer will install brightly colored construction fencing that establishes a boundary 76.2 m (250 ft.) from the active nesting colony. No disturbance associated with authorized development will occur within the fenced area during the nesting season. Additionally, disturbance within ½ mile upstream or downstream of the colony will be avoided if the colony is located upon a natural waterway.

The Conservancy has proposed the following measures to avoid, minimize, and mitigate take of the bank swallow:

1. The Conservancy will avoid disturbing active bank swallow nests during reserve management activities to the maximum extent practicable.

2. The Conservancy will utilize applicable Service or CDFG-approved bank swallow recovery or management plans and the adaptive management provisions described in the NBHCP to implement any additional conservation measures deemed appropriate, should use of the NBHCP Area by the species appreciably increase at any time in the future.

3. Disturbance to bank swallow nesting colonies will be strictly avoided within the nesting season (May 1 through August 31, or until a Wildlife Agency-approved biologist, with concurrence of the Service and CDFG, has determined that young have fledged or that the nest is no longer occupied) during Conservancy reserve development and management activities unless otherwise approved by the TAC.

4. If surveys identify an active bank swallow nesting colony that will be impacted by Conservancy activities, the Conservancy will identify and mark (through a method to be determined by the Conservancy in consultation with the TAC) a boundary 76.2 m (250 ft.) from the active nesting colony on reserve lands. No disturbance associated with Conservancy activities will occur within the 250 ft. marked area of the reserve during the nesting season of May 1 through August 31. Additionally, disturbance within ½ mile upstream or downstream of the colony on reserve lands will be avoided if the colony is located upon a natural waterway. Routine disturbances such as agricultural activities and Conservancy reserve management within 76.2 m (250 ft.) of an active nesting colony or within ½ mile upstream or downstream of an active nesting colony are not restricted so

long as no physical disturbance to the nest site occurs.

Northwestern Pond Turtle Avoidance and Minimization Measures.

In order to avoid, minimize, and mitigate take of the northwestern pond turtle by the proposed action, the Land Use Agencies have proposed to dewater suitable habitat, as described in the conservation measures for the snake.

In order to avoid, minimize, and mitigate take of the northwestern pond turtle by the proposed action, the Conservancy has proposed to consult with northwestern pond turtle researchers and experts periodically during implementation of the NBHCP to determine what, if any, conservation opportunities for the species exists within the Conservancy's reserve system. The Conservancy will implement such conservation measures through the NBHCP's adaptive management provisions as appropriate. Such opportunities might include, but are not limited to, provision of suitable upland habitat for nesting (e.g., unshaded slopes), plentiful basking sites (e.g., floating snags), and shallow water with dense emergent and submergent vegetation for juveniles.

California Tiger Salamander Avoidance and Minimization Measures.

In order to avoid, minimize, and mitigate take of the California tiger salamander by the proposed action, the Land Use Agencies have proposed to require a pre-construction survey prior to approval of an urban development permit. If the survey determines the presence of California tiger salamander, the Land Use Agency will require the developer to consult with the Service and CDFG to determine appropriate measures to avoid and minimize take of individuals. Examples include, but are not limited to: (1) developing specific measures to retain pools, hydrology, suitable estivation sites, open habitat between breeding and estivation sites; (2) replacing wetland within 1.5 miles of known breeding sites; (3) providing species and habitat training to construction personnel; (4) recording setbacks on maps; and (5) prohibiting the following: alteration of topography, structures, dumping, burning, impacting native vegetation, storm drains, fire protection, pesticides and chemicals.

The Conservancy will consult with the TAC and California tiger salamander experts periodically during implementation of the Plan to determine what, if any, additional conservation opportunities for this species might exist within the Plan's proposed reserve system. The Conservancy will implement such conservation measures through the Plan's Adaptive Management and the Site Specific Management Plans prepared for reserve sites as appropriate. In the event preconstruction surveys or other scientific evidence show that the salamander is impacted by authorized development, the Conservancy will create habitat within reserve sites that is conducive to California tiger salamanders, such as stock ponds or "artificial" vernal pools with nearby natural materials for cover such as logs or large rocks). Possible relocation from the site to be impacted or elsewhere in the Basin of tiger salamanders into the Conservancy's reserve system may be considered if preconstruction surveys or other NBHCP monitoring show the species is impacted by Authorized Development.

Western Spadefoot Toad Avoidance and Minimization Measures.

In order to avoid, minimize, and mitigate take of the western spadefoot toad by the proposed action, the Land Use Agencies have proposed to require a pre-construction survey prior to approval of an urban development permit. If the survey determines the toad is present, the Land Use Agency will require the developer to consult with CDFG and the Service to determine appropriate measures to avoid and minimize take of individuals. Examples include, but are not limited to: (1) timing restrictions (i.e., limiting time when pool can be filled to when it is not occupies by toads); and (2) avoidance of the pool.

In order to avoid, minimize, and mitigate take of the western spadefoot toad by the proposed action, the Conservancy has proposed to consult with the TAC and western spadefoot toad experts periodically during implementation of the NBHCP to determine what, if any, additional conservation opportunities for this species exist within the NBHCP's proposed reserve system. The Conservancy will implement such conservation measures through the NBHCP's adaptive management provisions as appropriate. Within reserve sites, the Conservancy will consider creating habitat that is conducive to western spadefoot toads such as areas of slow-moving waters (i.e., pools and plunge pools of small creeks), short grasses with sandy or gravelly soils, and other grassy areas.

Delta Tule Pea Avoidance and Minimization Measures.

In order to avoid, minimize, and mitigate loss of the Delta tule pea by the proposed action, the Land Use Agencies have proposed to require a pre-construction survey. If Delta tule pea plants are identified through a pre-construction survey, the involved Land Use Agency will provide notice to the Service, CDFG and the California Native Plan Society. The development proponent will allow the transplantation of the pea plants prior to site disturbance.

In order to avoid, minimize, and mitigate loss of the Delta tule pea by the proposed action, the Conservancy has proposed:

1. The Conservancy will evaluate the potential for, and as appropriate, implement measures to further the conservation of Delta tule pea within the NBHCP's reserve system through appropriate means. The Conservancy will implement such conservation measures through the NBHCP's adaptive management provisions as appropriate. In the event preconstruction surveys or other scientific documentation indicate impacts to the Delta tule pea as a result of authorized development, the Conservancy's adaptive management program and Site Specific Management Plan process will be used to further the conservation of the species including but not limited to, relocation of the impacted individuals of the into suitable locations on the Conservancy's reserve sites.

2. The Conservancy will monitor any known populations of the pea within the NBHCP Area.

Sanford's Arrowhead Avoidance and Minimization Measures.

In order to avoid, minimize, and mitigate the effects of the proposed action on Sanford's arrowhead, the Land Use Agencies have proposed to conduct a pre-construction survey. If Sanford's arrowhead plants are identified, the involved Land Use Agency will: (1) provide notice to the Service, CDFG and the California Native Plant Society; and (2) allow the development proponent to transplant the plants prior to site disturbance.

In order to avoid, minimize, and mitigate the effects of the proposed action on Sanford's arrowhead, the Conservancy has proposed to:

1. Evaluate the potential for, and as appropriate, implement measures to further the conservation of Sanford's arrowhead within the NBHCP's reserve system through appropriate means. In the event preconstruction surveys or other scientific documentation indicate impacts to the Sanford's arrowhead as a result of authorized development, the Conservancy's adaptive management program and Site Specific Management Plan process will be used to further the conservation of the species including but not limited to, relocation of the impacted individuals of the into suitable locations on the Conservancy's reserve sites.

2. Monitor any known populations of Sanford's arrowhead within the NBHCP Area.

Status of the Species and Environmental Baseline

Threatened Vernal Pool Fairy Shrimp and Endangered Vernal Pool Tadpole Shrimp

The vernal pool fairy shrimp and vernal pool tadpole shrimp were federally-listed as threatened and endangered, respectively, on September 19, 1994 (59 **FR** 48136). Neither species has been designated any special status by the State. The vernal pool fairy shrimp inhabits vernal pools, swales, and other seasonal wetlands in California and southern Oregon. The vernal pool tadpole shrimp lives in similar habitats in California's Central Valley and San Francisco Bay area. Additional information on the life history and ecology of these species may be found in the final rule, Eng *et al*. (1990), Simovich *et al*. (1992), Helm (1998), and Witham *et al.* (1998).

Description, Reproductive Ecology

The vernal pool fairy shrimp has a delicate, elongate body; large, stalked, compound eyes; 11 pairs of swimming legs; a length typically less than 2.5 cm; and no carapace. It swims or glides gracefully upside-down by means of complex, wavelike beating movements as it feeds upon algae, bacteria, protozoa, rotifers, and detritus. Females carry their eggs in pear-shaped, ventral brood sacs until the eggs are either dropped or sink to the pool bottom with the female as she dies. "Resting" or summer eggs are known as cysts. These cysts are able to withstand heat, cold, and prolonged desiccation. When pools refill in the same or subsequent seasons, some, but not all, of the cysts may hatch, resulting in a cyst bank in the soil that may include cysts from several breeding seasons (Donald 1983). Young develop rapidly and may become sexually mature as soon as two weeks after hatching (Gallagher 1996, Helm 1998). This quick maturation permits populations to persist in short-lived, shallow bodies of water (Simovich *et al*. 1992).

The vernal pool tadpole shrimp has a large, shield-like carapace typically measuring less than 2.5 cm in length that covers most of its body; dorsal, compound eyes; and a pair of long cercopods, one on each side of a flat caudal plate, at the end of the last abdominal segment. It is primarily bottom-dwelling and moves with its legs down as it feeds on detritus and living organisms, including fairy shrimp and other invertebrates (Pennak 1989). Females deposit their eggs on vegetation or other objects on the pool bottom. Although some eggs may hatch quickly, others remain dormant as cysts to hatch during later rainy seasons (Ahl 1991). When winter rains refill inhabited wetlands, the species reestablishes from dormant cysts. Individuals may become sexually mature within three to four weeks of hatching (Ahl 1991, Helm 1998) and reproductively mature adults may be present in pools until the habitats dry up in the spring (Ahl 1991, Simovich *et al*. 1992, Gallagher 1996).

Essential Habitat Components, Range

The vernal pool fairy shrimp inhabits alkaline pools, ephemeral drainages, rock outcrop pools, ditches, stream oxbows, stock ponds, vernal pools, vernal swales, and other seasonal wetlands (Helm 1998). Occupied habitats range in size from rock outcrop pools as small as one square meter to large vernal pools up to 4.5 hectares. Potential ponding depth of occupied habitat ranges from 3 cm to 1.2 m. The species has been collected from early December to early May. Known populations in California extend from Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County and along the central coast range from northern Solano County to Pinnacles National Monument in San Benito County. Several additional, disjunct populations exist: one near Soda Lake in San Luis Obispo County, one in the mountain grasslands of northern Santa Barbara County, one on the Santa Rosa Plateau in Riverside County, and one near Rancho California in Riverside County. Additional populations occur in southern Oregon (59 **FR** 48136).

The tadpole shrimp inhabits alkaline pools, clay flats, ditches, freshwater marshes, stream oxbows, vernal lakes, vernal pools, vernal swales, and other seasonal wetlands (Helm 1998).

Occupied habitats range in size from vernal pools as small as two square meters to large vernal lakes up to 36 hectares. The potential ponding depth of occupied habitat ranges from 4 cm to 1.5 m (59 **FR** 48136). Vernal pool tadpole shrimp populations occur in the Central Valley in California, ranging from east of Redding in Shasta County south to Tulare County. One occupied vernal pool complex is located on the San Francisco Bay National Wildlife Refuge in the City of Fremont, Alameda County (59 **FR** 48136).

The vernal pool fairy shrimp and vernal pool tadpole shrimp are ecologically dependent on seasonal fluctuations in their habitat such as presence or absence of water, duration and timing of inundation, and other abiotic factors such as temperature, salinity, conductivity, dissolved solids, and pH. Water chemistry is one of the most important factors affecting their distribution (Belk 1977, Simovich *et al.* 1992). For example, Helm (1998) found that water temperatures in excess of 24 degrees Celsius killed vernal pool fairy shrimp. This change in water temperature could be caused by placing fill in a portion of the pool. The resulting decrease in the size of the pool would change the period of inundation, thereby decreasing the capacity of the pool to buffer potential changes in water temperature caused by solar radiation.

The genetic characteristics of the fairy shrimp and tadpole shrimp, and ecological conditions, such as watershed continuity, indicate that populations of these animals are defined by pool complexes rather than by individual vernal pools (Fugate 1992). Therefore, the most accurate indication of the distribution and abundance of these species is the number of inhabited vernal pool complexes. Individual vernal pools occupied by these species are most appropriately referred to as subpopulations. The pools and, in some cases, pool complexes supporting these species are usually small. Man-caused and unforeseen natural catastrophic events such as long-term drought, non-native predators, off-road vehicles, pollution, berming, and urban development, threaten their extirpation at some sites.

Dispersal

The primary historical dispersal method for the vernal pool tadpole shrimp and vernal pool fairy shrimp may have been large-scale flooding resulting from winter and spring rains which allowed the animals to colonize different individual vernal pools and other vernal pool complexes. This dispersal mechanism may no longer function in some areas due to the construction of dams, levees, and other flood control measures, and widespread urbanization within significant portions of the range of this species. Waterfowl and shorebirds are now considered the primary dispersal agents for vernal pool tadpole shrimp and vernal pool fairy shrimp (Brusca and Brusca 1992, Simovich *et al.* 1992). The eggs of these crustaceans are ingested (Krapu 1974, Swanson 1974, Driver 1981, Ahl 1991) and/or adhere to the legs and feathers where they are transported to new habitats.

Reasons for Decline and Threats to Survival

The ephemeral wetlands that support this network of populations are remnants of what was formerly a pristine vernal pool ecosystem, which has been converted to primarily agricultural and urban uses. This highly disturbed remnant habitat is imperiled by a variety of human-caused activities, primarily urban development, water supply/flood control projects and conversion of land to agricultural use.

Holland (1978) estimated that between 60 and 85 percent of the habitat that once supported vernal pools, had been destroyed by 1973. Since 1973, a substantial amount of remaining habitat has been converted for human uses. The rate of loss of vernal pool habitat in the state has been estimated at two to three percent per year (Holland and Jain 1988).

Conversion of natural habitat for urban and agricultural uses has highly fragmented the habitat of the listed vernal pool crustaceans throughout their ranges. Fragmentation such as this results in small isolated fairy shrimp populations. Ecological theory predicts that such populations will be highly susceptible to extinction due to chance events, inbreeding depression, or additional environmental disturbance. If an extinction event occurs in a population that has been fragmented, the opportunities for recolonization are thought to be greatly reduced due to physical (geographical) isolation from other (source) populations (Gilpin and Soule 1986; Goodman 1987a, b).

Environmental Baseline and Status within the Action Area

The proposed action is located on the western extremity of the Southeastern Sacramento Valley Vernal Pool Region, one of 17 vernal pool regions defined by the CDFG in the State of California. Regions were identified according to biological, geomorphological, and soils information. According to the report, "One of the primary assumptions is that these regions are ecologically distinct and that they encompass the full range of variability of vernal pools and species in the State" (Keeler-Wolf *et al.* 1998). Of the seventeen defined regions, the Southeastern Sacramento Valley Vernal Pool Region is most threatened by development.

The Southeastern Sacramento Valley Vernal Pool Region contains almost 15 percent of the remaining vernal pool grasslands in the State of California, and supports 35 percent of the known occurrences of the vernal pool fairy shrimp documented in the California Natural Diversity Database.

Developments within Sacramento County have resulted in both direct and indirect impacts to vernal pools, and have contributed to the loss of vernal pool fairy shrimp and vernal pool tadpole shrimp populations. Although the reduction of federally-listed vernal pool crustacean populations has not been quantified, the acreage of lost habitat continues to increase. General and specific plans for the Sacramento area have identified significant, unavoidable impacts to biological communities, including elimination of vernal pools, intermittent drainages and other seasonal wetlands. Despite these impacts, many government entities continue to implement

development projects within the area. However, this is not the case in Natomas, where the City and Sutter County have engaged in regional habitat conservation planning efforts.

There are 314 reported occurrences of vernal pool fairy shrimp in California, 52 of which are reported from Sacramento County and one of which is reported from Sutter County (CNDDB 2002). However, there is only one vernal pool fairy shrimp occurrence known in the Basin; it is located in the eastern portion of Sutter's Permit Area. Additionally, there are several occurrences east of the Natomas Basin in Elverta and Rio Linda (CNDDB, 2002). Potential vernal pool fairy shrimp habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat per acre of grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat per acre of grassland in the Basin (K. Fuller, pers. comm. to C. Aubrey, 2003). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. Once again, this estimate greatly overestimates the amount of potential vernal pool habitat in the Basin, as most of the ponds and seasonally wet areas do not have the hydrology sufficient to support vernal pool crustaceans. No potential vernal pool fairy shrimp habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities.

There are 160 reported occurrences of vernal pool tadpole shrimp in California, 55 of which are reported from Sacramento County, and four of which are reported from Sutter County. There is only one vernal pool tadpole shrimp occurrence known in the Basin; it is located in the eastern portion of Sutter's Permit Area (CNDDB 2002). Potential vernal pool tadpole shrimp habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat in grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat in the Basin (K. Fuller, pers. comm.). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. Once again, this estimate greatly overestimates the amount of potential vernal pool habitat in the Basin, as most of the ponds and seasonally wet areas do not have the hydrology sufficient to support vernal pool crustaceans. No potential vernal pool tadpole shrimp habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities.

Threatened Giant Garter Snake

The Service published a proposal to list the giant garter snake as an endangered species on December 27, 1991 (56 **FR** 67046). The Service reevaluated the status of the snake before adopting the final rule. The snake was listed as a threatened species on October 20, 1993 (58 **FR** 54053). The *Draft Recovery Plan for the Giant Garter Snake* was published by the Service in July 1999. Additional information on the species' biology may be found in those documents.

Description

The giant garter snake is one of the largest garter snakes and may reach a total length of at least 160 centimeters (cm)(64 inches [in.]). Females tend to be slightly longer and proportionately heavier than males. The weight of adult female snakes is typically 500-700 grams (g)(1.1-1.5 pounds). Dorsal background coloration varies from brownish to olive with a checkered pattern of black spots, separated by a yellow dorsal stripe and two light-colored lateral stripes. Background coloration and prominence of a black-checkered pattern and the three yellow stripes are geographically and individually variable (Hansen 1980). The ventral surface is cream to olive or brown and sometimes infused with orange, especially in northern populations.

Historical and Current Range

This species formerly occurred throughout the wetlands that were extensive and widely distributed in the Central Valley. Fitch (1941) described the historical range of the snake as extending from the vicinity of Sacramento and Contra Costa Counties southward to Buena Vista Lake, near Bakersfield, in Kern County. Prior to 1970, the snake was recorded historically from 17 localities (Hansen and Brode 1980). Five of these localities were clustered in and around Los Banos, Merced County. The paucity of information makes it difficult to determine precisely the species' former range. Nonetheless, these records coincide with the historical distribution of large flood basins, fresh water marshes, and tributary streams. Destruction of wetlands for agriculture and other purposes apparently extirpated the species from the southern one-third of its range by the 1940s -1950s, including the former Buena Vista Lake and Kern Lake in Kern County, and the historic Tulare Lake and other wetlands in Kings and Tulare Counties (Hansen and Brode 1980, Hansen 1980). Surveys over the last two decades have found the snake as far north as the Butte Basin in the Sacramento Valley. As recently as the 1970s, the range of the snake extended from near Burrell, Fresno County (Hansen and Brode 1980), northward to the vicinity of Chico, Butte County (Rossman and Stewart 1987).

Essential Habitat Components

Endemic to wetlands in the Sacramento and San Joaquin valleys, the snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals and rice fields, and the adjacent uplands. The snake feeds on small fishes, tadpoles, and frogs (Fitch 1941, Hansen 1980, Hansen 1988). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, 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 uplands for escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1980).

Reproductive Ecology

The breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 young, with a mean of 23 (Hansen and Hansen 1990). At birth, young average about 20.6 cm (8.1 in.) snout-vent length and 3-5 g (0.10-0.18 ounces). Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own. Although growth rates are variable, young typically more than double in size by one year of age, and sexual maturity averages three years in males and five years for females (58 **FR** 54053).

Movements and Habitat Use

The snake typically inhabits small mammal burrows and other soil crevices throughout its winter dormancy period (November to mid-March). The snake also uses burrows as refuge from extreme heat during their active period. While the snakes usually remain in close proximity to wetland habitats, the Biological Research Division (BRD) of the U.S. Geological Service has documented snakes using burrows as much as 50 m (165 ft.) away from the marsh edge to escape extreme heat (Wylie *et al.* 1997). Overwintering snakes have been documented to use burrows as far as 250 m (820 ft.) from the edge of marsh habitat. Snakes typically select south- and west-facing burrows as hibernacula (58 **FR** 54053).

In studies of marked snakes in the Natomas Basin, snakes moved about 0.40-0.80 kilometers (km)(0.25-0.5 mile) per day (Hansen and Brode 1993). However, total activity varies widely between individuals, and individual snakes have been documented moving up to 8 km (5 miles) over the period of a few days in response to dewatering of habitat (Wylie *et al.* 1997). In agricultural areas, snakes were documented using rice fields in 19-20 percent of the observations, marsh habitat in 20-23 percent of observations, and canal and agricultural waterway habitats in 50-56 percent of the observations (Wylie 1999). Telemetry studies have also shown that active snakes use uplands extensively–more than 31 percent of observations were in uplands (Wylie 1999). Almost all snakes observed in uplands during the active season were near vegetative cover, where cover exceeded 50 percent in the area within 0.5 m (1.6 ft) of the snake; less than 1 percent of observations were of snakes in uplands with less than 50 percent cover nearby (Wylie 1999).

Reasons for Decline and Threats to Survival

Ongoing maintenance of aquatic habitats for flood control and agricultural purposes eliminate or prevent the establishment of habitat characteristics required by snakes and can fragment and isolate available habitat, prevent dispersal of snakes among habitat units, and adversely affect the availability of the garter snake's food items (Hansen 1988, Brode and Hansen 1992). In many areas, the restriction of suitable habitat to water canals bordered by roadways and levee tops renders snakes vulnerable to vehicular mortality. Fluctuation in rice and agricultural production affects stability and availability of habitat. Recreational activities, such as fishing, may disturb snakes and disrupt basking and foraging activities. Nonnative predators, including introduced

predatory gamefish, bullfrogs (*Rana catesbeiana*), and domestic cats (*Felis catus*) also threaten snake populations. While large areas of seemingly suitable snake habitat exist in the form of duck clubs and waterfowl management areas, water management of these areas typically does not provide the summer water needed by snakes. Although snakes on national wildlife refuges are relatively protected from many of the threats to the species, degraded water quality continues to be a threat to the species both on and off refuges. A number of land use practices and other human activities currently threaten the survival of the snake throughout the remainder of its range. Although some snake populations have persisted at low levels in artificial wetlands associated with agricultural and flood control activities, many of these altered wetlands are now threatened with urban development.

Status with Respect to Recovery

The draft recovery plan for the snake subdivided its historic range into four recovery units (Service 1999). These are: (1) the Sacramento Valley unit, extending from the vicinity of Red Bluff south to the confluence of the Sacramento and Feather Rivers; (2) the Mid-Valley unit, extending from the American and Yolo Basins south to Duck Creek near the City of Stockton; (3) the San Joaquin Valley unit, extending south from Duck Creek to the Kings River; and (4) the South Valley unit, extending south of the Kings River to the Kern River Basin. Portions of Mid-Valley recovery unit are within the action area.

The Sacramento Valley Recovery Unit at the northern end of the species' range is known to support relatively large, stable populations of the snake. This unit contains three populations (Butte Basin, Colusa Basin, and Sutter Basin) and a large amount of suitable habitat, in protected areas on state refuges and refuges of the Sacramento NWR Complex in the Colusa and Sutter Basins, and along waterways associated with rice farming (Service 1999).

The Mid-Valley Recovery Unit, directly to the south of the Sacramento Valley Recovery Unit, includes seven populations: American Basin, Yolo Basin–Willow Slough, Yolo Basin–Liberty Farms, Sacramento Area, Badger Creek/Willow Creek, Caldoni Marsh, and East Stockton. The status of the seven snake populations in the Mid-Valley Recovery Unit is uncertain. The East Stockton population may be extirpated, and is not considered recoverable as a result of urban encroachment into habitat (Service 1999). Five of the remaining six populations within the recovery unit are small, highly fragmented and isolated, and, except for the Badger Creek/Willow Slough population, are also threatened by urbanization. This latter population is within a small isolated area. Within the Mid-Valley unit, only the American Basin population supports a sizeable snake population which is dependent largely upon rice lands.

The remaining two recovery units are located to the south in the San Joaquin Valley, where the best available data indicate that the snake's status is precarious. The San Joaquin Valley Recovery Unit contains three historic snake populations: North and South Grasslands; Mendota Area; and Burrel/Lanare Area (Service 1999). This recovery unit formerly supported large snake populations, but numbers have declined severely in recent decades, and recent survey efforts indicate numbers are very low compared to Sacramento Valley populations.

No surviving snake populations are known from the fourth recovery unit, the South Valley Recovery Unit, at the southern end of the snake's historic range; this unit includes only extirpated populations, including the historic but lost Tulare and Buena Visa lakes.

The draft recovery criteria require multiple, stable populations within each of the four recovery units, with subpopulations well-connected by corridors of suitable habitat. Currently, only the Sacramento Valley Recovery Unit, at the northern end of the species' range, is known to support relatively large, stable populations. Habitat corridors connecting populations or subpopulations, even for the Sacramento Valley Recovery Unit, are not present and/or protected.

In 1994, the BRD (then the National Biological Survey) began a study of the life history and habitat requirements of the snake in response to an interagency request from the Service. Since April of 1995, the BRD has further documented occurrences of snakes within some of the known populations. The BRD has studied snake subpopulations at the Sacramento and Colusa NWRs within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, the Badger Creek area of the Cosumnes River Preserve within the Badger Creek-Willow Creek area, and the Natomas area within the American Basin (Wylie *et al.* 1997, Wylie 1999). These subpopulations represent the largest known extant subpopulations. With the exception of the American Basin, these subpopulations are largely protected from many of the threats to the species. Outside of these protected areas, snakes in these populations are still subject to all the threats identified in the final listing rule. The remaining nine populations identified in the final rule are distributed discontinuously in small isolated patches and are vulnerable to extirpation by stochastic environmental, demographic, and genetic processes. The 13 extant populations are largely isolated from each other, with any dispersal corridors between them limited and not protected. When small populations are extirpated, the recolonization is unlikely in most cases, given the isolation from larger populations and the lack of dispersal corridors between them.

Environmental Baseline

Surveys over the last two decades have located the giant garter snake as far north as the Butte Basin in the Sacramento Valley. Currently, the Service recognizes 13 separate populations of the snake, with each population representing a cluster of discrete locality records (Service 1993). The 13 extant population clusters largely coincide with historical riverine flood basins and tributary streams throughout the Central Valley (Hansen 1980, Brode and Hansen 1992): (1) Butte Basin, (2) Colusa Basin, (3) Sutter Basin, (4) American Basin, (5) Yolo Basin-Willow Slough, (6) Yolo Basin-Liberty Farms, (7) Sacramento Basin, (8) Badger Creek-Willow Creek, (9) Caldoni Marsh, (10) East Stockton-Diverting Canal and Duck Creek, (11) North and South Grasslands, (12) Mendota, and (13) Burrell-Lanare. These populations span the Central Valley from just southwest of Fresno (Burrell-Lanare) north to Chico (Hamilton Slough).

Since April of 1995, the Biological Resources Division (BRD) of U.S. Geological Survey has further documented occurrences of giant garter snakes at the Sacramento, Delevan, and Colusa National Wildlife Refuges within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, at the Badger Creek area of the Consumnes River Preserve within the Badger Creek-Willow Creek

area, and in the Natomas Basin within the American Basin (Wylie 1999; 2001: Wylie *et al.* 1997; 2000a,b; 2002). These populations of giant garter snakes represent the largest extant populations. With the exception of the American Basin, these areas are largely protected from many of the threats to the species. Outside of protected areas, giant garter snakes in these population clusters are still subject to all threats identified in the final rule. The remaining nine population clusters identified in the final rule are distributed discontinuously in small isolated patches and are vulnerable to extirpation by random environmental, demographic, and genetic processes. Until recently, there were no post-1980 sightings of snakes from Stockton and southward, and surveys of historic localities conducted in 1986 did not detect any snakes (Service 1999). Since 1995, however, surveys conducted by CDFG in cooperation with BRD in the Grasslands Area in the San Joaquin Valley have detected snakes, but in numbers much lower than those found in the Sacramento Valley populations. These observations indicate that snakes are still extant in at least three locations in the San Joaquin Valley, but probably in extremely low numbers (Service 1999). All 13 population clusters are isolated from each other with no protected dispersal corridors. Opportunities for recolonization of small populations which may become extirpated is unlikely given the isolation from larger populations and lack of dispersal corridors between them.

The proposed action occurs within the Natomas Basin portion of the American Basin population of giant garter snakes, within the Mid-Valley Recovery Unit identified by the giant garter snake recovery team (Service 1999). Scattered natural habitats comprise a small component of this larger, 53,000-acre agricultural habitat Natomas Basin complex. Numerous California Natural Diversity Database (CNDDB 2002) locality records for giant garter snakes are known from the Natomas Basin portion of the American Basin and are distributed throughout most of the Natomas Basin. Additionally, the snake has been documented in Area B (Hansen 2002). Because the Natomas Cross Canal may pose a barrier to the snake's movement, snakes in Area B and the Basin may now represent two distinct populations.

Brode and Hansen (1992) evaluated the status and future management of the snake within the Natomas Basin. They stated that the Basin provides the most important habitat remaining for the snake and observed that snake habitat within the Basin occurs in three large areas that are separated by major highways (Figure 5). Area 1 is defined as lands north of Interstate 5 (I-5) and west of State Route 99/70 (SR-99/70). Important habitat areas include Prichard Lake, the North Drain Canal, and its associated rice fields. Area 2 is defined as the lands south and west of I-5. The most important habitat area is Fisherman's Lake. Area 3 is defined as the lands east of I-5 and SR-99/70. Within Area 3, the most important habitat area is "Snake Alley," an area comprised of the North Main Canal and its associated rice fields and irrigation ditches on the east side of SR-99/70. The authors hypothesized that snakes could move between the three geographic areas through large box culverts under the major highways. Brode and Hansen (1992) attributed the snake's continued success in the Basin to the numerous irrigation ditches, rice fields, and especially the extensive network of irrigation canals, feeder canals, and drains. The authors concluded by presenting a conceptual conservation plan for the snake in the Basin. This plan was based upon a minimum of one core habitat in each of the geographic areas with connecting canal to ensure snake's could move between each of the three areas. The proposed

action includes effects to snake habitat within all three of the geographic areas.

Recent research efforts by BRD to collect demographic and habitat use data during from 1998 through 2002, have further documented occurrences of giant garter snakes within the Natomas Basin (Wylie *et al.* 2000b, Wylie and Cassaza 2002, Wylie and Martin 2002). BRD surveys have provided significant recent information on the distribution of giant garter snakes within the Natomas Basin, and supplement previous research on the snake within the Natomas Basin (e.g. Brode and Hansen 1992, Hansen and Brode 1993). BRD capture data and CNDDB records indicate giant garter snakes are distributed throughout the Natomas Basin, but the relative abundance varies. Wylie *et al.* (2000b) concluded that habitat within the Natomas Basin has apparently degraded over time, as compared to previous accounts of habitat in the Natomas Basin. They also concluded that the quality of habitat within the Natomas Basin is poorer than that at other geographic locations where giant garter snakes are found. The other localities studied by BRD included more extensive areas of native or restored and/or protected habitat as compared with the Natomas Basin. Results of the most recent snake surveys in the Natomas Basin indicated that habitat quality is decreasing near Fisherman's Lake and in the area addressed in the MAP biological opinion (Wylie and Cassaza 2002). This decrease in habitat quality is likely due to the fallowing of rice fields and encroaching development. Major areas classified as having good habitat quality are located in the northwest portion of the Basin (in the vicinity of the Conservancy's Lucich North, Lucich South, and Bennett South sites) and in the unincorporated area of Sacramento County between Elverta Road and the Sacramento-Sutter County line. Of those areas of the Basin sampled, snake densities were greatest at Bennett South, Lucich North, Lucich South, and Snake Alley.

A number of State, local, private, and unrelated Federal actions have occurred within the action area and adjacent region affecting the environmental baseline of the species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect impacts to snake habitat within the region.

Several flood control programs are completed or ongoing within the action area, within the range of the species, and within the Natomas Basin. Completed projects include the Natomas Area Flood Control Project that provided flood protection necessary for development in the Natomas Basin to move forward. On-going projects associated with the common features of the American River Watershed Investigation administered by the Corps of Engineers will affect giant garter snakes within the Natomas and American Basins. Activities that are either on-going or in various stages of planning include levee raising along the Natomas Cross Canal, American River, and Sacramento River; modification of the Natomas East Main Drainage Canal levee; and relocation of canals and construction of stability/seepage berms along the levees.

Ongoing agricultural activities also affect the environmental baseline for the snake, and are largely not subject to section 7 consultation. Some agriculture, such as rice farming, can provide valuable seasonal foraging and upland habitat for the snake. Although rice fields and agricultural waterways can provide habitat for the snake, agricultural activities such as waterway maintenance, weed abatement, rodent control, and discharge of contaminants into wetlands and

waterways can degrade snake habitat and increase the risk of snake mortality (Service 1999). Ongoing maintenance of agricultural waterways can also eliminate or prevent establishment of snake habitat, eliminate food resources for the snake, and can fragment existing habitat and prevent dispersal of snakes (Service 1999). Flood control and maintenance activities which can result in snake mortality and degradation of habitat include levee construction, stream channelization, and the riprapping of streams and canals (Service 1999).

In addition to agricultural, flood control, and maintenance activities, other activities have occurred in the Basin that likely affected the snake and did not receive incidental take authorization. For example, over the last three to four years, approximately 75 acres of potential snake seasonal wetland habitat were altered and/or degraded on lands owned by the Sacramento International Airport. This is a significant percentage of the remaining natural wetlands in the Basin. These unauthorized activities are currently under investigation by the Service.

The Natomas Basin currently supports approximately 24,567 acres of snake habitat (Table 4). Of that, approximately 96 acres are ponds and seasonally wet areas, 22,693 acres are rice fields, and 1,778 are canals.

Threatened Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle was listed as a federally-threatened species on August 8, 1980 (45 **FR** 52803). Two areas along the American River in the City's metropolitan area have been designated as critical habitat for the beetle [50 **FR** 17.95 (I)]. In addition, an area along Putah Creek, Solano County, and the area west of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to the Recovery Plan for the beetle (Service 1984). These areas support large numbers of mature elderberry shrubs (*Sambucus* spp.) with extensive evidence of use by the beetle. A detailed account of the beetle's life history is presented in the "Valley Elderberry Longhorn Beetle Recovery Plan" (Service 1984) and Barr (1991).

Description

Longhorn beetles (family Cerambycidae) are characterized by somewhat elongate and cylindrical bodies with long antennae, often in excess of 2/3 of the body length. The valley elderberry longhorn beetle is large and stout-bodied. Males range in length from about 13-21 mm (measured from the front of the head to the end of the abdomen) with antenna about as long as the body. Females are slightly more robust than males, measuring about 18-25 mm, with somewhat shorter antennae. The beetles are dark metallic-green with a bright red-orange border on the elytra (thickened, hardened forewings). Males generally have the metallic-green elytral pattern reduced to four oblong spots, exhibiting much of the red-orange color. Females and some males are mostly metallic-green and exhibit only a narrow band of red-orange color along the front margin of the elytra.

Reproductive Biology

Adult beetles are active from March through June. They are uncommon and rarely observed despite their large size and conspicuous coloration. They presumably mate at this time, the females laying their eggs on the bark of an elderberry. How the beetle locates mates is unknown, although some other cerambycids appear to use pheromones. The larvae hatch in a few days and bore into the stem, where they remain, feeding on the pith until they complete their development. The larva then cuts an emergence hole, pupates inside the stem, and emerges as an adult in the spring. The complete life cycle is thought to take one or two years. Adults are presumed to die after reproducing, but this is not definitively known.

Essential Habitat Components, Movement

The beetle is dependent on its host plant, elderberry, which is a common component of the remaining riparian forests of the Central Valley. Use of the elderberry by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva just prior to the pupal stage. Recent field work along the Cosumnes River and in the Folsom Lake area indicates that larval galleries can be found in elderberry stems with no evidence of exit holes; the larvae either succumb prior to constructing an exit hole or are not far enough along in the developmental process to construct an exit hole. Larvae appear to be distributed in stems which are 1.0 inch or greater in diameter at ground level. Barr (1991) noted that elderberry shrubs and trees with many exit holes were most often large, mature plants; young stands were seldom occupied.

Population densities of the beetle are probably naturally low (Service 1984); it has been suggested, based on the spatial distribution of occupied shrubs (Barr 1991), that the beetle disperses poorly. 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.

Range

The beetle's current distribution is patchy throughout the remaining habitat of the Central Valley from Redding to Bakersfield. Surveys conducted in 1991 (Barr 1991) found evidence of beetle activity at 28 percent of the 230 sites with elderberry. The beetle appears to be only locally common i.e., found in population clusters which are not evenly distributed across available elderberry shrubs). Frequently, only particular clumps or trees in the study areas were found to harbor the beetle.

Reasons for Decline and Threats to Survival

Extensive destruction of California's Central Valley riparian forests has occurred during the last 150 years due to agricultural and urban development (Katibah 1984, Smith 1977, Thompson 1961). Based on a 1979 aerial survey, only about 102,000 acres out of an estimated 922,000 acres of Central Valley riparian forest remain (Katibah *et al.* 1984). More extreme figures were given by Frayer *et al*. (1989), who reported that approximately 85 percent of all wetland acreage

in the Central Valley was lost before 1939 and that from 1939 to the mid-1980's, the acreage of wetlands dominated by forests and other woody vegetation declined from 65,400 acres to 34,600 acres. Differences in methodology may explain the differences between the studies. In any case, the historical loss of riparian habitat in the Central Valley strongly suggests that the range of the beetle has been reduced and its distribution greatly fragmented. Loss of non-riparian habitat where elderberry occurs (e.g., savanna and grassland adjacent to riparian habitat, oak woodland, mixed chaparral-woodland), and where the beetle has been recorded (Barr 1991), suggests further reduction of the beetle's range and increased fragmentation of its upland habitat. In Sacramento County, some riparian forest along the American River corridor is protected as parks and open space, but elderberries in savanna and streamside riparian habitats in the southern portion of the County are vulnerable to expansion of residential and commercial developments.

Habitat fragmentation not only isolates small populations, but also increases the interface between habitat and urban or agricultural land, increasing negative edge effects such as the invasion of non-native species (Huxel 2000) and pesticide contamination (Barr 1991). There are several edge effect-related factors that may be related to the decline of the beetle. Recent evidence indicates that the invasive Argentine ant (*Iridomyrmex humilis*) poses a risk to the long-term survival of the beetle. Surveys along Putah Creek found beetle presence where Argentine ants were not present or had recently colonized, and beetle absence from otherwise suitable sites where Argentine ants had become established (Huxel 2000). The Argentine ant has negatively impacted populations of other native arthropod species (Holway 1995; Ward 1987). Predation on eggs, larvae, and pupae are the most likely impacts these ants have on the beetle. In Portugal, Argentine ants have been found to be significant egg predators on the eucalyptus borer (*Phoracantha semipunctata*), a cerambycid like the valley elderberry longhorn beetle. Egg predation on the beetle could lead to local extirpations, as indicated by a population viability study suggesting that egg and juvenile mortality are significant factors affecting probability of extinction for the beetle (Huxel and Collinge, in prep.). The Argentine ant has been expanding its range throughout California since its introduction around 1907, especially in riparian woodlands associated with perennial streams (Holway 1995, Ward 1987). Huxel (2000) states that, given the potential for Argentine ants to spread with the aid of human activities such as movement of plant nursery stock and agricultural products, this species may come to infest most drainages in the Central Valley along the valley floor, where the beetle is found.

Direct spraying and drift of pesticide, including herbicides and/or insecticides, in or near riparian areas (which is done to control mosquitos, crop diseases, invasive and/or undesirable plants, or other pests) is likely to adversely affect the beetle and its habitat. Although there have been no studies specifically focusing on the effects of pesticides on the beetle, evidence suggests that the species is likely to be affected by pesticides. As of 1980, the prevalent land use adjacent to riparian habitat in the Sacramento Valley was agriculture, even in regions where agriculture was not generally the most common land use (Katibah *et al.* 1984). Therefore, the species is likely vulnerable to pesticide contamination from adjacent agricultural practices. Recent studies of major rivers and streams documented that 96 percent of all fish, 100 percent of all surface water samples and 33 percent of major aquifers contained one or more pesticides at detectable levels

(Gilliom 1999). Pesticides were identified as one of the 15 leading causes of impairment for streams included on the Federal Water Pollution Control Act, as amended (Clean Water Act), section 303(d) lists of impaired waters. As the beetle occurs primarily in riparian habitat, the contamination of rivers and streams affects this species and its habitat. Pesticides have been identified as one of a number of potential causes of pollinator species' declines and declines of other insects beneficial to agriculture (Ingraham *et al.* 1996). Therefore, it is likely that the beetle, typically occurring adjacent to agricultural lands, has suffered a decline due to pesticides.

Status Within the Action Area and Environmental Baseline

The California Natural Diversity Database lists 168 beetle occurrences in California (CNDDB 2002). Three of these are located in Sutter County and 16 are located in Sacramento County. The beetle has not been documented to occur within the Basin. However, several occurrences have been recorded in close proximity to the Basin along the Sacramento River. For example, the beetle has been observed on the Yolo County side of the Sacramento River directly west of Fisherman's Lake. Potential beetle habitat (i.e., elderberry shrubs with stems greater than one inch diameter at ground level) is located along the outside perimeter of the Basin, and small patches of potential habitat are known to exist in many locations within the Basin. The number of elderberry shrubs in the Natomas Basin and the local population status of the beetle are not known.

Beetle habitat is defined as elderberry shrubs (*Sambucus* spp.) with stems greater than one inch in diameter at ground level. No attempt was made to quantify the number of elderberry shrubs with stems measuring greater than one inch in diameter at ground level within the proposed action's action area. However, habitat class types identified in the EIR/EIS that may potentially be inhabited by elderberry shrubs (and therefore, the beetle) include 98 acres of oak groves, 124 acres of riparian, and 106 acres of other tree groves (i.e., groves that are neither oak groves or riparian)(Table 13). Additional elderberry shrubs are likely scattered throughout the action area.

Threatened Colusa Grass

Colusa grass is endemic to vernal pools of California's Sacramento and San Joaquin valleys. The Service (1997b) listed it as a threatened species in 1997. Colusa grass has been state-listed as endangered since 1979 (CDFG 1991) and has been considered to be rare and endangered by the California Native Plant Society since 1974 (Powell 1974). The California Native Plant Society now includes Colusa grass on List 1B and considers it to be "endangered throughout its range" (Skinner and Pavlik 1994) and "seriously endangered in California" (Tibor 2001). CDFG considers the status of Colusa grass to be declining (CDFG 2001).

Description

Unlike terrestrial grasses, Colusa grass has pith-filled stems, lacks distinct leaf sheaths and ligules, and produces exudate. Colusa grass differs from other members of the Orcuttieae in that it has zigzag stems, cylindrical inflorescences, and fan-shaped lemmas and lacks glumes,

whereas the other genera within the tribe have fairly straight stems and possess glumes. Moreover, *Orcuttia* species have distichous spikelets and narrow, five-toothed lemmas, and *Tuctoria* species have spikelets arranged in a loose spiral, and narrow, more-or-less entire lemmas. Colusa grass is not likely to be confused with Anthochloa, despite their former taxonomic affiliation. The latter does not occur in North America, is perennial, does not have glands, the inflorescence is not cylindrical, and the spikelets have glumes (Hoover 1940).

All members of the Orcuttieae share several characteristics that differ from many other grasses. Most grasses have hollow stems, but the Orcuttieae have stems filled with pith. Another difference is that the Orcuttieae produce two or three different types of leaves during their life cycle, whereas most grasses have a single leaf type throughout their life span. The juvenile leaves of the Orcuttieae, which form underwater, are cylindrical and clustered into a basal rosette. After the water dries, terrestrial leaves form in all species of the tribe; these leaves have flattened blades and are distributed along the stem (Keeley 1998). *Orcuttia* species have a third type of leaf that is not found in *Neostapfia* or *Tuctoria* (Reeder 1982, Keeley 1998). The terrestrial leaves of the Orcuttieae also differ from other grasses in other respects. Whereas grass leaves typically are differentiated into a narrow, tubular *sheath* that clasps the stem tightly and a broader blade that projects away from the stem, terrestrial leaves of the Orcuttieae are broad throughout and the lower portion enfolds the stem only loosely. The Orcuttieae also lack a ligule, which is a leaf appendage commonly found in other grasses (Reeder 1965, Reeder1982, Keeley 1998). Another characteristic common to all Orcuttieae is the production of an aromatic exudate, which changes from clear to brown during the growing season (Reeder 1965, Reeder 1982). The exudate most likely helps to repel herbivores (Crampton 1976, Griggs 1981).

Compared to other members of the Orcuttieae, Colusa grass shows fewer adaptations to existence underwater, indicative of its relatively primitive evolutionary position and the shorter duration of underwater growth (Keeley 1998). The aquatic seedlings of Colusa grass have only one or two juvenile leaves (Keeley 1998). The terrestrial stage consists of multiple stems arising in clumps from a common root system. The stems are decumbent and have a characteristic zigzag growth form (Crampton 1976). Overall stem length ranges from 10 to 30 cm (3.9 to 11.8 in.). The entire plant is pale green when young (Davy 1898) but becomes brownish as the exudate darkens (Reeder 1982, Reeder 1993). Leaf length is 5 to 10 cm (2.0 to 3.9 in.) (Hitchcock and Chase 1971). Each stem produces one dense, cylindrical inflorescence that is 2 to 8 cm (0.8 to 3.1 in.) long and 8 to 12 mm (0.31 to 0.47 in.) broad. Within the inflorescence, the spikelets are densely packed in a spiral arrangement; the tip of the rachis projects beyond the spikelets. Each spikelet typically contains five florets but does not have glumes. The fan-shaped lemmas are approximately 5 mm (0.20 in.) long. The grains are 2.5 mm (0.10 inch) long and are coated with exudate. Colusa grass has a diploid chromosome number of 40 (Reeder 1982, Reeder 1993).

Historical and Current Range

In the 50 years after its initial discovery (Davy 1898), Colusa grass was reported from only three sites other than the type locality; these were in Merced and Stanislaus counties. By the mid-

1970's, Colusa grass had been reported from a total of 11 sites in Colusa, Merced, Solano, and Stanislaus counties (Hoover 1936, Hoover 1940, Crampton 1959, Medeiros 1976, Reeder 1982). During the 1980's, many new populations of Colusa grass were located during extensive surveys. As of 1989, 40 occurrences were extant and 11 already had been extirpated. Of the 51 occurrences known up to that point, 26 were in Merced County, 22 were in Stanislaus county, two were in Solano County, and one was in Colusa County (Stone *et al*. 1988, CNDDB 2001). These occurrences were in the San Joaquin Valley, Solano-Colusa, and Southern Sierra Foothills vernal pool regions (Keeler-Wolf *et al*. 1998).

Although fewer than one-quarter of the historical occurrences have been visited within the past decade, their status is presumed to be the same as on the last visit (CNDDB 2002). Currently, CNDDB (2002) includes 59 occurrences of Colusa grass; 48 occurrences are presumed to be extant and 11 others are either known or presumed to be extirpated.

The extant populations occur primarily in the Southern Sierra Foothills Vernal Pool Region, where they are concentrated northeast of the city of Merced in Merced County (24 occurrences) and east of Hickman in Stanislaus County (16 occurrences). Of the remaining eight extant occurrences, four are in central Merced County, representing the San Joaquin Valley Vernal Pool Region. The others are in the Solano-Colusa Vernal Pool Region, with two each in southeastern Yolo and central Solano counties (Stone *et al*. 1988, Keeler-Wolf *et al*. 1998, CNDDB 2002). The species has been extirpated from Colusa County (CNDDB 2002).

Life History and Habitat

Many life-history characteristics are common to all members of the Orcuttieae. They are annuals, and all exhibit C_4 photosynthesis (Downton 1975, Griggs 1981, Keeley 1998). All are wind-pollinated, but pollen probably is not carried long distances between populations (Griggs 1980, Griggs and Jain 1983). Local seed (i.e., caryopsis) dispersal is by water, which breaks up the inflorescences (Reeder 1965, Crampton 1976, Griggs 1980, Griggs 1981). Long-distance dispersal is unlikely (Service 1985*c*) but seed may have been carried occasionally by waterfowl (family Anatidae), tule elk (*Cervus elaphus nannoides*), or pronghorn (*Antilocapra americana*) in historical times (Griggs 1980). The seeds can remain dormant for an undetermined length of time, but at least for three or four years, and germinate underwater after they have been immersed for prolonged periods (Crampton 1976, Griggs 1980, Keeley 1998). Unlike typical terrestrial

grasses that grow in the uplands surrounding vernal pools, members of the Orcuttieae flower during the summer months (Keeley 1998).

All members of the Orcuttieae are endemic to vernal pools. Although the various species have been found in pools ranging widely in size, the vast majority occur in pools of 0.01 hectares (0.025 acres) to 10 hectares (24.7 acres) (Stone *et al*. 1988). Large pools such as these retain water until May or June, creating optimal conditions for Orcuttieae (Crampton 1959, Crampton 1976, Griggs 1981, Griggs and Jain 1983). Within the pools, Orcuttieae occur in patches that are essentially devoid of other plant species (Crampton 1959, Crampton 1976). Typically, plants near the center of a pool grow larger and produce more spikelets than those near the margins, but patterns vary depending on individual pool characteristics and seasonal weather conditions (Griggs 1980).

Reproductive Ecology

In an experiment where Colusa grass was grown along with Greene's tuctoria and two species of *Orcuttia* (Keeley 1998), seeds of Colusa grass took approximately three months to germinate following inundation, longer than all other species. Unlike *Orcuttia* species, Colusa grass does not produce flattened, floating juvenile leaves (Reeder 1982, Keeley 1998). Germination and seedling development have not been studied in the wild but are assumed to be similar to those of *Tuctoria* species, which have similar seedlings. Thus, Colusa grass seed would be expected to germinate in late spring when little standing water remains in the pool, and flowering would begin approximately three to four weeks later, as observed for *Tuctoria* (Griggs 1980). Flowering individuals of Colusa grass have been collected as early as May throughout the range of the species (CNDDB 2002). Colusa grass spikelets break between the florets (Reeder 1993), shattering as soon as the inflorescence matures (Crampton 1976).

Among all members of the Oructtiaeae, the soil seed bank may be 50 times or more larger than the population in any given year. In general, years of above-average rainfall promote larger populations of Orcuttieae, but population responses vary by pool and by species (Griggs 1980, Griggs and Jain 1983). Population sizes have been observed to vary by one to four orders of magnitude among successive years and to return to previous levels even after three to five consecutive years when no mature plants were present (Griggs 1980, Griggs and Jain 1983, Holland 1987). Thus, many years of observation are necessary to determine whether a population is stable or declining.

Reproductive and survival rates of Colusa grass have not been reported, but annual monitoring confirms that population sizes of Colusa grass vary widely from year to year. Over a 6-year monitoring period, the population at the Bert Crane Ranch in Merced County dropped from 250 plants in 1987 to zero in 1989 and 1990 but rebounded to over 2,000 plants in 1992 (Silveira in litt. 2000). At Olcott Lake in Solano County, the lowest population of the decade was 1,000 in 1994 yet was followed by a high of over one million the following year (CNDDB 2001).

Habitat and Community Associations

Colusa grass has the broadest ecological range among the Orcuttieae. It occurs on the rim of alkaline basins in the Sacramento and San Joaquin valleys, as well as on acidic soils of alluvial fans and stream terraces along the eastern margin of the San Joaquin Valley and into the adjacent foothills (Stone *et al*. 1988). Elevations range from 5 m (18 ft.) to approximately 105 m (350 ft.) at known sites (CNDDB 2001). Colusa grass has been found in Northern Claypan and Northern Hardpan vernal pool types (Sawyer and Keeler-Wolf 1995) within rolling grasslands (Crampton 1959). It grows in pools ranging from 0.01 to 250 hectares (0.02 to 617.5 acres), with a median size of 0.2 hectares (0.5 acres), and also occurs in the beds of intermittent streams and in artificial ponds (Stone *et al*. 1988, K. Fuller personal communication 1997, EIP Associates 1999). This species typically grows in the deepest portion of the pool or stream bed (Crampton 1959, Stone *et al*. 1988) but also may occur on the margins (Hoover 1937, Stone *et al*. 1988). Deeper pools and stock ponds are most likely to provide the long inundation period required for germination (EIP Associates 1999).

Several soil series are represented throughout the range of Colusa grass. In the Solano-Colusa Vernal Pool Region, Colusa grass grows on clay, silty clay, or silty clay loam soils in the Marvin, Pescadero, and Willows series. In the San Joaquin Valley Vernal Pool Region, soils are clay or silty clay loam in the Landlow and Lewis series (Silveira in litt. 2000). Colusa grass habitat in the Southern Sierra Foothills Vernal Pool Region includes many soil series with textures ranging from clay to gravelly loam. For sites with known soil series, these include Bear Creek, Corning, Greenfield, Keyes, Meikle, Pentz, Peters, Raynor, Redding, and Whitney (Stone *et al*. 1988, EIP Associates 1999, CNDDB 2001). The type and composition of impermeable layers underlying occupied vernal pools also varies, ranging from claypan to lime-silica or iron-silica cemented hardpan and tuffaceous alluvium (Stone *et al*. 1988)

Colusa grass usually grows in single-species stands, rather than intermixed with other plants. Thus, associated species in this case are plants that occur in different zones of the same pools but are present in the same season. For example, Crampton (1959) observed that Colusa grass dominated pool beds, with hairy Orcutt grass forming a band around the upper edge of the stand. In saline-alkaline sites, common associates of Colusa grass are frankenia and saltgrass, whereas on acidic sites associates include coyote-thistle, turkey mullein (*Eremocarpus setigerus*), and vernal pool popcorn flower (Stone *et al*. 1988, EIP Associates 1999). Greene's tuctoria formerly grew in one vernal pool with Colusa grass, but the former no longer occurs there (Stone *et al*. 1988, CNDDB 2001).

Reasons for Decline and Threats to Survival

Colusa grass declined primarily because pools in which it occurred were destroyed by conversion to irrigated agriculture, primarily to orchards and vineyards (Crampton 1976, Medeiros 1976, CNDDB 2001). Other factors that extirpated populations of Colusa grass included altered hydrology, surface disturbance, and excessive livestock grazing. At least nine, and possibly 11, occurrences have been extirpated, although several others most likely were eliminated before being reported (Stone *et al*. 1988). The Yolo County occurrences have been damaged by herbicide application (Witham in litt. 2000) and the groundwater there has been

contaminated by industrial chemicals (K. Fuller personal communication 1997).

The same factors that contributed to the decline of Colusa grass continue to pose threats. Agricultural conversion is most likely to occur in eastern Stanislaus County and threatens the 16 extant occurrences there. Dry-land farming there is gradually being replaced by irrigated agriculture; the former apparently is compatible with the persistence of Colusa grass, but the latter is not (Crampton 1959, Crampton 1976). Changes in natural hydrology, such as draining pools or creating reservoirs, could create unsuitable conditions for Colusa grass by decreasing or increasing inundation periods. Increased grazing intensity or summer grazing would threaten Colusa grass, even though moderate cattle grazing in spring has not posed a problem (Stone *et al*. 1988). Sheep grazing is compatible if the flock is removed before Colusa grass begins growth for the year. However, sheep trampling and bedding during the seedling and flowering stages are detrimental (Witham in litt. 1992).

Another threat to the survival of Colusa grass comes from the construction of the proposed University of California campus and associated community in Merced County. Four occurrences (constituting five pools and ponds) are in the area expected to be developed within the next 15 years, and two others (constituting one pool and one stockpond) are within the "planning area" (EIP Associates 1999, CNDDB 2001).

Additional factors threaten the survival of Colusa grass, particularly the problem of small population size. Although populations may drop to only a few visible plants in certain years, seven consisted of fewer than 100 plants even at their peak (CNDDB 2002) and thus are likely to represent small populations. Non-native plants such as swamp grass and alkali mallow, and invasive native species such as cocklebur and lippia could out-compete Colusa grass and may be particular problems in combination with other factors such as decreased inundation and inappropriate livestock grazing (Stone *et al*. 1988, Witham in litt. 2000). Grasshopper foraging has been observed on Colusa grass (Stone *et al*. 1988), but the extent of this threat is unknown. The two Yolo County occurrences are threatened by herbicide run-off from adjacent agricultural operations (CNDDB 2001).

Status with Respect to Recovery

Most of the conservation efforts for Colusa grass have been accomplished as part of the broader effort to survey and protect vernal pools in the Central Valley. Surveys conducted by Crampton (1959), Medeiros (1976), and Stone *et al.* (1988) contributed to distributional records and identification of threats. Four occurrences of Colusa grass, comprising six occupied pools, have been protected by The Nature Conservancy. One is Olcott Lake on the Jepson Prairie Preserve in Solano County, where the Colusa grass population has been monitored annually since 1989

(Witham in litt. 1992, CNDDB 2001). The other five pools are on the Flying M Ranch conservation easement in eastern Merced County (Stone *et al*. 1988).

Three additional occurrences of Colusa grass are on federal land, which offers more options for conservation but does not in itself constitute protection. Two are on a U.S. Department of Defense facility in Yolo County, which was scheduled to be released from federal ownership in 2001 (Fuller in litt. 2000). The other occurrence is on the Arena Plains Unit of the Merced National Wildlife Refuge in Merced County. The Service, which administers the refuge, acquired the Arena Plains in 1992, and refuge personnel have been monitoring the Colusa grass population annually since 1993. Although the refuge allowed grazing to continue on the Arena Plains after it was purchased, temporary electric fencing was placed around the Colusa grass pool one year to exclude cattle when the population was deemed to be particularly vulnerable (D. Woolington pers. comm. 1997, Silveira in litt. 2000).

Status within the Action Area and Environmental Baseline

Fifty-nine Colusa grass occurrences have been reported in California (CNDDB 2002). None of those are from Sacramento County, Sutter County, or the Basin. The closest reported Colusa grass occurrences are from Yolo County, approximately ten miles southwest of the Basin.

The Natomas Basin supports limited amounts of potential Colusa grass habitat. Potential habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat per acre of grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat per acre of grassland in the Basin (K. Fuller, pers. comm. to C. Aubrey, 2003). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. However, none of the vernal pools that have been identified in the Basin are either large or deep. Orcuttieae are almost always associated with pools that retain water into May or June (Crampton 1959, Crampton 1976, Griggs 1981, Griggs and Jain 1983).

Threatened Slender Orcutt Grass

Slender Orcutt grass was federally listed as threatened in 1997 (Service 1997*b*) and has been state-listed as endangered since 1979 (CDFG 1991). It was recognized as rare and endangered by the California Native Plant Society as early as 1974 (Powell 1974), is now included on List 1B, and is considered to be "endangered throughout its range" (Skinner and Pavlik 1994).

Description

Slender Orcutt grass occurs in valley grassland and blue oak woodland. It grows in vernal pools on remnant alluvial fans and high stream terraces and recent basalt flows. It has some ability to

colonize artificial habitats, such as the margins of stock ponds (Stone *et al*. 1988, Corbin and Schoolcraft 1989, CNDDB 2000).

Slender Orcutt grass grows as single stems or in small tufts consisting of a few stems. The plants are sparsely hairy and branch only from the upper half of the stem. Although the stems typically are erect, they may become decumbent if many branches form near the stem tip (Reeder 1982). The stems range from 5 to 20 cm (2.0 to 7.9 in.) in height (Schoolcraft in litt. 2000) and are approximately 0.5 mm (0.02 in.) in diameter. The terrestrial leaves are 1.5 to 2 mm (0.06 to 0.08 in.) wide. In slender Orcutt grass, the inflorescence comprises more than half of the plant's height, and the spikelets are more or less evenly spaced throughout the inflorescence. Each spikelet contains from five to 20 florets. The grains are approximately 3 mm (0.12 in.) long (Hitchcock 1934, Reeder 1982, Stone *et al*. 1988, Reeder 1993). In one study, seed weight ranged from 0.32 to 0.81 milligrams (mg)(1.1 to 2.8 x 10^{-5} ounces) (Griggs 1980). The diploid chromosome number of slender Orcutt grass is 26 (Reeder 1982).

