Fong

Phase 1 Final Report

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan

Prepared for the Santa Rosa Plain Vernal Pool Task Force

June 30, 1995

CH2M HILL

SONOMA COUNTY VERNAL POOL TASK FORCE

June 30, 1995

SANTA ROSA PLAIN VERNAL POOL ECOSYSTEM PRESERVATION PLAN

The Sonoma County Vernal Pool Task Force is pleased to present the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. This plan is the result of a collaborative effort between Federal, State and local agencies, and local land use interests and organizations.

This plan is Phase 1 of a two part effort to preserve valuable resources and streamline the regulatory process for obtaining authorization for projects that fill less valuable seasonal wetlands.

The members of the Task Force affirm our commitment to achieve a workable solution to vernal pool ecosystem preservation and local development needs on the Santa Rosa Plain. We agree that the anticipated outcome of Phase 2 of the preservation plan will be a new General Permit issued by the Corps of Engineers to local government. This General Permit will address the regulatory requirements of all other Federal and State resource agencies and provide a detailed implementation agreement thereby significantly increasing regulatory predictability .

The Task Force urges that Phase 2 be fully funded and completed in a timely manner, to ensure swift implementation of the Plan and the General Permit.

MEMBERS OF THE SONOMA COUNTY VERNAL POOL TASK FORCE

PCW(C:\WPFILES\VERNAL\VPPP.LTR)

FINAL
Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan

Prepared for

Santa Rosa Plain Vernal Pool Task Force

Prepared by

CH2M HILL
1111 Broadway, Suite 1200
Oakland, California 94607

June 30, 1995

Contents

Chapter **Page**

Acknowledgments

Acronyms and Glossary **G-1**

Executive Summary **ES-1**

1 Introduction **1-1**

2 Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Goals and Objectives **2-1**

3 Santa Rosa Plain Vernal Pool Ecosystem **3-1**

3.1 The Santa Rosa Plain 3-1

3.1.1 The Santa Rosa Plain Ecosystem 3-1

3.1.2 Santa Rosa Plain Vernal Pool Ecosystem Definition 3-2

3.2 Santa Rosa Plain Wetlands 3-2

3.2.1 Types of Wetlands in the Santa Rosa Plain 3-3

3.3 Types of Seasonal Wetlands in the Santa Rosa Plain 3-3

3.3.1 Vernal Pools 3-3

3.3.2 Vernal Swales 3-6

3.3.3 Vernal Pool-Swale Complexes 3-6

3.3.4 Relationship of Vernal Pools to Other Wetlands 3-6

3.4 Significance of Vernal Pool Wetlands 3-7

3.5 Upland Habitats Associated with the Vernal Pool Ecosystem 3-8

3.6 Species of Special Concern 3-9

3.6.1 Plant Species of Special Concern 3-9

3.6.2 Wildlife Species of Special Concern 3-12

3.6.3 Conservation Biology of Plant Species of Special Concern 3-17

3.7 Wetlands Distribution in the Santa Rosa Plain 3-19

3.7.1 Vernal Pool and Swale Complexes 3-21

3.7.2 Major Riparian Corridors 3-21

3.7.3 Other Wetlands 3-21

3.8 Current Threats and Causes of Loss 3-21

3.8.1 Land Conversion 3-22

3.8.2 Filling of Wetlands 3-22

3.8.3 Irrigation 3-23

3.8.4 Hydrologic Modification 3-23

3.8.5 Non-Native Species Invasion 3-24

Contents
(continued)

Chapter			Page
4	**Regulatory Environment**		**4-1**
	4.1	Wetlands Regulations	4-1
		4.1.1 Clean Water Act Section 404	4-1
		4.1.2 Food Security Act	4-4
		4.1.3 Agency Wetlands Resources Policies	4-4
		4.1.4 Certification by the Regional Water Quality Control Board	4-4
	4.2	Endangered Species Regulations	4-4
		4.2.1 Federal Endangered Species Act	4-4
		4.2.2 California Endangered Species Act	4-5
		4.2.3 California Native Plant Protection Act	4-5
	4.3	General Environmental Regulations	4-5
		4.3.1 National Environmental Policy Act	4-5
		4.3.2 California Environmental Quality Act	4-5
		4.3.3. Migratory Bird Treaty Act	4-6
	4.4	Local Plans, Policies, and Ordinances	4-6
		4.4.1 County and City Policies Protecting or Affecting Biological Resources	4-6
		4.4.2 Fire Code Requirements	4-18
		4.4.3 Sonoma County Water Agency Policies	4-18
		4.4.4 Santa Rosa Subregional Water Reclamation System Policies	4-19
5	**Historic and Current Conditions in the Study Area**		**5-1**
	5.1	Historical and Existing Land Use	5-1
		5.1.1 Historical Conditions	5-1
		5.1.2 Existing Land Use	5-2
		5.1.3 Land Ownership	5-7
	5.2	Land Use Plans	5-7
		5.2.1 Sonoma County General Plan and Zoning Ordinance	5-7
		5.2.2 City General Plan and Zoning Ordinances	5-9
	5.3	Compatibility of Existing and Future Land Uses with Vernal Pool Preservation	5-11
6	**Vernal Pool Ecosystem Preservation Plan Framework**		**6-1**
	6.1	Evaluation and Identification of Habitat Quality and Potential Preserves	6-1
	6.2	Site Evaluation Process	6-1
		6.2.1 Site Evaluation Criteria Methods	6-2
		6.2.2 Site Evaluation Criteria Results	6-2
	6.3	Preserve Design	6-9
		6.3.1 Preserve Design Principles	6-9
		6.3.2 Preserve System Site Identification and Evaluation	6-10
	6.4	Land Use Compatibility With Vernal Pool Preservation	6-13

Contents
(continued)

Chapter		Page
	6.5 Restoration and Enhancement Potential	6-14
7	**Non-Regulatory Implementation Strategies**	**7-1**
	7.1 Preserve Management and Maintenance	7-1
	7.1.1 Management	7-1
	7.1.2 Monitoring and Maintenance	7-2
	7.2 Recommended Non-Regulatory Implementation Strategies	7-3
	7.2.1 Conservation Easements	7-4
	7.2.2 Market-Oriented Conservation Strategies	7-4
	7.2.3 Wetlands Registry	7-7
8	**Permitting Implementation Issues/Strategies**	**8-1**
	8.1 Regulatory Process-Clean Water Act Regulations	8-2
	8.1.1 Description of Streamlined Regulatory Process	8-2
	8.1.2 Specific issues for the General Permit	8-3
	8.2 Local Land Use Policy Compliance	8-5
	8.2.1 General Plan Revisions	8-6
	8.2.2 Special Area Plans/Master Plans	8-6
	8.2.3 Combining or Overlay Zoning	8-7
	8.2.4 Wetlands and/or Endangered Species Protection Ordinances	8-7
	8.2.5 Grading Ordinances	8-7
	8.3 CEQA/NEPA Compliance	8-7
	8.4 Mitigation Measures	8-7
	8.4.1 Preservation	8-8
	8.4.2 Restoration	8-8
	8.4.3 Enhancement	8-8
	8.4.4 Creation	8-8
	8.4.5 Endangered Plant Species Mitigation	8-9
9	**Tasks for Phase 2 of the Santa Rosa Plain Vernal Pool Preservation Project**	**9-1**
	9.1 Verify Habitat Quality	9-1
	9.2 Mitigation Banks	9-1
	9.3 U.S. Army Corps of Engineers General Permit	9-2
	9.4 General Plan Amendments	9-2
	9.5 Public Outreach and Incentives	9-2
	9.6 Site Ranking Training Workshop and Handbook	9-3
	9.7 Overall Preserve Design	9-3
	9.8 Environmental Review	9-3
10	**References**	**10-1**

Contents
(continued)

Chapter **Page**

Appendices

Appendix A. Public Participation
Appendix B. Additional Biological Data
Appendix C. U.S. Army Corps of Engineers Public Notice
Appendix D. Site Evaluation Criteria
Appendix E. Potential Preservation Areas
Appendix F. Mitigation Banks
Appendix G. Assessment of Compensation Techniques
Appendix H. Non-Regulatory Implementation Strategy Options
Appendix I. Response to Comments on Draft Plan

Contents
(continued)

Number **Page**

Tables

1-1 Santa Rosa Plain Vernal Pool Ecosystem Preservation Project Task Force 1-3

2-1 Location of Where Objectives Are Met in the Preservation Plan 2-2
2-2 In Which Phase of the Project are the Objectives Met? 2-3

3-1 Characteristic Plant Species in Santa Rosa Plain Vernal Pools 3-5
3-2 Plant Species of Concern Known within the Santa Rosa Plain 3-10
3-3 Special Status Wildlife Species 3-13

4-1 Regulatory Environment 4-2

5-1 Existing Land Uses 5-5

6-1 Evaluation Criteria for Potential Vernal Pool Preserves 6-3
6-2 Potential Preserve Evaluation 6-5
6-3 Acreage of Individual Preserves 6-12

8-1 Mitigation Ratios for Vernal Pool Ecosystem Impacts under a General Permit Application 8-6

Figures

1-1 Regional Location 1-6
1-2 Study Area 1-7

3-1 Major Areas of the Vernal Pool Ecosystem of the Santa Rosa Plain 3-20

5-1 Existing Land Use 5-3
5-2 Urban Boundaries 5-4
5-3 Land Use Designations 5-8

6-1 Santa Rosa Plain Potential Preserve Evaluation, Ranked Potential Preserves 6-6
6-2 High, Low, and Unknown Quality Resource Areas 6-7
6-3 Potential Preserve Areas 6-11

8-1 Santa Rosa Plain General Permit Regulatory Process 8-2

Acknowledgments

The Phase 1 Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan was developed through the cooperative efforts of representatives from regulatory agencies, local government, land management organizations, environmental and community interest groups, the agricultural community, developers, landowners, and members of the public. For the past year and a half, we have worked together to create a strategy that reflects all these interests. Developing this Plan was not easy, but it was a worthwhile challenge and we hope it will meet the needs of all those who participated in its development and those who will benefit from its implementation.

Thank you to all individuals who took the time to review the administrative and draft versions of the Plan and the fact sheets, and attend the public meetings. Your feedback was invaluable and this Plan would not be as good without the benefit of your insights and guidance.

Task Force Members

- David Bannister—Sierra Club
- Charlie Carson—Building Industry Association
- Jim Chaaban—Congresswoman Woolsey's Office
- David Wm. Hansen—Sonoma County Agricultural Preserve and Open Space District
- Grant Davis—Congresswoman Woolsey's Office
- Carolyn Dixon—Sonoma County Wetlands Watch
- Calvin Fong—U.S. Army Corps of Engineers
- Jeremy Graves—Sonoma County Permit and Resource Management Department
- Betty Guggolz—California Native Plant Society
- Ann Howald—California Department of Fish and Game
- Judy James—Sonoma County Farm Bureau
- Richard King—Natural Resources Conservation Service
- Jan Knight—U.S. Fish and Wildlife Service (Endangered Species Branch)
- Suzanne Marr—U.S. Environmental Protection Agency
- Sharon Moreland—U.S. Army Corps of Engineers
- Robert Muelrath—Sotoyome
- Jim Olmsted—Sonoma County Planning Department
- Charles Patterson—Consulting Biologist
- Ruth Pratt—U.S. Fish and Wildlife Service (Wetlands Branch)
- Chuck Regalia—Santa Rosa Department of Community Development
- Scott Stinebaugh—Subregional Utility Division/Laguna Wastewater Treatment
- Nick Tibbets—Habitat Mitigation Committee
- Tux Tuxhorn—Benjamin-Tuxhorn
- Renée Thériault Weber—Sonoma County Water Agency

- Carl Wilcox—California Department of Fish and Game

Consultant Team

- Dick Arnold—Entomological Consulting Services
- Marjorie Castleberry (Wildlife Biologist)—CH2M HILL
- Toby Hanes—Hydro Science
- Wayne Heiser—Technical Editor
- Amy Hiss (Botanist)—CH2M HILL
- Lynne Hosley (Co-Project Manager/Senior Biologist)—CH2M HILL
- Niall McCarten (Project Manager/Senior Botanist)—CH2M HILL
- Dawn Nilson (Planner)—CH2M HILL
- Scott Oppelt (Biologist)—CH2M HILL
- Jill Shapiro (Senior Review)—CH2M HILL
- Nadeem Shaukat (GIS)—CH2M HILL
- Jane Steven (Ecologist)—CH2M HILL
- Laurence Stromberg—Restoration Biologist
- Sharon Weinberg (Public Participation/Decision Process)—CH2M HILL
- Kyle Winslow—CH2M HILL
- Marco Waaland—Golden Bear Biostudies

Federal, State and Local Regulatory Agencies

- Roxanne Bittman (Botanist)— California Department of Fish and Game Natural Diversity Data Base
- Allan Buckmann—California Department of Fish and Game
- Joe Carboni (GIS)—California Department of Fish and Game Natural Diversity Data Base
- Jane Hicks—U.S. Army Corps of Engineers
- Ron Keith (Entomologist)—Marin -Sonoma County Mosquito Abatement
- Richard Lehtinen—Sonoma County Planning Department
- Tim Mayer—Sonoma County Public Works
- Tim Nossel (Botanist)— California Department of Fish and Game Natural Diversity Data Base
- Jim Olmstead—Sonoma County Planning Department
- Heather Townsend (Botanist)— California Department of Fish and Game Natural Diversity Data Base
- Mike Tuffly (GIS) — California Department of Fish and Game
- Natural Diversity Data Base

Local Government

- Ernie Carpenter—County of Sonoma Board of Supervisors
- Rick Jones—Town of Windsor
- Mayor James Pedgrift—City of Santa Rosa
- Richard Spitler—City of Sebastopol

Land Management Organizations

- Dino Bonos—Sonoma County Agricultural Preserve and Open Space District
- Maria Cipriani—Sonoma County Agricultural Preserve and Open Space

Local Organizations

- Jack Guggolz—California Native Plant Society
- Donna Strom—Sonoma County Wetlands Watch
- Scot Stegeman—Sonoma County Business Regulatory Roundtable

Members of the Public

- Stephen K. Butler—Clement, Fitzpatrick & Kenworthy, Inc.
- Woodrow C. Ersted—Northpoint Management Company, Inc.
- Craig Harrington—Quaker Hill Development Corporation
- Joyce Hunting—HBA
- Georgia Kelley—Georgia Kelley & Associates
- Mike Kelly—Sonoma County Realtors Association
- Jane W. Marx—Mitchell & Heryford
- Brad Olson—WESCO
- Diane J. Sohl—Housing Consultation
- Terrance A. Tremblay—Tremblay Construction
- Christine Vreeland
- John Zentner—Zentner and Zentner

Acronym Definitions

C	Commercial
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CNPS	California Native Plant Society
Corps	United States Army Corps of Engineers
CWA	Clean Water Act
DA	Diverse Agriculture
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Authority
LEA	Land Extensive Agriculture
LIA	Land Intensive Agriculture
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service (formerly Soil Conservation Service)
NWP	Nationwide Permit
PDR	Purchase of Development Rights
PF	Public Facilities
RR	Rural Residential
R & RD	Resources and Rural Development
R-V	Recreation-Visitor
RWQCB	Regional Water Quality Control Board
SCAPOSD	Sonoma County Agricultural Preservation and Open Space District
SCWA	Sonoma County Water Agency
SLT	Sonoma Land Trust
SWRS	Subregional Water Reclamation System
TDR	Transferable Development Rights
UR	Urban Residential
UA-C	Urban Area-Cities
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

Glossary

Bargain Sale. The sale of property to a public agency or conservation group at less than the assessed value.

Buffer. A designated area along the perimeter of a stream or wetland that is regulated to control (resist, absorb, or otherwise preclude) the negative effects of adjacent development from intruding into the natural area beyond the buffer. Upland buffers may function as habitat for terrestrial wildlife species.

Conservation Easement. A partial interest in land owned by a public agency or conservation group, often used to restrict or limit future development potential of the site.

Countywide Production Acreage. The amount of land in use in a given county to produce a specific agricultural commodity.

Covenant. A binding agreement affecting land.

Created Wetland. For the purpose of receiving mitigation credit, the alteration of soils, hydrology, and plants to produce a wetland where no wetland previously existed.

Deed Restrictions. Deed restrictions allow a landowner to define the future use of its property at the time the property is transferred.

Defensibility. As used in the site evaluation criteria for this polan, defensibility refers to the ability to protect significant resources from outside influences that might significantly affect these resources; it is a function of the size, shape, and surrounding uses of a site

Delineation. Determination of the boundaries of a jurisdictional wetland. The delineation may be marked in the field or on a map or aerial photograph.

Dendritic Network. The branching pattern of watercourses.

Due Process. Legal proceedings established to protect individual rights and liberties.

Easement. A partial interest in land held by someone other than the owner of the remaining property rights.

Ecosystem. An ecosystem is the combination of all the biological components and the physical environment that form a system of complementary relationships.

Effluent. The discharge or outflow of water from ground or sub-surface storage.

Eminent Domain. The government's power to take private land for public purposes with payment of compensation.

Encroachment. Any structure or activity that changes, expands, or diminishes the course, current, or cross-section of any water course, floodway, or body of water, including wetlands.

Endangered. Any species which is in danger of extinction throughout all or a significant portion of its range [Federal Endangered Species Act, Section 1532 (6)].

Endemic. Any species which is restricted to a habitat in a particular area or locality.

Enhancement. To improve one or more biological values in an existing wetland. The improvements may be to soils, water, or plants. Enhancement may improve a particular wetland value at the expense of other values.

Fee Simple. The acquisition of property by means of direct purchase.

Flood Plain. The low-lying land adjacent to a river, stream, or coast that may be submerged during a flood.

General Plan. A document setting out a county's or municipality's objectives and policies on the location, character, and timing of future land development.

Gradient. The degree of slope.

Grasslands. Land the predominant vegetation of which is native or non-native grassland.

Hydric Soil. Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Hydrogeomorphic. Physical and hydrologic.

Hydrology. The distribution of water in soils and rocks.

Hydrophytic Plants or Hydrophytes. Plants adapted to live in wetland conditions.

Incentives. Stimuli or motives (usually financial) for conserving or preserving lands.

Integrity. As used in the site evaluation criteria (see Appendix D) for this plan, integrity refers to the soundness or unimpaired condition of a habitat.

Jurisdictional. Falling under the authority of a given law.

Land Trust. A private, nonprofit organization whose purpose is to acquire and manage natural areas for the conservation of natural values.

Local Government. A municipality or county.

Margin. See "buffer."

Marsh. A frequently or continually inundated wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.

Mitigate. To lessen an adverse impact. With wetlands, the term generally means to avoid, minimize, or compensate for an impact.

Mitigation Bank. Wetland enhancement, restoration, or creation undertaken to provide mitigation (compensation) for wetlands losses from future development activities. The bank involves enhancing, restoring or creating wetlands before development of a wetland as part of a credit program.

Networking. Provision in a local law that conditions approval of local permits or plans upon compliance with federal and state laws.

Management Agreement. A legal contract between a land owner and a conservation organization requiring the owner to manage the property in a specific way for a determined amount of time.

Mutual Covenant. A binding agreement between landowners interested in protecting their land. Landowners enter into an agreement controlling the future use of their land through restrictions agreed upon by all the participating landowners. Such agreements are permanent and can be enforced by any of the landowners or future landowners of the involved properties.

Percolate. To pass or ooze through small interstices; to filter.

Perennial. Plants that live more than two years.

Perennial Wetlands. Wetlands that are wet throughout the year.

Police Powers. The authority of a government to act to protect the public health, safety, and general welfare.

Preferential Property Tax Assessment. Counties may offer a reduced property tax assessment to landowners who maintain their property in its open, natural state. This type of preferential treatment may be limited to those landowners operating their land under a covenant.

Qualified Conservation Easement. A donation of land or easement(s) for conservation purposes that is eligible for federal income tax benefits.

Rare. Under California law, native plant is considered rare when "although not presently threatened with extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens" [California Native Plant Protection Act].

Refugia. Small isolated areas that have escaped extreme changes undergone by the surrounding areas.

Restoration. To improve a disturbed wetland by returning wetland parameters that may be missing; adding soils, water, or plants. The restoration may return a missing or damaged wetland function to achieve a desired outcome; for example, removing an agricultural crop and planting native seeds to produce a wet prairie grassland.

Riparian. The land bordering a stream or river; also pertaining to the vegetation typical of those borders (grasses, shrubs, and trees such as reed canary grass, spiraea, willows, ash, and cottonwood).

Ruderal. A disturbed area.

Savannah (Oak). A grassland characterized by scattered oak trees.

Seasonal Wetlands. Wetlands that either carry water, are ponded, or have saturated soils during the winter and/or spring.

Species of Special Concern. Plant or animal species that are legally protected under federal or state law as well as those recognized by organizations such as the California Native Plant Society as requiring special protection.

Taking. A legal term referring to an action of the government that physically occupies or seizes private property or otherwise has the effect of doing so.

Threatened. Under the federal Endangered Species Act, any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Topography. Surface features of an area such as hills, valleys, canals, rivers, and roads.

Vernal. Springtime.

Vernal Pool. A seasonal wetland that forms in depressions as a result of a shallow, relatively impermeable soil layer that restricts downward movement of water. A vernal pool does not have an outlet, causing the water to pond seasonally.

Vernal Swale. A seasonal wetland that forms in depressions as a result of a shallow, relatively impermeable soil layer that restricts downward movement of water, but has an outlet, preventing the water from ponding. Vernal swales tend to be narrower than the vernal pools they connect to.

Watershed. An area in which water drains to a common outlet; an area drained by a river or river system.

Wetland. Generally, three factors determine the existence of a wetland: (1) hydric soils (those soils officially identified as being wetland-type soils), (2) water (surface or

groundwater within the root growing zone or upper 18 inches of soil), and (3) predominance of plants that are recognized as wetland species.

Wetland Registry. A wetland registry is an association of landowners who pledge to preserve their wetlands voluntarily. Registries can be administered by local governments or private conservation groups and can include a provision that gives the administrative body the right of first refusal or the right to match any purchase offer for the property.

Wetlands Delineation. Determination of the boundary of wetlands. The U.S. Corps of Engineers Wetlands Delineation Manual provides methods for making this boundary determination.

Executive Summary

Over the past 40 years, the Santa Rosa Plain has gone through a significant transformation: from an area that was largely rural residential, diverse agricultural, and extensive open space, with seasonal and perennial wetlands, grasslands, and oak woodlands, to more urbanized and intensive agriculture. The previous land uses were more consistent with a unique system of natural resources referred to as the vernal pool ecosystem. The rapid expansion of urbanization and more intensive agricultural practices, along with other changes in land use practices, have caused a substantial loss of the vernal pool ecosystem habitat, particularly in the vernal pool wetlands, and have so reduced the number of several plant species' populations that they are now recognized as endangered species.

In 1991, it was recognized that a plan was needed to strike a balance between continued growth and land use changes in the Plain, and maintaining natural values for future generations. A congressionally appointed Vernal Pool Task Force was formed to bring together federal, state, and local agencies, along with landowners and local land use interests. The goal of the Task Force in this first phase was to develop a Plan containing policies and guidance for future land use and vernal pool ecosystem preservation in the Santa Rosa Plain. Phase 2 of the Task Force's activities will involve implementing the Plan.

Phase 1: The Vernal Pool Ecosystem Preservation Plan

The Plan does the following:

- Identifies goals and objectives, including benefits to land owners and land use interests, and protection of unique natural resources (the vernal pool ecosystem)
- Identifies areas within the Santa Rosa Plain that may support vernal pool ecosystem habitats, and the associated seasonal wetlands and biological diversity, including species of special concern
- Identifies sites within the Santa Rosa Plain that may have high- or low-quality vernal pool ecosystem habitat
- Identifies and describes potential high-quality habitat sites that should be considered as potential preserves for long-term protection of the unique vernal pool ecosystem
- Identifies incentives to land owners to participate in the Plan, such as mitigation banks for preservation and mitigation, conservation easements, and habitat transaction methods
- Outlines a streamlined regulatory process that will allow landowners to obtain authorization quickly for development projects or other land use changes that involve the filling of low-quality vernal pool ecosystem wetlands

- This authorization will be provided through a General Permit from the U.S. Army Corps of Engineers given to the local agencies. Through this General Permit, vernal pool ecosystem wetland fills will be processed through local agencies, without additional permitting requirements from the federal and state regulatory agencies

- A time-saving benefit of the streamlined regulatory process is a rapid means of evaluating property habitat quality at the same time as delineating and verifying jurisdictional wetlands. In addition, a landowner can refrain from having a detailed biological field study by assuming that listed plant or animal species are present on the property and mitigating wetlands at a higher ratio

- Under the General Permit fills of vernal pool ecosystem wetlands will be mitigated off-site from proposed projects through purchase of a mitigation credit from mitigation banks. Some mitigation banks will specifically purchase land for the preservation of high-quality vernal pool habitat. Other banks will purchase low-quality land for restoration of vernal pool habitat, to account for the no-net-loss of wetlands required under federal and state policies

Phase 2: Implementation of the Vernal Pool Ecosystem Preservation Plan

The implementation phase outlined below is not part of this Plan. The implementation will require several important steps prior to establishing the streamlined regulatory process. These include:

- Developing the criteria and guidelines under which preservation and restoration/enhancement banks will be established and operated, and identifying specific public and private entities that would be suitable for operating mitigation banks. These mitigation banks will acquire both high-quality vernal pool ecosystem sites for preserves and low-quality wetland sites to restore and to mitigate wetland losses due to land use changes that result in filling wetlands.

- Developing detailed maps showing sites in the Santa Rosa Plain verified as low- or high-quality habitat. These sites will be determined when sufficient information allows site quality ranking. Sites not ranked as low- or high-quality habitats can be ranked through a process identified in the Plan that will take place during the wetlands assessment of a property. The maps will be maintained for public information at the planning departments of the County of Sonoma, and the Cities of Santa Rosa, Cotati, Sebastopol, and Rohnert Park, and the Town of Windsor.

- Developing a Corps General Permit giving authority to the County of Sonoma, the Cities of Santa Rosa, Cotati, Sebastopol, and Rohnert Park, and the Town of Windsor to allow fills in low-quality vernal pool ecosystem wetlands with the appropriate participation in the mitigation bank(s), and development of language for General Plan Amendments that may be needed

- Developing a public outreach program targeted at landowners, developers, and agricultural and natural resource conservation interests
- Developing an overall preserve design.
- Conducting environmental reviews necessary to meet the requirements of the California Environmental Quality Act.

