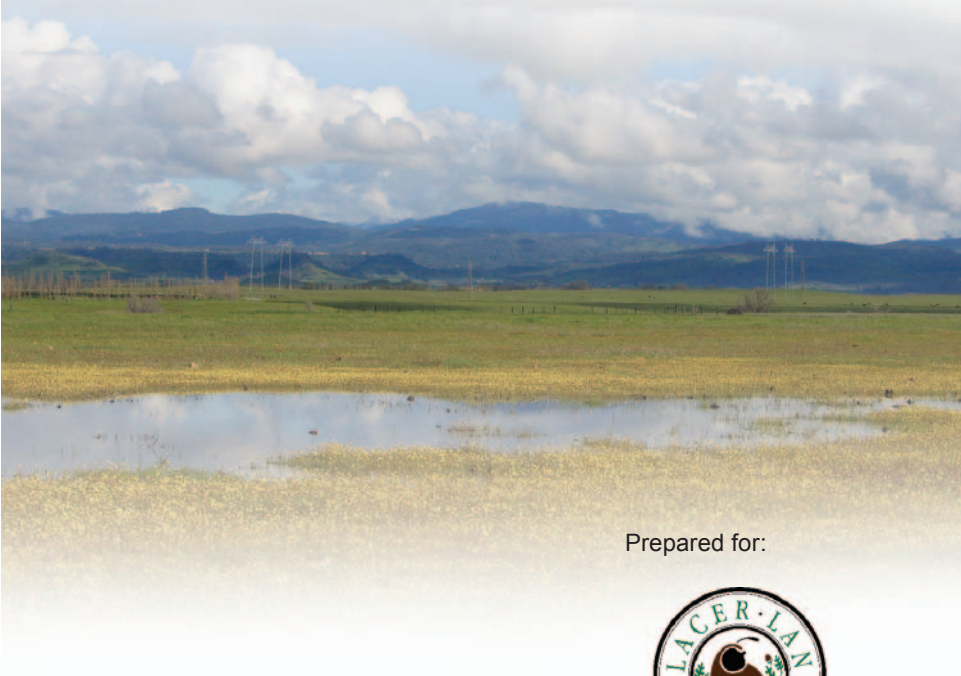


Summary Report

Loss of Central Valley Vernal Pools

Land Conversion, Mitigation Requirements,
and Preserve Effectiveness



Prepared for:



Prepared by:

AECOM

With Assistance from:
Vollmar Consulting and
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This report summarizes three research papers on the loss of vernal pools in the Central Valley of California. Funding for the research was obtained by Butte Environmental Council, California Native Plant Society, Defenders of Wildlife, Sierra Foothills Audubon Society, and Sierra Club Mother Lode Chapter.

The summary report, research papers, and data are available from Placer Land Trust at www.placerlandtrust.org.

INTRODUCTION AND BACKGROUND

Vernal pools are a unique ecological resource of California's Central Valley. Typically, they form within shallow depressions in grasslands that are underlain by a virtually impervious soil layer. In the winter, the pools fill with rain water and then slowly dry out through evaporation in the spring. Vernal pools support numerous native plant and animal species that are specially adapted to this unique, ephemeral environment—many of these species are found only in California.

MITIGATION: The U.S. Environmental Protection Agency defines mitigation in the Clean Water Act Section 404(b)(1) guidelines for wetlands and vernal pool protection as a three step process: (1) avoid adverse impacts associated with a proposed project through selection of less damaging practicable on-site or offsite alternatives; (2) minimize the impact of the selected alternative to the extent appropriate and practicable; and (3) compensate for remaining unavoidable impacts to the extent appropriate and practicable. Both the federal and State of California governments have adopted “no net loss” policies for wetlands, which require that State and federal agencies avoid a net loss of wetland area and values. Importantly, this mitigation process aims to reduce losses, but does not ensure that losses do not occur.

As a type of wetland, vernal pools are afforded special protections by the State and federal governments. In addition, several species of plants and animals that are found only in vernal pools have been designated with special conservation status as rare, threatened, or endangered by federal and State resource agencies. Because vernal pools, as well as these species, are protected by State and federal laws, damaging or filling vernal pools is subject to regulations. These regulations require permits for specified activities that would damage or fill a vernal pool, and require mitigation (see Mitigation sidebar) of any adverse effects to vernal pools. In spite of these regulations, many acres of natural grasslands with vernal pools have been lost to agricultural and urban development in recent decades. Much new agricultural development has not been regulated (see Farming and the Clean Water Act sidebar) and, although urban development has been regulated and impacts of urban development are usually mitigated, the required mitigation may not result in complete compensation of the loss of vernal pool ecosystems.