Slender Orcutt grass is most similar to hairy Orcutt grass, but the former has narrower stems and leaves, branches at the upper nodes, larger spikelets that are not crowded on the rachis, larger seeds, a different chromosome number, and flowers earlier (Reeder 1982). Other *Orcuttia* species have unequal lemma teeth and also differ in seed size and chromosome number (Reeder 1982).

Historical and Current Range

By the mid-1980's, slender Orcutt grass was known from only 18 localities in Lake, Sacramento, Shasta, and Tehama counties (Reeder 1982, Stone *et al*. 1988). During the late 1980's, Stone *et al*. (1988) and others (CNDDB 2000) discovered 34 additional occurrences of slender Orcutt grass. Of the 52 occurrences reported prior to 1990, the majority (29 occurrences, 55.8 percent) were in the Northeastern Sacramento Valley Vernal Pool Region of Tehama County; most of those were in the vicinity of Dales, except for four occurrences on the Vina Plains. Another 14 occurrences (26.9 percent) were in the Northwestern Sacramento Valley Vernal Pool Region, on the Stillwater and Millville Plains of Shasta County. The Modoc Plateau Vernal Pool Region accounted for another six occurrences (11.5 percent), including four in Shasta County and two in Siskiyou County. The remaining three occurrences included two in Lake County, which was in the Lake-Napa Vernal Pool Region, and one in Sacramento County, in the Southeastern Sacramento Valley Vernal Pool Region (Griggs and Jain 1983, Stone *et al*. 1988, CNDDB 2000).

During the past decade, 27 new occurrences of slender Orcutt grass have been reported, including three that were introduced into created pools. Thus, a total of 79 occurrences are known, of which 73 are presumed to be extant (Corbin in litt. 1999, CNDDB 2000). In addition to the counties where it was reported historically, slender Orcutt grass is now known from Lassen and Plumas counties.

The primary area of concentration for slender Orcutt grass (42.5 percent of occurrences) is still in the vicinity of Dales, Tehama County, where 28 natural occurrences and the three introduced populations remain extant. Those 31 occurrences and the four in the Vina Plains of Tehama County are all in the Northeastern Sacramento Valley Vernal Pool Region (Keeler-Wolf *et al*. 1998). A secondary area of concentration for slender Orcutt grass is the Modoc Plateau Vernal Pool Region in Lassen, Plumas, Shasta, and Siskiyou counties with 22 extant occurrences (30.1 percent). The portion of Shasta County that is in the Northwestern Sacramento Valley Vernal Pool Region has 12 extant occurrences (16.4 percent). The Lake-Napa Vernal Pool Region accounts for two extant occurrences, both in Lake County, and the remaining two occurrences are in Sacramento County, in the Southeastern Sacramento Valley Vernal Pool Region (Stone *et al*. 1988, Corbin and Schoolcraft 1989, Corbin in litt. 1999, CNDDB 2000).

Reproductive Ecology and Demography

Optimal germination of slender Orcutt grass is achieved through stratification followed by warm days and mild nights (Griggs 1974 in Stone *et al*. 1988). Peak flowering of this species typically occurs in May in the Central Valley (Griggs 1981, Reeder 1982) but not until June or July on the Modoc Plateau (Corbin in litt. 2000, Schoolcraft in litt. 2000). Unlike hairy Orcutt grass and Greene's tuctoria, slender Orcutt grass is not likely to die when pools are flooded by late spring or summer rains. At two sites near Dales that were inundated by rains in May 1977, slender Orcutt grass plants dropped their existing inflorescences but resprouted and flowered again within one month (Griggs 1980, Griggs and Jain 1983). Moreover, the population at the Vina Plains Preserve in Tehama County experienced a second pulse of germination after summer rains in 1982 (Broyles 1983, in Alexander and Schlising 1997). Conversely, drought has been known to cause 100 percent mortality (Griggs 1980, Griggs and Jain 1983).

Similar to other vernal pool annuals, slender Orcutt grass populations can vary greatly in size from year to year. Fluctuations of up to four orders of magnitude have been documented in Lake and Shasta counties (Griggs 1980, Griggs and Jain 1983). At the Vina Plains Preserve, the single population ranged in size from 1,000 to 147,700 individuals during the five times it was reported over a 13-year period (Stone *et al*. 1988, Alexander and Schlising 1997). However, slender Orcutt grass populations do not always fluctuate in size. Among five populations of slender Orcutt grass that Griggs tracked from 1973 to 1979, two remained at the same order of magnitude for the entire period. Both were in the Dales area. None of the other five species of Orcuttieae included in the study remained stable for the full seven years (Griggs 1980, Griggs and Jain 1983).

Seeds of slender Orcutt grass germinate even in dry years, but the proportion of plants surviving to maturity varies. In a 1977 demographic study of two slender Orcutt grass populations near Dales and a third near Redding (Griggs 1980, Griggs and Jain 1983), survivorship ranged from 0 to 75 percent (average = 40 percent). At the two sites near Dales, densities of slender Orcutt grass were 694 and 1,530 per square meter (64.5 and 142.1 per square foot, respectively) in 1977 (Griggs 1980, Griggs and Jain 1983). At the Vina Plains Preserve, the single occupied pool had a density of 71 plants per square meter (6.6 per square foot) in 1995 (Alexander and Schlising

1997). Slender Orcutt grass produced an average of 58 seeds per plant in 1977, ranging from 11.3 to 163.9 among the populations studied. At one Dales-area site, the soil seed bank was estimated to be more than 14 times greater than the population of growing plants in 1977 (Griggs 1980, Griggs and Jain 1983).

Griggs (1980) and Griggs and Jain (1983) reported that most of the genetic diversity in slender Orcutt grass occurred among individuals with the same seed parent. He found nearly as much genetic diversity within a single population but little difference between populations. However, his study included only two populations from Tehama County, which were in close proximity. One of the Sacramento County populations differs considerably from other occurrences in outward appearance, suggesting that it may differ genetically (Cochrane in litt. 1995*a*).

Habitat and Community Associations

Slender Orcutt grass is found primarily on substrates of volcanic origin (Crampton 1959, Corbin and Schoolcraft 1989), on soils that range from slightly to strongly acidic (Stone *et al*. 1988) and from clay to sandy, silty, or cobbly loam (Corbin and Schoolcraft 1989, CNDDB 2000 and unprocessed data). Sacramento Valley populations occur on the Redding, Toomes, and Tuscan soil series (Stone *et al*. 1988, CNDDB 2000). Elsewhere, soil series have not been reported. Natural pools in which slender Orcutt grass grows are classified as Northern Volcanic Ashflow and Northern Volcanic Mudflow vernal pools (Sawyer and Keeler-Wolf 1995). However, this species also has been reported from other natural and artificially-created seasonal wetlands such as creek floodplains, stock ponds, and borrow pits. Impervious layers beneath occupied pools range from iron-silica hardpan to bedrock (Stone *et al*. 1988, Corbin and Schoolcraft 1989, CNDDB 2000).

Among the populations studied by Stone *et al*. (1988), the median area of pools occupied by slender Orcutt grass was 0.65 hectares (1.6 acres) and ranged from 0.08 to 45 hectares (0.2 to 111 acres). On the Modoc Plateau, occupied pools known as of 1989 ranged in size from 2 to 40 hectares (5 to 100 acres) and were typically at least 30 cm (11.8 in.) deep; this species was restricted to the deepest areas of these pools (Corbin and Schoolcraft 1989). Slender Orcutt grass occurs through a wide range of elevations corresponding to its broad geographical range. The lowest reported elevation was 27 m (90 ft.) in Sacramento County (Stone *et al*. 1988) and the highest was 1,640 m (5,380 ft.) in Lassen County (CNDDB unprocessed data).

Vegetation types in which the occupied pools occur are diverse, ranging from grassland and oak woodland to mixed conifer forest, silver sagebrush (*Artemisia cana*) flats, and sedge meadows (Crampton 1959, CNDDB 2000). Associated species vary throughout the range of slender Orcutt grass. Among the most common associates in the Sacramento Valley are vernal pool popcorn flower, pale spikerush (*Eleocharis macrostachya*), coyote-thistle, whiteflower navarretia, and water shamrock. At other locations throughout northern California, slender Orcutt grass occurs with a wide variety of plants, including various species of *Downingia, Eryngium*, and *Navarretia* (Stone *et al*. 1988, Corbin and Schoolcraft 1989, Alexander and Schlising 1997, CNDDB 2000). Although slender Orcutt grass grows in the same vernal pool

complexes as hairy Orcutt grass in Tehama County (including the Vina Plains Preserve) and Sacramento Orcutt grass in Sacramento County, it has not been found to share any pools with either species (Stone *et al*. 1988, Cochrane in litt. 1995*a*, Alexander and Schlising 1997, CNDDB 2000).

Reasons for Decline and Threats to Survival

Urban development in the vicinity of Redding has extirpated or caused the severe decline of five slender Orcutt grass occurrences through construction activities and hydrological alterations (Griggs and Jain 1983, CNDDB 2000). Agricultural conversion apparently eliminated the species from the type locality. Although the exact location of the type collection is not known, the general area was being used for crop fields and both irrigated and dry pastures as of 1987 (Stone *et al*. 1988).

Urban development is continuing in the vicinity of Redding and could eliminate the remaining populations in that area. A variety of other factors are contributing to the continued decline of slender Orcutt grass including off-road vehicle use, inappropriate livestock grazing, altered hydrology, and competition from other plants (Stone *et al*. 1988, Corbin and Schoolcraft 1989). Off-road vehicle use is a particular problem near Redding and in forested areas of the Modoc Plateau. According to Stone *et al*. (1988), "moderate" livestock grazing in spring is compatible with slender Orcutt grass but overstocking, summer grazing, and trampling pose threats to several occurrences. However, grazing may be necessary to control aggressive competitors such as the native species, pale spikerush (Witham in litt. 2000). Altered hydrology contributes to the decline of slender Orcutt grass by creating conditions unsuitable for its germination, growth, or reproduction, and by promoting the growth of competing plant species.

Status with Respect to Recovery

Four natural occurrences of slender Orcutt grass are in designated preserves. These include the Trust for Wildland Communities' Boggs Lake Preserve in Lake County, The Nature Conservancy's Vina Plains Preserve in Tehama County, and two occurrences on CDFG's Dales Lake Ecological Reserve in Tehama County (Broyles 1987, Stone *et al*. 1988, CNDDB 2000). All four populations are monitored annually (Baldwin and Baldwin 1989*a*, Baldwin and Baldwin 1989*b*, Baldwin and Baldwin 1991, CNDDB 2000). A conservation area containing a population of slender Orcutt grass was recently established in Sacramento County to compensate for impacts to vernal pools (Fuller in litt. 2000). An unknown number of additional occurrences are protected from development by conservation easements; one is in Shasta County (CNDDB 2000), and the others are in the Dales Lake area of Tehama County, where a private landowner put more than 16,188 hectares (40,000 acres) of ranch land into a conservation easement in cooperation with The Nature Conservancy (Witham in litt. 2000).

Introductions of slender Orcutt grass have been attempted at two privately-owned sites. In 1978, slender Orcutt grass was seeded into two adjacent "ponds" in Chico, Butte County. Fewer than 100 plants grew in the two ponds that year or in 1979 (Griggs 1980), which was the last time the population size was reported. The other introduction was in 1982, when slender Orcutt grass was seeded into an artificial pool in Shasta County. As of 1987, the population was thriving (CNDDB 2000), but its current size is not known. An unintentional introduction may have taken place at the Dales Lake Ecological Reserve. In 1995, slender Orcutt grass appeared in 11 of 21 artificially-created vernal pools there, possibly because its seeds were contained in plant litter from nearby natural pools that was spread on the surface of the created pool (Witham in litt. 2000). The CNDDB (2000) considers those 11 pools to comprise three element occurrences, but the populations may not be viable; very few plants were found in 1995 and only one of the pools still supported slender Orcutt grass in 1999 (Witham in litt. 2000).

Twenty-seven of the 73 (37.0 percent) extant occurrences of slender Orcutt grass are wholly or partially on federal land. Seventeen of these are managed by the U.S. Forest Service, primarily the Lassen National Forest, although one is on the Shasta-Trinity National Forest. The other ten are on lands operated by the U.S. Bureau of Land Management; nine of these are in the Redding Resource Area and the other is in the Alturas Resource Area. Two of the occurrences on the Lassen National Forest, Adobe North and South Vernal Pools, are within an area that has been proposed as a Research Natural Area (Corbin in litt. 2000). The Green Place Reservoir occurrence in Shasta County is within a Wilderness Study Area and has been jointly proposed by the U.S. Bureau of Land Management and the Lassen National Forest as a Research Natural Area (Schoolcraft in litt. 2000). The Lassen National Forest and Susanville District of the U.S. Bureau of Land Management jointly prepared a management plan for slender Orcutt grass sites under their administration (including those in the Shasta-Trinity National Forest) in order to ensure the long-term survival of the species (Corbin and Schoolcraft 1989). Actions identified in that plan included avoidance of known populations, maintenance of natural hydrology, monitoring selected populations, and surveys in suitable habitats. As a result of the plan, several areas have been fenced to exclude livestock and a considerable number of additional populations have been discovered (Corbin in litt. 1999, CNDDB 2000, Corbin in litt. 2000, Schoolcraft in litt. 2000).

Status within the Action Area and Environmental Baseline

A review of CNDDB (2002) revealed that slender Orcutt grass had been reported 84 times in California. Slender Orcutt grass has not been recorded from Sutter County or the Basin. However, it has been reported twice from Sacramento County. The closest reported slender Orcutt grass record to the Basin is approximately 14 miles away in north-central Sacramento County.

The Natomas Basin supports limited amounts of potential slender Orcutt grass habitat. Potential habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat per acre of grasslands in

Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat per acre of grassland in the Basin (K. Fuller, pers. comm. to C. Aubrey, 2003). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. However, none of the vernal pools that have been identified in the Basin are either large or deep. Orcuttieae are almost always associated with pools that retain water into May or June (Crampton 1959, Crampton 1976, Griggs 1981, Griggs and Jain 1983).

Endangered Sacramento Orcutt Grass

Sacramento Orcutt grass was federally listed as an endangered species in 1997 (Service 1997b) and has been state listed as endangered since 1979 (CDFG 1991). The California Native Plant Society has included it on lists of very rare and endangered plants for over two decades (Powell 1974); Sacramento Orcutt grass is currently on List 1B, with the highest endangerment rating possible (Skinner and Pavlik 1994).

Description

Sacramento Orcutt grass has unequal lemma teeth, unlike hairy and slender Orcutt grasses. Both California and San Joaquin Valley Orcutt grasses have unequal lemma teeth but can be distinguished from Sacramento Orcutt grass by the length of the lemma and its teeth and bristles, the size and density of the inflorescence, and the size of the seeds. Moreover, the chromosome number of Sacramento Orcutt grass differs from all other *Orcuttia* species (Reeder 1982).

Historical and Current Range

Sacramento Orcutt grass is endemic to the Southeastern Sacramento Valley Vernal Pool Region (Keeler-Wolf *et al*. 1998) and has always been restricted to Sacramento County. The earliest collection was from 1936 near Phoenix Field. Three other occurrences documented in 1941 and 1958 extended the range north to Orangevale and south to near Sloughhouse. Sacramento Orcutt grass was introduced to Phoenix Park, Sacramento County, in 1978. Three additional natural occurrences were discovered in the late 1980's, including one in extreme southeastern Sacramento County near Route 104. Thus, by 1990, this species was known from a total of seven natural occurrences and one introduction (Stone *et al*. 1988, CNDDB 2000).

Within the past decade, Sacramento Orcutt grass has been discovered at one new site in Sacramento County, within the previously known range. However, one entire occurrence and a portion of another have been extirpated. Thus, eight of the nine occurrences are extant. Five occurrences, comprising more than 70 percent of the occupied habitat, are concentrated into a single area of approximately 6 km^2 (2.3 square miles) east of Mather Field. Two other occurrences are adjacent to each other: Phoenix Field Ecological Reserve and the introduced population at Phoenix Park. The eighth extant occurrence is near Rancho Seco Lake (Stone *et al*. 1988, Cochrane in litt. 1995*a*, Morey in litt. 1996, CNDDB 2000). All occurrences are in the Southeastern Sacramento Valley Vernal Pool Region (Keeler-Wolf *et al*. 1998).

Reproductive Ecology and Demography

Sacramento Orcutt grass flowers in May and June (Griggs 1977, Skinner and Pavlik 1994, Cochrane in litt. 1995*a*) and sets seed in June and July (Holland 1987). The plants are adapted for wind pollination but do provide a source of pollen for native bees (Griggs 1974, in Stone *et al*. 1988). Seeds likely do not disperse far under natural conditions. In a 6-year period, an experimental population spread at most 3 m (10 ft.) from the seed source, and 95 percent of plants were within 30 cm (11.8 in.) of the source (Holland in litt. 1986). A demographic study conducted from 1974 to 1978 (Griggs 1980, Griggs and Jain 1983) indicated that Sacramento Orcutt grass produced an average of 500 seeds per plant. At one site in 1978, 88 percent of plants survived to maturity. The size of the seed bank stored in the soil was approximately 44 times as great as the population of growing plants (Griggs 1980, Griggs and Jain 1983). The number of plants varies with rainfall. Large numbers of plants grow only in years when seasonal rainfall exceeds 40 cm (15.7 in.), particularly when heavy rains begin in November and continue through the end of April (Holland 1987). This species is less likely to germinate in years of below-normal precipitation than other members of the tribe (Griggs 1980, Griggs and Jain 1983).

In studies of enzyme systems, genetic diversity between populations of Sacramento Orcutt grass was low. However, plants from the primary area of concentration had alleles that did not occur in other areas. The amount of genetic variation occurring among related individuals was approximately equal to that within populations (Griggs 1980, Griggs and Jain 1983).

Habitat and Community Associations

Sacramento Orcutt grass has been found in Northern Hardpan and Northern Volcanic Mudflow vernal pools (Sawyer and Keeler-Wolf 1995). It occurs on high-terrace sites (Stone *et al*. 1988) at elevations of 46 to 82 m (150 to 270 ft.) (CNDDB 2000). Occupied pools occur in blue oak woodland and annual grassland (Crampton 1959, Griggs 1977, CNDDB 2000). Among occupied pools discovered prior to 1988, the median area was 0.28 hectares (0.69 acres) and ranged from 0.1 hectares (0.25 acres) to 0.82 hectares (2.03 acres). Soils underlying pools where Sacramento Orcutt grass grows are acidic with an iron-silica hardpan (Stone *et al*. 1988), and the pools contain numerous cobbles (Crampton 1959, Stone *et al*. 1988). Most of the known occurrences are on soils in the Redding series, but at least two are in the Pentz-Pardee-Red Bluff association (Stone *et al*. 1988).

The most common associates of Sacramento Orcutt grass are vernal pool popcorn flower, coyote-thistle, pale spikerush, and dwarf woolly-heads (Stone *et al*. 1988). Boggs Lake hedge-hyssop co-occurs with Sacramento Orcutt grass in one pool (Stone *et al*. 1988, CNDDB 2000). One population of slender Orcutt grass grows in the same vicinity as Sacramento Orcutt grass, but the two species have not been found together (Cochrane in litt. 1995*a*).

Reasons for Decline and Threats to Survival

One former occurrence of Sacramento Orcutt grass between Orangevale and Folsom was

eliminated by urban development. The species was extirpated from one pool near Grant Line Road by changes in hydrology: pool depth was increased artificially to provide a longer-lasting water source for livestock, which created conditions unsuitable for persistence of Sacramento Orcutt grass (Stone *et al*. 1988, CNDDB 2000). Although they have not been extirpated, extant occurrences at the Phoenix Field Ecological Reserve and the Phoenix Park Vernal Pool Preserve have been degraded by off-road vehicles and alterations to natural drainage patterns (Clark *et al*. 1998).

The remaining pools where Sacramento Orcutt grass grows are subject to a wide variety of factors that threaten the species' survival. Urban encroachment, which encompasses many activities, is the primary factor. One occurrence in the primary area of concentration could be destroyed by expansion of the county landfill (Cochrane in litt. 1995*a*); the precise area of expansion has yet to be determined. At present, trash from the landfill frequently blows into the pools (Cochrane in litt. 1995*b*). An industrial park and road widening threaten another one of the occurrences in the same area (Stone *et al*. 1988, Cochrane in litt. 1995*a*). The Phoenix Field Ecological Reserve and Phoenix Park occurrences are affected by excess runoff from lawns, ball fields, and roads; by herbicide and fertilizer applied in adjacent areas (Griggs and Jain 1983, Holland in litt. 1986, Stone *et al*. 1988, Cochrane in litt. 1995*a*, Morey in litt. 1996, Clark *et al*. 1998); and by dumping of landscape waste (Clark *et al*. 1998). Another threat at the Phoenix Field Ecological Reserve is invasion of garden plants (Clark *et al*. 1998). Recreational activities such as rollerblading (Witham in litt. 2000), biking, and horseback riding (Cochrane in litt. 1995*a*, Cochrane in litt. 1995*b,* Clark *et al*. 1998) also are damaging the Phoenix Park occurrence.

Competition from native plants such as pale spikerush and non-native plants such as mannagrass (*Glyceria* spp.) could displace Sacramento Orcutt grass (Stone *et al*. 1988, Cochrane in litt. 1995*a,* Cochrane in litt. 1995*b*, Clark *et al*. 1998). Livestock grazing during the growing season, or overstocking during winter grazing, may degrade habitat for Sacramento Orcutt grass; however, grazing may be useful in providing control of competing plants if appropriate timing and stocking rates can be determined (Griggs 1977, Stone *et al*. 1988, Cochrane in litt. 1995*b*).

Status with Respect to Recovery

Two reserves have been set aside to protect Sacramento Orcutt grass. The Phoenix Field Ecological Reserve encompasses 3.2 hectares (8 acres) and is managed by CDFG. The site has been fenced and only authorized persons have access. CDFG plans to install a drain to prevent urban and landscape runoff from entering the pools. Volunteers and agency personnel monitor the Sacramento Orcutt grass population periodically (Morey in litt. 1996, Clark *et al*. 1998). The nearby Phoenix Park Vernal Pool Preserve encompasses 5.7 hectares (14 acres) and is managed by the Fair Oaks Recreation and Park District. A low fence excludes motorized vehicles but allows foot traffic. Interpretive signs and a footbridge also have been installed (Clark *et al*. 1998).

Griggs (1980) studied the ecology, demography, and genetics of several species in the Orcuttiae

tribe, including Sacramento Orcutt grass. In the course of his research, he introduced local seeds into an unoccupied, natural pool in Phoenix Park. The introduction apparently was successful because the population has persisted and remained stable since 1978 (Cochrane in litt. 1995*a,* CNDDB 2000).

The Service funded a status survey for members of the Orcuttieae in the 1980's, which led to the discovery of several new populations (Stone *et al*. 1988). The CDFG sponsored a native plant recovery workshop in 1995 to develop recovery strategies for Sacramento Orcutt grass (Cochrane in litt. 1995*a*). Workshop participants have since conducted several tasks contributing to the species' recovery, including monitoring populations, assessing threats, and providing public education (Cochrane in litt. 1995*b*, Morey in litt. 1996).

Status within the Action Area and Environmental Baseline

A review of CNDDB (2002) revealed that Sacramento Orcutt grass had been reported nine times in California. Sacramento Orcutt grass has not been recorded from Sutter County or the Basin. However, it has been reported nine times from Sacramento County. Most of these records are from northeastern Sacramento County. The closest reported Sacramento Orcutt grass record to the Basin is approximately 15 miles away in northeastern Sacramento County.

The Natomas Basin supports limited amounts of potential Sacramento Orcutt grass habitat. Potential habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat per acre of grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat per acre of grassland in the Basin (K. Fuller, pers. comm. to C. Aubrey, 2003). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. However, none of the vernal pools that have been identified in the Basin are either large or deep. Orcuttieae are almost always associated with pools that retain water into May or June (Crampton 1959, Crampton 1976, Griggs 1981, Griggs and Jain 1983).

Swainson's Hawk

The Swainson's hawk is listed by the State of California as a threatened species and is protected under the MBTA. Additional information on the life history of the Swainson's hawk can be found in CDFG's November 1, 1994, *Staff Report regarding Mitigation for Impacts to Swainson's Hawk (Buteo swainsoni) in the Central Valley of California* (CDFG 1994).

Description

The Swainson's hawk is a medium sized buteo (708 - 992 g [25-35 ounces]) with relatively long, pointed wings and a long, square tail. It occurs in three primary color phases (plumage morphs), including a light-morph, dark-morph, and rufous-morph. Some individuals are an intermediate morph, with variations of the three primary morphs (Estep 2001, in City *et al.* 2003). The dark-morph hawk differs from the light-morph in that it is entirely brown with a light patch under the tail. The trailing edges of the wings are slightly lighter in color than the leading edges. Both the dark and light morphs can have white undertail coverts. The third variation is a rufous-morph, which is characterized by a lighter color of brown with rusty barrings on the underparts. The Swainson's hawk soars with its wings held above the horizontal in a dihedral or "v" shape. When perched, its wings are slightly pointed and extend to or beyond the tail feathers (Estep 2001, in City *et al.* 2003).

Swainson's hawks are opportunistic foragers, flushing prey (rodents, insects and some birds) from fields, pastures and grasslands adjacent to their nests. In the Central Valley, their primary diet consists of small rodents, including meadow voles (*Microtus californicus*). During the summer months, the hawks consume large quantities of insects (Estep 1989).

Historical and Current Range, Movements

The Swainson's hawk breeds throughout western North America, including provinces of Canada and most states west of the Mississippi River (Dechant *et al*. 2001). It winters in grassland and agricultural regions from Central Mexico to southern South America (England *et al*. 1997).

Historically, the Swainson's hawk nested throughout lowland California. However, its current California nesting distribution is limited to the Mojave Desert, northeastern California, the Central Valley, and a few isolated locations in the Owens Valley (CDFG 1992b, 1994). The Swainson's hawk typically occurs in California only during the breeding season (March through September) and winters outside of the U.S. in Mexico and South America. The species was once thought to winter exclusively in Argentina. However, recent telemetry studies (satellite radio) have shown the species to winter in Mexico, with additional detections in Central America and South America. The Central Valley population migrates only as far south as Central Mexico (Estep 2001, in City *et al.* 2003). Additionally, 30 individual hawks have been wintering in the Delta for the past several years (Estep 2001, in City *et al.* 2003) and there are records of small numbers of Swainson's hawks wintering in southern Florida and Texas.

Essential Habitat Components and Use

Stringers of remnant riparian forest along drainages contain the majority (87 percent) of known nests in the Central Valley (England *et al*. 1995, Estep 1984, Schlorff and Bloom 1984). Swainson's hawks usually nest in large (12.2-18.3 m, 40-60 ft.) native trees such as valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*), walnut (*Juglans* sp.), and large willow (*Salix* sp.) and generally do not utilize non-native trees (Estep and Teresa 1992). Nest sites are always

directly associated with high-quality foraging habitat (Estep 1989). The loss of foraging habitat is recognized as having the potential to cause the abandonment of breeding territories and to contribute to a continued reduction in the statewide breeding population (CDFG 1988).

The hawk's minimum foraging area depends upon the vegetation supporting the prey populations and the farming activities that make prey particularly susceptible to predation, such as reduction of cover after harvesting, discing, mowing, flood irrigation and burning. The hawk's highly active foraging behavior often results in birds traveling as far as 30 km from a nesting site (Estep, 1989). Hawk foraging ranges fluctuate annually in response to changing crop patterns, and seasonally in response to changes in prey accessibility and abundance (Estep and Teresa 1992). Communal foraging occurs, especially when agricultural fields such as alfalfa undergo some form of cutting or harvesting (Babcock 1995). Swainson's hawks have been observed foraging behind farm machinery (moving harvester blade or disc), capturing rodents that have become exposed from ground disturbance (Estep, 1989). Foraging ranges in fields with increased vegetation cover and reduced prey availability can be as large as 15,000 acres (Koford, 1992). Suitable cover types for foraging habitats, in order of suitability, include native grassland, agriculture soon after discing, alfalfa and other hay crops, fallow fields, lightly grazed pasture, combinations of hay, grain, and row crops, rice fields prior to flooding and after draining, and heavily grazed pasture. Unsuitable cover types for foraging habitats include vineyards, mature orchards, flooded rice fields, cotton, thistle in fallow fields and any crop where prey are unavailable due to high vegetation height and density (Estep 1989). Because of the distribution of remaining potential nest trees (i.e., narrow riparian bands), Central Valley hawks have shortest average inter-nest distance recorded to date (Estep 1989).

Reproductive Ecology

Swainson's hawks begin to arrive in the Central Valley from their wintering grounds in March to breed and raise their young. The species typically roosts and migrates in groups. Territories are usually established by April with incubation and brooding occurring through June. The earliest fledging of young occurs in July and the young remain with the parents for approximately one month following fledging or until the southern migration in early fall. Recent telemetry studies have shown that some fledglings leave the nesting area and their parents to join a juvenile group or remain alone before the fall migration (Estep 2001, in City *et al.* 2003). Males provision females while the females incubate the eggs. Later, both parents feed the young. Nesting success is inversely correlated with distance to foraging habitat (Woodbridge 1991).

Swainson's hawks show a high degree of nest fidelity and generally return to the same area in which they nested previously. They will investigate several nest sites within this "territory," and settle on one nest dependent on local disturbances, surrounding habitat variables, the proximity of other nesting raptors (i.e., great horned owls, redtail hawks, etc.), and nest condition, although this selection mechanism is not well understood. Some pairs may repair several nests before settling in on one nest site. In the case of juvenile birds, they may build and/or repair a nest and then leave without laying eggs. Therefore, in any given year, and any given area, depending on nest site availability, many of the available nest sites may not be used. Generally, in the

Natomas Basin, one in every three nest sites are used each year, based on annual surveys of successfully nesting Swainson's hawks (T. Roscoe, pers. comm., in NBHCP 2003).

Reasons for Decline and Threats to Survival

Swainson's hawks were once described as a very common raptor in California, found throughout the State's lowlands (Sharp 1902). Since the mid-1800s, the native grasslands have undergone a gradual conversion to agricultural uses. This habitat loss has caused a substantial reduction in the breeding range and size of the breeding population in California (Bloom 1980, England *et al.* 1995).

The loss of agricultural lands due to urban development is further removing essential Swainson's hawk foraging habitat throughout the mid-section of the Central Valley (Estep and Teresa 1992). Swainson's hawks are sensitive to habitat fragmentation and will avoid low density development even though suitable prey conditions may exist (Estep and Teresa 1992). They have not been found in apparently suitable urban areas in the Central Valley where foraging habitat is unavailable for 5-8 km (e.g., Lodi and Sacramento), thus requiring long-distance transport of prey throughout the entire nesting cycle. Rapid urbanization or crop changes near cities could cause the long-term decline of Swainson's hawks in existing urban neighborhoods (England *et al*. 1995). Additional threats are habitat loss due to riverbank protection projects, conversion from agricultural crops that provide abundant foraging opportunities to crops such as vineyards and orchards, shooting, pesticide poisoning of prey animals and hawks on wintering grounds, competition from other raptors, and human disturbance at nest sites.

Status with Respect to Recovery

Nesting surveys conducted periodically by CDFG indicate a relatively large and stable hawk population along the Sacramento River every three or four years. Populations of meadow voles, the principal prey item of adult Swainson's hawks in the Central Valley, vary cyclically, peaking every three to four years. Vole populations in the Basin appeared to reach a peak in 1999 (SHTAC 2000).

Historically, as many as 17,000 Swainson's hawk pairs may have nested in California (CDFG 1992b, 1994). Currently, there are 882 known extant nesting site occurrences in California (Estep 2001, in City *et al.* 2003). The proposed action is in the Central Valley population of hawks, which consists of an estimated 600 to 900 of the remaining breeding pairs. The overall Swainson's hawk population is considered to be declining (CDFG 1992b, 1994). However, the Central Valley's breeding population has remained stable over the past ten years (Estep 2001, in City *et al.* 2003).

Status within the Action Area and Environmental Baseline

More than 87 percent of the known nest sites in the Central Valley are within riparian systems (Estep, 1984; Schlorff and Bloom, 1984). This is primarily a function of tree availability and not a preference for large riparian stands or the presence of other components of a riparian forest. Swainson's hawks also nest in mature roadside trees, isolated individual trees in agricultural fields, small groves of oaks, and trees around farm houses (CDFG, 1992, 1994). The Sacramento River location affords the hawk relatively easy access to foraging uplands on either side of the river, including lands in Yolo County. Relative to the Basin specifically, information indicates that nesting sites and foraging activity occur throughout the Basin (Estep 2001, in City *et al.* 2003), again depending on the presence of suitable trees in proximity to upland foraging areas.

Estep (2002) monitored Swainson's hawk nesting in and along the Natomas Basin in 2002. Seventy hawk territories were identified and monitored; the majority of them were located along the banks of the Sacramento River. Nest trees included walnut, cottonwood, willow, eucalyptus, valley oak, ornamental mulberry, and sycamore. Forty-three of the total 70 territories monitored were active (i.e., at least one adult was active on the nesting territory). Of the 43 active sites, 24 were occupied by breeding pairs that successfully nested (i.e., reared at least one young to fledging). The remaining nineteen sites were either unsuccessful (N = 18) or could not be determined (N = 1). At the 18 failed nest sites, eleven nested but failed to rear young to fledging; seven were occupied by the adult breeding pair but did not attempt to nest. Although the number of nests and active nests has increased yearly since 1999, overall reproductive performance has remained relatively constant because the proportion of successful nests has declined. The number of young per successful nest has remained relatively stable and is consistent with the Sacramento Valley population as a whole.

The proposed action will occur within the range of the Central Valley population of Swainson's Hawks. Much of this population's nesting habitat has been lost to agricultural practices, flood control projects, and urban expansion (Estep 2002). These same factors have also contributed to an overall reduction in native foraging habitat (e.g., grasslands). Within the proposed action's action area, projects have been and continue to be conducted that likely degrade the baseline of the species. In 2001 and 2002, the County of Sacramento approved several small development projects (residential and commercial) in the Natomas Basin that likely resulted in the loss of Swainson's foraging habitat. These developments were discussed in a January 31, 2003, letter from the Service and CDFG to the County of Sacramento (Service File no. 1-1-03-TA-0052). Some of the County-approved developments were relatively close to Swainson's hawk nest trees, which may affect nesting success at those trees. However, the total amount of habitat converted was small (< 10 acres) and was dispersed throughout the southwestern portion of the Basin. The amount developed would not be considered urbanization. The Sacramento International Airport removed three Swainson's hawk nest trees in 2002, two of which had been active in 2001. The third had not been active for the last couple of years (J. Estep, pers. Comm. to Craig Aubrey, 2003).

The Natomas Basin currently supports approximately 328 acres of potential Swainson's nesting habitat (riparian = 124 acres, oak groves = 98 acres, tree groves = 106 acres) (Table 5). This does not include potential nesting habitat on the west side of the levee on the Sacramento River. The majority (80 percent) of nesting habitat is located outside of the proposed Permit Areas. The amount of potential Swainson's foraging habitat fluctuates and is dependant on the amount and composition of agricultural crops. There is currently a total of approximately 22,051 acres of potential Swainson's foraging habitat in the Basin. Non-rice crops represent the majority (16,686 acres). Additional habitat types include: alfalfa (371 acres), idle (1,464 acres), grassland (886 acres), pasture (674 acres), and ruderal (1,970 acres). About 40 percent of the potential foraging habitat is located within the proposed Permit Areas. Drained rice fields are also known to provide potential foraging habitat for the hawk. Therefore, when drained or fallow, a portion of the Basin's 22,693 acres of rice fields are potential foraging habitat for the hawk.

In their April, 2003, Addendum to the Technical Memorandum for the NBHCP (Technical Addendum), the applicants include a detailed analysis regarding potential suitable foraging habitat in the Basin (see Appendix K to the NBHCP). Using assumptions derived from the literature (e.g., Bechard 1982, Estep 1989, Estep and Theresa 1992), they classified the Basin's available foraging habitat according to habitat quality and temporal availability. They found: (1) the majority (almost 75 percent) of available foraging habitat is moderate in quality (Table 5); (2) only eight percent of potential foraging habitat in the Basin is considered high quality; and (3) most of the Basin's potential foraging habitat is not available during the hawk's nesting period, especially when considered in proximity to nest sites because most of the Basin's row crops are bot available as foraging habitat until the late summer and early fall crop harvest. The availability of foraging habitat in proximity to the nest during the nesting season is important because studies have shown that Swainson's hawk reproductive performance decreases with increasing distance between the nest and foraging habitat (England *et al.* 1997, Woodbridge 1991). The authors analyzed the effects of the project under three possible scenarios[3] in which mitigation would be implemented and determined: (1) in two of the three scenarios, although there was an overall decrease in the amount of available foraging habitat, the amount of foraging habitat available to the hawk throughout the nesting season increased; (2) the NBHCP's conservation recommendations directed the Conservancy to focus upland habitat acquisitions in the vicinity of Swainson's nests; (3) implementation of the NBHCP would result in a net increase in the amount of high-quality foraging habitat in the Basin, especially in the vicinity of nest sites; and (4) although some nest sites in the vicinity of the proposed development activities might be abandoned upon implementation of the proposed action, factors such as the existing surplus of nest territories and planned tree plantings in the Basin would prevent any significant adverse effects to the nesting population.

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[3]The authors evaluated these three potential scenarios in which the mitigation program would be implemented depending on the nature of the baseline habitat to be replaced by the mitigation in order to capture the full range of potential future baseline habitat conditions in the Natomas Basin.

Aleutian Canada Goose

The Aleutian Canada goose (goose) was federally listed as endangered on March 11, 1967 (32 **FR** 4001), reclassified as threatened on December 12, 1990 (55 **FR** 51112), and de-listed on March 20, 2001 (66 **FR** 15643). The State has not issued the goose any special status. Additional details of the physical description and life history of the goose can be found in the Aleutian Canada Goose Recovery Plan (Service 1991a).

Description

The Aleutian Canada goose is one of the smallest subspecies of Canada goose . Adults are slightly larger than a mallard duck (*Anas Platyrhynchos*), weighing 1.8-2.7 kg. Like all Canada geese, Aleutian Canada geese have a black head and neck with a white cheek patch, brown wings and back, a grayish-brown breast and belly, a white rump patch, and black legs and feet. The Aleutian Canada goose is distinguished from other Canada goose subspecies by its small size, short bill, and white ring encircling the base of the neck.

Wintering and migrating Aleutian Canada geese forage in harvested corn fields, newly planted or grazed pastures, or other agricultural fields (e.g., rice stubble and green barley). Lakes, reservoirs, ponds, large marshes, and flooded fields are used for roosting and loafing (Grinnell and Miller 1944, Service 1991). In winter, Aleutian Canada geese exhibit a crepuscular foraging pattern, roosting in large flocks during most of the day and night and flying to and from foraging areas during the hours around dawn and dusk.

Historical and Current Range

Historically, the Aleutian Canada goose nested on most of the larger islands in the Aleutian chain and in the Commander and northern Kuril Island chains. When it was listed in 1967, it was only known to nest on Buldir Island in the western Aleutian Islands. Subsequently, remnant flocks have been found on Chagulak Island in the eastern Aleutians, and Kaliktagik in the Semidi Islands.

The Aleutian Canada goose's major migration and wintering areas include coastal areas of Oregon and northern California and California's Sacramento and San Joaquin Valleys. The Aleutian Canada goose migrates between breeding and wintering areas from August to mid-March.

Reasons for Decline and Threats to Survival

The decline in numbers of Aleutian Canada geese and the reduction of their breeding range is attributed to predation by arctic fox (*Alopex lagopus*), which were introduced on many Aleutian islands by fur traders during the period from 1836 to 1930 (55 **FR** 239). The role of migration and wintering habitat loss in the historic decline of Aleutian Canada geese is not well understood. Changing land use practices, including the conversion of cropland and pastures to

housing and other urban development, and sport and subsistence hunting likely contributed to the historical decline (Service 1991).

Status with Respect to Recovery

Most historic nesting islands are protected and managed, in part, for Aleutian goose recovery by the Alaska Maritime National Wildlife Refuge (Service 1991). The overall population of Aleutian Canada geese has sustained a strong increase in numbers since 1990. The most recent and highest population estimate of Aleutian Canada geese from the Aleutian Islands is of birds from their staging area near Crescent City in spring 1998. This estimate suggests that the Aleutian Canada goose population now exceeds 27,000 individuals, compared to fewer than 800 birds in 1975. Since 1990, the annual rate of growth of the population, based on peak counts of birds in California, has averaged about 20 percent. The overall annual growth rate of the population since recovery activities began in the 1970s has been about 14 percent. The Service delisted the Aleutian Canada goose on March 20, 2001 (66 **FR** 15643).

Environmental Baseline and Status within the Action Area

Aleutian geese forage and roost in suitable habitats throughout the Sacramento Valley, including the Sacramento, Colusa, Butte Sink, and Sutter National Wildlife Refuges and the agricultural fields that surround them. The Butte Sink, in particular, is a major fall staging area for Aleutian geese. Aleutian geese migrate to this location in the fall, remain about 1.5 months, then continue south in December (Service 1991). Staging geese roost in flooded fields, ponds, and berms in rice fields in the Butte Sink, and fly out to surrounding agricultural fields to forage on waste grains and beans, and sprouting winter wheat. Approximately 40,000 acres of potential suitable winter habitat exists in the Natomas Basin (Table 6). The Aleutian Canada goose winters in areas both north and south of the Natomas Basin and occasionally seen as a winter transient foraging in the Basin.

Burrowing owl

The borrowing owl is classified by the State of California as a Species of Special Concern. It is classified as endangered in Canada and is listed as threatened or endangered in many of the states that it is known to inhabit (Rosenberg *et al*. 1998).

Description, Essential Habitat Components

The burrowing owl is a small, long-legged owl of open habitats that possesses a short tail, long, narrow wings, and flat head. It is often observed perched on the ground or on fence posts (Sibley, 2000). The burrowing owl generally inhabits vacated burrows created by small mammals, such as badgers (*Taxidea taxus*), ground squirrels (*Spermophilus* spp. and *Ammospermophilus* spp.), and foxes (*Vulpes* spp.) or artificial structures (e.g., culverts, wood debris piles, etc...) for nesting and shelter. It also uses the burrow as refugia from the daytime heat (Haug and Oliphant, 1990). Ground squirrel burrows are most often used by burrowing

owls in central California (Johnson, pers. comm.). At the Conservancy's Betts-Kismat-Silva and Ayala properties, owls use ground squirrel and muskrat burrows (Roberts, pers. comm.). Burrowing owls forage nocturnally on small mammals and may take invertebrates during the day (Haug and Oliphant, 1990). The species is often found in areas with few visual obstructions such as roadsides and other disturbed areas inhabited by ground squirrels. It also favors elevated places such as berms, levees, road and rail beds where it can overlook open lands (NBHCP 2003). Additional information about burrowing owls can be found in CDFG's *Staff Report on Burrowing Owl Mitigation* (CDFG, 1995).

Historical and Current Range, Movements

The burrowing owl is a neotropical migrant that occurs throughout the western United States, including portions of northern Mexico and southern Canada. Its breeding range extends from the Canadian prairie provinces through the western United States to southern California and Texas. The species is also locally distributed throughout suitable habitat in the Caribbean, Central America, and South America. The owl winters in the southern portion of its range (Haug *et al*. 1993).

There are two subspecies of burrowing owl in North America. The Florida burrowing owl (*Speotyto cunicularia floridans*) is located primarily in Florida and the Bahamas. The western burrowing owl (*S. c. hypugaea*) is located throughout Mexico, the western United States , and southwestern Canada (Haug *et al.* 1993).

California appears to have a nonmigratory population of burrowing owls (primarily in the Imperial Valley), as well as burrowing owls wintering from other regions. Burrowing owls in northern California are probably migratory, but little information is known about their migration habits (Haug *et al*. 1993). Burrowing owls in Natomas are non-migratory and resident (Johnson, pers. comm.). The owl is fairly uncommon along the coast north of Marin County, and rare east of the crest of the Sierra Nevada. Additional populations are reported from the Modoc Plateau and Great Basin region. Fragmentation or elimination of historic habitat and population declines have been noted throughout its range (NBHCP 2002).

Essential Habitat Components

Burrowing owls occupy open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation (e.g., campuses, airports, golf courses, perimeter of agricultural fields, banks of irrigation canals) (Natureserve 2000). They use well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground such as moderately to heavily grazed pasture. Although specific habitat characteristics associated with burrowing owls vary by location, the three basic attributes of nesting habitat are: (1) available nest burros; (2) short or sparse vegetation; and (3) open terrain (Zarn, 1974). Burrowing owls forage in a variety of habitats including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. In Saskatchewan, burrowing owls preferred foraging in dense, permanent grass-forb vegetation greater than 30 cm in height located in uncultivated areas and

right-of-ways. They also tended to avoid cultivated cropland and pasture (Haug and Oliphant 1990). Benedict *et al*. (1996), Warnock (1997), and Warnock and James (1996) stated that large, contiguous areas of native grassland are important for the species.

Reasons for Decline and Threats to Survival

Numerous factors have contributed to the owl's decline throughout its range including: (1) habitat loss, fragmentation, and degradation (e.g., agricultural practices, land development); (2) vehicle collisions; (3) rodent control measures; and (4) predation from domestic animals. Of these, habitat alteration and destruction is most important (Sheffield 1997). Habitat alteration and destruction as a result of development appears to be the most important recent influence on burrowing owl populations in central California. Agricultural practices such as the removal of ground squirrels, use of chemical herbicides on levees along irrigation canals, and increased use of insecticides and rodenticides likely also contribute to the owl's decline in central California (DeSante *et al.* 1997). Urbanization is likely a key threat to the species in the proposed action's action area.

Status with Respect to Recovery

Populations of the Florida burrowing owl are stable and are at no risk of extinction. In contrast, populations of the western burrowing owl are declining throughout the subspecies' range (Haug *et al.* 1993).

Burrowing owl populations are decreasing in California. DeSante *et al*. (1997) observed: (1) that only about 873 breeding pairs of owls existed in central California in 1991; (2) owls almost exclusively bred at lower elevations (where the majority of development is occurring); (3) the species was apparently extirpated in the last decade from Sonoma, Marin, Santa Cruz, and Napa Counties; (4) there was at least a 12 percent decrease in the number of breeding pairs in Central California between 1986 and 1991; and (5) there was at least a 23 percent decrease in the number of breeding groups in central California between 1986 and 1991. They also observed that burrowing owls in central California had been or would soon be reduced to three isolated breeding populations: (1) lower San Francisco Bay between Alameda and Redwood City; (2) Livermore; and (3) the Central Valley. Of the three remaining populations, the Central Valley was the largest with approximately 720 breeding pairs and appeared to have decreased the least between 1986 and 1991.

Little scientific information is available for the local burrowing owl population (e.g., home range information), but suitable habitat in the action area consists of areas with small mammal burrows and nearby foraging habitat. The Sacramento Regional County Sanitation District (SRCSD) monitors and manages burrowing owls at its Bufferlands facility south of Sacramento. The number of owls observed in annual surveys increased from 12 resident owls in 1991 to more than 20 in 1997, with as many as 38 birds observed in one survey (SRCSD 2002).

Status within the Action Area and Environmental Baseline

CNDDB (2002) lists 514 burrowing owl occurrences in the State; one of them is from Sutter and 25 are from Sacramento County. Four CNDDB occurrences are known from the Natomas Basin; three of them are presumed extant. Two of the three extant CNDDB occurrences are located within the City's and Sutter's proposed Permit Areas. CNDDB (2002) does not list all of the known owl occurrences (records were likely not submitted to CNDDB). There is presently a colony of burrowing owls located within the MAP Area (Thomas Reid Associates 2000), and colonies have been protected via the acquisition of the Betts-Kismat-Silva and Ayala reserves by the Conservancy (NBHCP EIR 2003). The Conservancy's Betts-Kismat-Silva and Ayala reserves include four owl sites (Roberts, pers. comm.).

The Natomas Basin has about 140 miles of canals and ditches and associated adjacent agricultural fields which are potentially suitable burrowing owl habitat. Due to the frequently changing conditions of the crop fields, occupied owl burrows are likely to be restricted to the canal and ditch banks which are mostly left undisturbed, except when bank stabilization is needed. The adjacent agricultural fields provide foraging habitat for the owls. Crop types that provide potential owl foraging habitat include alfalfa (371 acres), grassland (886 acres), and pasture (674 acres)(Table 7).

Loggerhead Shrike

The shrike is listed as threatened or endangered in 14 states, and is also listed as endangered in eastern Canada and threatened in western Canada. The Service designated it as a Migratory Nongame Bird of Management Concern in the United States in 1987. The shrike is designated as a state Species of Special Concern (CDFG 1992) and was designated as a Category 2 candidate for federal listing as threatened or endangered throughout its range in 1991. However, on November 15, 1994, the Service eliminated all subspecies of the shrike, except the migrant loggerhead shrike of the central, eastern, and southern United States, from the federal candidate list. The Service determined that populations of the other loggerhead shrike subspecies, including populations of the subspecies that occur in California, were more abundant or widespread than previously thought and were not subject to any identifiable threat (59 FR 58992, November 15, 1994). Therefore, no loggerhead shrike subspecies that occur in California are candidates for federal listing.

Description

The loggerhead shrike is a mockingbird-like songbird with a hooked and notched beak and a heavy build. It has slender legs and feet designed for perching. It ranges in size from 20 to 25 cm and has a wing span of 30 to 35 cm. The loggerhead shrike is gray with a black eye band and black tail. It has a white underbelly and white patch on the wing. Sex is indistinguishable from a distance. Juveniles are a lighter gray color on top then adults. Juveniles also have light gray barring on the breast (USACE, 1997).

The shrike preys upon insects, small rodents and small birds. It impales its prey on barded wire, and thorns in the fork of branches so that it can eat it (USACE 1997). The shrike's primary

spring and summer diet is insects. In the winter, it primarily fees upon small rodents (Fraser and Luukkonen 1986). The shrike is often observed perching on branches, fences or other structures with an unobstructed view its surrounding area. It drops off the perch before beginning a rapid flight low to the ground and glides upwards before perching. It has a rapid wing beat in flight.

Historical and Current Range

Deserts, shrub-steppes, and southern savannas were likely the shrike's main habitat types prior to 1800. Reforestation, abandoned fields and loss of habitat due to human development beginning in the 1930 pushed the shrike's populations from its northeast range (Cade and Woods 1997).

The expansion of agriculture and deforestation associated with settlement and western expansion of North America allowed for an expansion of the shrike's range. Logging practices and agricultural methods opened up addition breeding and feeding habitat for the loggerhead shrike (Cadman 1985). However, the development of new farming practices and the use of pesticides in central and southern Canada, throughout the United States and most of Mexico later caused the shrike's breeding and wintering range to contract. The shrike no longer breeds with regularity in the northeastern portions of its former range or in northern tier states of Michigan, Wisconsin, and Minnesota (CWS 1999). Loggerhead shrikes occasionally winter as far north as southern New England (Bent 1950). Eastern populations are not regularly found north of Oklahoma, Arkansas, Kentucky and Maryland (Miller 1931). The milder winters have allowed the species to extend its winter range into northern California, southern Pennsylvania, southern Nevada, northern Utah, central Colorado and southern and eastern Kansas (Hunter *et al*. 1995). The shrike's winter range also extends south into much of Mexico (Yosef 1996).

Essential Habitat Components

Habitat requirements include nesting habitat with nearby forging habitat. Nesting habitat requires shrubs or trees for nests that are isolated in short grass fields (Yosef 1996). Individuals may build nests in trees or shrubs from three to 6.1 m (20 ft.) from the ground (Fraser and Luukkonen 1990). They will require perches the allow for an unobstructed view of the surrounding area for hunting, as well as thorns, barbed wire, or other objects that can be used to impale or hang their prey.

Movement and Habitat Use

The loggerhead shrike prefers grassland habitat throughout its life cycle. It may use man-made or heavily altered habitat types to fulfill its habitat requirements. The shrike will use agricultural, pasture land and other man-made habitat types (Temple 1995). It requires isolated or thin patches of shrubs, trees or artificial perches like fences for nesting locations and perching locations for hunting. A site for impaling prey is also a necessary habitat feature. Winter habitat requirements are the same as the breeding habitat requirements (Yosef 1996). Nonmigratory populations will use the same region in the winter as they do other times of the year (Miller 1931).

Northern populations of loggerhead shrikes will migrate south into the United States from Canada. Areas with an annual average snow cover of ten to 30 days have less abundant winter populations (Miller 1931). Many of the southern populations of shrikes do not migrate. Nonmigratory populations use the same region in the winter as they do other times of the year (Miller 1931).

Reasons for Decline and Threats of Survival

Habitat loss and, to a lesser extent, the deleterious effects of pesticides have caused the shrike's populations to decline. The conversion of pasture lands and hayfields into row crops and urbanized areas has reduced the shrike's forging habitat. Modern framing practices have removed potential hunting perches (Brooks and Temple 1990). Abandonment and reforestation of fields has also reduced the forging habitat for the species. DDE and other organochlorines have been found in the tissue of adult shrikes and eggshells (Anderson and Dunzan 1978). Low concentrations of pesticides to kill young shrikes (Busbee 1977). Although the use of organochlorines in the United States has been banned, populations continue to decline. Collisions with automobiles may be minor factor in the decline of shrike populations. Suitable foraging habitat is often associated with roadsides.

Status with Respect to Recovery

Shrike populations have declined over much of the United States, especially in the central and eastern portions of the country. Shrike populations in the western United States declined slightly between 1955 and 1979 but currently appear to be stable. No recovery plan has been prepared for the shrike. Although current laws may protect the birds from trapping, killing or harassment, they do not protect the shrike's habitat. Therefore, no efforts are being made to reduce the most significant source of the shrike's decline.

Status within the Action Area and Environmental Baseline

The loggerhead shrike is common throughout most of lowland California (CDFG 1990). It is a non-migratory resident of the Natomas Basin, is known to breed in the Basin, and is observed regularly throughout Natomas Basin (Thomas Reid Associates 2000). Suitable nesting and

foraging habitat are common throughout the Basin. Several shrikes were observed on or near the Metro Air Park project site during a site reconnaissance conducted on March 23, 2000 (Thomas Reid Associates 2000), and three shrikes were observed along the eastern portion of the Plan Area during NBHCP habitat mapping surveys in 2001 (NBHCP 2003).

CNDDB (2002) only lists two occurrences of the shrike in California; both were from Riverside County. However, as indicated above, this is not indicative of the actual distribution or abundance of the species in the State or the project's action area. Several shrikes were observed on or near the MAP project site during a site reconnaissance conducted on March 23, 2000 (MAPPOA 2000). An additional three shrikes were observed along the eastern portion of the Basin in 2001 (May & Associates 2001).

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. BASED ON THE GIS, THE NATOMAS BASIN SUPPORTS APPROXIMATELY 23,350 ACRES OF POTENTIAL HABITAT FOR LOGGERHEAD SHRIKE. HABITAT TYPES THAT POTENTIALLY PROVIDE HABITAT FOR THE SHRIKE IN THE BASIN include: (1) alfalfa (371 acres); (2) grassland (886 acres); (3) non-rice crops (16,686 acres); (4) oaks groves (98 acres); (5) orchard (182 acres); (6) pasture (674 acres); (7) ponds and seasonally wet areas (96 acres); (8) riparian (124 acres); (9) ruderal (1, 970 acres); 10) rural residential (377 acres); (11) tree groves (106 acres); and (12) canals (1,778 acres)(Table 8). Potential foraging habitat for the 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. However, the actual value of much of this habitat is probably limited. Additionally, only a portion of the potential habitat likely would be used by loggerhead shrikes because the species occurs in close association with small trees and shrubs that it uses as perch sites from which foraging bouts are launched and as nest sites. Small trees and shrubs are often not found in the middle of a field; rather, they occur sporadically along the margins of fields. Telephone lines along the roads also are used as perch sites. 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 would predominantly use only the margins of fields and areas where there are perch sites. Considering the entire acreage of agricultural fields as potential habitat for loggerhead shrike likely overestimates the amount of habitat available to this species in the Natomas Basin.

Tricolored Blackbird

The Service (since 1995) considers the tricolor blackbird a Species of Concern (Service 1995) and CDFG has considered it a Bird Species of Special Concern in California since 1992.

Description

The tricolor was first described in 1836 and given the name "tricolored red-wing." In the mid 1900s the species was given its current name. There have been no subspecies described (American Ornithologist Union [AOU] 1998).

The tricolor is a medium-sized, sexually dimorphic blackbird. Males and females are strikingly similar in appearance to the common and ubiquitous red-winged blackbird (*Agelauis phoeniceus*, hereafter "redwing") with which they are sympatric (but do not hybridize). Adult male tricolors are entirely black to glossed bluish, with bright brownish-red lesser wing coverts forming a reddish patch (epaulet) on the wing shoulder and buffy white to pure white median coverts forming a distinctive white boarder to the epaulet (DeHaven 1975). Adult female tricolors are smaller than males, mostly black, with distinct grayish streaks, a whitish chin and throat, and a small but distinct reddish epaulet (DeHaven 1975). Immature (less than 2nd year) birds of both sexes, like redwings, are generally duller in color with more mottling and less distinctive epaulets.

Two other significant morphological distinctions between tricolors and redwings are: (1) the narrower and more pointed wing shape of tricolors; and (2) the somewhat longer and narrower bill of tricolors. Nevertheless, immature birds of the two species, and also adult females of the two species, are difficult for inexperienced observers to separate in the field. Distinctions between tricolors and redwings are especially problematic when the California race of the redwing (*A.p.californicus*) is involved, since it tends to lack the yellowish median covert boarder to the epaulet which is characteristic of other redwing races and helps to distinguish them from tricolors.

The tricolor is a relatively long-lived bird. From recoveries of banded birds, DeHaven and Neff (1973) showed that some individual tricolors survive up to 13 years. However, the available banding data was and still is insufficient for estimating annual survivorship.

Historical and Current Range

The tricolor is native to California where over 99 percent of the total population occurs (Beedy and Hamilton 1999). Tricolor distribution within California extends throughout the Central Valley, surrounding foothills, coastal areas, and scattered inland areas of northern and southern California (Beedy and Hamilton 1999). Small segments (less than 1 percent) of the population sporadically extend into scattered sites in Oregon, western Nevada, central Washington, and western coastal Baja California (Beedy and Hamilton 1999). Several occurrences on the fringes of the species' range are relatively recent phenomena, which may reflect either the increased focus of attention the species has experienced in recent decades or minor range extensions. However, there is no evidence that the species is undergoing any significant range expansion or

that its primary current range is substantially different from that described by Neff (1937), based on studies he conducted in the 1930s.

Reproductive Ecology

Tricolors are colony nesters which form the largest colonies of any North American passerine species. Under its colonial regime, the tricolor male only briefly defends a small area of up to a few square feet immediately around the nest(s), nests with 1-4 females (average 2), and (with females) forages in groups up to several miles from the colony site. The tricolors' synchronized colonial breeding may have been an adaptation resulting from the need to exploit a rapidly changing environment where the locations of secure nesting habitat and rich insect food supplies were ephemeral and likely to change each year (in Beedy and Hamilton 1997). Females breed in the first year, whereas males apparently defer breeding until at least year two (Orians 1963; Payne 1969).

Colony Distribution and Size

Over the past two decades, active breeding colonies of tricolors have been observed in 46 California counties, but most of the population and the species' largest colonies have regularly been recorded in the Sacramento and San Joaquin valleys (Beedy and Hamilton 1999). Colonies range in size from a few hundred birds (rarely as small as just a few dozen birds) to about 300,000 (Neff 1937), but the majority found during the 1930s by Neff (1937) and during the 1970s by DeHaven *et al*. (1975a) contained 1,000-10,000 birds. The most recent studies of the tricolor, beginning in the early 1990s show that many of today's colonies remain in the 1,000-10,000-bird range, but a significant number of larger colonies in the 25,000-50,000-bird range have also been located (in Beedy and Hamilton 1999). Overall during recent studies, most (greater than 60 percent) of the total range-wide nesting effort each year has been in the ten largest colonies, and in 1994, greater than 71 percent of all adult tricolors counted throughout the nesting season were associated with colonies of 10,000 or more birds (Beedy and Hamilton 1997). Also, the recent range-wide surveys of breeding colonies have demonstrated that in many years greater than two-thirds of all tricolor nests are found on private agricultural land (in Beedy and Hamilton 1997).

The annual concentration of such high proportions of the overall breeding population in just a few colonies which are often on private lands increases the risks of continued population declines of tricolors if perturbations to reproduction occur (Beedy and Hamilton 1997; RWD = Richard W. DeHaven's personal observations).