Commonly Asked Questions About The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Project

How do I find out if I have wetlands on my property?

Answer: A qualified wetland biologist/scientist can quickly advise you if potential wetlands occur on your property. Only the Corps of Engineers can make a final determination. Sources for qualified wetland biologists/scientists include environmental consulting firms listed in the telephone directory, lists available at local County and City planning departments, or federal or state agencies such as the Corps of Engineers, Natural Resource Conservation Service (formerly the Soil Conservation Service), U.S. Fish and Wildlife Service may know of local specialists. See Chapter 3 of the Plan for a discussion of wetlands. Landowners should also undertake endangered plant studies if they plan to develop their land or otherwise cause disruption to the plant populations..

If I have wetlands on my property, am I required by law to follow the regulatory policies proposed in the Santa Rosa Plain Vernal Pool Preservation Plan?

Answer: No. The Vernal Pool Preservation Plan is strictly voluntary. Landowners can, at any time, apply for any necessary permits through the existing regulatory process. The purpose of the Plan was to develop a set of policies and guidelines that would preserve the sites containing significant wetland resources while substantially reducing the amount of time and cost to obtain permits for filling low-quality wetlands.

If I have wetlands on my property what types of land use activities require a permit and what can I do without a permit?

Answer: Activities that may require a permit include those that cause wetlands to be disturbed, or filled with soil. Such activities include filling for development (e.g. housing developments, subdivisions, commercial and industrial projects), changes in drainage or channelization; road or bridge construction, and discing, and grading or leveling land. Many types of agricultural activities can be done without permits, such as cattle grazing, although in some cases discing and grading can constitute fill. Other agricultural activities can occur if the agricultural land use involved conversion of the wetlands to crops prior to 1972.

If I own property adjacent to a Vernal Pool Preserve, will I have limited use of my land?

Answer: No. Landowners adjacent to vernal pools will not be subject to any additional limitations beyond current laws and regulations. They will not be required to change their land use or be limited to particular land use activities. The Preserves will normally include within their boundaries sufficient buffer area to prevent adjacent land use from degrading the high-quality wetland resources within their boundaries. See Chapter 7 and 8 for information on land uses adjacent to Preserve sites.

Will the Vernal Pool Plan ensure that wetlands and important wetland resources in the Santa Rosa Plain will not be lost?

Answer: The current federal and state policies to prevent no-net-loss of wetlands will continue and are incorporated into the Plan. The Plan identifies important wetland resource areas in the plain that will be further evaluated for preservation and restoration. Chapter 6 of the Plan provides information on the high-quality vernal pool sites.

Can I receive compensation for preserving vernal pool wetlands?

Answer: Yes. If you own high-quality vernal pool habitat, you may be able to sell the property to a mitigation bank, an agency, or a preservation organization. You may be able to obtain a conservation easement through an agency, or sell mitigation credits through a habitat transaction program. Low-quality vernal pool sites may be restorable and the amount of wetlands increased. Through restoration, a landowner can act as a mitigation bank and sell wetland credits to others by coordinating with the agencies or Vernal Pool Task Force. See Chapter 7 for non-regulatory mechanisms.

Chapter 1
Introduction

Before humans arrived and transformed the land, valley oak woodlands and savannahs and grasslands covered the Santa Rosa Plain. A network of wetlands, year round and intermittent creeks, marshes, ponds, and seasonal pools and swales linked the whole mosaic together. This mosaic, and the many plant and animal species it supported, made up an ecosystem of great richness and beauty.

Over the last century, however, first agriculture, then, in the last 30 to 40 years, residential and commercial development occurred. Of the agricultural development, typically dairy farms, pasture, orchards, and vineyards, some was compatible with the existing ecosystem, but much was not, and so much of the oak woodlands and wetlands were lost or altered. Urban development, with its greater intensity, has altered the land even more.

Of the few remaining natural areas, those containing the seasonal pools and swales, called "vernal" because they fill with water during the spring, are extremely valuable. They are recognized as such because they are one of the rarest habitats anywhere on earth. With other wetlands vernal pools and swales share such functional benefits as water quality improvement, water fowl habitat, and recreation and aesthetic resources. But the pools and swales are unique for they harbor a highly-evolved biological system of plants and animals that exist nowhere else. Were the pools lost, these species would be lost too.

The pools and swales, because of their nature as wetlands and because of the species they harbor, fall under the purview and jurisdiction of the federal and state agencies charged with the husbandry of these resources. As Waters of the United States, wetlands and therefore vernal pools come under the authority of the U.S. Army Corps of Engineers (the Corps), which under the Clean Water Act approves permits for fills into such waters. Plant and animal species either endangered or of special concern are overseen by the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG), under the provision of the federal and California Endangered Species acts.

Land use, zoning, and development approvals are the responsibility of local governments, while the management and use of the land itself belongs to those who own it. Finally, others, concerned with the environment and the larger community, have a responsibility to express that concern.

As development has increased and pools and swales have diminished, the concern of responsible agencies and interested parties has grown. This concern has become manifest in the increasing difficulty and unpredictability of obtaining approvals for development that might cause damage. The result in an ever more complex interplay between the forces of development and preservation.

Recognizing the needs of all the parties interested in the Santa Rosa Plain, Congressman Frank Riggs convened the Sonoma County Vernal Pool Task Force, a group of federal, state, and local

agencies and representatives of development, agricultural, and resource conservation interests in 1991. The membership of the Task Force is shown in Table 1-1.

In general terms, the mission of the Task Force is to develop mechanisms to preserve and protect vernal pools and the vernal pool ecosystem in the context of potentially conflicting land uses such as urban development, agriculture, and irrigation with reclaimed wastewater in the Santa Rosa Plain. Continuing the efforts of Congressman Riggs, Congresswoman Lynn Woolsey obtained federal funding to allow the Task Force to draft a plan to preserve important biological resources while streamlining and simplifying the permit process for those who desire to develop or otherwise alter such resources. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan (the Plan) is the result of the efforts of the Task Force over the last 2 years.

As part of the Task Force's efforts, federal, state, and local agencies have developed a memorandum of understanding (MOU) that formally establishes relationships among themselves in order to develop the Santa Rosa Plain Vernal Pool Preservation Program, of which the Plan is a part. The agencies participating in the MOU include the USFWS, the Corps, the U.S. Environmental Protection Agency (USEPA), the CDFG, the City of Santa Rosa, and the County of Sonoma. As stated in the MOU, the purposes of the Santa Rosa Plain Vernal Pool Preservation Program are as follows:

- To conserve and protect vernal pools and associated ecosystems
- To standardize, to the extent possible and where applicable, development mitigation measures for vernal pools and associated ecosystems
- To integrate, to the extent possible, all applicable legal authorities into one comprehensive program to provide for the long-term protection of vernal pools and associated ecosystems

The MOU states that the purposes of the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan are

- To establish goals, policies, and implementation measures for activities potentially affecting vernal pools and associated ecosystems
- To provide a comprehensive framework for use in linking plant and animal conservation programs with local land use planning programs
- To help ensure coordinated, effective, and timely resolution of conflicts between development and conservation interests

Table 1-1
Santa Rosa Plain Vernal Pool Ecosystem Preservation Project
Task Force

Member/Telephone Number	Affiliation/Address
David Bannister (707) 578-3364	Sierra Club 412 Coddingtown Center, Santa Rosa, CA 95401
Charles Carson (707) 584-9133	Building Industry Association P.O. Box 1727, Rohnert Park, CA 94927
Jim Chaaban (707) 542-7182	Congresswoman Woolsey's Office (Federal Building) 1101 College Avenue, Suite 200, Santa Rosa, CA 95404
Grant Davis (415) 507-9554	Congresswoman Woolsey's Office 1050 Northgate Drive, Suite 140, San Rafael, CA 94903
Carolyn Dixon (707) 586-1435	Sonoma County Wetland Watch P.O. Box 8614, Santa Rosa, CA 95407
Jeremy Graves (707) 527-1920	Sonoma County Permit and Resource Management Department 575 Administration Drive, Room 105A, Santa Rosa, CA 95403
Betty Guggolz (707) 894-5798	California Native Plant Society 1123 Palomino Road, Cloverdale, CA 95425
David Hansen (707) 524-7360	Sonoma County Agricultural Preservation and Open Space District 415 Russell Avenue, Santa Rosa, CA 95403
Ann Howald (707) 944-5529	California Department of Fish & Game P.O. Box 47, Yountville, CA 94599
Judy James (707) 544-5575	Sonoma County Farm Bureau 970 Piner Road, Santa Rosa, CA 95403
Richard King (707) 575-1409	Natural Resources Conservation Service 777 Sonoma Avenue, Room 212, Santa Rosa, CA 95404
Jan Knight (916) 979-2725	U.S. Fish and Wildlife Service, Endangered Species Branch 2800 Cottage Way, Room E-1803, Sacramento, CA 95825-1846
Suzanne Marr (415) 744-1974	U.S. Environmental Protection Agency 75 Hawthorne Street, (W-3-1), San Francisco, CA 94105-3901
Sharon Moreland (415) 744-3318 ext.232	U.S. Army Corps of Engineers 211 Main Street, Room 803, San Francisco, CA 94105-1905
Bob Muelrath (707) 585-2195	Sotoyome - Santa Rosa 777 Sonoma Avenue, Room 212, Santa Rosa, CA 95404

Table 1-1
Santa Rosa Plain Vernal Pool Ecosystem Preservation Project
Task Force

Member/Telephone Number	Affiliation/Address
Charles Patterson	1806 Ivanhoe, Lafayette, CA 94549
Ruth Pratt (707) 646-2429 (916) 979-2113	U.S. Fish and Wildlife Service, Wetlands Branch 2800 Cottage Way, Room E-1803, Sacramento, CA 95825-1846 (Sacramento Wetlands Branch)
Chuck Regalia (707) 543-3189	City of Santa Rosa, Department of Community Development 100 Santa Rosa Avenue, Room 3, P.O. Box 1678, Santa Rosa, CA 95402-1678
Donna Strom	Sonoma County Wetlands Watch P.O. Box 8614, Santa Rosa, CA 95407
Scott Stinebaugh (707) 543-3350	Subregional Utility Division, Laguna Wastewater Treatment, 4300 Llano Road, Santa Rosa, CA 95407
Nicholas Tibbetts (707) 523-2972	Habitat Mitigation Committee P.O. Box 15055, Santa Rosa, CA 95402
Tux Tuxhorn (707) 545-1810	Benjamin-Tuxhorn P.O. Box 4258, Santa Rosa, CA 95402
Renée Thériault Weber (707) 526-5370	Sonoma County Water Agency 2150 West College Avenue, Santa Rosa, CA 95401
Carl Wilcox (707) 944-5529	California Department of Fish and Game P.O. Box 47, Yountville, CA 94599

To identify standardized development mitigation measures, as appropriate. These measures are anticipated to include a flexible plan to preserve an ecosystem of high-quality wetland areas while allowing, with appropriate mitigation, the development of areas with minimum environmental impacts to vernal pools and ecosystems

The 55,047-acre area covered by the Plan is the Santa Rosa Plain, defined in the MOU as

> An area which includes the valley lands west, northwest, and southwest of the City of Santa Rosa, extending north to the Town of Windsor, west to the vicinity of the Town of Trenton and City of Sebastopol, and south to the vicinity of the City of Sebastopol and the City of Cotati. The eastern boundary follows U.S. Route 101 and Petaluma Hill Road south of Santa Rosa, then follows Highway 101 through Santa Rosa, veering east along the base of the Mayacamas Mountains to the northern limit, north of the Town of Windsor. The western boundary follows State Highway 116 from the vicinity of Cotati to the vicinity of Sebastopol, encompassing the bottomlands tributary to the Russian River known as the Laguna de Santa Rosa. From that point north it follows approximately the 80-foot topographic contour line to the vicinity of Trenton, then follows Eastside Road to the northern limit.

Figure 1-1 shows a general vicinity map, and Figure 1-2 shows the Plan area.

The Plan is organized as follows:

Chapter 2 presents the goals and objectives of the Plan as developed and adopted by the Task Force. The overall goals of the Plan are the following:

- Preserve the full range of diversity characteristic of the Santa Rosa Plain vernal pool ecosystem and associated biological resources
- Develop measures to ensure effective and timely resolution of conflicts between landowner, agency, and conservation interests
- Simplify the permitting process

Chapters 3, 4, and 5 all provide background and context for the Plan. Chapter 3 defines and describes the Santa Rosa Plain vernal pool ecosystem and its significance, identifies the species of special concern in the Plan area, and discusses current threats and causes of loss of the vernal pool ecosystem. Chapter 4 describes the regulatory environment, including wetlands regulations, regulations affecting species of special concern, general environmental regulations, and local plans, policies, and ordinances. Chapter 5 discusses historic and current conditions in the Plan area, including historic and current land uses, land use plans and zoning, and the compatibility of existing and future land uses and agricultural practices with vernal pool preservation.

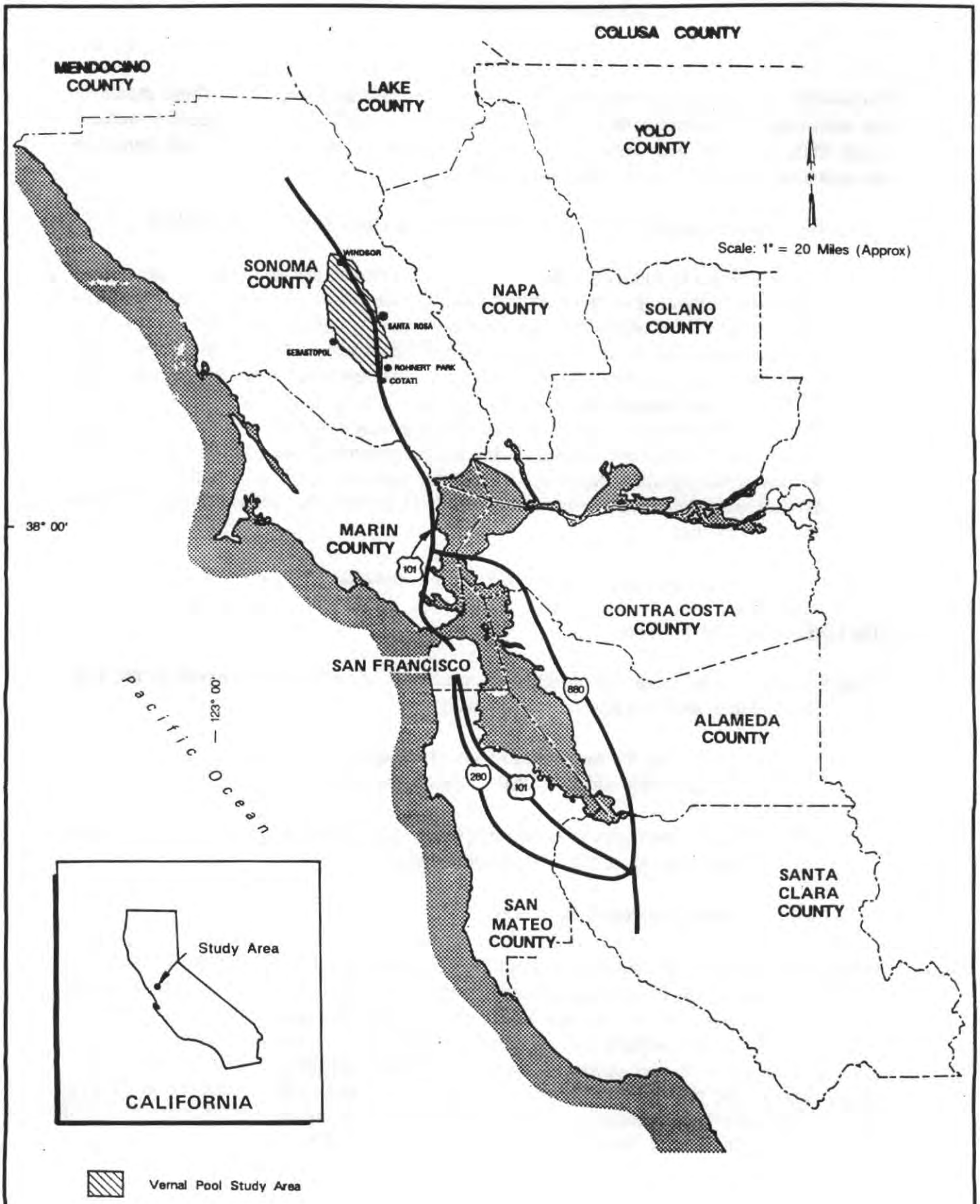


Figure 1-1
REGIONAL LOCATION

CH2MHILL

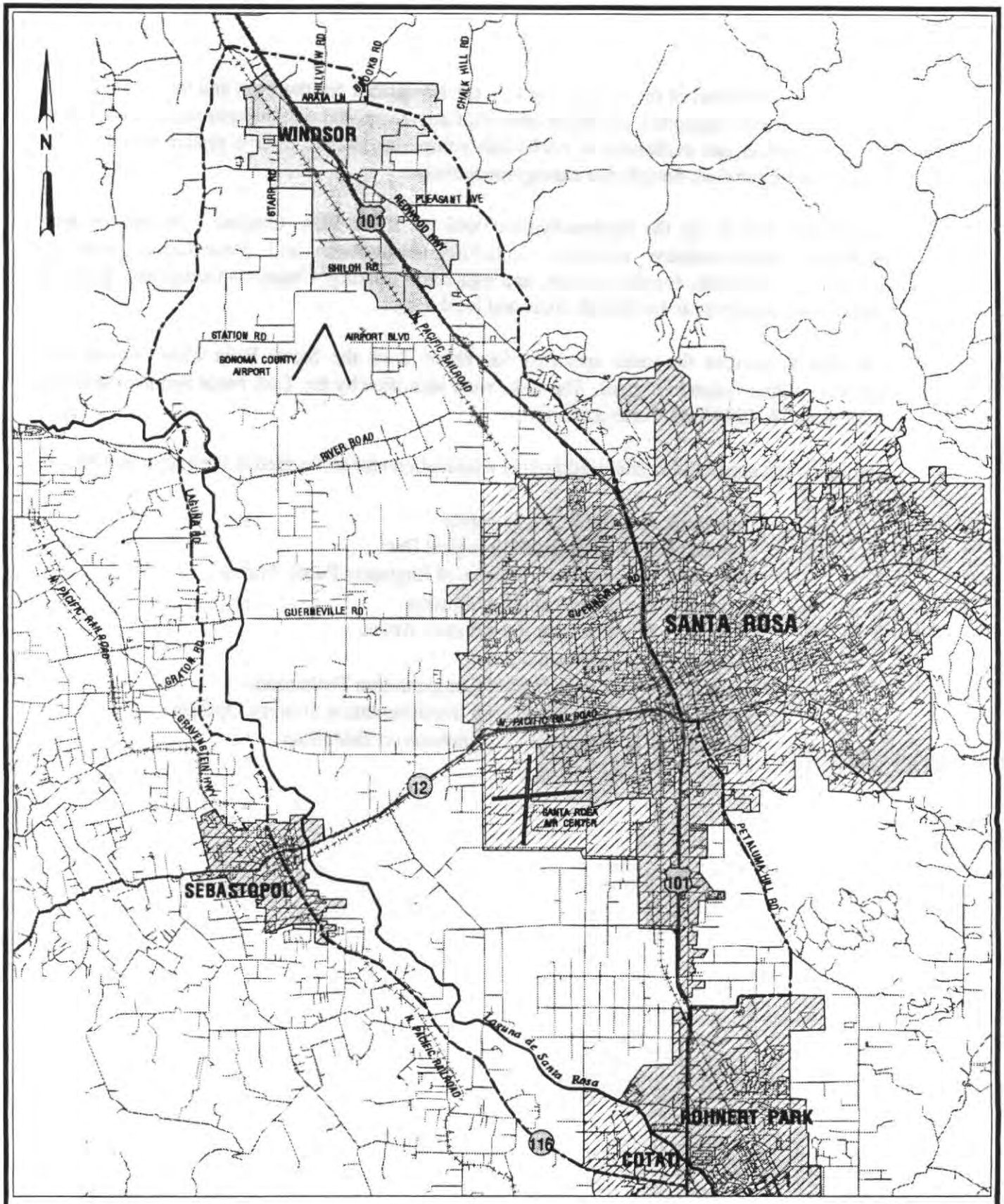


Figure 1-2

Study Area

FEATURES:

- City
- Sphere of Influence
- Vernal Pool Study Area

0 2 4

MILES
(1 Inch = 2 Miles)

/gis/wbl/nadeem/rosa/maps/small/fig1-2.aml
27 Jun 95 18:47:46 Tuesday

Plotted by CH2M HILL

Chapter 6 is the heart of the Plan. It presents the framework for the Plan and lays out potential land management categories, including areas that are designated for preserve status. It describes the identification and evaluation of pool/swale complexes in the preserve system and discusses preserve configuration, design, and management issues.

Chapters 7 and 8 are the implementation portions of the Plan. Chapter 7 focuses on non-regulatory implementation strategies, including management and conservation programs, acquisition of interests, funding options, and mitigation banking. Chapter 8 focuses on regulatory (permitting) strategies at the federal, state, and local levels.

Chapter 9 presents the tasks specified for Phase 2 of the Santa Rosa Plain Vernal Pool Ecosystem Preservation Program. The tasks were identified by the Task Force and the consultant at the June 14, 1994 Task Force meeting.

The following appendices contain additional information and are located at the end of this Plan:

- Appendix A Public Participation
- Appendix B Additional Biological Data
- Appendix C U.S. Army Corps of Engineers Public Notice
- Appendix D Site Evaluation Criteria
- Appendix E Potential Preservation Areas
- Appendix F Mitigation Banks
- Appendix G Assessment of Compensation Techniques
- Appendix H Non-Regulatory Implementation Strategy Options
- Appendix I Response to Comments on Draft Plan

Chapter 2

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Goals and Objectives

These are the overall goals of the Preservation Plan: to preserve the full range of diversity characteristic of the Santa Rosa Plain vernal pool ecosystems and associated biological resources; to develop measures to ensure effective and timely resolution of conflicts among landowner, agency, and conservation interests; and to simplify the permitting process. The more detailed goals that follow were adopted by the Vernal Pool Task Force on June 15, 1994. Table 2-1 shows where objectives are discussed in the Preservation Plan and which objectives are met in Phase I (in this Plan) and which will be met in Phase II of the project. Table 2-2 specifies in which phase of the project the objectives will be met.

Goal 1. Characterize and preserve the full range of diversity of the Santa Rosa Plain vernal pool ecosystem and associated biological resources.

Objective 1.1. Bring together existing information in a comprehensive database to develop an understanding of the range and variability within the vernal pool ecosystem and associated biological resources on the Santa Rosa Plain.

Objective 1.2. Provide a clear definition of vernal pools and the vernal pool ecosystem of the Santa Rosa Plain, and describe the range of biological diversity within these systems.

Objective 1.3. Evaluate vernal pool resources and ensure that the full range and diversity of the vernal pool ecosystem and associated biological resources are represented in proposed preserve sites.

Goal 2. Establish goals, policies, and implementation measures for preservation of vernal pool ecosystems and associated biological resources.

Objective 2.1. Implement early outreach to landowners.

Objective 2.2. Identify responsible parties involved in the acquisition and long-term management of a preserve system and mitigation banks.

Objective 2.3. Develop proposed preserve systems that will include (1) land management zones or areas suitable for preservation, enhancement, or restoration, (2) areas where impacts to wetlands would be minimal and which are therefore suitable for development with mitigation, and (3) areas where development can proceed where no mitigation is required.

Objective 2.4. Recommend a variety of potential funding mechanisms and develop an array of landowner incentives or compensation for participation in the Plan's implementation and establishment of preserves.

Table 2-1 Where Objectives are Met in the Preservation Plan	
Objectives	**Location**
1.1	See Chapter 3 (Santa Rosa Plain Vernal Pool Ecosystem)
1.2	See Chapter 3.3 (Seasonal Wetlands Components of the Vernal Pool Ecosystem)
1.3	See Chapters 3.6 (Species of Special Concern), 3.7 (Wetlands Distribution in the Santa Rosa Plain), and 3.8 (Classification of Vernal Pools).
2.1	See Appendix A (Stakeholder and Public Outreach)
2.2	See Chapter 7 (Non-Regulatory Implementation Strategy)
2.3	See Chapter 6 (Vernal Pool Ecosystem Preservation Plan Framework)
2.4	See Chapter 7.4 (Options for Potential Funding)
2.5	See Chapter 7.1 (Management and Conservation Programs)
2.6	See Chapter 9 (Recommendations for Future Study)
3.1	See Appendix A (Stakeholder and Public Outreach)
3.2	See Appendix A (Stakeholder and Public Outreach)
3.3	See Chapter 4 (Regulatory Environment)
3.4	See Chapter 5 (Historic and Current Conditions in the Study Area)
3.5	See Chapter 8.6 (Mitigation Measures)
4.1	See Chapter 5.3 (Compatibility of Future Land Uses with Vernal Pool Preservation)
4.2	See Chapter 8.4 (Local Land Use Policy Compliance)
4.3	See Chapter 8.4 (Local Land Use Policy Compliance)
5.1	See Chapter 8 (Permitting Implementation Issues/Strategies)
5.2	See Chapter 8 (Permitting Implementation Issues/Strategies)
5.3	See Chapter 8 (Permitting Implementation Issues/Strategies)

Table 2-2 In Which Phase of the Project are the Objectives Met?		
Objectives	**Phase 1**	**Phase 2**
1.1	✓	✓
1.2	✓	
1.3	✓	
2.1	✓	✓
2.2		✓
2.3	✓	✓
2.4	✓	
2.5	✓	
2.6	✓	✓
3.1	✓	
3.2	✓	✓
3.3	✓	
3.5	✓	
4.1	✓	✓
4.2	✓	
4.3	✓	✓
5.1	✓	
5.2	✓	
5.3		✓
Note: Objectives with check marks (✓) in both phases indicate the objective has been partially addressed in the Plan and will be completely met in Phase 2 of the project.		

Objective 2.5. Recommend a variety of long-term protection and management options. These should include potentially compatible activities in vernal pool preserves.

Objective 2.6. Identify additional information needs in order to produce recommendations and make decisions related to management of vernal pool preserves.

Goal 3. Ensure coordinated, effective, and timely resolution of conflicts among landowner, agency, and conservation interests.

