

Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon: Methods to Achieve Recovery

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ABSTRACT. The U.S. Fish and Wildlife Service published the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon in March 2006. The Plan contains recovery goals and actions for 33 listed and non-listed plants and animals associated with vernal pool habitats. The overarching goals of the Plan are to downlist or delist all of the listed species in the Plan and to conserve and protect the nonlisted species. There are many avenues that the Service is currently taking to protect and restore populations and habitat of these species. These include conservation easements, land acquisition, habitat restoration, and genetic research. Funding for these actions has come from many sources including the Central Valley Project Conservation Program/Central Valley Project Improvement Act Habitat Restoration Program (a joint program between Bureau of Reclamation and U.S. Fish and Wildlife Service), Section 6 of the Endangered Species Act, direct funding from the Sacramento Fish and Wildlife Office, and other sources. Additionally, an Implementation Team consisting of major stakeholders, agency representatives, and species experts has been formed to assist in overseeing implementation of the recovery actions outlined in the Plan. The first step for this team is to form working groups in each of the 16 vernal pool regions. These teams will develop partnerships with landowners, and with others which will lead to habitat protection and restoration and public outreach.

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INTRODUCTION

In March 2006, the U.S. Fish and Wildlife Service (Service) made available to the public the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Plan), which was signed in December 2005 (U.S. Fish and Wildlife Service, 2005). Recovery plans are the Service's official guidance on what actions are necessary to recover listed species to the point that they can be removed from the endangered species list. Recovery plans are guidance documents, not regulatory documents. All recovery actions are completely voluntary; no agency or other entity is required to implement any of the recommendations. Additionally, recovery plans do not have dedicated federal funds for im-

plementing all the actions in the Plan. The majority of the species addressed in the Recovery Plan are found on privately-owned lands; therefore, the success of this plan and the recovery and conservation of the species are dependent on the voluntary support, coordination, and cooperation of the public and other agencies.

Recovery is defined as the process by which the decline of an endangered or threatened species is stopped and the threats to its survival are minimized so that its long-term survival in nature is ensured. All recovery plans: 1) identify site-specific management actions, 2) estimate time frames and costs of the actions, and 3) set forth precise, objective, measurable criteria for recovery of listed species. The

Research and Recovery in Vernal Pool Landscapes

primary goal of the Recovery Plan is the maintenance of permanently-protected, self-sustaining wild populations of each of the species in the Plan with the minimum necessary investment of resources.

The Recovery Plan presents an ecosystem-level strategy for recovery and conservation of the species addressed in the Plan because they occur in the same habitat type and are generally threatened by the same human activities. By protecting entire ecosystems, the likelihood of successful recovery and conservation is increased.

SPECIES ADDRESSED IN THE PLAN

The Recovery Plan features 33 species of plants and animals that occur exclusively or primarily within vernal pool ecosystems in California and Southern Oregon (Table 1). The 20 Federally listed species include 10 endangered plants, 5 threatened plants, 3 endangered animals, and 2 threatened animals. In addition, 13 species of concern are addressed. Of these 33 species, the State of California has listed 12 plants as endangered, 1 plant as threatened, and 1 plant as rare; none of the animals has state status.

According to the Federal Endangered Species Act, an endangered species is any species which is in danger of extinction throughout all or a significant portion of its range. A threatened species is any species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Species of concern is an informal term used by some but not all U.S. Fish and Wildlife Service offices. Species of concern are sensitive species that have not been listed, proposed for listing, or placed in candidate status. Species of concern receive no legal

protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. The species of concern in the Recovery Plan are included because they are found in the same habitat as the listed species addressed in the Plan and they share similar threats and needs. All the species in the Recovery Plan occur primarily in vernal pool, swale or ephemeral freshwater habitat, and are largely confined to a limited area by topographic constraints, soil types, and climatic conditions. By including species of concern in this community-level plan, they may benefit from the actions that protect the listed species and therefore may not need to be listed themselves.