Because the loss of vernal pools poses a threat to the biological diversity of the Central Valley, three related scientific studies were conducted to better understand how much vernal pool habitat has been lost in recent years, how this loss has occurred under the current regulations, and how vernal pool loss has been mitigated. The studies were required and funded through the settlement of a lawsuit brought by a consortium of organizations, including Butte Environmental Council, California Native Plant Society, Defenders of Wildlife, Sierra Foothills Audubon Society, and Sierra Club Mother Lode Chapter, who challenged a large residential development in western Placer County, California, which would result in loss of vernal pool habitat. The studies include analyses of (1) historical losses of vernal pools in the Central Valley from the 1970s to 2005 and what land-use changes contributed, (2) losses of vernal pools and required mitigation related to permits for fill of vernal pool wetlands issued by the US Army Corps of Engineers (USACE) from 2000 to 2006, and (3) effectiveness of small preserves to protect vernal pool habitat.

As part of the legal settlement, parties on both sides of the lawsuit agreed to ask Placer Land Trust, as a neutral organization, to administer the three studies and facilitate public access to results. Reports on these studies, including this summary report, are available from Placer Land Trust at www.placerlandtrust.org. This report summarizes the findings of each of the three technical reports and their implications, each of which received detailed and independent scientific peer review as part of the project design and administration. These studies, reports, and accompanying data are presented as contributions to the factual understanding of vernal pools in the Central Valley.

FARMING AND THE CLEAN WATER ACT:

Placing fill in wetlands, including vernal pools, requires a permit under Section 404 of the federal Clean Water Act (CWA). Normal *ongoing* farming, ranching and forestry activities on existing agricultural land, such as plowing, seeding, and cultivating are exempted from this permit requirement. However, *new* farming activities that reduce the extent of wetlands or cause impairment of flow or circulation in wetlands are not exempted from the permit requirement (CWA, Section 404(f)(2)). The U.S. Supreme Court confirmed in 2002 that converting vernal pools to agricultural use without a Section 404 permit is in violation of the CWA (*Borden Ranch v. United States Army Corps of Engineers*).

LAND CONVERSION EFFECTS ON VERNAL POOLS

The historical extent of Central Valley grassland with vernal pools has been greatly reduced by the conversion of rangeland to intensive agriculture and urban and residential development. Dr. Robert Holland, a noted vernal pool biologist, developed a map of the extent of vernal pool habitat for 2005 and compared it to similar maps he prepared previously for the 1976-1995 period and for 1997 in order to assess the loss of vernal pool habitat. He has also evaluated the primary causes of vernal pool habitat loss throughout the Central Valley. Key findings are summarized below and in Table 1 and Figure 1.

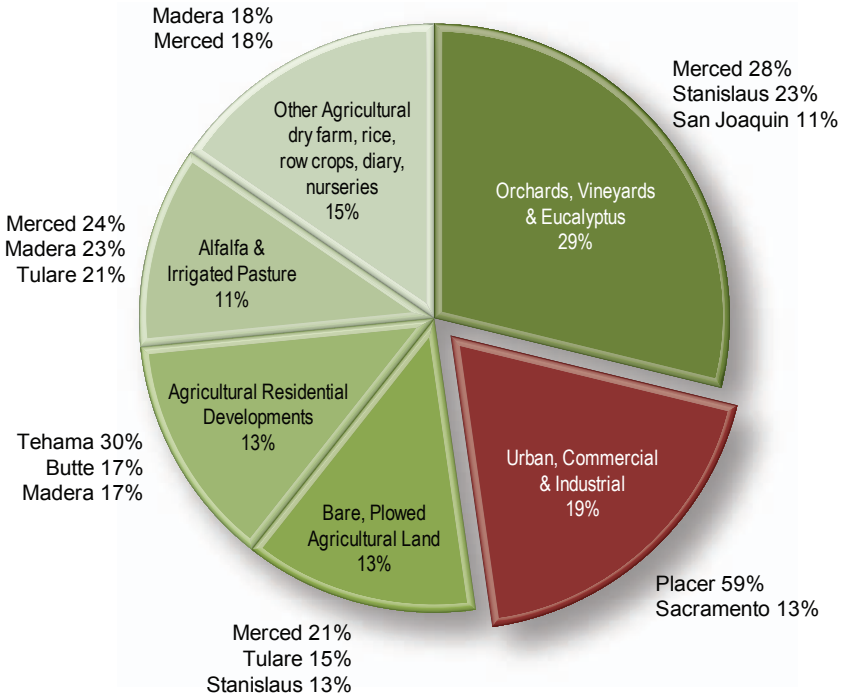
Table 1. Long-term changes and loss of Central Valley vernal pool habitat (in acres).