Objective 3.1. Identify stakeholders in the process, provide them with information, and involve them in Plan preparation and review, problem-solving, and decision-making.

Objective 3.2. Encourage community awareness of the unique character and importance of the vernal pool ecosystem and associated biological resources of the Santa Rosa Plain. Develop a speaker's bureau to present the Vernal Pool Preservation Plan process to the public in informal meetings.

Objective 3.3. Clearly identify agencies involved in reviewing or permitting activities on the Santa Rosa Plain, their jurisdiction, regulatory authority, and permitting processes and policies pertinent to vernal pool ecosystems and associated biological resources.

Objective 3.4. Evaluate existing land management practices in terms of compatibility with vernal pool ecosystems and associated biological resources.

Objective 3.5. Identify guidelines for appropriate mitigation measures for vernal pool ecosystems and associated biological resources.

Goal 4. Provide a comprehensive framework for use in linking plant and animal conservation with local land use programs.

Objective 4.1. Evaluate existing and future land use plans for compatibility with vernal pool preservation.

Objective 4.2. Evaluate methods for local jurisdictions to meet their housing and job goals while preserving vernal pool ecosystems and associated biological resources.

Objective 4.3. Develop mechanisms for incorporating plan recommendations into local land use plans, policies, and ordinances and outline the process.

Goal 5. Provide a framework for meeting the requirements of existing federal and state regulatory compliance, including Clean Water Act and federal and state endangered species compliance.

Objective 5.1. Develop permitting strategies that address the requirements of applicable federal and state laws.

Objective 5.2. Describe a streamlining process for all applicable federal and state and local permits that integrates applicable legal authorities into a comprehensive program and both shortens and simplifies the process.

Objective 5.3. Propose generalized permit conditions applying to specific types of projects and impacts. Include guidelines for appropriate mitigation measures that would be compatible with the policies, practices, and guidelines of the regulating agencies. Develop criteria for permitting vernal pool fills.

Chapter 3

Santa Rosa Plain Vernal Pool Ecosystem

Some of the biological and technical issues presented in this section are explored in further detail in Appendix B, which is intended for biologists, botanists, and other members of the scientific community. This section has been written for laypersons; please note that the first time a technical term appears, it is defined briefly in italics. The Glossary at the front of this volume also contains definitions and explanations of technical terms.

3.1 The Santa Rosa Plain

As it has been defined in this Plan, the Santa Rosa Plain study area includes the area shown in Figure 1-2. The plain is a relatively flat valley with low gradient watersheds *(the area drained by a river or river system)* that drain generally west-southwest to the Laguna de Santa Rosa. The plain includes the Laguna de Santa Rosa as well as its floodplain, Santa Rosa Creek, Mark West Creek, Roseland Creek, and their watersheds.

The Santa Rosa Plain was once a mosaic of valley oak woodlands and grasslands crossed by these creeks and tributary drainages. The flat terrain, clayey soils, and relatively high rainfall contributed to the once widespread occurrence of seasonally ponded or saturated areas knows as seasonal wetlands and vernal (*springtime*) pools and swales. Vernal pools occurred in both the grasslands and woodlands, some isolated from one another and from the creeks, others connected by vernal swales and smaller tributaries.

For over a century, human activities have brought about broad-scale changes on the Santa Rosa Plain, with commensurate effects on this mosaic of habitats and the associated drainage patterns. Agricultural activities such as dairy farming, the planting of orchards and vineyards, and the establishment and maintenance of pastures have affected the natural vegetation and landscape. Roads were constructed, creeks realigned, land leveled, trees harvested, woodlands fragmented, and networks of vernal swales and vernal pools modified, isolating remnants of natural habitat. In the last 30 to 40 years, the changes have accelerated with the advance of commercial and residential development. Today, little of the original mosaic and relatively few of the natural areas remain.

3.1.1 The Santa Rosa Plain Ecosystem

An ecosystem is the combination of a physical environment and all the biological components that inhabit it, bound together in a complex functional system of complementary relationships. (Whitaker, 1975). Because a change to a component of the system affects the whole, an ecosystem must be managed as a whole.

In the Santa Rosa Plain, events over the millions of years of geologic time have formed a flat landscape, interspersed with a few major creeks and a denser branching network of shallow vernal swales and lesser watercourses. Under all is a series of variable, clayey soils. The area has a Mediterranean climate of cool, rainy winters and warm, dry summers.

Although hills are few, and changes in height small, the ground between creeks and larger drainages is not level but filled with shallow depressions. It is in these depressions, which collect water during the winter and spring, where vernal pools and swales are found.

Covering this varied topography is a mosaic of natural and artificial habitats: oak woodlands and savannahs, grasslands and wetlands, and the farms, parks, roads, and settlements of people. These lands and their inhabitants, plants, animals, and people, together comprise the ecosystem of the Santa Rosa Plain.

3.1.2 Santa Rosa Plain Vernal Pool Ecosystem Definition

The Santa Rosa Plain vernal pool ecosystem comprises the vernal pool-vernal swale complexes; associated uplands such as grasslands, oak woodlands, savannahs, and some agricultural lands; the soils that support the vernal pools; and the hydrologic features that contribute to the wetland conditions. The ecosystem includes all plant and animal species that depend on vernal pools or vernal swales for a portion of their life cycle or that are integral parts of the associated habitats.

3.2 Santa Rosa Plain Wetlands

A "wetland" is an area that is wet because the soils are saturated or water is present at the surface. Some wetlands, such as marshes, are obvious from a distance because of the abundance of water and characteristic plants such as cattails and willows. Other wetlands are less obvious, such as the vernal pools that form in winter and spring on the Santa Rosa Plain, where the average annual rainfall is relatively high and much of the ground remains wet for many weeks every winter.

Wetlands on the Santa Rosa Plain include the obvious marshes, portions of riparian (*situated on the banks of a river, creek, or lake*) areas, and seasonal wetlands. Seasonal wetlands include vernal pools, vernal swales, and small tributary drainages. As wetlands are being treated for the purposes of this Preservation Plan, they are all characterized by wetland or "hydrophytic" vegetation, wetland or "hydric" soils, and wetland hydrologic function. The wetlands of the Santa Rosa Plain include the Laguna de Santa Rosa, year-round and intermittent creeks, marshes, permanent ponds, and seasonally wet depressional areas, vernal pools, and vernal swales.

Wetlands provide many benefits to people and wildlife. Some wetlands are depressional and hold rainwater, delaying the flow of water into creeks and reducing flood peaks and downstream flooding problems. Other wetlands—particularly those in vernal swales and lesser drainages—retain, trap, and/or convert sediment and urban and agricultural pollutants, cleaning water as they convey it to creeks. These wetlands improve water quality. Marshes, ponds, vernal pools and other seasonal wetlands all provide habitat for wildlife, including waterfowl and therefore provide opportunities for local educational and recreational activities such as birdwatching and hunting. Wetlands also offer aesthetic values, partly because they are quiet refuges from urban life, partly because of the appeal of wildlife, and partly because of the beauty of the plants. The seasonal wetlands on the Santa Rosa Plain, particularly the vernal

pools and vernal swales, produce showy wildflower displays in the spring. Wetlands also provide habitat for several rare or endangered plant and animal species.

3.2.1 Types of Wetlands in the Santa Rosa Plain

Two basic types of wetlands—perennial wetlands and seasonal wetlands—occur within the Santa Rosa Plain. Perennial wetlands include those that occur within the rivers, creeks, and ponds as well as marshes and other areas that are wet throughout the year. Examples of perennial creeks in the Santa Rosa Plain include the Laguna de Santa Rosa, Mark West Creek, and Santa Rosa Creek. These perennial creeks support a broad range of plants and often have well-developed riparian vegetation including willows, cottonwood, valley oaks, California bay trees, and other typical stream-side species.

Seasonal wetlands include those that occur in the smaller drainages and localized depressions and either carry water or are ponded or underlain by saturated soils during the winter and spring. Seasonal wetlands also occur along the lower banks and in sediments that accumulate in creeks. Where soils do not absorb water readily or are shallow and have only a limited capacity to store it, water can pond wherever the ground is low-lying. Because rainfall is relatively high on the Santa Rosa Plain, water can collect and remain ponded for long periods in even very shallow depressions. Vernal pools can remain ponded for several months during winters without dry spells.

Because the plain is basically flat, water flows very slowly through the vernal swales. Consequently, the vernal swales also hold slowly-flowing water and can remain filled for several months during the rainy season. Often the vernal pools fill first, and as the winter progresses and the soils begin to reach their capacity to store water, the vernal swales begin to not only carry water but store it. As the vernal swales begin to fill, the vernal pools and the connecting terrain become fully submerged, covered by an unbroken water surface that weaves through the landscape and, for at least part of the rainy season, provides truly aquatic habitat. Although they often contribute to the colorful springtime wildflower displays, vernal pools and swales are dry much of the year, and they rarely support perennial vegetation.

3.3 Types of Seasonal Wetlands of the Santa Rosa Plain

Seasonal wetlands on the Santa Rosa Plain include vernal pools and the wetlands in swales, ditches, and drainages. Because of the general importance of these seasonal wetlands and the important relationships between the pools and the other wetland types, they are discussed in greater detail in the following sections.

3.3.1 Vernal Pools

There is no widely accepted standard definition of the term "vernal pools." The term has been applied both to the communities of plants that grow in seasonally ponded areas and to the "hydrogeomorphic" (*landscapes with water*) areas themselves, without reference to the plant communities within. Generally, the term is applied to vernally ponded areas that support primarily native annual plant species. Vernal pools are characterized by plant species that are

capable of completing their life cycles and producing viable seed in an extremely variable habitat that is ponded at times and dry at others.

In this Plan, and for the Santa Rosa Plain, vernal pools are defined as follows:

> Seasonal wetlands that form in depressions as a result of a shallow, relatively impermeable soil layer that restricts downward movement of water, along with an outlet barrier, causing seasonal ponding. Although the vegetation composition of vernal pools varies as a result of land use practices and annual rainfall and temperature, the vegetation in relatively undisturbed vernal pools is typically characterized by native annual species such as those listed in Table 3-1.

The depth and duration of standing water is one of the primary factors that determine the types of plant and animal species that inhabit vernal pools. Pools that are ponded for short periods typically do not contain as many of or the same plant and animal species that occur in deeper pools. For example, spikerush, a perennial grass-like species, occurs in pools that are relatively deep and hold water for long periods. It is not found in shallow pools. Deeper pools provide habitat not found in shallow pools. Together, however, deep and shallow vernal pools provide a range in habitat and opportunities for diversity in plant and animal communities species that neither provides alone.

Each year, vernal pools pass through several phases of development that can be described as a wetting phase, an aquatic phase, a drying phase, and a drought phase (Zedler, 1987). Annual grasslands on the Santa Rosa Plain may have soils dried to brick-like hardness during the late summer, and saturated during the wet season, but never for as long as they are in vernal pools. As a result, annual grasslands are not characterized by the extremes found in vernal pools. Perennial marshes, on the other hand, remain wet year-round and, although the constant presence of water makes the habitat unsuitable for some species, the range in hydrologic conditions is, again, not as extreme as that characteristic of vernal pools. Inundation and drought are conditions that many species cannot tolerate; some are adapted to aquatic habitats and others to desert-like dryness, but the species adapted to live in vernal pools must be capable of surviving both.

Where the topography of a vernal pool allows deep water to pond near the center and only shallow water to pond at the periphery, an ideal setting exists for beautiful and unusual spring wildflower displays. As spring approaches, the plants begin to germinate and grow. Different plant species may grow in the deep center, and in the shallow margins rings appear to develop during the spring flowering season, each ring dominated by different species. As the water recedes and vegetation development proceeds, a concentric display of small but brightly-colored annual plants begins.

Vernal pools are not always circular or oval and their shapes and micro-topography do not always lend themselves to the type of concentric floral display mentioned above. Although swales are fundamentally conveyors of water, they do not necessarily slope consistently in the "downstream" direction. In some places the flow of water is impeded by a high spot, sometimes no more than a couple of inches higher than the upstream part of the swale, and water can

Table 3-1
Characteristic Plant Species
in Santa Rosa Plain Vernal Pools

Scientific Name	Common name
Alopecurus saccatus	foxtail
Blennosperma bakeri	Sonoma sunshine
Callitriche marginata	callitriche
Downingia concolor	fringed downingia
Downingia cuspidata	downingia
Eleocharis acicularis	small spiked sedge
Eleocharis macrostachya	spiked sedge
Eryngium aristulatum	coyote thistle
Eryngium armatum	spiny coyote thistle
Glyceria occidentalis	mannagrass
Isoetes howellii	quillwort
Juncus bufonius	toad rush
Lasthenia burkei	Burke's goldfields
Lasthenia californica	California goldfields
Lasthenia glaberrima	smooth goldfields
Lasthenia glabrata	goldfields
Lilaea scilloides	flowering quillwort
Limnanthes douglasii ssp. *douglasii*	Douglas' meadowfoam
Limnanthes vinculans	Sebastopol meadowfoam
Navarretia leucocephala ssp. *leucocephala*	white-flowered navarretia
Navarretia leucocephala ssp. *bakeri [N. bakeri]*	Baker's navarretia
Navarretia leucocephala ssp. *plieantha*	many-flowered navarretia
Plagiobothrys stipitatus var. *micranthus*	popcorn flower
Pleuropogon californicus	annual semaphore grass
Pogogyne douglasii ssp. *parviflora**	Douglas' pogogyne
Psilocarphus brevissimus	woolly-marbles
Ranunculus lobbii	Lobb's aquatic buttercup

Taxonomy follows the Jepson Manual of Higher Plants of California (Hickman, Ed., 1993).

* Taxonomy follows the California Native Plant Society of Rare and Endangered Vascular Plants of California (Skinner, Mark and Bruce M. Pavlik, Eds,. 1994).

collect, forming a linear vernal pool the shape and boundaries of which are like those of the swale.

Whether the pools are round, oval, crescent-shaped, or linear, their boundaries are not ordinarily regular. In fact, most pools have irregular natural boundaries and some have linear shapes with almost straight boundaries. Pools that are imbedded in swales have such shapes. Swales are common features on the plain because the landscape is so flat, and small changes in micro-relief can cause ponding anywhere. On the Santa Rosa Plain today, many pools that straddle property lines also have at least one straight-line boundary segment, typically at a fence between lands in different ownership or subject to partial fill (on one property) or different historic land uses.

3.3.2 Vernal Swales

Vernal swales are integral components of the vernal pool-vernal swale complexes on the Santa Rosa Plain, but are distinguished from pools by an outlet that allows water to drain. Swales also tend to be narrower than the vernal pools they connect. The characteristics of these swales vary, depending on the topography, watershed, and underlying soils. In the more gently sloped areas, where water flows slowly through portions of these swales for a sufficient length of time, species commonly thought of as vernal pool species will be found in the swales as well. These include many of the plant species listed in Table 3-1 and some of the vernal pool invertebrates such as vernal pool fairy shrimp. Certain other species that are associated with vernal pools, such as the California tiger salamander, require standing water for portions of their life-cycle and will not use swales even with slowly moving water.

Where pools are connected by swales, the distinction between vernal pools and vernal swales is difficult to make because the vegetation in the swales and pools is similar. On the Santa Rosa Plain, the term vernal pool has, in the past, been extended to include both true, linear pools in swales as well as other reaches of the swales that have no flow barriers, and therefore, cannot be ponded but do convey water slowly. The term "vernal pool" is used where ponding actually occurs, but not where the swale is a flow-through system.

3.3.3 Vernal Pool-Swale Complexes

Unlike many other areas with vernal pools and swales in California, the Santa Rosa Plain is unique in the extent to which the vernal pools and swales are integrated hydrologically. On the Santa Rosa Plain, most of the vernal pool fields have a high level of connectedness and integration. Swales meander across the plain, often with more than one connection with other swales. The vernal pools occur periodically as somewhat lower depressions where water will pond for a more extended period. Some vernal pools are remnants of a former swale meander that has since been cut off from the main channel course.

3.3.4 Relationship of Vernal Pools to Other Wetlands

Vernal pools relate to other wetlands in many ways. One relationship is physical and hydrologic. Vernal pools occur in virtually all topographic settings on the Santa Rosa Plain. Some are perched, isolated atop the small divides between watersheds that drain toward the

vernal swales and the network of creeks that drain the plain. They also occur in the vernal swales themselves, connected like the beads of a necklace. Although some of the vernal pools appear to be truly isolated hydrologically from even the smallest nearby drainages, most "spill" when filled. When they spill, water finds the quickest route downhill and flows over the ground surface into the vernal swales. Some vernal pools and vernal swales may exchange water through subsurface flow (Hanes, et al., 1990).

This hydrologic connectedness is one of the fundamental bases for ecological relationships between vernal pools and other wetlands as well as the surrounding grassland habitats. The water carries nutrients (including pollutants), seed, soil, and small aquatic invertebrate organisms (such as fairy shrimp) between vernal pools and between vernal pools and the other wetlands and aquatic features on the plain. In effect, the vernal pools and other wetlands functioned historically as an uninterrupted system. Today, drainage ditches, roads, orchards, housing developments, and other artificial features have severed many of the connecting links. Still, the fragments of the original natural system possess internal connections that remain intact and are critical to their continued function.

3.4 Significance of Vernal Pool Wetlands

Vernal pools are one of the rarest and most endangered ecosystems in the world. More than 60 known endemic (*restricted to habitat in a particular area or locality*) species of plants and invertebrates are found in California's vernal pools and nowhere else on Earth (Baskin, 1994). At least six genera of plants are restricted similarly to the pools: *Downingia, Legenere, Limnanthes, Neostapfia, Orcuttia,* and *Pogogyne* (Holland and Jain, 1977). As more data is gathered on vernal pools, the rarity of the plant and animal species that live in them becomes more apparent as we realize how little is actually known about their biodiversity. In a 1992 study of animal communities in northern California, researchers found 69 species of crustaceans, of which 50 percent had not been described previously (Baskin, 1994).

Vernal pools are unique as wetlands because of the highly evolved biological system that has developed in them. Many of the plant species and several animal species depend completely on these seasonal wetlands. Many of the plant species have evolved in the vernal pool system over thousands of years and are generally better adapted than any other species to these unique habitats. Plants that live in vernal pools tolerate a wide range of environmental conditions, such as moisture and salinity, and are able to grow and reproduce within a short period of time during the "wet" season (Zedler, 1987). Generally non-native weedy plant species are unable to invade vernal pools unless the pools are disturbed by changes in hydrology or soil. Thus, many of the dependent native plants and animals would likely become extinct if these wetlands were to vanish.

The uniqueness of vernal pools and the rarity of the plant and animal species in them is due to their evolutionary biology as well as the reduction in acreage they cover. More than 90 percent of the vernal pools in California have been destroyed or degraded as a result of urban development and agriculture (Ferren and Gevirtz, 1990; Holland, 1977; Baskin, 1994). Within a 28,000-acre portion of the Santa Rosa Plain defined by the Laguna de Santa Rosa

Characterization Study, 90 percent of the original acreage of the vernal pool ecosystem has been lost (D. W. Smith Consulting, 1990). This loss has resulted in habitat fragmentation and associated endangerment of vernal pool species. Therefore, protection of the good examples of the remaining pools is critical.

3.5 Upland Habitats Associated with the Vernal Pool Ecosystem

Originally the Santa Rosa Plain was a complex and continuous mosaic of upland and wetland habitats and a network of drainages, the larger of which supported riparian habitat. The upland habitats, which included grassland and the oak woodlands and savannahs, occupied the mounds, the higher ground, and the areas where the soils were well drained. The vernal pools and other wetland habitats occupied the vernal swales and included depressional areas. With the entry of Europeans, non-native annual grasses and weedy species displaced the native perennial grasses, changing the composition of the grasslands. Over time, people harvested the oaks and planted orchards and vineyards, leveled land for pastures and then irrigated them, eliminating many of the savannahs and opening the woodlands and creating new habitats in the process.

The upland habitats play important roles in the vernal pool ecosystem. The wooded areas, in particular, provide habitat variety. In many of the orchards some of the larger oaks were left standing. Today, many still remain in orchards that have since been abandoned and from which the fruit or nut trees have been removed. The oak woodland and savannah remnants and the orchards provide types of food, shelter, nesting and roosting habitat, and general habitat other than the vernal pools and annual grasslands, adding diversity to the ecosystem.

The uplands provide habitat for species that use them exclusively; however, they also are habitat for species that use wetlands and other aquatic habitat for a portion of their needs. California tiger salamanders, for example, breed in vernal pools and ponds during the winter but spend most of the rest of the year in the upland habitats underground in burrows excavated by other animals. The species needs the vernal pools and ponds for reproduction but cannot survive without the habitat that the surrounding annual grasslands and wooded habitats offer.

The upland habitats also buffer vernal pools and vernal swales from surrounding land uses. They provide natural areas between the pools and swales and incompatible adjacent activities and uses, lessening potential adverse impacts.

The uplands are also critical to the hydrologic function of the vernal pools and swales; without them these aquatic features of the ecosystem could not function naturally. For example, vernal pools can fill from rainfall alone on the Santa Rosa Plain. If a vernal pool were left physically intact but surrounded by pavement, it might continue to fill with water even if the runoff from the pavement was shed in the opposite direction. However, the chemical qualities of the water in vernal pools and the functioning of the organisms that live in them are strongly influenced by the minerals and nutrients carried by waters that run over the ground surface or through the soil and flow into them from the surrounding upland habitats. The inflow of water from the soil near the end of the rainy season buffers fluctuations in water levels in the pools and prolongs the time over which they hold water. Vernal swales have the same hydrologic relationship with the surrounding upland habitats. They may carry water from one pool to another and from pools to

creeks, but they also receive water from the banks at all the points in between. The chemical interactions between vernal pools, vernal swales, and the grasslands and wooded habitats are much the same.

3.6 Species of Special Concern

As habitat for plants and animals has been lost due to land use changes, the number of locations where these species occur has dwindled. Species that have been significantly affected by habitat loss have been given special legal status under federal and state endangered species and environmental laws. These rare, threatened, or endangered species are referred to as species of special concern. Some of the reasons for preserving these species are that plants and animals

- Have economic value as resources that current and future generations of people can use, such as in medicine, food, or materials (plants especially)
- Maintain a healthy and stable environment, including the air, water, and land
- Advance scientific knowledge by providing the opportunity to study and determine ecological processes
- Are used in cultural traditions and as symbols
- Inspire people and are aesthetically pleasing
- Have a right to exist and inherent moral value (Given, 1994)

The Preservation Plan considers the occurrence, distribution, ecology, and biological variability of plant and wildlife species that have special legal status or are otherwise of special concern in the area. This subsection describes these in general terms, while a more detailed discussion is included in Appendix B.

3.6.1 Plant Species of Special Concern

Several plant species of special concern are known to occur in the seasonal wetland habitats within the Santa Rosa Plain. Three species, Sonoma sunshine, Burke's goldfields, and Sebastopol meadowfoam are federal- and state-listed as endangered. Another species, the many-flowered navarretia, is proposed to be federal-listed as endangered and is state-listed as endangered. These four endangered species are considered the primary plant species of concern in this report. More information regarding these endangered species is provided in Appendix B.

In addition to the above federally-listed or proposed endangered species, other plant species of concern known from the Santa Rosa Plain are included in Table 3-2 and described briefly as secondary species of concern in Appendix B. Most of these special plants are typical of seasonal wetland habitat types; however, other species of concern are known from uplands habitats or perennial wetland habitats (for example, riparian areas and perennial marshes) within the Santa Rosa Plain. These special plant species included in this Plan are recognized

Table 3-2
Plant Species of Concern Known within the Santa Rosa Plain

Scientific and Common Name	Status Federal/State/ CNPS List	Habitat	Species Known to Occur Within the Santa Rosa Plain
Primary Plant Species of Concern–Federal- and State-Listed or Proposed Species—Found in Seasonal Wetland Habitats (e.g. Vernal Pools, Swales, and Vernal Pool/Swale Complexes)			
Blennosperma bakeri Sonoma sunshine	FE/SE/1B	Drying edges of vernal pools and along swales	Yes
Lasthenia burkei Burke's goldfields	FE/SE/1B	Vernal pools and swales	Yes
Limnanthes vinculans Sebastopol meadowfoam	FE/SE/1B	Moist grasslands and vernal pools	Yes
Navarretia leucocephala ssp. *plieantha* many-flowered navarretia	FPE/SE/1B	Drying edges of volcanic ash flow vernal pools	Yes
Secondary Plant Species of Concern-Rare/Biologically Vulnerable or Uncommon Species Found in Seasonal Wetland Habitats (e.g. Vernal Pools, Swales, and Vernal Pool/Swale Complexes)			
Downingia pusilla [D. humilis] dwarf downingia	C3C/-/2	Moist grasslands, and vernal pools and swales	Yes
Navarretia leucocephala ssp. *bakeri [N. bakeri]* Baker's navarretia	-/-/1B	Vernal pools, swales, and moist grasslands	Yes
Perideridia gairdneri ssp. *gairdneri* Gairdner's yampah	C2/-/4	Moist places in grasslands, and woodlands	Yes
Pogogyne douglasii var. *parviflora* Douglas's pogogyne	C3c/-/3	Vernal pools and swales	Yes
Ranunculus lobbii Lobb's aquatic buttercup	-/-/4	Shallow vernal ponds at low elevations in grassland, woodland habitats, and evergreen or redwood forests	Yes
Primary Plant Species of Concern-Rare/Biologically Vulnerable or Uncommon Species Found Mostly in Non-Seasonal Wetlands or in Uplands			
Alopecurus aequalis var. *sonomensis* Sonoma alopecurus	C1/-/1B	Freshwater marshes and swamps; wet meadows, and riparian scrub	Yes * Historic occurrence; may be extirpated
Pleuropogon hooverianus North Coast semaphore grass	C2/SR/1B	Moist grasslands (sometimes shaded) and vernal pools	Yes * May be an erroneous occurrence
Trifolium amoenum showy Indian clover	C2/-/1B	Open, sunny sites in grasslands (sometimes on serpentine). Rediscovered in Sonoma County outside the Santa Rosa Plain in 1993	No * Historic occurrences; believed extirpated

Table 3-2
Plant Species of Concern Known within the Santa Rosa Plain

Scientific and Common Name	Status Federal/State/ CNPS List	Habitat	Species Known to Occur Within the Santa Rosa Plain
Primary Plant Species of Concern-Rare/Biologically Vulnerable or Uncommon Species Found Mostly in Non-Seasonal Wetlands or in Uplands			
Carex albida white sedge	C1/SE/1B	Sphagnum bogs	Yes
Secondary Plant Species of Concern-Rare/Biologically Vulnerable or Uncommon Species Found Mostly in Uplands			
Hemizonia congesta ssp. *leucocephala* Hayfield tarplant	-/-/3	Found in low elevation grasslands and fallow fields	Yes

Sources:

California Natural Diversity Data Base. 1994. Rare Find. California Department of Fish and Game. Sacramento, CA.