Nesting Substrates

Breeding colonies may establish over water or land and utilize a wide range of nesting substrates. In studies conducted prior to the 1990s, the most common substrates were cattail and bulrush marshes, and Himalaya blackberries (Neff 1937; DeHaven *et al*. 1975a). During the 1990s, along with these substrates, a significant number of colonies have been recorded utilizing

certain spiny grain crops, including barley and wheat grown for either grain or dairy silage (Beedy and Hamilton 1999). Sporadic nesting also occurs in other dense, protective vegetation such as willows, nettles, thistles, giant cane, and safflower, and at sites with various mixtures of the recorded wetland and upland vegetation types (DeHaven *et al*. 1975a; Beedy and Hamilton 1999).

In several recent years, over half of the total yearly breeding effort has occurred in Himalya blackberries (California blackberry is rarely utilized, perhaps due to its smaller clump-size, larger spines, and generally more robust cane structure) and other exotic, non-native plant substrates (in Beedy and Hamilton 1997). During one recent study, the overall reproductive success for entire colonies was higher in Himilaya blackberry colonies than in cattail marshes (Cook 1996), although great variation can occur between years (RWD).

The tricolors' nests are generally bound with grasses to upright plant stems from a 0.3 to 1.5 m (1-5 ft.) above the water or ground.

Insect Requirements

In addition to a spiny, thorny, or wetland-plant nesting substrate capable of supporting the nests and affording protection from weather and predators, another major tricolor breeding requirement is for a large supply of insects (for adults to feed nestlings) in proximity to, and in synchrony with, the colony's nestling production (in DeHaven *et al*. 1975a; DeHaven 2000a; in Beedy and Hamilton 1999). Insect foraging associated with any given colony may occur nearby (within sight of the colony) or extend out greater than ten miles; however, most foraging occurs within about 3 miles of the nesting site (Orians 1961a; Beedy and Hamilton 1997).

Tricolors opportunistically utilize locally available insect populations (Skorupa *et al*. 1980; Beedy and Hamilton 1997). Thus, the insect taxa utilized for nestling provisioning may vary widely by location or time, or both. For example, Beedy and Hamilton (1999) found extensive utilization of dragonfly larvae (Odonata) and lakeshore midges (Diptera) at different colonies. Crase and DeHaven (1977) and Skorupa *et al*. (1980) found other insect taxa broadly utilized for nestling provisioning, including Coleopterans (ground-dwelling beetles, water beetles, and weevils), Orthopterans, Arachnidans, Hemipterans, and others.

Nesting success at large colonies of tricolors in particular necessitates exploitation of concentrated and temporarily abundant insect food resources (Orians 1961b; Payne 1969). Often, suitable insect densities for provisioning nestlings of large colonies become available in response to insects being driven from the ground en masse by shallow flooding associated with agricultural or wetlands management. The most ideal shallow flooding occurs where livestock pastures (or silage fields) of alfalfa, hay, grain, or native grasses, which have recently been cut or grazed to optimal height (less than 15 cm [6 in.]; see below), are being flood-irrigated to stimulate additional forage production (DeHaven 2000a).

Such ideal habitat is often found in association with dairy operations, and dairies and livestock

feedlot operations have become an increasingly important component of many tricolor breeding habitats (Beedy and Hamilton 1999). For example, in 1994, over half of all observed tricolor nesting efforts were associated with dairies and their related/surrounding crops and agricultural uses (Beedy and Hamilton 1997); this included pastures, hay, and silage fields as well as tricolors using the feeding troughs or bunkers at dairies and feedlots (for both grain- and insect-gathering).
The flock-foraging behavior and characteristics of tricolors facilitates their locating and most efficiently exploiting insect food resources suitable to support their colonial breeding activity (Orians, 1961a; RWD). Large foraging areas may be needed by the species to locate the proper juxtaposition of abundant seasonal insect supply and protective nesting substrate capable of supporting a successful colony. Tricolors can quickly respond and begin nesting when such proper conditions are located.

Range-wide breeding surveys in recent years have shown that often, less than 85 percent of all foraging by nesting tricolors occurs on private agricultural land (in Beedy and Hamilton 1997). Tricolors generally do not forage over, or in, deep water greater than wading depth of 2.5-5 cm (1-2 in.). However, recently, birds from several breeding colonies nesting near flooded rice fields have been observed procuring insects from the fields while perching on the rice plants (Hamilton pers. comm., 2001 and report in prep.).

Water Requirement

The more recent studies of tricolors over the past decade have also cited the importance of a third breeding colony requisite: the presence nearby of open, accessible water (Beedy and Hamilton 1997; 1999). Water is necessary for tricolor drinking, preening, and bathing. While a strong association of colonies with such water is apparent, it is less clear whether the lack of such water constitutes a significant limitation on breeding substrate utilization (RWD).

Low-Value Habitats

Outside of dairy (or pasture and grazing)-associated habitats and crops, most cultivated agricultural crops are low in insect-foraging values for breeding tricolors. Examples of low-value, mainly non-habitat crops include: tomatoes, sugar beets, potatoes, beans, cole (Brassica spp.) crops, melons, cucumbers, peas, peppers, spices and herbs, and a wide range of other vegetables. Cotton fields, vineyards (grapes; berry crops), and orchards (fruit or nut crops) are particularly low in value, and are rarely utilized by tricolors for food gathering (RWD; Beedy and Hamilton 1997, 1999).

The large number of agricultural crop-types with low or no values for tricolor breeding is likely related to: (1) the relative lack of large concentrations of preferred insects in such crops; and (2) the tricolors' basic foraging strategy. Like other blackbirds, tricolors forage primarily in small groups or flocks in open spaces, where the vegetative ground cover is less than 15.2 cm (6 in.) in height and overhead cover is sparse or absent, thereby providing good visibility of aerial predators (DeHaven 2000a).

Occasionally, grain crops not associated with dairy operations, including ripening corn, oats, wheat, barley, sorghum, rye, and rice are utilized by tricolors for insect gathering and provisioning of young. More often, however, adult tricolors are found "milking" such crops and consuming the ripening seed heads as they mature during spring through fall.

Patterns Determined from Banding

Banding studies (i.e., Neff 1942; DeHaven and Neff 1973; DeHaven *et al*. 1975b) in which about 70,000 tricolors were banded through the early 1970s revealed:

1. During the annual post-breeding period, many tricolors from throughout the Sacramento Valley and San Joaquin Valley converge on the major rice-growing area near Colusa (in the Sacramento Valley), presumably because of abundant food (waste rice grain) and suitable roosting habitat (blackbirds utilize large [hundreds of thousands to greater than one million birds], mixed-species, communal roosts at night during fall and winter).

2. During winter, a sizable but variable proportion of the Central Valley tricolor population migrates to the San Joaquin Valley and San Francisco Bay-Delta area, with other tricolors wintering throughout fringe areas of their range, including foothill locations above 305 m (1,000 ft.) elevation adjacent to agricultural valleys.

3. During spring, roving flocks of tricolors begin to distribute back out to breeding areas. However, most individuals do not end up breeding where they were hatched or where they bred the previous year (although there may indeed be somewhat greater breeding site fidelity after the initial breeding; RWD). Breeding colony establishment is probably largely controlled by where abundant insects necessary for nestling provisioning are encountered by the roving flocks. Thus, the general distribution of breeding colonies can vary widely between years.

4. Some tricolors may travel nomadically the entire length of the Central Valley and from there into the Bay-Delta region, the northern and eastern plateau region of California, and southern Oregon. In short, Central Valley tricolors move nearly everywhere within the species' range, except no band recoveries have demonstrated any interchange with southern California (which could support a hypothesis that tricolors consist of two separate and largely distinct metapopulations). Thus, overall, a reasonable description of the tricolor is that it is largely a resident within California, but partly migratory within the Sacramento-San Joaquin drainage.

Despite most tricolors not nesting where they were hatched or had nested the previous year (DeHaven *et al*. 1975b), certain breeding sites do show site fidelity with the same location and substrate being used year after year. The consistently used sites may have the three essential breeding requirements–a protective nest substrate, water, and suitable insect-foraging habitat–available on a consistent basis (Beedy and Hamilton 1997;1999).

Habitat Use

Throughout their non-breeding periods, and particularly during winter, tricolors continue to forage in flocks. Such flocks may contain mixed blackbird species and sexes or be highly species and/or sex-specific. For example, during the 1970s, flocks estimated at from 50,000 to over 100,000 tricolors have been observed foraging, and on foraging flights, in the San Joaquin Valley and Bay-Delta area; some of these large flocks were less than 99 percent composed of adult male tricolors (RWD). Tricolors collected during food-habits studies in the fall and winter months in the 1970s had consumed by volume predominantly (88-91 percent) plant matter composed of rice, water grass, sorghum, oats and various other cultivated grains and wild seeds. Rice utilization was particularly high, at 49 and 37 percent, respectively, during the fall and winter periods (Crase and DeHaven 1978). The present non-breeding season food-habits of tricolors, including whether significant changes have occurred since the 1970s have not been assessed (RWD). Nevertheless, it is clear that irrigated and non-irrigated pastures (alfalfa, various hay crops, etc.) and grasslands of various kinds, dry seasonally-wet areas, dairies, livestock feedlots, and harvested grain fields continue to be important foraging areas for tricolors during their non-breeding periods (Beedy and Hamilton 1997, 1999; RWD) just as during breeding periods.

Reasons for Decline and Threats to Survival

Early in the twentieth century, widespread commercial hunting of blackbirds, including tricolors, occurred in California, partly for their commercial value and partly because of their depredations on agricultural crops. In one 5-year period during the 1930s for example, greater than 300,000 tricolors and redwings were killed and marketed for food in the Sacramento Valley alone (Neff 1937). As agriculture expanded in the State, blackbird depredations also increased, and blackbird "control" was expanded to include widespread poisoning of thousands of blackbirds annually for many decades up to about the mid-1960s.

Prior to 1989, under two depredations orders (50 CFR 21.43 and 21.44), such population control could be done without a Federal permit if birds were "committing or about to commit" depredations. However, effective November 15, 1989 [Federal Register 54(219):47524-47526], the Service modified these two previous depredations orders and began requiring Federal permits for such depredations control efforts. This gave the additional protection believed necessary for tricolors and several other birds, while still permitting control if and when necessary for the protection of California's agriculture.

More recently, in 1991, as tricolor populations appeared to be continuing a long-term population decline, the Service included the species as a candidate (Category 2) for federal listing as either Threatened or Endangered (Federal Register 59 [219]:58990). However, subsequent policy changes by the Service in 1995 eliminated the Category 2 designation and further listing action for the tricolor was curtailed.

Nevertheless, the most recent work suggests that this species' downward trend is continuing.

Relevant factors include further incremental habitat losses and direct losses during nesting, which, because of the species' colonial breeding, have the potential to affect thousands of nests and birds.

In the Central Valley, of the more than 4 million acres of wetlands estimated to exist at the start of modern, intensive development and reclamation in the 1850s, only about 560,000 acres (14 percent) remained by 1939. By the mid-1980s, freshwater emergent marsh acreage had been reduced to only about 243,000 acres (6 percent). In addition, the native perennial grasslands historically used by foraging tricolors were reduced by greater than 99 percent in the Central Valley and surrounding foothills (in Beedy and Hamilton 1997).

The early decades of modern development in California may have had little, if any, overall effect on tricolor populations. However, as agriculture, especially expansion of low-tricolor-value crops and urbanization expanded, critical thresholds were eventually exceeded beyond which tricolors were no longer able to continue adapting to cumulative habitat losses. Their populations began a gradual decline. The habitat losses, and downward population trend, are both continuing today.

Urbanization, which in most cases totally eliminates tricolor habitat, has been large and ever-intensifying throughout most of the important tricolor range areas. For example, just within the CALFED sphere of influence alone, over 1.4 million acres in the State are estimated to now be urbanized (Service 2000). This suggests that for the State as a whole, the loss of historical habitat, much of which served the tricolor, due to urbanization has likely been in the range of at least 2-3 million acres. And urbanization is continuing today at an ever-increasing pace.

Losses of tricolor habitat in the State to agriculture have also been quite large, are still continuing, and in some instances, are accelerating. Some 350 crops, including seeds, flowers, and ornamentals are produced in the State. Agricultural commodities include at least 13 field crops, 25 fruit and nut crops, 22 vegetable and melon crops, and numerous nursery products and cut flowers. In addition, the State produces at least 11 major categories of livestock and poultry products. A vast majority of these commodities are neither utilized by, nor otherwise useful to, tricolors.

Crops which do provide some limited values to the species in certain circumstances include barley, wheat, corn, and oats. In recent years, tricolors have been recorded nesting in dense fields of wheat, barley, and various other spinous, grain-crop hybrids being grown for dairy silage. And the species is known to feed on both ripening grain and waste grain left in fields following harvest. The Statewide acreage for barley, wheat, corn, and oats combined is usually about two million acres annually.

Probably the crop of highest recent historical value to tricolors is rice. During the 1970s, Crase and DeHaven (1978) found that rice was an important component of the tricolor's fall and winter diet. Although Statewide acreages of rice have remained relatively stable over the past quarter century at about 0.4-0.5 million acres annually, this crop may now have become much less

valuable to the species, which in turn may be resulting in a population-limiting factor during fall and winter (DeHaven 2000a). The drop in value of rice to tricolors is related to major changes in cultural practices.

From the time rice was introduced in the State early in the century to about the mid-1980s, rice fields were commonly burned in the fall following harvest. This practice resulted in abundant fall-winter food resources for blackbirds and other birds including waterfowl, in the form of waste rice seeds remaining on the ground in harvested fields. And burning of fields reduced or removed the rice straw, thus providing the "open" foraging conditions with less than 6-inch-tall vegetation, which is preferred by blackbirds. As a result, in the Sacramento Valley during the fall and winter months of the 1970s, it was quite common to observe huge foraging flocks of mixed blackbird species (including large numbers of tricolors) foraging in burned rice fields. Such flocks commonly contained tens of thousands of birds (DeHaven 2000a).

Conditions today are much different. Miller and Wylie (1996) have reported that in the past (i.e., until about the mid-1980s), rice fields harvested with conventional cutter-bar headers which cut off the rice heads, left rice stubble behind (which was burned) and rice waste grain on the ground totaling about 388 kg/ha. Today, use of cutter-bar headers has been largely replaced by new, faster technology called a "stripper header" which strips the seeds from the rice head. Although stripping results in roughly the same amount of waste rice remaining in harvested fields (Miller and Wylie 1996), it is much less available to blackbirds, because of the taller stubble left standing. This problem (for blackbird foraging) is further exacerbated because burning, which clears and opens fields for blackbird foraging, is being phased out because of environmental concerns. Moreover, an increasing amount of rice acreage is now being flooded in the fall following harvest. This provides high-value water bird habitat, especially for waterfowl, but generally precludes any significant foraging by blackbirds (DeHaven 2000a).

Clearly, the specific issue of availability of waste rice grain and the overall issue of fall-winter food resources and availability for blackbirds in the Central Valley, including tricolors, needs further study. How these factors may relate to the tricolors' observed and continuing population decline have not been studied. Clearly, problems for this species may not only be related to its breeding, as is being commonly assumed and reported by most recent investigators (DeHaven 2000a).

Besides rice (and occasionally the other spinous grain crops), the other main agricultural crop-type of importance to tricolors is hay. Hay is classified as either "alfalfa" or "other" by the California Agricultural Statistics Service (CASS). Together, these two hay classifications total about 1.5 million acres statewide annually. The benefits of hay fields, as well as irrigated and non-irrigated pastures, grasslands, and vernal pool/grassland complexes, is mainly for tricolor insect-foraging, especially during the breeding season. Generally, for tricolors to extensively use a particular field, it must have been grazed or mowed to reduce vegetative height to less than 15.2 cm (6 in.). Tricolors will generally not settle to the ground to forage in taller, very dense vegetation. Although there have been no confirming studies, with respect to hay fields, it is likely that modern, intensive pest control management practices implemented over recent

decades have substantially reduced insect-foraging opportunities in such crops (RWD).

Population Status

A number of studies were conducted on tricolors throughout the 1990s, including: (1) an historical breeding records analysis; (2) several annual State- or range-wide surveys of breeding colonies, beginning in 1994; and (3) a number of studies of breeding ecology. While these recent efforts have shown the species' geographic range mostly unchanged compared to the 1930s (Neff 1937) and 1970s (DeHaven *et al*. 1975a), they do provide strong evidence of a continuing overall population decline. In particular, Beedy *et al*. (1991) summarized all historical and recent breeding records, including unpublished reports and inventories, and through supplemental field surveys concluded that breeding tricolors had declined further since the DeHaven *et al*. (1975a) study era. In addition, extensive breeding colony surveys in 1994 and 1997, showed a 37 percent population decline in the later year (Beedy and Hamilton 1997; 1999). The recent population declines have been most apparent in historical strongholds of the species' range in the Central Valley, including Fresno, Kern, Merced and Sacramento counties, although range-wide losses are evident as well (Beedy and Hamilton 1997).

Recent extensive breeding-season surveys of tricolors in which dozens of participants canvassed all known breeding sites, except a few very sparsely used areas on fringes of the species' range, found these total numbers of individuals: 1994–369,000 birds; 1997–238,000 birds; 1999–105,000 birds; and 2000–163,000 birds (in Hamilton 2000). It is believed that these annual totals reflect most of the overall remaining breeding population of the species.

The consensus among recent tricolor investigators as well as the principal investigator from the 1970s work on this species (RWD) is that the tricolors' decline is resulting largely from continuing losses of nesting and foraging habitats due to agricultural conversions and urban expansions (e.g., Cook 1996; Beedy and Hamilton 1997, 1999; DeHaven 2000a). Range-wide losses of tricolor habitat due to such land-use changes have not yet been systematically quantified. However, a picture of the severity of the problem is evident in DeHaven's (2000a) recent report comparing tricolor breeding over a quarter-century observation period. In Sacramento County–a traditional stronghold of the species' breeding, for example, he found that the losses of habitat due to urbanization of thousands of acres in the Natomas, Elk Grove, and Galt areas, was striking. Similar striking losses of habitat have occurred from conversions of pastures, grasslands, hay, and grain fields to vineyards and orchards. For example, Sacramento County's grape acreage expanded 75 percent from 7,533 acres to 13,176 acres in just one recent 2-year (1996-1998) period, which was far ahead of the 50 percent increase rate for the State overall during the entire previous 10-year (1989-1998) period.

Status within the Action Area and Environmental Baseline

CNDDB (2002) lists 348 tricolor occurrences in the State; six of these are from Sutter and 79 are from Sacramento County. A nesting colony is located on the Conservancy's Betts-Kismat-Silva reserve in the eastern edge of the Natomas Basin. The colony nests in riparian scrub and its population has increased in recent years (Roberts, pers. comm.).

In the Natomas Basin, large canals, ponds and seasonally wet areas, and riparian habitat have the potential to support tricolor nesting colonies. For foraging, pasture, annual grassland, alfalfa, rice, and nonrice crops could be used in addition to the nesting habitats. Based on these definitions, the Natomas Basin currently supports about 1,998 acres of potential nesting habitat and 41,310 acres of potential foraging habitat (Table 9).

White-Faced Ibis

The white-face ibis was formerly included as a Category 2 candidate for listing as endangered or threatened (Service 1991b), but is now considered a species of concern. It is a Species of Special Concern in the State of California because of population declines in the 1960s and 1970s (Remsen 1978). Additional information can be found in the *Draft Recovery Plan for the Giant Garter Snake* (Service 1999).

Description

The white-faced ibis (*Plegadis chihi*) is closely related to the glossy ibis (*P. falcinellus*) and the puna ibis (*P. ridgwayi*) (Hancock *et al*. 1992) and is considered a full species (American Ornithologist's Union 1988, Sibley and Ahlquist 1990, Hancock *et al.* 1992). There are no recognized subspecies (American Ornithologist's Union 1998).

Adult white-faced ibis are medium-sized wading birds [total length 46 to 56 cm (18.1 to 20.0 in.), weight 450 to 525 g (15.8 to 18.5 ounces)], dark maroon-brown in color, with a long decurved bill that is thicker at the base than in curlews. The neck and legs are long; the bill and legs are blackish in color (Belknap 1957, Cogswell 1977, Ryder and Manry 1994). During the breeding season the plumage reflects iridescent purple, violet, and green; a white band of feathers separates the face from the forehead and extends completely behind the back of the eye; the legs and the irises are red; and bare facial skin turns reddish or purple (Belknap 1957, Cogswell 1977, Hancock *et al*. 1992, Ryder and Manry 1994).

Breeding white-faced ibis can be distinguished from breeding glossy ibis by the latter's brown iris, blackish facial skin, grayish legs, and lack of white encircling the back of the eye (Belknap 1957, Ryder and Manry 1994). Non-breeding adult plumage is similar in these two species except for the red iris (versus brown) in the white-faced ibis (Belknap 1957, Ryder and Manry 1994). In the wild, juveniles of the two species are difficult or impossible to distinguish (Hancock *et al.* 1992).

White-faced ibis forage largely on invertebrates and to a lesser degree on small vertebrates. Major food items reported include earth worms (Bray and Klebenow 1988), crayfish (Belknap 1957) and larval and adult insects (Belknap 1957, Capen 1976). Other foods include spiders, snails, leeches (Kaneko 1972, Capen 1976), small fish, and frogs (Belknap 1957).

White-faced ibis are highly gregarious and feed in loose flocks that can exceed 1,000 birds (Ryder and Manry 1994). They feed while walking by probing in soft substrates or at the base of vegetation (Belknap 1957, Kotter 1970, Bray and Klebenow 1988). Foraging white-faced ibis also secure food by snatching animals exposed on the soil surface (Capen 1976). In deeper water, they feed by sweeping their bills sideways while vibrating their mandibles rapidly in the water column (Belknap 1957).

Historical and Current Range

White-faced ibis occur in two disjunct populations, one largely in western North America and the other in the pampas of central and southern South America (Hancock *et al.* 1992). In North America, white-faced ibis winter primarily in Mexico and also in the Central and Imperial Valleys of California, coastal Louisiana, and Texas (Ryder 1967, Capen 1976, Ryder and Manry 1994, Shuford and Hickey 1996). Key areas of wintering white-faced ibis in California's Central Valley include the Delevan-Colusa Butte Sink Area, northwestern Yuba County, the Yolo Bypass, Grasslands Wetlands Complex, and Mendota Wildlife Area (Shuford and Hickey 1996). In southern California, wintering areas include the Imperial and Coachella Valleys, and the Prado Basin/Upper Santa Ana River Valley (Shuford and Hickey 1996).

The largest North American breeding colonies of white-faced ibis occur in Utah (Great Salt Lake), Nevada (Carson River Basin), Oregon (Harney Basin), and coastal Texas and Louisiana (Ivey *et al.* 1988, Taylor *et al.* 1989, Ryder and Manry 1994, Kelchlin 1997). Substantial colonies of nesting white-faced ibis have recently been reported in southeastern Idaho (Taylor *et al.* 1989) and in California. The largest recent breeding colonies in the Central Valley of California have been reported from Mendota Wildlife Area and Colusa National Wildlife Refuge. Reports of smaller breeding colonies of white-faced ibis in California's Central Valley since 1985 include the Woodland Sugar Ponds (Earnst *et al*. 1998), San Luis National Wildlife Refuge, and Tulare Lake Basin. White-faced ibis have also bred in California's Central Valley at South Wilbur Flood Area (Ivey and Severson 1984), Kern National Wildlife Refuge (Voeks and English 1981, J. Allen pers. comm. 1998), and Buena Vista Lake (Voeks and English 1981, Booser and Sprunt 1980).

The distribution of white-faced ibis before settlement by Europeans was likely greater than it is now because rapid human population growth during the last century has destroyed wetland habitat throughout its distribution in California (Frayer *et al.* 1989). Ibis breeding colonies have been destroyed at various historical locations throughout California, including Tulare and Buena Vista Lakes (Kern County) and San Jacinto Lake (Riverside County). Both of these areas also provided habitat for ibis during migration (Booser and Sprunt 1980).

Reproductive Ecology

White-faced ibis nest in colonies of varying size. Nesting in North America begins about mid-April and ends with fledged young in August or September (Kotter 1970, Kaneko 1972, Capen 1977, Ryder and Manry 1994). Reproduction is often asynchronous with courting, nest-building, incubating birds, and fledglings present concomitantly within larger colonies (Belknap 1957, Ivey and Severson 1984).

Usually three to four eggs are laid, approximately one every two days per nest (Kotter 1970, Kaneko 1972, Capen 1976, Kelchlin 1997). Both parents share with incubation, which lasts about 17 to 26 days (Belknap 1957, Kotter 1970). The parents also share with feeding their altricial (not capable of moving about on its own soon after hatching) young until fledging approximately eight weeks later (Kotter 1970). Mortality of young occurs from exposure to excessive heat, cold and rain, and predation by birds and mammals (Belknap 1957, Kotter 1970, Capen 1976). Usually one brood is attempted each nesting season except when an earlier nesting attempt fails (Capen 1976). Annual reproductive success has been reported to range from 1.42 to 2.99 chicks per clutch (Ryder and Manry 1994, Taft *et al.* 1995).

Nesting and wintering white-faced ibis concentrate locally in large numbers and also occur in lesser numbers over a wide area of its range (Ryder 1967, Booser and Sprunt 1980, Hancock *et al.* 1992). The white-faced ibis is well adapted to changes in environmental conditions such as drought and flooding (Ryder 1967). Therefore, use of specific areas can vary greatly from year to year depending on habitat conditions (Ryder 1967).

Most populations of white-faced ibis are migratory (Ryder 1967). Birds breeding in Utah, Nevada, Oregon, and Idaho migrate southerly to wintering grounds in Mexico, and the Central Valley and southern coastal regions of California (Ryder 1967, Ryder and Manry 1994, Kelchlin 1997). Ibis breeding in California's Klamath Basin also migrate south in winter. However, the proportion of California's breeding population that overwinters outside of California is unknown (E. Kelchlin pers. comm. 1998). White-faced ibis nesting in Louisiana and Texas are mostly resident (Ryder and Manry 1994). Individuals also wander and have been sighted in southern British Columbia, Alberta, Saskatchewan, Ohio, New York, Illinois, Florida, and Hawaii (Hancock *et al.* 1992, Ryder and Manry 1994).

Habitat Use

White-faced ibis typically nest over water in emergent vegetation such as hardstem bulrush (*Scirpus acutus*), baltic rush (*Juncus balticus*), and cattail (*Typha latifolia*) (Kaneko 1972, Capen 1976, Ivey and Severson 1984, Cornely *et al*. 1994, Taft *et al.* 1995). The height of the nest above water is variable ranging from near the water's surface to 137 cm (53.9 in.) above (Ryder and Manry 1994). Nests are constructed of the dominant emergent plants available (Ryder and Manry 1994).

Foraging occurs in flooded [less than 20 cm (7.9 in.) water depth] fields, pastures, open marshes

(Kotter 1970, Capen 1976, Bray and Klebenow 1988, Taft *et al.* 1995), mudflats, and edges of canals, ponds and ditches (Belknap 1957, Taylor *et al.* 1989). In Yolo, Sacramento and Colusa Counties, rice is preferred foraging habitat; ibis may be foraging primarily on crayfish (E. Beedy pers. comm. 1998). Flooded alfalfa is reported to be a preferred foraging habitat compared to irrigated pasture, wheat-barley, and corn (Capen 1976, Bray and Klebenow 1988). Nitrogen fixation by alfalfa and reduced tillage practices may contribute to greater invertebrate abundance for foraging ibises (Bray and Kebenow 1988).

White-faced ibis communally roost in dense vegetation over shallow water and in open sites. They are reported to roost in dense emergent vegetation such as reed (*Phragmites communis*), bulrush, and cattail (Belknap 1957, Kaneko 1972, Ryder and Manry 1994). They also roost in open marshes and small shallow ponds surrounded by dense emergent vegetation, and on exposed islands in the middle of ponds (Hancock *et al.* 1992, Shuford and Hickey 1996).

Other bird species that have been reported to nest in mixed colonies with white-faced ibis include great blue heron (*Ardea herodias*), double crested cormorant (*Phalacrocorax auritus*), great egret (*Casmerodius albus*), snowy egret (*Egretta thula*), cattle egret (*Bubulcus ibis*), black-crowned night heron (*Nycticorax nycticorax*), Franklin's gull, Forster's tern (*Sterna foresteri*) and American coot (*Fulica americana*) (Ryder 1967, Kotter 1970, Ivey and Severson 1984, Cornely *et al*. 1994, Taft *et al.* 1995).

Reasons for Decline and Threats to Survival

Low numbers of white-faced ibis in the western United States including California during the 1950s and 1960s have been attributed to a variety of human induced factors, including destruction of breeding habitat and pesticide effects (Ryder 1967, Booser and Sprunt 1980, Ryder and Manry 1994). Approximately 91 percent of wetlands [more than 1.8 million hectares (4.5 million acres)] in California have been lost to agricultural and urban development since the 1780s (Dahl 1990). About 98,000 hectares (243,000 acres) of potential ibis nesting habitat (emergent wetlands) were lost in the California Central Valley between 1939 and the 1980s (Frayer *et al.* 1989). Wetlands were also lost at high rates in other western states with important white-faced ibis breeding colonies: Idaho (56 percent wetland loss), Nevada (52 percent wetland loss), Oregon (38 percent wetland loss) and Utah (30 percent wetland loss) (Dahl 1990).

The agricultural pesticide DDT was used widely in the United States until its ban in the 1970s. DDE, a metabolic biproduct of DDT, is positively associated with egg shell thinning and cracking, and crushed eggs in birds including white-faced ibis (Capen 1976, Steele 1984, Henny and Herron 1989, Dileanis and Sorenson 1992, Dileanis *et al.* 1996). DDE concentrations greater than or equal to three to four parts per million have been associated with lower hatching success and reproductive output in white-faced ibis (Steele 1984, Henny and Herron 1989). White-faced ibis are considered highly susceptible to the toxic effects of DDE because DDE concentrations in body tissues have remained relatively high in this species, and the levels of DDE resulting in reproductive failure are lower in white-faced ibis compared to other bird

species (Capen 1976, Henny *et al.* 1985).

White-faced ibis continue to experience high concentrations of DDE, egg shell thinning, and reproductive failure in California and adjacent western states (Henny and Herron 1989, Dileanis and Sorenson 1992, Cornely *et al.* 1994, Dileanis *et al.* 1996). Ibis may be exposed to DDT used in agricultural fields in Mexico (Shuford and Hickey 1996). In the Imperial Valley of California, a major wintering area for white-faced ibis, DDE residues are among the highest reported in the United States (Setmire *et al.* 1993). DDE concentrations in white-faced ibis are among the highest of the birds sampled at the Salton Sea, California (Setmire *et al.* 1993).

A wide variety of agricultural pesticides are currently used as algicides, fungicides, herbicides and insecticides in California (Dileanis *et al.* 1996). Many pesticides in use are moderately to highly toxic; synergistic effects are largely unknown. White-face ibis are at risk to direct contact with pesticides during and shortly after application because they feed in and nest near agricultural lands (King *et al.* 1980). Ibis wintering in Mexico are at potential risk from pesticide contamination, excessive hunting, and habitat destruction (Hancock *et al.* 1992). The magnitude of these risks for white-faced ibis wintering in Mexico, however, has received little attention (Ryder 1967).

Because white-faced ibis depend on wetland habitat for nesting, increased competition in the Central Valley for water by urban, industrial, and agricultural uses may threaten the integrity of breeding habitat in the future. White-faced ibis wintering and breeding colonies close to large human populations such as the southern Sacramento Valley, San Joaquin Valley and the southern California region may be at risk from increasing human disturbance and loss of foraging habitat to urban development.

Status With Respect to Recovery

Numbers of overwintering white-faced ibis in the major wintering areas of California have tended to increase from the 1970s to the 1990s (Shuford and Hickey 1996). In the Sacramento Valley, wintering ibis were rare in the 1970s, with the highest counts of 11 birds in 1978 and 1979 (Shuford and Hickey 1996). In the 1980s, flocks of 225 were frequently seen at or near Colusa and Delevan National Wildlife Refuges, Colusa County. At Delevan National Wildlife Refuge in January and December 1994, 1,100 and 1,370 ibis were reported, respectively (Shuford and Hickey 1996). Aerial surveys of the Grasslands wetlands complex near Los Banos showed increases in ibis numbers from 100-300 in the early 1980s, to 500-700 in the mid to late 1980s, to 2,000-2,200 during 1992 to 1994 (Shuford and Hickey 1996). In 1985, Beedy (pers. comm. 1998) estimated about 800 adult ibis at the Woodland Sugar Ponds in Yolo County. Shuford and Hickey (1996) estimated that a minimum of 10,000 to 11,000 ibis wintered in California's Central Valley in 1994-1995. Between 2,000 to 3,000 ibis were in the Sacramento Valley, and up to 8,000 in the Grasslands wetlands complex during this time.

There are seven known ibis occurrences (rookeries) in California (CNDDB 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 white-faced ibis nesting habitat occurs in the Natomas Basin, although approximately 20,000 acres of suitable winter foraging habitat (i.e., rice, alfalfa, and other agricultural fields) exists there (MAPPOA 2000). In the Sacramento Valley, wintering ibis were very rare in the 1970s, with the highest counts numbering only 11 birds in 1978 and 1979. Since then, they have increased in the Sacramento Valley, and white-faced ibis are now common in the Natomas Basin in the winter.

Overall numbers of white-faced ibis breeding pairs have tended to increase in the Central Valley of California since 1985. Ibis are not reported to have bred at Mendota Wildlife Area during 1985 to 1991. However, breeding ibis numbers at Mendota Wildlife Area represented approximately 95 percent of breeding ibis in the Central Valley during 1992 to 1997. Ibis numbers at Colusa National Wildlife Refuge increased from 1985 to 1989, but no nesting was reported there from 1990 to 1997.

Environmental Baseline

White-faced ibis are most-often associated with emergent wetland habitats, particularly for nesting. The elimination of marsh habitat from the Natomas Basin has precluded the ibis from nesting there. However, the ibis does commonly winter and forage in the Basin. The Natomas Basin supports about 25,000 acres of potential ibis wintering and foraging habitat including alfalfa fields (371), rice (22,693), canals (1,778), and ponds and seasonally wet areas (96 acres)(Table 10).

Bank Swallow

The bank swallow is listed by the State of California as a threatened species. It is a protected migratory bird in the United States and Canada (Schloriff 1992, Palmer-Ball 1996).

Description

The bank swallow (*Riparia riparia*) is approximately 12 cm long, has a wing span of 89-110 cm, and weighs 10-18 g. Adults have a grayish brown mantle, crown, rump and wing-coverts; a white throat with a distinct brown breast-band that extends to the belly and ends at a point; a black to brown-black bill; a dark brown iris; and black-brown or dark brown legs and feet. Adult males and females have the same color scheme but may be distinguished by the presence or absence of a brood patch (Lethaby 1996, Pyle 1997, Turner and Rose 1989).

Juvenile bank swallows can be identified from adults by whitish upperparts and a buffy pink wash to the throat, which they lose after one year (Lethaby 1996 and Pyle 1997). They have a horn-brown bill and pale yellow bill flanges that darken after the first month of fledging. The iris of juveniles is a lighter brown, and the feet and legs are flesh-brown or horn brown at fledging. The claws are dull yellow.

The bank swallow is a social bird that spends most of its life in a colony or migrating with mix-

species flocks. It develops colonies from ten to 2,000 birds. The bank swallow is an aerial feeder that forages over lakes and ponds, rivers and streams, meadows, pastures, and bogs (Stoner 1936, Gross 1942). It tends to avoid dense forests, woodland, deserts, and alpine areas. During breeding, its forging sites are usually 200 m from the colony (Mead 1979; Turner 1980, in Garrison 1999). The bank swallow feeds upon terrestrial and aquatic jumping or fly insects and larvae. It forages primarily from dawn to dusk (Hobson and Sealy 1987) and may feed singly, in pairs or in a flock. Flock feeding usually occurs when a colony is feeding on a local source of food (Stoner 1936, Turner and Rose 1989).

Preening can occur singly or in large groups. Preening in larger groups usually occurs during the migration period (Cramp *et al*. 1988, in Garrison 1999). Preening occurs on wires and vegetation, often spaced as closely as three to four cm or with shoulders touching (Meservey and Kraus 1976). Bank swallows are also known to dust-bathe in areas of loose bare soil (Hobson and Sealy 1987). A bank swallow will bathe in water by wading into shallow water or hitting the surface of the water briefly while flying (Cramp *et al*. 1988, in Garrison 1999). Sunbathing is done by spreading open both wings slightly away from body, ruffling feathers, and leaning to one side (Barlow *et al*. 1963).

Historical and Current Range

The breeding range for the bank swallow covers most of central and southern Alaska, most of Canada (except in the northern extremes), and across the northern half of the United States. The winter range is primarily in South America and the Pacific slopes of southern Mexico. The bank swallow can also be found in most of Europe and Asia during the breeding season and in Arabia and Africa during the winter. Its range has been changed in local areas where development, flood and erosion control projects has reduced the available nesting habitat.

In California, bank swallow colonies were found in Siskiyou, Shasta, and Lassen Counties. Colonies were also found along the Sacramento River from Shasta County south to Yolo County (Small 1994). Colonies in California range from sea level to 21,00 m above sea level (Campbell *et al*. 1997). The bank swallow was know to nest on coastal bluffs in southern California and riverbanks throughout the Central Valley and northern California. Current populations are concentrated on the banks of the Central Valley streams. Seventy-five percent of the current populations occur along the banks of the Sacramento and Feather Rivers (most on the Sacramento River upstream of its confluence with the Feather River). Other colonies are located along the central coast, from Monterey to San Mateo County. There are no breeding colonies remaining in southern California (Laymon *et al.* 1988). No suitable nesting habitat exists within the Natomas Basin.

Essential habitat components

The bank swallow requires vertical or near vertical dirt banks formed by erosion action on low-gradient, meandering streams or rivers, or bluffs or cliffs formed by storms, tidal action and wind-eroded banks along the coastline. Potential nesting sites need alluvial soils or other soil material that the bank swallow can dig a burrow in. Foraging areas should be near the colony and may include wetlands, open water, agricultural areas or grasslands.

Reproductive ecology

The bank swallow usually arrives at the colony site unpaired. In California, some of the flocks arrive at the colony site and spend most of their time foraging for food for two to three weeks before the rest of the flocks arrive. The later groups arrive at the colony site and begin to form pair bonds (Kuhnen 1985). The male secures a mate as he builds the burrow. Soon after he secures a mate and the burrow is finished, nest building begins. Building of the burrow usually takes four to five days; the nest takes one to three days to complete (Asbik 1976, Sieder 19870). Nest building has been observed as early as April 12 in California. However, egg-laying has been observed as early as April 11. A brood may be replaced if lost in the early or middle of the breeding period.

Egg incubation by the female begins one to two days before the clutch is complete (Petersen 1955, Turner and Rose 1989). The male only incubates the clutch when the female leaves the nest (Ellis 1982). The clutch is incubated for 13 to 16 days before hatching begins. Hatching may take two to three days to finish (Petersen 1955). Brooding begins after hatching and is continuous for the first two to three days, gradually decreasing and halting after seven to ten days. Females do all the brooding at night. Both parents brood during the day (Beyer 1938). Feeding of the hatchlings begins after hatching and ends three to five days after fledging. Both parents are involved in the feeding process, with the male predominating. Feeding rate increases as hatchling size increases. Fledging occurs in mid-July approximately 22 days after hatching. During fledging, the parents reduce the feeding rate of the hatchlings. The fledgling returns to the nest after first flight and stays in the burrow for four to five days before leaving the nest. The flock stays at the colony site about one week after the juveniles fledge (Turner and Bryant 1979, Petersen 1955; Cramp *et al*. 1988, in Garrison 1999).

Movements and Habitat Use

The bank swallow is a medium to long-distant migrant that migrates with mixed-species flocks, which may be as large as 5,000 to 9,000 birds (Bull 1985, in Garrison 1999). The flocks can be mixed with Barn, Cliff, Northern Rough-winged, and Tree swallows. The bank swallow usually leaves the wintering grounds in February (when nestlings fledge) and arrive in North America between early March and late May. It returns to the wintering grounds in Mexico, Central America and South America during late summer or early fall (Am. Ornithol Union 1998, Hilty and Brown 1986, Oberholser 1974, in Garrison 1999; Keller *et al*. 1986). The species arrives in California around early March and begins to leave for the wintering grounds in July and early

August (NBHCP 2003).

Nesting colonies are usually found along rivers, streams, lakes, coastlines, or in sand and gravel pits. The colony site is usually near open water at erosion sites, or areas exposed to wave wash (Hjertaas 1984, in Garrison 1999). The colony site is chosen by the colony before the individual burrow sites are chosen. The colony site selection is based on the colony size, breeding success of the previous year and available habitat. A colony site is more likely to be recolonized if the previous year was a successful breeding year (Freer 1979). The preferred burrow site is higher on the stream bank to protect them from predators (Sieder 1980). The burrow is dug with bill, feet and wings, which takes about 4 to 5 days to complete.

Both the male and female bank swallow roost in the burrow during nest-building and the beginning of the egg-laying period. During the egg incubation and brooding of young nestlings period the female would spend most of the time roosting in the burrow. During this period of time the male would roost on rocks, fences, trees, empty burrows or other available structures. The male bank swallow may occasionally roost in the burrow at night during the brooding period. In adverse weather several adults may roost in the same burrow. Young bank swallows would roost in the burrow about one week after fledging. After fledging and before the colony migrates, adults and juveniles roost on exposed rocks, vegetation, logs and other available structures (Cramp *et al*. 1988, in Garrison 1999). Migration roosts include vegetation at wetlands and marshes (Paton and Fellows 1994).

The average burrow depth in California is 61.5 cm long with an average entrance of 5.5 cm by 7.2 cm. The average distance between each burrow in California is 13.2 cm (Humphrey and Garrison 1987). Most of the colonies in California were found in the banks of rivers, lakes, streams, and coastlines at a rate of 105 to 111 colonies (Laymon *et al*. 1988). The colonies were located in the vertical face of the bank and bluffs in friable soils made up mostly of sandy, silty, loamy soils. In California, of the 22 sites recorded, 14 (64 percent) were located in sandy loam soil, 4 (18 percent) in loam sand soil, 3 (14 percent) in loam soils, and 1 (5 percent) in sand soils. The average height of the colony was 3.3 m (Humphrey and Garrison 1987). The average success rate of building and occupying a burrow in California is 59.6 percent (Garrison *et al*. 1987).

Reason for Decline and Threats to Survival

The bank swallow is sensitive to weather changes that effect successful foraging, cold weather during the migration, and cause banks to collapse (i.e., flood and rain events). Predation by birds or reptiles and the collapse of a burrow when predators are digging into the burrow also result in mortalities (Persson 1987). Collision with automobiles has contributed to the decline of bank swallow populations. Juveniles are more likely to be killed by vehicles then older bank swallows. However, loss of nesting habitat is the primary cause of decline of the species. For

example, California has lost most of its central and southern nesting habitat to flood and erosion control projects along streams and rivers (Garrison *et al*. 1987, Small 1994).

Status with respect to Recovery

In 1987, it was estimated that California had 111 colonies, with an estimated total population of 25,180 pairs. The Breeding Bird Survey estimated that between 1966 and 1991, North American bank swallow populations were stable. However, California nesting populations were reported to be declining at the same time (Humphrey and Garrison 1987).

A Recovery Plan for the Bank Swallow has been written in California. Along the Sacramento River, artificial banks and enhanced banks were built. In 1986, burrows were dug with a hand auger on the Sacramento River (Schlorff 1992, Garrison 1991).

Environmental Baseline

There are 171 known bank swallow occurrences in California (CNDDB 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. The Natomas Basin supports about 43,000 acres of potential bank swallow foraging habitat including alfalfa (371 acres), grassland (886 acres), nonrice crops (61,686 acres), pasture (674 acres), ponds and seasonally wet areas (96 acres), rice (22,693 acres), riparian (124 acres), and canals (1,778 acres)(Table 11).

Northwestern Pond Turtle

The northwestern pond turtle (*Clemmys marmorata marmorata*) is a subspecies of the Pacific pond turtle (*C. marmorata*) and is a member of the family Emydidae (box and water turtles). It is considered a Species of Concern by Service and is a state Species of Special Concern. In 1993, the Service reviewed the status of the pacific pond turtle and found that listing was not warranted (Service 1993b). Both subspecies of the pacific pond turtle, however, are considered Species of Concern.

Description

The pacific pond turtle is a small (9-19 cm) aquatic turtle characterized by an olive, dark brown, or black shell with a spotted head and neck (Stebbins 1985). Ventrally, it is yellowish, sometimes with dark blotches in centers of the plasteral shield (Storm *et al.* 1995). The northern pacific subspecies is defined on the basis of its mottled head and neck coloration and a relatively high frequency of inguinal shields. The southern subspecies is defined on the basis of its light head and neck coloration with more prominent markings in these areas, and a reduced frequency of occurrence of large inguinal shields. The two subspecies of pacific pond turtle can be slightly

distinguished morphologically. *C. m. marmorata* has a pair of well-developed triangular inguinal scutes on the bridge and its brown or grayish neck and head are well marked with dark dashes. *C. m. pallida* has poorly developed inguinal scutes (missing in 60 percent of individuals) and its throat and neck are a uniform, light color (Ernst *et al.* 1994).

In both subspecies, the pacific pond turtle demonstrates sexual dimorphism at maturity. Holland (1994) noted over 20 different dimorphic characteristics between adult male and female turtles, although their gender can usually be identified by utilizing just a few. The degree of dimorphism is variable for each character and each individual, but generally adult males tend to have a flatter carapace, concave plastron posteriorly, thicker tail base with the cloacal opening at or beyond the margin of the carapace, larger head with a longer nose and pointier snout, and a larger neck with yellow or whitish chin and throat (Ashton 1997). The characteristics should be viewed in concert to determine gender, versus pinpointing a single characteristic. Juvenile males and females usually resemble adult females, but are smaller in size with relatively long tails.

The diet of pacific pond turtles is comprised primarily of small aquatic invertebrates, including crustaceans, insects and occasionally annelids (Holland 1994, Bury 1986). They may also consume small vertebrates, including fish and amphibians (Holland 1985, Bury 1986). Feeding on carrion of mammals, birds, reptiles, amphibians and fish is common (Evenden 1948; Carr 1952; Holland 1985, 1994; Bury 1986), but live prey is preferred (Bury 1986). Prey is ingested in the water, as the turtles are apparently unable to swallow in air (Holland 1991). Turtles infrequently forage on plants such as pond lily (*Nuphar polysepalum*), inforescences, willow and alder catkins and ditch grass inflorescences (Holland 1994), although post-partum females have been observed ingesting large amounts (up to 8.5 g) of tule (*Scirpus* sp.) and cattail (*Typha latifolia*) roots (Holland 1985).

Historical and Current Range

Fossil evidence indicates that pacific pond turtles have existed in the western United States since at least the late Pliocene (Hay 1908). In California, remains discovered at archaeological sites indicate that Indians ate them (Ernst *et al.* 1994). The northwestern pond turtle historically and currently ranges from Puget Sound, Washington, south through Oregon, generally west of the Sierra-Cascade crest, to the American River drainage in central California. The southern pacific subspecies ranges from the vicinity of Monterey Bay, California, south through the coast ranges to Baja California Norte, Mexico. The area of the Central Valley of California between the American River drainage and the Transverse Ranges is considered to be a zone of intergradation between the two subspecies (Seeliger 1945). Historically, the pacific pond turtle inhabited the vast permanent and seasonal wetlands on the Central Valley, with the Tulare Lake Basin being a stronghold for the species.

Records of *C. m. marmorata* from Grant County, Oregon, and British Columbia, Canada, are believed to represent introduced animals (Nussbaum *et al*. 1983, Storer 1937). Outlying populations of *C. m. marmorata* occur in Nevada primarily in the Truckee and Carson River

drainages.

Essential Habitat Components

The pacific pond turtle is found in fresh to brackish permanent to intermittent aquatic riparian habitats, including marshes, rivers, ponds, streams, and vernal pools. Pond turtles also may occur in man-made habitats, such as irrigation ditches, reservoirs, and sewage and mill ponds. Preferred aquatic habitat is characterized by slow moving or quiet water, emergent aquatic vegetation, deep pools with undercut banks for refugia, and partially submerged rocks and logs, open mud banks, matted floating vegetation, sandbars or warm water for thermoregulatory basking. Hatchling and young turtles (1 year) require shallow, slow-flowing water areas (less than 30 cm deep) dominated primarily by emergent aquatic reeds (*Juncus* sp.) and sedges (*Carex* sp.) (Holland 1991 and Reese and Welsh 1998). Pacific pond turtles have been located from brackish estuarine waters at sea level to mountains streams over 1,800 m in elevation.

Viable terrestrial habitat is nearly as important as sufficient aquatic habitat to the existence of pacific pond turtles. They have been documented as traveling on land during all times of the year (Reese and Welsh 1997). Even in the central and southern portions of its range where air temperatures are warmer, pacific pond turtles spend nearly four months a year on terrestrial sites (Rathbun *et al*. 2002). Characteristics of terrestrial habitats frequented by pacific pond turtles for basking, dispersal, nesting, overwintering and protection from predators are highly variable throughout its range, but some type of vegetative cover is required. Reese and Welsh (1998) found that the portions of the Trinity River in northwestern California containing nonvegetated shorelines were nearly absent of pacific pond turtles. Peak terrestrial activity occurs during nesting season for adult females and during an overwintering period for adults and hatchlings of both sexes. Reese and Welsh (1997) believe that the traditionally protected buffer zones along rivers is simply not adequate enough for the turtles. Holland (1994) advised 0.5 km from the known aquatic site of pacific pond turtles are needed to adequately protect nesting habitat and turtle populations. Rathbun *et al.* (2002) recommended that each site be assessed individually, due to the complex interaction of factors associated with terrestrial areas and behavioral flexibility of the pacific pond turtle.

Reproductive Ecology

The reproductive ecology of the pacific pond turtle remains poorly understood (Holland 1994). It is assumed that size and age determine first reproductive capability and it varies geographically and possibly altitudinally (Holland 1994). Most female turtles do not develop eggs until they achieve a carapace length of at least 120 millimeters (mm) (Holland 1994). The age of first reproduction is usually seven to nine years for the southern pacific pond turtle and ten to 14 years of age for the northwestern pond turtle (Holland 1994). Ashton (1997) reported that mating occurs underwater, typically in late April to early May, but may occur year-round (Holland

1994). Most females lay eggs in alternate years, although some females, particularly in southern and central California, oviposit annually (Holland 1994, Ashton 1997).

Known clutch size ranges from one to 13 eggs (average is four to seven), with larger females generally laying larger clutches (Holland 1985, 1991, 1994). Females may deposit more than one clutch a year (Rathbun *et al.* 1993, 2002; Scott *et al.* 2002; Lovich and Meyer 2002). The first clutch of 25 turtles studied in coastal streams of California had significantly more eggs than the second clutch with 27 to 43 days between each oviposit (Scott *et al.* 2002). From May through July, females move into upland habitat to nest, although observations of egg deposits have been recorded as early as late April and as late as early August (Storer 1930; Buskirk 1992; Rathbun *et al.* 1992, 1993; Holland 1994; Scott *et al.* 2002). Through hand palpation and x-radiography, Scott *et al.* (2002) and Lovich and Meyer (2002) reported that females carry shelled eggs from two to three weeks on average (recorded longest was 33 days) before oviposition.

Nest locations range from three to 585 m from aquatic habitat (Storer 1930, Holland 1994, Lovich and Meyer 2002). Nest sites are typically located in open areas dominated by sparse, low vegetation such as grasses and forbs, that allow long exposures to direct sunlight. Soils are dry and generally well drained with significant clay/silt content and have a low slope angle. Nests on sloping terrain often have a southern or southwestern exposure. Females empty the contents of their bladders to soften the soil, excavate their nests in the ground, deposit the eggs, and cover the nest by scraping soil and vegetation over the eggs. Time requirements for completion of the nest and oviposition varies from less than two hours to 86 hours (Holland 1994, Rathbun *et al.* 2002, and Lovich and Meyer 2002). Females tend to be very wary during overland nesting movements and may abandon nesting or delay attempts if even slightly disturbed (visually or audibly) or if they hit a rock or root during excavation (Holland 1991, 1994; Rathbun *et al*. 1992, 2002). Additionally, some female turtles have been observed producing one or more "false scrapes" in which they excavate a nest, but do not deposit eggs (Holland 1994). Incubation requires from 90 to 126 days in the wild with overall hatching rates at about 70 percent (Holland 1994). Hatching of the eggs occurs in the fall with hatchling sizes ranging from 23-31 mm in carapace length and 1.5-7 g (0.05-0.25 ounces) in weight with larger hatchlings occurring in the northern part of the range (Holland 1994). The majority of hatchlings remain in the nest throughout the winter and finally emerge in the spring. In southern and central California, a few records exist of some hatchlings emerging from the nest in late summer or early fall (Buskirk 1992, Holland 1994). Hatchlings that overwinter in the nest receive nourishment from an umbilical yolk sack (Holland 1994). Hatchlings double in size by the end of the first growing season (Holland 1991).

Survivorship in pacific pond turtles apparently is dependent on age. Hatchlings and first year juveniles are subject to low survivorship, averaging ten to 15 percent; survivorship may not increase significantly until turtles are four to five years old (Holland 1994). Once turtles achieve a carapace length of 120 mm, survivorship improves with an average adult turnover rate of three to five percent per year (Holland 1994). Under normal circumstances, pacific pond turtle populations consist of 55 to 70 percent adults. But in areas such as the Willamette Valley, Oregon where intense threats to juvenile survivorship exist, adult-bias populations average 90

percent (Holland 1994).

Movements and Habitat Use

In the majority of its range, pacific pond turtles are active from about March through October with the peak of activity in May and June in both aquatic and terrestrial habitats. Some turtles "overwinter" in aquatic sites such as the primary lake or pond they inhabit or other nearby ponds or pools. Turtles may also overwinter in undercut areas or holes in the banks of watercourses or move to upland habitat. It appears that most turtles that overwinter in aquatic habitats are found in lacustrine systems (lakes and ponds), whereas most turtles that overwinter in terrestrial sites are found in flowing-water systems (streams and rivers) (Holland 1994). Reese and Welsh (1997) suggested that the timing for turtles to overwinter was related to avoidance of flood conditions. An additional study supports that premise, but further surmises that subzero winter temperatures also regulated the timing of turtles seeking terrestrial refuge (Rathbun *et al.* 2002).

Turtles may move up to 260 m from aquatic habitat to overwinter under dense vegetation, logs or leaf litter (Holland 1994). Microhabitat characteristics of terrestrial overwintering sites are highly variable ranging from habitats of conifer to hardwood to woody shrubs. In northern California, Reese and Welsh (1997) studied 12 pacific pond turtles and determined that the turtles preferred terrestrial overwintering sites on relatively cool north- and east-facing slopes as opposed to south- and west-facing slopes. Rathbun *et al.* (2002) suggested the sites are a complicated interaction of factors involving elevation, moisture, slope, solar exposure and vegetative cover. Despite overwintering, most turtles still exhibit activity, although at a reduced level, including basking, foraging and moving between overwintering sites in subzero air and water temperatures (Rathbun *et. al* 2002, Reese and Welsh 1997, Holland 1994). Turtles may also engage in communal overwintering, with large numbers concentrated in a relatively small area (Holland 1994).

Bury (1972) found home ranges of pacific pond turtles to average 1 hectare (2.5 acres) for males, 0.3 hectare (0.7 acre) for females, and 0.4 hectares (1 acre) for juveniles. Within the northern California stream system studied by Bury (1972), males moved greater distances than females or juveniles. Turtles move significant distances (at least 2 km) if the local aquatic habitat changes (e.g., disappears), and adult turtles can tolerate at least seven days without water (Holland 1994). Nevertheless, dispersal abilities of juveniles and the recolonization potential of pacific pond turtles after extirpation of a local population are unknown.

Reasons for Decline and Threats to Survival

Adult males typically have a higher probability of survivorship than adult females, with skewed sex ratios observed as high as 4:1 males to females (Holland 1991). The most plausible explanation for these observed sex ratios is that females suffer higher rates of predation during overland nesting attempts (Holland 1991). Females display a rate of scarring on the shell up to six times greater than males, usually indicating attempted predation by mammals (Holland 1994). Adults are long lived, the maximum life span being approximately 40 years (Bury and

Holland unpubl. data).

Habitat loss and alteration are the primary factors that caused the historic decline of the pacific pond turtle throughout its range. In California, over 90 percent of historic wetlands have been diked, drained and filled primarily for agricultural development and secondarily for urban development (Frayer *et al*. 1989). Much of the wetland habitat lost, such as in the Tulare Lake basin, was prime habitat for the pacific pond turtle. Historic levels of pacific pond turtle populations in the Tulare Lake Basin and southern San Joaquin Valley were estimated at 3.35 million turtles (Holland 1991). Today, the pacific pond turtle remains in 90 percent of its historic range, but at greatly reduced numbers (Holland 1991).

Water projects in the mid 1900s, which accompanied agricultural growth, also had a negative effect on pond turtle populations. Construction of reservoirs directly eliminated pond turtle habitat and isolated or fragmented remaining populations. Historically, urbanization also has significantly altered or eliminated pond turtle habitat, with the greatest impact occurring in southern California within the range of the southern pacific pond turtle.

Records of harvesting pacific pond turtles for food date back to an account by Lockington (1879) of the commercial harvest of the species for the San Francisco market. At the time, commercial harvest had already depleted populations of the pacific pond turtle in the San Francisco area, resulting in commercial operations focusing on populations in the San Joaquin Valley, particularly Tulare Lake (Elliot 1883, Brown 1940). Over 18,000 pond turtles were offered for sale in San Francisco markets, presumably in one year in the 1890s (Smith 1895). This practice of large scale harvesting continued at least through the 1920s (Storer 1930).

A variety of factors working together continue to result in a significant decline of pacific pond turtle populations throughout 75 to 80 percent of its range (Holland 1991). These natural, introduced and human made factors include predators, exotic competitors, habitat destruction, alteration and degradation, parasites and disease, and drought.

The pacific pond turtle is preyed upon by a wide variety of native and introduced predators, including large and small mammals, raptors, herons, corvids, snakes, frogs and fish. Pacific pond turtles are relatively poor swimmers and rely on crypsis and use of refugia to escape predation (Reese and Welsh 1998). Of the native predators, the raccoon (*Procyon lotor*) is a ubiquitous and effective predator, taking animals of all sizes, including eggs and hatchlings. Raccoon populations, in particular, respond favorably to urban environments, where human refuse may support larger populations than normal. Larger populations of raccoons and other predators combined with reduced nesting habitat for pond turtles adjacent to aquatic habitat, results in concentrations of nests which are more easily detected by predators. In Oregon, over 99 percent of nests examined in 1991-1993 were destroyed by predators, most likely raccoons, spotted skunks (*Spilogale putorius*) or coyotes (*Canis latrans*) (Holland 1994).

Two introduced predators of particular concern are the bullfrog (*Rana catesbeiana*) and the largemouth bass (*Micropterus salmoides*). Both species were introduced into the western United

States in the latter part of the 19th century, and through range expansions, reintroductions, and transplants these species have become established across most of the western United States (Moyle 1973). Both species have been observed to feed on juvenile pacific pond turtles. When these introduced species occur in large numbers, they may effectively preclude any significant level of recruitment in some turtle populations (Holland 1994). In aquatic habitats containing largemouth bass, but no bullfrogs, a fringe of emergent vegetation around the pond edge may protect hatchling and juvenile pond turtles from predation by bass (Holland 1991).

Humans are also major predators on pacific pond turtles. Collection of pond turtles for food still exists today with numbers from 20 to over 100 known to be taken in a single instance (Holland 1991, 1994). A commercial pet market exists for pond turtles despite state prohibitions (Holland 1991). Indiscriminate shooting of pacific pond turtles can be a significant mortality factor, particularly in areas adjacent to urban development. Some sportsman shoot turtles as they incorrectly assume that turtles consume game fish and waterfowl. Turtles are also shot by private landowners that fear they may lose property rights if this species is granted federal threatened or endangered status (Ashton 1997). There are also reports of shooting turtles for target practice or sport (Milner 1986 and Holland 1994).

In some areas, humans also accidentally predate on pacific pond turtles from automobile, boat and off-road vehicle traffic, as well as incidental catch during fishing. A study of a pacific pond turtle population in the Willamette Valley indicated an annual actual or potential loss of three to five percent of the total population to automobile traffic (Holland 1994). Reese and Welsh (1997) noted that pacific pond turtles frequently cross roads in agricultural areas.

Off-road vehicle activity poses a threat to pacific pond turtles both directly and indirectly. Direct impacts include crushing of individual turtles or nests and access to remote populations of the turtle for the purposes of collection or shooting. Off-road vehicle activity indirectly impacts pond turtles by interfering with normal foraging and basking activities, and by altering or restricting overland or instream movements of turtles. Long-term impacts of off-road vehicle activity include increased soil erosion, soil compaction, vegetation removal, siltation of the watercourse, and alteration or loss of refugia. According to Holland (1991), pacific pond turtle populations located in off-road vehicle areas in California tend to be small and disjunct, and occur in very limited habitats. Poor habitat quality combined with a very low probability of maintenance or reestablishment by immigration, renders these populations highly susceptible to extirpation.