Habitat Category	Baseline ¹	1997 ²	2005 ³
Low Density ⁴	394,700	380,900	314,900
Medium Density	390,400	371,800	283,200
High Density	196,500	193,400	173,200
Disturbed ⁵	50,300	48,600	124,500
Lost	-	37,200	137,100
TOTAL	1,032,000	1,032,000	1,032,900⁶
% Baseline Habitat Lost		3.6%	13.3%

Source: Dr. Robert. F. Holland, 2009

NOTES:

1. Baseline refers to the 1976-1995 period (Data obtained the California Department of Water Resources Crop Mapping Program)
2. Data obtained from the California Department of Conservation U2 Flight
3. Data obtained from the National Agricultural Imagery Program
4. Density was based on visual interpretation an aerial photograph signatures
5. Disturbances include modified topography, hydrology, land use and other modifications.
6. Total includes 900 acres of habitat that were erroneously mapped as non-habitat in previous years.



Vernal Pool Habitat Loss (137,100 Acres)

Figure 1. Central Valley vernal pool habitat loss by land use conversion type observed in 2005 as a percentage of baseline (1976-1995). Counties with significant contributions to a specific type of loss are individually indicated—for example 59% of all Central Valley urban development loss occurred in Placer County. Land use types and vernal pool habitat extent were obtained by Dr. Robert F. Holland through interpretation of aerial photographs from the Crop Mapping Program of the California Department of Water Resources for 1976-1995 (depending on county) and the National Agriculture Imagery Program for 2005.



Source: AECOM 2009

Vernal pool in spring displaying characteristic rings of native flowering wetland plants

Approximately 1,030,000 acres of vernal pool habitat were documented in the Central Valley during initial mapping efforts based on aerial photographs from 1976 to 1995. Today, about 893,000 acres of habitat remain, a reduction of about 137,000 acres, or 214 square miles. This loss of vernal pool habitat has not been distributed evenly across the Central Valley. For example, Mariposa County has not lost any vernal pool habitat since 1976, but at the opposite extreme, Merced County has lost 24,000 acres and Placer County has lost 17,000 acres of the vernal pool habitat found during initial mapping (1987 and 1994, respectively). Three other counties have also lost more than 10,000 acres since the original mapping: Madera (14,300 acres), Stanislaus (14,100 acres), and Tehama (11,000 acres). In addition, counties with smaller acreage losses, but substantial percentage losses, include Yolo (75%), Colusa (63%), Sutter (52%) and Glenn (39%).

Various forms of agricultural land conversion have far exceeded urbanization as a cause of vernal pool habitat loss. Eighty-one percent (110,000 acres) of the total habitat loss between the initial mapping period and 2005 was lost due to agricultural land conversions. Orchards and vineyards represent the largest cause of vernal pool habitat loss, totaling approximately 40,000 acres. Most of this loss was concentrated in the southern Sacramento Valley and

northern San Joaquin Valley. Vernal pool habitat was also lost to agricultural residential development (“ranchettes” or “hobby farms”), fallow agricultural land, irrigated pasture, and other agricultural activities. With the exception of agricultural residential development, which has been most common in the northeastern Sacramento Valley, these activities have been concentrated in the San Joaquin Valley.

Despite the frequent focus on urbanization as a cause of vernal pool habitat loss, urban development has accounted for the minority of Central Valley habitat loss—26,000 acres or 19 percent. Most urban habitat loss, however, was concentrated in Placer and Sacramento Counties, with relatively small amounts of loss to urbanization scattered in other parts of the Central Valley.

CUMULATIVE PERMITTED VERNAL POOL LOSSES

While a large amount of vernal pool habitat has been lost in the Central Valley within the last 20 to 30 years, many details about mitigation measures required to compensate for this loss cannot be discerned from permit files. With certain exceptions, activities that would result in the fill of vernal pools must receive a wetlands fill permit from the USACE under Section 404 of the federal Clean Water Act. As was discussed above, an extensive amount of vernal pool habitat was lost in recent decades due to agricultural conversions. Permits were generally not obtained for establishing these new agricultural practices, although permits are required under Section 404 of the Clean Water Act (*Borden Ranch vs. U.S. Army Corps of Engineers* – see Farming and the Clean Water Act sidebar). And, because the issuance of a wetlands fill permit by the USACE constitutes a federal action that may adversely affect species listed as threatened or endangered under the federal Endangered Species Act (ESA) (for example vernal pool tadpole shrimp, vernal pool fairy shrimp, and California tiger salamander), the USACE must consult with the U.S. Fish and Wildlife Service (USFWS) to determine if issuance of the fill permit would jeopardize the continued existence of these species. If a permit is applied for and approved, the USACE and USFWS generally require that appropriate mitigation be implemented to compensate for the loss of vernal pools. This mitigation usually includes a habitat restoration or creation component and a habitat preservation component.