Hickman, James C., Ed., 1993. The Jepson Manual. Higher Plants of California. University of California Press, Berkeley, CA.

Patterson, Charles A., in collaboration with Betty Guggolz and Marco Waaland. 1994. Seasonal Wetland Baseline Report for the Santa Rosa Plain, Sonoma County. Submitted to the California Department of Fish and Game. June 30, 1994.

Skinner, Mark W., and Bruce M. Pavlik, Editors. 1994. California Native Plant Society Inventory of Rare and Endangered Vascular Plants of California. Special Publication No. 1, Fifth Edition. February 1994. 338 pp.

Taxonomy follows the California Native Plant Society of Rare and Endangered Vascular Plants of California (Skinner, Mark and Bruce M. Pavlik, Eds,. 1994).

Federal Status:

E: Endangered
T: Threatened
FPE: Proposed as Endangered by U.S. Fish and Wildlife Service
C1: Federal Candidate with enough biological data on file to support proposal for listing
C2: Federal Candidate with threat or distributional data insufficient to support federal listing.
C3c: Not a Candidate at present due to widespread distribution of species or absence of threat

State Status:

SE: Endangered
ST: Threatened
SR: Rare

California Native Plant Society (CNPS):

1B: Plants rare, threatened or endangered in CA and elsewhere
2: Plants rare, threatened or endangered in CA but more common elsewhere
3: Review list: plants for which more information is needed
4: Watch list: plants of limited distribution

because they are candidates for listing and/or are included in the California Native Plant Society (CNPS) inventory and all plants listed in the CNPS inventory are recognized in the California Environmental Quality Act.

3.6.1.1 Primary Plant Species of Concern

Blennosperma bakeri (Sonoma sunshine). Sonoma sunshine is a small annual herb with colorful, yellow flowers that is endemic to Sonoma County. During the early spring, bright yellow rings of Sonoma sunshine may be found at the drying edges of vernal pools and along swales. Few populations of this species are known, and Sonoma sunshine is federal- and state-listed as endangered. Sonoma sunshine is distributed primarily in the central and southern part of the Santa Rosa Plain, west of Santa Rosa (CNPS, 1994; NDDB, 1994).

Lasthenia burkei (Burke's goldfields). Burke's goldfields is a slender, diminutive annual herb that is endemic to California. This federal- and state-listed endangered species is an infrequent member of the showy, annual displays of flowers that carpet moist grasslands in the spring. Burke's goldfields is known only from southern portions of Lake and Mendocino counties and from northeastern Sonoma County. Populations of Burke's goldfields are distributed throughout the Santa Rosa Plain, with the majority of the populations occurring in the northwestern and central areas of the plain (CNPS, 1994; NDDB, 1994).

Limnanthes vinculans (Sebastopol meadowfoam). The Sebastopol meadowfoam is a showy annual herb with white, bell-shaped flowers that blooms in spring. This species is a narrowly restricted endemic, and is found only in moist grasslands and vernal pools in southern Sonoma County and in Napa County. Most populations of this federal- and state-listed endangered plant are found within the Laguna de Santa Rosa watershed (CNPS, 1994; NDDB, 1994; Patterson et. al., 1994).

Navarretia leucocephala ssp. *plieantha* (many-flowered navarretia). The many-flowered navarretia is a small, spiny, annual herb that has small, pale blue flowers, and blooms in mid- to late-spring. This navarretia is a California endemic, and is found in moist habitats in volcanic ash vernal pool systems in Lake and Sonoma counties. The many-flowered navarretia is proposed to be federally listed and is listed as endangered in California. Within the Santa Rosa Plain, the many-flowered navarretia is only known from one population, south of Windsor (NDDB, 1994; Patterson et.al., 1994).

3.6.2 Wildlife Species of Special Concern

Wildlife species of special concern are listed in Table 3-3. The species discussed below are those which may be potentially found in or adjacent to vernal pool habitat. Two wildlife species of potential concern are associated with seasonal wetlands of the Santa Rosa Plain: the California linderiella, a fairy shrimp, and the California tiger salamander. Three other species, western yellow-billed cuckoo, burrowing owl, and American badger, can potentially be found adjacent to the seasonal wetlands in open fields.

Table 3-3 Special Status Wildlife Species		
Scientific and Common Name	**Status Federal/State**	**Habitat**
Special Status Wildlife Species Found in Seasonal Wetland Habitats (e.g., Vernal Pools, Swales, and Vernal Pool-Swale Complexes)		
Invertebrate		
Linderiella occidentalis California linderiella	C3/-	Vernal pools, seasonal waters
Amphibian		
Ambystoma tigrinum californiense California tiger salamander	C1/CSC	Vernal pools, seasonal ponds, isolated ponds & small lakes
Special Status Wildlife Species Found in Non-Seasonal Wetlands or Uplands		
Invertebrates		
Syncaris pacifica California freshwater shrimp	FE/SE	Cool shaded streams, natural creekbanks
Ischnura gemina San Francisco fork-tail damsel fly	C2/-	Slow moving freshwater with dense vegetation, often near brackish marshes
Reptile and Amphibian		
Clemmys marmorata marmorata western pond turtle	C2/CSC	Ponds and perennial streams
Rana aurora draytonii California red-legged frog	FPE/CSC	Quiet pools of wetlands and streams
Rana boylii foothill yellow-legged frog	C2/CSC	Creeks, streams in woodland chaparral
Birds		
Accipiter cooperii Cooper's hawk	-/CSC	Heavily wooded areas along streams or near springs; forages in seasonal wetlands
Accipiter gentilis northern goshawk	C2/CSC	Middle and high elevation forests; forages in seasonal wetlands
Accipiter striatus sharp-shinned hawk	-/CSC	Heavily wooded areas along streams or near springs; forages in seasonal wetlands
Aquila chrysaetos golden eagle	-/CSC	Nests in tall trees with views or on cliffs; forages in open grasslands, etc.
Circus cyaneus northern harrier	-/CSC	Meadows, marshes, grasslands, open fields; forages in seasonal wetlands
Coccyzus americanus western yellow-billed cuckoo	-/SE	Riparian woodland and forest in major valleys, along major rivers. Historic, no suitable large habitat patches remain
Elanus caeruleus black-shouldered kite	-/FP	Meadows, marshes, grasslands, open fields; forages in seasonal wetlands
Falco columbarius merlin	-/CSC	Winter migrant; forages in grasslands, wetlands, etc.
Falco mexicanus prairie falcon	-/CSC	Nests on cliffs; forages in open country wetlands
Speotyto cunicularia burrowing owl	-/CSL	grasslands, open fields
Mammal		
Taxidea taxus American badger	-CSC	Oak savannah, grassland

Table 3-3
Special Status Wildlife Species

Note:
Only known and/or likely occurrences within the study area are cited in this table.

Source: California Department of Fish and Game, 1992, List of Special Animals.

Federal Status:
FE: Endangered
FT: Threatened
FPE: Proposed as Endangered by U.S. Fish and Wildlife Service
C1: Federal Candidate with enough biological data on file to support proposal for listing
C2: Federal Candidate with threat or distributional data insufficient to support federal listing
C3c: Not a Candidate at present due to widespread distribution of species or absence of threat

State Status:
SE: Endangered
ST: Threatened
FP: Fully Protected
CSC: California Department of Fish and Game "Species of Special Concern"

Linderiella occidentalis (California linderiella). Fairy shrimps, such as the California linderiella, are among the most characteristic inhabitants of temporary ponds and pools of water, especially vernal pools or other ephemeral bodies of water that form after winter rains. They are absent from running waters. This species of fairy shrimp is currently recognized by the U.S. Fish and Wildlife Service (USFWS) as a Category 3C candidate for endangered or threatened status (USFWS, 1991a). Although the USFWS recently published a proposed rule recognizing the California linderiella as an endangered species (USFWS, 1992), it was determined that this fairy shrimp should remain a candidate species (USFWS, 1994).

The California linderiella is associated with vernal pools and grassy swales and is found in more than 100 locations throughout the Central Valley, valleys of the Coast Range mountains, and as far south as Riverside County (Eng, et al., 1990). This shrimp has been observed in Butte, Contra Costa, Fresno, Lake, Madera, Merced, Monterey, Placer, Riverside, Sacramento, San Mateo, Santa Barbara, Sonoma, Tehama, and Ventura counties. In the greater Santa Rosa area, the California linderiella has been found at a number of locations. Specific locality information is either contained in a great volume of environmental impact reports (EIRs) or has not been disclosed pending the publication of private surveys. Hence, many of the records within the study area are inaccessible either due to time constrains for EIR reviews, or because the information has not been made public.

Ambystoma tigrinum californiense (California tiger salamander). The California tiger salamander inhabits annual grasslands and oak savannahs in the valleys and low hills of central and coastal California. Extensive habitat conversion has eliminated this species from much of its former range. Adults spend most of their lives underground, typically in burrows of badger, gopher, and other animals. During winter rains, typically between November and March, adults emerge from these burrows to feed, travel toward breeding habitat, and court and breed. Vernal pools and quiet, semi-permanent waters such as ponds are preferred sites for egg-laying. After hatching in 2 to 3 weeks, the larvae are only a few inches long. The young salamanders continue to develop for 3 to 4 months until they metamorphose. Following transformation, juvenile salamanders seek out mammal burrows or deep cracks in the ground in which they remain until the next winter rains. The California tiger salamander is currently listed as a Category 1 species following a ruling by the USFWS (1994) that found endangered status "warranted but precluded" by higher-priority species. A ruling must, therefore, be published annually by USFWS regarding the species' status.

Ischnura gemina (San Francisco fork-tailed damselfly). The San Francisco fork-tailed damselfly is typically found in shallow ponds and sluggish streams but has also been found in pools of faster-flowing water. Both the adults and aquatic immature stage are predaceous on other insects and invertebrates. Adults have been observed from late February through mid-November. The San Francisco fork-tailed damselfly is currently listed as a Category 3 candidate for listing by the USFWS in 1993.

Rana aurora draytonii (California red-legged frog). The California red-legged frog is found primarily in quiet pools of wetlands and streams in coastal drainages of California. Adult frogs require dense, shrubby or emergent riparian vegetation associated with deep still or slow moving water for foraging and breeding. Breeding typically occurs during early spring through

July. Eggs are laid below the surface of the water in large clusters attached to shoreline vegetation. The California red-legged frog is currently listed as a Proposed Endangered species under the federal Endangered Species Act following a ruling by the USFWS. In California, the red-legged frog is a Species of Special Concern.

Rana boylii (foothill yellow-legged frog). The foothill yellow-legged frog is found in a variety of habitats, ranging from rocky streams and wet meadows to valley-foothill hardwood. Adults often bask on exposed rock surfaces near streams and take refuge under submerged rocks or sediments. This species rarely travels far from permanent water. Breeding occurs from mid-March to May, depending upon water conditions. Eggs are typically attached to gravel or rocks in moving water or near stream margins. Tadpoles require water for at least 3 or 4 months while completing their aquatic life stage. The foothill yellow-legged frog is currently listed as a federal Category 2 species and a California Species of Special Concern.

Clemmys marmorata marmorata (western pond turtle). The western pond turtle typically inhabits areas with permanent or semi-permanent sources of water, such as freshwater marsh, streams, drainage canals, and irrigation ditches with rocky or muddy bottoms and aquatic vegetation. They require basking sites, such as partially submerged logs, vegetation mats, rocks, and mud banks. Breeding occurs in early spring, with eggs laid from March to August predominantly in nests located in moist soil. The western pond turtle is currently listed as a federal Category 2 species and a California Species of Special Concern.

Coccyzus americanus (western yellow-billed cuckoo). The western yellow-billed cuckoo is a secretive bird, inhabiting dense riparian habitat dominated by willows. Returning from their wintering areas in June, breeding occurs between June and July, with eggs laid between June and August. Nests are typically made in densely vegetated trees and shrubs, preferably willow. In California, nests have also been found in walnut and almond orchards. Once abundant in California, the western yellow-billed cuckoo has suffered a severe decline in population due to the loss of riparian habitat and diversion and channelization of rivers and streams. The western yellow-billed cuckoo is currently listed as a California Endangered Species.

Speotyto cunicularia (burrowing owl). The burrowing owl is a yearlong resident of California, preferring habitats with few visual obstructions (open grasslands with existing burrows and large areas of bare ground and low vegetation) and elevated areas for perching. Ground squirrel and other mammal burrows are used by the burrowing owls as nest holes. Breeding takes place between March through August. The burrowing owl is currently listed as a California Species of Special Concern.

Taxidea taxus (American badger). American badgers live underground in deep burrows in friable soils in a variety of habitats, such as open grasslands and shrub-scrub. Mostly carnivorous, American badgers help control small mammal populations. Years of indiscriminate trapping and poisoning have drastically reduced the number of American badgers in California.

The American badger is currently listed as a California Species of Special Concern.

3.6.3 Conservation Biology of Plant Species of Special Concern

One of the goals of the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan is to develop a series of preserves to protect vernal pool ecosystem resources including populations of species of special concern (refer to Appendix B for a more detailed discussion of conservation biology). To achieve those goals, the biological factors associated with particular plants and animals must be considered. These factors include the following:

- Reproductive cycle, such as the number of seeds produced or the requirement for special pollinators that may occur only in vernal pool habitats
- Genetic variability, which involves the ability of a species to adapt to changes in the environment
- Life history, which includes knowing the seasonal timing of flowering and setting seed
- Population size, which involves having information on the number of plants growing at a particular site each year
- Habitat specificity, such as the geographic limits of a species and whether it only grows on a particular soil type
- Watershed integrity, including whether a vernal pool is hydrologically connected to other wetland areas along which some species may travel or be influenced by external wetland components such as nutrients
- Endemism in vernal pools, which is when a species is only found in particular habitats such as wetlands
- Threats to populations, which involves recognizing land use practices that are not compatible with particular species habitat needs.

The above biological factors are important in developing a plan for species conservation. Often that information is not available, and biologists must make difficult decisions about which populations should be preserved to ensure the long-term viability and protection of species.

In the Santa Rosa Plain, some information is known about the conservation biology factors for three of the plant species of special concern: Sonoma sunshine, Burke's goldfields, and Sebastopol meadowfoam. An important point of information regarding these species is that they often grow on specific soil types and have very localized distributions within the Santa Rosa Plain. During the development of the site evaluations to determine which areas have sufficient habitat quality and other factors for consideration as a potential preserve site, the conservation biology principles were used to help guide the selection for the species of special concern. Conservation biology principles are discussed in detail in Appendix B.

To achieve the conservation goals of the Preservation Plan as it applies to the plant species of special concern, a specific goal and objectives were developed to determine which of the populations of these plants would need to be preserved.

Plant Species of Special Concern Conservation Goal: Ensure that a sufficient number of populations of each species is preserved so that long-term viability is achieved both within the constraints of the Santa Rosa Plain and for the species as a whole.

Objective 1: Populations will be preserved from the full geographic range of a species within the Santa Rosa Plain. This objective will be taken into account for giving special consideration to populations on the margins of the range where plant populations may be genetically isolated from other populations and, therefore, have a significant contribution to the species as a whole

Objective 2: Populations will be preserved from the full range of local habitat conditions, including all soil series, different plant species associations such as co-occurrence of other species of special concern, and different plant community types including annual grassland and oak woodlands

Objective 3: Populations will be preserved that include population sizes that are large enough to function as natural seed sources for smaller populations, which may become temporarily extirpated because of natural environmental changes during droughts

3.6.3.1 Vernal Pool Endemic Plant Populations

Historically, a vernal pool endemic plant population would have covered a considerably larger geographic area than it does currently. Previously, a population may have encompassed as much as 1,000 acres of land. Because of historic and recent land use changes, extensive areas of vernal pool and swale complexes became fragmented, resulting in smaller, more isolated populations of the vernal pool endemic species. Populations of species of special concern that are considered in addressing the conservation biology goal and objectives of the Plan include only naturally occurring populations, not populations that became established through translocation of seed or plants. Studies of translocation of plant species of special concern from vernal pools and other ecosystems have been unable to establish methods that can ensure the long-term survival of the species and have not been cost-effective (see Appendix G for more information).

Definition: A Vernal Pool Endemic Plant Population

> A vernal pool endemic plant population is a group of plants of a particular species that only grow in vernal pool and swale habitats that are in close proximity to one another. Vernal pools and swales that are not geographically close together harbor different populations of the same species.

A more technical definition for vernal pool endemic plant populations and discussion on how populations were analyzed for developing the conservation strategy is given in Appendix B.3.4.

3.7 Wetlands Distribution in the Santa Rosa Plain

The distribution of wetlands, including vernal pool/swale complexes, within the Santa Rosa Plain is currently restricted to relatively localized areas where development over the past 40 years has not destroyed the vernal pool habitats.

Information on wetland areas in the Santa Rosa Plain used in preparation of this Plan include the following sources:

- A mapping and data study by the CDFG and the USFWS that mapped some of the important seasonal and other wetlands in the study area, as well as some rare plant species
- CDFG Natural Diversity Data Base (NDDB), which maps some plant communities and rare plants and animals in the state
- U.S. Army Corps of Engineers Regulatory Branch, San Francisco District documents on jurisdictional wetlands and areas that have received a Corps permit.
- County of Sonoma planning documents
- City of Santa Rosa planning documents
- Local organizations and individual experts on wetlands and wetland resources.

The information in this Plan is based on an evaluation of existing information obtained prior to March 1994, but does not include new field work. Available information on the location of specific wetland areas and populations of species of special concern were mapped into an ArcInfo geographic information system (GIS). The information on the location of wetland areas, including vernal pools and swales, is spotty and, therefore, does not include all of these areas within the Santa Rosa Plain. Ultimately, the mapping included available information on vernal pool and swale complexes, certain other wetland areas, species of special concern, soil types that support vernal pools, potential areas of wetlands for which little information is available, existing land uses, land use designations from county planning documents, city boundaries, and local specific planning areas.

Figure 3-1 presents the potential areas of vernal pool ecosystem (shaded areas) within the Santa Rosa Plain. These areas are derived primarily from interpretation of existing land use from 1990 aerial photographs (for more information on existing land use see Chapter 5). In addition, CDFG and USFWS maps and data on wetlands and rare plants, CDFG NDDB maps and data on rare plants and animals, Corps documents on jurisdictional areas and areas with Corps permits, Sonoma County and Santa Rosa planning documents, and local organizations and wetland experts were used to verify or modify the areas of potential vernal pool ecosystem that were identified from the aerial photographs.

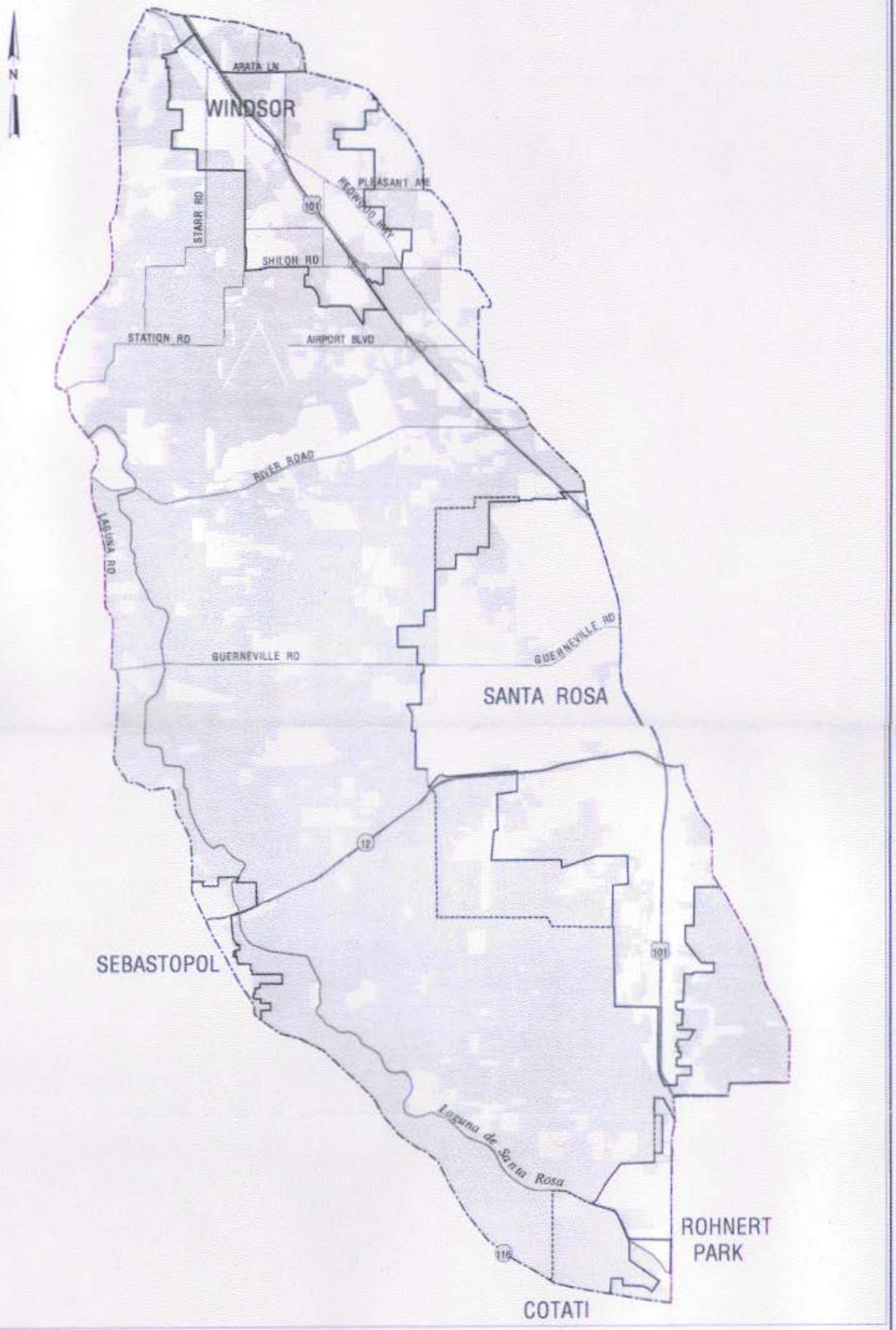


Figure 3-1

Potential Areas of Vernal Pool Ecosystem of the Santa Rosa Plain

FEATURES:

- Potential Areas of Vernal Pool Ecosystem
- Sphere of Influence
- City Boundary
- Vernal Pool Study Area

0 0.5 1 2
MILES
(1 Inch = 1.2 Miles)

/gis/wbl/nadeem/rosamaps/small/fig3-1.ami
01 May 95 17:34:12 Monday

Plotted by CH2M HILL

The functional land uses that are included as potential vernal pool ecosystem are open space (grassland/ruderal and valley areas with oak woodland), extensive agriculture (row crop/hayfield), and rural residential, and comprise 35,333 acres or 64 percent of the study area. This acreage represents the potential vernal pool ecosystem only. Based on this information it is unknown how much of this area is represented by vernal pool ecosystem wetlands. Some areas of the ecosystem will require restoration to provide the functions and values of the vernal pool ecosystem (functions and values of vernal pools and other wetlands are described in Chapter 3.2). Row crops and hayfields are included because vernal pool and swale complexes were visible on the aerial photographs for portions of these areas. Vernal pool and swale complexes are visible within the yards of rural residential areas. Field verification and wetland delineations are required to determine the actual acreage of vernal pool and swale complexes.

The unshaded areas on Figure 3-1 represent urban/residential/industrial, agriculture (vineyard/ orchard), and open space (riparian forest and hills with oak woodland) functional land uses. These land uses have little or no potential to contain areas of vernal pool ecosystem.

3.7.1 Vernal Pool and Swale Complexes

The vernal pool and swale complexes are currently limited to small localized clusters because of extensive land use development that was incompatible with the maintenance of the hydrological systems of these wetlands. These clusters are scattered throughout the Santa Rosa Plain, but primarily occur within the jurisdiction of Sonoma County, with a few very good sites still remaining within municipal limits or spheres of influence.

3.7.2 Major Riparian Corridors

The major riparian corridors remaining in the study area are associated with the Laguna de Santa Rosa and sections of Mark West Creek, Santa Rosa Creek, and Roseland Creek. Most stream corridors have been channelized, and riparian vegetation is sparse.

3.7.3 Other Wetlands

Other wetlands in the study area include freshwater marshes, intermittent drainages, and seeps or springs. Marshes are found along the major creeks and the Laguna de Santa Rosa as well as in stock ponds and other man-made perennial wetlands. Intermittent creeks and flood control channels may also include strips of wetlands with either marsh vegetation or seasonal wetland vegetation, depending on the flows. These habitats are interspersed throughout the study area, and generally do not support the species of concern described for vernal pool complexes.

3.8 Current Threats and Causes of Loss

In the Santa Rosa Plain, as elsewhere, habitat loss can be either direct or indirect. Direct impacts on vernal pool habitat have come about as a result of land conversion to agriculture and urban development, as well as stream channelization projects and the draining and filling of wetlands. Fragmentation and isolation of the vernal pool ecosystem are indirect impacts which nevertheless are a major cause of habitat loss.

3.8.1 Land Conversion

A previous study (Waaland et al., 1990) identified 12,000 acres out of a 28,000-acre study area of the Santa Rosa Plain that have been converted to urban area, cropland, orchards, or vineyards. This study area included about half of our study area. The study indicated that the habitat type most affected has been the oak woodland/vernal pool complex, which has the appropriate topography and soils for both agriculture and construction. Native biodiversity under these land uses is largely lost as a result of agricultural management practices (weed and pest abatement) or standard urban landscaping (introduction of seed from horticultural gardens, which greatly reduce or eradicate some endemic populations). It should be noted, however, that biodiversity remains stable or increases as a result of certain mosquito abatement practices (Rush and Balling, 1983a, Collins and Rush, 1985; Balling and Rush, 1982; Rush and Balling, 1983b). In addition, while natural vernal pools rarely support mosquitos, created or altered vernal pools have been documented as mosquito breeding areas, (Keith, 1995).