AREAS INCLUDED IN THE RECOVERY PLAN

Vernal Pool Regions

The Recovery Plan addresses vernal pool species that are found from the Agate Desert in southern Oregon to California's southern border with Baja California—a distance of 800 miles. The general areas that support vernal pool habitat are divided into 16 Vernal Pool Regions. Vernal Pool Regions are large areas that may share the same watershed boundaries, soil types, and support the same vernal pool species (although there is some overlap of these features among the regions). The region boundaries are based on the system of vernal pool regions identified by the California Department of Fish and Game in their California Vernal Pool Assessment Preliminary Report (Keeler-Wolf et al., 1998). Because these regions did not extend into Oregon, an additional region for southern Oregon was created for the Plan. Not all land within the region boundaries is vernal pool habitat or supports the species addressed in this Plan.

Warne: Vernal Pool Ecosystems Recovery Plan

TABLE 1. Species addressed in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (U.S. Fish and Wildlife Service, 2005).

| Scientific Name | Common Name | Status ¹ |
|---|---------------------------------|---------------------|
| Listed Plant Species | | |
| <i>Castilleja campestris</i> ssp. <i>succulenta</i> | fleshy owl's clover | FT, SE |
| <i>Chamaesyce hooveri</i> | Hoover's spurge | FT |
| <i>Eryngium constancei</i> | Loch Lomond button-celery | FE, SE |
| <i>Lasthenia conjugens</i> | Contra Costa goldfields | FE |
| <i>Limnanthes floccosa</i> ssp. <i>californica</i> | Butte County meadowfoam | FE, SE |
| <i>Navarretia leucocephala</i> ssp. <i>pauciflora</i> | few-flowered navarretia | FE, ST |
| <i>Navarretia leucocephala</i> ssp. <i>plieantha</i> | many-flowered navarretia | FE, SE |
| <i>Neostapfia colusana</i> | Colusa grass | FT, SE |
| <i>Orcuttia inaequalis</i> | San Joaquin Valley Orcutt grass | FT, SE |
| <i>Orcuttia pilosa</i> | hairy Orcutt grass | FE, SE |
| <i>Orcuttia tenuis</i> | slender Orcutt grass | FT, SE |
| <i>Orcuttia viscida</i> | Sacramento Orcutt grass | FE, SE |
| <i>Parvisedum leiocarpum</i> | Lake County stonecrop | FE, SE |
| <i>Tuctoria greenei</i> | Greene's tuctoria | FE, SR |
| <i>Tuctoria mucronata</i> | Solano grass | FE, SE |
| Listed Animal Species | | |
| <i>Branchinecta conservatio</i> | Conservancy fairy shrimp | FE |
| <i>Branchinecta longiantenna</i> | longhorn fairy shrimp | FE |
| <i>Branchinecta lynchi</i> | vernal pool fairy shrimp | FT |
| <i>Elaphrus viridis</i> | delta green ground beetle | FT |
| <i>Lepidurus packardii</i> | vernal pool tadpole shrimp | FE |
| Plant Species of Concern | | |
| <i>Astragalus tener</i> var. <i>ferrisiae</i> | Ferris' milk-vetch | None |
| <i>Astragalus tener</i> var. <i>tener</i> | alkali milk-vetch | None |
| <i>Atriplex persistens</i> | vernal pool smallscale | None |
| <i>Eryngium spinosepalum</i> | spiny-sepaled button-celery | None |
| <i>Gratiola heterosepala</i> | Boggs Lake hedge-hyssop | SE |
| <i>Juncus leiospermus</i> var. <i>ahartii</i> | Ahart's dwarf rush | None |
| <i>Legenere limosa</i> | legenere | None |
| <i>Myosurus minimus</i> var. <i>apus</i> | little mousetail | None |
| <i>Navarretia myersii</i> ssp. <i>deminuta</i> | small pincushion navarretia | None |
| <i>Plagiobothrys hystriculus</i> | bearded popcornflower | None |
| Animal Species of Concern | | |
| <i>Branchinecta mesovallensis</i> | midvalley fairy shrimp | None |
| <i>Linderiella occidentalis</i> | California fairy shrimp | None |
| <i>Spea hammondii</i> | western spadefoot toad | None |

¹FE = Federally Endangered, FT = Federally Threatened, SE = State Endangered, ST = State Threatened, SR = State Rare

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Core Areas

Within each Vernal Pool Region, the areas that support the highest density of vernal pools and the greatest number of vernal pool species and populations are designated as “core areas.” The core areas are ranked as Zone 1, 2, and 3 in order of their overall priority for recovery.