To better understand the permitting process as it affects fill of vernal pools and the types of measures that are implemented to mitigate for vernal pool loss, 64 permits issued by the USACE from 2000 to 2006 that resulted in the loss at least 0.5 acre of vernal pool wetlands were evaluated. For each permit, the amount of affected vernal pool habitat, affected species, mitigation acreages and methods, and a variety of other data were recorded in a relational database. The location of each project site was recorded and mapped in a geographic information system (GIS), and every permit document was scanned and saved in Adobe Portable Document Format (PDF) with text search capabilities.

Most permit files were found to be incomplete and were missing key documents that would have provided important information regarding the biological effects of the permitted vernal pool loss, measures that were required as compensatory mitigation, and the success of this mitigation (Table 2). In many cases, it was not clear from the permit files if the required mitigation measures were implemented.

Table 2. Contents of 64 individual Clean Water Act Section 404 permits for development projects with the potential to affect vernal pools in the Central Valley issued from 2000 to 2006.

Document	Number of Files	Percent of Files
USACE permit	64	100
USFWS BO	60	94
Evaluation and decision document	51	80
Public notice	50	78
Wetland delineation	43	67
Mitigation and monitoring plan	35	55
Habitat management plan	31	48
Biological assessment	22	34

Source: AECOM 2009

Notes: BO = biological opinion; USACE = U.S. Army Corps of Engineers;
USFWS = U.S. Fish and Wildlife Service

Permit files indicate that pre-established mitigation banks and off-site mitigation areas were preferred by applicants, both in terms of the number of projects selecting these mitigation methods and the acreage of vernal pools restored and preserved, as opposed to on-site mitigation (Figure 2). It was difficult, however, to determine how mitigation requirements were met due to a lack of data in the permit files for many projects.

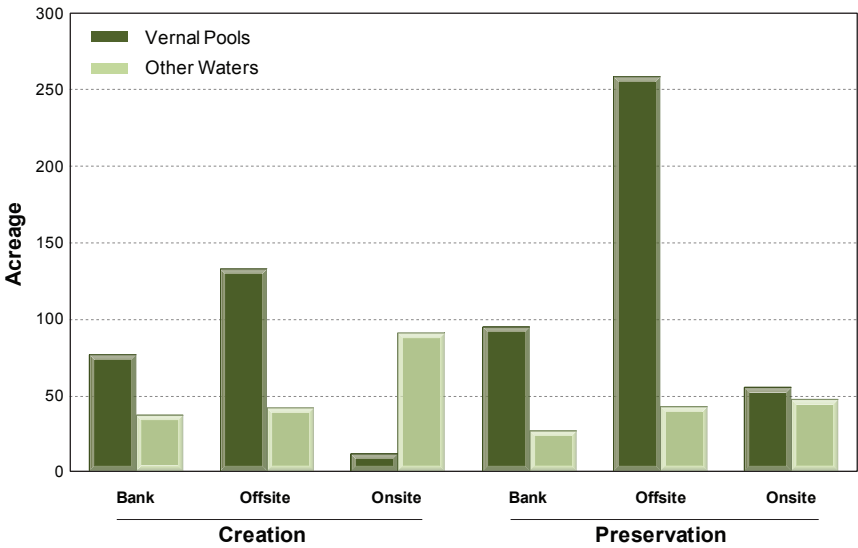


Figure 2. Distribution of mitigation area according to mitigation method in 64 individual Section 404 Clean Water Act permit files for Central Valley development projects that had the potential to affect vernal pools.

EFFECTIVENESS OF SMALL VERNAL POOL PRESERVES

As a first step in gathering data on the status of vernal pool preserves, 12 small vernal pool preserves (preserves of less than 60 acres) in California’s Central Valley were examined in detail. Small preserves were selected for study because smaller preserves have historically been most common (although they are becoming less prevalent with the advent of mitigation banks and large off-site mitigation areas), and because they are commonly used to preserve



Source: VernalPools.org 2008

Unauthorized tire tracks through a vernal pool

populations of threatened and endangered plants, since many of these species are not found in mitigation banks.

Data on the small preserves included in the study were gathered through questionnaires completed by preserve managers, review of preserve management and monitoring documents provided by preserve managers, and site visits. These data included: general physical and biological characteristics of the preserve, existing infrastructure and land use information, details on preserve establishment and funding, preserve management and monitoring reports, general ecological conditions and trends, and information on educational outreach programs.