Urbanization. The greatest source of change in the Santa Rosa Plain has been the development of urban habitats (Waaland et al., 1990). Roughly 25 percent of the 28,000-acre area studied was occupied by golf courses, subdivisions, rural ranchettes, and commercial buildings.

Agriculture. The second greatest source of land conversion is agricultural development. Approximately 4,000 acres were identified as orchard and vineyard, and 1,000 acres as cropland (Waaland et al., 1990). Together, these intensive agricultural uses have converted about 17 percent of the study area. Additional land is going to be required for vineyard expansion in the future.

Livestock grazing. Since the arrival of Spaniard colonists in the late 1700s, the Santa Rosa Plain has been subjected to the influence of grazing by domestic cattle, horse, and sheep. Along with these animals came a host of introduced plants, "weeds", which originated in Europe and were adapted to the Mediterranean conditions in the region. The combined effects of the introduction of cattle, horses, llamas, and sheep as well as weeds has been the replacement of the native bunchgrasses and wildflowers with non-native annual grasses. These influences have also contributed to the decline in valley oak woodland, largely because regeneration is negligible where seedlings can be grazed. The annual grasses also compete with the oak seedlings for water. Despite the grazing pressure, vernal pools continue to remain composed largely of native species because most weeds are not adapted to aquatic habitats and cannot tolerate the extreme environmental fluctuations found in vernal pools.

3.8.2 Filling of Wetlands

Over the past century, vernal pools and associated seasonal wetlands have been filled for a variety of reasons. When orchards and vineyards have been planted, the ground has been leveled, and soil from higher ground has been pushed into the depressional areas to reduce the difference in relief and to make the site drier. Annual grasslands used as pasture have sometimes been leveled to produce drier conditions for pasture animals and to prepare the site for mechanical irrigation.

Although leveling activities on farmed properties eliminated problems with the wettest sites, often soil settlement occurred, and gradually shallow depressions reformed where the deeper vernal pools were filled. Seasonal wetlands developed in these depressions. These shallower, drier wetlands, however, do not provide the same habitat for either plants or wildlife as the original pools, and many natural resource values have been diminished.

3.8.3 Irrigation

Irrigation with treated wastewater began in the 1970s. The effects on the vernal pool ecosystem include loss of oak woodland and change in the plant community of vernal pools. Irrigation can profoundly affect species in the vernal pool ecosystem because most of the plant species evolved under a summer-dry Mediterranean climate. Application of irrigation during the summer alters the water regime of the soil, often creating perennially wet conditions to which the native vernal pool species are not adapted. Also, irrigated areas are often seeded with a standard seed mix of pasture grasses and clovers that replace native wildflowers and bunchgrasses. Irrigation of the summer-dry valley oak savannah has also contributed to an increased number of dead trees.

Significant available acreages for irrigation expansion are composed of oak savannahs and annual grassland/vernal pool complexes in the south half of the study area and seasonal wetlands west of Rohnert Park. These habitats are biologically significant and, therefore, have certain constraints regarding their use, such as protection of special status plant or wildlife species. Urban growth causes the need for expansion of reclaimed water irrigation in similar habitats. The continuing need to expand effluent irrigation acreage to keep pace with population growth may threaten the existence of oak woodlands and vernal pools in the Santa Rosa Plain, unless other, less sensitive lands are found for irrigation or these impacts are mitigated.

3.8.4 Hydrologic Modification

Few vernal pool complexes on the Santa Rosa Plain are fully hydrologically isolated; swales carry water from most complexes to others at lower points on the landscape. When lands are leveled, drainage is usually modified. Leveling does not remove the lands from the watershed of downstream wetlands, but the created roadside ditches and other drainage facilities often reroute or divert surface water. If leveled lands are paved, subsurface water relations are also changed.

Agricultural practices can also hydrologically affect adjacent wetland complexes. Discing increases the surface roughness and retards surface runoff. Equipment operated near fences may result in the accumulation of sidecast material and the formation of berms. Irrigation adds water at the time of the year when seasonal wetlands are dry (Waaland, 1994a). Even where land leveling is not involved, agricultural practices can affect the hydrologic function of vernal pools on adjacent or included lands.

Residential and commercial development have resulted in large-scale changes in the drainage network and its hydrologic function. Where water is shed from impervious surfaces into nearby swales, it carries an array of urban pollutants that may adversely affect the water quality in the

associated wetlands. Pavements and buildings shed water more quickly than unpaved earth ground, and the more rapid delivery of water to the local creeks causes flood peaks to increase. To handle increased flood peaks, the major drainages have been altered virtually completely within the urbanized areas of the plain. In the rural areas, the channels have also been straightened and deepened, as described above. Swales have been cut, water has been diverted, and ponding regimes have changed. All but the smallest, lowest-order (headwater) drainages have been crossed by roads over much of the plain. Roadside ditches carry water away from some swales and release it in others or in the flood control channels where it is no longer available to vernal pools or other seasonal wetlands.

Channelization of natural waterways. Channelization of waterways such as Roseland and Colgan creeks to control flood waters has resulted in the realignment of the channels, often laterally into terrain that once supported vernal pool-vernal swale complexes. The channels have been deepened, and considerable dredged material has required disposal. The soil dredged from the new alignments has been spread in broad bands on both sides of the new channels, and, as a direct impact, many acres of vernal pool-vernal swale complexes have been filled.

Straightened channels have cut across swales, interrupting flow and cutting off the upstream watershed to the portions of the complexes that are on the other side of the new channels. Because the source of water was cut off, the swales and pools have become drier. As a result, both have become covered with grasses, such as perennial ryegrass, that are well-suited to the drier conditions, and many of the smaller native annual species have been displaced. The opposite occurs on the upstream side of the channel where runoff through swales is blocked and water collects behind the berms or disposed spoil material.

All of these activities have had hydrologic effects on vernal pools and swales and other seasonal wetlands. The periods of ponding have decreased where water has been diverted and have increased where the flow of water has been blocked. Reductions in the periods of ponding permit the aggressive non-native annual grasses to become established. Their increase usually spells decreases for the smaller native species. Increases in ponding in other areas have resulted in the establishment of marsh species and periods of inundation that are excessive for the vernal pool annual species.

3.8.5 Non-Native Species Invasion

Non-native plant species are weeds from other parts of the world that are brought to an area intentionally or unintentionally by people or animals. For example, they may be planted for their agricultural value or transported by assistance with ship cargo. These plants are also referred to as "exotics" because they originate from outside the area. In California, most non-native plant species are of Mediterranean origin, because the climate is similar. Some exotics are able not only to live outside the places where they evolved, but also to "take over" or invade the habitats to which they are transported. Because their natural competitors and predators are not present, exotic plant species frequently can out-compete the native plants, particularly if the native habitat has been disturbed.

The spread of exotics is facilitated by soil disturbance and hydrologic changes, such as land conversion, channelization, filling of wetlands, irrigation, and livestock grazing. Although these uses have contributed to an increase in non-native species in vernal pools and swales, upland areas have been affected to a much greater extent. Because of winter ponding in vernal pools and swales, they are seasonally unusable for cultivation or ranching. The surrounding grasslands and oak communities may be used year-round, which results in introducing more alteration and more non-native species to vernal pools (Patterson et al., 1994). Vegetation in vernal pools generally consists of only 5 to 10 percent exotic species (mostly from South America and Africa), whereas in the grassland, 38 percent of the species are exotics (primarily from Europe and the Mediterranean region) (Holland and Jain, 1977).

Ponding in vernal pools and swales not only reduces their potential for conversion, but also reduces the ability of non-native species to invade. Survival of species in vernal pools depends upon their ability to survive a wide range of conditions and to grow and reproduce within a short period of time (generally during the "wet season") (Zedler, 1987). Few non-native plants are adapted for survival under these conditions (Cheatham, 1976). The presence of exotic species in a vernal pool is severely decreased when water stands for 2 weeks or longer (Bauder, 1986). Native populations are, therefore, favored in years with high rainfall or in large pools.

Because the potential for survival of non-native species is reduced the longer water remains in pools, it makes sense that the shallow broad swales and pools of the region are more susceptible to invasion by non-native grasses and weeds. Species such as Italian ryegrass, Mediterranean barley, curly dock, and annual bluegrass are well adapted to clayey soils and saturated soils often found in vernal pools (Patterson et al., 1994). These exotic species are strong competitors and are able to reduce the habitat available to native species.

Although the deeper vernal pools and swales are less vulnerable to invasion by non-native species, they are not completely unaffected. Certain non-native wetland species, such as dock, mint, umbrella sedge, rabbitfoot grass, cocklebur, and lippia are even able to invade wetlands with longer ponding regimes (Patterson et al., 1994).

Chapter 4

Regulatory Environment

The purpose of this chapter is to define the regulatory framework within which the Preservation Plan will be developed and implemented. This chapter includes a discussion of federal, state, and local laws, regulations, and policies relating to activities affecting the vernal pool ecosystem and its related biological resources, including endangered species, and aspects of the human environment.

The study area for the Preservation Plan covers a large portion of the Santa Rosa Plain. Local jurisdictions within this area include Sonoma County, Santa Rosa, Rohnert Park, Cotati, Sebastopol, and Windsor. The vernal pool ecosystem and its biological resources fall under the jurisdiction of several federal and state local laws, as summarized in Table 4-1.

The federal and California Endangered Species and California Native Plant Protection acts regulate activities and approvals that could affect listed and other sensitive plant and animal species. Several listed and candidate species are known to occur in the vernal pool ecosystem, including three federal- and state-listed endangered plant species: Sonoma sunshine (*Blennosperma bakeri*), Sebastopol meadowfoam (*Limnanthes vinculans*), and Burke's goldfields (*Lasthenia burkei*); the federal proposed and state-listed many-flowered navarretia (*Navarretia leucocephala* ssp. *plieantha*); the federal candidate California linderiella (*Linderiella occidentalis*); and the federal candidate California tiger salamander (*Ambystoma californiense*).

4.1 Wetlands Regulations

The following chapter describes federal and state laws and policies that protect wetland resources.

4.1.1 Clean Water Act Section 404

The Clean Water Act has as its purpose to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Waters of the U.S. protected by this act include rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands. Wetlands are a particularly sensitive and valuable component of the nation's waters and therefore merit special attention. Wetlands provide habitat for many important species of wildlife and plants, provide important flood control benefits, and play an important role in improving and sustaining water quality.

Section 404 of the Clean Water Act regulates the placement of fill into Waters of the U.S. and establishes a permit program to ensure that such fills comply with environmental requirements and meet the purpose of the act. The Corps is the agency that administers the permit program

Table 4-1

Regulatory Environment

Agency	Law or Regulatory Authority	What Practices the Law Regulates
Wetlands		
U.S. Army Corps of Engineers (Corps), U.S. Environmental Protection Agency (EPA)	Clean Water Act Section 404	Placement of fill within waters of the United States including wetlands
Natural Resources Conservation Service (NRCS)	Food Security Act (the Swampbuster Provision of the Food, Agricultural, and Conservation and Trade Act of 1990)	Withholds subsidies for activities in wetlands converted since 1985; defines prior-converted wetlands and farmed wetlands
California Department of Fish and Game (via CFG Commission)	Wetlands Resources Policy	Provides policy seeking to protect, preserve, restore, enhance, and expand wetland habitat in California. State agencies follow the policies in reviewing projects for permitting or review under the California Environmental Quality Act
	Streambed Alteration Agreement	Regulates projects that alter the bed or banks of streams or lakes supporting fish or wildlife
Regional Water Quality Control Board (RWQCB)	Clean Water Act Section 401	Regulates discharges to waters that could affect water quality; is responsible for issuing water quality certifications or waivers for Corps 404 permits
Endangered Species		
U.S. Fish and Wildlife Service (USFWS)	Federal Endangered Species Act	Protects plants and wildlife listed as endangered or threatened species and the ecosystems on which they depend
California Department of Fish and Game (CDFG)	California Endangered Species Act	Applies to all projects that involve potential taking of listed species
CDFG	California Native Plant Protection Act	Defines rare and endangered plants and requires notification for impacts to those species
General Environmental		
State and Local Agencies	California Environmental Quality Act (CEQA)	Agencies must consider impacts to the environment, including wetlands and rare plants and animals, in reviewing projects submitted for their approval
Federal Agencies	National Environmental Policy Act (NEPA)	Agencies must consider impacts to the environment, including wetlands and rare plants and animals, in reviewing projects submitted for their approval
Federal Agencies	Fish and Wildlife Coordination Act (FWCA)	Requires lead federal agencies to coordinate with the USFWS and CDFG whenever they review alteration of waters under permit or license
USFWS	Migratory Bird Treaty Act (MBTA)	Prohibits taking or killing of migratory birds, including their eggs and nests

for Section 404. The EPA, under the provisions of the act, participates in Section 404 activities by reviewing and commenting on selected permit applications.

The Corps can issue either an individual or general permit. An individual permit is issued after a case-by-case evaluation of a specific project. The process requires a public notice, an analysis of alternatives, an environmental assessment, and a full review to determine if the project is in the public interest. Additionally, mitigation may be required to reduce or offset any unavoidable impacts of the project. The processing of an individual permit can require a significant amount of time and resources. An individual permit can be denied if the project fails the alternatives analysis or is found to be contrary to the public interest.

A general permit is issued on a nationwide or regional basis for a category of activities where the activities are similar in nature and have minimal environmental impacts. A general permit can also be issued to a state or local regulatory agency when that agency is essentially duplicating the Corps' regulatory program.

Nationwide permits (NWPs) are general permits that are issued on a "nationwide" basis, that is, they are issued to be used anywhere in the U.S. Like any general permit, they must be for similar activities that have minimal environmental impacts. The Corps currently has more than 35 types of NWPs issued for activities such as outfalls, bank stabilization, and navigational markers. Specific limits and a number of conditions apply to all NWPs. All of the conditions must be followed for the NWP to be valid. If the Corps believes that the environmental impacts of a certain project are greater than minimal, the Corps can either place additional conditions on the nationwide permit to ensure project impacts are minimal, or require that the applicant apply for an individual permit.

Nationwide Permit Number 26 (NWP 26) is a permit that allows as much as 10 acres of fill in certain types of waters and wetlands, if the environmental impacts are minimal. In the past, this permit was used fairly frequently in the Santa Rosa Plain. The Corps, however, became aware of the seriousness of the impacts that were occurring by the use of this permit, and several plants found only in this area were considered for listing as endangered. The Corps imposed conditions on NWP 26 that required that all projects proposed be reviewed by the Corps to see if their impacts were truly minimal. After three plants were included on the federal endangered list, the Corps further conditioned NWP 26 so that the public would be aware that individual permits would be required for most projects in the area, and made known the specific criteria for their decision. See Appendix C for the text of the March 1994 Corps Public Notice regarding NWP 26.

No matter what the form of permitting, the Corps is required to abide by several other laws in its permitting process: among them the National Environmental Policy Act (NEPA), the Coastal Zone Management Act, the National Historic Preservation Act, and the Clean Air Act. Another one of these laws is the Endangered Species Act. The Corps consults with USFWS regarding endangered species issues. The USFWS determines whether a proposed permitting action will place the confirmed existence of a listed species in jeopardy and makes recommendations regarding conditions that could reduce the harm to endangered species. The Corps carefully considers and often includes the USFWS' recommendations as conditions to a permit.

4.1.2 Food Security Act

The Swampbuster Provision of the Food, Agriculture, Conservation, and Trade Act of 1990 withholds federal farm program benefits from persons who plant agricultural commodities on a wetland that was converted by drainage, dredging, or any other means after December 23, 1985, or who convert a wetland for the purpose of making agricultural commodity production possible after November 25, 1990. The Swampbuster Provision is administered by the Natural Resources Conservation Service (formerly Soil Conservation Service). The NRCS is responsible for determining wetlands on land receiving federal subsidies. In the nine Bay Area counties, including Sonoma County, the Corps and the NRCS determine whether an area falls under the definition of prior-converted croplands or is a farmed wetland under the Swampbuster Provision. Fill activities in wetlands are still under the authority of the Corps.

4.1.3 Agency Wetlands Resources Policies

The CDFG, through the CFG Commission, has adopted a wetlands resources policy that seeks to protect, preserve, restore, enhance, and expand the wetland habitat in California. This policy strongly discourages development in or conversion of wetlands that would result in a reduction of wetland acreage or wetland habitat values, unless, at a minimum, project mitigation ensures there will be no net loss of either wetland habitat values or acreage. This policy further elaborates that the CFG Commission strongly prefers mitigation that would achieve expansion of wetland acreage and enhancement of wetland habitat values.

4.1.4 Certification by the Regional Water Quality Control Board

Section 401 of the Clean Water Act requires persons planning activities that could result in a discharge of pollutants to certify that they will comply with limitations placed on the discharge activity. A Section 401 state water quality certification or waiver is required for all general permits. The State of California administers the Section 401 water quality certification program for the Corps' Section 401 permits through the RWQCB.

4.2 Endangered Species Regulations

The following material describes federal and state laws that protect endangered plant and animal species.

4.2.1 Federal Endangered Species Act

The federal Endangered Species Act protects plants and wildlife that are listed as endangered or threatened by USFWS and the ecosystems on which they depend. Section 9 of the act prohibits the taking of endangered wildlife, where taking defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct" (50 CFR 17.3). For plants, this protection extends to removing, possessing, maliciously damaging, or destroying any endangered plant on federal land, and removing, cutting, digging-up, damaging or destroying any

endangered plant on non-federal land in knowing violation of a state law (16 USC 1538). Under Section 7 of the act, federal agencies, including the Corps and NRCS, are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect an endangered species (including plants) or its critical habitat. Section 10 of the act allows for incidental taking of fish and wildlife species by individuals, provided a habitat conservation plan is developed.

4.2.2 California Endangered Species Act

The California Endangered Species Act was adopted to conserve, protect, restore, and enhance any endangered or threatened species and its habitat as defined by CDFG. State agencies are directed to refuse approval of projects that could jeopardize the continued existence of any threatened or endangered species.

4.2.3 California Native Plant Protection Act

The California Native Plant Protection Act requires CDFG notification for impacts on rare or endangered plant species and describes notification procedures for the state to implement relocation or salvage, if possible, for these species.

4.3 General Environmental Regulations

The following chapter describes federal and state environmental regulations that are intended to protect, preserve, and enhance all aspects of the human and natural environment.

4.3.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) applies to projects that are carried out, financed, or approved in whole or in part by federal agencies. NEPA is part of the individual permit review process required by Section 404 of the Clean Water Act. This process includes agency review by the EPA and USFWS.

4.3.2 California Environmental Quality Act

The California Environmental Quality Act (CEQA) is similar to NEPA in that it requires lead agencies to review projects they fund or approve for potential impacts to the environment. For projects that would generate significant environmental impacts, agencies must require mitigation for those impacts or determine that they cannot be mitigated and produce findings stating that overriding considerations exist that warrant project approval. Under CEQA any project that has the potential to affect adversely wetlands or endangered species is considered to have potential significant environmental impacts.

4.3.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 U.S.C. 703-711) prohibits the taking, killing, or possession of migratory birds, their eggs, and nests. The U.S. Fish and Wildlife Service is authorized to determine, after review of a variety of factors such as population distribution or abundance, economic value, and times and lines of migratory flight, to determine when and to what extent any such take or killing could be undertaken.

4.4 Local Plans, Policies, and Ordinances

4.4.1 County and City Policies Protecting or Affecting Biological Resources

Growth management is a major component of Santa Rosa area local comprehensive planning programs, and is one of the primary management tools for protecting and preserving biological resources within the Santa Rosa Plain. Urban development is concentrated within five major urban centers that lie within or partly within the Santa Rosa Plain: Windsor, Santa Rosa, Sebastopol, Rohnert Park, and Cotati. These urban areas are separated from one another by "community separators" or open space areas. For example, Rohnert Park and Santa Rosa are separated by 1,700 acres designated open space; Santa Rosa and Sebastopol by about 1,400; and Windsor, Larkfield, and Santa Rosa by 2,000. This land use pattern enables the county to maintain a rural character while providing for urban services within the core areas. Managing growth within urban boundaries, and thereby reducing the need for extensive infrastructure construction and urban sprawl, affords considerable protection for biological resources. The cities within the Santa Rosa Plain and Sonoma County have developed planning policies to further emphasize these growth management principles.

As mentioned in Chapter 3.9, there are threats to biological resources other than urban development. The county has included maps in its general plan identifying "biotic resources" to provide protection to these resources. There are several elements of the Sonoma County General Plan and municipal general plans that may be considered as indirectly protecting or affecting biological resources. The discussion below focuses on those policies, plans, or ordinances that directly address biological concerns, and provides a summary of each.

4.4.1.1 Sonoma County Resource Conservation Element

The resource conservation element of the 1989 Sonoma County General Plan contains several goals, objectives, and policies applicable to the protection of vernal pool ecosystems. Brief descriptions are presented below.

Goal RC-1. Encourage the conservation of soil resources to protect their long-term productivity and economic value.

Objective RC-1.1. Preserve lands containing prime agricultural and productive woodland soils and avoid their conversion to incompatible residential, commercial, and industrial uses.

Goal RC-5. Promote and maintain the county's diverse plant and animal communities and protect biotic resources from development activities.

Objective RC-5.1. Identify and encourage protection of areas with important habitats and woodland resources.

Objective RC-5.2. Encourage use of native plants in landscaping.

Objective RC-5.3. Recognize and preserve the Laguna de Santa Rosa and San Pablo Bay area as biotic resource areas and historic water retention basins of particular significance to Sonoma's environment.

Policy RC-5a. Manage and conserve natural resources while allowing a compatible level of residential development.

Policy RC-5d. Develop comprehensive programs for preserving and restoring the Laguna de Santa Rosa. Include mechanisms for preservation, such as, acquisition, zoning, and easements.

Goal RC-6. Identify and protect rare and endangered species and their environment.

Objective RC-6.1. Identify locations of rare and endangered plants and animals.

Objective RC-6.2. Require that any development on land containing rare and endangered species be done in a manner which protects the resource or mitigates adverse impacts.

Policy RC-6a. Maintain and update "biotic resources" data maps. Use in environmental review process for development permits.

Policy RC-6b. Protection of rare and endangered species not indicated on the map shall be accomplished in compliance with applicable state and federal law.

Policy RC-6c. Provide for the creation of separate parcels of land, where necessary, to establish sites for the preservation of rare and endangered species and other biotic resources.

4.4.1.2 Sonoma County Open Space Element

The 1989 Sonoma County Open Space Element identifies four classifications of open space: Scenic Resources, Biotic Resources, Outdoor Recreation, and Archaeological/Historical Resources. The following are brief descriptions of the adopted policies as identified in the 1989 Sonoma County General Plan:

Goal OS-1. Preserve the visual identities of communities by maintaining open space areas between cities and communities.

Objective OS-1.2. Retain a rural character and promote low-intensity development in community separators. Avoid their annexation or inclusion in spheres of influence for sewer and water service providers.

Policy OS-1c. Identifies provisions for allowing changes in land use in community separator zones, such as providing for the exchange of permanent open space through grants or third-party land trusts and providing special considerations where developers provide mechanisms to maintain and preserve open space or parkland, which may be dedicated in fee as part of the development.

Policy OS-1i. Consider voluntary transferrable development rights (TDRs) and purchase of development rights (PDRs), and make community separators eligible with owner consent.

Goal OS-4. Identify critical habitat areas and ensure the quality of these natural resources is maintained and not adversely affected by development activities. (Critical habitats include wetlands and marshes, including vernal pools, and other habitats, such as native bunchgrasses and oak savannahs.)

Objective OS-4.1. Designate critical habitat areas and maintain low-intensity land uses in these areas.

Objective OS-4.2. Establish development guidelines to protect designated critical habitat areas.

Policy OS-4a. Add a biotic resources combining district to the zoning ordinance.

Policy OS-4b. Rezone to the biotic resources combining district any lands designated as a critical habitat.

Policy OS-4c. Require a biotic resource assessment to develop mitigation measures if a discretionary project could adversely affect a critical habitat area.

Policy OS-4e. Maintain a minimum 50-foot setback for building permits near wetlands that are within a critical habitat area.

Policy OS-4g. Consider TDRs or PDRs for critical resource areas.

Goal OS-5. For riparian corridors along selected streams, provide protective measures that balance the need for agricultural production, urban development, timber and mining operations, and flood control with preservation of riparian values.

Policy OS-5b. Rezone to the biotic resources combining district any lands designated as riparian corridors.

Policy OS-5d. Designate additional riparian corridors in specific plans, area plans, or local area development guidelines that will be subject to policies included herein.

Policy OS-5e. Identify acceptable uses within any streamside conservation area. It should be noted that grazing is an acceptable use.

4.4.1.3 Santa Rosa General Plan

To prevent urban sprawl, growth within Santa Rosa will be restricted to within the Urban Boundary line, and a belt of open space consisting of agricultural uses and low-density rural residences will be established around the city. The general plan policies relevant to protecting biological resources are summarized below. The general plan is supplemented in the Santa Rosa Plain by the Southwest Santa Rosa Specific Area Plan. A summary of this specific plan's relevant policies follows this discussion.

Growth Management

Policy GM-3a. Adopt an ordinance initiating a growth management program.

Urban Design

Policy UD-5b. Promote mixed-use development in the core area and regional, community, and neighborhood shopping centers.

Residential Land Use

LUR-3. To conserve the visual and biotic values of the city's hillsides, ridgelines, outlying valleys, and drainage courses.

LUR-3c. Incorporate protection and restoration of creeks and their riparian corridors into the residential review and approval process.

LUR-3d. Allow development in areas designated Open Space on the land use diagram when development constraints are mitigated.

Portions of southwest Santa Rosa where vernal pools and rare endangered plants may occur are designated Open Space on the land use diagram, for the time being, in order to minimize development. When a development agreement acceptable to all resource agencies is reached the city will amend the diagram with the appropriate land use classification.

Open Space Land Use

LUS-1. To protect open spaces and unique natural features from intrusion or degradation by inappropriate land uses.

LUS-1a. Ensure conservation of the city's open spaces and significant natural features in those open spaces when evaluating private or public development projects or improvements.

LUS-1b. Encourage maintenance of open space community separators between Santa Rosa and neighboring communities.

LUS-1c. Coordinate with public and private entities to link open space with a network of paths and trails.

Agriculture Land Use

LUA-1. To support protection of productive and potentially productive agricultural lands in the planning area outside the urban boundary as a community resource.

Community Services

PSF-13a. Continue programs using treated wastewater for agriculture and investigate expanding the program to include golf courses, landscaped areas, open space, and other large water users.