- Zone 1 core areas are those areas that support the highest number of species and populations, are occupied by species with a small range, and whose protection is necessary to prevent the extinction or irreversible decline of one or more species.
- Zone 2 core areas have fewer species and populations or are occupied by species that are more widespread, with greater numbers of occurrences.
- Zone 3 core areas are no longer occupied by the species addressed in this plan but include locations of historic occurrences that are potential sites for restoration or reintroduction of the species.
- Not all vernal pool habitat or populations of the species addressed in the Plan are included in core areas.

RECOVERY STRATEGY

The recovery strategy of the Plan has five basic elements which are described in greater detail in the Stepdown Narrative of the Recovery Plan. The Stepdown Narrative is an outline of recovery actions that facilitates seeing the big picture of the Recovery Plan. The recovery actions in the Stepdown Narrative are numbered sequentially to reflect the timing of the actions and their subdivision into more specific component actions. The five elements are as follows:

1) Habitat Protection. Habitat loss and fragmentation are the greatest threats to the species; therefore, the protection of vernal pool habitat from loss, fragmentation, degradation, and incompatible uses is the most important strategy to assist in the recovery of the species. Habitat protection includes the preservation of the hydrology, topography, pollinators, and other features that are components of the vernal pool habitat supporting the species.

2) Adaptive Habitat Management, Restoration, Creation, and Monitoring. An adaptive management plan to control non-native species, maintain the hydrology of the habitat, and provide suitable upland buffers is important to guide the management of the species. Changes in management should be supported by data collected by monitoring. Restoration of former or degraded habitat, and, if necessary, creation of vernal pools may help to maintain the range of vernal pool habitat.

3) Status Surveys. Expand and statistically perform surveys to help determine how a species is doing throughout its range and identify suitable locations for introduction or reintroduction of the species.

4) Research. Expand and target research to increase knowledge of habitat requirements, habitat management and restoration techniques, optimum preserve design, and species biology and ecology.

5) Participation and Outreach. The species addressed in the Recovery Plan are found on lands owned by a wide variety of landowners; therefore, recovery cannot be accomplished by the Service alone. Working relationships must be developed with all stakeholders, including private and public land owners.

Warne: Vernal Pool Ecosystems Recovery Plan

RECOVERY ACTION IMPLEMENTATION

Using the recovery actions from the Plan's Stepdown Narrative and the overall Recovery Goals as guidelines to achieve recovery, there are many avenues that the Service is pursuing to protect populations and habitat of the species addressed in the Plan. Implementation of the Plan has a two-tiered approach: the range-wide Implementation Team and the regional Working Groups.

Vernal Pool Implementation Team

The Implementation Team consists of representatives of major stakeholders, including agriculture, ranching, building industry, species experts, academia, and federal and state agencies from throughout the range of the Recovery Plan. The first task for the Implementation Team (2011) is to establish working groups within each Vernal Pool Region. Some regions may have more than one working group depending on the number of species present in the region and the degree of threat to the species. The Implementation Team will also oversee the range-wide recovery efforts for all the species in the Recovery Plan. The Team initially established working groups in Butte and Tehama Counties and in Merced and Madera Counties.

Regional Working Groups

The membership of these groups will be similar to that of the Implementation Team. They will consist of representatives from local agencies, stakeholders and species experts; however, these groups will also include local landowners. The primary tasks of the working groups will generally be to develop outreach and incentive programs for habitat protection and to track the progress of recovery actions within the region. All groups will work with landowners to identify vernal pool habitat that

can be protected either permanently through fee title or conservation easements or by other means. Habitat protection does not necessarily require land acquisition or easements, only that land uses maintain or enhance the species' habitat values.

Tasks of individual groups may vary depending on the needs of the species in the region. For example, public outreach is ongoing in the Chico/Butte County area through local groups such as the Vernal Pool Landscape Committee which organized this conference, but knowledge of the status of vernal pool species distributions in the area is not current and needs to be updated. Conversely, in the Merced area, surveys for vernal pool species have occurred and the results have been published; therefore, the focus for this area will be public outreach and establishment of an outdoor education program. The Working Groups will develop work plans under the supervision of the Implementation Team. These plans will guide and unify the efforts of the Working Groups to ensure that the groups' products are consistent with the goals of the Recovery Plan.