Of the 12 preserves included in the study, many preserve managers reported that public trespass, vandalism, trash dumping, domestic animal use, and similar activities, were threatening the preserve's ecological integrity and the species and habitats that the preserve was established to protect (Table 3). Many of the preserve managers also indicated that the condition of the preserve had declined since establishment or that populations of threatened and endangered species, or habitat quality for these species, had declined since preserve establishment (Table 3).

Only four of the 12 preserves examined had a dedicated funding source sufficient to pay for some level of ongoing maintenance, preserve oversight, and preserve management. With limited funding, eight of the preserves lacked a formal vegetation management program, such as regular prescribed grazing, prescribed burning, or some other form of vegetation management designed to prevent the build-up of thatch (i.e., residue from previous years' grass growth) within the uplands surrounding vernal pools and within the pools themselves. And, while cursory monitoring is conducted on many preserves, most preserves

Table 3. Preserve establishment, endowment, management, and monitoring compared with reported overall ecological trends at 11 small vernal pool preserves in the Central Valley.

Preserve No.	Year Established	Preserve Acreage	Financial Endowment?	Management Plan?	Site Monitoring?	Monitoring Results Used?	Ecological Conditions Since Establishment
A	2006	53	Yes	Yes	Yes	Frequently	Same
B	2007	6	Yes	Yes	Yes	Frequently	Decline
C	2007	15	Yes	Yes	Yes	Always	Unknown
D	1990	48	Yes	Yes	Yes	Frequently	Decline
E	1993	36	Yes	Yes	Yes	Frequently	Decline
F	1988	33	Yes	Yes	Yes	Frequently	Same
G	1979	8	No	Yes	Yes	ND	Decline
H	1979	15	No	Yes	Yes	ND	Decline
I	1998	10	No	Yes	No	ND	Decline
J	1992	37	No	No	No	ND	Unknown
K	1964	40	No	No	No	ND	Unknown

Source: Data obtained from preserve managers and compiled by Vollmar Consulting in 2009

NOTES:

ND = No data collected or available.

SHADING:

No Shading (A-C) = recently established preserves, protected by conservation easements, sizable endowments; Light Green (D-H) = older preserves, deed restrictions or fee simple ownership, either endowments or other funding sources; Dark Green (I-K) = older preserves, deed restrictions or fee simple ownership, no endowment or funding source.



Source: AECOM 2009

Vernal pool habitat in winter in close proximity to a housing development

lacked a formal, quantitative monitoring program that could be used to guide management of the preserve. Despite the fact that many of these preserves were established to meet regulatory agency compensatory mitigation requirements, it appeared that little to no agency follow-up has taken place to ensure that required management and monitoring activities are being conducted.

IMPLICATIONS FOR IMPROVING VERNAL POOL PROTECTION

These studies indicate that the effectiveness of vernal pool protection can be improved and several possible actions are described below, which follow directly from the findings. Although some of these actions are currently applied by the USACE or other agencies, the scientists who conducted the three technical studies concluded that more comprehensive and improved implementation would increase both the extent and effectiveness of vernal pool protections that are required by federal and State law.

- Extend active regulatory oversight to agricultural land use changes that violate the applicable laws that protect vernal pools and the threatened and endangered species that depend on them. These laws potentially include the Clean Water Act, the Porter-Cologne Water Quality Control Act, the Endangered Species Act, and the California Fish and Game Code.
- Increase coordination among federal and State regulatory agencies and local government planning departments, particularly when local planning departments issue discretionary permits that may result in adverse effects on vernal pools. This is particularly important for agricultural conversions that have not historically triggered review under the federal Clean Water Act.
- Improve the record-keeping practices employed by the regulatory agencies when reviewing and issuing permits so that the effectiveness of vernal pool protections can be tracked over time and improved.
- Require annual monitoring reports for vernal pool preserves for a defined period after the preserve's initial establishment (e.g., 10 years), and at regular intervals (e.g., every 5 years), so that problems can be identified and addressed as they arise and so that the most effective preserves become a learning experience for the future. Experience with preserves to date indicates that regulatory staff should review these reports in the field with the preserve manager and ensure that preserve managers take corrective action within some defined period of time.
- Require that all proposed new vernal pool preserves be protected by a recorded conservation easement, including a preserve-specific management plan, and be managed by an organization with demonstrated experience managing vernal pool preserves.
- Require a dedicated preserve management and maintenance funding source and a financial plan that shows that the funding estimates are realistic, given the likely management requirements for the preserve.



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