Incidental collection of pond turtles by fisherman may be a significant mortality factor in some areas. Approximately 3.6 percent of turtles captures by Holland (1991) at an Oregon site had ingested fish hooks. At a southern Sierra Nevada, California site, about six percent of captured turtles showed evidence of trauma related to removal of hooks, had hooks in place, or were found dead with hooks embedded in the esophagus or stomach (Holland 1991). Turtles captured by Holland (1991) in Oregon before and after ingestion of fish hooks had lost a significant amount of weight, suggesting that hooked turtles may eventually starve to death. Hooked turtles are often killed by fisherman, who mistakenly presume that pond turtles are competitors for fish

or consume ducklings (Holland 1991).

Another factor that may adversely affect pond turtle populations is the introduction of nonnative competitors. Numerous species of nonnative aquatic turtles have been observed within the range of the pacific pond turtle (Jennings 1987). These include the painted turtle (*Chrysemys picta*), red-eared slider (*Pseudemys scripta elegans*), common snapping turtle (*Chelydra serpentina*), spiny soft-shelled turtle (*Apalone spinifera*), alligator snapping turtle (*Macroclemys temmincki*), stinkpot (*Sternotherus odoratus*), diamondback terrapin (*Malaclemys terrapin*), and the Mississippi map turtle (*Graptemys kohni*). Most of these turtles represent animals imported for the pet or food trade that have been released or escaped captivity. In addition to competition for food, exotic turtles also may carry new pathogens and/or parasites for which pond turtles exhibit no immunity.

Additional exotic competitors of particular concern are carp (*Cyprinus carpio* and *Carassius auratus*), sunfish (*Lepomis* spp. and *Pomoxis* spp.), and crayfish (*Cambarus*, *Procambarus*, and *Pacifasticus*). Carp alter aquatic habitats by consuming emergent and floating vegetation. Their activities also produce turbid water conditions. These alterations of the aquatic habitat may have a significant impact on hatchling turtle habitat, may reduce the availability of invertebrate prey and decrease turtle foraging success as turtles rely primarily on vision to capture prey (Holland 1991). Sunfish, which are capable of reaching large population sizes in aquatic habitats may modify or compete for the available invertebrate prey base (Holland 1991). Although direct scientific data are unavailable to support this hypothesis, Holland (1991) noted that several sites lacking native or non-native fishes support the largest known pacific pond turtle populations. Crayfish, which also may prey on young pond turtles, may compete with pond turtles for both the invertebrate prey base and carrion (Holland 1991).

The pacific pond turtle has been described as an aquatic generalist as it occurs in a wide variety of aquatic habitats throughout its range (Holland 1991, 1994). Currently across its range, Ashton (1997) believes that loss of aquatic habitat through destruction, alteration or degradation is the greatest anthropogenic threat to pacific pond turtles. Reese and Welsh (1997) and Holland (1994) agree but charge that since pacific pond turtles are semi-terrestrial, finding protection not only for their aquatic habitat, but also adjacent uplands used for nesting, overwintering and dispersal purposes is of paramount importance to protecting pacific pond turtles. Conversion of wetlands to farmland, destruction of riparian area and uplands, urbanization, irrigation, channelization, water diversions, dams, grazing, mining, contaminants, roads, railroads and recreational activity all continue to have significant negative impacts on turtle populations.

Wetlands that have persisted are often indirectly affected by adjacent agricultural practices. Many of these aquatic habitats are utilized to convey or store agricultural water and, therefore, are subject to changes in the timing and amount of water flow. These wetlands often are channelized and periodically cleaned of aquatic vegetation rendering them unsuitable for pond turtles. Where pond turtles persist adjacent to agricultural lands, upland nesting opportunities may be limited or nonexistent because of the practice of farming up to the edge of the aquatic habitat. Because the pond turtle is long-lived, populations may persist in these areas long after

recruitment of young has ceased. According to Holland (1991), turtle populations in agricultural settings tend to be very small and heavily adult biased.

Another significant source of habitat alteration throughout the range of the pacific pond turtle is livestock grazing. Livestock have been documented as a major cause of excessive habitat disturbance in riparian areas (Behnke and Raleigh 1978, Kauffman and Krueger 1984). Cattle have a disproportionately greater adverse affect on riparian and other wetland habitats because they tend to concentrate in these areas, particularly during the dry season (Marlow and Pogacnik 1985). Cattle trample and eat emergent vegetation (Platts 1981) that serves as foraging habitat for turtles of all sizes and as critical microhabitat for hatchlings and first year animals. Streambanks also are trampled by cattle often resulting in the collapse of undercut banks (Platts 1981, Kauffman *et al*. 1983) that provided refugia for turtles. Cattle grazing results in increased erosion in the stream (Winegar 1977) which fills in deep pools, increases stream velocity, and adversely affects aquatic invertebrates (Behnke and Raleigh 1978, Platts 1981). Cattle may also crush turtles (Holland 1991).

Construction of roadways adjacent to pond turtle habitat adversely affects pond turtles in several ways. First, roads often present a partial or complete barrier to turtles traveling overland to nesting or overwintering sites. In studies in California, Oregon and Washington, pacific pond turtles have been observed crushed on roadways (Holland 1985, 1992), with the majority of these being gravid or post-partum females. In addition to hampering access to nesting areas, the road bed itself reduces the area of potential nesting. Roads constructed on south-facing slopes adjacent to the Umpqua River in Oregon probably eliminated both existing and potential nesting habitat (Holland 1992).

Parasites known to use pacific pond turtles as a host include trematodes, helminths, nematodes, lungworms and leeches (Holland 1994). Leeches were found on 7 to 10 percent of turtles studied from several sites in northern California (Holland 1991). Substantial numbers of nematodes have been found in the guts of northern pacific pond turtles from northern California (Bury 1986).

Status with Respect to Recovery

Northwestern pond turtle recovery efforts have been limited. In Washington, long-term recovery efforts are underway. Lands containing remaining populations have been preserved through purchase by the state of Washington or other non-profit organizations. The pacific pond turtle habitat on these lands have been enhanced by elimination of grazing, addition of basking materials, removal of non-native predators (bullfrogs and warm water fish), removal of invasive plant species, and planting of native shrubs (Washington Dept. of Fish and Wildlife 2000). A captive breeding program formally initiated in 1990 through the partnering of the Washington Department of Fish and Wildlife, Woodland Park Zoo and Center for Wildlife Conservation resulted in the release of 38 juvenile turtles in the Columbia River Gorge Puget Sound lowlands between 1991 and 1998 (Washington Dept. of Fish and Wildlife 2000). Since the program informally started (i.e., prior to 1990), 490 juvenile turtles have been released back into the wild

in Washington, with at least 90 percent surviving.

A similar "head start" program was implemented for the Kern River Preserve in 1992, 1993 and 1995 by the Audubon Society with consultation from the Woodland Park Zoo. The program successfully released and gave a head start to 53 turtles onto the Kern River Preserve. Recapture studies indicate the released turtles appeared healthy in 1993 with future studies forthcoming to determine exact survival rate and long-term success of the program (Overtree and Collings 1997). Additionally, the Service is developing long range management plans for the National Wildlife Refuges in the Columbia River Gorge (Pierce, Franz and Steigerwald) to support the recovery efforts.

Status within the Action Area and Environmental Baseline

CNDDB (2002) lists 14 pond turtle occurrences in Sacramento County and two pond turtle occurrences in Sutter County. Although no CNDDB occurrences have been recorded in either the Natomas Basin, the species is known to occur there. The species has been observed at Fisherman's Lake (NBHCP EIR 2002) as well as along the Natomas Main Drain (May & Associates 2001). The Natomas Basin probably supports a limited pond turtle population; however, no systematic surveys have been conducted.

Environmental Baseline

The canals and drains throughout the Natomas Basin are considered potential aquatic habitat for pond turtles. The species has been observed at Fisherman's Lake (NBHCP EIR 2002) as well as along the Natomas Main Drainage Canal (May & Associates 2001). Currently, there are about 250 miles of canals and drains in the Basin. Fisherman's Lake is considered high-quality aquatic habitat for the pond turtle and turtles have been observed there. Because most of the basin is developed agricultural land or commercial/ residential development, many of the potential upland breeding habitats have been eliminated. Despite this, a limited amount of potential breeding habitat probably occurs along many of the canals and aquatic habitats.

The Natomas Basin supports approximately 24,691 acres of potential pond turtle habitat (Table 12). Of that, approximately 96 acres are ponds and seasonally wet areas, 22,693 acres are rice, 124 acres are riparian, and 1,778 acres are canals. Although the importance of rice habitat to the turtle has not been documented, rice fields likely provide some foraging opportunities. The Basin's ponds and seasonally wet areas and its extensive system of drainage and delivery canals likely provide more suitable aquatic and upland habitat for the turtle.

Midvalley Fairy Shrimp

The midvalley fairy shrimp is considered a Species of Concern by the Service. The Service is currently conducting a status review of the species, and will issue a 12-month finding to determine if a petition to list it as endangered is warranted (68 **FR** 22724). The midvalley fairy shrimp has not been designated any special status by the State.

Description

The midvalley fairy shrimp (*Branchinecta mesovallensis*) was described by Belk and Fugate in June, 2000. The species was named for its limited range in the Central Valley of California. The type locality is on the Virginia Smith Trust land in Merced County, California (Belk and Fugate 2000). Midvalley fairy shrimp specimens were collected as early as 1989.

Male midvalley fairy shrimp are most similar in appearance to the Conservancy fairy shrimp (Belk and Fugate 2000). These species are distinguished by the shape of the tip of their antennae. The midvalley fairy shrimp's antennae is bent such that the larger hump of two humps possessed by both species is anterior, whereas this same hump is posterior in the Conservancy fairy shrimp. Females of these two species differ in the shape of their brood pouches. The brood pouch of the midvalley fairy shrimp is pyriform and extends to below segments 3 and 4. The brood pouch of the Conservancy fairy shrimp is fusiform and extends to below segments 5 and 7. Midvalley fairy shrimp females also closely resemble the vernal pool fairy shrimp, except that vernal pool fairy shrimp females have a pair of dorsolateral processes on each side of thoracic segment 3, whereas the midvalley fairy shrimp does not have any dorsolateral processes on this thoracic segment.

Historic and Current Range

Although the historic distribution of the midvalley fairy shrimp is unknown, vernal pool habitats in the regions where it is currently known to occur have been dramatically reduced since pre-agricultural times (Holland 1998). The habitat of the midvalley fairy shrimp may have been even more severely reduced than other vernal pool habitats, since it can occur in swales and short-lived pools that may escape detection in dry years or during the dry season (Helm 1999, Belk and Fugate 2000).

The midvalley fairy shrimp is endemic to a small portion of California's Central Valley. Helm (1998) found midvalley fairy shrimp in less than 0.5 percent of the vernal pools he examined. Based on the few known occurrences, the species' distribution is limited to the Southeastern Sacramento, Southern Sierra Foothill, San Joaquin, and Solano-Colusa vernal pool regions. In the Southeastern Sacramento region, most occurrences are clustered around the City of Sacramento and Mather Air Force Base in Sacramento County. In the Southern Sierra Foothills and San Joaquin vernal pool regions, the midvalley fairy shrimp has been documented in the vicinity of the Virginia Smith Trust property in Merced County and from isolated occurrences in San Joaquin, Madera, and Fresno counties. However, because this species was described only

recently, it is likely additional occurrences will be found in the future.

Life History and Reproductive Ecology

The life cycle of the midvalley fairy shrimp is well suited to the unpredictable conditions of vernal pool habitats. The midvalley fairy shrimp can mature and reproduce very rapidly; it has been observed to reach maturity in as little as eight days and reproduction was observed in as few as 16 days after hatching (Helm 1998). Under the culturing conditions described in Helm (1998), the midvalley fairy shrimp lived for 147 days, about as long as other Central Valley species observed. Multiple hatchings of the midvalley fairy shrimp have been observed in a single rainy season as its vernal pool habitat repeatedly fills and dries. Helm (1998) found the midvalley fairy shrimp to be very tolerant of warm water, occurring in pools with water temperatures ranging from 5 to 32˚C . This temperature is higher than that measured for any other Central Valley fairy shrimp collected, except for the California fairy shrimp. Little is known about the midvalley fairy shrimp's tolerance to variations in water chemistry, but it has been found in some relatively alkaline pools (Helm 1998).

Essential Habitat Components

The midvalley fairy shrimp has been found in small, short-lived vernal pools and grass-bottomed swales ranging from 1.2 to 202 m^2 in area and averaging less than 10 cm in depth (Helm 1998). The species has been collected from pools on a volcanic mudflow landform of the Merhten Formation in Pentz Gravelly Loam and Raynor Clay soils. The midvalley fairy shrimp has also been found on San Joaquin Silt Loam soils on the Riverbank formation on Low Terrace landforms. At the time the type specimens were collected, the dominant macrophytes in the pool were the wetland grasses *Lolium multiflorum, Hordeum maximum gussoneanum,* and *Deschampsia danthanoides*, species that are characteristic of extremely short-lived pools and swales.

The midvalley fairy shrimp has only been collected with one other fairy shrimp, the vernal pool fairy shrimp, on three occasions (Eriksen and Belk 1999). It may occupy habitats that are not inundated for a sufficient period of time for other species to inhabit.

Reasons for Decline and Threats to Survival

As with all vernal pool species that occur in the Central Valley, suitable habitat for the midvalley fairy shrimp has declined dramatically over the past century, and pressure to develop remaining lands in the Central Valley are increasing rapidly. Holland (1998) estimated that only 25 percent of vernal pool habitats remain in the Central Valley, including the Southeastern Sacramento Valley and San Joaquin vernal pool regions where the species is currently known to occur.

Because the midvalley fairy shrimp occupies very small pools and was only recently recognized as a separate species, it may actually be at greater risk than the species already protected under the Act. These small depressions require less preparation prior to conversion to urban or agricultural uses because they are already relatively level, and thus may be more attractive to developers. Even during the wet season, they may not contain water continuously, even when nearby larger pools are full. Under these conditions, midvalley fairy shrimp pools may not be surveyed at all, and conversion allowed. Continued conversion of the grassland-vernal pool ecosystem matrix to urban or agricultural uses is the largest threat to survival of the midvalley fairy shrimp. The largest number of known locations is in Sacramento County, around the City of Sacramento, which is growing rapidly. Urban expansion in this area poses a threat to the majority of the midvalley fairy shrimp populations known to exist today.

Environmental Baseline and Status within the Action Area

There are 52 reported occurrences of midvalley fairy shrimp in California, 12 of which are reported from Sacramento County (CNDDB 2002). The midvalley fairy shrimp has not been recorded from Sutter County or the proposed action's action area. However, as stated above, this may be due to the short time that the midvalley fairy shrimp has been recognized as a distinct species. Potential midvalley fairy shrimp habitat occurs in the vernal pools on the east side of the Basin, in grasslands north of Del Paso Road. Additional potential habitat occurs in other ponds and seasonally wet areas in the Basin. No potential midvalley fairy shrimp habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities.

Potential midvalley fairy shrimp habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat in grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat in the Basin (K. Fuller, pers. comm.). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. Once again, this estimate greatly overestimates the amount of potential vernal pool habitat in the Basin, as most of the ponds and seasonally wet areas do not have the hydrology sufficient to support vernal pool crustaceans.

Western Spadefoot Toad

The western spadefoot toad was listed as a Category 2 species by the Service in 1994 (Service 1994*b*). Due to a change in policy regarding candidate species, western spadefoot toads are now considered a Species of Concern (Service 1998). The western spadefoot toad was designated a Species of Special Concern by the State in 1994 (Jennings and Hayes 1994, CDFG 1998).

Description

Spadefoot toads are distinguished from the true toads (*Bufo* spp.) by their cat-like eyes (due to vertically elliptical pupils), the single black sharp-edged "spade" on each hind foot, teeth in the upper jaw, and rather smooth skin (Stebbins 1985). The parotid glands (large swellings on the

side of the head and behind the eye) are absent or indistinct on spadefoot toads. Their pupils are vertical in bright light but are round at night. Males may have a dusky throat and dark nuptial pads on the innermost front toes. Amplexus, the copulatory embrace by males, is pelvic (Stebbins 1985).

The western spadefoot toad ranges in size from 3.7 to 6.2 cm snout-vent length. It is dusky green or gray above and often has four irregular light-colored stripes on its back, with the central pair of stripes sometimes distinguished by a dark, hourglass-shaped area. The skin tubercles (small, rounded protuberances) are sometimes tipped with orange or are reddish in color, particularly among young individuals (Storer 1925, Stebbins 1985). The iris of the eye is usually a pale gold. The abdomen is whitish without any markings. Spadefoot toads have a wedge-shaped, glossy black "spade" on each hind foot. The call of western spadefoot toads is hoarse and snore-like, and lasts about one-half to one second (Stebbins 1985).

Historical and Current Range

The western spadefoot toad is nearly endemic to California, and historically ranged from the vicinity of Redding in Shasta County southward to Mesa de San Carlos in northwestern Baja California, Mexico (Stebbins 1985). In California, western spadefoot toads ranged throughout the Central Valley, throughout the Coast Ranges, and the coastal lowlands from San Francisco Bay southward to Mexico (Jennings and Hayes 1994).

The western spadefoot toad is no longer present throughout most of the lowlands of southern California (Stebbins 1985). The species also is believed to be extirpated from many historic locations within the Central Valley (Jennings and Hayes 1994, Fisher and Shaffer 1996). According to Fisher and Shaffer (1996), western spadefoot toads have suffered a severe decline with virtually complete extirpation from the Sacramento Valley, and a reduced density of populations in the eastern San Joaquin Valley. Declines in abundance have been more modest in the Coast Ranges. This species occurs mostly below 900 m (Stebbins 1985), but can occur up to 1363 m (Morey 1988). However, the average elevation of sites where the species still occurs is significantly higher than the average elevation for historical sites; this suggests that declines have been more pronounced in lowlands.

Jennings and Hayes (1994) examined 832 museum and sighting records from 346 locations and concluded that western spadefoot toads occurred in 18 California counties: Alameda, Amador, Butte, Kern, Madera, Mariposa, Monterey, Orange, Riverside, Sacramento, San Benito, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, Tehama, and Tulare. Based on these same records, they concluded that western spadefoot toads may no longer occur in six counties: Calaveras, Fresno, Los Angeles, San Bernardino, Shasta, and Yolo. Fisher and Shaffer (1996) conducted field surveys of 315 sites in the Sacramento Valley, San Joaquin Valley, and Coast Ranges from 1990 to 1992. These surveys confirmed the presence of western spadefoot toads in Alameda, Calaveras, Glenn, Kern, Madera, Merced, Monterey, Sacramento, San Benito, San Luis Obispo, Santa Barbara, Stanislaus, and Tulare Counties. Western spadefoot toads were not found at sites surveyed in Amador, Butte, Fresno, Mariposa, San

Joaquin, Shasta, Tehama, and Yolo Counties.

Essential Habitat Components

According to Stebbins (1985), western spadefoot toads are primarily a species of lowland habitats such as washes, floodplains of rivers, alluvial fans, playas, and alkali flats. However, they also occur in the foothills and mountains. Western spadefoot toads prefer areas of open vegetation and short grasses, where the soil is sandy or gravelly. They are found in the valley and foothill grasslands, open chaparral, and pine-oak woodlands.

Western spadefoot toads require two distinct habitat components in order to meet life history requirements, and these habitats probably need to be in close proximity. As mentioned previously, spadefoot toads are primarily terrestrial. They require upland habitats for feeding and constructing burrows for their long dry-season dormancy. Typical of amphibians, wetland habitats are required for reproduction. Western spadefoot toad eggs and larvae have been observed in a variety of permanent and temporary wetlands including rivers, creeks, pools in intermittent streams, vernal pools, and temporary rain pools (CDFG 2000). This indicates a degree of ecological plasticity. However, it appears that vernal pools and other temporary wetlands may be more optimal for breeding due to the absence of or at least reduced abundance of both native and non-native predators, many of which require more permanent wetlands.

Western spadefoot toads also have exhibited a capacity to breed in altered wetlands as well as man-made wetlands. Spadefoot toads, including eggs and larvae, have been observed in vernal pools that have been disturbed by activities such as earthmoving, disking, intensive livestock use, and off-road vehicle use. Spadefoot toads, again including eggs and larvae, also have been observed in artificial ponds, livestock ponds, sedimentation and flood control ponds, irrigation and roadside ditches, roadside puddles, tire ruts, and borrow pits (Fisher and Shaffer 1996, CDFG 2000). This again exhibits a degree of ecological plasticity and adaptability. However, although western spadefoot toads have been observed to inhabit and breed in wetlands altered or created by man, survival and reproductive success in these pools have not been evaluated relative to that in unaltered natural pools.

Reproductive ecology

Western spadefoot toads breed from January to May in temporary pools that form following winter or spring rains. Water temperatures in these pools must be between 9 and 30˚C for western spadefoot toads to reproduce (Brown 1966, 1967). During breeding, highly vocal aggregations of more than 1,000 individuals may form (Jennings and Hayes 1994). Breeding calls are audible at great distances, which serves to bring individuals together at suitable breeding sites (Stebbins 1985).

Females deposit their eggs in numerous small irregularly cylindrical clusters of ten to 42 eggs (average = 24) (Storer 1925) and may lay more than 500 eggs in one season (Stebbins 1951). Eggs are deposited on plant stems or pieces of detritus in temporary rain pools, or sometimes

pools in ephemeral stream courses (Storer 1925, Stebbins 1985). Oviposition does not occur until water temperatures reach the required minimum of 9˚C (Jennings and Hayes 1994). Depending on the temperature regime and annual rainfall, oviposition may occur between late February and late May (Storer 1925, Burgess 1950, Feaver 1971, Stebbins 1985).

Depending on temperature, western spadefoot toad eggs hatch in 0.6-6 days (Brown 1967). At relatively high water temperatures (e.g., 21ºC), Storer (1925) noted that about half of the western spadefoot toad eggs had failed to develop, possibly due to a fungus that thrives in warmer water and invades toad eggs. Larval development can be completed in three to 11 weeks (Burgess 1950, Feaver 1971), depending on food resources and temperature. In eight vernal pools examined by Morey (1998), the average duration to complete larval development (hatching to metamorphosis) was 58 days (range 30-79 days). Longer periods of larval development were associated with larger size at metamorphosis. Larval development must be completed before pools dry. Morey (1998) stated that vernal pools must persist for at least five weeks for western spadefoot toads to successfully breed. Pools that persist for longer periods permit longer larval development resulting in larger juveniles with great fat reserves at metamorphosis (Morey 1998), and these larger individuals have a higher fitness level and survivorship (Pfennig 1992). Recently metamorphosed juveniles emerge from water and seek refuge in the immediate vicinity of natal ponds. They spend several hours to several days near ponds before dispersing. Weintraub (1979) reported that toadlets of plains spadefoot toads seek refuge in drying mud cracks, under boards, and under other surface objects including decomposing cow manure. Annual reproductive success probably varies with precipitation levels, success being lower in drier years (Fisher and Shaffer 1996). Metamorphosing larvae may leave the water while their tails are still relatively long (greater than 1 cm) (Storer 1925). Age at sexual maturity is unknown, but considering the relatively long period of subterranean dormancy (eight to nine months), individuals may require at least two years to mature (Jennings and Hayes 1994).

Movements and Habitat Use

Western spadefoot toads are almost completely terrestrial and enter water only to breed (Dimmitt and Ruibal 1980). However, typical of amphibians, toads require a certain level of moisture to avoid dessication, which can be a challenge in the arid habitats occupied by spadefoot toads. Spadefoot toads have behavioral and physiological adaptations that facilitate moisture retention.

During dry periods, spadefoot toads construct and occupy burrows that may be up to 0.9 m (3 ft.) in depth (Ruibal *et al*. 1969). Toads may remain in these burrows for 9-10 months. While in these burrows, they are completely surrounded by soil and appear to enter a state of torpor. Typical of amphibians, spadefoot toads have very permeable skin, which allows them to absorb moisture from the surrounding soil. Spadefoot toads may retain urea to increase the osmotic pressure within their bodies. This prevents water loss to the surrounding soil and even facilitates water absorption from soils with relatively high moisture tensions (Ruibal *et al*. 1969, Shoemaker *et al*. 1969). Spadefoot toads appear to construct burrows in soils that are relatively sandy and friable, as these soil attributes facilitate both digging and water absorption (Ruibal *et al*. 1969).

Spadefoot toads emerge from burrows to forage and breed following rains in the winter and spring. The factors that stimulate emergence are not well understood. In Arizona, spadefoot toads emerged after as little as 0.25 cm of precipitation, which barely wet the soil surface and obviously did not soak down to burrows (Ruibal *et al*. 1969). Sound or vibration from rain striking the ground appears to be the primary emergence cue used by spadefoot toads, and even the vibrations of a motor can cause toads to emerge (Dimmitt and Ruibal 1980). Spadefoot toads may move closer to the surface prior to precipitation and may even emerge to forage on nights with adequate humidity.

Above-ground activity is primarily nocturnal, presumably to reduce water loss. Even when exposed to artificial light, spadefoot toads will immediately move away or begin burrowing underground (Storer 1925, Ruibal *et al*. 1969). During the day, toads dig and occupy relatively shallow burrows 2-5 cm in depth (Ruibal *et al*. 1969) and may even use small mammal burrows. In addition to breeding during periods of above-ground activity, spadefoot toads must acquire sufficient energy resources prior to reentering dormancy (Seymour 1973).

Reasons for Decline and Threats to Survival

The principal factors contributing to the decline of the western spadefoot toad are loss of habitat due to urban development and conversion of native habitats to agricultural lands, the introduction of non-native predators, and stochastic events that particularly impact small, isolated populations (e.g., Morey 1998). The species likely suffered dramatic reductions in the mid to late 1900s when urban and agricultural development was rapidly destroying natural habitats in the Central Valley and southern California (Jennings and Hayes 1994). According to Jennings and Hayes (1994), over 80 percent of the habitat once known to be occupied by the western spadefoot in southern California (from the Santa Clara River Valley in Los Angeles and Ventura counties southward) has been developed or converted to uses that are incompatible with successful reproduction and recruitment. In northern and central California, loss of habitat has been less severe, but nevertheless significant; it is estimated that over 30 percent of the habitat once occupied by western spadefoot toads has been developed or converted (Jennings and Hayes 1994). Regions that have been severely affected include the lower two-thirds of the Salinas River system and much of the areas east of Sacramento, Fresno, and Bakersfield. Many of the remaining suitable rainpool or vernal habitats, which are concentrated on valley terraces along the edges of the Central Valley floor, have disappeared or been fragmented (Jennings and Hayes 1994).

Another reason for decline in the population of western spadefoot toads is the introduction of non-native predators, specifically bullfrogs, crayfish, and fish (Hayes and Warner 1985, Hayes and Jennings 1986, Fisher and Shaffer 1996). All of these were introduced into California in the late 1800s and early 1900s, and through range expansions, additional introductions, and transplants, have become established throughout most of the state. Fisher and Shaffer (1996) reported an inverse relationship between the presence of western spadefoot toads and that of non-native predators. They further reported that non-native predators may have displaced western spadefoot toads at lower elevations resulting in the toads being found primarily at higher

elevation sites where these predators apparently are less abundant.

Habitat loss and fragmentation results in populations that are small in size and increasingly isolated. This reduces movements by individuals and genetic exchange between populations. Small populations are more likely to go extinct due to catastrophic or stochastic events. Isolation reduces the potential for recolonization of areas where toads have disappeared. This results in lower overall abundance and population viability.

Fisher and Shaffer (1996) also discussed the possible role of ultraviolet radiation in the declines of native amphibians in the Central Valley. However, they concluded that there is no evidence that ultraviolet radiation is a significant factor in amphibian declines at this time.

Habitat loss and fragmentation remain significant threats to the vernal pool ecosystems that support western spadefoot toads (Service 1994*a*). This loss is a result of urban, industrial, and agricultural development. Many remaining vernal pools and wetlands are suffering from habitat degradation resulting from disking, intensive livestock grazing and trampling, off-road vehicle use, and contaminant runoff. In addition to contaminant problems, run-off from adjacent developed areas also could change hydrologic regimes by converting temporary pools to more permanent wetlands. This increases the likelihood of invasion and colonization by non-native predators.

The continued presence and proliferation of non-native predators is a significant threat to western spadefoot toads. Western spadefoot toads have evolved with natural predators such as snakes and wading birds. Non-native species may increase predation pressure beyond natural levels, thereby causing western spadefoot toads to decline in abundance.

Fisher and Shaffer (1996) assessed native amphibian populations in the Coast Ranges, Sierra foothills, and Central Valley. They predicted that widespread declines of western spadefoot toads will occur if non-native species continue to spread into low-elevation Coast Range habitats. However, in the San Joaquin Valley, they found that although there were relatively few introduced exotics, native amphibians have still declined significantly. The San Joaquin Valley is intensively farmed and has been subject to extensive habitat loss, degradation, and fragmentation (Service 1998). Adverse impacts from these activities as well as isolation from other western spadefoot toad populations may have caused the observed declines.

Another threat to western spadefoot toads is roads. This threat likely will increase in significance as new roads are built and existing roads are expanded. Roads can result in direct mortality, habitat loss and fragmentation, disturbance, and contaminants, as well as inducing urban growth. Mortality on roads could particularly be a problem during dispersal when toads are more likely to encounter roads. Morey and Guinn (1992) reported road mortality among spadefoot toads in San Joaquin County, and Jennings (1998) reported road mortality at all seven sites that he surveyed in Kings and Alameda Counties. Three CNDDB (2000) occurrences report observations of western spadefoot toads killed by vehicles in San Joaquin, San Luis Obispo, and Santa Barbara Counties. The impact of road mortality on populations of western

spadefoot toads is unknown. Roads can be a barrier to movements and effectively isolate populations. Roads were found to be significant barriers to gene flow among common frogs (*Rana temporaria*) in Germany and this has resulted in genetic differentiation among populations separated by roads (Reh and Seitz 1990). Contaminants from road materials, leaks, and spills also could adversely impact toads by contaminating the water in wetlands.

Activities that produce low frequency noise and vibration in or near habitat for western spadefoot toads may be detrimental to the species. Dimmitt and Ruibal (1980) determined that spadefoot toads were extremely sensitive to such stimuli; toads were caused to break dormancy and emerge from their burrows. Disturbances that cause spadefoot toads to emerge at inappropriate times could result in detrimental effects such as mortality or reduced productivity.

A less-visible but equally important threat to smaller populations of western spadefoot toads is the decrease in vigor and viability sometimes observed in small populations of animals. Small, isolated populations have an increased risk of detrimental effects from stochastic genetic and demographic changes. One such impact is inbreeding, which can result in an increase in incidence of birth defects, slower growth, higher mortality, and lower fecundity.

Status with Respect to Recovery

Vernal pools and other wetlands now are recognized as both sensitive and ecologically important, and efforts are being made to conserve these habitats. A number of sites with suitable habitat for western spadefoot toads already are being protected in national wildlife refuges, state parks, state ecological reserves, private preserves, habitat mitigation banks, and conservation easements. Additionally, 23 vernal pool species are now Federally protected including 18 plants and five animals. This will result in habitat conservation and management efforts that will contribute to the conservation of western spadefoot toads.

Status within the Action Area and Environmental Baseline

The western spadefoot toad has not been reported from within the proposed action's action area or Sutter County (CNDDB 2002). Five occurrences have been reported from eastern Sacramento County; the closest reported occurrence in Sacramento County is approximately 15 miles from the Basin. The closest overall spadefoot occurrence to the Basin is from Placer County and is approximately six miles from the Basin.

Potential toad habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat in grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat in the Basin (K. Fuller, pers. comm.). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. Once again, this estimate greatly overestimates the amount of potential vernal pool habitat in the Basin, as most of the ponds and seasonally wet areas do not have the hydrology sufficient to support the toad. No potential toad habitat is

located within 76 m (250 ft.) of any of MAP's proposed action activities. Based upon the toad's limited distribution and distance form the Basin, it is very unlikely that the toad would be found in the Basin (K. Fuller, pers. comm. to C. Aubrey 2003).

California Tiger Salamander

In 1994, the Service issued a 12-month warranted but precluded finding for the California tiger salamander (59 **FR** 18353). Subsequently, the Service issued its final rule listing the Santa Barbara County distinct population segment of the species as endangered (65 **FR** 57242). The Sonoma County distinct population segment of the California tiger salamander was listed as endangered on an emergency basis under the Act on July 22, 2002 (67 **FR** 47726). The California tiger salamander throughout the remainder of its range, including Fresno County, is a Federal candidate species. The Service proposed to list the Central California Distinct Population Segment of the California Tiger Salamander as threatened and reclassify the Sonoma County and Santa Barbara County Distinct Populations of the salamander from endangered to threatened on May 23, 2003 (68 **FR** 28647). The State considers the California tiger salamander a Species of Special Concern.

Description

The California tiger salamander is a large, stocky, terrestrial salamander with a broad, rounded snout. Adults may reach a total length of 207 mm (8.2 in). California tiger salamanders exhibit sexual dimorphism; males tend to be larger than females. Coloration of the California tiger salamander is white or yellowish markings against black. As adults, California tiger salamanders tend to have the creamy yellow to white spotting on the sides with much less on the top, whereas other tiger salamanders have brighter yellow spotting with more on the top.

Historic Range

Historically, the California tiger salamander inhabited low elevation grassland and oak savanna plant communities of the Central Valley, adjacent foothills, and the inner coast ranges in California (Storer 1925, Shaffer *et al.* 1993) from sea level up to about 460 m (1500 ft). Along the coast ranges, the species occurred from the Santa Rosa area of Sonoma County south to the vicinity of Buellton in Santa Barbara County. In the Central Valley and surrounding foothills, the species occurred from northern Yolo County southward to northwestern Kern County and northern Tulare County. Today, the species is found in grasslands and oak savannah in the Sierra Nevada foothills, Central Valley, Bay Area, and the coast ranges in central California. Populations in areas such as Santa Barbara County and Sonoma County are now considered endangered.

Essential Habitat Components

California tiger salamanders require both wetland and adjacent upland habitat to complete their life cycle (Shaffer *et al.* 1993). Subadult and adult California tiger salamanders spend the dry

summer and fall months of the year aestivating (a state of dormancy or inactivity in response to hot, dry weather) in the burrows of small mammals, such as California ground squirrels (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925; Loredo and van Vuren 1996; 1998; Trenham 1998a). During estivation, California tiger salamanders eat very little (Shaffer *et al.* 1993). Once fall or winter rains begin, they emerge from the upland sites on rainy nights to feed and to migrate to the breeding ponds (Stebbins 1985, 1989; Shaffer *et al.* 1993). Historically, the California tiger salamander utilized vernal pools, but it also currently breeds in stockponds. Occurrence of California tiger salamanders is significantly associated with occurrence of ground squirrels (Seymour and Westphal 1994). Active ground burrowing rodent colonies probably are required to sustain California tiger salamanders because inactive burrow systems become progressively unsuitable over time. Loredo *et al.* (1996) found that ground squirrel burrow systems collapsed within 18 months following abandonment by or loss of the mammals; although California tiger salamanders used both occupied and unoccupied burrows, they apparently did not use collapsed burrows. California tiger salamanders cannot persist without upland habitat.

Reproductive Ecology, Life History

Adult California tiger salamanders may migrate up to 2 km (1.2 mi) from their upland sites to the breeding ponds (S. Sweet, University of California, Santa Barbara, *in litt*. 1998), which may be vernal pools, stockponds, or other seasonal water bodies. The distance between the upland sites and breeding pools depends on local topography and vegetation, and the distribution of ground squirrel or other rodent burrows (Stebbins 1989). Males migrate before females (Twitty 1941; Shaffer *et al.* 1993; Loredo and Van Vuren 1996; Trenham 1998b). Males usually remain in the ponds for an average of about six to eight weeks, while females stay for approximately one to two weeks. In dry years, both sexes may stay for shorter periods (Loredo and van Vuren 1996; Trenham 1998b). Marked salamanders have been recaptured at the pond where they were initially captured; in one study, approximately 80 percent were recaptured at the same pond (Trenham 1998b). The rate of natural movement of salamanders among breeding sites depends on the distance between the ponds or complexes of ponds and on the intervening habitat (e.g., salamanders may move more quickly through sparsely covered and more open grassland than densely vegetated lands)(Trenham 1998a). As with migration distances, the number of ponds used by an individual over its lifetime will be dependent on landscape features and environmental factors.

Adult salamanders mate in the breeding ponds, after which the females lay their eggs in the water (Twitty 1941; Shaffer *et al.* 1993; Petranka 1998). Females attach their eggs singly, or in rare circumstances, in groups of two to four, to twigs, grass stems, vegetation, or debris (Storer 1925, Twitty 1941). In ponds with no or limited vegetation, they may be attached to objects, such as rocks and boards on the bottom (Jennings and Hayes 1994). After breeding, adults leave the pool and return to the small mammal burrows (Loredo *et al.* 1996; Trenham 1998a), although they may continue to come out nightly for approximately the next two weeks to feed (Shaffer *et al.* 1993). In drought years, the seasonal pools may not form and the adults can not breed (Barry and Shaffer 1994).

Salamander eggs hatch in ten to 14 days with newly hatched salamanders (larvae) ranging from 11.5 to 14.2 mm (0.45 to 0.56 in) in total length (Petranka 1998). The larvae are aquatic. They are yellowish gray in color and have broad fat heads, possess large, feathery external gills, and broad dorsal fins that extend well onto their back. The larvae feed on zooplankton, small crustaceans, and aquatic insects for about six weeks after hatching, after which they switch to larger prey (J. Anderson 1968). Larger larvae have been known to consume smaller tadpoles of Pacific treefrogs (*Pseudacris regilla*) and California red-legged frogs (*Rana aurora*) (J. Anderson 1968; P. Anderson 1968). The larvae are among the top aquatic predators in the seasonal pool ecosystems. They often rest on the bottom in shallow water, but also may be found at different layers in the water column in deeper water. The young salamanders are wary and when approached by potential predators, will dart into vegetation on the bottom of the pool (Storer 1925).

The larval stage of the California tiger salamander usually last three to six months, as most seasonal ponds and pools dry up during the summer (Petranka 1998). Amphibian larvae must grow to a critical minimum body size before they can metamorphose (change into a different physical form) to the terrestrial stage (Wilbur and Collins 1973). Individuals collected near Stockton in the Central Valley during April varied from 47 to 58 mm (1.88 to 2.32 in) in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left the breeding pools 60 to 94 days after the eggs had been laid, with larvae developing faster in smaller, more rapidly drying pools. The longer the ponding duration, the larger the larvae and metamorphosed juveniles are able to grow, and the more likely they are to survive and reproduce (Pechmann *et al.* 1989; Semlitsch *et al.* 1988; Morey 1998; Trenham 1998b). The larvae will perish if a site dries before metamorphosis is complete (P. Anderson 1968, Feaver 1971). Pechmann *et al.* (1988) found a strong positive correlation with ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 pools sampled supported larval California tiger salamanders, and 5 of these dried before metamorphosis could occur. Therefore, out of the original 30 pools, only six (20 percent) provided suitable conditions for successful reproduction that year. Size at metamorphosis is positively correlated with stored body fat and survival of juvenile amphibians, and negatively correlated with age at first reproduction (Semlitsch *et al.* 1988; Scott 1994; Morey 1998)

In the late spring or early summer, before the pools dry completely, metamorphosed juveniles leave their pools and settle in small mammal burrows at the end of their nightly movements (Zeiner *et al.* 1988; Shaffer *et al.* 1993; Loredo *et al.* 1996). Like the adults, juveniles may emerge from these retreats to feed during nights of high relative humidity (Storer 1925; Shaffer *et al.* 1993) before settling in their selected upland sites for the dry, hot summer months. Juveniles have been observed to migrate up to 1.6 km (1 mi) from breeding pools to upland areas (Austin and Shaffer 1992). An estimated 83 percent of the salamanders rely on rodent burrows for shelter (Petranka 1998). Mortality of juveniles during their first summer exceeds 50 percent (Trenham 1998b). Unseasonable emergence from uplands in hot dry weather occasionally results in mass mortality of juveniles (Holland *et al.* 1990). Juveniles do not typically return to the breeding pools until they reach sexual maturity at several years of age (Trenham 1998b; L. Hunt, *in litt*. 1998). Trenham (1998b) estimated survival from metamorphosis to maturity at his study site at less than five percent (well below an estimated replacement level of 18 percent). Adult survivorship varies greatly between years, but is a crucial determinant of whether a population is a source or sink (i.e., whether net productivity exceeds the level necessary to maintain the population).

Lifetime reproductive success for California and other tiger salamanders is low. Trenham *et al.* (2000) found the average female bred 1.4 times and produced 8.5 young that survived to metamorphosis per reproductive effort. This resulted in roughly 11 metamorphic offspring over the lifetime of a female. Two reasons for the low reproductive success are the preliminary data suggest that most individuals of the California tiger salamanders require two years to become sexually mature, but some individuals may be slower to mature (Shaffer *et al.* 1993); and some animals do not breed until they are four to six years old. While individuals may survive for more than ten years, many breed only once, and in some populations, less than 5 percent of marked juveniles survive to become breeding adults (Trenham 1998b). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well as from human caused factors that reduce breeding success and individual survival. Factors that repeatedly lower breeding success in isolated pools can quickly extirpate a population.

Reasons for Decline and Threats to Survival

California tiger salamanders are imperiled by a variety of human activities. Current factors associated with declining populations of the salamander include continued degradation and loss of habitat due to agriculture and urbanization, non-native plants, hybridization with non-native tiger salamanders, and introduced predators. Fragmentation of existing habitat and the continued colonization of existing habitat by non-native tiger salamanders may represent the most significant current threats to California tiger salamanders, although populations are likely threatened by more than one factor. Isolation and fragmentation of habitats within many watersheds have precluded dispersal between sub-populations and jeopardized the viability of metapopulations (broadly defined as multiple subpopulations that occasionally exchange individuals through dispersal, and are capable of colonizing or “rescuing” extinct habitat patches).

Although no systematic, range-wide studies have been conducted, it is known that significant

numbers of California tiger salamanders are killed by vehicular traffic while crossing roads (Hansen and Tremper 1993; S. Sweet, *in litt*. 1993). For example, during a 1-hour period on a road bordering Lake Lagunita on the Stanford University campus, 45 California tiger salamanders were collected, 28 of which had been killed by cars (Twitty 1941). More recently, during one 15-day period in 2001 at a Sonoma County location, 26 road-killed California tiger salamanders were found (D. Cook, pers. comm. 2002). Overall breeding population losses of California tiger salamanders due to road kills have been estimated to be between 25 and 72 percent (Twitty 1941; S. Sweet *in litt*. 1993; Launer and Fee *in litt*. 1996). Mortality may be increased by associated roadway curbs and berms as low as nine to 12 cm (3.5 to 5 in), which allow California tiger salamanders access to roadways but prevent their exit from them (Launer and Fee 1996; S. Sweet *in litt*. 1998).

In a recent study along a 1.05 km (0.7 mi) high-vehicular-use (21,450 vehicles per day) section of the Trans-Canadian Highway in Alberta, Canada, Clevenger *et al.* (2001) recorded 183 road-killed tiger salamanders (*Ambystoma tigrinum*) in 30 days and concluded it was likely that very little of the local population had survived. In California, vehicular-use levels along various State, interstate, and secondary roads commonly far exceed the level of use reported in the Alberta study. Vehicular usage on California roads is also increasing rapidly and directly with human population and urban expansion. During November 2002, California's estimated total vehicular travel on State highway system roads alone was 23 billion km (14.27 billion mi)(this figure and subsequent vehicular-use data from California Department of Transportation's Internet website, January 2, 2003). From 1972 to 2001, State highway system total vehicular usage rose steadily from 108.6 km to 270 km (67.11 to 167.81 billion mi) annually. For the 23 California counties in which the California tiger salamander may occur, State highway system total annual vehicular usage in 1999, 2000, and 2001 was 53.27, 55.85, and 57.21 billion miles (86, 90, and 92.1 billion km), respectively. The steady increase of vehicular use is thus continuing. We believe such figures illustrate (1) the general growth in vehicular usage that has been, and is still, occurring in many parts of the California tiger salamander's range, and (2) that additional increments of road-kill losses, which are already a potentially serious problem for the species, are likely occurring.

The most overwhelming threat to the California tiger salamander is from continuing habitat destruction, degradation, and fragmentation. Secondary threats exist from predation and competition from introduced exotic species; possible commercial overutilization; disease; hybridization with non-native salamanders; various chemical contaminants; road-crossing mortality; and certain unrestrictive mosquito and rodent control operations. The various primary and secondary threats are not currently being offset by existing Federal, State, or local regulatory mechanisms. The California tiger salamander also is vulnerable to chance environmental or demographic events, to which small populations are particularly vulnerable. The combination of its biology and specific habitat requirements makes the animal highly susceptible to random events, such as drought, disease, and other occurrences.

Environmental Baseline, Status within the Action Area

The proposed action is closest to the Central Valley population of the California tiger salamander. This population occupies Yolo County, Solano, Sacramento County south of the Cosumnes River, northeastern Contra Costa County, eastern San Joaquin County, western Amador County, western Calaveras County, western Tuolumne County, eastern Stanislaus County, Merced, western Mariposa County, and northwestern Madera County. Six percent (42) of the known California tiger salamander localities are in this population (CNDDB 2002). Ten localities in Calaveras, Contra Costa, Madera, Merced, Sacramento, Solano, Stanislaus, and Yolo counties are considered extirpated (CNDDB 2002). The species historically occurred as far north as Butte County, but has not recently been documented north of the Cosumnes River. The remaining sites inhabited by the California tiger salamander occur in the low elevation foothills on the eastern side of the Central Valley (Shaffer *et al.* 1993). Urban development and agriculture have eliminated much of the grassland and vernal pools. From 1996 to 1998, 14361 ha (35487 ac) of native habitat were converted to urban and agricultural uses in Yolo, Solano, Contra Costa, Stanislaus, Merced, Sacramento, San Joaquin, Stanislaus, Merced, and Madera counties. There are 361,761 acres of habitat for the California tiger salamander in the Central Valley.

Of 127 California tiger salamander localities where wetland type was identified, 26 percent (33) were in vernal pools. The Central Valley population of California tiger salamanders occurs within the Southeastern Sacramento Valley and Southern Sierra Foothills Vernal Pool Regions (Keeler-Wolf 1998). Vernal pools in both regions are threatened by conversion of grasslands and grazing land to housing developments and intensive agriculture.

California tiger salamander localities in the Central Valley population may be affected by proposed or recently implemented development projects, including a vineyard (Borden Ranch, Launa Creek Partnership), housing developments (Mueller Ranch, Liberty Hills Community), and highway construction (Oakdale Bypass). These development projects would destroy upland estivation habitat and wetland breeding habitat, thereby killing salamanders and reducing the viability of subpopulations at the affected localities. Vineyards planted in areas such as Borden Ranch along the San Joaquin-Sacramento County line have degraded and destroyed habitat for California tiger salamanders (Service files). The now-closed Rancho Seco nuclear power plant site in southeast Sacramento County has been converted to a public park, which could degrade or eliminate potential habitat for the nearby California tiger salamander subpopulation.

In Yolo and Solano counties, the major impacts to California tiger salamander populations have been agricultural. Portions of the California tiger salamander subpopulation at Jepson Prairie in Solano County is protected by the University of California Natural Reserve System and the Solano Land Trust. However, some estivation habitat may have been disrupted by construction of a PG&E natural gas pipeline in the vicinity of the reserve. California tiger salamanders also were found at the proposed Calpine power plants near Jepson Prairie. Vernal pool and upland habitat at this site was partially disced and planted to winter wheat in 1992, potentially killing salamanders and reducing the viability of the habitat (C. Nagano, Service, pers. obs).

In Stanislaus County, California tiger salamanders were considered extirpated until they were found by biologists surveying a potential route for the Oakdale Bypass near Oakdale (California Department of Transportation 2001). This route threatens the only known population of California tiger salamanders in the Oakdale area.

A total of 671 California tiger salamander species occurrence have been recorded in California (CNDDB 2002). Of these, eight occurrence have been recorded in Sacramento County. No salamanders have been recorded in either Sutter County generally or within the proposed action's action area. The closest salamander record is from Yolo County and is approximately 12 miles from the Basin. However, this location is considered extirpated. The closest extant occurrence is from Yolo County, approximately 20 miles west of the Basin.

Legenere

The Service classifies legenere as a Species of Concern. The species has no special state status. It has been included on California Native Plant Society lists of rare and endangered species for 25 years (Powell 1974) and is currently on List 1B because it is "endangered throughout its range" (Skinner and Pavlik 1994).

Description

Legenere is an inconspicuous annual. The entire plant is hairless. The main stems are 10 to 30 cm (3.9 to 11.8 in.) long and decumbent, although many branches are erect. Extra roots often arise from the lower nodes. The leaves, which are produced underwater, are 1 to 3 cm (0.4 to 1.2 in.) long and narrowly triangular; they fall off the plant before flowers appear. The egg-shaped or oval bracts are 6 to 12 mm (0.24 to 0.47 in.) long and remain throughout the flowering period. A single flower arises above each bract. Legenere flowers may or may not have corollas, and a single plant can produce both types of flowers. When present, the corollas are white or yellowish, 3.5 to 4 mm (0.14 to 0.16 in.) long, and two-lipped. The upper two corolla lobes are narrower than the lower three, and the corolla tube is slit on the upper side. The stamens are joined to form a tubular structure. The flower stalks are very slender and elongate as the fruit matures, reaching a final length of as much as 3 cm (1.2 in.). Legenere has a cylindrical capsule 6 to 10 mm (0.24 to 0.39 in.) long, which splits open only at the tip. Each capsule contains up to 20 seeds, which are approximately 1 mm (0.04 in.) long, brown, smooth, and shiny (McVaugh 1943, Mason 1957, Abrams and Ferris 1960, Holland 1984, Morin 1993). The chromosome number of legenere has not been determined.

The genera most likely to be confused with legenere are *Howellia, Downingia*, *Lobelia,* and *Porterella*. Both *Howellia* and *Downingia* have capsules that split along the sides, whereas legenere's capsule opens at the tip. Moreover, *Downingia* flowers are not stalked. The *Lobelia* species in California have either red or blue flowers and spherical fruits, as opposed to the whitish flowers and cylindrical fruits of legenere. *Porterella* has showy blue flowers with yellow or white marks at the base of the corolla lobes, and it occurs at higher elevations than legenere (Morin and Niehaus 1977, Holland 1984, Morin 1993).

Historical and Current Range

Between 1890 and 1984, legenere had been reported from 12 sites in eight counties encompassing six vernal pool regions. The historical counties of occurrence were Solano (three sites, including the type locality), Lake and Sacramento (two sites each), and Napa, Placer, San Mateo, Sonoma, and Stanislaus counties (one site each) (Hoover 1937, Mason 1957, Rubtzoff and Heckard 1975, Holland 1984). These sites were located in the Central Coast, Lake-Napa, Santa Rosa, Solano-Colusa, Southeastern Sacramento Valley, and Southern Sierra Foothills vernal pool regions (Keeler-Wolf *et al*. 1998). As of 1984, the only three populations believed to remain extant were in Napa, Placer, and Sacramento counties (Holland 1984).

Since 1984, legenere has been rediscovered at several historical sites and has been found at numerous new locations. During that time, the type locality and six other occurrences have been extirpated. Among the 42 occurrences presumed to be extant, 20 are in Sacramento County, including nine in the vicinity of Elk Grove and six in the vicinity of the former Mather Air Force Base. Another area of concentration, with ten extant occurrences, is near Dozier in Solano County. Other counties where this species is presumed to remain are Lake, Napa, Placer, San Joaquin, San Mateo, Shasta, and Tehama (Skinner and Pavlik 1994, CNDDB 2000).

The vernal pool regions (Keeler-Wolf *et al*. 1998) where legenere remains extant are Lake-Napa, Northeastern Sacramento Valley, Northwestern Sacramento Valley, Santa Rosa, Solano-Colusa, and Southeastern Sacramento Valley. It has been extirpated from the Southern Sierra Foothills Vernal Pool Region. The Central Coast Vernal Pool Region occurrence in San Mateo County has not been rediscovered since 1906 but is presumed to be extant because suitable habitat remains in the area (CNDDB 2000).

Reproductive Ecology and Demography

Legenere seeds germinate between late February and April. The specific conditions necessary for seed germination are unknown. The plants grow through the standing water; as the water evaporates or recedes, legenere stems may collapse onto the lake bottom or become caught on taller, stronger plants (Holland 1984). Legenere flowers during April, May, or June (Morin and Niehaus 1977, Holland 1984, Skinner and Pavlik 1994). Pollination in legenere has not been studied, but the small, inconspicuous flowers suggest that it may be self-pollinated (Holland 1984). By late June, each plant typically produces six to ten capsules containing several hundred seeds each. Seed dispersal agents are unknown but may include gravity, water, and waterfowl. Most populations contain densities of less than one plant per square meter (10.8 $ft.^2$) (Holland 1984). Legenere is even more variable than are other vernal pool annuals; entire populations have disappeared for decades, then reappeared (Holland 1984, CNDDB 2000). Thus, a persistent soil seed bank most likely exists. Survival rates and other aspects of demography have not been investigated.

Habitat and Community Associations

Legenere grows in a variety of habitats including vernal pools, vernal marshes, artificial ponds, and floodplains of intermittent streams. Occupied vernal pool types include Northern Basalt Flow, Northern Claypan, Northern Hardpan, Northern Volcanic Ashflow, and Northern Volcanic Mudflow (Sawyer and Keeler-Wolf 1995). The surrounding plant community may be grassland,

open woodland, or hardwood forest containing oaks (*Quercus* spp.) or California buckeye (*Aesculus californica*). At one site, legenere grows in both a vernal pool and the adjacent grassland (CNDDB 2000). The vernal pools and lakes supporting legenere vary in size from approximately 4 m^2 (43 $ft.^2$) to 41 hectares (100 acres) (Holland 1984, CNDDB 2000). When it occurs in large pools and vernal lakes, legenere grows only in the shallower areas (less than 20 cm [8 in.] deep) (Holland 1984). Substrates in occupied areas may have been deposited by streams or volcanic flows. Soils underlying the pools themselves typically are shallow, acidic clays with few stones (Holland 1984). Legenere has been reported from elevations ranging from 3 m (10 ft.) in Solano County to 884 m (2,900 ft.) in Lake County (CNDDB 2000).

Legenere occurs most often with smooth goldfields and pale spikerush, and to a lesser extent with Boggs Lake hedge-hyssop and dwarf downingia (CNDDB 2000 and unprocessed data).

Reasons for Decline and Threats to Survival

Of the four occurrences of legenere known to be extirpated, two were destroyed by conversion to agriculture, one by changes in hydrology, and one by urban development (Holland 1984, CNDDB 2000). Several sites where the species still occurs have been degraded by discing or other agricultural practices, inappropriate livestock grazing, dirt biking, and trash dumping (CNDDB 2000). The San Mateo County site has been subjected to logging and hydrological changes; legenere has not been observed there in over 90 years (Holland 1984). Legenere occurred at Boggs Lake in the 1950's but has not been seen there since (Rubtzoff and Heckard 1975, Holland 1984, CNDDB 2000), even though suitable habitat remains.

Approximately one-third of the extant occurrences of legenere are in areas slated for commercial or residential development (Holland 1984, CNDDB 2000). In fact, some of the populations extant in 1983 already may have been destroyed by development, but they have not been visited since that time. More than one-third of populations are subject to livestock grazing (CNDDB 2000), but few appear to be declining. Holland (1984) indicated that "light" grazing during the winter and early spring did not seem to be detrimental to legenere. Competition from lippia (*Lippia* spp.) is a threat at one Solano County site (CNDDB 2000).

Status with Respect to Recovery

Holland (1984) conducted a status survey of legenere in 1983 with funding from the County of Sacramento, R.C. Fuller Associates, and The Nature Conservancy. He confirmed that several historical populations no longer persisted. New populations of this species were discovered during pre-project surveys and during searches by The Nature Conservancy volunteers (Holland 1984, CNDDB 2000).

Sixteen occurrences of legenere are (or were) on nature preserves or publicly-owned lands. Five occurrences are known currently from the Jepson Prairie Preserve in Solano County, two from the nearby Calhoun Cut Ecological Reserve, and two from the Dales Lake Ecological Reserve. Legenere was known from Boggs Lake before the preserve was established, but it has not been rediscovered in that area for over 40 years (Holland 1984). Two occurrences, at Hog Lake and on the Stillwater Plains, are on property administered by the U.S. Bureau of Land Management. Sacramento County owns land supporting three occurrences of legenere; one is at a wastewater treatment plant, and the other two are in county parks. Finally, one occurrence is on land owned

by the Sacramento Municipal Utility District (CNDDB 2000). However, mere occurrence on public land is not a guarantee of protection. Only the preserves and the U.S. Bureau of Land Management occurrences are managed to promote the continued existence of legenere and other rare species. As of 1991, one Sacramento County developer had plans to preserve several pools containing legenere when he developed the property (CNDDB 2000).

Status within the Action Area and Environmental Baseline

A review of CNDDB (2002) revealed that legenere had been reported 57 times in California. Legenere has not been recorded from Sutter County or the Basin. However, it has been reported 20 times from Sacramento County. The closest reported Legenere occurrence to the Basin is approximately two miles away.

The Natomas Basin supports limited amounts of potential Legenere habitat. Potential legenere habitat of approximately 21.3 acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat in grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat in the Basin (K. Fuller, pers. comm.). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. Once again, this estimate greatly overestimates the amount of potential vernal pool habitat in the Basin, as most of the ponds and seasonally wet areas do not have the hydrology sufficient to support legenere. No potential legenere habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities.

Boggs Lake Hedge-Hyssop

Boggs Lake hedge-hyssop has no federal listing status. It was listed as endangered in California in 1978 (CDFG 1991) and is a candidate for listing in Oregon (Skinner and Pavlik 1994). It was included in the first California Native Plant Society list of rare and endangered plants (Powell 1974) and is now on List 1B (Tibor 2001). The U.S. Forest Service formerly considered Boggs Lake hedge-hyssop to be "sensitive" but has reclassified it as a "special interest plant" because it is more abundant than previously thought (Corbin in litt. 2000). The U.S. Bureau of Land Management classifies Boggs Lake hedge-hyssop as a "special status" species (Corbin *et al*. 1994).

Description

Boggs Lake hedge-hyssop is a an erect annual with hollow stems two to ten cm (0.8 to 3.9 in.) tall. The stems are mostly hairless, except for a few glandular hairs in the inflorescence. The leaves are opposite and have entire margins. Leaves near the base of the stem are 1 to 2 cm (0.4 to 0.8 in.) long and lance-shaped, but the leaves become shorter, wider, and blunt-tipped farther up on the stem. The 6 to 8 mm (0.23 to 0.31 in.) long flowers are borne singly in the upper leaf axils. Each corolla has two lips; the tube and upper lip are yellow, whereas the lower lip is white. However, the flowers appear yellow from a distance. The calyx is 4 to 6 mm (0.16 to 0.24 in.) long and has five sepals of differing lengths and shapes, giving rise to the specific epithet, heterosepala (meaning different sepals). The upper three sepals are united for approximately one-third of their length; the center sepal is longer than the others. The two lower sepals are separate and have notched tips, in contrast to the blunt tips of the upper sepals. The fruit of Boggs Lake

hedge-hyssop is a small, dry, pear-shaped capsule that is approximately the same length as the calyx. The tiny seeds are oblong and have narrow lengthwise ridges (Mason and Bacigalupi 1954, Mason 1957, Wetherwax 1993).

Boggs Lake hedge-hyssop is most similar to bractless hedge-hyssop (*G. ebracteata*). However, in bractless hedge-hyssop, the sepals are longer, pointed, and are separate almost all the way to their bases; all five corolla lobes are white; and the seeds have both lengthwise and crosswise ridges. The other California species, common American hedge-hyssop (*G. neglecta*), has bracts below the calyx, purplish corolla lobes, and a corolla at least twice as long as the calyx (Mason 1957, Wetherwax 1993).

Historical and Current Range

Boggs Lake hedge-hyssop was first collected in Lake County in 1923. The exact collection site is uncertain, but probably was Boggs Lake, where the species also was collected in 1929 and 1953 (Mason and Bacigalupi 1954). Another site was found in Madera County in 1961, then one in Sacramento County in 1977 (CNDDB 2000). During the 1980's, 20 additional occurrences were discovered in California, plus one in Lake County, Oregon (CDFG 1987). These additional California occurrences included nine in Shasta County; three each in Fresno, Placer, and Sacramento counties; and one each in Lake and Modoc counties (CNDDB 2000). Thus, the historical range included the Lake-Napa, Modoc Plateau, Southeastern Sacramento Valley, and Southern Sierra Foothills vernal pool regions (Keeler-Wolf *et al*. 1998).