Open Space and Conservation

OSC-1. Preserve and restore the natural network of creek and creek habitats.

OSC-1a. Develop a creeks and waterways master plan.

OSC-2. Identify and preserve vernal pool wetlands and restore modified pools.

OSC-2a. Prepare a vernal pool master plan for the purpose of conserving existing and modified vernal pools through the development process and local restoration efforts. (The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan satisfies this policy.)

OSC-2b. Interim measures to continue to use existing regulations and procedures, for example, subdivision, zoning, design review, and environmental impact assessment.

OSC-2c. Coordinate efforts for vernal pool protection with Sonoma County since most vernal pool areas are in the county.

OSC-3. Conserve significant trees and vegetation in Santa Rosa, including creek corridors and hillsides in rural, agricultural, and urban areas.

OSC-4. Conserve the habitats and movement corridors required by wildlife.

OSC-5. Integrate the variety of open spaces and maximize the biological, recreational, and other benefits of the spaces.

OSC-5b. Encourage the Sonoma County Agricultural Preservation and Open Space District to appropriate funds for acquiring open space immediately outside Santa Rosa's ultimate urban boundary and along Santa Rosa Creek.

OSC-8. Support conservation of prime agricultural land in the planning area outside the Urban Boundary. Preserve and enhance commercial agriculture as a component of the economy and as a part of Santa Rosa's environmental quality.

4.4.1.4 Southwest Santa Rosa Specific Area Plan

Santa Rosa's Southwest Specific Area Plan contains a conceptual wetlands habitat management plan that primarily protects the variety of vernal pools found in this area. The Southwest Specific Area encompasses 3,800 acres, of which 900 acres are already within city limits and 1,500 acres are planned for annexation. Land use within the area is primarily designated Rural Residential, with some diverse agriculture. The plan promotes mixed-use development and preservation of rare and endangered plants and animals to ensure no net loss of these species. The conceptual plan also provides an outline to focus future discussions on the range of mitigation approaches available to optimize the protection of vernal pools and associated plants and animals in the area. Elements of the plan are

1) A preserve area set aside and designated for "no taking" of wetlands

   The set aside area designated for no development is justified as a preservation area based on biological or ecological criteria. A consolidated area of vernal pool, vernal swale, and other seasonal wetland habitat would be retained as a preserve.

2) A designated wetland "take" area

   This area would allow mitigated residential and commercial development, and infrastructure improvements. Wetlands in the take areas are distributed in a pattern of small or isolated vernal pools, seasonal wetlands, and sensitive species habitat. Wetland compensation would be required for unavoidable impacts to wetlands within these take areas. The compensation could take the form of wetland creation and enhancement on site or within the designated wetland preserve area. A development fee could be assessed on lands within the take areas for acquiring conservation easements or fee-simple title to lands within the preservation area.

3) Options for plan implementation and funding

Options for the plan implementation, habitat management, and funding are presented in the conceptual plan. Compensatory habitat development and protection methods, procedures, specifications, responsibilities, and implementation strategies for habitat preservation are also discussed in the plan.

4.4.1.5 Santa Rosa Tree Ordinance

The city's tree ordinance protects valley oaks and other heritage trees by requiring a permit for removal of trees having a diameter of 6 inches or greater at 4.5 feet above grade, and by specifying special precautions that must be taken when construction activity or development takes in the vicinity of oaks. These precautions include fencing during construction, avoidance of disturbance and trenching within driplines, maintaining grade around trees, and prohibiting the placement of paving or landscaping requiring summer irrigation in the vicinity of oaks.

4.4.1.6 Santa Rosa Grading Ordinance

The existing ordinance regulating grading uses the Universal Building Code (UBC) to determine exempt fill operations. The Santa Rosa Grading Ordinance is enforced by the Sonoma County Building Department. It is worth noting that although this ordinance affords some protection of sensitive habitat, often fill operations considered exempt under the UBC significantly affect vernal pools.

4.4.1.7 Santa Rosa Zoning Code

The following sections of the 1993 Santa Rosa Zoning Code contain regulations relating to biological resource and environmental protection.

Chapter 20-03, Article 22. Designation of Environmental Management Districts. The purpose of Environmental Management Districts is to protect the public health, safety, and welfare and to manage natural and environmental resources in certain selected areas having significant and critical natural resource values. These districts are "combining" districts, which may be overlain on any other zoning district, consistent with provisions in the zoning code. The provisions of this district include

- Minimizing cut, fill, and earth moving
- Minimizing storm water runoff and soil erosion problems
- Regulating uses in areas with high potential for liquefaction
- Regulation of areas in 100-year flood zone
- Preservation of riparian areas
- Minimizing fire hazards

- Encouraging developments that preserve the land's significant natural resources.

Chapter 20-05, Article 3.1. Creekside Setback. This article establishes minimum setbacks from creeksides for new buildings. Only natural and "modified" natural watersheds are covered. For them, the setback is 30 feet from the creekbank top. (For steeper banks, the setback is 30 feet from the intersection of the top of the bank with a line drawn at a 2.5:1 angle from the toe of the bank).

4.4.1.8 Windsor Specific Plan

The Windsor Specific Plan was prepared in 1986 by the Sonoma County Planning Department to assist in the "systematic implementation" of the overall Sonoma County General Plan for the Windsor area. The land area encompassed by the plan comprises about 8,250 acres. This land is relatively flat, bordered by hills to the east and west, and is primarily in agricultural use, including vineyards, pasture, and orchards.

The Windsor Specific Plan was prepared in such a way that it could function adequately as a general plan for a newly-incorporated city. Although Windsor is now incorporated, land use and conservation policies are still dictated by the specific plan. Development policies that apply to certain individual parcels are contained in the plan elements, in order to express clearly the allowed uses and/or residential densities, and provide incentives for the donation of land for public facilities and consolidation of obsolete or substandard parcels. Descriptions of policies that pertain to biological resources follow. (Note that the town is preparing a new general plan.)

General Goals and Policies

General Goal G. States that it is the goal of the plan to preserve the various natural and cultural resources within and surrounding the community. It is the plan's policy to conserve, to the maximum extent practical, unique and sensitive biotic features such as rare and endangered plants, woodlands and hedgerows, and riparian corridors for their educational, recreational, and wildlife habitat value.

Land Use Element. The land use element establishes a rural/agricultural "fringe" that surrounds the more intensely developed center of Windsor. The fringe area poses safety and open space concerns, and is not needed to accommodate the population anticipated within the 20-year planning period. The land use element promotes "balanced" community growth and establishes several categories, generally divided into "urban" and "rural" land uses.

Open Space and Conservation Element. The open space element is intended to directly complement the land use plan, providing implementation measures to ensure that environmental, recreational, and other resource values are maintained. This element contains several policies relating to preservation of natural resources, including riparian corridors, rare and endangered plants, and woodlands and hedgerows. The element also contains policies addressing the managed production of resources, including agriculture, natural recharge areas, and mineral resources.

Scenic resources, outdoor recreation opportunities, parks, open space linkages (such as bike lanes and scenic highway corridors), and archaeological/historical resources are also identified in this element.

Public Facilities and Services Element-Storm Drainage Facilities. The Sonoma County Water Agency (SCWA) completed a Windsor Area Master Drainage Plan for the Windsor watershed in June 1989. The plan provides for alternative designs that retain natural waterways, and for preservation and enhancement of existing wildlife habitat for streams designated as riparian corridors in the open space element. Individual projects are required to analyze and mitigate drainage impacts. (An environmental impact report was prepared in August 1981 for the Windsor Specific Plan Drainage Element, covering some of the projects proposed in this water drainage plan.)

4.4.1.9 Sebastopol General Plan

The 1994 Sebastopol General Plan is an update to the 1982 plan. The city is on State Route 12 east of Santa Rosa, and functions as a market center serving the large dairy farms, apple orchards, and other agricultural uses in the surrounding region (from Guerneville and the Russian River area, to Graton, Bodega, and Bloomfield). The city is bordered by scenic wetlands (Atascadero Creek and Ragle Regional Park) on the west and Laguna de Santa Rosa on the east, offering large expanses of open space, along with a gently sloping topography and many heritage trees. The general plan has several themes, one of which is to protect and enhance environmentally sensitive areas such as the Laguna de Santa Rosa, Atascadero Creek, and the adjacent ecosystems. A description of policies that address biological resources follows.

Land Use Element. The element establishes a range of land use designations stressing the importance of preserving the natural environment. High priorities of the community (as expressed in the results of the community survey and public meetings conducted as part of the general plan process) are maintaining open space separators around Sebastopol and preserving the Laguna de Santa Rosa and Atascadero Creek. The land use element establishes Urban Growth Boundaries to prohibit development from encroaching into open space. This element also has a program to consider implementation of a cooperative TDR plan with Sonoma County, and to provide information to property owners about available funding sources and tax benefits for maintaining open space in perpetuity.

Conservation, Parks, and Open Space Element. This element emphasizes the preservation of biological resources, particularly in areas bordering watercourses, and recognizes the city's need for a well-distributed system of parks, open spaces, and trails. Since the protection of natural resources depends on cooperation among different levels of government, many city policies and implementation programs reflect and strengthen those of Sonoma County.

The Laguna de Santa Rosa and Atascadero Creek are considered important natural resources that must be protected and enhanced. The city has established goals, policies, and programs to preserve and enhance these areas through this element of the general plan. Because the majority of these open space areas are located in the "Referral Area," an area outside of the city's sphere of influence, the county and other jurisdictions will inform and request comments from the city

regarding proposed development and changes to their land use regulations in the Referral Area. Extension of city services, such as water and sewer, and the resulting urbanization, is thereby precluded in these environmentally sensitive areas. The city has also adopted the Laguna Park Master Plan (as part of its 1994 general plan update), which establishes limited recreational uses and habitat restoration programs for approximately 250 acres located at the eastern edge of Sebastopol. Agricultural activity within the Sebastopol Planning Area is limited to several small orchards and pasture land.

This element establishes a policy to encourage the use of conservation easements wherever possible to protect, in perpetuity, environmentally sensitive areas. As part of this policy, development proposals for land that includes or is adjacent to environmentally sensitive areas must develop a resource analysis of the property. This analysis determines the boundary of wetlands, upland habitat, the presence and location of endangered plant and animal species, and any other information relevant to the preservation of biotic resources. This element also contains a policy to secure permanent open space as a condition of approval. The element requires parks and recreation facilities to be designed and sited in a manner that ensures protection of biotic resources.

The Laguna Park Master Plan is discussed at length in the conservation element. This plan contains several goals and policies for protecting and enhancing existing sensitive habitats in the Laguna. Vernal pools are one of the habitats in the Laguna, and the plan contains the following policy for this resource:

Policy 51 Vernal Pools and Endangered Species. Seek voluntary landowner cooperation for elimination of irrigation and fill on those areas identified as vernal pool or sensitive area in Map 3 of the Laguna Park Master Plan in the absence of purchase or conservation easement.

4.4.1.10 Cotati General Plan

Cotati is located in the south of the Santa Rosa Plain. The city has a strict policy of limiting urban growth to within its urban limit line. Other policies that affect biological resources are described below.

Objective 9.3.3. Encourage the development of well-located green open spaces (primarily applies to open space within new subdivisions).

Objective 13.1.1. Open space land shall be protected from development. City planning shall work with county staff to ensure that environmentally sensitive lands within the sphere of influence are zoned appropriately as agricultural preserves, parks, and other limited development or recreational uses.

Objective 13.1.2. Encourage infill housing through a growth management program. The city is limited to issuing 100 residential building permits each year.

Objective 13.1.3. All future development of residential lands shall be contiguous to urban development, and clustered development shall be given preference to preserve a sense of openness within the town. Zoning shall address clustering in new development.

Objectives 13.1.4 & 13.1.5. Creek Protection.

4.4.1.11 Rohnert Park General Plan

Rohnert Park is almost entirely urbanized (only 16 percent is undeveloped) and sits immediately adjacent to Cotati between U.S. 101 and Santa Rosa and Petaluma. Applicable policies affecting biological resources are described in various elements of the city's general plan, and are summarized below.

Land Use Element

Objective 4. Designate a permanent open space buffer surrounding the city boundaries and determine ways to ensure that this buffer remains permanent.

Implementation No. 5. Work with the county to maintain agricultural lands around the city and prevent invasion of rural residential development.

Implementation No. 6. Establish a greenbelt around the city (community separator) using a variety of methods.

Implementation No. 7. To preserve community separators, establish standards and procedures for granting to the city open space lands, preservation easements, and development rights in exchange for provision of city services, annexation, or authorization of development.

Conservation Element

Policy 2. Use treated wastewater where economically feasible for irrigation of golf courses, parks, landscaping, agricultural lands, and similar areas.

Policy 3. Expand, wherever possible, the use of treated wastewater for irrigation purposes.

Principle 3. Watershed lands shall be protected, and any development of watershed areas shall retain as much natural vegetation as is feasible.

Policy 4. Control density and restrict types of development on watershed lands.

Policy 6. Require a hydrologic analysis of runoff and drainage from new development.

Objective 6. By the year 2000, establish an enhanced wildlife habitat and maintain wildlife corridors along waterways.

Implementation Measure 14. Increase the amount of treated wastewater used to irrigate public lands in Rohnert Park.

Open Space Element

Goal. Maintain and increase open space land within the city limits for the enjoyment of scenic beauty, recreation, and natural resources of the community.

Policy 6. Use drainage canal and creek rights-of-way for permanent open space and compatible purposes including stormwater drainage, trails and bike paths, wildlife habitat, and native plant landscaping.

Standard 6. One regional park of approximately 50 acres within 5 miles of the city center should be explicitly preserved as an open space resource.

Goal. Discourage conversion of open space and agriculture lands to urban uses outside the city limits.

Objective 1. Establish a plan for acquisition of large parcels of land for development rights beyond the city limits to create a permanent open space border around the city.

Implementation Measure 6. A citizen's general plan committee will prepare a plan to create an open space border around the city within the context of a thorough general plan update process.

Objective 2. Preserve open space lands beyond the city limits to create a permanent open space border around the city.

Principle 2. Maintain the concept of community separators and open spaces around the city.

Implementation Measure 7. Work with Sonoma County to maintain the agricultural lands around the city and to prevent the intrusion of rural residential developments.

Implementation Measure 8. Use feasible methods to establish a green belt around the city including maintenance of community separators, identified in the Sonoma County General Plan, annexation and imposition of city preservation zoning, the purchase of development easements, the purchase of property, and uses of land consistent with open space objectives.

Implementation Measure 9. To preserve community separators, establish standards and procedures for the granting to the city of open space lands, preservation easements, and/or development rights in exchange for provision of public services by the city, annexation, and/or authorization of development.

Implementation Measure 13. Develop as a natural habitat the area owned by the city between the Rohnert Park Expressway and the Laguna de Santa Rosa, west of the city limits.

Goal. Create an awareness that open space land is a limited and valuable resource that must be conserved wherever possible.

4.4.2 Fire Code Requirements

The responsibilities of Santa Rosa Fire Department include fire prevention, as well as fire-fighting. The department's jurisdiction includes all properties within the city limits and the unincorporated Sonoma County areas within the Roseland Fire District. Each spring, the fire department conducts a weed abatement program to reduce the available fire fuel. A city ordinance provides the department with the legal authority to require property owners to either disk their properties or keep grasses and weeds mowed to a height of 4 inches or less. The department does not currently specify the method that the property owner should use. The most effective and preferred method for fire prevention is disking because it is only needed once a season and results in less available fuel than mowing.

The department is, however, aware of the negative impacts that disking has on vernal pools and is currently coordinating its weed abatement policies with the Corps, USFWS, and CDFG. The new policy will require mowing as the weed abatement method on all properties with any vernal pools. This policy will initially affect the properties where CDFG has identified vernal pools and may be expanded to include other areas identified in this Preservation Plan.

No schedule has been established for the implementation of any new policies because some issues still need to be resolved. For example, mowing affects vernal pools less if done after June 1. If an owner, however, does not disk or mow his or her own property in a timely manner following the fire department's request, it conducts the work and bills the property owner through the annual tax bill. With a delay until June 1, the department would miss the annual deadline for billing through the assessor's office. The department is working to resolve this and other issues in order to implement these policies. In the future, the department intends to coordinate weed abatement policies with adjacent fire districts.

4.4.3 Sonoma County Water Agency Policies

The SCWA is responsible for drainage, flood control, and water supply in Sonoma County. Also, the SCWA has recently acquired some responsibilities for sanitation facilities. As part of the reorganization efforts for Sonoma County government, on January 1, 1995 the SCWA assumed responsibility for administering, operating, and maintaining seven county sanitation service areas (also known as county service area benefit zones) and five sanitation districts.

SCWA activities that could potentially affect vernal pools include construction of SCWA facilities and maintenance of existing drainage channels. SCWA also reviews drainage and grading permits for other proposed construction projects within the county. These three activities–construction, maintenance, and permit review–are discussed further below.

Construction of SCWA facilities may include drainage channels, pipes, and structures, and water supply pipes, structures, and wells. All of these capital improvement projects are required to undergo CEQA environmental review, which includes an assessment of their potential impacts on vernal pools.

Maintenance activities for existing drainage channels include mowing within SCWA easements and periodic sediment removal from channels. SCWA typically uses upland sites for sediment spoil disposal and has a Corps representative visit a site to confirm the absence of vernal pools and wetlands before any spoils are placed on it.

When SCWA reviews drainage and grading permits for proposed construction projects, its comments focus on the project's impact on SCWA facilities and the impact on existing drainage patterns. Since SCWA is not a responsible agency for vernal pools, it does not comment on potential project impacts.

4.4.4 Santa Rosa Subregional Water Reclamation System Policies

The Santa Rosa Subregional Water Reclamation System (Subregional System) provides reclaimed water for irrigation of over 5,000 acres in the area surrounding the Laguna Subregional Water Reclamation Facility. The subregional system is interested in adding new properties to the irrigation program to increase the reuse of reclaimed water. Before adding properties to the program, the subregional system conducts a biotic survey of the property. Typically, properties containing vernal pools are not added to the program. Exceptions are made for larger properties when vernal pools are located in a small section of the property. In these cases, the vernal pool areas are excluded from the irrigation program in the contract between the owner and the subregional system.

Chapter 5

Historic and Current Conditions in the Study Area

5.1 Historical and Existing Land Use

5.1.1 Historical Conditions

Human use of the Santa Rosa Plain may extend back as far as 8,000 years. The area offered an abundance of waterfowl, fish, game, and plant foods, especially acorns. When the first Europeans arrived, the area was occupied by three Native American communities, Konhomtara, Bitakomtara, and Kataictema, of the Pomo language family, numbering about 3,000 persons (Waaland et al., 1990). The economy of the three communities consisted of hunting, fishing, and collecting. Profound changes to lifeways of native peoples, as well as decimation by disease, occurred following sustained contact with European settlers (Waaland et al., 1990).

Agricultural activities have been responsible for shaping and influencing the mosaic of land uses comprising the Santa Rosa Plain. European settlement began in the 1830s, with the establishment of large ranchos under Mexican jurisdiction. The number of American farmers increased dramatically after the end of the Mexican-American War in 1848. At this time, American farming practices required lumber, and in 1855 there were five water sawmills in Sonoma County. By the mid-1850s a post office and a store served the growing farm population in the area.

With the establishment of Petaluma and Santa Rosa—the major cities in the area—and the advent of the railroad in 1870, the valley region was further developed with a variety of income-producing crops and ranching activities (Patterson et al., 1994). Early agricultural operations for the area produced ground crops, orchard crops, hops, poultry, hay, and grazing pastures. Beginning in 1940, hopfields and prune orchards became the crops of choice, displacing mainstay ground crops and poultry. The dairy industry continued to thrive, not subject to the fluctuations experienced by other agricultural activities.

As the orchards and hopfields disappeared from the land in the 1960s, urbanization intensified. In 1949, the population of Santa Rosa was approximately 15,000. Forty-five years later, it has multiplied eightfold, spreading into areas previously used as rural residential, agricultural, and open space (Patterson et al, 1994). Rohnert Park, once the site of a vegetable seed farm, was incorporated in 1963, and Cotati and Petaluma experienced marked growth during this period as well. Today, urban uses occupy as much land as agricultural ones did in the decade following 1910.

Countywide production acreage from 1900 to 1960 remained stable, averaging from 700,000 to 800,000 of the county's 1 million acres. There was a precipitous drop in acreage beginning in the 1960s and continuing until about 1980. Recent land conversion has been relatively low and stable, with production acreage remaining at about 430,000 acres. The increase in vineyards in the 1980s enabled the Santa Rosa Plain to retain a relatively stable acreage of agricultural land.

Before European settlement and cultivation, the area around the Laguna de Santa Rosa contained an oak woodland and vernal pool ecosystem that formed a vast, continuous habitat of several thousand acres. Tree populations have declined enormously since the 1850s, mainly because of land clearing. Uplands have been converted to orchards, vineyards, and pastures, or been used for urban development. Urbanization continues to consume both remaining undeveloped savanna and agricultural land.

Although, based on soils (see Figure B-1 in Appendix B), approximately 80 percent of the Santa Rosa Plain could support the vernal pool ecosystem, increased agricultural development and subsequent intensive urbanization have continued to replace the region's seasonal wetlands. Native vegetation and perennial grasslands were virtually eliminated from the area by activities associated with grazing and crop cultivation. Most recently, large-scale irrigation has affected large areas of rural land, and residential growth has resulted in filling wetlands on undeveloped land around the study area's municipalities (Waaland and Vilms, 1988; Patterson et al., 1990).

5.1.2 Existing Land Use

The character of the study area is primarily rural and agricultural to the west and more urban to the east, along the Highway 101 corridor. As illustrated in Figure 5-1, which shows existing functional land uses, and Figure 5-2, which shows municipal boundaries, urban development is concentrated within the five metropolitan centers of the Santa Rosa Plain: Santa Rosa, Windsor, Sebastopol, Rohnert Park, and Cotati.

The urban areas are separated from one another by "community separator" or open space areas. This land use pattern enables the county to maintain a rural character, while providing for urban services within core areas distributed throughout the plain. For example, Rohnert Park and Santa Rosa are separated by 1,700 acres of open space; Santa Rosa and Sebastopol are separated by about 1,400 acres; and Larkfield, Windsor, and Santa Rosa are separated by 2,000 acres.

Existing land use within the study area is shown in Figure 5-1; acreages are summarized in Table 5-1. These areas and corresponding acreages are based on interpretation of aerial photographs from 1990. The 1995 acreage may vary slightly from these. The land use categories identified in Table 5-1 do not reflect the specific land use categories of the Sonoma County General Plan or the general plans of Santa Rosa, Rohnert Park, Cotati, or Windsor, but were created specifically for this document with the aim of reflecting the actual use of the land, as identified from the aerial maps.