TYPES OF RECOVERY ACTIONS

Conservation Easements

A conservation easement is a restriction placed on a piece of property to protect its resources. An easement can either be voluntarily donated or sold by the landowner, and limits the type of uses or development on the land. The landowner retains many property rights and can continue to live on and work the land while providing habitat to the species. Conservation easements can be either in the form of voluntary conservation or for mitigation. A management plan is a component of most conservation easements.

Research and Recovery in Vernal Pool Landscapes

Land Acquisition

Lands may be acquired through purchase from willing sellers. In all cases, a management plan to control nonnative species and maintain the hydrology of the vernal pool habitat is important to guide the management of the vernal pool species. Whenever possible, blocks of conservation lands should be of sufficient size and location so that species dispersal mechanisms remain functional.

Habitat Restoration

Habitat restoration may be necessary to achieve proper functioning of an altered or damaged vernal pool ecosystem with the goal of returning the natural and historic functions to a former or degraded vernal pool. Vernal pool restoration may include diverting excess surface runoff (*e.g.*, from agriculture, roads, or urban hardscapes), reconstructing the characteristic gradient and depth from the overlying soil surface to the impermeable layer beneath (*e.g.*, removing silt accumulation from agricultural use or repairing damage due to off-road vehicle use), replacing appropriate vegetation, managing grazing, and/or removing competing species.

Status Surveys

Rangewide species monitoring through use of standardized status surveys is necessary to assess whether the recovery criteria regarding population sustainability and habitat protections are being met. These standardized status surveys will additionally assist in determining whether populations are actually extant. The surveys include the current status of threats, the historical management regimes associated with the species, and may identify additional species occurrences that will contribute to recovery.

Research

Many important aspects of species biology and management have not yet been studied. Thus, continued research, in conjunction with adaptive management, is a crucial component of this Recovery Plan. Results of research will be used to protect and maintain the full range of genetic and geographic variation in each species and to refine habitat protection, habitat management, and species and ecosystem monitoring to more effectively meet recovery criteria. Recovery criteria and actions may be reevaluated for each species as research is completed. The primary information needs for the species covered in the Recovery Plan are:

- surveys to determine species distributions,
- population censusing and monitoring,
- reproductive and demographic studies,
- habitat management technique research,
- restoration technique research,
- biosystematic and population genetics studies,
- studies of pesticide and herbicide effects, and
- habitat and species restoration trials.

EXAMPLES OF IMPLEMENTATION FUNDING SOURCES

Central Valley Project Conservation Program/Central Valley Project Improvement Act Habitat Restoration Program

One of largest sources of funding for all five categories of recovery actions has been the Central Valley Project Conservation Pro-

Warne: Vernal Pool Ecosystems Recovery Plan

gram/Central Valley Project Improvement Act Habitat Restoration Program (CP/HRP). This is a joint program between the Bureau of Reclamation and the U.S. Fish and Wildlife Service which was established under the Endangered Species Act to restore and protect species and habitats impacted by the Central Valley Project. This program has an annual budget of approximately \$3,000,000 that is used to fund four categories of projects: land acquisition, habitat restoration, research and other (Planning/Management/Outreach) projects. Since 1996, when the program began, it has provided complete or partial funding for the protection of over 80,000 acres of land supporting vernal pool species from Shasta to Merced County. The protection mechanisms are either by fee title acquisition or by purchase of conservation easements, usually by a non-profit organization such as The Nature Conservancy. An example of use of CP/HRP funds for land protection in Butte County, California, was the partial funding of the acquisition of the 754-acre Stone Ridge Ranch which supports the Butte County meadowfoam (*Limnanthes floccosa* ssp. *californica*), a federally-listed endangered plant.