Currently, Boggs Lake hedge-hyssop is known from 86 extant occurrences in California (CNDDB 2002) plus one in Oregon. Only one of the historical occurrences is believed to have been extirpated; it was in Sacramento County. In addition to the four vernal pool regions where it was known historically, Boggs Lake hedge-hyssop is now known from the Northeastern and Northwestern Sacramento Valley and the Solano-Colusa vernal pool regions (Keeler-Wolf *et al*. 1998). Additional counties of occurrence are Merced, San Joaquin, Solano, and Tehama (CNDDB 2000, Witham in litt. 2000).

Reproductive Ecology and Demography

Most of the life history information regarding Boggs Lake hedge-hyssop comes from an intensive study of the Oregon population by Kaye *et al*. (1990). California plants are morphologically similar to those in Oregon and grow in similar habitats; therefore, the life history of Boggs Lake hedge-hyssop is presumed to be similar in the two states.

The seeds of Boggs Lake hedge-hyssop most likely germinate in response to autumn or winter rains (Kaye *et al*. 1990, Corbin *et al*. 1994). By the time the water recedes the plants already are in bud or in flower; flowering can begin when as much as 5 cm (2.0 in.) of water remains (Kaye *et al*. 1990, Corbin *et al*. 1994). Throughout the range of the species flowers are open between April and August, with those at the highest elevations flowering later (Corbin *et al*. 1994). Each plant typically produces only one or two flowers (Kaye *et al*. 1990, Corbin *et al*. 1994), which mature into fruits within one to two weeks after flowering begins. The plants disappear quickly after seed-set (Corbin *et al*. 1994).

Kaye *et al*. (1990) determined that Boggs Lake hedge-hyssop is self-compatible and does not require insects for pollination. During their one-season study in Oregon, plants set equal amounts of seed whether or not insects were excluded. Moreover, insects were not observed visiting the flowers in natural settings (Kaye *et al*. 1990). The Oregon population averaged approximately 150 seeds per fruit, but the number of fruits per plant was not reported. The fruits showed no insect damage (Kaye *et al*. 1990). Seed dispersal agents are not known, and seed longevity in the soil has not been tested. However, seeds in one population on the Lassen National Forest (Shasta County) apparently remained dormant for three years, which was the interval between observations of growing plants (Corbin *et al*. 1994).

California populations of Boggs Lake hedge-hyssop range in size from only a few individuals to over one million (CNDDB 2000). As observed with other vernal pool annuals, population numbers fluctuate greatly from year to year (Corbin *et al*. 1994). The Boggs Lake population declined from 1,000 individuals in 1981 to zero in 1989 and remained at zero (Serpa 1993, CNDDB 2000) until 1997, when five plants were found (R. Bittman personal communication). The plants were widely scattered at Boggs Lake historically, with individuals growing isolated from each other (Mason and Bacigalupi 1954). At the one Vina Plains occurrence, the density of Boggs Lake hedge-hyssop was 67.4 plants per square meter (6.3 per square foot) in 1995 (Alexander and Schlising 1997).

Habitat and Community Associations

Boggs Lake hedge-hyssop occurs in vernal pools and in marshy areas on the margins of reservoirs and lakes, as well as in man-made habitats such as borrow pits and cattle ponds (Kaye *et al*. 1990, Corbin *et al*. 1994, CNDDB 2000). It has been found in several types of vernal pools, including Northern Basalt Flow, Northern Claypan, Northern Hardpan, Northern Volcanic Ashflow, and Northern Volcanic Mudflow (Sawyer and Keeler-Wolf 1995). Occupied wetlands are amongst annual grassland, oak woodland, juniper (*Juniperus* spp.) woodland, or conifer forest (CDFG 1987, Kaye *et al*. 1990, Corbin *et al*. 1994, CNDDB 2000).

Although Boggs Lake hedge-hyssop most often occurs on the margins of lakes and pools where water does not become too deep (Corbin *et al*. 1994), it also has been found in the beds of deeper vernal pools (CNDDB 2000). Clay is the most frequently encountered soil underlying occupied habitats, although loam and loamy sand also have been noted. Most sites are underlain by an impermeable layer (Corbin *et al*. 1994, CNDDB 2000). Kaye *et al.* (1990) noted that in juniper woodlands, Boggs Lake hedge-hyssop occurred on acidic soils with a pH of approximately 5. Some northern California sites are on slightly acidic soils, but soil pH has not been tested in other areas (Corbin *et al*. 1994). Known Boggs Lake hedge-hyssop sites in California range in elevation from 8 m (25 ft.) in Solano County to at least 1,576 m (5,170 ft.) in Modoc County (CNDDB 2000, Corbin in litt. 2000). A reported occurrence of Boggs Lake hedge-hyssop at North Emerson Lake Modoc County is at 2,400 m (7,900 ft.) in elevation (CNDDB 2000), but several species experts have revisited the site and found only bractless hedge-hyssop (Corbin in litt. 2000, Schoolcraft in litt. 2000). The elevation of the Lake County, Oregon, occurrence is 1,634 m (5340 ft.) (Kaye *et al*. 1990).

The most frequent associate of Boggs Lake hedge-hyssop is bractless hedge-hyssop (CNDDB 2000); the latter may form dense colonies containing only a few individuals of Boggs Lake hedge-hyssop (Mason and Bacigalupi 1954). Other typical associates, in order of frequency, are

vernal pool popcorn flower, two-horned downingia (*Downingia bicornuta*), slender Orcutt grass, and pale spikerush (CNDDB 2000, Corbin in litt. 2000).

Reasons for Decline and Threats to Survival

Habitat conversion for housing was responsible for the extirpation of one Boggs Lake hedge-hyssop population in Sacramento County (CNDDB 2000). Cattle trampling destroyed many immature plants at the Oregon occurrence (Kaye *et al*. 1990). Four occurrences have been disturbed but not extirpated by hydrological alterations such as excavation and damming, and another three by surface disturbances such as discing and grading (CNDDB 2000).

Urban growth through residential development, shopping center construction, and landfill expansion threatens seven of the populations in Placer and Sacramento counties (CNDDB 2000). Competition from medusahead (*Taeniatherum caput-medusae*) potentially threatens the species at five sites on the Modoc Plateau (Corbin *et al*. 1994). Nine of the extant occurrences contain fewer than 100 individuals at their maximum, and several are undergoing rapid declines (CNDDB 2000). These populations are sufficiently small that they are in danger of extirpation from chance events (Menges 1991).

Livestock grazing may or may not pose a threat to the survival of Boggs Lake hedge-hyssop. Although 48 California occurrences are subject to grazing by cattle, sheep, horses, or feral pigs (Corbin *et al*. 1994, CNDDB 2000, Corbin in litt. 2000), only 6 of those were reported to have heavy grazing or severe trampling (CNDDB 2000). Trampling and herbivory can be detrimental if they occur before seed set or if use is concentrated in a small area. However, moderate grazing is believed to be a compatible use if it occurs after Boggs Lake hedge-hyssop sets seed (Mason and Bacigalupi 1954, CDFG 1987). Directed research is necessary to establish appropriate use levels and seasons. The 47 occurrences administered by the U.S. Forest Service and the U.S. Bureau of Land Management potentially are subject to disturbance or destruction from livestock grazing and trampling, activities associated with logging, assorted recreational uses, hydrological alterations, road construction, fire suppression, weed competition, and herbicide drift (Corbin *et al*. 1994, California Natural Diversity Data Base 2000). However, management guidelines proposed by the agencies (Corbin *et al*. 1994) would mitigate such disturbances.

Status with Respect to Recovery

Twelve (14 percent) of the known occurrences of Boggs Lake hedge-hyssop are in nature reserves. Seven of those are on ecological reserves operated by CDFG, including four at Dales Lake in Tehama County, two at Thomes Creek in Tehama County, and one at Big Table Mountain in Fresno County. Nature reserves owned by private conservation organizations support another five occurrences, including two at Big Table Mountain Preserve in Fresno County (one of which is partially on federal land) and one each at Boggs Lake Preserve in Lake County, Vina Plains Preserve in Tehama County, and Jepson Prairie Preserve in Solano County. When The Nature Conservancy managed the Boggs Lake Preserve, they erected fences around colonies of Boggs Lake hedge-hyssop to keep out horses and deer (Serpa 1993). Volunteers conduct annual monitoring and searches for Boggs Lake hedge-hyssop and other rare plants at the Boggs Lake, Jepson Prairie, and Vina Plains preserves (Baldwin and Baldwin 1991, California Natural Diversity Data Base 2000).

Forty-seven (57 percent) of Boggs Lake hedge-hyssop occurrences are on federal land, which does not necessarily mean that they are protected from disturbance. Among the occurrences on federal land, 32 are on the Lassen and Modoc National Forests in Lassen, Modoc, and Shasta counties. Two of these are in areas with special designations, the Murken Botanical Special Interest Area and the South Warner Wilderness, where many uses are restricted (Corbin *et al*. 1994). Another 15 occurrences are at least partially on lands administered by the U.S. Bureau of Land Management in five different resource areas. These include six occurrences in Tehama County, five in Shasta County, two in Fresno County (one of which is partially on a private nature reserve), and one each in Lassen County, California, and Lake County, Oregon (Kaye *et al*. 1990, Corbin *et al*. 1994, California Natural Diversity Data Base 2000, Corbin in litt. 2000). Four of the occurrences on U.S. Bureau of Land Management property are in wilderness study areas (Corbin *et al*. 1994) and may be afforded additional protection if Congress designates those areas as official wilderness.

The U.S. Forest Service and the U.S. Bureau of Land Management developed a formal conservation strategy for Boggs Lake hedge-hyssop (Corbin *et al*. 1994) on lands they administer in northeastern California. Their goal was to protect 90 percent of the plants and sites from direct disturbance and hydrological alterations over a ten-year period. Additional conservation measures identified in the plan were comparisons of grazed and control areas, monitoring, surveys, and acquisition through land exchanges. However, due to funding priorities and the reclassification from "sensitive" status, intensive monitoring has been discontinued (Corbin in litt. 2000). The agencies have fenced several sites in northeastern California (Corbin *et al*. 1994, Corbin in litt. 2000) and in Fresno County (CDFG 1991, Franklin in litt. 1993) to prevent cattle from trampling Boggs Lake hedge-hyssop. Boggs Lake hedge-hyssop also may benefit from a grazing-management experiment being conducted at Big Table Mountain in Fresno County.

Status within the Action Area and Environmental Baseline

A review of CNDDB (2002) revealed that Boggs Lake hedge-hyssop had been reported 86 times in California. Boggs Lake hedge-hyssop has not been recorded from Sutter County, Area or the Basin. However, it has been reported eleven times from Sacramento County. The closest reported Boggs Lake hedge-hyssop occurrence to the Basin is approximately three miles away. However, that occurrence is presumed extirpated; the site has been developed). The next closest reported occurrence is from Sacramento County, approximately 12 miles from the Basin.

The Natomas Basin supports limited amounts of potential Boggs Lake hedge-hyssop habitat. Potential Boggs Lake hedge-hyssop habitat of approximately 21.3 wetted acres occurs in the vernal pools on the east side of the Basin, in 886 acres of grasslands primarily north of Del Paso Road. This estimate of vernal pool acreage is based upon assessments of the amount of vernal pool habitat in grasslands in Sacramento County and probably greatly overestimates the actual amount of vernal pool habitat in the Basin (K. Fuller, pers. comm.). Additional potential habitat occurs in 96 acres of other ponds and seasonally wet areas in the Basin. Once again, this estimate greatly overestimates the amount of potential vernal pool habitat in the Basin, as most of the ponds and seasonally wet areas do not have the hydrology sufficient to support vernal pool plants. No potential Boggs Lake hedge-hyssop habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities.

Sanford's Arrowhead

The Service considers Sanford's arrowhead a Species of Concern and the California Native Plant Society includes it on List 1B (Tibor 2001). The State has not designated the species any special status.

Description, Reproductive Ecology

Sanford's arrowhead is a perennial herbaceous plant belonging to the water-plantain family (Alismataceae). It is one of five species of arrowhead and is endemic to California. Sanford's arrowhead plants are immersed aquatic plants that grow from underground tubers or heavy rhizomes. When mature, three-sided, erect, lance-shaped leaves develop to a height of 30.5 to 99 cm (12 to 39 in.) (Mason 1957). White flowers occur in several small whorls and appear from May through October (Tibor 2001). The lower flowers are female, occur in a group of three at a node and rarely have functional stamens. The upper flowers are usually male, recurved, and subtended by a triangular bract. Seedling establishment is rarely observed, as this species normally reproduces asexually from tubers.

Historic and Current Range, Habitat Types

Sanford's arrowhead was historically found throughout California, from Tehama and Shasta County in the north to Ventura and Orange County in the south. It is now extirpated from southern California and is rare throughout the rest of its range. Sanford's arrowhead is currently found from Shasta to Kern County (Tibor 2001).

Sanford's arrowhead occurs in slow, shallow assorted freshwater habitats, such as marshes and swamps in the Central Valley. Many populations have been lost to urban development and conversion to agriculture (Tibor 2001). No information regarding ecological niche requirements, genetics, pollinators, competition with other aquatic plants, or potential transplant site suitability criteria is available.

Reasons for Decline and Threats to Survival

Populations of Sanford's arrowhead are variously threatened by application of herbicides, competition from non-native plants, urban development, foot traffic and trampling, improper livestock grazing, surface water diversion and channel alteration, and illegal dumping (CNDDB 2001, Tibor 2001).

Environmental Baseline and Status within the Action Area

In 1980, a status review was conducted of the 36 historical sites in the Central Valley containing Sanford's arrowhead. Only five extant populations were found and 31 populations were determined to be extirpated due to habitat losses from urban development or agricultural practices. This review prompted future additional searches for the species. Currently, Sanford's arrowhead is known from 50 populations in Butte, Del Norte, Fresno, Kern, Madera, Merced, Sacramento, San Joaquin, and Tehama counties. The species is extirpated from Orange and Ventura counties. Sanford's arrowhead is known from two populations in San Joaquin County, one last seen in 1994 and the other last seen in 1940. The location of the population found in

1940 was revisited in 1980 but no plants were found. The single relocated population of Sanford's arrowhead covers an estimated area in excess of 46.5 m^2 (500 $ft.^2$) within a 5 acre-area of private land. Although occurring along the shoreline of an eroding island 1.5 m (5 ft.) above sea level, the extant population is considered to be in excellent condition and the condition of the other one is unknown. No status or trend information is available for any population of Sanford's arrowhead (CNDDB 2001).

A review of CNDDB (2002) revealed that Sanford's arrowhead had been reported 50 times in California. It has not been recorded from Sutter County or the Basin. However, it has been reported 27 times from Sacramento County; one record is less than one mile from the Basin. Several records are from along the American River within the City of Sacramento's City Limits.

Habitat classes identified in the EIR that may support Sanford's arrowhead in the Basin include ponds and seasonally wet areas (96 acres) and canals (1,778 acres)(Table 15). Of the total ponds and seasonally wet areas, seven acres are in the City's proposed Permit Area, four acres are in MAP's Permit Area, and ten acres are in Sutter's Permit Area. Of the total canals, 117 acres are in the City's proposed Permit Area, 72 acres are in MAP's Permit Area, and 215 acres are in Sutter's Permit Area.

Delta Tule Pea

Species description and life history

Delta tule pea is perennial herbaceous vine-like plant in the pea family (Fabaceae). Delta tule pea plants are entirely smooth (lacking hairs) and generally robust. Semi erect to prostrate stems arise from underground rootstocks. The stems have a flattened appearance due to the broad wings along the margins of the stems. Tangled masses of stems can grow as a group from 1.0-2.5 m (39-98 in.) tall. The compound leaves are composed of ten to 14 lance-like to semi-elliptical leaflets. Individual plants are difficult to distinguish from one another when growing in masses. Clusters of ten to 20 crimson to rose-purple flowers appear in May and June. Delta tule pea occupies slough edges and marsh lands and can form colonies on the slightly drier uplands sites, typically 0-2.7 m (0-9 ft.), adjacent to freshwater and brackish marshes. Little to no information is available regarding reproductive strategy, ecological niche requirements, salt tolerance, competitors, pollinators, genetics or why the species occurs as many small patches even though apparent suitable habitat is available for expansion.

Reasons for decline

Agricultural land conversion, bank protection (rip-rap), improper livestock grazing, recreational uses, accelerated soils erosion, use of herbicides, and competition from non-natives variously threaten the species (CNDDB 2001).

Distribution, Status Within the Action Area, and Environmental Baseline

Delta tule pea is known from numerous locations in freshwater and brackish marshes throughout much of the San Francisco Bay and upper delta. Although the total population and occupied habitat of Delta tule pea has been reduced historically by extensive diking and draining of wetlands, the species is known from 119 populations in Contra Costa, Napa, Sacramento, San

Joaquin, and Solano counties (CNDDB 2002). Delta tule pea has also been reputed to occur in Alameda, Fresno, Marin, San Benito, San Mateo, Santa Clara, and Tulare counties. The material from these counties is not currently considered to be delta tule pea. The Service has no information of any populations from these seven counties. Over half of the known populations are in Solano County. Land ownership where populations of Delta tule pea occur are mostly unknown. CDFG owns four populations, California Department of Parks and Recreation owns two populations, the Department of Defense owns seven populations.

Delta tule pea is known from nine locations in southern Sacramento County (none north of Paintersville), all of them presumed to be extant (CNDDB 2002). The species is not known from Sutter County or the Basin. The closest occurrence to the Basin is in southern Sacramento County, approximately 20 miles south of the Basin. The species is not anticipated to be in the Basin (see effects analysis). However, if the species were found in the Basin, habitat classes identified in the EIR that may support the species in the Basin include ponds and seasonally wet areas (96 acres) and canals (1,778 acres)(Table 15). Of the total ponds and seasonally wet areas, seven acres are in the City's proposed Permit Area, four acres are in MAP's Permit Area, and ten acres are in Sutter's Permit Area. Of the total canals, 117 acres are in the City's proposed Permit Area, 72 acres are in MAP's Permit Area, and 215 acres are in Sutter's Permit Area.

Although CDFG, the California Department of Parks and Recreation, the Department of Defense, and the Service have populations of Delta tule pea under their ownerships and management, most populations occur on private lands and are unprotected. Little has been accomplished on the ground to promote the survival or enhance populations of Delta tule pea.

Effects of the Proposed Action

The effects of the issuance of the proposed ITPs to the City, Sutter, and Conservancy are analyzed below. The effects of the issuance of an ITP to MAP were analyzed in the January 16, 2002, biological opinion for that project (Service File # 1-1-01-F-0302). However, because the development authorized by the MAP project is considered part of the total 17,500 acres considered in the NBHCP, development authorized by MAP is considered in this effects analysis. Some differences may exist between the acreage totals used in this biological opinion as compared to the MAP biological opinion. However, after completing the effects analysis, these acreage differences do not change any determinations regarding jeopardy to any of the proposed Covered Species.

The NBHCP proposes to investigate the possible intentional (re)introduction of several Covered Species (i.e., California tiger salamander, delta tule pea, Sanford's arrowhead, Bogg's Lake hedge-hyssop, Sacramento Orcutt grass, slender Orcutt grass, Colusa grass, legenere) that are not currently found in the proposed action's action area. Reintroduction, as defined in the NBHCP, is not the intentional introduction of Covered Species into the Basin from outside the Basin. Instead, it refers to the relocation of Covered Species from either: (1) one Conservancy reserve to another; or (2) from an urban development site to a Conservancy reserve. The effects analyses also consider potential colonization of the Basin by several species (i.e., Sanford's arrowhead, Bogg's Lake hedge-hyssop, Sacramento Orcutt grass, slender Orcutt grass, Colusa grass, legenere). In these cases, the Service believes that the species are in close enough proximity to the Basin for dispersal to the Basin to occur. The Service does not believe that either the

California tiger salamander or the delta tule pea have the potential to occur in the Basin (discussed below).

Direct and Indirect Effects

Direct effects are the immediate effects of the proposed project on the species or its habitat and include the effects of interrelated actions and interdependent actions. Interrelated actions are those actions that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those actions that have no independent utility apart from the proposed action (50 CFR §402.02). Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur (50 CFR §402.02).

Threatened Vernal Pool Fairy Shrimp, Endangered Vernal Pool Tadpole Shrimp, and Midvalley Fairy Shrimp

Issuance of the proposed ITPs to the City, Sutter, and Conservancy will likely have minimal adverse effects on covered vernal pool crustaceans. Suitable potential habitat exists in the Permit Areas and the vernal pool fairy shrimp and vernal pool tadpole shrimp have been identified in the Basin. The midvalley fairy shrimp has not been identified in the proposed action's action area. However, the species has been identified approximately 11 miles southeast of the Basin in Sacramento County (and consequently, likely close enough for dispersal by birds) and has only recently been recognized as being a distinct species. So, the midvalley fairy shrimp may either already exist in the action area or may reasonably occur during the life of the proposed Permits. Furthermore, the midvalley fairy shrimp appears to inhabit pools that would not stay inundated long enough to support other vernal pool crustaceans, which may make the small vernal pools characteristic of the eastern Natomas Basin more likely to support the species. When present in the proposed Permit Areas, vernal pool crustaceans will likely be taken through the destruction of their habitat by development activities.

As stated in the species descriptions, the applicants did not quantify the amount of suitable vernal pool crustacean habitat in the Basin. The Basin is not known to contain substantial numbers of vernal pools and is not considered to be essential to recovery of the shrimp species by the Service; the proposed action's action area is not included in the Service's proposed vernal pool critical habitat rule (67 FR 59884). The vernal pool fairy shrimp and vernal pool tadpole shrimp have only been identified once in the Basin. The midvalley fairy shrimp has not been identified there. Based upon estimates derived from data gathered in Sacramento County (see Environmental Baseline for details), the Basin's 886 acres of grasslands would contain at the most 21.3 acres of vernal pools. Additionally, some portion of the Basin's 96 acres of ponds and seasonally wet areas may be suitable for vernal pool crustaceans. However, this estimate greatly overestimates the actual amount of vernal pool habitat in the Basin because grasslands in the Basin have a lower density of vernal pools than surrounding areas of Sacramento County (see Environmental Baseline) and most of the ponds and seasonal wetlands do not have appropriate hydrology to support covered vernal pool species. Of the total 886 acres of grasslands in the Basin, 427 are in the City's Permit Area and 134 are in Sutter's Permit Area (Table 14). This equates to 10.2 and 3.26 acres of vernal pools in the City and Sutter's Permit Areas, respectively. Of the total 96 acres of ponds and seasonally wet areas in the Basin, seven are in the City's Permit Area, four are in the MAP Permit Area, and ten are in Sutter's Permit Area (Table 14). Most of the potential

habitat that will be lost is located in the eastern portion of the City's Permit Area. As stated above and in the species descriptions, ponds and seasonally wet area acreages almost certainly vastly overestimate the actual potential vernal pool crustacean acreage in the Basin, as most of the ponds and seasonally wet areas do not have the appropriate hydrology to support vernal pool-associated species. Ponds and seasonally wet areas located in the MAP Permit Area do not have the appropriate hydrology to support vernal pool crustaceans and no other potential habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities (Service 2002).

Issuance of the proposed ITP to the Conservancy will likely have little effect on vernal pool crustaceans in the Natomas Basin. The majority of potential suitable habitat is located in the Land Use Agencies' Permit Areas and therefore, will not likely be acquired by the Conservancy. Any other potential suitable habitat in the Basin that the Conservancy may acquire would likely be considered potential foraging habitat for the Swainson's Hawk (because vernal pools are often found in upland areas such as grasslands) and therefore, most-likely not considered for conversion to other land uses such as managed marsh. The most likely forms of direct effects caused by the Conservancy would be management activities such as grazing and invasive plant control. However, if done properly, these activities should actually benefit vernal pool species.

The conservation measures proposed by the Permittees will minimize the effects of the proposed ITPs on vernal pool crustaceans. If potential vernal pool crustacean habitat is located within a proposed development site in the City's or Sutter's Permit Area, applicants will be required to survey for vernal pool crustaceans. If covered vernal pool crustaceans are observed, measures have been proposed to avoid, minimize and mitigate the impacts to the species. Applicants will be required to consult with the Service to determine how to best avoid and minimize the take of vernal pool crustaceans. Measures that will be applied as appropriate are: (1) preserving the occupied pool(s) and surrounding uplands on site; (2) temporary avoidance and relocation of resources; or (3) payment into a Service-approved conservation bank. Off-site mitigation lands require mitigation ratios different from those used for other Covered Species (i.e., 0.5:1 used for snake, hawk, etc...)(see Table 3). If the vernal pool tadpole shrimp is identified within a proposed development site, the Wildlife Agencies may require the developer to avoid and preserve the vernal pool resource. In these cases, the Conservancy would be tasked with managing the vernal pools. Management activities such as grazing and invasive plant control could likely affect vernal pool crustaceans. For example, disturbance to wetted vernal pools could affect water quality and therefore, any vernal pool crustaceans in the water. However, the SSMPs developed by the Conservancy would be designed to protect the species and their vernal pool habitat.

Indirect effects to Covered vernal pool crustaceans may occur if upland areas surrounding potential crustacean habitat is altered. For example, if the upland area adjacent to an occupied vernal pool is graded, the hydrology of the vernal pool could be changed, thereby affecting the crustaceans that inhabit it. However, given the limited extent of vernal pool habitat, the extremely limited documented occurrences of Covered vernal pool crustaceans in the permit areas and the take avoidance and minimization measures in the plan, the level of indirect impacts to the three vernal pool shrimp species will be low to non-existent.

Overall, the proposed action should have little effect on the vernal pool fairy shrimp, vernal pool tadpole shrimp, and midvalley fairy shrimp. The vernal pool fairy shrimp and vernal pool tadpole shrimp have only been identified once in the Basin and the midvalley fairy shrimp has not been identified there. There is very little suitable habitat and the Permittees have proposed

suitable measures that minimize mitigate the impacts. The Natomas Basin represents a small portion of the range of these three species and does not contain habitat essential for the recovery of the species. Because the proposed action is unlikely to have much, if any, effect on the species locally, it is not anticipated to affect either the Southeastern Sacramento Valley Vernal Pool Region (as defined by Keller-Wolf *et al.* 1998) or the species as a whole.

Threatened Giant Garter Snake

The giant garter snake is found throughout the proposed action's action area and suitable snake habitat exists in each of the proposed permit areas. Implementation of the proposed action will have direct effects on the snake throughout the project's action area by authorizing the City, Sutter, Conservancy, and MAPPOA[4] to participate in and authorize activities that directly result in the disturbance, wounding, and death of snakes throughout the Permit Areas and on the Conservancy's reserves. In addition, project-related activities will likely result in the take of the snake through the destruction of 8,512 acres of its habitat (Table 4). This is approximately one-third of the existing snake habitat in the Basin (total = 24,567 acres) and much of the habitat that will be affected is likely important to the snake in the Basin because it is used for movement, foraging, or important activities. Examples of possible direct effects on the snake caused by the proposed action include: (1) injury and death of snakes as a result of being crushed or entombed during construction activities; (2) injury and death of snakes as a result of vehicles striking snakes while accessing construction sites; (3) displacement of snakes from their habitat to areas of less suitable habitat; and (4) loss of prey items on or downstream of the project sites due to silting, fill, or spill of oil or other contaminants. However, there are numerous conservation measures incorporated into the plan that will minimize the effects of the proposed action on the snake such as construction work windows, surveys, and dewatering requirements.

Issuance of an ITP to the City of Sacramento. Issuance of the proposed ITP to the City will result in the loss of 1,094 acres of potential snake habitat (7 acres of ponds and seasonally wet areas, 970 acres of rice, and 117 acres of canals). Some snake habitat in geographic Areas 2 and 3 (southwest and east, respectively) (Figure 5), as described by Brode and Hansen (1992), will be lost. The most important snake habitat in Area 2 to be affected is Fisherman's Lake. Numerous CNDDB (2002) records are known from Fisherman's Lake and the City's Permit Area abuts the eastern side of the lake. The Conservancy has already acquired reserves (i.e., Natomas Farms and Cummings tracts) on the western side of Fisherman's Lake. Additionally, an as yet to be determined buffer between development in the City's Permit Area along the eastern side of the lake and the lake will likely minimize some of the effects of development near the lake. This buffer will: (1) minimize human intrusion into the habitat; (2) help minimize the number of domestic animals that prey upon snakes; (3) reduce the effects of run-off from urban development; and (4) reduce the disturbance of snakes from surrounding development. However, since it appears that the buffer will be a multiple-use area (i.e., accessible by local residents for walking, etc.), the effectiveness of the buffer for the snake will be less than that if the area were

[4]Reminder: Activities associated with the MAP project were analyzed and authorized under the biological opinion (Service File no. 1-1-01-F-0302) for that project. However, because the development authorized by the MAP project is included in the total 17,500 acres considered in the NBHCP, development authorized by MAP is considered in this effects analysis. Therefore, although the effects of the MAP project are re-analyzed here, activities associated with MAP have already been authorized.

isolated from all entry. By allowing the area to be accessed by the public, snakes will likely still be disturbed (although to a lesser extent) on an on-going basis. Although the buffer likely will provide some benefit, its ability to protect snakes will be limited because the area will not be solely managed for the benefit of snake or other Covered Species and the buffer may not include all of the snake's upland habitat. The majority of the City's effects on snake habitat in Area 3 occur in the northern portion of the City's Permit Area and will mostly result from the conversion of rice fields and their associated drainage/irrigation canals to development.

Development as a result of issuing the proposed ITP to the City will likely have little effect on the connectivity between Area 2 and Areas 1 and 3 (see Figure 5). With regard to movement between Areas 1 and 2 (northwest and southwest), although some delivery and drainage canals crossing under I-5 and SR-99/70 will likely be affected (especially east of Fisherman's Lake), other canals with the potential to provide movement corridors for the snake between the two geographic areas will remain after the issuance of the proposed ITP to the City. With regards to movement between geographic Areas 2 and 3 (southwest and east), it is unlikely that direct movement between these two geographic areas exists even today. The most probable movement corridor between Areas 2 and 3 would be the East Drainage Canal, which is surrounded by development. There is little or no upland buffer for the snake in this area and it is unlikely that the snake uses this canal as a movement corridor. Therefore, additional development along the East Drainage Canal will have little effect on the connectivity between Areas 2 and 3, as there is already considerable development along the canal that likely precludes its use by snakes. Other canals between geographic areas 2 and 3 probably provide for only very limited movement and dispersal between areas and may not represent a true movement corridor for the snake between geographic areas. It is unlikely that snakes would traverse through these types of culverts because of lack of suitable habitat within the culverts over several hundred feet or more. The culverts are extremely long, often do not have emergent vegetation near their entrances, and have little clearance (i.e., distance between the water's surface and the top of the culvert) during the snake's active season (May 1-October 1); the culverts lack the 2-3 foot clearance described by Brode and Hansen (1992) as typical for culverts that allow for snake passage. The use of larger culverts or free-standing bridges (best) that contain some of the minimum habitat characteristics of the snake (i.e., emergent vegetation up to the culvert entrances, burrows, prey) should provide improved passage opportunities for the snake.

Issuance of an ITP to Sutter County. Most of Sutter's proposed Permit Area is potential snake habitat and issuance of the ITP to Sutter will result in the loss of 5,802 acres of potential snake habitat (10 acres of ponds and seasonally wet areas, 5,577 acres of rice, and 215 acres of canals). As a result, development in Sutter's Permit Area will have a greater direct effect on the snake than development in the City's Permit Area. Some snake habitat in geographic Areas 1 and 3 (northwest and east, respectively) (see Figure 5), as described by Brode and Hansen (1992), will be lost. In Area 1, development will encompass portions of the North and East Drainage Canals and much of their extensive system of associated rice fields. In Area 3, development will occur in the northern portion of "Snake Alley," by encompassing the northern half of the North Main Canal and its system of associated rice fields and irrigation canals in the southeastern portion of the Permit Area. In addition, portions of the East Drainage Canal and the canal that parallels the east side of SR 99/70 between Elverta Road and the northern end of Snake Alley will also be lost. These areas were identified by Brode and Hansen (1992) as being important for the snake in the Basin. In addition, Wylie *et al.* (2002) described much of these areas as good snake habitat.

Sutter County drainage improvements associated with the proposed South Sutter County Specific Plan include expanding two existing drainage channels outside of the proposed Permit Area; the Montna Drain and the Natomas East Drain (East Drainage Canal) (Figure 2 and 3). These drainage improvements are included in the proposed action and widening these canals will likely directly affect the snakes. Both of these canals were described by Wylie *et al.* (2002) as good snake habitat and snakes have been observed in close proximity to where activities will occur. Based upon observations of Hansen and Brode (1993), it will take at least 3-5 years for the canals to be inhabited by snakes, if ever, following the improvements. The Montna Drain and the Natomas East Drain parallel the North Main Canal (commonly referred to as "Snake Alley") to the east and west, respectively, but will not affect Snake Alley outside of Sutter's Permit Area, except where the East Drainage Canal crosses Snake Alley at Elverta Road. It is anticipated that the proposed Sutter County drainage improvements will convert approximately 16.5 acres of existing agricultural land (rice) to drainage channel. This acreage is included in Sutter's total permitted acreage.

Issuance of the proposed ITP to Sutter will have no direct effect on the movement of snakes between Area 2 and Areas 1 and 3 because Area 2 is located completely within Sacramento County and is removed from Sutter County (Figure 5). However, issuance of the ITP to Sutter will affect the movement of snakes within Area 1 and may affect the movement of snakes between Areas 1 and 3. The Sutter Permit Area divides the available snake habitat in Area 1 in half. Some canals in Sutter's Permit Area that are likely used by the snake for connectivity in Area 1 will be lost. However, other opportunities for movement (e.g., canals) will be available if the proposed ITP is issued. For example, suitable movement corridors will remain in the Swainson's Hawk Zone west of Sutter's Permit Area. Sutter has committed in the NBHCP that the County will not allow development in the Swainson's Hawk Zone. In addition, Sutter will provide protective measures for the snake, such as fencing along the East and North Drainage Canals in its Permit Area to help ensure that snakes are able to move through these canals.

Some of the movement opportunities for snakes between Areas 1 and 3 will likely be affected by the issuance of the proposed ITP to Sutter because some canals will be closed or otherwise made unavailable to snakes. However, issuance of the proposed ITP to Sutter will not prevent movement of snakes between the two geographic areas because some connectivity corridors will remain. Protective measures (e.g., fencing and gaited access) have been provided for the North and East Drainage Canals where they traverse through Sutter's Permit Area and additional connectivity corridors will remain south of Sutter's Permit Area, in northern Sacramento County.

Issuance of an ITP to the Metro Air Park Property Owners Association. The effects of the issuance of an ITP to MAP were analyzed in the January 16, 2002, biological opinion for that project (Service File # 1-1-01-F-0302). Issuance of the ITP to MAPPOA will result in the loss of 1,617 acres of potential snake habitat (4 acres of ponds and seasonally wet areas, 1,541 acres of former rice lands, and 72 acres of canals). Some snake habitat in Area 1 (Figure 5), as described by Brode and Hansen (1992), will be lost. Numerous CNDDB (2002) snake records are known from the canals within and adjacent to MAP. Wylie *et al.* (2002) identified good snake habitat on site. Although MAP development will affect the snake and its habitat, extensive areas of snake habitat will remain in Area 1 following implementation of the proposed action.

As stated in the January 16, 2002, biological opinion for the MAP project, issuance of the MAP ITP will not affect the connectivity between Areas 1 and 2. Although the potential for Lone Tree

Canal to fully function as snake habitat will be reduced, it will remain suitable for foraging and passage to upstream and downstream areas. MAPPOA will install a snake road deterrent on Lone Tree Road and is required to maintain at least 12 inches of water in the canal between April and October. The connection between the Lone Tree Canal and the southwestern zone presently exists as a culvert beneath Interstate 5. This passage is currently ineffective, and will not be improved or worsened as a result of the activities within MAP or by the Conservancy. A snake-excluding fence will be constructed along Lone Tree Canal so that snake mortality in adjacent areas is not increased.

Issuance of an ITP to the Natomas Basin Conservancy. Issuance of an ITP to the Conservancy will result in both significant beneficial and only minor detrimental effects to the snake. Restoration, enhancement, maintenance, and farming activities that take place on Conservancy lands inhabited by snakes may directly result in the injury or death of snakes on those lands. As stated in the NBHCP, the Conservancy will be responsible for the preservation of 8,750 acres of land. Three quarters (6,562.5 acres) of the total acreage will be managed as either marsh (2,187.5 acres) or rice habitat (4,375 acres). All of the marsh and rice habitat is likely to be inhabited by snakes in the future. As there is very little existing marsh habitat in the project's action area, almost all of the marsh habitat managed by the Conservancy will be created through habitat enhancement and creation activities. Since most of the lands available for preservation are currently rice fields considered to be inhabited by snakes and the soils underlying rice fields are typically the best for managed marsh enhancement, habitat restoration and creation activities on these lands will likely result in injury and death of snakes. After habitat restoration and enhancement activities are completed, on-going maintenance activities will likely result in some injury to and death of snakes as a result of activities such as change/repair of water control structures and levee repairs. Management of Conservancy lands as rice fields will also likely result in the injury to and death of snakes. The remaining 2,187.5 acres of land that are not managed as marsh or rice fields will be managed as uplands. Although the uplands will be managed for the hawk and other upland-associated Covered Species, irrigation canals or ditches traversing the uplands and uplands within 61.0 m (200 ft.) of the aquatic resources could be inhabited by or used by snakes. Therefore, habitat restoration, enhancement, and maintenance activities in these upland areas could also result in the disturbance, harm, and death of these snakes.

The Conservancy plans to annually fallow 10 percent of its ricelands. Therefore, 10 percent (437.5 acres) of the total 4,375 acres of rice habitat will not be available to the snake each year. However, the actual loss of snake habitat due to rice field fallowing is likely to be much less than 400 acres per year because: (1) the extensive system of canals traversing the rice fields will still be available to the snake; and (2) the portions of fallowed rice fields within 61.0 m (200 ft.) of the snake's aquatic habitat will serve as upland habitat (although marginal) for the snake during the active season.

The adaptive management provisions of the NBHCP allow for the habitat management ratio to be increased from 25 percent marsh/ 50 percent rice/ 25 percent upland to up to 75 percent marsh/ 25 percent upland. If this occurs, then up to 6,562.5 acres of Conservancy lands may be restored, enhanced, and managed as marsh. However, since: (1) the ratio change is applied prospectively; (2) the Service has not issued a final recovery plan for the snake; and (3) the Conservancy has already acquired over 2,750 acres of land, the total amount of potential marsh habitat created would be much less than 6,562.5 acres.

Effects of the Proposed Conservation Measures on the Snake. The Land Use Agencies and the Conservancy have proposed a number of conservation measures that minimize the effects of the proposed action on the snake (see NBHCP, sections V.A.5. and V.B.4.). These measures are similar to those included in Appendix C of the Service's November 13, 1997, *Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California* (Snake Programmatic Consultation). Examples of conservation measures include, but are not limited to: (1) construction windows (i.e., limiting construction to periods when snakes are least likely to be injured or killed); (2) dewatering; (3) snake surveys to minimize the potential that snakes are located on the project site when construction activities occur; and (4) environmental awareness training. These measures will all minimize direct effects to snakes. Additional conservation measures include provisions such as protecting the North and East Drainage Canals with fencing to ensure some connectivity remains between and within the system of habitat reserves.

The most important conservation measure proposed in the NBHCP is the development of a system of habitat reserves. Once complete, the Conservancy will have acquired/restored/ enhanced a minimum of 2,187.5 acres of marsh and 4,375 acres of rice habitat to be managed for the snake and other Covered Species in perpetuity. Managed marsh is at least equivalent and likely greater in habitat quality to the canals, ponds, and seasonally wet areas that will be destroyed as a result of issuing the ITPs to the Land Use Agencies. As such, a total of 2,187.5 acres of marsh will created and preserved for the 425 acres of canals, ponds, and seasonally wetted areas lost. This is equivalent to approximately five acres of habitat preserved for every acre habitat lost. Much of the uncertainty regrading the ability of created marsh habitat no longer exists. Data gathered by BRD on the Conservancy's reserves and at the Colusa National Wildlife Refuge demonstrate that snakes use created marsh habitat (Wylie and Martin 2002, Wylie *et al.* 2003). In fact, Wylie *et al.* (2003) stated that the enhanced areas at the Colusa Nation Wildlife Refuge are occupied by a healthy population of snakes. Managed marsh habitat, because it is interlaced with meandering channels, has lots of edge habitat. The snake often travels and hunts along these edges. They are also directly adjacent to upland habitat, where they can go to escape from predators. Snake rice habitat lost as a result of issuing the ITPs to the Land Use Agencies will be preserved at rate of approximately one acre for every two acres of rice lost. Additional benefits will be gained for the snake on Conservancy rice lands through the use of wildlife-friendly practices such as minimizing mowing on rice checks, berms, and other water control structures.

In order to mitigate for the loss of 1,094 acres of snake habitat resulting from the issuance of the proposed ITP to the City, the Conservancy will provide (with fees acquired by the City) 3018.8 acres of habitat for the snake. Of that, 1006.2 acres will be managed marsh and 2012.5 acres will be rice fields. However, as stated above, 10 percent of the total rice field habitat will be fallowed annually; therefore, the total acreage of rice field habitat is actually 1811.2 acres. In order to mitigate for the loss of 5,802 acres of snake habitat resulting from the issuance of the proposed ITP to Sutter, the Conservancy will provide (with fees acquired by Sutter) 2800.1 acres of snake habitat for the snake. Of that, 933.4 acres will be managed marsh and 1866.8 acres will be rice fields. However, as stated above, 10 percent of the total rice field habitat will be fallowed annually; therefore, the total acreage of rice field habitat is actually 1680.1 acres. In order to mitigate for the loss of 1,617 acres of snake habitat resulting from the issuance of the proposed ITP to MAPPOA, the Conservancy will provide (with fees acquired by MAPPOA) 743.6 acres of

snake habitat for the snake. Of that, 247.9 acres will be managed marsh and 743.6 acres will be rice fields. However, as stated above, 10 percent of the total rice field habitat will be fallowed annually; therefore, the total acreage of rice field habitat is actually 669.3 acres.

After implementation of the proposed action, the Conservancy will have acquired/restored/ enhanced a minimum of 2,187.5 acres of marsh and 4,375 acres of rice habitat to be managed for the snake and other Covered Species in perpetuity. Although this amount is less than that being impacted by the proposed action, the NBHCP adequately protects the snake because the effective mitigation ratio is greater than 0.5:1. Managed marsh habitat on the Conservancy's reserves is more valuable to the snake than the existing habitat in the Basin because: (1) the habitat will be protected in perpetuity; (2) the habitat is monitored and actively managed for the benefit of the snake and other Covered Species; (3) the habitat will not be subject to continuos disturbance caused by farming or canal maintenance activities; (4) the habitat will be available for the snake year-round whereas the Basin's rice habitat is only available during a portion of the year; (5) the habitat will not be periodically made unavailable to the snake as occurs with canal maintenance activities; and (6) the habitat will be relatively free of human intrusion. In short, managed marsh preserves will provide high-quality habitat that is not subject to most of the impacts that routinely adversely affect the snake and its existing habitat throughout the rest of the Basin. With regard to the Conservancy's rice reserves, Conservancy rice lands will be more advantageous for the snake because rice production practices will be more "snake-friendly." For example, the Conservancy will maintain rice checks, berms, and other water-control structures in as natural a state as practicable and maintain prey species (e.g., mosquito fish) in or near the rice fields. These rice fields will also be consistently available, regardless the market for water transfers, unlike non-Conservancy rice habitat in the Basin, which is available for water transfers.

Summary/Discussion of Direct Effects on the Snake. The proposed action is likely to directly affect the snake throughout much of the Basin. Some areas that have historically been known to be occupied by large numbers of snakes will be developed. In addition, some potential connectivity corridors between the Basin's three geographic areas will be compromised. However, after implementation of the proposed action, much of the potential snake habitat in the Basin will remain. Of over 24,000 acres of potential snake habitat in the Basin, over 16,000 acres will remain after implementation of the proposed action. These lands include areas in both Sutter and Sacramento County that are designated in land use plans as either agriculture or open space and are anticipated to be so in the future. Up to 6,500 acres of the remaining snake habitat in the Basin will be protected and enhanced as part of the Conservancy's system of reserves. Additionally, much of the habitat that has historically been and is currently known to be important for the snake will not be affected. For example, much of Snake Alley (the North Main Canal and its important surrounding matrix of irrigation/drainage canals and rice fields) will not be directly affected by the proposed action because it lies south of Sutter's proposed Permit Area in unincorporated Sacramento County. This area is designated as agricultural cropland and as discussed in the cumulative effects section (below), is not anticipated to change in the foreseeable future. Based upon the adopted land use plans for the area and the fact that much, if not all, of Snake Alley is located within the 100 year floodplain, Snake Alley is expected to remain in agricultural use and rice would be the most appropriate crop. Because rice farming is expected to persist, many of the irrigation canals are expected to persist. Because Based upon the historical literature (e.g., Brode and Hansen 1992), the observed density of snakes, and the amount, configuration, and quality of suitable snake habitat in the area (e.g., Wylie and Martin 2002; Wylie *et al.* 2002), Snake Alley appears to be important for the continuation of the snake in the

Basin. In another example, portions of the North Drainage Canal in the western Basin will not be affected because they are outside of Sutter's proposed Permit Area. Although development will get as close, or closer, than 61.0 m (200 ft.) to it, Fisherman's Lake, an important snake habitat area in Area 2, will be mostly protected. The Conservancy has already purchased lands on Fisherman's Lake's west bank (Figure 6) and the east bank will be partially protected from development. Lands in the northwestern corner of the Basin support snakes, will not be developed, and have been targeted by the Conservancy for some mitigation land acquisitions. Lastly, lands in northern Sacramento County between Snake Alley and the North Drainage Canal will not be developed because it is unincorporated land in Sacramento County which is outside the urban services boundary. These lands will allow movement between Snake Alley to the western and northwestern portions of the Basin.

Implementation of the proposed action will likely have some negative effects on connectivity. For example, development will surround the North and East Drainage Canals and other canals connecting the three geographic Areas will be lost. However, connectivity corridors will remain for the snake. Canals are required for flood control in the Basin and agriculture (which requires irrigation water) is anticipated to continue through the life of the Permits. The Land Use Agencies, through their adopted general plans, community plans, and specific plans, will promote compact urban development within limited portions of the Natomas Basin. Under the NBHCP, the Land Use Agencies are required to ensure connectivity (see NBHCP, Section IV.C.1.d.) and the Plan includes measures to help maintain connectivity. The Conservancy will consolidate reserve acquisitions during the 50-year life of the permits in order to build larger blocks of habitat reserve lands. Reducing the number of blocks reduces the number of connections to be maintained. Specific measures identified in the NBHCP to ensure viability of the reserve system include: (1) relocating reserve components; (2) MOAs; (3) easements; and (4)s outright purchases of land, which would be designed to ensure connectivity for the snake between Conservancy reserves. The NBHCP does not include the closure of canals as a Covered Activity and the Water Agencies have not applied for ITPs at this time. Therefore, in the event of a proposed canal closure, the Water Agency (or project sponsor for canal closure) would be required to comply with the Act.

The NBHCP requires that an annual assessment of connectivity within and between reserves be conducted. If an annual assessment determines that connectivity has been lost, it then must be reestablished. Otherwise, the Conservancy could have its permit suspended or revoked. Because the Conservancy, as the plan operator, acts on behalf of the Land Use Agencies, the agencies could also have their Permits suspended or revoked if connectivity is lost. Therefore, it is in the City's and Sutter's best interest to ensure connectivity for the snake in the Basin. The Final EIS/EIR provides detailed discussion regarding connectivity in the Basin.

Indirect Effects. Implementation of the proposed action is likely to have several indirect effects on the snake. Snakes displaced as a result of development activities could: (1) encounter intraspecific and interspecific competition in their new habitats; (2) be more susceptible to predation in their new, unfamiliar habitats; and (3) experience lower survivorship as they hunt in unfamiliar habitat. Development adjacent to snake habitat could: (1) result in decreased water quality in the snake's aquatic habitat through the introduction of pesticides, herbicides, petroleum products, heavy metals, polynuclear aromatic hydrocarbons, and other organic compound and nutrients in run-off; (2) introduce new snake predators (i.e., cats) to the snake's habitat; (3)

disrupt snake activities and behavior through noise and other disturbances; and (4) disturb the snake by increasing the number of snake-human interactions.

Perhaps the most important indirect effect potentially caused by the proposed action is the availability of irrigation/drainage canals for the snake. However, Natomas Mutual is a long-established privately held water company and as the Conservancy becomes a major land owner within the Basin, it will require substantial water deliveries that will assist Natomas Mutual with remaining an economically viable company. Additionally, substantial agricultural interests are anticipated to remain within the Natomas Basin throughout the life of the Permit(s). The NBHCP represents all reasonably foreseeable development in the Basin and except for some airport lands, adopted land use plans and policies designate the remaining areas of the Basin as either open space or agriculture. Natomas Mutual has provided irrigation water for over 80 years and there are no plans to discontinue service. As long as agricultural activities continue in the Basin, there will be a demand for Natomas Mutual's services. So, even if Natomas Mutual ceases to operate, there will likely be a demand for irrigation water, which would be met by some other provider. In addition to irrigation canals provided by Natomas Mutual, it is anticipated that drainage canals will remain throughout the life of the Permits. Figure 17 of the NBHCP identifies drainage channels within the Natomas Basin that are considered likely to be retained for flood control purposes for both existing agricultural uses and for Planned Development. Regardless of the type of uses within the Basin, whether agricultural or urban, major flood control channels are required to convey water through the Basin. These canals and their surrounding rice fields will continue to provide habitat and movement corridors for the snake.

Issuance of the proposed permits to the Permittees will provide the conditions necessary for the permanent maintenance of a stable, protected snake population in the Basin (and, consequently, for the continued viability of the snake in the Basin) for the following reasons: (1) the measures proposed by the City and Sutter, including pre-construction surveys and dewatering and fencing of important canals, will minimize the impacts to the snake; (2) the protection and enhancement/ restoration/creation 6,562.5 acres of higher quality managed marsh and rice reserves, and in particular, the creation of a minimum 2187.5 acres of managed marsh habitat in place of 425 acres of canals, ponds and other seasonally wetted areas that will be lost and that will result in an effective mitigation ratio of approximately 5 to 1 for this key snake habitat, will effectively mitigate the impacts resulting from the conversion of 8,512 acres (including MAP) of varying quality snake habitat to urban development; (3) essential connectivity among the Basin's three geographic areas will remain following project build-out; (4) after implementation of the proposed action, over 16,000 acres of snake habitat will remain, including many areas that are recognized as important to the viability of the snake in the Basin; and (5) the creation of year round, protected snake habitat that is specifically managed to benefit the snake will substantially reduce mortality sources such as farming activities (e.g., field preparation, harvest) and canal maintenance activities. The proposed action will not adversely affect snakes outside of the Natomas Basin. Therefore, because the proposed action will not affect the viability of the snake in the Basin or affect the snake outside the Basin, the viability of the American Basin population and the entire species will not be compromised.

Threatened Valley Elderberry Longhorn Beetle

Implementation of the proposed action will likely affect the beetle by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that result in direct effects

to any beetles inhabiting the Permit Areas or on the Conservancy's reserves. Although the beetle has not been observed in the Basin, it has been observed in close proximity to the Basin (i.e., across the Sacramento River from the Basin). Suitable beetle habitat is known to occur in the Basin and the Permittees have requested incidental take authorization in case beetles or their habitat is found in the Permit Areas. Take could be in the form of injury, or death of beetles. For example, beetles could be adversely affected if the elderberry shrub they inhabit is relocated. This is the most likely form of direct effects and would presumably injure or kill some beetles. The January 16, 2002, biological opinion that evaluated the potential effects of the proposed Metro Air Park project (Service File # 1-1-01-F-0302) found that the proposed action would not directly affect the beetle, as no elderberry shrubs were located on-site. However, suitable beetle habitat could grow in the MAP project site by time development occurs and therefore, incidental take coverage for direct effects to the beetle was granted.

The Conservancy's management and restoration activities may have a minor adverse effect on the beetle. Management activities may include mechanical treatment and removal of non-native shrubs and limited excavation to establish new plants. The Conservancy will avoid impacts to elderberry shrubs to the maximum extent practicable. However, it is reasonable to expect that in some instances, the Conservancy will have to conduct activities that affect the elderberry shrubs, and as a consequence, the beetles that inhabit them. For example, a berm on which an elderberry shrub is located could need repair. There may also be potential direct effects associated with the need to relocate shrubs that become established outside of riparian restoration areas, such as along irrigation ditches. However, because of the small number of elderberry shrubs in the Basin and Conservancy's goal to minimize impacts to the species, direct effects of the Conservancy's management activities on the beetle should be minimal.

As stated in the Environmental Baseline for the species, the amount of potential beetle habitat in the proposed action's action area has not been quantified. However, beetle habitat is more likely to be located in some habitat classes than others. Within the Basin, the habitat classes most likely inhabited by the beetle include oak groves, riparian, and tree groves. Of the total 98 acres of oak groves in the Basin, eight acres (City = 6, MAP = 2) will be lost (Table 13). Of the total 124 acres of riparian habitat in the Basin, 24 acres (City = 24) will be impacted. However, much of the 24 acres of affected riparian areas are located on the east side of Fisherman's Lake and will not be developed. Therefore, 24 acres overstates the actual amount of riparian habitat that will be lost. Of the total 106 acres of tree groves in the Basin, 33 acres (City = 10, MAP = 23) will be lost. It must be emphasized that: (1) loss of oak groves and riparian habitat overstates the amount of potential beetle habitat lost; (2) elderberry shrubs are likely located in some additional isolated areas of the Basin; and (3) there are no documented occurrences of the beetle in the basin.

The conservation measures proposed by the Land Use Agencies and the Conservancy will effectively minimize and mitigate the potential effects of the proposed action on the beetle. The Permittees will conduct surveys for the beetle and its habitat. When possible, Permittees will avoid beetle habitat. When this is not possible, shrubs will be transplanted during their dormant season (to minimize any potential adverse effects on the shrub and consequently, the beetle) and replacement seedlings will be planted. Beetles have observed emerging from shrubs after they were transplanted to conservation areas (B. Cordone, pers. comm. to Craig Aubrey, 2003) and beetles have been observed emerging from replacement seedlings in conservation areas (G. Sutter, pers. comm. to Craig Aubrey, 2003). The Land Use Agencies and Conservancy have

agreed to adhere to the Service's Beetle Guidelines, or any updated Guidelines, as they are updated in the future. This provision will help ensure that the NBHCP's beetle conservation strategy is consistent with the Service's most current conservation strategy for the species.

Indirect effects of the proposed action on the beetle should be minimal. The most likely potential indirect effect is the removal of elderberry shrubs with stems less than one inch diameter at ground level. When development activities occur, these shrubs will not be considered suitable beetle habitat (because their stems are not yet large enough) and will therefore, not be protected. Left alone, they would presumably grow to become suitable beetle habitat. Construction activities would preclude these shrubs from becoming suitable habitat for the beetle.

Overall, the effects of the proposed action on the beetle should be minimal. There are few elderberry shrubs in the Basin, limited areas where elderberry shrubs would be likely to occur, and the beetle has never been observed in the Basin. Impacts to the beetle are unlikely to occur on either a frequent or large-scale basis. The Permittees have proposed measures that minimize and mitigate the impacts such as requiring land owners/developers to mitigate according to the Service's Beetle Guidelines. Therefore, the proposed action is minimized and unlikely to affect the survival of the beetle in the Basin. Furthermore, because of the proposed action's minimal effects on the beetle and the Basin represents only a small portion of the beetle's current range, the proposed action is not likely to affect the survival or recovery of the species overall.

Threatened Colusa Grass, Threatened Slender Orcutt Grass, Endangered Sacramento Orcutt Grass, Legenere, and Boggs Lake Hedge-Hyssop

Issuance of the proposed ITP's to the City, Sutter and the Conservancy may adversely affect Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, and Boggs Lake hedge-hyssop. The species have been reported from the vicinity of the proposed action's action area and potential habitat may occur in the proposed action's action area. However, none of these species has been observed in the Basin and the potential habitat is likely not suitable for three of the species: Colusa grass, slender Orcutt grass, and Sacramento Orcutt grass. The three species are known to occur inhabit large vernal pools that remain inundated for long periods of time. The Basin's vernal pools are typically small and do not remain inundated for long periods of time. In addition, because of the very limited amount of vernal pool resources in the proposed action's action area, the proposed action is likely to have very little, if any, effect on the five vernal pool species. MAPPOA did not request coverage for the Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, or the Boggs Lake hedge-hyssop and it does not appear that suitable habitat for any of these species exists on the proposed MAP project site. Although four acres of ponds and seasonally wet areas exist on the proposed MAP project site, these wetlands do not appear to support vernal pool-associated species.

The most likely direct effect to Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, and Boggs Lake hedge-hyssop resulting from the Land Use Agencies' activities would be direct mortality or destruction of the seed bank as a result of development, should any plants be found to exist in the permit areas, as a result of development. For example, construction equipment may kill plants by crushing them when it runs over them. Seeds could be destroyed or rendered unable to germinate when seasonal wetland areas they occupy are partially or wholly filled.

As stated in the species descriptions, the actual amount of suitable vernal pool habitat in the Basin was not quantified. The Basin is not known to contain substantial numbers of vernal pools and is not considered essential to the species' recovery or included in the Service's proposed vernal pool critical habitat rule (67 **FR** 59884). Based upon estimates in southern Sacramento County, the Basin's 886 acres of grasslands would contain at the most 21.3 acres of vernal pools. Additionally, some portion of the Basin's 96 acres of ponds and seasonally wet areas may be suitable for vernal pool plants. However, this estimate greatly overestimates the actual amount of vernal pool habitat in the Basin because grasslands in the Basin have a lower density of vernal pools than surrounding areas of Sacramento County (see Environmental Baseline) and most of the ponds and seasonal wetlands do not have correct hydrology to support covered vernal pool species. Of the total 886 acres of grasslands in the Basin, 427 are in the City's Permit Area and 134 are in Sutter's Permit Area (Table 14). This equates to 10.2 and 3.26 acres of vernal pools in the City and Sutter's Permit Areas, respectively. Of the total 96 acres of ponds and seasonally wet areas in the Basin, seven are in the City's Permit Area, four are in the MAP Permit Area, and ten are in Sutter's Permit Area (Table 14). Most of the potential habitat that will be lost is located in the eastern portion of the City's Permit Area. As stated in the species descriptions, ponds and seasonally wet areas acreages almost certainly vastly overestimate the actual potential vernal pool acreage in the Basin, as most of the ponds and seasonally wet areas do not have the correct hydrology to support vernal pool-associated species. Ponds and seasonally wet areas located in the MAP Permit Area do not have the correct hydrology to support vernal pool plants and no other potential habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities (Service 2002).

Issuance of the proposed ITP to the Conservancy may result in the loss of Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, and Boggs Lake hedge-hyssop, should any of these species be found on reserve lands. Plants could be harmed or killed during reserve restoration or maintenance activities. For example, plants could be crushed by construction equipment creating habitat on the Conservancy's reserves or grazed by cattle used for invasive weed abatement. However, because the plants have not been observed in the Basin and there is very little, if any, suitable habitat in the Basin, the chance of the Conservancy impacting the species is very small.

Implementation of the proposed conservation measures will minimize the potential effects of the proposed action on the Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, and Boggs Lake hedge-hyssop. The Land Use Agencies have proposed to require developers to survey, using a Service-approved protocol, for vernal pool plants in potential habitat. If vernal pool plants are identified, developers will be required to avoid impacts or mitigate for any effects on the plants. Possible strategies include: (1) on-site avoidance and preservation of the vernal pool resource; (2) payment into a Service-approved conservation bank; or (3) relocation of vernal pool resources (another potential direct effect related to development).

Indirect effects to Covered vernal pool plants may occur if upland areas surrounding potential vernal pool plant habitat are altered. For example, if the upland area adjacent to an occupied vernal pool is graded, the hydrology (i.e., depth, frequency and length of inundation, etc.) of the vernal pool could be changed, thereby affecting the plants that inhabit it. However, the Land Use Agencies have proposed conservation measures that either avoid or minimize indirect effects to vernal pool species. For example, if either Sacramento Orcutt grass, slender Orcutt grass, or Colusa grass are identified on-site, the Wildlife Agencies may require the landowner/developer to

preserve the vernal pool resource. In other cases, the landowner/developer will be required to mitigate for the effects according to the Service's current vernal pool guidelines.

Overall, the proposed action should have little to no effect on the Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, and Boggs Lake hedge-hyssop. There is very little (if any) suitable habitat in the Basin and none of the species have been identified there. The plan contains avoidance, minimization, and mitigation measures to eliminate or offset any impacts to this species should any be discovered during pre-construction surveys required under the plan. The proposed action will not adversely affect the species outside the Basin. Therefore, the proposed action will not affect the viability of the Colusa grass, slender Orcutt grass, Sacramento Orcutt grass, legenere, and Boggs Lake hedge-hyssop in the vicinity of the Natomas Basin or as species.