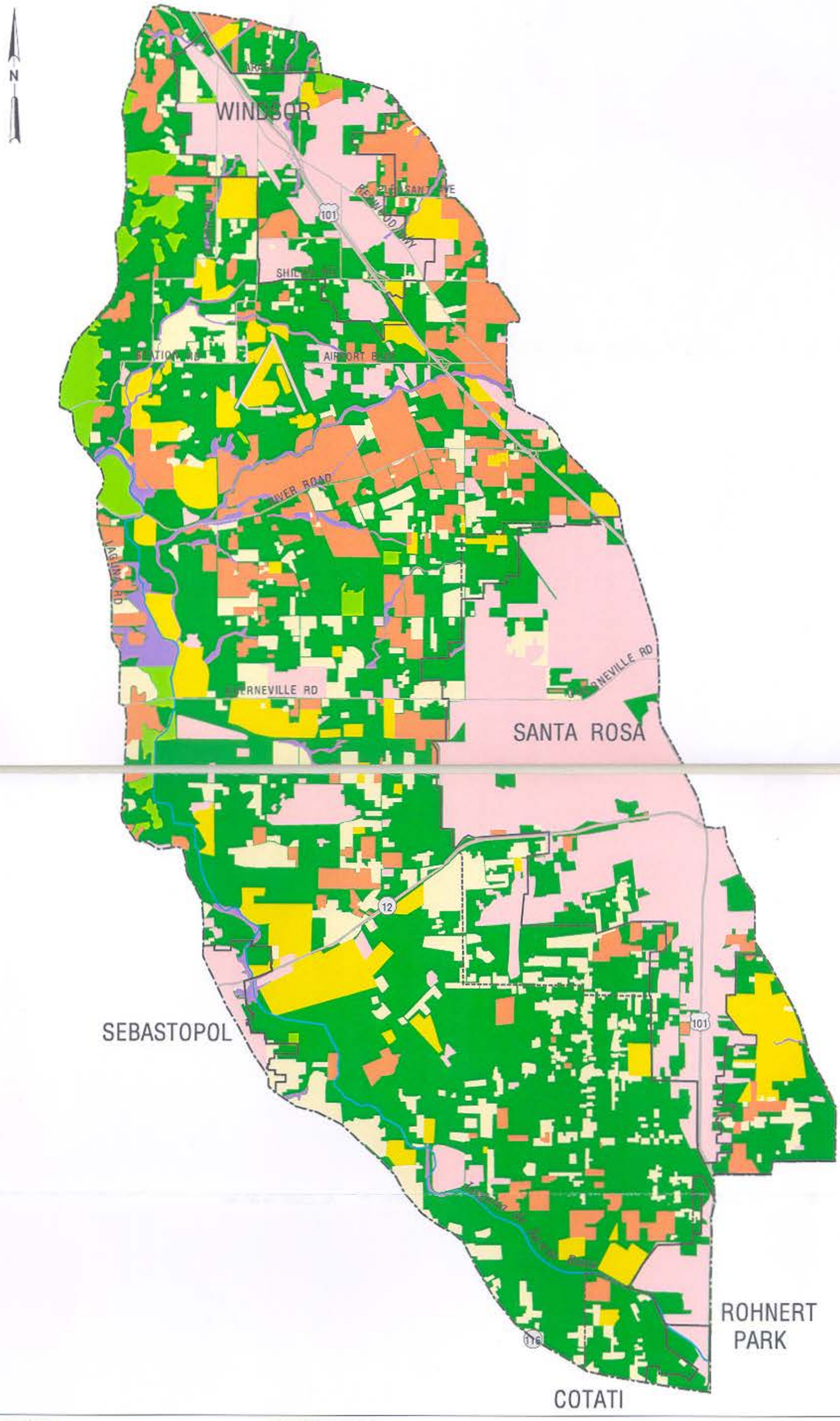


Figure 5-1

Existing Land Use

/gis/wbl/nadeem/rosa/maps/small/fig5-1.aml
26 Apr 95 13:05:19 Wednesday

Plotted by CH2M HILL

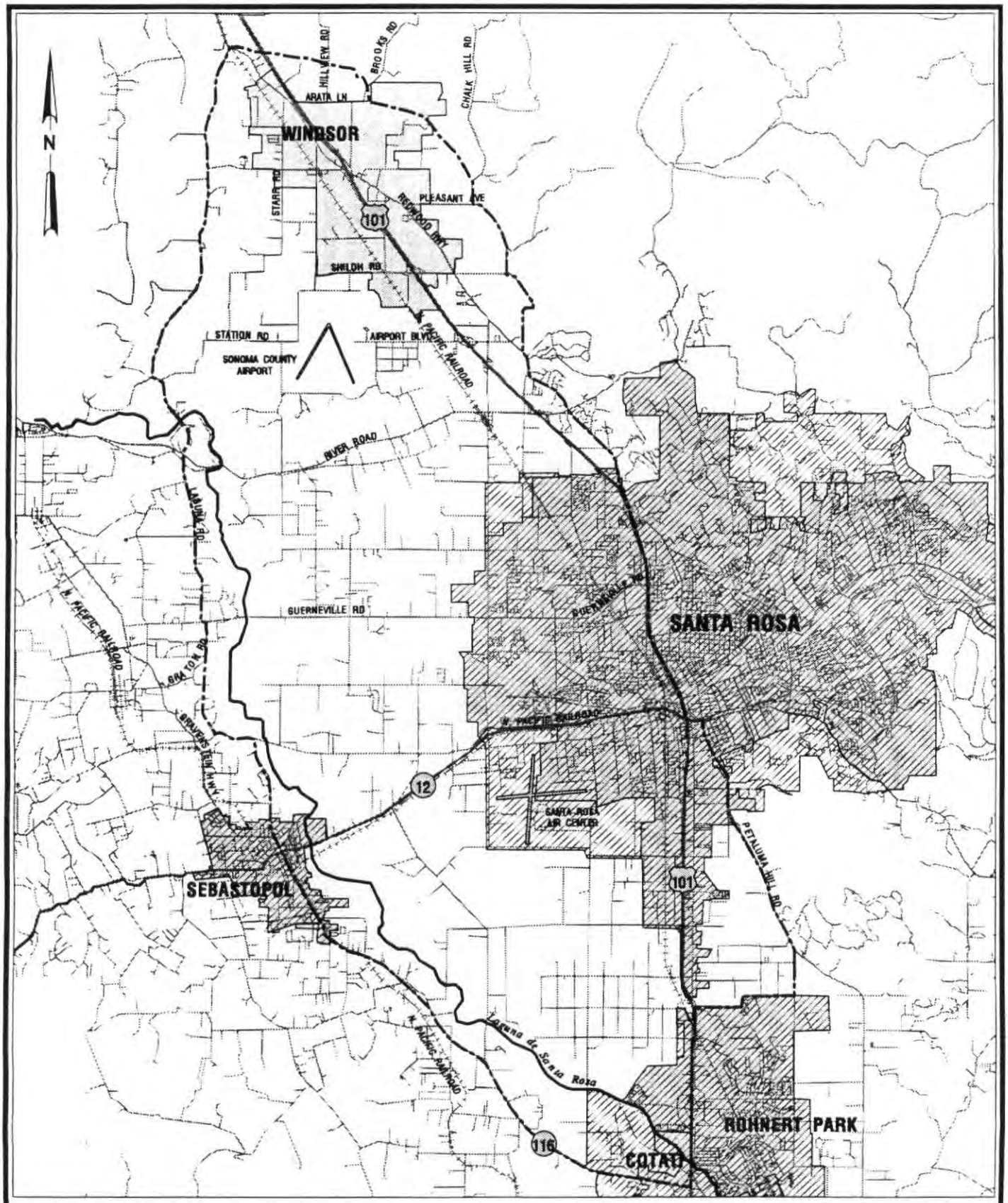


Figure 5-2

Urban Boundaries

FEATURES:

- City
- Sphere of Influence
- Vernal Pool Study Area

0 2 4

MILES
(1 Inch = 2 Miles)

/gis/wbl/nadeem/rosa/maps/small/fig5-2.aml
20 Feb 95 17:31:50 Monday

Plotted by CH2M HILL

Table 5-1 Existing Land Uses		
Land Use	**Acreage**	**Percent**
Urban, Residential, Industrial	11,871	22
Rural Residential	5,507	10
Vineyard/Orchard	5,417	10
Row Crop/Hayfield	3,879	7
Grassland/Ruderal	25,947	47
Oak Woodland	1,111	2
Riparian Forest	1,018	2
Total	55,047	100

The most extensive land use is grassland/ruderal, which comprises almost half of the study area. This land use is scattered throughout the study area, primarily in the western portion. It should be noted that this includes ruderal or disturbed areas that do not have any indication of agricultural use as well as areas of more pristine grassland with vernal pool and swale complexes.

The second largest existing land use, a little less than one quarter of the area, is urban, mostly residential and industrial, concentrated in the five municipalities. Rural residential areas cover about 10 percent of the study area and are scattered throughout. Vineyards and orchards make up another 10 percent. These uses are located primarily in the northern portion of the study area. Many of the vineyards and orchards are located along Mark West Creek and along the western boundary of the town of Windsor. Cropland and hayfields are located in fairly large patches throughout the study area, while most of the oak woodland is in the hilly areas along the northwestern boundary.

Northern Study Area

The portion of the study area north of Mark West Creek includes the recently incorporated Town of Windsor, which occupies about 8,250 acres. This area is relatively flat, bordered by hills to the east and west, and the land is primarily in residential agricultural use, with vineyards increasingly predominating over pasture and orchards. Along the western boundary extends the only intact oak woodland and savanna contained within the study area. A business park near the airport is a relatively recent development, and has expanded rapidly. Few areas of vernal pools remain in the vicinity.

East Central (Santa Rosa) Study Area

Santa Rosa occupies much of the eastern central portion of the study area. This urbanized area includes about one-third of the county's population, and much of its commercial and retail development. The city boundaries and sphere of influence still include a few undeveloped areas that support wetland resources, particularly in the southwest and in the northwest.

The Southwest Area Plan includes several wetlands and rare plants. It is estimated that approximately 650 acres of vernal pools, swales, and associated grasslands exist within this area, many located on private property. There are three large vernal pool areas owned by the federal government (FEMA) that form a critical part of the vernal pool complex in the Roseland Creek drainage (EIP Associates, September 1993).

Twenty listed plant species of concern to the California Native Plant Society occur within the city boundaries of Santa Rosa. Four of these species occur in vernal pools in the southwest portion of the Southwest Area Plan, including Sonoma sunshine *(Blennosperma bakeri)*, Burke's goldfields *(Lasthenia burkei)*, and Sebastopol meadowfoam *(Limnanthes vinculans)*.

Western Study Area

The western portion of the study area includes the relatively flat, mostly rural area between Santa Rosa and the Laguna de Santa Rosa, south of Mark West Creek, and corresponds roughly to the Laguna de Santa Rosa Characterization Study Area. Approximately one quarter of the area is urban and another quarter annual grassland.

The western portion of the study area also includes the city of Sebastopol, which is located on State Route 12 west of Santa Rosa. Sebastapol functions as a market center serving the large dairy farms, apple orchards, and other agricultural uses in the surrounding region (from Guerneville and the Russian River area, to Graton, Bodega, and Bloomfield). The city is bordered by the Laguna de Santa Rosa on the east, offering large expanses of open space, along with a gently sloping topography and many heritage trees.

Southern Study Area

The southern portion of the study area includes the cities of Rohnert Park and Cotati. Rohnert Park is almost entirely urbanized (only 16 percent is undeveloped) and is situated immediately adjacent to Cotati along Highway 101 between Santa Rosa and Petaluma. This portion of the study area also contains the Highway 101 corridor on its eastern side.

Outside the cities, the land is primarily irrigated pasture and hayfields, with scattered rural residential areas. Occasional vineyards and orchards are interspersed throughout the area. Potential vernal pool areas appear to exist in this study area.

5.1.3 Land Ownership

Landowners in the study area include private citizens, private/public organizations, and several public agencies. While a detailed accounting of ownership within the 55,000-acre area has not yet been conducted, it can be assumed that roughly 90 percent of the land is in private hands. This assumption is based on ownership data developed for the 28,000-acre Laguna de Santa Rosa Characterization Study Area, almost two-thirds of which lie within, and make up almost half of, the Preservation Plan study area. In the Laguna area, 90 percent of the land is privately held, and 75 percent of that is in agriculture. (Nearly 5,000 acres are under annually-revolving, 10-year Williamson Act contracts, which limit uses incompatible with agriculture for 9 years after the contract expires.)

Of the roughly 3,125 acres of identified public land in the Preservation Plan area, the California Department of Fish and Game (CDFG) owns four parcels totaling 227 acres, and holds conservation easements on about 92 more acres. The Sonoma County Water Agency (SCWA) owns over 500 acres, all within the Laguna area, including the Cotati-Intertie water supply pipeline (50 feet wide for 9 miles), the Laguna pilot channel strip running from Occidental Road north (100 feet wide for 4.3 miles), the 100-year flood control channels of Santa Rosa, Roseland, and Colgan creeks, and the Laguna channel and its tributaries southeast of the Llano Road Bridge.

The Subregional Water Reclamation System (SWRS) owns 1,848 acres in the area, with 385 occupied by the Laguna treatment plant and two storage pond sites. The remaining 1,463 acres are agricultural reclamation lands.

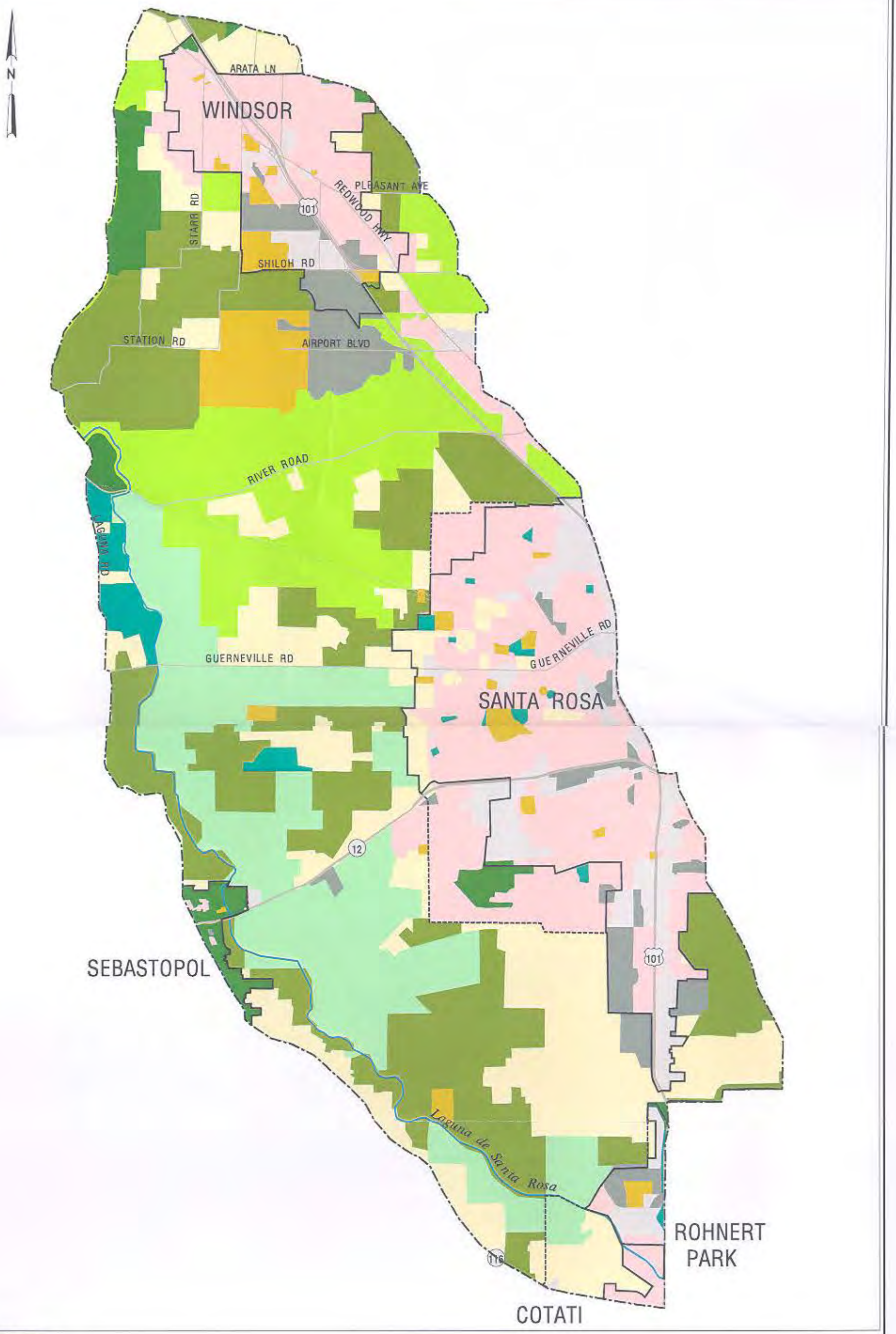
Finally, Sebastopol holds 100 acres, and Windsor 450, of public land in the area. Sonoma County owns a considerable number of parcels in the vicinity, but the exact acreage and disposition is not currently known. Likewise, the Sonoma Land Trust and Sonoma County Agricultural Preservation and Open Space District both have holdings in the area. In Phase 2 of this project, more exact and definite information on ownership will be obtained as necessary to implement the detailed measures.

5.2 Land Use Plans

Because of the mix of jurisdictions in the study area, formal land use designations vary. For the sake of clarity, the county's designations are used on Figure 5-3, with city and town categories grouped with the corresponding county designation. In the following discussion, however, each jurisdiction's actual designations are employed.

5.2.1 Sonoma County General Plan and Zoning Ordinance

As is true of most of Sonoma County, the predominant land use designations within the Santa Rosa Plain are agricultural. Vernal pools in the Santa Rosa Plain are primarily associated with these land use designations. In the Sonoma County General Plan, remaining vernal pool



FEATURES:

- Vernal Pool Study Area
- City Boundary
- Sphere of Influence
- Diverse Agriculture
- Land Intensive Agriculture
- Land Extensive Agriculture
- Residential, Rural
- Residential, Urban
- Resources and Rural Development
- Commercial
- Industrial
- Community Facility
- Parks and Recreation

Figure 5-3

Land Use Designations

0 0.5 1 2

MILES

(1 Inch = 1.2 Miles)

/gis/wbl/nadeem/rosa/maps/small/fig5-3.aml
26 Apr 95 11:53:28 Wednesday

Plotted by CH2M HILL

ecosystem habitat occurs primarily in agricultural lands designated Land Intensive Agriculture (LIA) or Land Extensive Agriculture (LEA). Lands designated LIA are fairly contiguous and are distributed slightly north and immediately west of Santa Rosa. Lands designated as LEA are primarily distributed in the southwestern region of the Santa Rosa Plain. LIA lands are generally more productive than LEA lands. Vernal pool areas known or potentially occurring in these two land use designations, LIA and LEA, are mostly located near the Laguna de Santa Rosa.

Land uses most often supporting potential vernal pool areas, and not having an association with the Laguna, are Rural Residential (RR) and Diverse Agriculture (DA). Both land uses occur frequently and throughout the plain. Vernal pools also occur fairly frequently within these two types of land uses. The likely reason for this vernal pool frequency and distribution within lands designated RR and DA is that these lands are not heavily managed or altered for agricultural or residential development. DA areas are where small, intensive farms and part-time farms predominate. Farming is typically not the principal occupation of the owner. Lands designated RR are characterized by residential development at densities of 1 to 20 acres per dwelling unit.

Lands designated as Residential, Urban (RU) are some of the most frequently occurring in the Santa Rosa Plain, and are mostly in Rohnert Park, Santa Rosa, Sebastopol, Cotati, and Windsor. It is not surprising that vernal pool occurrence or potential occurrence is minor within this land designation.

Commercial (C) land represents the most uncommon land use found within the Santa Rosa Plain. A small area of vernal pools is located immediately east of Sebastopol and in northern Cotati within lands designated Commercial. Lands designated as Public Facilities (PF) also occur infrequently, and support occurrences of vernal pools. Industrial lands represent a minor amount of the total land area within the Santa Rosa Plain, but it is important to note that known or potential vernal pools occur very frequently in industrial lands, particularly in the South West Specific Plan Area of Santa Rosa and just south of Windsor.

5.2.2 City General Plans and Zoning Ordinances

The Santa Rosa Plain includes portions of five cities, including eastern Sebastopol, western Santa Rosa, all, or nearly all of Windsor, northwestern Rohnert Park, and northern Cotati. Known or potentially occurring vernal pools have been identified in every city, except for Sebastopol. The frequency and distribution of vernal pools and their associated land uses within each of the cities is described below.

Sebastopol

Vernal pools do or may exist within the limits of Sebastopol, although none have been identified to date.

Santa Rosa

Vernal pool and swale habitats within Santa Rosa are concentrated in the Southwest Area Plan and along the northwest portion of the city limits.

Within the southwest area, vernal pool and swale complex habitat occurs on about 650 acres. The area's conceptual management plan proposes to designate 495 of these acres as a preserve. The preserve area is roughly defined as the properties located north of Ludwig Avenue, west of Stony Point Road and generally south of Northpoint Parkway. The preservation area includes the areas proposed by the developer to mitigate losses of Sebastopol meadowfoam at the Santa Rosa Air Center, Madera Parcels, and Northpoint Village. It also includes the FEMA property and the wetland/rare plant preserve called "Broadmoor Acres North." An additional 264 acres of preserve would be located just outside of the southwest area.

In the area north of San Miguel Avenue, vernal pool resources occur in an area designated as Low Density Residential. A few vernal pools are also found near Piner Road in Low Density Residential and Commercial designations.

Windsor

Vernal pools and swales within the town of Windsor are located primarily west of Highway 101 in a variety of land use designations. In the northeast portion of the town they are located primarily in very low and medium density residential and light industrial designations. In the central portion the vernal pools and swales are located in medium density residential areas. In the southern portion west of Highway 101, vernal pools and swales are located in land designated for business parks/open space. East of Highway 101 in the southern portion vernal pools and swales are located in very low density residential and orchard and vineyard areas.

Rohnert Park

Only one area has been identified as supporting vernal pools within Rohnert Park. The site is located west of Highway 101 in northern Rohnert Park and is designated as Planned Unit Development and Special Services.

Cotati

There are two areas of vernal pools in upper Cotati. One area is designated by the city as Commercial and is associated with large lot sizes, and the other area is designated as General Industrial, and is also associated with large, undeveloped lots.

5.3 Compatibility of Existing and Future Land Uses with Vernal Pool Preservation

Successful creation and maintenance of a vernal pool preservation system will require matching existing and planned future land uses with the unique physical and hydrologic needs of vernal pools. We know that a large share of the vernal pool ecosystem within the Santa Rosa Plain has been lost due to agriculture and development. Rural Residential (1 to 20 acres per dwelling unit) and Diverse Agriculture (small, intensive farms and part-time farms) land uses are most supportive of the vernal pool ecosystems, since they are not heavily managed or altered for agricultural or residential development. Developing preserves in these areas will, in all probability, meet conservation goals, while allowing for growth and development in the other areas of the Santa Rosa Plain that are not supportive of vernal pool ecosystems.

Chapter 6

Vernal Pool Ecosystem Preservation Plan Framework

6.1 Evaluation and Identification of Habitat Quality and Potential Preserves

The paramount goal of this Preservation Plan is to provide regional protection for the vernal pool ecosystem, while allowing planned urban development and land use changes. To achieve this goal, sites within the Santa Rosa Plain must be identified, evaluated, and classified, so that those potentially having vernal pools, species of concern, and other valuable natural resources may be considered for preservation. Evaluating and classifying sites also allows the implementation of a new, streamlined regulatory process, in which approvals for filling sites lacking significant resources can be obtained with considerably less time, effort, and expense. The majority of landowners will benefit from this reform, and so will have an incentive to participate in the Plan and make its preservation goals a success. (This process is described in detail in Chapter 8).

This chapter describes the site evaluation process to be used, and its thresholds for determining whether a site is of high- or low-quality. In order to evaluate a site fully a reasonable amount of information is needed. But many areas of the Santa Rosa Plain do not have adequate information, so not all sites could be evaluated. Sites which could not be evaluated are considered unknown-quality habitat in this Plan. The information that was available was not verified through ground-truthing. All sites identified within this Plan, either in tables, maps, or appendices, represent potential habitat quality evaluations. Thus, any sites identified in this Plan as high- or low-quality habitat do not represent a final determination and will require verification based on field investigations. Final determination of many individual sites will be made during the implementation phase (Phase 2) of this Plan. During Phase 2, sites will also be evaluated to determine if they fit into the no-resource value category. This chapter also discusses how landowners can have their properties evaluated if they desire. This chapter also discusses potential preserve sites. Potential funding mechanisms, incentives, and compensation to encourage landowner participation in implementing the Plan and establishing preserves is presented in Chapter 7 (Nonregulatory Implementation Strategies).

6.2 Site Evaluation Process

This section describes the system developed to evaluate sites based on biological resources, land use, and acquisition feasibility. A site, for the purposes of the evaluation process of the Plan, is defined to be a contiguous area irrespective of property ownership or parcel boundaries. A site identified as potential high-quality habitat could include areas that are, in fact, not high-quality. The site evaluation system includes a numerical ranking method that separately considers criteria for biological resources, land use, and site acquisition feasibility. The ranked criteria for each site were weighted as to their level of significance in determining habitat quality and preserve potential. Site evaluation criteria were analyzed to determine a numerical threshold

below which a site is identified as low-quality habitat and above which the site is considered high-quality.

6.2.1 Site Evaluation Criteria Methods

Evaluation criteria were developed to assess the following three categories of information for a site:

- Biological resources
- Land use
- Acquisition feasibility

Site evaluation criteria are presented in Table 6-1. Each of the 14 criteria was ranked on a scale of 1 to 5. As shown in the table, some criteria include only some of potential ranks between 1 and 5, such as 1, 3, and 5 only. A score of 5 represents the highest value for a criterion, a 1 represents the lowest value. Appendix D provides the basis for how sites are ranked for each of criterion assessed.

Each criterion is assigned a weighting factor. This weighting factor reflects the relative importance of each criterion: for instance, as shown in Table 6-1, the presence of federal- or state-listed plants and animals carries a weight of 10, indicating that it has the highest importance in evaluating a potential site in terms of biological resources.

The information used to evaluate biological resources criteria was obtained from existing information, discussed in Chapter 3 and Appendix B. The information used for land use and acquisition feasibility was obtained from existing information discussed in Chapter 5.

6.2.2 Site Evaluation Criteria Results

A relatively small portion of the Santa Rosa Plain was evaluated during the development of this Plan. The purpose of the evaluation was to identify high-quality habitat areas that could then be evaluated as potential preserves. All of the high-quality sites are considered to be potential preserves in this Plan. Thus, sites already known to have important vernal pool ecosystem resources represent the majority of the sites evaluated. Some sites recognized as not having important vernal pool ecosystem resources were used for comparison.

The maximum weighted score a site could have is 415, reflecting maximum scores for all criteria in biological resources, land use, and acquisition feasibility. The lowest value a site could potentially receive is a score of 83. The maximum score a site could receive for biological resources is 250 and the lowest is a score of 50. Biological resources were the primary set of criteria determining whether or not a site could qualify as high-quality. The weighted cumulative score for biological resources criteria represents the most important numerical value in the determination of these sites.

Table 6-1 Site Evaluation Criteria Summary		
Evaluation Criteria	**Rank Low–High**	**Weight**
Biological Resources		
Listed Plants and Animals	1-5	10
Plant Species of Special Concern	1-5	6
Wildlife Species of Special Concern	1-5	6
Habitat Quality of Vernal Pool Ecosystem	1-5	10
Other Types of Habitat Values	1-5	5
Integrity of Resource/Level of Disturbance	1-5	6
Habitat Size, Shape, and Defensibility	1,3,5	7
Land Use		
Zoning	1,2,4,5	2
Existing On-Site Land Use	1-5	5
Land Use Designation	1,3,5	4
Adjacent Land Use	1-5	4
Land Use Policies	1-5	4
Acquisition Feasibility		
Conservation Easements	1-5	5
Land Ownership and Management	1,2,3,5	5
Relevancy to Other Preservation Plans	1-5	4
Restoration		
Soil Suitability	1-5	6
Watershed Integrity	1,2,3,5	5
Restoration Effort Needed	1, 5	6
Note: Appendix D specifies how sites are ranked for each criterion.		

6.2.2.1 High-Quality Habitat Sites

High-quality sites of vernal pool ecosystem habitat are those that have higher cumulative scores for biological resources, land use, and acquisition feasibility in the site evaluation. (Chapter 3 and Appendix B of this Plan should be referred to for a discussion of the conservation issues associated with assessing biological and habitat information.)

The presence of listed plants and animals and the habitat quality of vernal pool ecosystems are the two most important and highest-weighted criteria in determining what constitutes a high-quality habitat site. A combined weighted score of 50 for listed plants and animals and habitat quality of vernal pool ecosystems was determined to be the minimum necessary to characterize a site as high-quality. The remaining five biological resources criteria must have a minimum cumulative weighted score of 75. Therefore, high-quality habitat sites must have a minimum cumulative weighted score for biological resources criteria of 125.