Since the Recovery Plan was completed in 2005, CP/HRP has also helped to fund seven research projects that address such topics as vernal pool plant associations, soil biota in restored vernal pools, ecology and genetics of vernal pool grasses, ecological function of created vernal pools, and control of waxy mangrass, an invasive species. Since 1996, the CP/HRP program has also helped fund vernal pool habitat restoration on approximately 10,000 acres of land in Butte, Colusa, Glenn, Merced, Sacramento, Tulare, and Yolo Counties.

Section 6 of the Endangered Species Act Recovery Land Acquisition Program

Federal Recovery Land Acquisition grant

funds are matched by states and non-federal entities to acquire, from willing sellers, lands that support listed species that have approved recovery plans. Section 6 funding was also used in the fee title purchase of Stone Ridge Ranch in Butte County, California. In addition to land acquisition funding, other types of funding available under Section 6 include conservation grants, habitat conservation planning land acquisition, and habitat conservation planning assistance.

U.S. Fish and Wildlife Service, Sacramento Office Recovery Funding

Direct funding from the Sacramento Fish and Wildlife Office's Recovery Program has supported at least two research projects on vernal pool species. In 2009, Christina Sloop completed a genetic study of Butte County meadowfoam (Sloop, 2011). Her analysis of the genetic diversity within and among populations of the meadowfoam will help inform the Service's conservation decisions with respect to possible translocation of individuals (i.e., seeds or plants) from one area to another to recover critically declining populations, and to guide the design of possible seed collection scenarios for long-term off-site seed storage.

Another example of research funded by the Sacramento Fish and Wildlife Office's Recovery Program is an ongoing study of the federally-threatened vernal pool fairy shrimp (*Branchinecta lynchi*) by Bernie May of the University of California, Davis, Genomic Variation Laboratory. He will analyze the genetic relationships of individuals across the landscape and the historic factors contributing to observed patterns of the historic and remaining populations of *Branchinecta lynchi* present in California and Southern Oregon. The study will identify geographic boundaries of demographically independent populations inferred from population genetic structure and estimated levels of migration among sites. It will

Research and Recovery in Vernal Pool Landscapes

also attempt to correlate genetic data with environmental factors (e.g., hydrology and topography). Information regarding the taxonomic status and genetic diversity in the vernal pool fairy shrimp will be helpful in making conservation decisions regarding currently listed species as well as form a reference database for future designations.

Partners for Fish and Wildlife Grants Program

The U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program provides cost-share funding and technical assistance to private land owners and their local partners. Assistance is given to restore streams, wetlands, and other native habitat on private property. The program operates on a voluntary basis. The landowners agree to maintain the restoration for at least ten years while keeping full control of their lands. In addition to forming partnerships with private landowners, the Service works with private organizations, and local, state, or other federal government programs.

An example of a project funded by the Partners for Fish and Wildlife program is a grassland and seasonal wetland enhancement project on the privately-owned Suscol Creek Preserve in Napa County. The site supports the largest population of the federally-endangered Contra Costa goldfields (*Lasthenia conjugens*) in Napa County. The site is proposed to be grazed to benefit the listed plant. The funds would cover the cost of purchase and installation of fencing and water troughs.

CONCLUSIONS

The Recovery Plan is the Service's official guidance document on actions that are necessary to achieve permanently-protected, self-sustaining, wild populations of the listed and

non-listed species addressed in the Plan. All recovery actions are completely voluntary. The majority of species in this plan occur on privately-owned land; therefore successful recovery and conservation of the species are dependent on the voluntary support of the public and other agencies.

The recovery strategy for the species in the Plan has five basic elements: 1) habitat protection, 2) adaptive habitat management and restoration, 3) status surveys 4) research, and 5) public participation and outreach. The recovery actions described in the Plan will be overseen by the range-wide Vernal Pool Implementation Team and the regional working groups. Examples of recovery actions are conservation easements, land acquisition, status surveys, habitat restoration, and genetic research. Like all recovery plans, this plan has no dedicated federal budget for implementing all of the recommended recovery actions.

Many sources of funding have been used to implement recovery actions to date including, most notably, the Central Valley Project Conservation Program/Central Valley Project Improvement Act Habitat Restoration Program, funds provided by Section 6 of the Endangered Species Act, the Sacramento Fish and Wildlife Office, and Partners for Fish and Wildlife.

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