Swainson's Hawk

The Swainson's hawk is a common inhabitant of the Natomas Basin. In 2001, active hawk nests were located in the City's, MAPPOA's, and Conservancy's proposed permit areas. Although no nests were located in Sutter's proposed permit area, nests were located close (< 1 mile) from the permit area. The overwhelming majority of the Basin's hawk nests are in mature trees situated either on the banks of or near the Sacramento River. Suitable hawk foraging habitat exists throughout the Basin in each of the proposed permit areas and is well within the known foraging range of the hawk. Implementation of the proposed action will likely affect the hawk throughout the action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that result in adverse effects to hawks through loss of habitat within the Permit Areas and on the Conservancy's reserves. Hawks will be disturbed through the removal of their nest trees and foraging habitat.

Effects to Nesting Habitat

The majority of the Basin's potential nesting habitat will not be directly affected by the issuance of the ITPs to the Permittees. Most known hawk nests and potential nest trees are located in unincorporated Sacramento County along the Sacramento River and outside of the proposed Permit Areas. Additional nest sites are located on lands within the City adjacent to the Sacramento River. These areas, which are located within the one mile-wide swath of land abutting the Sacramento River in the Basin known as the Swainson's hawk zone, constitute the core nesting habitat for the hawk within the Basin. With the exception of 252 acres previously approved for development by the City within the Swainson's hawk zone, ,the Permittees have committed to avoid development within this area. Following implementation of the proposed action, at least 263 of the Basin's total 328 acres (80.1 %) of potential nesting habitat will remain. However, it is likely that closer to 287 acres (87.5 %) of nesting habitat will remain, as the riparian habitat bordering Fisherman's Lake will not be removed.

Issuance of the proposed ITP to the City will likely result in effects on 40 acres of potential Swainson's nesting habitat (Table 5). Most of the potential nesting habitat is comprised of riparian areas (24 acres). Other nesting habitat types include oak groves (6 acres) and tree groves (10 acres). Much of the 24 acres of affected riparian areas is located on the east side of Fisherman's Lake and will not be developed. Although this habitat will not be destroyed, indirect effects are still likely (see below).

According to Figure 13 of the NBHCP, six Swainson's hawk nest trees are located in the City's proposed Permit Area (excluding the nests adjacent to Fisherman's Lake). A seventh tree was removed in 1998. Four of the six nests were inactive in 2002 (Estep 2002). At least two of these are in areas that have already been developed. In addition to the six nests that are located in the City's proposed Permit Area, a single nest is located just west of the City's proposed Permit Area, north of El Camino and west of I-80 (Estep 2002). This nest was active in 2002 and will likely be indirectly affected (described below) by the issuance of the proposed ITP to the City. Hawks could be also be disturbed by construction noise or daily activities once the City's Permit Area is developed.

Issuance of the proposed ITP to Sutter will not result in the direct loss of any potential nesting habitat (Table 5). Additionally, there are no Swainson's nests in Sutter's proposed Permit Area.

The effects of issuing the proposed ITP to the MAPPOA were analyzed in the January 16, 2002, biological opinion for that project (Service File # 1-1-01-F-0302). Issuance of the ITP to MAPPOA has or will result loss of 25 acres of potential hawk nesting habitat (tree groves = 23 acres, oak groves = 2 acres). A single hawk nest tree will be removed. This tree was active in 2001 (NBHCP 2002) and inactive in 2002 (Estep 2002). Another inactive nest is located on Powerline Road between the airport and MAP (Estep 2002). Sufficient information was not available to determine if the nest tree will be removed by the MAP project. However, at the very least, because of its proximity to MAP, hawks in the nest tree will likely be disturbed by construction activities or by daily activities once MAP is completed. A single active nest tree is also located directly south of the MAP Permit Area (Estep 2002) and will likely be directly affected by the issuance of the proposed ITP to MAPPOA. For example, hawks nesting in the tree could be disturbed by construction activities or disturbed as the site is used once it is developed. Hawks in nest trees in urban areas have been shown to have lower reproductive success than those in rural areas (England *et al.* 1995) (see indirect effects section below). To mitigate for the loss of the nest tree on the MAP site and other Swainson's hawk habitat, MAPPOA will secure 200 contiguous acres, in perpetuity, via fee title or conservation easement and turn the lands over to the Conservancy to manage for the benefit of Swainson's hawk nesting. The nest tree conservation lands will be secured entirely within the Natomas Basin in the Swainson's hawk one-mile zone along the Sacramento River, or in the eastern portion of the Natomas Basin, including, but not limited to, areas near the levees and Natomas East Main Drain. Acquisition will focus on sites that provide upland foraging habitat, have potential for additional acquisition of adjoining properties, and are surrounded by agricultural lands. The nest tree conservation lands will be planted with a minimum of fifteen trees. MAPPOA will provide funding sufficient for monitoring the success of replacement trees for a period of 3 years and plant additional replacement trees at the rate of one additional replacement tree for every replacement tree lost prior to the end of the 3 year monitoring period. Trees planted to replace trees lost, will be monitored for an additional 3 year period to ensure survival until the end of the monitoring period.

The NBHCP requires that the City and Sutter replace any nest trees directly impacted by the proposed action. Therefore, in order to mitigate for impacts to hawk nesting habitat (effects on four nest trees not located in existing development), the City has proposed to plant 60 trees (5 gallon size) at a ratio of 15:1 within 14 months of the issuance of the proposed Permit (see section V.A.5.b. of the NBHCP). Trees will be maintained, monitored, and as needed, replaced, in accordance with section V.A.5.b. of the NBHCP. Although the City has not yet provided

funding for planting the 60 nest trees, the Conservancy has planted potential nesting habitat on its Betts, Kismat, and Sliva, Bennet South preserves. Additional plantings are planned for Bennet North and Lucich South in 2003. Sutter does not propose to plant additional nest trees if the proposed ITP is approved, as no nest trees will be affected within their proposed Permit Area.

The conservation measures that the Land Use Agencies have proposed will mitigate the proposed action's impacts to nest trees. Very few documented nest trees will be directly impacted by the proposed action and there appears to be a surplus of Swainson's nest trees in the Basin. According to Estep (2002), only 43 of the Basin's 70 nest territories were active in 2002.[5] The NBHCP and associated EIR/EIS also document the amount of potential nesting habitat lost. Although it appears that approximately 20 percent of the Basin's total 328 acres of potential nesting habitat will be lost, in actuality, this value is closer to 13 percent.

Based upon Estep (2002), even if all six nest trees located in the City's Permit Area become unsuitable following issuance of the proposed ITPs, sufficient nest trees will remain for the Basin's hawks. In addition, replacement nest trees are being planted at a ratio of 15:1 to replace the four nest trees to be impacted by new development. This indicates that sufficient nesting habitat will be available for the hawk both in the short- and long-term. In addition, the Conservancy is already conducting nest tree plantings in its reserve system. Loss of nesting habitat is not a concern of implementing the NBHCP.

Effects to Foraging Habitat

In contrast to the small loss of Swainson's nesting habitat, issuance of the proposed ITPs will result in a larger loss of foraging habitat. Approximately 40 percent, or 9,188 acres, of the Basin's total 22,051 acres of potential foraging habitat will be lost as a result of issuing the proposed ITPs to the City, Sutter, and MAPPOA. However, while the amount of potential foraging habitat that will be lost is substantial, the location and quality of that existing habitat reduces the impacts of its loss on the hawk. Almost all of this habitat is considered moderate-quality habitat and, importantly, is not available for foraging during the majority of the hawk's nesting season. As discussed in the April 2003, Technical Addendum, the amount of usable foraging habitat available to the hawk in the Basin varies considerably during the hawk's time in the Basin. While available foraging habitat is abundant in some periods such as late summer or early fall, much less habitat is available in April, May, and July. Swainson's hawks lay eggs in April; young fledge in July. Therefore, much less foraging habitat is available during the hawk's nesting period. Based upon the results of Estep (1989) and Bechard (1982), this lack of available foraging habitat during the nesting period likely leads to larger foraging ranges. The overwhelming majority of foraging habitat lost to urban development is also greater than one mile (the distance from nest to foraging considered by CDFG [1994] to be of most importance to the hawk) from the majority of the Basin's Swainson's nest trees. Studies have shown that reproductive success decreases as the distance required to forage from the nest increases (Woodbridge 1991, England *et al.* 1997). The effects of the loss of foraging habitat on the hawk are lessened because plentiful foraging habitat west of the Sacramento River is currently, and in

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[5] Estep's (2002) data included nest trees on both sides of the waterways [i.e., Sacramento River, American River, Natomas East Main Drainage Canal and Natomas Cross Canal] surrounding the Natomas Basin.

the future will remain, available to and used by Swainsons' hawks nesting in the Basin (discussed below).

Issuance of the proposed ITP to the City will likely result in the loss of 6,925 acres (31.4 percent) of the Basin's total foraging habitat (Table 5). Of that total, 675 acres are considered high-quality habitat, 5,098 acres are considered moderate-quality habitat, and 1,152 acres are considered low-quality habitat. Issuance of the proposed ITP to Sutter will likely result in the loss of 1,860 acres (8.4 percent) of the Basin's total foraging habitat. Of that, eight acres are considered high-quality habitat and 1,852 acres are considered moderate-quality habitat. Issuance of the ITP to MAPPOA will likely result in the loss of 403 acres (1.8 percent) of the Basin's total foraging habitat. Of that 50 acres are considered high-quality habitat, 349 acres are considered moderate-quality habitat, and four acres are considered low-quality habitat. An additional 119 acres of potential foraging habitat will be affected by construction of off-site drainage, sewer, and roadway improvement related to the MAP project. In addition to reductions in potential Swainson's foraging habitat for the habitat types listed above, implementation of the proposed action will result in the loss of approximately 8,000 acres of rice. When fallowed or otherwise not flooded, rice fields provide potential marginal to moderate-quality foraging habitat for hawks. Therefore, issuance of the proposed ITPs to the Permittees will likely result in a further loss of rice foraging habitat.

Indirect Effects of Urban Development

In addition to the direct effects posed by the proposed ITPs, implementation of the proposed action will indirectly affect the hawk. The most likely indirect effect is a potential decrease in reproductive performance associated with development in proximity to nest trees. In these instances, nest trees would not be removed, but nearby foraging habitat would be converted to non-appropriate Swainson's foraging habitat types. For example, three nest trees located along Fisherman's Lake will not be removed as a result of the proposed action. However, they will be located in close proximity (250 ft. or less along the eastern edge of the lake) to urban development. Swainson's nesting success in developed areas has been shown to be reduced in comparison to rural areas (England *et al*. 1995). In another example, seven Swainson's hawk nest trees (3 active) are currently either located in or directly adjacent to existing development. Issuance of the proposed ITP will allow further development near these nest trees, thereby decreasing the amount of available foraging habitat nearby. The increased energy required to forage over greater distances could lead to a decrease in reproductive performance, as described in England *et al.* (1995). For the same reasons discussed above, Swainson's hawks using two nest trees adjacent to MAP will likely have reduced reproductive success in comparison to hawks nesting in rural areas.

Effect of Issuing the Proposed ITP to the Conservancy

Issuance of the proposed ITP to the Conservancy will have negligible negative effects on the hawk. Nesting and foraging hawks could be disturbed as a result of the Conservancy's reserve restoration and management activities. However, these effects are temporary, and should be minimal since the Conservancy will manage the mitigation lands for the benefit of the Covered Species. Perhaps the largest potential negative effect of the Conservancy's activities on the hawk could be the destruction of hawk foraging habitat during the construction of wetland reserves. However, this is unlikely, given the fact that lands suitable for wetland restoration will most

likely be either rice or existing wetlands. The creation of wetlands from rice may remove some marginal hawk foraging habitat, but of the potential foraging habitat types affected in the Basin, rice is least beneficial to the hawk (Estep 1989). The upland component of the managed marsh reserves will continue to provide suitable foraging and nesting habitat for the hawk.

The main positive benefit of the issuance of the proposed ITP to the Conservancy will be the development of the Conservancy's reserve system. After implementation of the proposed action, 2,187.5 acres of high-quality upland foraging habitat will be created and/or preserved and protected in perpetuity for the hawk. As described in the NBHCP, the upland foraging habitat will be managed for the hawk and will include both nesting and foraging habitat. Proposed acquisition criteria will help ensure that these upland areas are in close proximity to nesting hawks.

In addition to the Conservancy's upland reserves, the hawk will benefit somewhat from the Conservancy's managed marsh reserves and rice habitat. Rice fields will provide foraging habitat after they have been drained and before they are filled. The Conservancy will also fallow ten percent of its rice fields annually, which will provide up to 437.5 acres of fallow rice habitat in any given year. Managed marsh reserves contain between 20 and 30 percent uplands, which will provide between 437.5 and 656.25 acres of additional upland habitat. Rice fields and managed marsh uplands will likely be less beneficial for the hawk than habitats in upland reserves because upland reserves will be managed to maximize the amount of available hawk prey.

In order to mitigate for its effects to 6,925 acres of mostly moderate-quality foraging habitat, the City will provide 1,509.3 acres of potential foraging habitat. Of that, 1006.2 acres will be high-quality foraging habitat on the Conservancy's upland reserves; 201.2 acres will be moderate-quality habitat provided in the form of fallowed rice habitat on the Conservancy's rice lands; and up to 301.9 acres of moderate-quality uplands will be provided in the upland component of the managed marsh reserves. In order to mitigate for its effects to 1,860 acres of Swainson's mostly moderate-quality foraging habitat, Sutter will provide up to 1400.1 acres of foraging habitat. Of that, 933.4 acres will be potential high-quality foraging habitat on the Conservancy's upland reserves; 186.7 acres will be provided in the form of moderate-quality fallowed rice habitat on the Conservancy's rice lands; and up to 280.0 acres of moderate-quality uplands will be provided in the upland component of the managed marsh reserves. In order to mitigate for its effects to 502 acres (403 acres from project footprint and 199 acres from off-site improvements) of mostly moderate-quality Swainson's foraging habitat, MAPPOA will provide up to 371.9 acres of potential foraging habitat. Of that, 247.9 acres will be high-quality foraging habitat on the Conservancy's upland reserves; 49.6 acres will be provided in the form of moderate-quality fallowed rice habitat on the Conservancy's rice lands; and up to 74.4 acres of moderate-quality uplands will be provided in the upland component of the managed marsh reserves. An additional 200 acres of high-quality foraging habitat will be provided by MAPPOA to mitigate for the loss of a Swainson's hawk nest tree and surrounding foraging habitat.

When the potential effects of the proposed action on potential foraging habitat and proposed mitigation are considered together, the proposed action may cause a net decrease of between 7,000.5 and 9,188 acres of potential foraging habitat in the Basin. The exact amount will be determined by the existing use of upland reserves at the time of acquisition. For example, if a reserve is acquired that already provides suitable habitat for the hawk, no new habitat is created. If, on the other hand, a reserve is acquired that does not provide habitat for the hawk and is

restored/managed so that it provides habitat for the hawk, then new habitat is created. Therefore, if only existing upland habitat is preserved, the net loss will be 9,188 acres. In contrast, if all preserved upland habitat is created following acquisition by the Conservancy, there will be a net decrease of 7,000.5 acres of foraging habitat.

Benefits obtained through the creation of the Conservancy's upland reserves are actually greater than those described in the preceding paragraph. The majority of the Basin's existing Swainson's foraging habitat (e.g., sugar beets, tomatoes, melons, etc.) is moderate in quality and is not available throughout the hawk's nesting season. In contrast, the Conservancy's upland reserves will be high-quality habitat that is available throughout the time hawks are in the Natomas area. Because of the priorities established for the acquisition of upland reserves, there will be an increase in the amount of high-quality foraging habitat in the vicinity of the majority of the Basin's hawk nesting territories which will be available to the hawks during the nesting season, which should result in a decrease in the distance required for hawks to forage and a potential increase in reproductive success.

Even though there will be a net loss of available foraging habitat in the basin, the Conservancy's reserve system will have several advantages over existing foraging opportunities in the Basin. These include: (1) the Conservancy's uplands will be managed for the hawk and other upland species in perpetuity; (2) priorities for acquiring upland reserves will help ensure that managed uplands are in close proximity to the majority of the Basin's nests thus increasing the amount of foraging habitat in close proximity to nests during the critical nesting season; (3) upland reserves and the upland component of managed marsh reserves will provide opportunities for the establishment of new nest trees; (4) the upland component of managed marsh reserves will provide additional moderate-quality potential foraging habitat in perpetuity; (5) Conservancy rice fields will provide additional moderate-quality potential foraging habitat in perpetuity; (6) the amount of high-quality hawk foraging habitat will increase; (7) foraging habitat will be made available for Swainson's hawks throughout their time in the Basin; and (8) no development will occur in the one-mile wide Swainson's Hawk Zone, except for a small amount of acreage previously authorized for development in the City's proposed Permit Area. These factors will help avoid, minimize, and mitigate the effects of the proposed action on the hawk's nesting and foraging habitat.

Effect of the Proposed Conservation Measures

Implementation of the proposed conservation measures (see Sections V.A.1-3 and V.A.5.b of the NBHCP) will minimize the potential adverse effects of the proposed action on the hawk. Except for lands approved for urban development in the North Natomas Community Plan in 1994, the City and Sutter will not approve development permits within the one-mile-wide Swainson's Hawk Zone, which is adjacent to the Sacramento River. MAP is not located within the Swainson's Hawk Zone. If the City or Sutter seek to expand development into the Swainson's Hawk Zone beyond that described above, granting of such coverage would require an amendment to the NBHCP and ITPs, which would be subject to review and approval by the Service and the CDFG in accordance with all applicable statutory and regulatory requirements. Approval of any Urban Development within the Swainson's Hawk Zone beyond that described above would constitute a significant departure from the Plan's OCP and would trigger a new effects analysis, potential amendments and/or revisions to the Plan and Permits, a separate conservation strategy and issuance of ITPs to the permittee for that additional urban development, and/or possible

suspension or revocation of the City's and/or Sutter's Permits. Neither the City nor Sutter control lands in the Swainson's Hawk Zone within the unincorporated portion of Sacramento County. However, on December 10, 2002, the City and Sacramento County entered in to the "Joint Vision," a Memorandum of Understanding, in which they acknowledged no future growth may occur in the Basin without first analyzing the impacts to protected species (see Cumulative Effects section below). Therefore, the City, Sutter, and Sacramento County have acknowledged that no additional development may occur in the Swainson's Hawk Zone without environmental review.

In addition to not developing in the Swainson's Hawk Zone, additional measures will minimize and mitigate the potential effects of the proposed action on the hawk. Potential disturbance of active nests will be minimized through the use of pre-construction surveys, avoidance buffers (until the young have fledged), timing restrictions, and monitoring (see Section V.D.5.b of the NBHCP). These measures will ensure that disturbance of active nesting hawks is minimized. The loss of nest trees will be minimized by preserving large trees wherever possible and avoiding construction activities near active nests. In addition, the Land Use Agencies will mitigate the loss of nest trees in its proposed Permit Area by replacing lost trees at a rate of 15:1. The City will plant 60 replacement trees within 14 months of issuance of the proposed ITPs. By planting these trees up front and selecting trees that are likely to become suitable for the hawk relatively quickly (accomplished through species selection, management, and size at planting), the City will minimize the potential temporal effects of removing nest trees.

Implementation of the proposed conservation measures by the Conservancy will also help minimize the effects of the proposed action on the hawk. The Conservancy's measures include: (1) minimizing disturbance of active nests; (2) minimizing the number of nest trees lost; (3) mitigating loss of nest trees; (4) maximizing the foraging potential of upland reserves; and (5) maximizing the amount of available nesting habitat in the Basin. In addition, criteria established for the acquisition of upland reserves will help maximize their potential benefit to the hawk. All of these benefits will have the effect of making the mitigation lands more valuable to the hawk than if the lands were simply preserved.

Discussion

Following implementation of the proposed action, between 13,000 and 15,000 acres of potential Swainson's foraging habitat (including high-quality mitigation lands) will remain in the Basin. Most of the foraging habitat remaining after implementation of the proposed action will be moderate-quality habitat, but as shown in Table 5, most of the Basin's existing potential foraging habitat is moderate-quality habitat. Both the City and Sutter have committed to not developing lands in the Swainson's Hawk Zone (without conducting additional analyses and obtaining appropriate permits) if the proposed ITPs are approved. Because of its proximity to the majority of the Basin's hawk nests, this area is critical for the area's hawks. This is also where much of the high-quality foraging habitat that is expected to produce prey throughout the hawk's nesting season will be created on the Conservancy's upland reserves because the upland reserve acquisition criteria have been established so that much of the upland reserves are acquired in the Swainson's Hawk Zone. In addition to the continuing availability of foraging lands in the Basin, large expanses of foraging habitat are available in Yolo County on the west side of the Sacramento River. In fact, according to the Technical Addendum, Yolo County supports more than 200,000 acres of non-rice agricultural crops, 40,000 acres of which are planted in alfalfa.

Much of Yolo County's available foraging habitat is within the Swainson's flight distance. Much of this habitat is located in the Yolo and Sutter bypasses and because the bypasses are flood control structures that are subject to annual flooding and the State Reclamation Board's floodway restrictions, is very likely to never be developed. It is very likely that hawks nesting in or adjacent to the Basin currently forage in Yolo County. Even with the loss of potential foraging habitat that will result from implementation of the proposed action, a large amount of foraging habitat will remain available to support the Basin's hawks.

The proposed action is not likely to affect the viability of the hawk in the Basin, Central Valley, or as a species. Overall, the proposed action is likely to result in a shift in the timing and quality of Swainson's foraging habitat and an increase in the amount of suitable nest trees. Although approximately 9,000 acres (including MAP) of mostly moderate-quality foraging habitat will be lost, approximately 13,000 acres of mostly moderate-quality foraging habitat will not be affected. Almost all of the lost habitat will be outside the 1-mile Swainson's Hawk Zone and therefore, more than one mile away from the majority of the Basin's nest trees. In addition, a total of 2,387.5 acres (including extra 200 acres for MAP) of high-quality foraging habitat will be enhanced/ managed for the benefit of the hawk. This habitat will help offset the effects of the proposed action on Swainson's foraging by providing a consistent source of abundant prey for hawks, including times of the year (e.g., nesting season) when foraging habitat is limited in the Basin and much of it will be in close proximity to the majority of the Basin's nest trees. Additional Swainson's foraging opportunities will be gained from the 10 percent of the Conservancy's rice reserves that will be fallowed annually (437.5 acres) and the 20-30 percent of managed marsh reserve habitat that will be comprised of upland habitat (437.5-656.2 acres). Tens of thousands of acres of foraging habitat are also available just across the Sacramento River in Yolo County; which will not be developed in the foreseeable future. Very few Swainson's nest trees will be affected by the proposed action and almost 40 percent of the available hawk nest territories are not being used (Estep 2002). This surplus of nest territories will minimize the temporal loss of those nest trees that are directly affected. Nest trees that are affected will also be replaced at a ratio of 15:1. This, in conjunction with other tree plantings on the Conservancy's reserves, will result in a substantial increase in the number of nest trees in the Basin. Because of the avoidance, minimization and mitigation measures proposed by the applicants, and the habitat conditions within and outside the Basin after implementation of the proposed action, the proposed action should not result in the significant injury or death of hawks that nest and forage in the Basin. The primary impact of the proposed action will be a net loss of potential Swainson's hawk foraging habitat; however, because of the varying quality of that habitat and its limited availability to the species during the nesting season, this loss will not result in significant adverse effects to the hawks in the basin. Substantial amounts of foraging habitat will remain in the basin as well as abundant foraging habitat in nearby Yolo County, and the proposed action will result in the addition of high-quality foraging habitat managed specifically to benefit the hawk (i.e., located in close proximity to nest trees, managed to produce mots of hawk prey, available throughout the hawk's time in the Basin, etc.). The environmental baseline combined with the conservation measures provided under the plan should continue to support a viable Natomas Basin Swainson's hawk population. Because significant adverse effects to the species are not anticipated locally, the Service does not anticipate adverse effects to either the Central Valley population or the species as a whole.

Aleutian Canada Goose

Implementation of the proposed action will likely affect the goose throughout the action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that directly result in the disturbance of geese throughout the Permit Areas and on the Conservancy's reserves. The goose is known to occasionally occur in the Basin during the winter and suitable goose foraging habitat will be altered/destroyed by each of the Permittees. Loud noises produced by construction activities on or adjacent to the goose's habitat in the winter will likely disturb geese.

In addition to disturbing the goose, implementation of the proposed action may result in minimal impacts to the goose through the destruction of 14,751 acres of potential winter habitat (Table 6). Although the total number of acres of goose habitat that will be lost is greater than that for species such as the snake, the goose is not constrained by such factors as connectivity and is only an occasional visitor to the Basin. Issuance of the ITP to the City will result in the loss of 4,663 acres of non-rice crops, 23 acres of pasture, and 970 acres of rice habitat. Issuance of the ITP to Sutter will result in the loss of 1,529 acres of non-rice crops, 101 acres of pasture, and 5,577 acres of rice habitat. The effects of the issuance of an ITP to MAP were analyzed in the January 16, 2002, biological opinion for that project (Service File # 1-1-01-F-0302). Issuance of the ITP to MAPPOA will result in the loss of 325 acres of non-rice crops, 22 acres of pasture, and 1,541 acres of rice habitat.

Issuance of an ITP to the Conservancy will have both beneficial and deleterious effects on the goose. Construction activities conducted in the goose's wintering habitat (e.g., non-rice crops) when the goose is in the Basin may disturb geese. The construction of up to 2,187.5 acres of managed marsh will further decrease the amount of available foraging habitat for the goose. However, the managed marsh may be used as loafing or roosting habitat. Hunting is being considered on Conservancy reserves and may also directly affect the goose. Geese may be injured or killed by hunting activities. However, hunting is not a covered activity and this should only happen rarely. Given the goose's limited use of the Basin, the fact that the species ranges from southern Oregon through the San Joaquin Valley, and the healthy increasing population, hunting's effects on the goose in the Basin should be negligible.

Implementation of the proposed goose conservation measures will minimize impacts to the goose. Most importantly, the establishment of the Conservancy's system of reserves will help provide a stable system of winter habitat for the goose. All of the Conservancy's 8,750 acres of rice reserves and 2,187.5 acres of upland reserves will serve as potential habitat for the species and uplands within the managed marsh reserves may be used as loafing or roosting habitat. In order to mitigate the loss of the 5,656 acres of goose habitat resulting from the issuance of the proposed ITP to the City, 2012.5 acres of rice habitat and 1006.2 acres of uplands will be preserved and managed in perpetuity. In order to mitigate the loss of the 7,207 acres of goose habitat resulting from the issuance of the proposed ITP to Sutter, 1866.8 acres of rice habitat and 933.4 acres of uplands will be preserved and managed in perpetuity. In order to mitigate the loss of the 1,888 acres of goose habitat resulting from the issuance of the proposed ITP to the MAPPOA, 495.8 acres of rice habitat and 247.9 acres of uplands will be preserved and managed in perpetuity. Additional potential foraging and loafing acreage will be gained through the development of the 2,187.5 acres of managed marsh reserves.

In addition to the Conservancy's reserves, disturbance effects of the proposed action on geese in rice fields will be minimized by the use of the May 1-October 1 snake construction window. Because of the work window, no geese should be in rice fields when construction activities occur.

Overall, the effects of the proposed action on the goose should be minimal. Considering the goose's limited use of the Basin, the very small amount of the goose's total wintering range occupied by the Basin, the overall health of the subspecies, and the abundant habitat throughout the Central Valley, the loss of habitat resulting from the proposed action is practically inconsequential to the goose. This subspecies most often winters in other areas of the Sacramento Valley, including the Sacramento, Colusa, Butte Sink, and Sutter National Wildlife Refuges and the agricultural fields that surround them. Outside of the Natomas Basin, there are hundreds of thousands of acres (just considering rice fields) of potential winter foraging habitat for the goose. Furthermore, the amount of foraging habitat does not appear to be a factor limiting the number of geese in the Basin and the Conservancy's reserve system will increase the amount of available loafing and roosting habitat. Based upon the baseline habitat of the goose, its use of the Basin, the health of goose populations, and benefits acquired from the Conservancy's reserve system, the amount of development planned in Natomas will not affect the viability of the goose in the Basin, Central Valley, or species as a whole.

Burrowing Owl

Implementation of the proposed action will likely affect the owl by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that result in direct effects to owls throughout the Permit Areas and on the Conservancy's reserves. The owl is known to occur in the proposed action's action area, nesting owls have been observed in each of the proposed permit areas, and suitable habitat will be altered/destroyed by each of the Permittees. Take could be in the form of disturbance, injury or death of owls. Examples of possible owl take include, but are not limited to: (1) owls could be disturbed by noise produced by construction activities or humans working within the owl's habitat; (2) owls could be killed if burrows are destroyed while inhabited by owls; (3) owls could be displaced if their burrows are destroyed while they are not in them; and (4) development conducted in foraging habitat adjacent to an owl's burrow could cause the owl to venture further for food or move to another burrow.

Approximately 700 acres of potential burrowing owl foraging habitat (alfalfa, grassland, pasture) (Table 7) and 64.5 (35.4 percent) of the total 246.8 miles of canals in the Basin will be lost as a result of the proposed action. Berms, banks, and levees bordering the canals are often used by ground squirrels and therefore, offer burrows for the owl. Some canals not lost as a result of development will also become unsuitable for the owl because they will be surrounded by development and therefore, no longer in proximity to suitable foraging habitat. On the other hand, some of the canals are surrounded by rice habitat (not suitable foraging habitat) and are therefore probably less likely to be inhabited by owls.

Issuance of the proposed ITP to the City will result in the development of 427 acres of grassland and 23 acres of pasture, which constitute suitable owl foraging habitat (Table 7). In addition, at least 19.3 miles of canals whose banks may be inhabited by ground squirrels (whose burrows are often used by owls) will be lost. Issuance of the proposed ITP to Sutter will result in the development of 134 acres of grassland and 101 acres of pasture, which constitute suitable owl foraging habitat. In addition, approximately 33.6 miles of canals whose banks may be inhabited

by ground squirrels will be lost. The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA will result in the development of 22 acres of pasture, which constitute suitable owl foraging habitat. In addition, 11.6 miles of canals whose banks may be inhabited by ground squirrels will be developed.

Upon implementation of the proposed action, the Conservancy will create/restore and protect in perpetuity 8,750 acres of habitat preserves. Of that, approximately 2,187.5 acres will would be maintained as upland habitat and would be potential foraging habitat for the burrowing owl. However, the burrowing owl exhibits strong site fidelity and may not readily find newly created suitable habitat. Additional habitats made available to the owl as a result of implementing the Conservancy's reserve system include upland foraging habitat within the managed marsh component of the reserve system and irrigation/drainage canals on reserve lands. Approximately 20-30 percent (437.5-656.2 acres) of the total 2,187.5 acres of managed marsh reserves will be managed as dryland pasture or grasslands. In addition, those irrigation/drainage canals located on Conservancy lands not operated by Natomas Mutual or RD 1000 will be managed in a more ground squirrel-friendly manner, which should provide more burrows for the owl. Contiguity of marsh upland reserves will be important to help maintain larger groups of burrowing owls. In 1999, the Conservancy acquired the Betts-Kismat-Silva property, which is "probably home to the largest concentration of burrowing owls in the Natomas Basin" (Wildlands 2000). The Conservancy has also acquired the Ayala tract, which is inhabited by owls. These two reserves represent the only known owl occurrences within the Basin that are outside of the proposed Permit Areas.

In order to mitigate the loss of 450 acres of potential owl foraging habitat resulting from the issuance of the proposed ITP to the City, 1006.2 acres of potential upland foraging habitat will be created on the Conservancy's upland reserves. In addition, between 201.2 and 301.9 acres of potential upland foraging habitat will be created on the Conservancy's managed marsh reserves. In order to mitigate the loss of 235 acres of potential owl foraging habitat resulting from the issuance of the proposed ITP to Sutter, 933.4 acres of potential upland foraging habitat will be created on the Conservancy's upland reserves. In addition, between 186.7 and 280.0 acres of potential upland foraging habitat will be created on the Conservancy's managed marsh reserves. In order to mitigate the loss of 22 acres of potential owl foraging habitat resulting from the issuance of the proposed ITP to the MAPPOA, 247.9 acres of potential upland foraging habitat will be created on the Conservancy's upland reserves. In addition, between 49.6 and 74.4 acres of potential upland foraging habitat will be created on the Conservancy's managed marsh reserves.

As described in the effects analysis for the giant garter snake, a decrease or change in demand for irrigation water may lead to a change or decrease in the number of canals in the Basin. Canals removed from use may no longer support mammals such as the ground squirrels, whose burrows are used by owls in the Basin. Additionally, if canals are modified or moved, the burrows in the banks of the existing canals may be destroyed.

Implementation of the proposed conservation measures will avoid, minimize, and mitigate the effects of the proposed action on the owl. The Land Use agencies will not permit owls to be disturbed during the nesting season and owl relocation efforts will be made during the rest of the year. Studies are currently being conducted to evaluate the effectiveness of passive owl relocations (D. Gifford, pers. comm.). Relocation efforts in Canada and California have been

somewhat successful (Haug *et al.* 1993) and management efforts using artificial nets boxes in burrows in Sacramento County have led to habitual use by burrowing owls (SRCSD 2002). Conservation measures employed by the Conservancy will also minimize the effects of the proposed action on the owl.

The NBHCP's acquisition strategy and the SSMPs it develops for each of the reserves will reflect the needs of the owl and should provide effective measures to offset impacts to the owl resulting from development in the Permit areas. The Conservancy will consider the habitat and management requirements of burrowing owls when developing management plans for the upland reserves and upland components of managed marsh reserves.

Although burrowing owls will be impacted by the proposed action, proposed action activities will not affect the viability of the subspecies. Although owls in the Basin will be impacted, the Permittees have proposed conservation measures that mitigate the impacts. For example, relocation will be used to move owls from areas to be developed to Conservancy reserves. Once on the Conservancy's reserves, the owls will benefit from the stability of high-quality foraging and burrow habitat. The Conservancy's proposed conservation measures include measures to provide burrow and foraging habitat for the owl as well as minimize impacts to burrowing animals such as ground squirrels (whose burrows are used by the owl). In contrast, much of the Basin's existing potential habitat is subject to frequent disturbance that lessens its value to the species. The conservation measures provided under the plan should provide for the continued viability of the owl in the basin. In addition, because the Natomas Basin represents a very small portion of both the subspecies' and Central Valley population's population and range, and any negative impacts to the owl resulting from the proposed action will not compromise the viability of the Central Valley population, the subspecies, or the species as a whole.

Loggerhead Shrike

Implementation of the proposed action will likely affect the loggerhead shrike throughout the proposed project's action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that may result in the disturbance, injury or death of shrikes throughout the Permit Areas and on the Conservancy's reserves. The shrike is a non-migratory resident of the Natomas Basin, is known to breed in the Basin, and is observed regularly throughout Natomas Basin (Thomas Reid Associates 2000). Suitable shrike habitat will be altered/destroyed by each of the Permittees. In addition to disturbance, take of shrikes will likely occur in other forms. For example, shrike mortalities could occur as a result of increased vehicular traffic.

Habitat conversion will likely be the greatest effect to the shrike as a result of the proposed action. Land converted from compatible to incompatible habitat types will likely result in the displacement of birds, decreased nesting and foraging habitat and increased competition. Based on the habitat and land use analysis, potential shrike habitat would decline by about 9,000 acres. However, most of the potential habitat that would be lost would be nonrice crops which provide relatively poor habitat for loggerhead shrike because the shrike 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 contribute to the decline of loggerhead shrike populations (Kaufman, 1996).

Issuance of the proposed ITP to the City will result in the loss of 427 acres of grassland habitat, 4,663 acres of non-rice crop habitat, six acres of oak groves, 13 acres of orchards, 23 acres of pasture, seven acres of ponds and seasonally wet areas, 24 acres of riparian habitat, 1,137 acres of ruderal areas, 46 acres of rural residential, ten acres of tree groves, and 117 acres of canals (Table 8). Issuance of the proposed ITP to Sutter will result in the loss of 134 acres of grassland habitat, 1,539 acres of non-rice crop habitat, 101 acres of pasture, 10 acres of ponds and seasonally wet areas, 88 acres of ruderal areas, and 215 acres of canals. The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA will result in the development of 325 acres of non-rice crop habitat, two acres of oak groves, 22 acres of pasture, four acres of ponds and seasonally wet areas, six acres of ruderal areas, ten acres of rural residential, 23 acres of tree groves, and 72 acres of canals.

Issuance of the proposed ITP to the Conservancy will have both beneficial and deleterious effects on the shrike. Potential negative effects include, but are not limited to: (1) construction activities conducted in or near the shrikes's foraging habitat may disturb shrikes; and (2) conversion of habitat on Conservancy reserves may inadvertently make that habitat less suitable for shrike nesting or foraging. However, since the Conservancy must consider the needs of all Covered Species when designing SSMPs, adverse effects should be minimal. Once completed, the Conservancy's habitat reserves will provide 2,187.5 acres of high-quality upland habitat for the shrike in perpetuity. This habitat will be more stable in quality and location and may encourage the establishment and long-term persistence of a breeding population in the Natomas Basin. Specifically to attract and maintain loggerhead shrikes, the Conservancy will encourage development and maintenance of perching and nesting sites on habitat reserves. Riparian habitat and some of the managed marsh on the reserves may provide additional nesting opportunities and foraging perch sites.

In order to mitigate the loss of potential shrike foraging habitat resulting from the issuance of the proposed ITP to the City, 1006.2 acres of potential foraging habitat will be created on the Conservancy's upland reserves. In order to mitigate the loss of potential shrike foraging habitat resulting from the issuance of the proposed ITP to Sutter, 933.4 acres of potential upland foraging habitat will be created on the Conservancy's upland reserves. In order to mitigate the loss of potential shrike foraging habitat resulting from the issuance of the proposed ITP to the MAPPOA, 247.9 acres of potential upland foraging habitat will be created on the Conservancy's upland reserves.

Implementation of the proposed conservation measures will minimize the adverse effects of the proposed action on the shrike. Active shrike nests will be avoided by at least 30.5 m (100 ft.), thereby decreasing disturbance of nesting shrikes. The use of pre-construction surveys should also minimize the take of shrikes.

Loss of canal habitat (see snake discussion) and predation are two potential indirect effects of the proposed action. Development authorized as a result of this HCP could result in the future loss of irrigation/drainage canals in the Basin. As stated in the species description, suitable shrike nesting habitat may grow along canals. Cats are known to prey upon the San Clemente Loggerhead Shrike. Indirect effects of predation will be minimized by acquiring preserves no closer than
800 feet from development.

Issuance of the proposed ITPs to the Permittees is not likely affect the viability of the shrike in the Basin, Central Valley, or as a species. After implementation of the proposed action, over 14,000 acres of shrike foraging habitat will remain in the Basin and additional nesting and perching opportunities will be available. Continued use of the Basin by the shrike is very likely. The species is not considered to be subject to any identifiable threat in the State and populations in the western United States appear to be stable. Shrikes are common throughout lowland California and the Natomas Basin represents a very small fraction of the species' range.

Tricolored Blackbird

Implementation of the proposed action will likely affect the tricolored blackbird throughout the project's action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that directly result in the disturbance of blackbirds throughout the Permit Areas and on the Conservancy's reserves. Tricolor nesting colonies occur in the Basin and suitable tricolor habitat (especially foraging habitat) will be altered/destroyed by each of the Permittees. Displacement of tricolors will also result from loss of potential nesting and foraging habitat.

A total of 449 acres of potential nesting habitat (404 acres of canals, 21 acres of ponds and seasonally wet areas, and 24 acres of riparian) would be converted to urban development as a result of implementing the proposed action (Table 9). However, the actual acreage of nesting habitat lost may be lower than this because: (1) most of the 24 acres of riparian habitat lost is actually located within the buffer area adjacent to Fisherman's Lake (it is not known whether the limited buffer provided at the Lake will fully protect the tricolor); and (2) much of the canal acreage is open water and therefore, not nesting habitat. Nesting habitat would likely be limited to the vegetated margins of the canals. Implementation of the proposed action would result in the loss of 15,311 acres of potential tricolor foraging habitat (non-rice crops = 6,517 acres, grassland = 560 acres, pasture = 147 acres, and rice = 8,087 acres)(Table 9).

Issuance of the proposed ITP to the City would result in the loss of approximately 148 acres of potential tricolor nesting habitat (ponds and seasonally wet areas = 7 acres, riparian = 24 acres, canals = 117 acres) and 6,083 acres of potential tricolor foraging habitat (non-rice crops = 4,663 acres, grassland = 427 acres, pasture = 23 acres, and rice = 970 acres) (Table 9). Issuance of the proposed ITP to Sutter would result in the loss of 225 acres of potential nesting habitat (ponds and seasonally wet areas = 10 acres and canals = 215 acres) and 7,341 acres of potential foraging habitat (non-rice crops = 1,529 acres, grassland = 134 acres, pasture = 101 acres, and rice = 5,577 acres). The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA would result in the loss of 76 acres of potential nesting habitat (ponds and seasonally wet areas = 4 acres, canals = 72 acres) and 1,888 acres of potential foraging habitat (non-rice crops = 325 acres, pasture = 22 acres, and rice = 1,541 acres).

Issuance of the proposed ITP to the Conservancy will have both beneficial and deleterious effects on the tricolor. Potential adverse effects include, but are not limited to: construction activities conducted in or near the tricolor's foraging and nesting habitat may disturb tricolors. However, overall, the beneficial effects of issuing the ITP to the Conservancy will far out-weigh the deleterious effects.

Once completed, the Conservancy's habitat reserves will provide up to 8,750 acres of habitat for the tricolor in perpetuity. Potential nesting habitat will be created in the 2,187.5 acres of managed marsh. With the limited amount of marsh habitat currently available in the Basin, this is a substantial increase the amount of potential nesting habitat available to the Basin's tricolors. Potential foraging habitat will also be created on the Conservancy's 4,375 acres of rice and 2,187.5 acres of upland reserves. The NBHCP's requirement that the Conservancy consolidate reserves will help ensure that abundant potential foraging habitat is in close proximity to nesting habitat. According to DeHaven (2003, pers. comm, with Craig Aubrey), suitable insect prey bases in close proximity to breeding substrates is important for the tricolor.

In order to mitigate the loss of potential tricolor foraging habitat resulting from the issuance of the proposed ITP to the City, 3018.8 acres of potential foraging habitat (rice and uplands) will be created/managed on the Conservancy's upland and rice reserves. In order to mitigate the loss of tricolor nesting habitat resulting from the issuance of the proposed ITP to the City, 1006.25 acres of potential nesting habitat will be created on the Conservancy's managed marsh reserves. In order to mitigate the loss of potential tricolor foraging habitat resulting from the issuance of the proposed ITP to Sutter, 2,800.1 acres of potential foraging habitat (rice and uplands) will be created on the Conservancy's upland and rice reserves. In order to mitigate the loss of potential tricolor nesting habitat resulting from the issuance of the proposed ITP to the City, 933.4 acres of potential nesting habitat will be created on the Conservancy's managed marsh reserves. In order to mitigate the loss of potential tricolor foraging habitat resulting from the issuance of the proposed ITP to the MAPPOA, 743.7 acres of potential foraging habitat (rice and uplands) will be created on the Conservancy's upland and rice reserves. In order to mitigate the loss of tricolor nesting habitat resulting from the issuance of the proposed ITP to the MAPPOA, 247.9 acres of potential nesting habitat will be created on the Conservancy's managed marsh reserves.

Implementation of the proposed conservation measures will minimize the adverse effects of the proposed action on the tricolor. The Land Use Agencies and Conservancy will avoid active tricolor nests by at least 152 m (500 ft.), thereby decreasing disturbance of nesting tricolors and preventing the destruction of active nests. The use of pre-construction surveys should also minimize the take of tricolors. The Conservancy has also proposed to avoid, to the maximum extent possible, foraging habitat in the vicinity of currently or historically active nests, which may help increase survivorship of young. Lastly, the tricolor should indirectly benefit from conservation measures proposed or the snake such as: (1) timing restrictions; (2) dewatering requirements; and (3) vegetation control management because these measures should minimize the disturbance of tricolors.

Potential indirect effects of the proposed action is the loss of canal habitat (see snake discussion) and predation by feral or domestic animals. Development authorized as a result of this HCP could result in the future loss of irrigation/drainage canals in the Basin, which may result in additional losses of potential nesting habitat. Indirect effects of predation will be minimized by acquiring preserves no closer than 800 feet from development.

Overall, the tricolor should benefit from the Plan. Construction of the Conservancy's managed marsh reserves will increase tricolor nesting habitat in proximity to foraging habitat, which is currently limited in the Basin and the Central Valley as a whole. Even though over 15,000 acres of foraging habitat will be converted to urban uses as a result of issuing the ITPs, over 25,000 acres of foraging habitat will remain after issuance of the proposed ITPs. This remaining

foraging habitat, coupled with the created high-quality nesting habitat should increase the value of the Basin to the tricolor. As stated earlier, tricolor numbers have declined in Sacramento County. An increase in nesting habitat and numbers of tricolor in the Basin could result in a small boost (given the species' range and population size) to the species overall.

White-Faced Ibis

Implementation of the proposed action will likely affect the white-faced ibis throughout much of the proposed action's action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that directly result in the disturbance of wintering ibis throughout the Permit Areas and on the Conservancy's reserves. Although the ibis does not nest in the Basin (there is a lack of potential nesting habitat), the species does winter and forage there and suitable foraging habitat will be altered/destroyed by each of the Permittees.

The greatest source of potential take associated with the implementation of the proposed action is the loss of approximately one-third (8,512 acres) of the available potential foraging and wintering habitat in the Basin, the overwhelming majority of which is comprised of rice. Of the total ibis habitat lost in the Basin, 95 percent (8,087 acres) is rice, 0.25 percent (21 acres) is ponds and seasonally wet areas, and 4.75 percent (404 acres) is canals (Table 10).

Issuance of the proposed ITP to the City will result in the loss of 1,097 acres of potential ibis habitat (Table 10). Of that, 970 acres will be rice, seven acres will be ponds and seasonally wet areas, and 117 acres will be canals. Issuance of the proposed ITP to Sutter will result in the loss of 5,802 acres of potential ibis habitat. Of that, 5,577 acres will be rice, ten acres will be ponds and seasonally wet areas, and 215 acres will be canals. The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA will result in the loss of 1,617 acres of potential ibis habitat. Of that, 1,541 acres will be rice, four acres will be ponds and seasonally wet areas, and 72 acres will be canals.

Issuance of the ITP to the Conservancy will have both negative and positive direct effects on the ibis. Examples of possible negative effects on the ibis include, but are not limited to: (1) disturbance as a result of construction and maintenance activities on Conservancy reserves; and (2) the loss of rice foraging habitat due to conversions to other habitat types. However, the Conservancy's overall effects on the ibis will be almost overwhelmingly positive. Rice production practices on Conservancy lands should prove to be more "ibis friendly" and more importantly, the development of the managed marsh component of the reserve system should provide nesting and roosting opportunities for the ibis, which are currently limited in the Central Valley and virtually non-existent in the Natomas Basin. The potential benefit of the managed marsh as nesting and roosting habitat should increase through time, as the reserve system increases in size and individual reserves are consolidated.

In order to mitigate the loss of potential ibis foraging habitat (alfalfa, ponds and seasonally wet areas, rice canals) resulting from the issuance of the proposed ITP to the City, 2012.5 acres of potential rice foraging habitat (rice and uplands) will be managed by the Conservancy in perpetuity. In addition, 1006.2 acres of potential foraging, nesting, and roosting habitat will be created on the Conservancy's managed marsh reserves. In order to mitigate the loss of potential ibis foraging habitat (alfalfa, ponds and seasonally wet areas, rice canals) resulting from the

issuance of the proposed ITP to Sutter, 1866.8 acres of potential rice foraging habitat (rice and uplands) will be managed by the Conservancy in perpetuity. In addition, 933.4 acres of potential foraging, nesting, and roosting habitat will be created on the Conservancy's managed marsh reserves. In order to mitigate the loss of potential ibis foraging habitat (alfalfa, ponds and seasonally wet areas, rice canals) resulting from the issuance of the proposed ITP to the MAPPOA, 495.8 acres of potential rice foraging habitat (rice and uplands) will be managed by the Conservancy in perpetuity. In addition, 247.9 acres of potential foraging, nesting, and roosting habitat will be created on the Conservancy's managed marsh reserves.

Implementation of the proposed conservation measures by the Permittees should minimize the effects of the proposed action on the ibis. Avoidance of developed areas by at least 244 m (800 ft.) by the Conservancy's reserves will help minimize exposure of ibis to development-related effects. Measures included for the avoidance of active ibis nests should benefit the ibis, if and when ibis use lands in the Basin for nesting. Lastly, the ibis should benefit from conservation measures proposed for the snake. For example, limiting construction activities in snake habitat to the snake's active season will limit the destruction of ibis wintering habitat to times when the majority of ibis are not in the Basin.

Potential indirect effects of the proposed action include predation and the additional closure of canals. Development authorized as a result of this HCP could result in the future loss of irrigation/drainage canals in the Basin (see snake discussion), which may result in additional losses of potential nesting habitat. Indirect effects of predation will be minimized by acquiring preserves no closer than 800 feet from development.

Issuance of the proposed ITPs to the Permittees should benefit the ibis. Although about 1/3 of the ibis' foraging habitat in the Basin will be converted to urban uses, over 16,000 acres of ibis foraging habitat will remain after implementation of the proposed action. More importantly, the Conservancy's system of managed marsh reserves will provide potential nesting habitat for the ibis. Ibis nesting habitat is limited throughout the Central Valley; foraging habitat is not. The species is precluded from nesting in the Basin because no nesting habitat occurs there. Therefore, although there will be an overall decrease of foraging habitat in the Basin, the species should benefit because of the opportunities created for the breeding portion of its life cycle.

Bank Swallow

Implementation of the proposed action will likely affect the bank swallow throughout the project's action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that directly result in the disturbance of swallows throughout the Permit Areas and on the Conservancy's reserves. Although the swallow does not nest in the Basin, the species does nest nearby and could forage in the Basin. Potential foraging habitat will be altered/ destroyed by each of the Permittees. In addition to disturbance, once completed, implementation of the proposed action will result in the conversion of approximately 15,760 acres of potential swallow foraging habitat.

Issuance of the proposed ITP to the City will result in the loss of 6,231 acres of potential swallow foraging habitat. Effected habitat types include: grassland (427 acres), nonrice crops (4,663 acres), pasture (23 acres), ponds and seasonally wet areas (7 acres), rice (970 acres), riparian

(24 acres), and canals (117 acres) (Table 11). Issuance of the proposed ITP to Sutter will result in the loss of 7,566 acres of potential swallow foraging habitat. Effected habitat types include: grassland (134 acres), nonrice crops (1,529 acres), pasture (101 acres), ponds and seasonally wet areas (10 acres), rice (5,577 acres), and canals (215 acres). The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA will result in the loss of 1,964 acres of potential swallow foraging habitat. Effected habitat types include: nonrice crops (325 acres), pasture (22 acres), ponds and seasonally wet areas (4 acres), rice (1,541 acres), and canals (72 acres).

Issuance of the proposed ITP to the Conservancy would have both positive and negative effects on the swallow. Swallows could be disturbed by construction or management activities on Conservancy reserves. Additionally, swallow foraging habitat may be temporarily disturbed or converted to other types during the implementation of SSMP's. Although some negative effects would likely occur to the swallow as a result of issuance of the proposed ITP to the Conservancy, the overall effects of issuing the ITP to the Conservancy would be overwhelmingly positive. Construction of the Conservancy's reserves would ensure a permanent source of swallow foraging habitat in the Basin. In addition, the diversity of habitat types on the Conservancy's reserves would help provide varying prey types at different times of year.

All of the Conservancy's rice, managed marsh, and upland reserves will provide potential foraging habitat for the swallow. In order to mitigate the loss of potential swallow foraging habitat resulting from the issuance of the proposed ITP to the City, 4025 acres of potential foraging habitat will be created on the Conservancy's managed marsh, rice, and upland reserves. In order to mitigate the loss of potential swallow foraging habitat resulting from the issuance of the proposed ITP to Sutter, 3733.5 acres of potential foraging habitat will be created on the Conservancy's managed marsh, rice, and upland reserves. In order to mitigate the loss of potential swallow foraging habitat resulting from the issuance of the proposed ITP to MAPPOA, 991.5 acres of potential foraging habitat will be created on the Conservancy's managed marsh, rice, and upland reserves.

If swallows begin to nest in the Basin (unlikely, given the absence of suitable nesting habitat), implementation of the proposed conservation measures by the Permittees will help minimize direct effects to the bank swallow. In addition, the Conservancy is proposing to use CDFG's swallow recovery plan, which should assist the Conservancy's efforts to manage the species on its lands.

Potential indirect effects of the proposed action include predation and the additional closure of canals (see snake discussion). Development authorized as a result of this HCP could result in the future loss of irrigation/drainage canals in the Basin, which may result in additional losses of potential nesting habitat. Indirect effects of predation will be minimized by acquiring preserves no closer than 800 feet from development.

Overall, the impacts of issuance of the proposed ITPs to the Permittees should be negligible. Although the vast majority of California's bank swallows are found on the Sacramento River, most nesting colonies are found upstream of the confluence of the Sacramento and Feather Rivers (Garrison *et al.* 1987, Laymon *et al.* 1988) and there is little potential nesting habitat (i.e., vertical banks) in the vicinity of the Natomas Basin (R. DeHaven, pers. comm., to Craig Aubrey, 2003). Much of the river bank in the vicinity of Sacramento and the Natomas Basin is covered in riprap

or otherwise is not suitable for bank swallow nesting habitat. Although about one-third of the Basin's potential foraging habitat will be converted to urban uses, over 27,000 acres (not considering the Conservancy's reserves) will remain after implementation of the proposed action. Development is precluded from the Swainson's Hawk Zone, which is the portion of the Basin closest to the Sacramento River (where swallow nesting colonies would occur). This is especially important during the breeding season, when swallows forage in close proximity to their nests. Because of the upland reserve acquisition criteria, much of the lands in close proximity to the river will be protected in perpetuity after implementation of the proposed action.

Northwestern Pond Turtle

Implementation of the proposed action will likely affect the turtle throughout the proposed action's action area by authorizing the City, Sutter, Conservancy, and MAPPOA to participate in and authorize activities that directly result in the death, harm, or injury of turtles throughout the Permit Areas and on the Conservancy's reserves. The turtle is known to occur throughout the Basin and each of the Permittees will destroy potential turtle habitat within their Permit Areas. Take of turtles is likely to result from each of the Permittees actions and the greatest potential source of direct effects is the loss of approximately 8,500 acres of potential turtle aquatic and upland habitat (ponds and seasonally wet areas = 21 acres, rice = 8,087 acres, riparian = 24 acres, canals = 404 acres)(Table 12). Additionally, turtles could be disturbed, injured, or killed by construction activities. For example, grading activities could crush turtles or their nests. The construction of new roads could present a barrier to turtle movements.

Issuance of the proposed ITP to the City will result in the loss of 1,118 acres of potential turtle habitat. Of that, 970 acres will be rice, seven acres will be ponds and seasonally wet areas, 24 acres will be riparian, and 117 acres will be canals. Issuance of the proposed ITP to Sutter will result in the loss of 5,802 acres of potential turtle habitat. Of that, 5,577 acres will be rice, ten acres will be ponds and seasonally wet areas, and 215 acres will be canals. The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA will result in the loss of 1,617 acres of potential turtle habitat. Of that, 1,541 acres will be rice, four acres will be ponds and seasonally wet areas, and 72 acres will be canals. Based solely upon the fact that more rice habitat is in Sutter's Permit Area than any of the other permit areas, issuance of the proposed ITP to Sutter will result in the majority of the direct effects to the turtle.

In order to mitigate the loss of potential turtle habitat resulting from the issuance of the proposed ITP to the City, 1006.25 acres of potential foraging/nesting/basking/overwintering habitat will be created/managed on the Conservancy's managed marsh reserves. In addition, 2012.5 acres of rice foraging habitat will be preserved/managed in perpetuity. In order to mitigate the loss of potential turtle habitat resulting from the issuance of the proposed ITP to Sutter, 933.4 acres of potential foraging/nesting/basking habitat will be created/managed on the Conservancy's managed marsh reserves. In addition, 1866.8 acres of rice foraging habitat will be preserved/managed in perpetuity. In order to mitigate the loss of potential turtle habitat resulting from the issuance of the proposed ITP to the MAPPOA, 247.9 acres of potential foraging/nesting/basking habitat will be created/managed on the Conservancy's managed marsh reserves. In addition, 495.8 acres of rice foraging habitat will be preserved/managed in perpetuity. Conservancy upland reserves in proximity (less than 2 km) to turtle aquatic habitat may provide additional nesting and overwintering opportunities for the turtle.

Issuance of the ITP to the Conservancy will have both negative and positive direct effects on the turtle. Examples of possible negative effects on the turtle include, but are not limited to disturbance by construction activities on Conservancy reserves or the loss of rice habitat due to conversions to other habitat types. However, the Conservancy's overall effects on the turtle will be almost overwhelmingly positive. Rice production practices on Conservancy lands should prove to be more "turtle friendly" and more importantly, the development of the managed marsh component of the reserve system should provide foraging, nesting, overwintering, and basking opportunities for the turtle. Most importantly, habitat reserves will provide upland habitat opportunities for the turtle. Upland habitat is currently limited for the turtle in the Basin and most of that which currently exists is regularly disturbed.

The turtle will likely benefit from conservation measures proposed by the Permittees for the snake. For example, dewatering of habitat prior to construction should encourage turtles to seek suitable aquatic habitat elsewhere. Limiting construction activities in suitable snake habitat to between May 1 and October 1 should help minimize turtle mortalities, since they often overwinter underground in a manner similar to the snake. Avoidance of Fisherman's Lake by at least 61 m (200 ft.) will help protect much of the turtle's aquatic and upland habitat there. The NBHCP's connectivity assurances will also help preserve connectivity for the turtle throughout the Basin.

Predation by domestic and feral animals, increased vehicular strikes, and the additional closure of canals (see snake discussion) are three potential indirect effects of the proposed action. Under the Proposed Action, habitat reserves would be located at least 244 m (800 ft.) from urban areas and areas designated for urban development (unless a smaller distance is approved by CDFG and the Service on a case-by-case basis) and a buffer at least 9 m (30 ft.) 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 and predation should be reduced, although not eliminated.

Overall, the proposed action is likely to benefit the turtle. Most of the potential habitat that will be lost as a result of the proposed action is rice. Its value to the turtle is questionable because there is little associated upland habitat for basking, nesting, and other upland-associated activities. In contrast, the Conservancy's system of managed marsh reserves will provide both suitable aquatic and upland habitat. Additionally, the Conservancy's upland reserves may provide potential turtle nesting and overwintering habitat. Therefore, the proposed action should increase the viability of the turtle in the Basin. As stated earlier, the Basin currently supports limited numbers of turtles. Because of the wide range of both the subspecies and species, the limited number of turtles in the Basin, and the limited amount of good-quality turtle habitat in the Basin, the Natomas Basin is probably not essential to the turtle's recovery.

Western Spadefoot Toad

Issuance of the proposed ITP's to the City, Sutter, and the Conservancy may result in limited direct effects to the western spadefoot toad. Although the toad has not been observed in the proposed action's action area, it has been observed approximately six miles from the Basin and suitable toad habitat may exist in the Basin (including the City's and Sutter's Permit Areas).

Development activities proposed by the Land Use agencies may result in the disturbance, injury, or deaths of toads. Toads could be injured or killed by construction activities when they are

crushed by construction equipment in their aquatic and upland habitats. Low frequency noises caused by heavy earth moving equipment could cause toads to come out of dormancy and emerge at inappropriate times. This disturbance could then indirectly result in the harm or death of toads. For example, vibrations could cause toads to emerge from their burrows during the summer months, thereby making them more susceptible to dessication.

As stated in the species descriptions, the amount of suitable toad habitat in the Basin was not quantified. The Basin is not known to contain substantial numbers of vernal pools and is not considered essential to recovery; the proposed action's action area is not included in the Service's proposed vernal pool critical habitat rule (67 FR 59884). The toad has not been identified in the Basin. Based upon estimates derived from data gathered in Sacramento County (see Environmental Baseline for details), the Basin's 886 acres of grasslands would contain at the most 21.3 acres of vernal pools. Additionally, some portion of the Basin's 96 acres of ponds and seasonally wet areas may be suitable for the toad. However, this estimate greatly overestimates the actual amount of vernal pool habitat in the Basin because grasslands in the Basin have a lower density of vernal pools than surrounding areas of Sacramento County (see Environmental Baseline) and most of the ponds and seasonal wetlands do not have correct hydrology to support covered vernal pool species. Of the total 886 acres of grasslands in the Basin, 427 are in the City's Permit Area and 134 are in Sutter's Permit Area (Table 14). This equates to 10.2 and 3.26 acres of vernal pools in the City and Sutter's Permit Areas, respectively. Of the total 96 acres of ponds and seasonally wet areas in the Basin, seven are in the City's Permit Area, four are in the MAP Permit Area, and ten are in Sutter's Permit Area (Table 14). Most of the potential habitat that will be lost is located in the eastern portion of the City's Permit Area. As stated in the species description, ponds and seasonally wet areas acreages almost certainly vastly overestimate the actual potential toad in the Basin, as most of the ponds and seasonally wet areas do not have the correct hydrology to support vernal pool-associated species. Ponds and seasonally wet areas located in the MAP Permit Area do not have the correct hydrology to support the toad and no other potential habitat is located within 76 m (250 ft.) of any of MAP's proposed action activities (Service 2002).

Issuance of the proposed ITP to the Conservancy may have some minimal detrimental effects on the toad on Conservancy reserve lands, if the toad ever occurs in the Basin and Conservancy reserve lands. Toads could be disturbed, harmed, or killed during construction and maintenance activities on Conservancy lands, especially managed marsh reserves and surrounding grasslands. Toads could be crushed in their burrows by heavy equipment, disturbed by heavy equipment, disturbed by people performing vegetation management, etc. The Conservancy's managed marsh reserves will likely provide some potential habitat for the toad. However, the species appears to be more successful in seasonally inundated environments such as vernal pools. Managed marsh reserves will likely not have large amounts of wetlands seasonally flooded in the winter; therefore, the toad will not benefit greatly from the reserves. However, the Conservancy has proposed to periodically consult with toad experts and investigate the possibility of creating potential toad habitat on its reserves.

The Land Use Agencies did not propose take avoidance and minimization measures specific to the toad because of the low likelihood of the species to occur in the Basin. However, they will require toad surveys. If toads are found, the Land Use Agencies will require the developers to consult with the Wildlife Agencies on how to avoid and minimize take. In addition, the toad may benefit from conservation measures proposed for other vernal pool Covered Species. For

example, if vernal pool crustaceans are identified, developers will be required to minimize their impacts according to current Service guidelines. Therefore, the toad may indirectly benefit from conservation measures proposed for the crustaceans. If toads are found in the Basin, the Conservancy will be required to provide suitable habitat for them on its reserves. Therefore, any take of toads is both minimized and mitigated.

Two potential indirect effects of the proposed action include predation and vehicular strikes. For example, the number of toads killed or injured by automobiles will likely increase as automobile traffic increases in the Basin. Vehicle mortalities has been identified as a source of toad mortalities. Under the Proposed Action, habitat reserves would be located at least 244 m (800 ft.) from urban areas and areas designated for urban development (unless a smaller distance is approved by CDFG and the Service on a case-by-case basis) and a buffer at least 9.1 m (30 ft.) 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 toads (if toads eventually inhabit the Basin) from vehicle strikes and predation should be reduced, although not eliminated.

Overall, the proposed action is likely to have little to no adverse effects on the toad. The toad has not been observed in the Basin and is very unlikely to occur there (K. Fuller, pers. comm. to C. Aubrey, 2003). In addition, very little suitable toad habitat exists in the Basin. In the remote event toads are discovered in the Basin, the Permittees would implement measures to minimize and mitigate the take. For example, a breeding pond could be avoided altogether or not filled until after the pond had dried and toads no longer inhabited it. Therefore, the proposed action will not impact the species as a whole.

California Tiger Salamander

The closest known occurrence of California tiger salamander is 11 miles from the proposed action's action area. There is a limited amount of potential habitat in the proposed action's action area and it seems likely that the Service would know if salamanders occurred there. The species is readily identifiable when its breeding ponds are surveyed and the species' presence in an area is often discovered when individuals are struck by cars while migrating to the breeding ponds. The Service is also unaware of any likely natural dispersal mechanism that would cause the salamander to occur in the proposed action's action area in the future. Therefore, issuance of the proposed ITPs to the City, Sutter, and Conservancy is not likely to result in any effects to the salamander.

In the very unlikely event salamanders are discovered in the future, the Permittees have proposed conservation measures to minimize and mitigate the impacts. For example, if a developer discovers salamanders on their property, they must consult with the Service to determine how to avoid and minimize impacts to the species. The Conservancy would then be required to provide salamander-conducive habitat in its reserves.

Sanford's Arrowhead

Issuance of the proposed ITP to the City, MAPPOA, Sutter and the Conservancy may adversely affect Sanford's arrowhead. Although the species has not been identified in the proposed action's action area, it is known to occur less than one mile from the Basin and suitable habitat exists in the proposed action's action area. The most likely potential source of direct effects to Sanford's

arrowhead is the death of plants during activities that alter the habitat of Sanford's arrowhead. For example, if a canal inhabited by the species is filled, plants inhabiting the canal could be crushed or otherwise destroyed by construction equipment. Additionally, the plants could be adversely affected if the canal is filled so that habitat is destroyed or sufficient water is no longer provided to the plants.

Issuance of the proposed ITP to the City is likely to destroy 124 acres of potential Sanford's arrowhead habitat (Table 14). Of this, seven acres are ponds and seasonally wet areas and 117 acres are canals. Issuance of the proposed ITP to Sutter is likely to destroy 225 acres of potential Sanford's arrowhead habitat. Of this, ten acres are ponds and seasonally wet areas and 215 acres are canals. The effects of issuance of the ITP for the MAP project were analyzed in the January 16, 2002, biological opinion for that project. Issuance of the proposed ITP to the MAPPOA is likely to destroy 76 acres of potential Sanford's arrowhead habitat. Of this, four acres are ponds and seasonally wet areas and 72 acres are canals. Although canals are considered potential habitat, water diversions and channel alteration have been listed as a threat to Sanford's arrowhead (CNDDB 2001, Tibor 2001).

Issuance of the proposed ITP to the Conservancy is likely to have both detrimental and beneficial effects on Sanford's arrowhead. Plants could be destroyed during the construction and management of reserves. For example, tractors working in an enhancement area could crush plants. The main potential beneficial effect is the construction of the Conservancy's system of managed marsh reserves. The overall effect of these reserves will likely be to improve habitat conditions for Sanford's arrowhead in the Basin. Reserves acquired as mitigation for development resulting from issuance of the ITPs (both together and separately) to the Land Use Agencies will provide a greater amount of potential habitat than currently exists in the Basin. As a result of destroying 124 acres of potential Sanford's arrowhead habitat in the City's Permit Area, the Conservancy (using mitigation fees) will develop 1006.2 acres of managed marsh habitat. As a result of destroying 225 acres of potential Sanford's arrowhead habitat in Sutter's Permit Area, the Conservancy (using mitigation fees) will develop 933.4 acres of managed marsh habitat. As a result of destroying 76 acres of potential Sanford's arrowhead habitat in MAPPOA's Permit Area, the Conservancy (using mitigation fees) will develop 247.9 acres of managed marsh habitat. In addition to the large increase in potential habitat, the habitat on managed marsh reserves is superior because it will not be subject to the relatively intense management practices that occur in the Basin's drainage and irrigation canals.

In addition to acquiring fees for the development of managed marsh reserves, the Land Use Agencies have proposed to minimize the effects of the proposed action on Sanford's arrowhead by conducting pre-development surveys and relocating any potentially affected plants (another potential direct effect related to development). The Conservancy will monitor any populations identified on Conservancy reserves and manage for their conservation.

The most likely potential indirect effect of the proposed action is the closing or reduced usage of drainage and irrigation canals in response to development. This potential effect is addresses in the snake's indirect effects section.

Overall, issuance of the proposed ITPs to the Permittees should have little to no adverse effects on the Sanford's arrowhead. The species has not been observed in the Basin. However, if the species later colonizes the Basin, it is likely to benefit from the proposed action because the

project will result in a net increase of suitable habitat. In the event the species is identified in an area to be developed, the plan allows for their transplantation prior to disturbance. The Conservancy's managed marsh reserves will provide high-quality habitat for the species that is not subject to the adverse impacts of practices such as devegetating irrigation and drainage canals. Because the proposed action is likely to have little adverse effects on Sanford's arrowhead locally, particularly as the species is not known to occur in the basin, and the range of the species is far greater than the immediate project area, the proposed action is not expected to adversely affect the species as a whole.

Delta Tule Pea

Delta tule pea is not known to occur within 20 miles of the action area and the Service does not believe that it is likely that the species will naturally occur in the action area during the future. The Service also does not anticipate any indirect effects to the species in the Basin or in general. Therefore, issuance of the proposed ITPs to the City, Sutter, and MAPPOA is not likely to result in adverse effects to the delta tule pea. In the very unlikely event the delta tule pea does eventually colonize the Basin, the Land Use Agencies have proposed to allow plants to be transplanted from development sites to minimize impacts to the affected individuals. The Conservancy's managed marsh reserves will provide high-quality habitat for the species that is not prone to management practices such as devegetating canals.

Cumulative Effects

Cumulative effects are the effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal Action under review (50 C.F.R. 402.02).

The NBHCP anticipates that a total of 17,500 acres of development will occur in the Basin during the 50-year life of the ITPs. This is based upon the extent, amount, and location of future development outlined in the City's, Sutter's, and Sacramento County's adopted Land Use Plans as well as the level of development contemplated in adopted community plans and specific plans. Section 3.1.4 of the Final NBHCP EIR/EIS discusses a number of development projects including, but not limited to, Alleghany Properties, Northern Territories/Brookfield Land Company, expansion of the Sacramento International Airport, and a private university proposal, that are outside of the development analyzed in the NBHCP and could potentially occur in the Basin in the future. However none of these potential development projects is reasonably certain to occur in the action area of the plan. These areas are not planned for urban development under adopted land use plans; (2) these areas are located outside of the City's Sphere of Influence, the City of Sacramento city limits and Sacramento County's Urban Services Boundary; (3) no urban services (such as sewage) are available to serve development; and (4) other significant legal and planning hurdles must be overcome before development could proceed. In addition, neither the City, Sutter, nor Sacramento County are considering proposed amendments to their general plans that would result in additional urban development in the Natomas Basin. Therefore, none of the projects are either "reasonably certain to occur" within the action area of the plan. Detailed discussion can be found in Section 3.1.4 of the Final NBHCP EIR/EIS.

In addition, any activities in the Natomas Basin that result in take of listed animal species would require either: (1) a Section 10 permit, a federal action, which in turn will trigger formal

consultation under Section 7 with the Service; or (2) a Section consultation with the service if a federal action is involved. The giant garter snake is known to occur in many of the areas identified above, so that incidental take authorization under Section 7 or Section 10 would likely be required before projects in these areas could legally proceed. Therefore, these activities would not be considered cumulative effects.

Both the City and Sutter have agreed to restrict development in the Basin to that outlined in the NBHCP (17,500 acres [including MAP]). If either the City or Sutter does decide to pursue additional development, they agree that prior to approval of any related rezoning or prezoning, such future urban development shall trigger a reevaluation of the Plan and ITPs, a new effects analysis, potential amendments and/or revisions to the Plan and ITPs, a separate conservation strategy and issuance of ITPs to the City and/or Sutter for that additional development. Failure to meet these requirements, could trigger suspension or revocation of their ITP(s).

Threatened Vernal Pool Fairy Shrimp, Endangered Vernal Pool Tadpole Shrimp, Threatened Colusa Grass, Threatened Slender Orcutt Grass, Endangered Sacramento Orcutt Grass, Midvalley Fairy Shrimp, Western Spadefoot Toad, California Tiger Salamander, Legenere, and Boggs Lake Hedge-Hyssop

Changes in land use practices could adversely affect Covered vernal pool species. For example, if an area used for grazing contains vernal pools, conversion of that area to row crops, vineyards, or orchards could result in the destruction of those vernal pools and the organisms that inhabit them. However, considering that most of the species have not been observed in the action area and that the amount of potential habitat in the Basin is very limited, this cumulative effect is likely to have little to no effect on the species by itself, or when added to the proposed action. If a listed vernal pool animal species occurs in the vernal pools, federal action would be required to authorize incidental take, so that these effects would not be considered cumulative to the current action.

Threatened Giant Garter Snake

Because the snake inhabits wetlands and adjacent uplands in highly modified portions of the proposed action's action area, the Service anticipates that a wide range of activities will affect the species. An undetermined number of future land use conversions and routine agricultural practices (including those by RD 1000 and Natomas Mutual) may convert or otherwise alter habitat or disturb, kill, or injure snakes. Ongoing agricultural activities also affect the giant garter snake and other Covered Species, and are largely not subject to an obvious bosection 7 consultation. Some agriculture, such as rice farming, can provide valuable seasonal foraging and upland habitat for Covered Species. Although rice fields and agricultural waterways can provide habitat for the snake and other Covered Species, agricultural activities such as waterway maintenance, weed abatement, rodent control, and discharge of contaminants into wetlands and waterways can degrade habitat and increase the risk of mortality (Service 1999). Maintenance of agricultural waterways can also eliminate or prevent establishment of snake habitat, eliminate food resources, and can fragment existing habitat and prevent dispersal of giant garter snakes and wetland-dependent species (Service 1999). In addition, crop rotation within the Natomas Basin causes shifts in habitat availability, quantity, quality, and affects the presence of giant garter snakes. Although these agricultural practices can result in take of the snake, the snake has persisted despite these activities for decades and therefore, its baseline is probably not being

further depressed by these activities. In addition, in the event take resulted from these activities, it would violate the Act unless authorized through an incidental take statement or an incidental take permit, both of which would trigger Section 7 consultation.

Other cumulative effects include: (1) fluctuations in acres of aquatic habitat due to water management or acres of ricelands in production; (2) diversion of water; (3) levee repairs; (4) riprapping or lining of canals and stream banks; (5) dredging, clearing, and spraying to remove vegetation from irrigation canals; (6) discing, mowing, clearing and spraying vegetation adjacent to canals and streams; (7) use of burrow fumigants on levees and other potential upland refugia; (8) contaminated runoff from agriculture and urbanization; and (9) use of herbicides and pesticides in ricelands and other agricultural lands that provide snake habitat, or which are adjacent to and/or drain into snake habitat. As with the agricultural activities discussed in the preceding paragraph, the snake has persisted despite these activities for decades and therefore, its baseline is probably not being further depressed by these activities.

Non-agricultural flood control and maintenance activities which can result in snake mortality and degradation of habitat include levee construction, stream channelization, and the riprapping of streams and canals (Service 1999); most of these activities would require permits from the U.S. Army Corps of Engineers and trigger a section 7 consultation with the Service. The interior drainage channels within the Natomas Basin are subject to fewer impacts than banks along riverine systems, but plans exist for a possible relocation of a reach of the Natomas East Main Drainage Canal. Similar to flood control and maintenance activities, these activities would likely not be considered cumulative effects because they would require a Section 404 Clean Water Act Permit and therefore, would require section 7 formal consultation if they were likely to adversely affect the snake.

Threatened Valley Elderberry Longhorn Beetle

No potential cumulative effects within the proposed action's action area are anticipated because habitat for this species is limited in the basin, the species is not known to occur in the basin and additional growth beyond planned development covered by the NBHCP not reasonably certain to occur within the action area.

Swainson's Hawk

Infection of hawks by West Nile virus could potentially occur within the Central Valley population of Swainson's hawks (M. Bradbury, pers. comm. to Craig Aubrey, 2002). However, the Service is not aware of Swainson's hawks being infected by the disease in California, although the species has been observed carrying the virus (Centers for Disease Control and Prevention, 2002). Infection of hawks from this disease is not reasonably certain to occur within the action area of the plan and is not considered a cumulative effect. In addition, according to Bradbury (2002, pers. comm. to Craig Aubrey), the more individuals there are, the more likely there will be enough immune individuals to allow the population to recover and the larger the area they cover, the less chance any individual will come into contact with the disease. The proposed action should have no affect on the ability of the hawk to either avoid or recover from the virus. The proposed action is not anticipated to reduce the number of hawks and the amount of habitat being converted is very small in comparison to the total amount of habitat in the vicinity of the proposed action.

Aleutian Canada Goose

A potential cumulative effect of the proposed action specific to the goose is the use of herbicides and pesticides in ricelands and other agricultural lands that provide goose foraging habitat. However, as discussed in the analysis of direct and indirect effects, the goose is only an occasional visitor to the Basin and the Basin represents only a small portion of the goose's winter range in California. Therefore, such use should have little effect on the goose, by itself or when added to the effects of the proposed action.

Burrowing Owl

Potential cumulative effects of the proposed action specific to the owl are: (1) the use of herbicides and pesticides in agricultural lands that provide owl foraging and nesting habitat; and (2) use of rodenticides in lands that provide owl burrowing habitat. However, neither of these activities is likely to reduce the viability of the owl in the Basin or as a whole, either alone or when added to the effects of the proposed action. The burrowing owl has persisted in the basin despite the use of herbicides, pesticides, and rodenticides for decades in the Basin, and the use of these substances is not expected to increase in the future.

Loggerhead Shrike

A potential cumulative effect of the proposed action specific to the shrike is use of herbicides and pesticides in agricultural lands that provide shrike foraging habitat. Herbicides and pesticides have been used for decades in the Basin; their use is not anticipated to increase or to affect the viability of the shrike in the Basin or as a species. The species is not considered to be subject to any identifiable threat in the State and populations in the western United States appear to be stable. Shrikes are common throughout lowland California and the Natomas Basin represents a very small fraction of the species' range. There for, such use is should have little effect on the shrike, by itself, or when added to the effects of the proposed action.

Tricolored Blackbird

A potential cumulative effects of the proposed action specific to the tricolor is the use of herbicides and pesticides in agricultural lands that provide tricolor nesting and foraging habitat. Because of the similarity of habitat requirements with the snake, many of the cumulative effects described for the snake such as agricultural activities will also affect the tricolor. As with the snake, these cumulative effects should not affect the viability of the tricolor in the Basin or as a species, by itself or when added to the effects of the plan. Herbicides and pesticides have been used for decades in the Basin; their use is not anticipated to increase.

White-Faced Ibis

A potential cumulative effect of the proposed action specific to the ibis is the use of herbicides and pesticides in agricultural lands that provide ibis wintering and foraging habitat. In addition, because of the similarity of habitat requirements with the snake, many of the cumulative effects described for the snake will also affect the ibis. Although agricultural pesticide use is a concern, ibis appear to be performing well in Central Valley rice fields, and rice fields represent the majority of available ibis habitat in the Basin. These cumulative effects, by themselves, or when

added to the effects of the proposed action, are not expected to reduce the viability of the ibis in the Basin or as a species.

Bank Swallow

A potential cumulative effects of the proposed action specific to the bank swallow the is use of herbicides and pesticides in agricultural lands that provide swallow foraging habitat. Herbicides and pesticides have been used for decades in the Basin; their use is not anticipated to increase. Furthermore, the swallow is only an occasional visitor to the Basin. Therefore, the cumulative effects of such use on the bank swallow are not, by themselves, or when added to the effects of the proposed action, expected to affect the viability of the swallow in the Basin or as a species.

Northwestern Pond Turtle

A potential cumulative effects of the proposed action specific to the turtle is the use of herbicides and pesticides in agricultural lands that provide turtle foraging habitat. In addition, because of the similarity of habitat requirements with the snake, many of the cumulative effects described for the snake such as canal maintenance will also affect the turtle. The turtle has probably persisted despite the use of herbicides and pesticides in the Basin for decades; their use is not anticipated to increase. The Basin currently provides limited habitat for the turtle and the species ranges from Washington to Mexico. The subspecies ranges from Washington to just south of the project area. Therefore, these cumulative effects, by themselves, or when added to the effects of the proposed action, are not expected to affect the viability of the turtle in the Basin or as a species.

Sanford's Arrowhead

One potential cumulative effect of the proposed action on Sanford's arrowhead is water transfers. In 2003, a number of northern California water districts (including Natomas Mutual) sold water to water districts in southern California. According to news accounts (e.g., Hacking 2003) southern California water districts are currently negotiating for long-term water transfer contracts. If entered into, these contracts could result in a decrease in the amount or suitability of potential Sanford's arrowhead habitat because less water would be available in the proposed action's action area for the species. However, since the basin area provides little potential habitat for this species and the the species has not been observed in the proposed action's action area, future water transfers, by water districts in the basin, either by themselves or when added to the proposed action, are not likely to affect the viability of the Sanford's arrowhead in the Basin or as a species.

Delta Tule Pea

Because the species has neither been observed in nor is expected to occur in the proposed action's action area, no cumulative effects are anticipated.

Conclusion

<u>Federally-Listed, Proposed and Delisted Species</u>

After reviewing the current status of the endangered vernal pool tadpole shrimp, threatened giant garter snake, threatened valley elderberry longhorn beetle, threatened vernal pool fairy shrimp,

endangered Sacramento Orcutt grass, threatened Colusa grass, threatened slender Orcutt grass, proposed California tiger salamander, and delisted Aleutian Canada goose, the environmental baselines for the action area, and the effects of the proposed action, including all measures proposed to avoid, minimize, and mitigate adverse effects and the cumulative effects, it is the Service's biological opinion that the issuance of incidental take permits to the City, Sutter, MAPPOA, and Conservancy pursuant to section 10(a)(1)(B) of the Act is not likely to jeopardize the continued existence of the vernal pool tadpole shrimp, giant garter snake, valley elderberry longhorn beetle, vernal pool fairy shrimp, Sacramento Orcutt grass, Colusa grass, slender Orcutt grass, California tiger salamander, and Aleutian Canada goose for the reasons stated in the "Effects of the Proposed Action" section of this opinion. Critical habitat has not been designated for the giant garter snake, therefore none will be affected. Critical habitat for the valley elderberry longhorn beetle exists to the south/southeast of the project area, but will not be affected. Proposed critical habitat for the listed vernal pool Covered Species (vernal pool tadpole shrimp, vernal pool fairy shrimp, Colusa grass, Sacramento Orcutt grass, and slender Orcutt grass) does not include the proposed action's action area; therefore, none will be affected. As stated earlier, the effects of the issuance of an ITP to MAP were previously analyzed in the January 16, 2002, biological opinion for that project (Service File # 1-1-01-F-0302) and the Service issued an ITP to MAPPOA on February 21, 2002 (TE036473-0). The MAP biological opinion is incorporated by this reference into this opinion.

Other Covered Species - Not Federally-Listed as Threatened or Endangered

After reviewing the current status of the unlisted Swainson's hawk, white-faced ibis, bank swallow, tricolored blackbird, northwestern pond turtle, loggerhead shrike, burrowing owl, western spadefoot toad, midvalley fairy shrimp, Boggs Lake hedge-hyssop, legenere, Sanford's arrowhead, and delta tule pea, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's opinion that should any of these species be listed in the future, issuing incidental take permits that include these species as covered species and that authorize the incidental take of the currently unlisted animal covered species should they become listed during the term of the permits, is not likely to jeopardize the continued existence of the Covered Species. Summaries of the components of the proposed NBHCP that were particularly instrumental in supporting the Service's conclusion with regard to currently unlisted Covered Species are provided in the effects section of this opinion. As stated earlier, the effects of the issuance of an ITP to MAP were previously analyzed in the January 16, 2002, biological opinion for that project (Service File # 1-1-01-F-0302) and the Service issued an ITP to MAPPOA on February 21, 2002 (TE036473-0). The MAP biological opinion is incorporated by this reference into this opinion.

Incidental Take Statement

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened animal species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which

include, but are not limited to, breeding feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement. Sections 7(b)(4) and 7(o)(2) of the Act do not apply to listed plant species.

Ten of the fifteen covered animal species addressed in this biological opinion are neither proposed for listing nor currently listed. As such, there is no take prohibitions under the Act for these animal species at the time of writing. The Incidental Take Statement for the unlisted animal Covered Species and the Permit shall become effective as to each currently unlisted Covered animal Species if and when it becomes are listed under the Act during the terms of the permits.

The proposed NBHCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the proposed HCP, together with terms and conditions described in the associated IA and any section 10(a)(1)(B) permit or permits issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) to apply. If the Permittees fail to adhere to these terms and conditions, protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed NBHCP, associated reporting requirements, and provisions for disposition of dead or injured animals are described in the NBHCP and its accompanying section 10(a)(1)(B) permits.

The proposed action's action area is known to be occupied or visited by ten of the Covered animal Species. Although the valley elderberry longhorn beetle, bank swallow, midvalley fairy shrimp, western spadefoot toad, and California tiger salamander are not known from the action area, all but the California tiger salamander have potential to be observed there in the future. The amount of take (killing, harming, harassing, wounding) of most animal species, described below, is anticipated to be low, due to the effectiveness of the take avoidance and minimization measures. Many of the species are highly mobile and/or only frequent the Natomas Basin during the winter and are expected to avoid direct effects. Indirect effects are best interpreted as the extent of habitat lost or degraded by the covered activity.

The section 10 (a) incidental take permit would also constitute a Special Purpose permit under 50 CFR 21.27 for the take of any Covered animal Species which may be listed as threatened or endangered under the Endangered Species Act during the permit term and which are also protected by the MBTA, in the amount and/or number and subject to the terms and conditions specified in the 10(a) permit. The MBTA special purpose permit would become effective upon the listing of the species under the ESA. Any such take shall not be in violation of the MBTA of 1918, as amended (16 U.S.C. 703-712). The Special Purpose permit shall be valid for a period of three years from the effective date, provided the section 10(a) permit remains in effect for such period. The Special Purpose permit shall be renewed, provided the permittees remain in compliance with the terms of the 10(a) permit and the Implementation Agreement. Each such

renewal shall be valid for the maximum period of time allowed by 50 CFR 21.27 or its successor at the time of renewal.

Incidental take associated with the MAP project was authorized in the 10(a)(1)(B) permit for that project. Therefore, incidental take related to that project and mitigation reserve lands acquired as a result of that project are not included in this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Service so that they become binding conditions of any grant or permit issued to the City, Sutter, and Conservancy, as appropriate, for the exemption in section 7(o)(2) to apply. The Service has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Service (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Service must track the progress of the action and its impact on the species as specified in the Incidental Take Statement. [50 CFR §402.14(i)(3)]

Amount or Extent of Take

The City and Sutter propose to permanently convert a maximum of 15,517 acres in accordance with the requirements, guidelines, measures, and processes described in the NBHCP and NBHCP IA. Additionally, if all of the 15,517 acres are developed, at least 7,758.5 acres of reserve lands are expected to be established under the NBHCP; take incidental to management of reserves is expected. The disturbance and conversion of land is expected to result in incidental take of the Covered Species. Incidental take that will result from the City's, Sutter's, and the Conservancy's habitat conversion and acquisition, restoration, and management of reserve lands will be authorized through the section 10(a)(1)(B) permit for the NBHCP. Take will be in the form of disturbance, harm, and kill. It is expected that individuals of the Covered Species will or may be taken during development as well as other activities addressed above and in the NBHCP.

The Service expects that incidental take of various Covered Species will be difficult to detect or quantify for the following reasons: (1) the aquatic nature of certain of the organisms and their relatively small body size make the finding of a dead specimen unlikely; (2) the secretive nature of certain of the species makes detection or quantification difficult; (3) species abundance may be masked by seasonal fluctuations in numbers or other causes; (4) species occur in habitats that make them difficult to detect; (5) the species use of the habitat is intermittent. Therefore, the Service estimates that take of covered animal species associated with loss of up to 15,517 acres of Covered Species habitat will be affected as a result of issuing the proposed ITPs to the City and Sutter.

The Service expects that incidental take of various Covered Species on the Conservancy's reserves will be difficult to detect or quantify for the following reasons: (1) the aquatic nature of certain of the organisms and their relatively small body size make the finding of a dead specimen unlikely; (2) the secretive nature of certain of the species makes detection or quantification difficult; (3) species abundance may be masked by seasonal fluctuations in numbers or other causes; (4) species occur in habitats that make them difficult to detect; (5) the species use of the habitat is intermittent. Due to the difficulty in quantifying the number of Covered Species that will be taken as a result of the proposed management actions (described in SSMPs and effects

section), the Service is quantifying take incidental to the project as the number of acres of habitat that could be affected for the Covered Species as a result of the action. Therefore, the Service estimates that take of covered animal species associated with restoration/enhancement/perpetual management of up to 7,758.5 acres of Covered Species habitat (excluding mitigation lands for MAP) will be affected as a result of issuing the proposed ITP to the Conservancy.

Listed and Proposed Species

Threatened Vernal Pool Fairy Shrimp and Endangered Vernal Pool Tadpole Shrimp

The Service anticipates that an undetermined number of vernal pool fairy shrimp and vernal pool tadpole shrimp could be taken over a 50-year period as a result of this proposed action. Vernal pool crustaceans could be killed, harmed, or disturbed during construction activities, implementation of the proposed conservation measures, or management on the Conservancy's reserves. We estimate that the City will incidentally take up to all vernal pool tadpole shrimp and vernal pool fairy shrimp via the disturbance associated with construction activities on 10.2 acres of vernal pools and up to 7 acres of ponds and seasonally wet areas within the City's Permit Area and in association with off-site infrastructure improvements. We estimate that Sutter will incidentally take up to all vernal pool tadpole shrimp and vernal pool fairy shrimp via the disturbance associated with construction activities on 3.3 acres of vernal pools and up to 10 acres of ponds and seasonally wet areas within Sutter's Permit Area and in association with off-site infrastructure improvements. We estimate that the Conservancy will incidentally take up to all vernal pool tadpole shrimp and vernal pool fairy shrimp via the disturbance associated with management activities on up to 0.9 acres per year of vernal pool habitat within the Conservancy's Permit Area. These estimates vastly overstates the actual amount of take likely to occur because it assumes: (1) that all ponds and seasonally wet areas are suitable vernal pool habitat; (2) that the applicants always fill pools; (3) that the applicants always mitigate according to the programmatic ratios; (4) that the Conservancy will disturb one percent of its pools per year to the point of taking all vernal pool fairy shrimp and vernal pool tadpole shrimp inhabiting them; and (5) that all of the Conservancy's pools are occupied by the vernal pool fairy shrimp and/or vernal pool tadpole shrimp. The number of vernal pool crustaceans affected by implementation of the proposed action should be very small, as the amount of potential vernal pool crustacean habitat is very limited throughout the proposed project's action area. No proposed critical habitat will be affected, as none is located in the proposed project's action area.

Threatened Giant Garter Snake

The Service anticipates that an undetermined number of giant garter snakes could be taken over a 50-year period as a result of this proposed action. Take associated with initial construction activities will be in the form of harm, disturbance, and injury or death. We estimate that the City will incidentally take two (2) giant garter snakes via mortality and ten (10) giant garter snakes via the disturbance associated with construction activities on 1,094 acres of snake habitat within the City's Permit Area and in association with off-site infrastructure improvements. Snake take values are based upon data gathered at Colusa National Wildlife Refuge (Service 1999). We estimate that Sutter will incidentally take thirteen (13) giant garter snakes via mortality and fifty-one (51) giant garter snakes via the associated with construction activities on 5,802 acres of snake habitat within Sutter's Permit Area and in association with off-site infrastructure improvements.

Sutter's development activities will kill no more than two (2) snakes per year. Snake take values are based upon data gathered at Colusa National Wildlife Refuge (Service 1999).

Giant garter snakes are likely to inhabit certain lands acquired for reserves and will thus be subject to harm and disturbance from restoration/enhancement/management activities. While minimization measures will be implemented, it is possible that giant garter snakes will be found within reserve lands during these activities. We estimate that the Conservancy will incidentally take three (3) giant garter snakes via mortality and eighteen (18) giant garter snakes via the disturbance associated with construction activities on the Conservancy's 1,939.7 acres of managed marsh reserves. The Conservancy's managed marsh construction activities will kill no more than two (2) snakes per year. We estimate that the Conservancy will incidentally take twenty-one (21) giant garter snakes per year via the disturbance associated with perpetual management activities on the Conservancy's 1,939.7 acres of managed marsh reserves. In addition, we estimate that the Conservancy will incidentally take (primarily in the form of disturbance) forty-one (41) giant garter snakes via the disturbance associated with activities on the Conservancy's 3879.3 acres of rice reserves.

Snake take values are based upon data gathered at Colusa National Wildlife Refuge (Service 1999). Colusa National Wildlife Refuge was chosen as a reference point because at the time the data were gathered, Colusa likely had snake habitat most similar to that of the Basin, when compared to Gilsizer Slough and Badger Creek. The Service would expect that, given the extensive marsh habitats at Gilsizer and Badger Creek, snake densities observed there would be greater than those expected in the Basin and therefore, they would not be good indicators of the density of snakes in the Basin. Although some snake populations have been estimated for the Basin, these populations are based upon linear estimates (i.e., snakes/unit length) and are therefore, not appropriate for estimating the number of snakes affected by the proposed project, which is expressed in the amount of habitat lost in acres (i.e., snakes/unit area).

Threatened Valley Elderberry Longhorn Beetle

The Service anticipates that an undetermined number of beetles could be taken over a 50-year period as a result of this proposed action. Take could be in the form of disturbance, harm, or death. The applicants did not conduct surveys for the beetle in the proposed Permit Areas. However, the amount of potential beetle habitat affected is expected to be very limited, as the Basin is not known for large stands of elderberry shrubs. We estimate that the City will incidentally take up to all valley elderberry longhorn beetles via the disturbance associated with elderberry shrub relocation activities on 6 acres of oak groves, 24 acres of riparian area, and 10 acres of tree groves in the City's Permit Area and in association with off-site infrastructure improvements. We estimate that Sutter will not take any beetles, as no potential habitat is expected to be in Sutter's proposed Permit Area. It is anticipated that some beetles inhabiting elderberry shrubs in riparian restoration areas of reserve lands could be subject to some direct and indirect effects from reserve management activities. Therefore, we estimate that the Conservancy will incidentally take up to all valley elderberry longhorn beetles inhabiting 25 elderberry shrubs per year via the disturbance associated with management activities on 1,939.7 acres of managed marsh in the Conservancy's Permit Area. This amount of take is based upon the amount of potential elderberry shrub habitat that will be lost, the average density of elderberry plant plantings outlined in the Beetle Guidelines (5 elderberry shrubs per 1800 square feet), an assumption that one elderberry shrub is located on each acre of potential beetle habitat to be lost,

and an assumption that ten percent of the Conservancy's elderberry shrubs will be affected per year. It greatly overestimates the actual amount of take likely to occur, as the Conservancy should not be conducting a significant amount of activity that will affect the beetle and not all elderberry shrubs, if any, will be occupied by the beetle. No critical habitat will be affected, as none is located in the proposed project's action area.

California Tiger Salamander

No salamanders are known or expected to occur within the proposed project's action area; therefore, no incidental take is expected from the issuance of the proposed ITP's to the City and Sutter.

Unlisted Species

Swainson's Hawk

The Service anticipates that an undetermined number of Swainson's hawks could be taken over a 50-year period as a result of this proposed action. Take associated with initial construction activities and the Conservancy's management activities (including monitoring) will be in the form of harm or disturbance. Loss of prey species and foraging habitat and disturbances to nesting and foraging hawks from construction are anticipated forms of take. Due to the difficulty in quantifying the number of hawks that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential nesting and foraging habitat that will be impacted due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 8,785 acres of potential hawk foraging habitat will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in 6,925 acres of potential foraging habitat and 40 acres of nesting habitat becoming unsuitable for the hawk. Issuance of the proposed ITP to Sutter is likely to result in 1,860 acres of potential foraging habitat becoming unsuitable for the hawk. Estimates of foraging and nesting habitat lost overestimate the actual take associated with the action. As stated in the "Effects of the Proposed Action" section, most of the potential nesting habitat lost (24 acres) will not actually be developed because it is in the Fisherman's Lake buffer area. Loss of potential nesting and foraging habitat is not expected to result in injury or mortality of hawks because hawks can both forage and nest in other habitat that is available in and around the Basin. Also, Swainson's nest trees will not be removed while young are still in the nest. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion/restoration/ enhancement of up to 1,939.7 acres of potential hawk habitat when the Conservancy's upland reserves are created. Conservancy management practices will also potentially disturb hawks on 2,909.5 acres of managed marsh uplands, upland, and fallowed rice reserves.

Aleutian Canada Goose

The Service anticipates that an undetermined number of Aleutian Canada geese could be taken over a 50-year period as a result of this proposed action. Due to the difficulty in quantifying the number of geese that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential foraging habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 12,863 acres of potential goose foraging habitat will become unsuitable as a result

of the proposed action. Issuance of the proposed ITP to the City is likely to result in 5,656 acres of potential foraging habitat becoming unsuitable for the goose. Issuance of the proposed ITP to the Sutter is likely to result in 7,207 acres of potential foraging habitat becoming unsuitable for the goose. Estimating take in terms of foraging habitat lost overestimates the actual take, as geese will very likely forage in other areas available in the Basin and will not incur any significant disruption of their normal behavioral patterns. And, the goose is only a transient visitor to the Basin. Loss of its foraging habitat in the Basin should have very little impact on the goose. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of up to 1,939.6 acres of potential goose habitat when the Conservancy's managed marsh reserves are created. Conservancy management practices will also potentially distrub geese on 7,758.5 acres of managed marsh, upland, and rice reserves.

Burrowing Owl

The Service anticipates that an undetermined number of owls could be taken over a 50-year period as a result of this proposed action. Take will likely occur in the form of harm, disturbance and mortality. Due to the difficulty in quantifying the number of owls that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential foraging and nesting habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 685 acres of potential foraging habitat and 235.2 miles of canals will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in 450 acres of potential foraging habitat and 19.3 miles of canals becoming unsuitable for the owl. Issuance of the proposed ITP to the Sutter is likely to result in 235 acres of potential foraging habitat and 33.6 miles of canals becoming unsuitable for the goose. Estimating take in terms of foraging habitat lost overestimates the actual take, as burrowing owls will likely forage in other areas available in the Basin, especially when that foraging habitat is not located near any burrowing owl burrows, and will not incur any significant disruption of their normal behavioral patterns. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of undetermined amount of potential foraging habitat when the Conservancy's managed marsh reserves are created. Conservancy management practices will also potentially disturb owls on 5,818.9 acres of managed marsh and upland reserves.

Loggerhead Shrike

The Service anticipates that an undetermined number of shrikes could be taken over a 50-year period as a result of this proposed action. Take will likely occur in the form of mortality, harm, and disturbance. Due to the difficulty in quantifying the number of shrikes that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 8,550 acres of potential shrike habitat will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in 6,473 acres of potential habitat becoming unsuitable for the shrike. Issuance of the proposed ITP to the Sutter is likely to result in 2,077 acres of potential habitat becoming unsuitable for the shrike. Estimating take in terms of foraging habitat lost overestimates the actual take, as the shrike will very likely forage in other areas available in the Basin and will not incur any significant disruption of its normal behavioral patterns. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of undetermined amount

of potential shrike habitat when the Conservancy's managed marsh and upland reserves are created. Conservancy management practices will also potentially disturb shrikes on 3,879.25 acres of managed marsh and upland reserves.

Tricolored Blackbird

The Service anticipates that an undetermined number of tricolored blackbirds could be taken over a 50-year period as a result of this proposed action. Take will likely occur in the form of harm and disturbance. Due to the difficulty in quantifying the number of tricolors that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 373 acres of potential nesting habitat and 13,341 acres of potential foraging habitat will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in148 acres of potential nesting habitat and 6,083 acres of potential foraging habitat becoming unsuitable for the tricolor. Issuance of the proposed ITP to the Sutter is likely to result in 225 acres of potential nesting habitat and 7,341 acres of potential foraging habitat becoming unsuitable for the tricolor. Estimating take in terms of foraging habitat lost overestimates the actual take, as the tricolor will very likely forage in other areas available in the Basin, especially when the foraging habitat is not near any tricolor nesting colonies, and will not incur any significant disruption of its normal behavioral patterns. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of undetermined amount of potential tricolor habitat when the Conservancy's managed marsh and upland reserves are created. Conservancy management practices will also potentially disturb tricolors on up to 7,758.5 acres of managed marsh upland, and rice reserves.

White-Faced Ibis

The Service anticipates that an undetermined number of white faced ibis could be taken over a 50-year period as a result of this proposed action. Take expected to be in the form of disturbance or harm, through loss of aquatic foraging habitat, primarily rice fields, canals and ditches. Due to the difficulty in quantifying the number of ibis that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 6,899 acres of potential ibis habitat will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in 1,097 acres of potential habitat becoming unsuitable for the ibis. Issuance of the proposed ITP to the Sutter is likely to result in 5,802 acres of potential habitat becoming unsuitable for the ibis. Estimating take in terms of foraging habitat lost overestimates the actual take, as the ibis will very likely forage in other areas available in the Basin and will not incur any significant disruption of its normal behavioral patterns. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of undetermined amount of potential ibis habitat when the Conservancy's managed marsh and upland reserves are created. Conservancy management practices will also potentially disturb ibis on 7,758.5 acres of managed marsh, upland, and rice reserves.

Bank Swallow

The Service anticipates that an undetermined number of bank swallows could be taken over a 50-year period as a result of this proposed action. Take expected to be in the form of harm or disturbance through loss of rarely-used foraging habitat. Due to the difficulty in quantifying the number of swallows that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 13,797 acres of potential foraging habitat will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in 6,231 acres of potential foraging habitat becoming unsuitable for the swallow. Issuance of the proposed ITP to the Sutter is likely to result in 7,566 acres of potential foraging habitat becoming unsuitable for the swallow. Estimating take in terms of foraging habitat lost overestimates the actual take, as the bank swallow will very likely forage in other areas available in the Basin and will not incur any significant disruption of its normal behavioral patterns. In addition, there is there is very little potential nesting habitat near the Natomas Basin and therefore, the number of swallows that forage in the Basin should be small. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of undetermined amount of potential swallow foraging habitat when the Conservancy's managed marsh and upland reserves are created. Conservancy management practices will also potentially disturb shrikes on 7,758.5 acres of managed marsh, upland, and rice reserves.

Northwestern Pond Turtle

The Service anticipates that an undetermined number of pond turtles could be taken over a 50-year period as a result of this proposed action. Take expected to be in the form of harm, disturbance and killing, through construction-related loss of habitat and management of the Conservancy's reserves. Due to the difficulty in quantifying the number of turtles that will be taken as a result of the proposed action, the Service is quantifying take incidental to the project as the number of acres of potential habitat that will become unsuitable due to direct or indirect effects as a result of the action. Therefore, the Service estimates that 6,920 acres of potential turtle habitat will become unsuitable as a result of the proposed action. Issuance of the proposed ITP to the City is likely to result in 1,118 acres of potential habitat becoming unsuitable for the turtle. Issuance of the proposed ITP to the Sutter is likely to result in 5,802 acres of potential habitat becoming unsuitable for the turtle. Estimating take in terms of habitat lost overestimates the actual take, as much of the Basin's available turtle habitat is rice and as stated in the "Effects of the Proposed Action," has limited value to the turtle. Issuance of the proposed ITP to the Conservancy is likely to result in the conversion of undetermined amount of potential shrike habitat when the Conservancy's managed marsh and upland reserves are created. Conservancy management practices will also potentially disturb turtles on 7,758.5 acres of managed marsh and rice reserves.

Western Spadefoot Toad and Midvalley Fairy Shrimp

The Service anticipates that an undetermined number of toads and midvalley fairy shrimp could be taken over a 50-year period as a result of this proposed action. Toads and midvalley fairy shrimp could be killed, harmed, or disturbed during construction activities, implementation of the proposed conservation measures, or management on the Conservancy's reserves. The number of

toads and midvalley fairy shrimp affected by implementation of the proposed action should be very small, as the amount of potential suitable habitat is very limited throughout the proposed project's action area. We estimate that the City will incidentally take up to all western spadefoot toads and midvalley fairy shrimp via the disturbance associated with construction activities on 10.2 acres of vernal pools and up to seven acres of ponds and seasonally wet areas within the City's Permit Area and in association with off-site infrastructure improvements. We estimate that Sutter will incidentally take up to all western spadefoot toads and midvalley fairy shrimp via the disturbance associated with construction activities on 3.3 acres of vernal pools and up to 10 acres of ponds and seasonally wet areas within Sutter's Permit Area and in association with off-site infrastructure improvements. We estimate that the Conservancy will incidentally take up to all western spadefoot toads and midvalley fairy shrimp via the disturbance associated with management activities on up to 0.9 acres per year of vernal pool habitat within the Conservancy's Permit Area. This estimate vastly overstates the amount of actual take likely to occur because it assumes: (1) that all ponds and seasonally wet areas are suitable vernal pool habitat; (2) that the applicants always fill pools; (3) that the applicants always mitigate according to the programmatic ratios; (4) that the Conservancy will disturb one percent of its pools per year to the point of taking all western spadefoot toads and midvalley fairy shrimp inhabiting them; and (5) that all of the Conservancy's pools are occupied by the western spadefoot toads and/or midvalley fairy shrimp. The number of midvalley fairy shrimp and western spadefoot toads affected by implementation of the proposed action should be very small, as the amount of potential vernal pool habitat is very limited throughout the proposed project's action area and neither one of the species has ever been observed in the Basin.

Effect of the Take

Listed and Proposed Species

For the reasons stated in the analyses of the proposed project's effects, the Service determined that the level of incidental take specified in the effects of the action and this Incidental Take Statement is not likely to result in jeopardy to the endangered vernal pool tadpole shrimp, threatened giant garter snake, threatened valley elderberry longhorn beetle, threatened vernal pool fairy shrimp, or proposed California tiger salamander. The Service has also determined that the proposed action will not destroy or adversely modify either valley elderberry longhorn beetle critical habitat or proposed vernal pool fairy shrimp and vernal pool tadpole shrimp critical habitat.

Unlisted Species

For the reasons stated in the analyses of the proposed project's effects, the Service determined that the level of incidental take specified in the effects of the action and this Incidental Take Statement is not likely to result in jeopardy to the following unlisted Covered Species should they become listed: Swainson's hawk, white faced ibis, bank swallow, tricolored blackbird, northwestern pond turtle, loggerhead shrike, burrowing owl, western spadefoot toad, and midvalley fairy shrimp. The Service has determined that the specified level of incidental take is not likely to result in jeopardy to the Aleutian Canada goose, should it become re-listed.

Reasonable and Prudent Measures and Terms and Conditions

The NBHCP and accompanying agreements identify anticipated adverse effects to all Covered Species likely to result from the proposed actions, and the specific measures and levels of species and habitat protection that are necessary and appropriate to minimize those adverse effects. All of the conservation and management measures in the NBHCP and accompanying agreements, together with the terms and conditions identified in the associated Implementing Agreement, are hereby incorporated by reference as reasonable and prudent measures, and terms and conditions for this incidental take statement pursuant to 50 CFR 402.14(I). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the Applicants fail to adhere to these terms and conditions, the protection of the Permit, and section 7(o)(2), may lapse. The amount or extent of the incidental take anticipated under the NBHCP, associated reporting requirements, and provisions for disposing of dead or injured animals, are as described in the Permit.

Further, the following terms and conditions apply to the Service after issuance of the Permit:

1. The Service shall provide technical assistance to the Applicants throughout the term of the Permit.

2. The Service shall, at all time of listing of any of the currently unlisted Covered Species, reinitiate consultation on the proposed actions in accordance with 50 C.F.R. 402.16.

3. The Service shall ensure that any section 7 consultation with other Federal agencies regarding development activities covered by the permits are consistent with the conservation goals and objectives of the NBHCP, and that any such activities reviewed under section 7 and the Act shall provide levels of listed species protection consistent with the protection afforded under the NBHCP.

Reporting Requirements

The Conservancy shall provide the Wildlife Agencies with an Implementation Annual Report by May 1 of each calendar year the NBHCP is in effect. The Implementation Annual Report shall include all of the information identified in Chapter VI of the NBHCP, including the results of the Compliance Monitoring implemented by City, Sutter and the Conservancy and the Biological Effectiveness Monitoring implemented by the Conservancy during the prior calendar year, and provide an accounting of all mitigation fees collected, all urban development permits issued, and all mitigation lands acquired.

The City and Sutter shall each implement the annual report requirements described at Chapter VI of the NBHCP. In addition, at any other time during the Permit terms, City and Sutter, at the request of the Service or CDFG, shall provide within thirty (30) days, to the Wildlife Agencies additional information relevant to implementation of the NBHCP reasonably available to the City and Sutter.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service has the following conservation recommendations:

1. Pursue available funding sources to enhance and enlarge the habitat preservation program of the MAPHCP and the NBHCP. Priority areas for acquisition should have known giant garter snake presence. In addition, known giant garter snake corridors should be acquired to enhance population exchange.

2. Investigate methods whereby phased agricultural practices can be employed on upland parcels such that maximum net benefits are achieved for Swainson's hawks, burrowing owls, loggerhead shrikes, tricolored blackbirds, and bank swallows.

Reinitiation-closing statement

This concludes formal consultation and conference on the issuance of a Permit to implement the NBHCP. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals that the agency action may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Incidental Take Statement provided in this conference opinion for unlisted Covered Species does not become effective until the unlisted Covered Species is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. If you have any questions regarding this consultation, please contact Wayne S. White, Field Office Supervisor, at (916) 414-6600.

Enclosures

Literature Cited

Abrams, L. and R. S. Ferris. 1960. Illustrated flora of the Pacific states: Washington, Oregon, and California. Vol. IV. Bignoniaceae to Compositae: bignonias to sunflowers. Stanford, California: Stanford University Press. 732 p.

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

Alexander, D. G. and R. A. Schlising. 1997. Vernal pool ecology and vernal pool landscape management as illustrated by rare macroinvertebrates and vascular plants at Vina Plains Preserve, Tehama County, California. Redding, California: Unpublished report to the California Department of Fish and Game. 139 p.

American Ornithologist Union. 1998. Check-List of North American Birds. 7th ed. Washington D.C.: American Ornithologist Union. 829 p.

Anderson, J. D. 1968. Comparison of the food habits of *Ambystoma macrodactylum sigillatum*, *Ambystoma macrodactylum croceum*, and *Ambystoma tigrinum californiense*. Herpetologica 24(4):273-284.

Anderson, P. R. 1968. The reproductive and developmental history of the California tiger salamander [MSc thesis]. Fresno, California: Fresno State College. 82 p.

Anderson, W. C. and R. E. Dunzan. 1978. DDE residues and eggshell thinning in loggerhead shrikes. Wilson Bull. 90:215-220.

Asbrik, S. 1976. Studies in the Breeding Biology of the Sand Martin *Riparia riparia* (L.)(Aves) in Artifical Nest Sites. Vidensk, Dansk, Naturh. Foren. 139:147-177.

Austin, C. and H. B. Shaffer. 1992. Short-, medium-, and long-term repeatability of locomotor performance in the tiger salamander, *Ambystoma californiense*. Functional Ecology 6:145-153.

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.

Baldwin, P. and S. Baldwin. 1989a. Annual monitoring of rare plants at The Nature Conservancy's Boggs Lake Preserve for 1988. San Francisco, California: Unpublished report to The Nature Conservancy. 22 p.

Baldwin, P. and S. Baldwin. 1989b. Annual monitoring of rare plants at The Nature Conservancy's Boggs Lake Preserve for 1989. San Francisco, California: Unpublished report to The Nature Conservancy.

Baldwin, P. and S. Baldwin. 1991. Report on annual monitoring of rare plants at The Nature Conservancy's Boggs Lake Preserve for 1991. San Francisco, California: Unpublished report to The Nature Conservancy. 19 p.

Barlow, J. C., E. E. Klaas, and J. L. Leny. 1963. Sunning of bank swallow and cliff swallow. Condor 65:483-440.

Barr, C. B. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle *Desmocerus californicus dimorphus* Fisher (Insecta: Coleoptera: Cerambycidae). Sacramento, California: U. S. Fish and Wildlife Service. 134 p.

Barry, S. J. and H. B. Shaffer. 1994. The status of the California tiger salamander (*Ambystoma californiense*) at Lagunita: A 50-year update. Journal of Herpetology 28(2):159-164.

Bechard, M. J. 1982. Effect of vegetative cover on foraging site selection by Swainson's hawk. Condor 84:153-159.

Beedy, E. C. and W. J. Hamilton III. 1997. Tricolored blackbird status update and management guidelines. (Jones & Stokes Associates, Inc. 97-099). Sacramento, California: Prepared for U. S. Fish and Wildlife Service, Portland, Oregon and California Department of Fish and Game, Sacramento, California.

Beedy, E. C. and W. J. Hamilton III. 1999. Tricolored blackbird (*Agelaius tricolor*). In: A. Poole and F. Gill, eds. The Birds of North America. No. 423. Philadelphia, Pennsylvania: The birds of North America. p. 1-24.

Beedy, E. C. and A. Hayworth. 1992. Tricolored blackbird nesting failures in the Central Valley of California: general trends of isolated phenomena? In: D. F. Williams, S. Byrne, and T. A. Rado, eds. Endangered and Sensitive Species of the San Joaquin Valley, California. Sacramento, California: California Energy Commission. p. 33-46.

Beedy, E. C., S. D. Sanders, and D. Bloom. 1991. Breeding status, distribution, and habitat associations of the tricolored blackbird (Agelaius tricolor) 1850-1989. (Jones & Stokes Associates, Inc. 88-187) Sacramento, California. Sacramento, California: Prepared for U. S. Fish and Wildlife Service.

Belk, D. 1977. Zoography of the Arizona fairy shrimps (Crustacea: Anostraca). Journal of the Arizona Academy of Sciences 12:70-78.

Belk, D. and M. Fugate. 2000. Two new *Branchinecta* (Crustacea: Anostraca) from the southwestern United States. The Southwestern Naturalist 45:111-117.

Belknap, H. W. 1957. Observations on the white-faced ibis, *Plegadis chihi*, in Louisiana [Msc thesis. Baton Rouge, Louisiana: Louisiana State University, 89 p.

Behnke, R. J. and R. F. Raleigh. 1978. Grazing and the riparian zone: Impacts and management perspectives. In: R. R. Johnson and J. F. McCormick,eds. Strategies for Protection and Management of Floodplain Wetlands and Other Riparian Ecosystems. Washington, D.C.: United States Department of Agriculture Forest Service General Technical Report WO-12. 410 p.

Benedict, R. A., P. W. Freeman, and H. H. Genoways. 1996. Prairie legacies - mammals. In: F. B. Samson and F. L. Knopf, eds. Prairie conservation: preserving North America's most endangered ecosystem. Covelo, California: Island Press. p. 149-167.

Bent, A. C. 1950. Life Histories of North America wagtails, shrikes, vireos, and their allies. United States National Museum. Bull. 197. 411 p.

Beyer, L. K. 1938. Nest Life of the Bank Swallow. Wilson Bull. 50:122-137.

Bloom, P.H. 1980. The Status of the Swainson's Hawk in California. (Project W-54-R-12, Job Final Report.) California Department of Fish and Game, Nongame Wildlife Investigations. Sacramento, California.

Booser, J. and A. Sprunt. 1980. A literature review and annotated bibliography of the Great Basin/Rocky Mountain population of the white-faced ibis. Portland Oregon: Report prepared by Natl. Audubon Soc. for U. S. Fish and Wildlife Service. 134 p.

Bray, M. P. and D. A. Klebenow. 1988. Feeding ecology of white-faced ibises in a Great Basin Valley, USA. Colonial Waterbirds 11:24-31.

Brode, J. and G. Hansen. 1992. Status and future management of the giant garter snake (*Thamnophis gigas*) within the southern American Basin, Sacramento and Sutter counties, California. Rancho Cordova, California: California Department of Fish and Game, Inland Fisheries Division. 26 p.

Brooks, B. L. and S. A. Temple. 1990. Habitat Availability and Suitability for the Loggerhead Shrike in the upper Midwest. The American Midland Naturalist 123(1):75-83.

Brown, H. A. 1966. Temperature adaptation and evolutionary divergence in allopatric populations of the spadefoot toad, *Scaphiopus hammondii* [dissertation]. Riverside, California: University of California. 118 p.

Brown, H. A. 1967. Embryonic temperature adaptations and genetic compatibility of two allopatric populations of the spadefoot toad, *Scaphiopus hammondii*. Evolution 21(4):742-761.

Brown, R. R. 1940. History of Kings County. Hanford, California: A. R. Cawston. 385 p.

Broyles, P. 1987. A flora of the Vina Plains Preserve, Tehama County, California. Madroño 34:209-227.

Brusca, G. and R. Brusca. 1992. Invertebrates. Sunderland, Massachusetts: Sinauer Associates, Inc. 922 p.

Bull, J. 1985. Birds of New York State. Ithaca, New York: Cornell University Press. 703 p.

Burgess, R. C., Jr. 1950. Development of spade-foot toad larvae under laboratory conditions. Copeia 1950(1):49-51.

Bury, R. B. 1972. Habits and home range of the Pacific pond turtle, *Clemmys marmorata*, in a stream community [dissertation]. Berkeley, California: University of California. 205 p.

_____1986. Feeding ecology of the turtle, *Clemmys marmorata*. Journal of Herpetology 20(4):515-521.

Busbee, E. L. 1977. The effects of dieldrin on the behavior of young loggerhead shrikes. Auk 94:28-35.

Cade, T. J. and C. P. Woods. 1997. Changes in distribution and abundance of the loggerhead shrike. Conservation Biology 11(1):21-31.

Cadman, M. D. 1985. Status report on the loggerhead shrike (*Lanius ludovicianus*) in Canada. Edmonton, Alberta: Committee on the Status of Endangered Wildlife in Canada. 95 p.

California Department of Fish and Game. 1987. California native plant status report: *Gratiola heterosepala*. Sacramento, California: California Department of Fish and Game Endangered Plant Project, California Natural Diversity Data Base, and California Native Plant Society. 4 p.

_____1988. Five year Status Report: Swainson's Hawk. Nongame Bird and Mammal Section. Sacramento, California.

_____1991. Annual report on the status of California state listed threatened and endangered animals and plants. Sacramento, California. 192 p.

_____1992. 1991 Annual report on the status of California State-listed threatened and endangered animals and plants. Sacramento, California.

_____1994. Staff report regarding mitigation for impacts to Swainson's hawk (*Buteo swainsoni*) in the Central Valley of California. Sacramento, California. 14 p.

_____1995. Staff Report on Burrowing Owl Mitigation. Sacramento, California. 8 p.

_____1998. Special animal list. California Natural Heritage Division. 66 p.

California Natural Diversity Database (CNDDB). 2000. Natural Heritage Division, California Department of Fish and Game. State of California.

_____2001. Natural Heritage Division, California Department of Fish and Game. State of California.

_____2002. Natural Heritage Division, California Department of Fish and Game. State of California.

Capen, D. E. 1976. The impact of pesticides on the white-faced ibis [dissertation]. Logan, Utah: Utah State University.

Carr, A. 1952. Handbook of turtles: The turtles of the United States, Canada and Baja California. Cornell University Press, Ithaca, New York, 128 p.

Centers for Disease Control and Prevention [web application]. 2002. Vertebrate Ecology: West Nile Virus. Fort Collins, Colorado: Centers for Disease Control and Prevention. Available: http://www.cdc.gov/ncidod/dvbid/westnile/birdspecies.htm. Accessed: May 8, 2003.

City of Sacramento, Department of Planning and Development, Environmental Services Section. 1996a. Negative Declaration for the Natomas Basin Habitat Conservation Plan (NBHCP). June.

City of Sacramento, Sutter County, Natomas Basin Conservancy, Reclamation District No. 1000, and Natomas Mutual Water Company (NBHCP). 2003. Final Natomas Basin Habitat Conservation Plan. Sacramento, California: Prepared for the U. S. Fish and Wildlife Service and CDFG. April.

Clark, G. M., T. J. Roscoe, M. J. van Ess, and N. Wymer. 1998. Management considerations for small vernal pool preserves - the Phoenix vernal pools. In: C.W. Witham, E.T. Bauder, D. Belk, W.R. Ferren, Jr., and R. Ornduff, eds. Ecology, conservation, and management of vernal pool ecosystems - proceedings from a 1996 conference. Sacramento, California: California Native Plant Society. p. 250-254.

Clevenger, A. P., M. McIvor, D. McIvor, B. Chruszcz, K. Gunson. 2001. Tiger salamander, *Ambystoma tigrinum*, movements and mortality on the Trans-Canada Highway in southwestern Alberta. Canadian Field Naturalist 115:199-204.

Cogswell, H. L. 1977. Water birds of California. Berkeley, California: University of California Press. 399 p.

Cook, L. 1996. Nesting adaptations of tricolored blackbirds (*Agelaius tricolor*) [MSc thesis]. Davis, California: University of California.

Collinge, S. K., M. Holyoak, C. B. Barr, and J. T. Marty. 2001. Riparian habitat fragmentation and population persistence of the threatened valley elderberry longhorn beetle in central California. Biological Conservation 100:103-113.

Corbin, B. and G. Schoolcraft. 1989. *Orcuttia tenuis* species management guide. Unpublished report to Lassen National Forest and Susanville District Bureau of Land Management (BLM). 31 p.

Corbin, B., G. Schoolcraft, A. Sanger, and J. Molter. 1994. *Gratiola heterosepala* conservation strategy. Unpublished report to Lassen National Forest, Modoc National Forest, Alturas Resource Area BLM, and Redding Resource Area BLM. 68 p.

Cornely, J. E., S. P. Thompson, C. J. Henny, and C. D. Littlefield. 1994. Nests and eggs of colonial birds nesting in Malheur Lake, Oregon, with notes on DDE. Northwest Naturalist 74:41-48.

Cramp, S. D., J. Brooks, E. Dunn, R. Gillnor, J. Hill-Craggs, et al. 1988. The Birds of the Western Palcarcte. Volume 5: Tryant Flycatchers to Thrushes. Oxford, United Kingdom: Oxford University Press.

Crampton, B. 1959. The grass genera *Orcuttia* and *Neostapfia*: a study in habitat and morphological specialization. Madroño 15:97-110.

Crampton, B. 1976. Rare grasses in a vanishing habitat. Fremontia 4(3):22-23.

Crase, F. T., and R. W. DeHaven. 1977. Food of nestling tricolored blackbirds. Condor 79:265-269.

Crase, F. T., and R. W. DeHaven. 1978. Food selection by five sympatric California blackbird species. California Fish and Game 64:255-267.

Csuti, B., A. S. Kimerling, T. A. O'Neil, M. M. Shaughnessy, E. P. Gaines, and M. M. P. Huso. 1997. Atlas of Oregon Wildlife. Corvallis, Oregon: Oregon State University Press.

Dahl, T. E. 1990. Wetlands losses in the United States 1780s to 1980s. Washington, D. C.: U. S. Fish and Wildlife Service.

Davy, J. B. 1898. *Stapfia*, a new genus of Meliceae, and other noteworthy grasses. Erythea 6(11):109-113.

Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, and B. R. Euliss. 2001. Effects of Management Practices on Grassland Birds: Swainson's Hawk. Northern Prairie Wildlife Research Center, Jamestown, North Dakota.

DeHaven, R. W. 1975. Plumages of the tricolored blackbird. Western Bird Bander 50:59-61.

DeHaven, R. W. 2000a. Breeding tricolored blackbirds in the Central Valley, California: a quarter-century perspective. Sacramento, California: Unpublished Report to the U. S. Fish and Wildlife Service. 22 p.

DeHaven, R. W. 2000b. Strategy for exit from the dilemma of tricolored blackbirds nesting in dairy silage fields in the San Joaquin Valley, California. Sacramento, California: White paper and briefing statement to the U. S. Fish and Wildlife Service. 2 p.

DeHaven, R. W., F. T. Crase, and P. P. Woronecki. 1975a. Breeding status of the tricolored blackbird, 1969-1972. California Fish and Game 61:166-180.

DeHaven, R. W., F. T. Crase, and P. P. Woronecki. 1975b. Movements of tricolored blackbirds banded in the Central Valley of California, 1965-1972. Bird-Banding 46:220-229.

DeHaven, R. W. and J. A. Neff. 1973. Recoveries and returns of tricolored blackbirds, 1941-1964. Western Bird Bander 48:10-11.

DeSante, D. F., Ruhlen, E. D., Adamany, S. L., Burton, K. M., and S. Amin. 1997. A census of burrowing owls in 1991. J. Raptor Res. Report 9:38-48.

Dileanis, P. D. and S. Sorenson. 1992. Reconnaissance investigation of water quality, bottom sediment, and biota associated with irrigation drainage in the Sacramento National Wildlife Refuge Complex, California, 1988-89. Sacramento, California: U. S. Geological Survey, Water-Resources Investigations Report 92-4036.

Dileanis, P., S. E. Schwartzbach, J. Bennett, and others. 1996. Detailed study of water quality, bottom sediment, and biota associated with irrigation drainage in the Klamath Basin, California and Oregon, 1990-1992. Sacramento, California: U.S. Geological Survey Water-Resources Investigations Report 95-4232.

Dimmitt, M. A. and R. Ruibal. 1980. Environmental correlates of emergence in spadefoot toads (*Scaphiopus*). Journal of Herpetology 14(1):21-29.

Donald, D. B. 1983. Erratic occurrence of anostracans in a temporary pond: colonization and extinction or adaptation to variations in annual weather? Canadian Journal of Zoology 61:1492-1498.

Downton, W. J. S. 1975. The occurrence of C_4 photosynthesis among plants. Photosynthetica 9:96-105.

Driver, E. A. 1981. Caloric value of pond invertebrates eaten by ducks. Freshwater Biology 11:579-581.

Earnst, S. L., L. Neel, G. L. Ivey, and T. Zimmerman. 1998. White-faced ibis in the Great Basin area: a population trend summary, 1985-1997. Office of Migratory Birds, Region 1: U. S. Fish and Wildlife Service (in preparation).

EIP Associates. 1999. UC Merced/UC community planning area 1999 special-status plant survey report. Sacramento, California: Unpublished report to the University of California and Merced County. 66 p.

Ellis, J. H. 1982. The thermal nest environment and parental behavior of harrowing birds, the bank swallow. Condor 84:441–443.

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

Eriksen, C. H. and D. Belk. 1999. Fairy shrimps of California's puddles, pools, and playas. 196 p.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Washington, D.C.: Smithsonian Institution Press. p. 234-239.

Elliot, W. W. 1883. History of Tulare County, California. San Francisco, California.

England, A. S., M. J. Bechard, and C. S. Houston. 1997. Swainson's Hawk (*Buteo swainsoni*). In: the Birds of North America, No. 265 (A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

England, A.S., J.A. Estep, and W.R. Holt. 1995. Nest-Site Selection and Reproductive Performance of Urban-Nesting Swainson's Hawks in the Central Valley of California. J. Raptor Res. 29(3): 179-186.

Estep, J.A. 1984. Diurnal Raptor Eyrie Monitoring Program (Project W-65-R-1, Job No. II-2.0.) California Department of Fish and Game, Nongame Wildlife Investigations. Sacramento, California.

_____1989. Biology, Movements, and Habitat Relationships of the Swainson's Hawk in the Central Valley of California, 1986-87. Calif. Dep. Fish and Game, Nongame Bird and Mammal Sec. Rep.

_____2002. Nesting Swainson's hawks (*Buteo swansoni*) in the Natomas Basin Habitat Conservation Plan Area - 2002 Annual survey results. Sacramento, California: Prepared for the Natomas Basin Conservancy. 39 pp. + appendixes.

_____ and S. Teresa. 1992. Regional Conservation Planning for the Swainson's Hawk (*Buteo swainsoni*) in the Central Valley of California. In: Wildlife 2001: Populations, pages 775-789, D. R. McCullough and R. H. Barrett, editors. Elsevier applied Science, New York.

Evenden, F.G., Jr. 1948. Distribution of the turtles of western Oregon. Herpetologica 4:201-204.

Feaver, P. E. 1971. Breeding pool selection and larval mortality of three California amphibians: *Ambystoma tigrinum californiense* Gray, *Hyla regilla* Baird and Girard and *Scaphiopus hammondi hammondi* Girard [MSc thesis]. Fresno California: Fresno State College. 58 p.

Fisher, R. N., and H. B. Shaffer. 1996. The decline of amphibians in California's Great Central Valley. Conservation Biology 10(5):1387-1397.

Fitch, H. S. 1941. Geographic variation in garter snakes of the genus *Thamnophis sirtalis* in the Pacific coast region of North America. American Midland Naturalist 26:570-592.

Fraser, J. D. and D. R. Luukkonen. 1986. The loggered shrike. In: R.L. De Silvestro, ed. Audubon Wildlife Report-1986. New York, New York: National Audubon Society. p. 933-941.

Frayer, W. E., D. D. Peters, and H. R. Pywell. 1989. Wetlands of the California Central Valley: Status and trends. Portland, Oregon: U. S. Fish and Wildlife Service.

Freer, V. M. 1977. Colony Structure and Function in Bank Swallow, *Riparia riparia* L. [dissertation]. Binghamton, New York: State University of New York.

Freer, V. M. 1979. Factors Affecting Site Tenacity in New York Bank Swallows. Bird-Banding 50:349-357.

Fugate, M. L. 1992. Speciation in the fairy shrimp genus *Branchinecta* (Crustacea: Anostraca) from North America [dissertation]. Riverside, California: University of California.

Gallagher, S. P. 1996. Seasonal occurrence and habitat characteristics of some vernal pool Branchiopoda in northern California, U.S.A. Journal of Crustacean Biology 16(2):323-329.

Garrison, B. A., J. M. Humprey, and S. A. Laymon. 1987. Bank swallow distribution and nesting ecology on the Sacramento River, California. West. Birds 18:71-76.

Gilliom, R. J. 1999. Pesticides in the nation's water resources. Washington D.C.: U. S. Geological Survey. Water Environment Federation Briefing Series Presentation. Capitol Building. March 19, 1999.

Gilpin, M. E. and M. E. Soule. 1986. Minimum viable populations: processes of species extinction. In: M. E. Soule, ed. Conservation biology: the science of scarcity and diversity. Sunderland, Massachusetts: Sinauer Associates, Inc. p. 19-34.

Goodman, D. 1987a. The demography of chance extinction. In: M. E. Soule, ed. Viable populations for conservation. Cambridge, Great Britain: Cambridge University Press. p. 11-34.

Goodman, D. 1987b. How do any species persist? Lessons for conservation biology. Conservation Biology 1:59-62.

Griggs, F. T. 1977a. Rare plant status report: *Orcuttia californica* Vasey var. *inaequalis* (Hoover) Hoover. Sacramento, California: California Native Plant Society. 3 p.

Griggs, F. T. 1977b. Rare plant status report: *Orcuttia greenei* Vasey. Sacramento, California: California Native Plant Society. 4 p.

Griggs, F. T. 1977c. Rare plant status report: *Orcuttia mucronata* Crampton. Sacramento, California: California Native Plant Society. 3 p.

Griggs, F. T. 1980. Population studies in the genus *Orcuttia* (Poaceae) [dissertation]. Davis, California: University of California. 98 p.

Griggs, F. T. 1981. Life histories of vernal pool annual grasses. Fremontia 9(1):14-17.

Griggs, F. T., and S. K. Jain. 1983. Conservation of vernal pool plants in California. II. Population biology of a rare and unique grass genus *Orcuttia*. Biological Conservation 27:171-193.

Grinnell, J. and A. H. Miller. 1944. The Distribution of the Birds of California. Pacific Coast Avifauna No. 27.

Gross, A. D. 1942. Bank Swallow. In: A. C. Bert, ed. Histories of North America flycatchers, larks, swallows, and their allies. U.S. National Museum. Bull. 179:400-424.

Hacking, H. [web application]. 2003. Longer-term water sales are being considered. Chico, California: Chico Enterprise record. Available: http://www.chicoer.com/articles/2003/03/16/news/news2.txt. Accessed: March 19, 2003.

Hamilton, W. J. III. 1998. Tricolored blackbird itinerant breeding in California. Condor 79:218-226.

Hamilton, W. J. III, L. Cook, and R. Grey. 1995. Tricolored blackbird project 1994. Portland, Oregon: Unpublished report prepared for U. S. Fish and Wildlife Service.

Hamilton, B., L. Cook, and K. Hunting. 1999. Tricolored blackbird 1999 status report. Davis California: Department of Environmental Science and Policy, University of California. Prepared for California Department of Fish and Game, Sacramento, California.

Hamilton, W. J. III. 2000. Tricolored blackbird 2000 survey and population analysis. Portland, Oregon: Unpublished report prepared for U. S. Fish and Wildlife Service.

Hancock, J. A., J. A. Kushlan, and M. P. Kahl. 1992. Storks, ibises, and spoonbills of the world. London, United Kingdom: Academic Press.

Hansen, E. 2002. Year 2001 investigations of the giant garter snake (*Thamnophis gigas*) in the greater American Basin: Sutter County, California. Sacramento, California: Prepared for the Sacramento Area Flood Control Agency. 18 p. + appendixes + figs.

Hansen, R. W. 1980. Western aquatic garter snakes in central California: an ecological and evolutionary perspective [Ma thesis]. Fresno, California: California State University. 78 p.

Hansen, R. W. and R. L. Tremper. 1993. Amphibians and reptiles of central California. California Natural History Guides. Berkeley, California: University of California Press.

Hansen, G. E. 1988. Review of the status of the giant garter snake (*Thamnophis couchi gigas*) and its supporting habitat during 1986-1987. Final report for California Department of Fish and Game Contract C-2060. Unpublished. 31 p.

Hansen, G. E. and J. M. Brode. 1980. Status of the giant garter snake *Thamnophis couchi gigas* (Fitch). Rancho Cordova, California: California Department of Fish and Game, Inland Fisheries Endangered Species Program Special Publication 80-5. 14 p.

Hansen, G. E. and J. M. Brode. 1993. Results of relocating canal habitat of the giant garter snake (*Thamnophis gigas*) during widening of State Route 99/70 in Sacramento and Sutter

counties, California. Final Report for Caltrans Interagency Agreement 03E325 (FG7550)(FY87/88-91-92). Unpublished. 36p.

Hansen, R. W. and G. E. Hansen. 1990. *Thamnophis gigas* (giant garter snake) reproduction. Herpetological Review 21(4):93-94.

Harrison, C. 1984. A field guide to the nests, eggs, and nestlings of North America birds. Brattleloro, Vermont: Stephen Greene Press.

Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing owl. A. Poole and F. Gill, eds. The Birds of North America. No. 61. Philadelphia, Pennsylvania: The Academy of Natural Sciences of Philadelphia. 20 p.

Haug, E. A. and L. W. Oliphant. 1990. Movements, activity patterns, and habitat use of burrowing owls in Saskatchewan. J. Wildl. Manage. 54(1):27-35.

Hay, O. P. 1908. The fossil turtles of North America. Washington, D.C.: Carnegie Institute of Washington.

Hayes, M. P. and J. Warner. 1985. *Rana catesbeiana* (bullfrog) food. Herp Review 16(4):109.

Hayes, M. P., and M. R. Jennings. 1986. Decline of ranid frog species in western North America: are bullfrogs (*Rana catesbeiana*) responsible?. Journal of Herpetology 20:490-509.

Helm, B. P. 1998. Biogeography of eight large branchiopods endemic to California. In: C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren, Jr., and R. Ornduff, eds. Ecology, conservation, and management of vernal pool ecosystems. Sacramento, California: California Native Plant Society. p. 124-139.

Helm, B. P. and W. Fields. 1998. Aquatic macro-invertebrate assemblages occurring in selected vernal pools on the Agate Desert and nearby sites in Jackson County, Oregon. Portland, Oregon: Oregon Natural Heritage Program.

Henny, C. J., and G. B. Herron. 1989. DDE, selenium, mercury, and white-faced ibis reproduction at Carson Lake, Nevada. Journal of Wildlife Management 53:1032-1045.

Henny, C. J., L. J. Blus, and G. S. Hulse. 1985. Trends and effects of organochlorine residues on Oregon and Nevada wading birds, 1979-1983. Colonial Waterbirds 8:117-128.

Hilty, S. L. and W. L. Brown. 1986. A Guide to the birds of Colombia. Princeton, New Jersey: Princeton University Press. 836 p.

Hitchcock, A. S. 1934. New species, and changes in nomenclature of grasses of the United States. American Journal of Botany 21:127-139.

Hitchcock, A. S. and A. Chase. 1971. Manual of the grasses of the United States. Volume I. New York, New York: Dover Publications, Inc. 569 p.

Hjertaas, D. G. 1984. Colony Site Selection in bank swallow [MSc thesis]. Saskatoon, Saskatchewan: University of Saskatchewan.

Hobson, K. A. and S. G. Sealy. 1987. Forging, scavenging, and other behavior of swallow on the ground. Wilson Bull. 99:111-116.

Holland, D. C. 1985. An ecological and quantitative study of the western pond turtle (*Clemmys marmorata*) in San Luis Obispo County, California [MSc thesis]. Fresno, California: California State University Fresno. 181 p.

_____1991. A synopsis of the ecology and status of the western pond turtle (*Clemmys marmorata*) in 1991. Report prepared for the U. S. Fish and Wildlife Service, National Ecology Research Center. 146 p.

_____1992. A synopsis of the distribution and current status of the western pond turtle (*Clemmys marmorata*) in Oregon. Report prepared for Oregon Department of Fish and Wildlife. 41 p. + tables and figures.

_____1994. The western pond turtle: habitat and history. Portland, Oregon: Bonneville Power Administration. DOE/BP #62137-1.

Holland, D. C., M. P. Hayes, and E. McMillan. 1990. Late summer movement and mass mortality in the California tiger salamander (*Ambyostoma californiense*). Southwestern Naturalist 35:217-220.

Holland, R. F. 1978. The geographic and edaphic distribution of vernal pools in the Great Central Valley, California. California Native Plant Society, Special Publication 4:1-12.

Holland, R. F. 1984. Endangerment status of *Legenere limosa* (Greene) McVaugh in California. Orangevale, California. Unpublished report. 46 p.

Holland, R.F. 1987. What constitutes a good year for an annual plant? Two examples from the Orcuttieae. In: T.S. Elias, ed. Conservation and management of rare and endangered plants. Sacramento, California: California Native Plant Society. p. 329-333.

Holland, R. F. 1998. Great Valley vernal pool distribution, photorevised 1996. In: C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren Jr. and R. Ornduff, eds. Ecology, conservation, and management of vernal pool ecosystems--Proceedings from a 1996 conference. Sacramento, California: California Native Plant Society. p.71-75.

Holland, R. F. and S. Jain. 1978. Vernal pools. In: M. E. Barbour and J. Major, eds. Terrestrial vegetation of California. New York, New York: John Wiley and Sons. p. 515-533.

Holland, R. F. and S. Jain. 1988. Vernal pools. In: M. E. Barbour and J. Major, eds. Terrestrial vegetation of California, new expanded edition. Sacramento, California: California Native Plant Society, Special Publication Number 9. p. 515-533.

Holway, D. A. 1995. Distribution of the Argentine ant (*Linepithema humile*) in Northern California. Conservation Biology 9:1634-1637.

Hoover, R. F. 1936b. Notes on California grasses. Madroño 3:227-230.

Hoover, R. F. 1937. Endemism in the flora of the Great Valley of California [dissertation]. Berkeley, California: University of California. 76 p.

Hoover, R. F. 1940. Observations on Californian plants - I. Leaflets of Western Botany 2:273-274.

Humphrey, J. M. and B. A. Garrison. 1987. The status of bank swallow populations on the Sacramento River - 1986. California Department of Fish and Game, Wildlife Management Division Administration 87-1.

Hunter, S. A., D. Brauning, R. E. Chambers, and A. L. Kennell. 1995. Status of the loggerhead shrike in Pennsylvania. In: Yosef and F. E. Lohrer, eds. Shrike (Laniidae) of the World: Biology and Conservation. Proceedings of the Western Foundation of Vertebrate Zoology 6(1):78-80.

Huxel, G. R. 2000. The effect of the Argentine ant on the threatened valley elderberry longhorn beetle. Biological Invasions 2:81-84.

Huxel, G. R., Collinge, S. K. Modeling viability of the valley longhorn beetle: the influence of habitat loss, fragmentation and restoration. Ecological investigations (in review).

Ingraham, M., G. P. Nabhan, and S. Buchmann. 1996. Impending Pollination Crisis Threatens Biodiversity and Agriculture. Tropinet 7:1.

Ivey, G. L. and D. J. Severson. 1984. White-faced ibis nesting in the southern San Joaquin Valley of California. Condor 86:492-493.

Ivey, G. L., M. A. Stern, and C. Carey. 1988. An increasing white-faced ibis population in Oregon. Western Birds 19:105-108.

Jain, S. K. 1978. Local dispersal of *Limnanthes* nutlets: an experiment with artificial vernal pools. Canadian Journal of Botany 56:1995-1997.

Jennings, M. R. 1987. Annotated check list of the amphibians and reptiles of California, second revised edition. Southwestern Herpetologists Society, Special Publication 3:1-48.

Jennings, M.R. 1988. Natural history and decline of native ranids in California. *In* Proceedings of the conference on California Herpetoloty (H. F. DeLisle, P. R. Brown, B. Kaufman, and B. M. McGurty, eds.) p. 61-72, Southwestern Herpetologists Society.

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptiles species of special concern in California. California Department of Fish and Game Final Report.

Jennings, M. R. 1998. California Natural Diversity Data Base field notes. Unpublished data.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game.

Kaneko, K. D. 1972. Nesting of the white-faced ibis (*Plegadis chihi*) on Utah Lake [MSc thesis]. Provo, Utah: Brigham Young University. ? p.

Katibah, E. F., K. J. Dummer, and N. Nedeff. 1981. Evaluation of the riparian vegetation resource in the Great Central Valley of California using remote sensing techniques. Technical Papers of the American Society of Photogammetry. ASP-ACSM Fall Tech Mtg., San Francisco, Sept. 9-11 and Honolulu Sept 14-16, 1981. p. 234-246.

Katibah, E. F. 1984. A Brief History of Riparian Forests in the Central Valley of California. In: Warner, R. E. And K. M. Hendrix, eds. California riparian systems: ecology, conservation, and productive management. Berkeley, California: University of California Press. p. 23-29.

Katibah, E. F., K. J. Dummer, and N. Nedeff. 1984. Current condition of riparian resources in the Central Valley of California. In: Warner, R. E. and K. M. Hendrix, eds. California riparian systems: ecology, conservation, and productive management. Berkeley, California: University of California Press. p. 314-321.

Kaufman, K. 1996. Lives of North American Birds. Boston, Massachusetts: Haughton Mifflin Co. 675 p.

Kauffman, J. B. and W. C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications - a review. Journal of Range Management 37(5):430-438.

Kauffman, J. B., W.C. Krueger, and M. Vavra. 1983. Impacts of cattle on streambanks in northeastern Oregon. Journal of Range Management 36(6):683-685.

Kaye, T., W. Messinger, S. Massey, and R. Meinke. 1990. *Gratiola heterosepala*: inventory and breeding system evaluation. Lakeview, Oregon: Unpublished report to the U.S. Bureau of Land Management. 22 p.

Keeler-Wolf, T., D. R. Elam, K. Lewis, and S.A. Flint. 1998. California vernal pool assessment preliminary report. California Department of Fish and Game, Sacramento, California.

Keeley, J. E. 1998. C_4 photosynthetic modifications in the evolutionary transition from land to water in aquatic grasses. Oecologia 116:85-97.

Kelchlin, E. P. 1997. Habitat selection and reproductive success of white-faced ibis in the Carson River Basin, Nevada. Final Progress Report for the 1996 Season, Louisiana State University, School of Forestry, Wildlife and Fisheries, Baton Rouge, Louisiana.

Keller, C. E., S. A. Keller, and T. C. Keller. 1986. Indiana birds and their haunts. Bloomington, Indiana: Indiana University Press. 206 p.

King, K. A., D. L. Meeker, and D. M. Swineford. 1980. White-faced ibis populations and pollutants in Texas, 1969-1976. Southwestern Naturalist 25:225-240.

Kotter, B. L. 1970. An ecological natural history of the white-faced ibis (*Plegadis chihi*) in northern Utah [MSc Thesis]. Salt Lake City, Utah: University of Utah. 125 p.

Krapu, G. L. 1974. Foods of breeding pintails in North Dakota. Journal of Wild. Manag. 38(3):408-417.

Kuhnen, K. 1985. On pair formation in sand martin, *Riparia riparia*. J. Ornithal 126:1-3.

Laymon, S.A., B.A. Garrison, and J.M. Humphrey. 1988. Historic and current status of the bank swallow in California, 1987. Calif. Dep. of Fish and Game, Wildl. Manage. Div., Admin. Rep. No. 88-2. 35pp. + append.

Launer, A. and C. Fee. 1996. Biological Research on California Tiger Salamander at Stanford University. Annual Report, August 8, 1996.

Lethaby, N. 1996. Identification of tree, northern rough-winged and bank swallow. Birding 28:111-116.

Lockington, W. N. 1879. Notes on some reptiles and batrachia of the Pacific coast. The American Naturalist 13(12):780-784.

Loredo, I. and D. van Vuren. 1996. Reproductive ecology of a population of the California tiger salamander. Copeia 1996(4):895-901.

Loredo, I., D. Van Vuren and M. L. Morrison. 1996. Habitat use and migration behavior of the California tiger salamander. Journal of Herpetology 30(2):282-285.

Lovich, J. and K. Meyer. 2002. The western pond turtle (*Clemmys marmorata*) in the Mojave River, California, USA: highly adapted survivor or tenuous relict? Journal of Zoology, London 256:537-545.

Marlow, C. B. and T. M. Pogacnik. 1985. Time of grazing and cattle-induced damage to streambanks. In: R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Folliott, and R. H. Hamre, tech. eds. Riparian Ecosystems and Their Management: Reconciling Conflicting Uses. First North American Riparian Conference. United States Department of Agriculture, National Forest Service, General Technical Report RM-120. p. 279-284.

Marsh, R. L. 1979. Development of endotherny in nestling bank swallow (*Riparia riparia*). Physiol. Zool. 52:340-353.

Mason, H. L. 1957. A flora of the marshes of California. Berkeley, California: University of California Press. 878 p.

Mason, H. L. and R. Bacigalupi. 1954. A new *Gratiola* from Boggs Lake, Lake County, California. Madroño 12: 150-152.

May and Associates. 2001. Biological Resource Mapping of the Natomas Basin. Sacramento, California: Prepared for City of Sacramento, NPDS Department.. August.

McVaugh, R. 1943. Campanulaceae (Lobelioideae). North American Flora 32a:1-134.

Mead, C. J. 1979. Colony fidelity and interchange in the sand martin. Bird Study 26:99-109.

Mead, C. J. and J. D. Harrison. 1979. Sand martin movements within Britain and Ireland. Bird Study 26:73-86.

Medeiros, J. L. 1976. The future of the Great Valley pools. Fremontia 4(3):24-27.

Menges, E. S. 1991. The application of minimum viable population theory to plants. In: D. A. Falk and K. E. Holsinger, eds. Genetics and conservation of rare plants. New York, New York: Oxford University Press. p. 45-61.

Meservey, W. R. and G. F. Kraus. 1976. Absence of "individual distance" in three swallow species. Auk 93:177-178.

Miller, A. H. 1931. Systematic revision and natural history of the American shrike (Lanius). University of California Publishing in. Zool. 38:11-242.

Miller, M. R., and G. D. Wylie. 1996. Preliminary estimate of rice present in strip-harvested fields in the Sacramento Valley, California. California Fish and Game 82:187-191.

Milner, R. 1986. Status of the western pond turtle (*Clemmys marmorata*) in northwestern Washington, 1986. Unpublished report. Washington State Department of Fish and Game, Olympia, Washington.

Morey, S. R. 1988. Western spadefoot *Scaphiopus hammondi*. In: D.C. Zeiner, W.F. Laudenslayer, Jr., and K.E. Mayer, eds. California's wildlife. Volume 1. Amphibians and reptiles. Sacramento, California: California Statewide Wildlife Habitat Relationships System, California Department of Fish and Game. p. 56-57.

Morey, S. R. 1998. Pool duration influences age and body mass at metamorphosis in the western spadefoot toad: implications for vernal pool conservation. In: Witham, C. W., E. T. Bauder, D. Belk, W. R. Ferren Jr., and R. Ornduff, eds. Ecology, Conservation, and Management of Vernal Pool Ecosystems - Proceedings from a 1996 conference. Sacramento, California: California Native Plant Society. p. 86-91.

Morey, S. R., and D. A. Guinn. 1992. Activity patterns, food habits, and changing abundance in a community of vernal pool amphibians. In: D. Williams, S. Byrne, and T. A. Rado, eds. Endangered and sensitive species of the San Joaquin Valley, California. Sacramento, California: California Energy Commission. p. 149-158.

Morin, N. 1993. Campanulaceae. In: J.C. Hickman, ed. The Jepson manual: higher plants of California. Berkeley, California: University of California Press. p. 459-468.

Morin, N. and T. Niehaus. 1977. Rare plant status report: *Legenere limosa* (Greene) McVaugh. Sacramento, California: California Native Plant Society. 3 p.

Moyle, P. B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. Copeia 1973(1):18-22.

NatureServe: An online encyclopedia of life [web application]. 2000. Version 1.1 . Arlington, Virginia, USA: Association for Biodiversity Information. Available: http://www.natureserve.org/. (Accessed: December 24, 2000).

Neff, J. A. 1937. Nesting distribution of the tri-colored red-wing in central California. Condor 39:61-81.

Neff, J. A. 1942. Migration of the tricolored red-wing in Central California. Condor 44:45-53.

Niehaus, T. and D. Fruchter. 1977. Rare plant status report: *Navarretia pauciflora* Mason. Sacramento, California: California Native Plant Society. 3 p.

Nussbaum, R. A., E. D. Brodie, Jr., and R. C. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. Moscow, Idaho: University Press of Idaho. 332 p.

Oberholster, H. C. 1974. The bird life of Texas. Volume 2. University of Texas Press, Austin, Texas.

Orians, G. H. 1961a. The ecology of blackbird (*Agelaius*) social systems. Ecological Monographs 31:282-312.

Orians, G. H. 1961b. Social stimulation within blackbird colonies. Condor 63:330-337.

Orians, G. H. 1963. Notes on fall-hatched tricolored blackbirds. Auk 80:552-553.

Overtree, L. and G. Collings. 1997. Western pond turtles in the Kern Valley region. Kern River Research Center Fieldnotes 6(1):1-2.

Palmer-Ball, B. L., Jr. 1996. The Kentucky Breeding Bird Atlas. Lexington, Kentucky: University of Kentucky Press. 327 p.

Paton, P. W. C. and S. D. Fellows. 1994. Use of Great Salt Lake wetlands by swallows during migration. Utah Birds 10:49-57.

Pavlik, B. M. 1994. Demographic monitoring and the recovery of endangered plants. In: M.L. Bowles and C.J. Whelan, eds. Restoration of endangered species: conceptual issues, planning and implementation. Cambridge, England: Cambridge University Press. p. 322-350.

Payne, R. B. 1969. Breeding seasons and reproductive physiology of tricolored blackbirds and redwinged blackbirds. University of California Publications in Zool. 90:1-137.

Pechmann, J. H. K., D. E. Scott, J. W. Gibbons, and R. D. Semlitsch. 1989. Influence of wetland hydroperiod on diversity and abundance of metamorphosing juvenile amphibians. Wetlands Ecology and Management 1(1):3-11.

Pennak, R. W. 1989. Freshwater invertebrates of the United States, 3rd Edition. New York, New York: Wiley & Sons. 628 p.

Persson, C. 1987. Age structure, sex ratios, and survival rates in a south Swedish sand martin (*Riparia riparia*) population: 1964 to 1984. J. Zool. Land. (B)1:639-670.

Petersen, A. J. 1955. The breeding cycle in the bank swallow. Wilson Bull. 67:235-286.

Petranka, J. W. 1998. Salamanders of the United States and Canada. Washington, D. C.: Smithsonian Institution Press. 576 p.

Pfennig, D. W. 1992. Polyphenism in spadefoot toad tadpoles a locally adjusted evolutionary stable strategy. Evolution 46:1408-1420.

Platts, W. S. 1981. Influence of forest and rangeland management on anadromous fish habitat in western North America - effects of livestock grazing. Portland, Oregon: U. S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. General Technical Report PNW-124. 25 p.

Powell, W. R. 1974. Inventory of rare and endangered vascular plants of California. Sacramento, California: California Native Plant Society. Special Publication No. 1. 56 p.

Pyle, P. 1997. Identification guide to North American birds: Part I Calumbidae to Ploceidae. Balinas, California: Slate Creek Press.

Rathbun, G. B., N. Siepel, and D. Holland. 1992. Nesting behavior and movements of western pond turtles, *Clemmys marmorata*. The Southwestern Naturalist 37(3):319-324.

Rathbun, G. B., M. R. Jennings, T. G. Murphey, and N. R. Siepel. 1993. Status and ecology of sensitive aquatic vertebrates in the lower San Simeon and Pico Creeks, San Luis Obispo County, California. Springfield, Virginia: Final Report under Cooperative Agreement 14-16-0009-91-1909 between U. S. Fish and Wildlife Service and California Department of Parks and Recreation. Publ. No. PB93-230779, National Technical Information Service. Ix + 103 p.

Rathbun, G. B., N. J. Scott, Jr. and T. G. Murphey. Terrestrial habitat use by pacific pond turtles in a Mediterranean climate. Southwestern Naturalist (in review).

Reeder, J. R. 1965. The tribe Orcuttieae and the subtribes of the Pappophoreae (Gramineae). Madroño 18:18-28.

Reeder, J. R. 1982. Systematics of the tribe Orcuttieae (Gramineae) and the description of a new segregate genus, *Tuctoria*. American Journal of Botany 69:1082-1095.

Reeder, J. R. 1993. *Orcuttia*. In: J. C. Hickman, ed. The Jepson manual: higher plants of California. Berkeley, California: University of California Press. p. 1276-1277.

Reese, D. A. and H. H. Welsh, Jr. 1997. Use of terrestrial habitat by western pond turtles, *Clemmys marmorata*: implications for management. In: J. Van Abbema, ed. Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles – An International Conference, July 1993. Purchase, New York: State University of New York, New York Turtle and Tortoise Society. p. 352-357.

Reese, D. A. and H. H. Welsh, Jr. 1998. Habitat use by western pond turtles in the Trinity River, California. Journal of Wildlife Management 62(3):842-853.

Remsen, J.V. 1978. Bird species of special concern in California. Sacramento, California: California Department of Fish and Game.

Reh, W. and A. Seitz. 1990. The influence of land use on the genetic structure of populations of the common frog *Rana temporaria*. Biological Conservation 54:239-249.

Rosenberg, D., Gervais, J., Ober, H., and D. DeSante. 1998. An adaptive management plan for the burrowing owl population at Naval Air Station Lemoore, Lemoore, California. San Bruno, California: Prepared for U. S. Navy, Engineering Field Activity West. 51 p.

Rossman, D. A. and G. R. Stewart. 1987. Taxonomic reevaluation of *Thamnophis couchi*. Occasional Papers of the Museum of Zoology, Louisiana State University, No. 63. 23 p.

Rubtzoff, P., and L. R. Heckard. 1975. New distributional records for California flowering plants of aquatic and moist habitats. Wasmann Journal of Biology 33:89-106.

Ruibal, R., L. Tevis, Jr., and V. Roig. 1969. The terrestrial ecology of the spadefoot toad *Scaphiopus hammondii*. Copeia 1969:571-584.

Ryder, R. A. 1967. Distribution, migration and mortality of the white-faced ibis (*Plegadis chihi*) in North America. Bird-Banding 38:257-277.

Ryder, R. R. and D. E. Manry. 1994. White-faced ibis. In: A. Poole and F. Gill, eds. The birds of North America, Volume 130. Philadelphia, Pennsylvania: The Acad. of Natural Sciences, Washington D.C., The American Ornithologist's Union.

Sacramento Regional County Sanitation District. 2002. Case Study: Burrowing Owls. Sacramento, California: Sacramento Regional County Sanitation District. Available: http://www.srcsd.com/casebur.html. Accessed: December 6, 2002).

Sawyer, J. O. and T. Keeler-Wolf. 1995. A manual of California vegetation. Sacramento, California: California Native Plant Society. 471 p.

Schloriff, R. W. 1992. Recovery Plan: Bank Swallow (*Riparia riparia*) California Department of Fish and Game.

Schlorff, R., and P. Bloom 1984. Importance of Riparian Systems to Nesting Swainson's Hawks in the Central Valley of California. Pages 612-18 in R. E. Warner and K. M. Hendrix (eds.), California riparian systems: Ecology, conservation, and productive management. University of California Press. Berkeley, California.

Scott, D. E. 1994. The effect of larval density on adult demographic traits in *Ambystoma opacum*. Ecology 75:1383-1396.

Seeliger, M. L. 1945. Variation in the Pacific mud turtle. Copeia 1945(3):150-159.

Semlitsch, R. D., D. E. Scott, and J. H. K. Pechmann. 1988. Time and size at metamorphosis related to adult fitness in *Ambystoma talpoideum*. Ecology 69:184-192.

Serpa, L. 1993. Monitoring report [*Gratiola heterosepala* at Boggs Lake Preserve], 1992. Pages 67-69.

Setmire, J. G., R. A. Schroeder, J. N. Densmore, S. L. Goodbred, D. Audet, and W. R. Radke. 1993. Detailed study of water quality, bottom sediment, and biota associated with irrigation drainage in the Salton Sea area, California, 1988-90. Sacramento, California: U. S. Geological Survey, Water-Resources Investigation Report, 93-4014.

Seymour, R.S. 1973. Energy metabolism of dormant spadefoot toads (*Scaphiopus*). Copeia 1973:435-445.

Seymour, R., and M. Westphal. 1994. Final Report - Status and habitat correlates of California tiger salamanders in the eastern San Joaquin Valley: results of the 1994 survey. Sacramento California: Report prepared by the Coyote Creek Riparian Station for the U. S. Fish and Wildlife Service. 33 p.

Shaffer, H. B., R. N. Fisher, and S. E. Stanley. 1993. Status Report: The California Tiger Salamander (*Ambystoma californiense*). Sacramento, California: Final report for the California Department of Fish and Game.

Sharp, C. S. 1902. Nesting of Swainson's hawk. Condor 4:116-118.

Sheffield, S.R. 1997. Current status, distribution, and conservation of the burrowing owl (*Speotyto cunicularia*) in Midwestern and Western North America. In: J.R. Duncan, D.H. Johnson, and T.H. Niccolls, eds. Biology and conservation of owls of the Northern Hemisphere. St. Paul, Minnesota. U. S. D. A. Forest Service, General Technical Report NC-190. North Central Forest Experiment Station. p. 399-407.

Shoemaker, V. H., L. McClanahan, Jr., and R. Ruibal. 1969. Seasonal changes in body fluids in a field population of spadefoot toads. Copeia 1969:585-591.

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

Sibley, C. G. and J. E. Ahlquist. 1990. Phylogeny and classification of birds. New Haven, Connecticut: Yale University Press.

Sibley, D. 2000. The North American bird guide. East Sussex, United Kingdom: Pica Press. 544 p.

Sieder, O. 1980. Casual and functional aspects of brood distrubution in sand martin (*Riparia riparia* L.). Z. Tierpsychal 52:19-56.

Simovich, M., R. Brusca, and J. King. 1992. Invertebrate survey 1991-1993 PGT-PGE/Bechtel pipeline expansion project. San Diego, California: University of San Diego.

Skinner, M. W. and B. M. Pavlik. 1994. Inventory of rare and endangered vascular plants of California. Fifth edition. Sacramento, California: California Native Plant Society. Special Publication No. 1. 338 p.

Skorupa, J. P., R. L. Hothem, and R. W. DeHaven. 1980. Foods of breeding tricolored blackbirds in agricultural areas of Merced County, California. Condor 82:465-467.

Small, A. 1994. California Birds: Their Status and Distrubution. Vislia, California: Ibis Publishing Co.

Smith, J. P., Jr. 1977. Vascular plant families. Eureka, California: Mad River Press. 320 p.

Smith, H. M. 1895. Notes on the reconnaissance of the fisheries of the Pacific Coast of the United States in 1884. Bulletin of United States Fish Commission 14:223-288.

Stebbins, R. C. 1951. A field guide to western reptiles and amphibians. Boston, Massachusetts: Houghton Mifflin Company.

Stebbins, R. C. 1985. A field guide to western reptiles and amphibians. Second Edition, revised. Boston, Massachusetts: Houghton Mifflin Company. 336 p.

Steele, B. B. 1984. Effects of pesticides on reproductive success of white-faced ibis in Utah, 1979. Colonial Waterbirds 7:80-87.

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 hooveri* (Euphorbiaceae) in the Central Valley of California. 2 volumes. Sacramento, California: U. S. Fish and Wildlife Service Technical Report. 124 p.

Stoner, D. 1936. Homing Instinct in the Bank Swallow. Bird-Banding 12:104-109.

Storer, T. I. 1925. A synopsis of the amphibia of California. University of California Publications in Zoology 27:1-1-342.

Storer, T.I. 1930. Notes on the range and life-history of the Pacific fresh-water turtle, *Clemmys marmorata*. University of California Publications in Zoology 32(5):429-441.

_____1937. Further notes on the turtles of the north Pacific coast of North America. Copeia 1937:250-252.

Storm, R. M. and W. P. Leonard. 1995. Reptiles of Washington and Oregon. Seattle, Washington: Seattle Audubon Society - The Trailside Series. 176 p.

Swanson, G. A. 1974. Feeding Ecology of the blue-winged teals. Journal of Wild. Manag. 38(3):396-407.

Swainson's Hawk Technical Advisory Committee (SHTAC). Nesting Swainson's Hawks in the Natomas Basin Habitat Conservation Plan Area 2000 Annual Survey Results. Sacramento, California.

_____2001. Nesting Swainson's Hawks (*Buteo swainsoni*) in the Natomas Basin Habitat Conservation Plan Area. 2001 Annual Survey Results. Sacramento, California: Prepared for the Natomas Basin Conservancy.

Taft, M. R., D. M. Mauser, and T. W. Arnold. 1995. Ecology of breeding white-faced ibis on Lower Klamath National Wildlife Refuge, California. Progress Report, U. S. Fish and Wildlife Service, Klamath Basin National Wildlife Refuge, Tule Lake, California.

Taylor, D. M., C. H. Trost, and B. Jamison. 1989. The biology of the white-faced ibis in Idaho. Western Birds 20:125-133.

Temple, S. A. 1995. Shrike research and conservation. In: Yosef and F. E. Lohrer, eds. Shrike (Laniidae) of the World: Biology and Conservation. Proceedings of the Western Foundation of Vertebrate Zoology 6(1):1-343.

Thomas Reid Associates. 2000. Draft habitat conservation plan for the Metro Air Park project in the Natomas Basin, Sacramento County, California. Palo Alto, California: Thomas Reid Associates.

Thompson, K. 1961. Riparian forests of the Sacramento Valley, California. Annals of the Association of American Geographers 51:294-315.

Tibor, D. P. 2001. California Native Plant Society's Inventory of Rare and Endangered Plants of California, 6th edition. Sacramento, California: California Native Plant Society. 388 p.

Trenham, P. 1998a. Radiotracking information. Davis, California: University of California.

Trenham, P. 1998b. Demography, migration, and metapopulation structure of pond breeding salamanders [dissertation]. Davis, California: University of California.

Trenham, P. C., H. B. Shaffer, W. D. Koening and M. R. Stromberg. 2000. Life history and demographic variation in the California tiger salamander (*Ambystoma californiense*). Copeia 2000(2):365-377.

Turner, A. K. 1980. The use of time and energy by aerial-feeding birds [dissertation]. Stirling, Scotland: University of Stirling.

Turner, A. K. and D. M. Bryant. 1979. Growth of nestling sand martins. Bird Study 26:117-122.

Turner, A. K. and C. Rose. 1989. Swallows and martins: an identification guide and handbook. Boston. Massachusetts: Houghton Miffin Co. 258 p.

Twitty, V. C. 1941. Data on the life history of *Ambystoma tigrinum californiense* Gray. Copeia 1941(1):1-4.

U. S. Army Corps of Engineers. 1997. Species Profile: loggerhead shrike (*Lanius hidoicians*) on Military Installations in Southeastern United States.

U.S. Fish and Wildlife Service (Service). 1984. Valley elderberry longhorn beetle recovery plan. Portland, Oregon. 62 p.

_____1985. Delta green ground beetle and Solano grass recovery plan. Portland, Oregon: U. S. Fish and Wildlife Service. 68 p.

_____1991a. Aleutian Canada goose recovery plan. Anchorage, Alaska: U. S. Fish and Wildlife Service.

_____1991b. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered or threatened, proposed rule. Federal Register 56(225):58804-58836.

_____1993a. Endangered and threatened wildlife and plants; determination of threatened status for the giant garter snake. Federal Register 58:54053-54066.

_____1993b. Endangered and threatened wildlife and plants; petition finding on the western pond turtle. Federal Register 58(153):42717-42718.

_____1994a. Endangered and threatened wildlife and plants; determination of endangered status for the conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool tadpole shrimp; and threatened status for the vernal pool fairy shrimp. Federal Register 59(180):48136-48152.

_____1994b. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered or threatened species; proposed rule. Federal Register 59(219):58982-59028.

_____1995. Migratory nongame birds of management concern in the United States: the 1995 list. Washington, D. C.: Prepared by the Office of Migratory Bird Management.

_____1997a. Environmental Assessment for the issuance of an incidental take permit under Section 10(a)(1)(B) of the Endangered Species Act for the Natomas Basin Habitat Conservation Plan. Sacramento, California. June.

_____1997b. Endangered and threatened wildlife and plants; determination of endangered status for three plants and threatened status for five plants from vernal pools in the Central Valley of California. Federal Register 62:14338-14352.

_____1998. Recovery plan for upland species of the San Joaquin Valley, California. Portland, Oregon: Region 1. 319 p.

_____1999. Draft Giant Garter Snake Recovery Plan. Portland, Oregon.

_____2000. Programmatic formal consultation and conference opinion (file: 1-1-00-F-184) on the CALFED Bay-Delta program. Prepared August 28, 2000, by the Sacramento Field Office, U. S. Fish and Wildlife Service.

_____2001. Final environmental impact statement for the Metro Air Park Habitat Conservation Plan. Sacramento, California. July.

_____(NBHCP EIR). 2003. Natomas Basin Habitat Conservation Plan Final Environmental Impact Report/Environmental Impact Statement. Sacramento, California. April.

Voeks, R. and S. English. 1981. White-faced ibis (*Plegadis chihi*) population and distribution in the western United States: 1979-1980. Portland, Oregon: U. S. Fish and Wildlife Service.

Ward, P. S. 1987. Distribution of the introduced Argentine ant (*Iridomyrmex humilis*), natural habitats of the lower Sacramento Valley and its effects on the indigenous ant fauna. Hilgardia 55:1-16.

Warnock, R. 1997. Is habitat fragmentation a factor in the decline of the burrowing owl in Saskatchewan?. Blue Jay 55:222-228.

Warnock, R. and P. C. James. 1996. Effects of habitat fragmentation on burrowing owls (*Speotyto cunicularia*) in Saskatchewan. In: W. D. Williams and J. F. Dormaar, eds. Proceedings of the fourth prairie conservation and endangered species workshop, Natural History Occasional Paper 23. Edmonton, Alberta: Provincial Museum of Alberta. p. 318.

Washington Dept. of Fish and Wildlife. 2000. Endangered western pond turtles to be released at new Columbia Gorge site. Olympia, Washington: News release by Washington Dept. of Fish and Wildlife. August, 9.

Weintraub, J. D. 1979. Selection of daytime retreats by recently metamorphosed *Scaphiopus multiplicatus*. Journal of Herpetology 14(1):83-84.

Wetherwax, M. 1993. *Gratiola*. In: J. C. Hickman, ed. The Jepson manual: higher plants of California. Berkeley, California: University of California Press. p. 1032-1033.

Wilbur, H. M. and J. P. Collins. 1973. Ecological aspects of amphibian metamorphosis. Science(n.s.) 182(4119):1305-1314.

Wildlands. 2000. Site-specific management plans for the Natomas Basin Conservancy's mitigation lands, Sacramento and Sutter Counties, California. Citrus Heights, California: Prepared for The Natomas Basin Conservancy, Sacramento, California. July.

Windsor, D. and S. T. Emlen. 1975. Predator-prey interactions of adult and prefledgling bank swallows and American kestrels. Condor 77:359-361.

Winegar, H. H. 1977. Camp Creek channel fencing - Plant, wildlife, soil, and water response. Rangeman's Journal 4(1):10-12.

Witham, C. W.; E. T. Bauder; D. Belk; W. R. Ferren, Jr.; and R. Ornduff. 1998. Ecology, conservation, and management of vernal pool ecosystems - proceedings from a 1996 conference. Sacramento, California: California Native Plant Society. 285 p.

Woodbridge, B. 1991. Habitat selection by nesting Swainson''s hawk: a hierarchical approach. M.S. Thesis, Oregon State University, Corvallis, Oregon. 80 pp.

Wylie, G. 1999. Giant garter snake project 1998 progress report. Dixon, California: Unpublished report, U. S. Geological Survey. (USGS), Biological Resources Division, Dixon Field Station.

Wylie, G. D. and M. Cassaza. 2002. Investigations of the giant garter snakes in the Natomas Basin: 1998-1999. Dixon, California: Unpublished report, USGS, Biological Resources Division, Dixon Field Station.

Wylie, G. D. and L. Martin. 2002. Investigations of giant garter snakes in the Natomas Basin: 2002 field season. Dixon, California: Unpublished report, USGS, Biological Resources Division, Dixon Field Station.

Wylie, G. D., M. Cassaza, and N. M. Carpenter. 2000a. Monitoring Giant Garter Snakes at the Colusa National Wildlife Refuge: 2000 Progress Report. Dixon, California: USGS, Biological Resources Division, Dixon Field Station.

Wylie, G. D., M. Cassaza, L. Martin, and Hansen, E. 2000b. Investigations of the giant garter snakes in the Natomas Basin: 2000 Field Season. Dixon, California: Unpublished report, USGS, Biological Resources Division, Dixon Field Station.

Wylie, G. D., M. Cassaza, and N. M. Carpenter. 2002. Monitoring giant garter snakes at the Colusa National Wildlife Refuge: 2001 Progress Report. Dixon, California: USGS, Biological Resources Division, Dixon Field Station.

Wylie, G. D., M. Cassaza, L. Martin and N. M. Carpenter. 2003. Monitoring giant garter snakes at the Colusa National Wildlife Refuge: 2002 Progress Report. Dixon, California: USGS, Biological Resources Division, Dixon Field Station.

Wylie, G. D., M. Cassaza, and J. K. Daugherty. 1997. 1996 Progress report for the giant garter snake study. Dixon, California: Preliminary report, USGS, Biological Resources Division, Dixon Field Station.

Yosef, R. 1996. Loggerhead shrike (*Lanius ludovicianus*). In: A. Poole and F. Gill, eds. The Birds of North America, Number 231. Philadelphia, Pennsylvania: The Academy of Natural Science. 28 p.

Zarn, M. 1974. Burrowing owl: *Speotyto cunicularia hypugaea*. Habitat management series for unique or endangered species, Report No. 11. Technical note. Denver, Colorado: Bureau of Land Management Denver Service Center.

Zeiner, D. C., W. Laudenslayer, and K. Mayer. 1988. Tiger salamander *Ambystoma tigrinum*. California 's Wildlife, Volume 1: Amphibians and Reptiles. The Resources Agency, California Department of Fish and Game. p. 2-3.

Personal Communications

Allen, J. 1998. Kern National Wildlife Refuge, Delano, California.

Beedy, E. 1998. Jones and Stokes Associates, Inc., Sacramento, California.

Bradbury, M. 2002. California Department of Water Resources, Sacramento, California.

Cook, D. 2002. Sonoma State University, Rohnert Park, California.

Cordone, B. 2003. SFWO. Sacramento, California.

Estep, J. 2002. Jones and Stokes Associates, Inc., Sacramento, California.

Fuller, K. 1997. U. S. Fish and Wildlife Service, Sacramento, California.

Gifford, D. 2002. CDFG, Rancho Cordova, California.

Johnson, B. 2002. California Department of Fish and Game, Sacramento, California.

Kelchlin, E. 1998. Ornithologist, Baton Rouge, Louisiana.

Meredith, R. 2003. Padre Associates, Sacramento, California.

Nagano, C. 2002. U. S. Fish and Wildlife Service, Sacramento, California.

Roberts, J. 2002. The Natomas Basin Conservancy, Sacramento, California

Sutter, G. 2003. Wildlands, Inc., Sacramento, California.

Woolington, D. 1997. San Luis National Wildlife Refuge Complex, Los Banos, California.

In Litt. **References**

City of Sacramento. 2003a. Letter to Wayne White (SFWO Field Office Supervisor) presenting the City's 2002 Annual Report of Urban Development. Sacramento, California. February 20, 2003. 2 pp + appendixes.

City of Sacramento. 2003b. Letter to Cay Goude (SFWO Field Office Supervisor) notifying the Service that the City was prepared to begin its Independent Mid-Point Review. Sacramento, California. June 19, 2003. 2 pp.

Cochrane, S. A. 1995a. Recovery workshop summary: Sacramento Orcutt grass (*Orcuttia viscida*) and slender Orcutt grass (*Orcuttia tenuis*) in Sacramento County. Letter of 2 June 1995 to workshop participants. 10 p.

Cochrane, S. A. 1995b. Summary of 2/7/95 Recovery workshop information and 1995 field survey information on the extant occurrences of slender Orcutt grass (*Orcuttia tenuis*) in Sacramento County and all extant occurrences of Sacramento Orcutt grass (*Orcuttia viscida*). Letter of 22 November 1995 to workshop participants. 4 p.

Corbin, B. 1999. List sent to Ken Fuller, U. S. Fish and Wildlife Service, Sacramento, California. 1 p.

Corbin, B. 2000. Letter to Ellen Cypher, Endangered Species Recovery Program, Bakersfield, California. 3 p. + 4 p. attachments.

Franklin, A. 1993. California native species field survey form for *Castilleja campestris succulenta*. Submitted to CNDDB, Sacramento, California. 3 p.

Fuller, K. 2000. Electronic mail to Ellen Cypher, Endangered Species Recovery Program, Bakersfield, California. 1 p. + 5 p. attachments.

Holland, R. F. 1986. Memorandum of 8 July 1986 to Bill Bailey, Scott Clemons, and Susan Cochrane, California Department of Fish and Game, Sacramento, California. 2 p.

Morey, S. 1996. Letter of 27 November 1996 to workshop participants, California Department of Fish and Game, Sacramento, California. 3 p.

Schoolcraft, G. D. 2000. Letter to Ellen Cypher, Endangered Species Recovery Program, Bakersfield, California. 2 p.

Silveira, J. 2000. Letter to Ellen Cypher, Endangered Species Recovery Program, Bakersfield, California. 1 p. + 35 p. attachments.

Stebbins, R. C. 1989. Declaration of R. C. Stebbins in support of petition of writ of mandate. Sierra Club and Richard Pontuis v. Gilroy City Council, Shappell Industries et al. Santa Clara County Superior Court. March 16, 1989. 11 p. plus exhibits.

Witham, C. W. 1992. Letter to Greg Elliot, Cosumnes River Preserve, Galt, California. 4 p.

Witham, C. W. 2000. Letter to Ellen Cypher, Endangered Species Recovery Program, Bakersfield, California. 1 p. + 18 p. attachments.

Table 1. Species proposed for coverage (Covered Species) in the Natomas Basin Habitat Conservation Plan (E = endangered, T = threatened, P = Proposed, D = delisted, SC = species of concern, R = rare, SSC = species of special concern).

Species	Federal Status	State Status
Aleutian Canada goose	D	
Bank swallow		T
Burrowing owl		SSC
Loggerhead shrike	SC	SSC
Swainson's hawk		T
Tricolored blackbird	SC	SSC
White-faced ibis	SC	SSC
Giant garter snake	T	T
Northwestern pond turtle	SC	SSC
California tiger salamander	P	SSC
Western spadefoot toad	SC	SSC
Valley elderberry longhorn beetle	T	
Midvalley fairy shrimp	SC	
Vernal pool fairy shrimp	T	
Vernal pool tadpole shrimp	E	
Boggs Lake hedge-hyssop		E
Colusa Grass	T	
Delta tule pea	SC	
Legenere	SC	
Sacramento Orcutt grass	E	E
Sanford's arrowhead	SC	
Slender Orcutt grass	T	E

Table 2. Habitat reserve types to be created based upon Planned Development in the Natomas Basin Habitat Conservation Plan.

Permittee	Planned Development	Reserve Total to be Created at 0.5 to 1.0	50 percent Rice Reserves	25 percent Managed Marsh Reserves	25 percent Upland Reserves
City of Sacramento	8,050	4,025.0	2,012.5	1,006.3	1,006.3
Sutter County	7,467	3,733.5	1,866.8	933.4	933.4
Metro Air Park	1,983	991.5	495.8	247.9	247.9
TOTAL	**17,500**	**8,750.0**	**4,375.0**	**2,187.5**	**2,187.5**

Table 3. Ratios used to calculate amount of habitat to be acquired to compensate for vernal pool resources.

	Bank	Non-Bank
Preservation	2:1	3:1
Creation	1:1	2:1

Table 4. Anticipated change in the amount of potential giant garter snake habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	After Implememntation
Ponds / seasonally wet areas	96	-7	-4	-10	-21	75
Rice	22,693	-970	-1,541	-5,577	-8,087	14,606
Canals	1,778	-117	-72	-215	-404	1,374
TOTAL	**24,567**	**-1,094**	**-1,617**	**-5,802**	**-8,512**	**16,055**

Table 5. Anticipated change in the amount of potential Swainson's hawk habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan (a = nesting habitat, b = foraging habitat). Acreage values for nesting habitat were obtained from the Draft NBHCP EIR/EIS. Acreage values for the foraging habitat were obtained from the *Addendum to the NBHCP EIR/EIS Technical Memorandum* (see Appendix K of the NBHCP), which includes an updated analysis of Swainson's hawk foraging habitat.

(a)

Habitat Class	**Baseline**	**City of Sacramento**	**Metro Air Park**	**Sutter County**	**Total Change**	**Future Condition**
Riparian	124	-24	0	0	-24	100
Oak groves	98	-6	-2	0	-8	89
Tree groves	106	-10	-23	0	-33	73
TOTAL	**328**	**-40**	**-25**	**0**	**-65**	**263**

(b)

Habitat Quality	**Baseline**	**City of Sacramento**	**Metro Air Park**	**Sutter County**	**Total Change**	**Future Condition**
High	1,835	-675	-50	-8	-733	1102
Moderate	15,666	-5,098	-349	-1,852	-7,299	8,367
Low	4,550	-1,152	-4	0	-1,156	3,394
TOTAL	**22,051**	**-6,925**	**-403**	**-1,860**	**-9,188**	**12,863**

Table 6. Anticipated change in the amount of potential Aleutian Canada goose habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	**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
Rice (roosting/ 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**

Table 7. Anticipated change in the amount of potential burrowing owl habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	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**

Table 8. Anticipated change in the amount of potential loggerhead shrike habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	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	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**

Table 9. Anticipated change in the amount of potential Tricolored blackbird habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan (a = nesting habitat, b = foraging habitat). Acreage values were obtained from the Draft NBHCP EIR/EIS.

(a)

Habitat Class	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Ponds and seasonally wet areas	96	-7	-4	-10	-21	75
Riparian	124	-24	0	0	-24	100
Canals (all)	1,778	-117	-72	-215	-404	1,374
TOTAL	**1,998**	**-148**	**-76**	**-225**	**-449**	**1,549**

(b)

Habitat Class	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
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	**41,310**	**-6,083**	**-1,888**	**-7,341**	**-15,311**	**25,998**

Table 10. Anticipated change in the amount of potential white-faced ibis habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	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**	**-1,097**	**-1,617**	**-5,802**	**-8,512**	**16,426**

Table 11. Anticipated change in the amount of potential bank swallow habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	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
Canals (all)	1,778	-117	-72	-215	-404	1,374
TOTAL	**43,308**	**-6,231**	**-1,964**	**-7,566**	**-15,760**	**27,547**

Table 12. Anticipated change in the amount of potential northwestern pond turtle habitat (acres) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	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)	1,769	-117	-72	-215	-404	494
TOTAL	**24,691**	**-1,118**	**-1,617**	**-5,802**	**-8,536**	**16,155**

Table 13. Anticipated change in the amount of habitat (acres) most likely to support habitat of the valley elderberry longhorn beetle (elderberry shrubs [*Sambucus* spp.] with stems greater than one inch diamter) in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values are based upon data available in the Draft NBHCP EIR/EIS.

Habitat Class	Baseline	City of Sacramento	Metro Air Park	Sutter County	Total Change	Future Condition
Oak groves	98	-6	-2	0	-8	89
Riparian	124	-24	0	0	-24	100
Tree groves	106	-10	-23	0	-33	73
TOTAL	**328**	**-40**	**-25**	**-0**	**-65**	**262**

Table 14. Anticipated change in the amount of habitat (acres) most likely to support habitat of the vernal pool fairy shrimp, vernal pool tadpole shrimp, midvalley fairy shrimp, western spadefoot toad, Colusa grass, Sacramento Orcutt grass, slender Orcutt grass, legenere, and Bogg's Lake hedge-hyssop in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values are based upon data available in the Draft NBHCP EIR/EIS.

Habitat Class	Baseline	City of Sacramento	Sutter County	Total Change	Future Condition
Ponds and seasonally wet areas	96	-7	-10	-17	75
Grassland	886	-427	-134	-561	325
TOTAL	**982**	**-434**	**-144**	**-578**	**400**

Table 15. Anticipated change in the amount of habitat (acres) most likely to support Sanford's arrowhead and Delta tule pea in the Natomas Basin as a result of implementing the Natomas Basin Habitat Conservation Plan. Acreage values were obtained from the Draft NBHCP EIR/EIS.

Habitat Class	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**