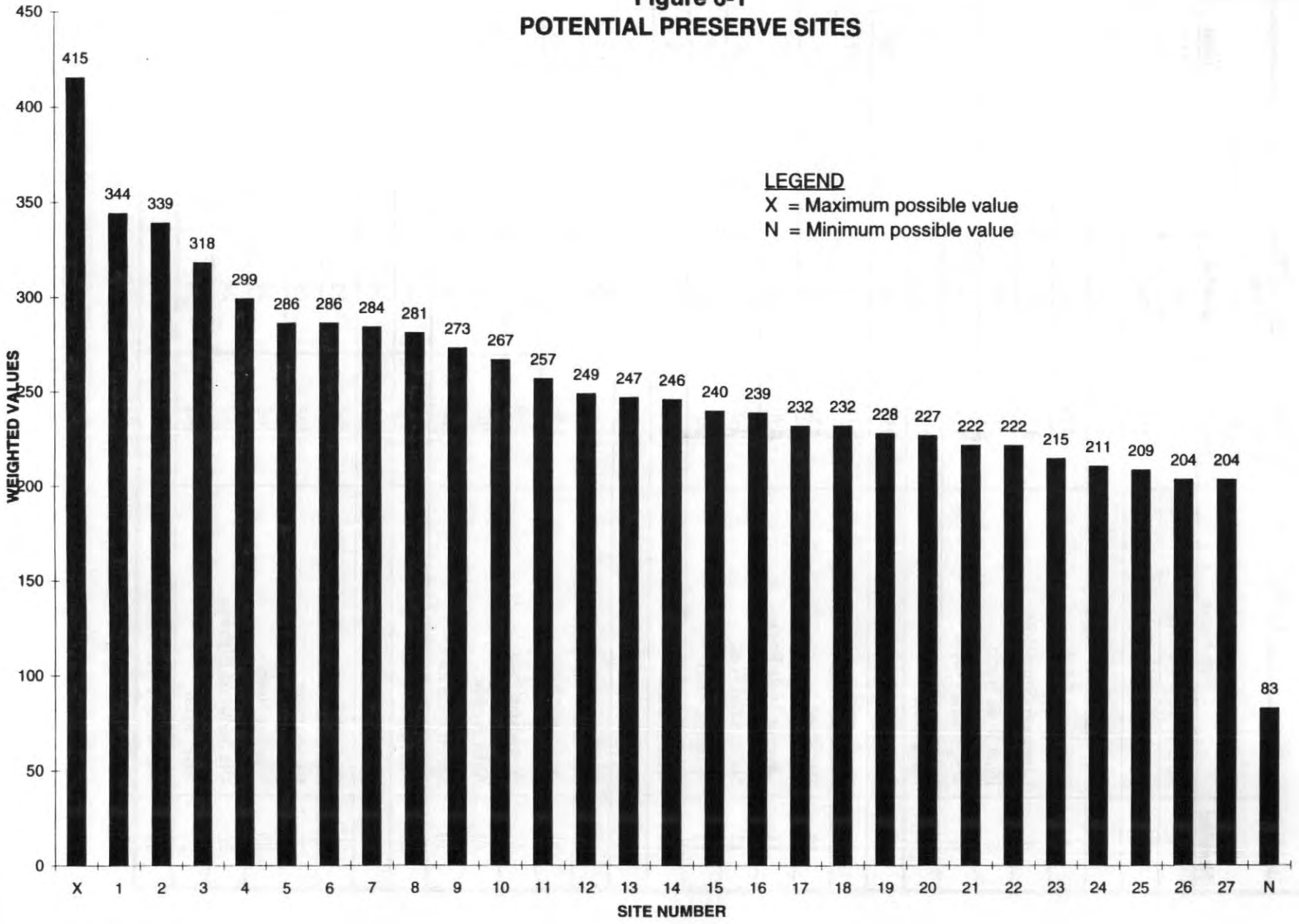
The site criteria values for land use and acquisition feasibility are more important to determine preservation potential. A minimum combined weighted score for land use and acquisition feasibility was set at 75. Therefore, a total site weighted score (including biological resources, land use, and acquisition feasibility) of 200 was the lowest for consideration as a high-quality site. A total of 27 sites have been identified as potentially being high-quality based on these evaluations and threshold levels (Table 6-2, Figure 6-1). Approximately 5,907 acres are included in potential high-quality habitat. All the potential high-quality habitats identified are tentative and will require ground-truthing. It should be noted that the high-quality habitat geographical boundaries shown in Figure 6-2 represent rough estimates and may include lower-quality habitat within them. Greater resolution of these boundaries will be determined during Plan implementation. Landowners who believe their land is within a potential high-quality habitat site may voluntarily contact the Santa Rosa Plain Vernal Pool Task Force to determine if in fact their property contains potential high-quality habitat.

6.2.2.2 Low-Quality Habitat Sites

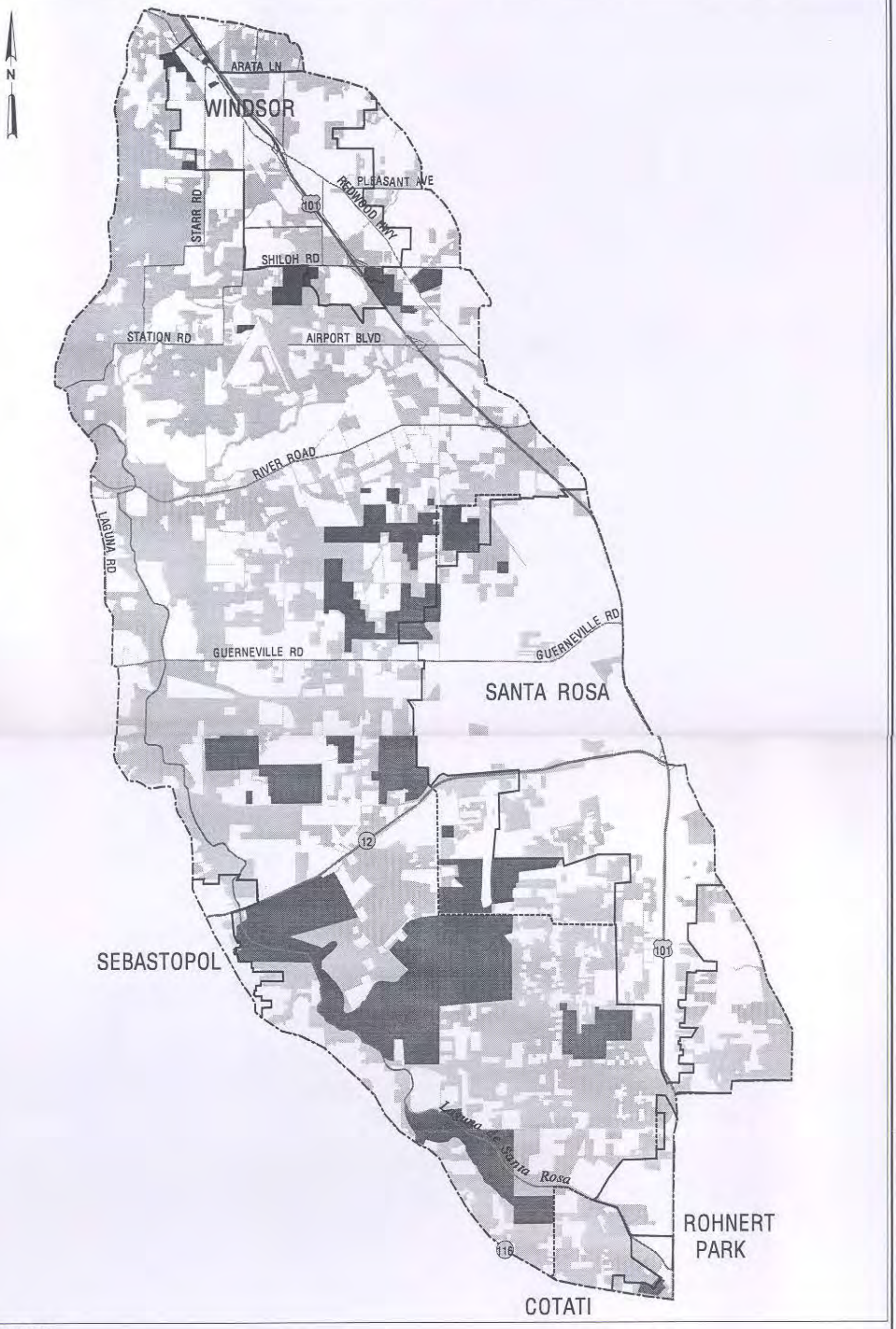
Low-quality sites are those with scores of less than 200 for all criteria and a biological resources score of less than 125. Detailed information on potential low-quality sites was limited. Existing land use categories were evaluated, however, to determine how some of those categories may score using the site evaluation criteria. The land use categories of urban, residential, industrial, rural residential, vineyard/orchard, and row crop/hayfield were generally found to be incompatible with high-quality vernal pool ecosystem habitats. Site evaluations on examples of each of these functional land uses determined that in general these sites fall below the threshold for high-quality habitats. Figure 6-2 shows the areas of potential low-quality habitat within the Santa Rosa Plain. These potential low-quality habitats correspond directly with the land uses mentioned above. Approximately 26,476 acres of land (48 percent) of the Plain were identified as low-quality. The majority of the areas identified as potential low-quality habitat will require either no additional verification or minimal ground-truthing. In most cases, ground-truthing will not require direct access to land, either private or public. Most of the information to verify whether a site is low-quality can be determined by analyses of high-resolution aerial photographs or by street-side

Table 6-2 Evaluation Scores for Potential Preserve Sites					
Site Number	**Site Name**	**Biological Resource Subtotal**	**Land Use Subtotal**	**Acquisition Feasibility Subtotal**	**Total**
X	MAXIMUM WEIGHTED VALUE	250	95	70	415
1	Todd Road	210	76	58	344
2	Southwest Santa Rosa	218	73	48	339
3	Piner Road South	210	54	54	318
4	Laguna de Santa Rosa	172	73	54	299
5	Piner Road North	182	85	19	286
6	Wright Road North	194	73	19	286
7	Alton Lane	157	73	54	284
8	Sonoma County Airport	158	69	54	281
9	Brown Farm	153	76	44	273
10	Hall Road	174	69	24	267
11	Llano de Santa Rosa	170	68	19	257
12	Shiloh Road West	176	54	19	249
13	Spurgeon Road	161	62	24	247
14	Waltzer Road	171	51	24	246
15	Wood Road West	143	73	24	240
16	Windsor South	148	67	24	239
17	Occidental Road	146	72	14	232
18	Wood Road East	139	69	24	232
19	Alder Avenue	161	43	24	228
20	Shiloh Road East	144	60	23	227
21	San Miguel Road	162	46	14	222
22	Wright Road South	148	40	34	222
23	Biaggi Road	129	62	24	215
24	Faught Road	133	69	9	211
25	Windsor North	165	30	14	209
26	Old Redwood Highway	137	24	43	204
27	Alves Road	142	38	24	204
N	MINIMUM WEIGHTED VALUE	50	19	14	83

Figure 6-1
POTENTIAL PRESERVE SITES



SFO1004017C.XLS



FEATURES:

- High Quality Habitat Site
- Low Quality Habitat Site
- Unknown Quality Habitat Site
- Sphere of Influence
- City Boundary
- Vernal Pool Study Area

Figure 6-2

Potential High, Low, and Unknown Quality Habitat Sites

0 0.5 1 2

MILES

(1 Inch = 1.2 Miles)

/gis/wbl/nadeem/rosa/maps/small/fig6-2.aml
27 Jun 95 20:35:45 Tuesday

Plotted by CH2M HILL

viewing of a property. Landowners interested in having their lands verified may do so on a voluntary basis.

6.2.2.3 Unknown-Quality Habitat Sites

Sites were evaluated using existing information; the determination of potential low-quality sites was based on assumptions about land use and compatibility with vernal pool ecosystem habitat quality. Sites where information was not available or where the land use could not be assumed to be incompatible with high-quality vernal pool habitat could not be evaluated. Therefore, many portions of the Santa Rosa Plain could not be identified as potential low- or high-quality habitat during the preparation of the Plan. The unknown-quality habitat sites are shown in Figure 6-2. It should be noted that the Santa Rosa Plain Vernal Pool Task Force recognizes that a majority of the area within the unknown-quality habitats mapped in Figure 6-2 are most likely low-quality.

Unknown-quality habitats mapped in Figure 6-2 include the three functional open space categories of riparian forest, oak woodland, and grassland/ruderal that are not currently included in the high-quality habitats. Approximately 22,365 acres (41 percent) of the land in the plain are mapped as unknown habitat quality.

6.2.2.4 No-Resource Value Sites

No-resource value sites are those are those areas which are fully developed and have no habitat value. These areas have not been identified as part of Phase 1 and, therefore, do not appear in Figure 6-2. During Phase 2, some of the low-quality sites and the unknown-quality sites may be determined to be no-resource value sites and will be mapped as such.

6.2.2.5 Habitat Quality Verification

The map in Figure 6-2 showing potential low-, high-, and unknown-quality habitats is not detailed enough for landowners to determine accurately the habitat quality of their property. Verification of low- and high-quality habitat sites, resolution of many unknown-quality habitat sites, and determination of no-resource value sites will occur during Plan implementation in Phase 2. During the implementation process detailed maps will be developed showing the boundaries of sites that have been verified by the Santa Rosa Vernal Pool Task Force or the Corps.

Landowners having property with unknown-quality habitat can have it evaluated either as part of the regulatory process described in Chapter 8 or through independent site evaluation. Sonoma County and the cities of Santa Rosa, Rohnert Park, Cotati, Sebastopol, and Windsor will have site evaluation forms available. These forms can be filled out in part by the landowner for the land use and site acquisition feasibility based on information available from local planning departments. The biological resources part of the site evaluation form will need to be completed by a qualified biologist. A list of consulting biologists will be available at the local agency where the site evaluation forms were obtained. It is recommended that when qualified biologists are filling out the site evaluation they should at least do a wetland assessment. The

wetland assessment will determine if a landowner in fact has wetlands on their property and whether or not they are vernal pool ecosystem wetlands. If vernal pool ecosystem wetlands are not present, the landowner does not need to complete a site evaluation form. Other wetland habitats, such as riparian and freshwater marsh, may occur on a landowner's property, however, these wetlands are not part of the vernal pool ecosystem and cannot be processed through the regulatory mechanism that will be implemented based on this Plan. A qualified biologist or wetlands ecologist can assist a landowner in determining which regulatory process, if any, the landowner may need to follow.

6.3 Preserve Design

6.3.1 Preserve Design Principles

The following general principles of preserve design were used in the identification of appropriate sites for potential preservation, and in evaluating those sites. These general principles were balanced with consideration of the ecology of the listed plants to be targeted by the Plan. The following principles are reflected in the choice of evaluation criteria described in Chapter 6.3.2.

- **Multi-species protection.** Preserve design should be optimized to include as many species of concern as possible. This maximizes management and maintenance cost efficiency, and may prevent further endangerment of species not yet listed.
- **Range.** Conserve target species throughout their range in the study area. Preserves that are well-distributed will be generally less susceptible to loss or extinction of species than species confined to small portions of their historic ranges. This wide-ranging protection also allows for the variation within a species to be maintained, and will make populations less susceptible to unpredictable events such as fire, disease, and vandalism.
- **Size and shape.** Size and shape affect a site's value. Generally, larger, round sites are more desirable than smaller sites or sites that are irregular or linear in nature. Larger sites generally have larger and more diverse populations of species of concern. Larger sites and sites that are block-shaped or round have less edge effect (disruption caused by adjacent land uses) than smaller or more linear sites. Smaller sites or populations also have a reduced chance of surviving unforeseen environmental changes or catastrophes because of their reduced size and the smaller gene pool involved; however, smaller isolated sites may also support important genetic variation within a species.
- **Contiguity or proximity of habitats and preserve areas.** In general, blocks of habitat located closer to similar habitats are at an advantage. Habitat contiguous with other preserves is generally of greater value since these areas are less fragmented, easier to manage and maintain, and less susceptible to edge effects. This also allows opportunity for wildlife movement and greater exchange of genetic material between sites than if sites are isolated. Given, however, that

vernal pool and swale complexes and their rare plant populations may be more independent of each other than many systems, with limited gene flow between populations, this is not thought a key consideration.

- **Connectivity.** An important concept for most preserve designs is that of interconnectedness: allowing for corridors between preserve areas to allow species to travel between them. This concept may be less important where the focus is on plant species and a relatively isolated system such as vernal pools; however, given that the Plan also has as a secondary goal protection of species such as the tiger salamander, and given that swale systems which do interconnect hydrologically may be important for seed dispersal along swales, connectivity should still be considered preferable to isolated blocks of land.
- **Diversity**. Preserves should represent the diversity of biological resources within the region. This could include consideration of soil types that support vernal pools and swales as well as the diversity of plant communities and diversity between populations of rare plants.
- **Minimum viable population size.** This embodies the concept that a certain minimum number of populations and individuals within populations is necessary to ensure self-perpetuation of a species. Determining this number is, however, extremely difficult without long-term genetic and population studies, particularly when dealing with annual plants that are subject to high variability in population size between years. This level of data is not available for the plant species of the Santa Rosa Plain, and some species or populations could be lost while awaiting long-term study results. For this reason, any quantification of habitat value should take into consideration the existing habitat quantity and quality, rather than looking at establishing target population numbers.
- **Adjacent Land Uses.** Resources are generally easier to sustain in relatively undisturbed environments. Highly disturbed lands may require extensive enhancement work or increased management efforts.
- **Buffer zones.** Buffer zones are areas of compatible use surrounding sites or located along the edges of preserves. Upland areas or wooded areas can serve to protect vernal pools or swales from hydrological disruption. Buffer zones can provide water quality benefits by screening a site from potential nutrient or pollutant loading from incompatible uses. Buffer zones can also help to protect rare plants or animals from vandalism, trash disposal, and the effects of pets.

6.3.2 Preserve System Site Identification and Evaluation

The sites identified in Chapter 6.2 as high-quality vernal pool ecosystem habitats are also potential preserves. Each of these potential preserve sites include areas that represent significant habitat for vernal pools and swales and species of special concern.

The 27 potential preserves are shown in Figure 6-3 and listed in Table 6-3. The biological resources, land use, and acquisition feasibility of each site are detailed on fact sheets in

N

Windsor North
Old Redwood Highway
ARATA LN
Alves Road
WINDSOR
Windsor South
STARR RD
PLEASANT AVE
REDWOOD HWY
101
SHILOH RD
Shiloh Road West
Shiloh Road East
Faught Road
STATION RD
Sonoma County Airport
AIRPORT BLVD
RIVER ROAD
LAGUNA RD
Wood Road West
Spurgeon Road
Wood Road East
Piner Road North
San Miguel Road
Alton Lane
Waltzer Road
Piner Road South
GUERNEVILLE RD
GUERNEVILLE RD
SANTA ROSA
Occidental Road
Hall Road
Wright Road North
Blaggi Road
Wright Road South
12
Southwest Santa Rosa
Brown Farm
SEBASTOPOL
Todd Road
101
Llano de Santa Rosa
Laguna de Santa Rosa
Laguna de Santa Rosa
ROHNERT PARK
116
Alder Ave
COTATI

NOTE: Areas identified as potential preserve sites will be further evaluated in Phase 2.

FEATURES:

- Potential Preserve Site
- Sphere of Influence
- City Boundary
- Vernal Pool Study Area

Figure 6-3

Potential Preserve Sites

0 0.5 1 2

MILES

(1 Inch = 1.2 Miles)

/gis/wbl/nadeem/rosa/maps/small/fig6-3.aml
28 Jun 95 09:45:38 Wednesday

Plotted by CH2M HILL

Table 6-3 Acreage of Potential Preserve Sites		
Site Number	**Site Name**	**Acres**
1	Todd Road	1,873.9
2	Southwest Santa Rosa	415.9
3	Piner Road South	488.1
4	Laguna de Santa Rosa	579.6
5	Piner Road North	273.3
6	Wright Road North	321.8
7	Alton Lane	37.8
8	Sonoma County Airport	11.0
9	Brown Farm	495.4
10	Hall Road	78.0
11	Llano de Santa Rosa	279.3
12	Shiloh Road West	125.9
13	Spurgeon Road	19.7
14	Waltzer Road	13.9
15	Wood Road West	5.0
16	Windsor South	12.6
17	Occidental Road	461.1
18	Wood Road East	4.9
19	Alder Avenue	31.9
20	Shiloh Road East	100.0
21	San Miguel Road	150.3
22	Wright Road South	14.8
23	Biaggi Road	8.7
24	Faught Road	58.9
25	Windsor North	36.9
26	Old Redwood Highway	3.9
27	Alves Road	4.2
	TOTAL	5,906.8

Appendix E. (Table E-1 in Appendix E lists plant populations within the recommended preserves for three federal-listed species of concern.)

Of the 5,907 acres in these potential preserves, 302 are already preserved or protected under conservation easements, and under management by CDFG, City of Santa Rosa, the Sonoma County Agricultural Preservation and Open Space District, or various private individuals and organizations. Proposed additions of adjacent areas would enhance some of these existing preserves.

6.4 Land Use Compatibility With Vernal Pool Preservation

Chapter 3 of this Preservation Plan discusses the role that annual grasslands and other upland habitats play in the Santa Rosa vernal pool ecosystem, as well as the effects on vernal pools and other seasonal wetlands of the many types of land use practices. Vernal pool preservation must be undertaken with an understanding of these roles and effects, and with recognition that it is the whole ecosystem that must be protected and managed.

Preservation of a vernal pool or a pool-swale complex and its recognized values over the long term requires protection and maintenance of the ecosystem and the events and activities that take place within it and at its boundaries. Maintenance of the physical integrity of the pools and swales is necessary but not sufficient. Upland habitat must be included and managed in a manner compatible with whole ecosystem preservation and to limit undesirable "edge effects" associated with incompatible surrounding land uses. Land adjacent to preserves will not by this Plan be subject to additional regulation beyond what currently exists.

Vernal pool preservation can be compatible with surrounding agricultural, residential, or commercial development. Vernal pool compensation through the restoration and enhancement of vernal pool wetlands can also be compatible with surrounding development. Control over hydrologic impacts is, however, fundamental. Protection of both water sources and water quality must be guaranteed. If a particular pool-swale complex has sufficient value to warrant preservation, it must be functioning adequately in spite of the surrounding land uses. Improvements, however, may be possible through control over water quality. As an example, runoff carrying urban pollutants, fertilizers, or agricultural chemicals may flow into the preserve. Removal of these pollutants from the runoff may require construction of facilities or even other wetlands to remove unwanted substances.

Land use changes outside the preserve boundary that affect water quality and quantity must be considered through careful coordination with adjacent high-quality habitat and preserve sites. Summer irrigation of grounds that are landscaped after a preserve is established, development of new parking areas, and changes in drainage facilities at adjacent roads can be detrimental and demand a watchful eye. Maintenance of desired hydrologic conditions at preserve boundaries could include conservation easements on adjacent properties.

Buffer areas will be included within the preserves to reduce the potential for adverse effects from external influences on preventing external influences that could negatively affect the vernal pool ecosystem. Therefore, the buffers within the preserves will be considered high-

quality habitat. Areas outside the preserve, which may be low-quality, will remain as such and not subject to the restrictions identified for high-quality habitat. These buffer zones may include drainage systems or berms that prevent the runoff from adjacent land when that runoff may reduce the water quality of the wetlands. Landowners adjacent to the preserves greatly benefit from the high environmental quality of their vernal pool preserve neighbor. Adjacent landowners should be encouraged to work with preserve management to manage land compatibly. Offsite influences on preserves will be addressed by existing regulations and incentives.

In any area to be set aside and managed as a preserve, uplands management is critical to the function of the protected vernal pools and native wetlands. Grazing can be beneficial only if the requirements of both preserve management and ranchers are recognized. Some ranchers may have herds that are too large or too small for a preserve: placing a small herd on a preserve may result in inadequate grass removal; a herd that is too large may result in overgrazing. Some owners may want to move their livestock on the range earlier or keep livestock on the preserve later than would be desirable. The period over which livestock are allowed to graze the preserve can be timed to accommodate, for example, the reproductive periods of sensitive plant species, but constraints on the grazing season may reduce the fees livestock owners will pay to graze the lands.

6.5 Restoration and Enhancement Potential

High-quality habitat sites may have areas of low-quality habitat within them. These areas and many low-quality sites have potential for restoration and enhancement. In addition, low-quality sites that are adjacent to potential preserves should be considered for acquisition to expand the preserve area.

Restoration of vernal pool and swale complexes involves considerable on-site assessment. Mapping of lands with soil series (Figure B-1) that indicate they may support vernal pool and swale habitats is not detailed enough to make a restoration potential evaluation. (Appendix G describes technical aspects of restoration.) Because of the level of information necessary, and the focus of the Plan on high-quality vernal pool ecosystem areas with preservation potential, no lands were specifically evaluated for restoration potential. Still, lands that are determined to be low-quality or known to be former vernal pool and swale wetlands are candidates for restoration activities.

Site evaluation criteria can be used to evaluate sites for potential restoration. In addition to the biological resources criteria, three additional criteria for restoration potential are given in Appendix D, Table D-1: soil suitability, watershed integrity, and restoration effort needed. At this point the Plan does not specify a minimum weighted score for restoration potential prior to recommending a particular site. Nevertheless, soil suitability would require a minimum rank of 3 and watershed integrity a minimum of 2.

A critical condition for identifying a site for restoration or enhancement is that specific high-quality vernal pool ecosystem habitats are not degraded as part of a restoration or enhancement activity. Vernal pools and swales must not be inserted between existing high-quality vernal

pools or change the local hydrology. Guidelines will be developed to identify constraints and opportunities for restoration and enhancement in the Santa Rosa Plain.

Chapter 7

Non-Regulatory Implementation Strategies

The Vernal Pool Ecosystem Preservation Plan has been designed for implementation at two levels. One level could be considered proactive in that the Plan is intended to foster resource conservation prior to or absent a development proposal. The second level could be considered reactive in that it is intended to respond directly to a development proposal and foster a streamlined permitting process. Implementation strategies are therefore discussed separately: Chapter 7, Non-Regulatory Implementation Strategies, and Chapter 8, Permitting Implementation Strategies. The purpose of Chapter 7 is to recommend non-regulatory implementation strategies, given both the regulatory environment and ecological requirements, for preserving the vernal pool ecosystem in the Santa Rosa Plain. The feasibility of various strategies was identified by reviewing the information gathered, described, and analyzed in Chapter 3.6 of this Plan. In addition, Task Force members, city and county officials, and entities familiar with land preservation efforts in the local area were consulted to characterize the current use, local appeal, and likely success of different preservation and management options. The comments of Task Force members on the Administrative Draft Plan were instrumental in determining these recommended strategies.

Chapter 7.1 discusses general guidelines for management and maintenance, including monitoring, of areas that are to be preserved because of their high-quality resources. Chapter 7.2 presents the recommended non-regulatory implementation strategies.

7.1 Preserve Management and Maintenance

The success of a preservation plan depends as much on proper management of the preserve system as on appropriate identification and selection of preserve areas. If preserve areas are not properly managed and maintained, preserve resources and functional values can be lost in various ways, such as invasion of exotic species or other native species that may displace the desired ones; or disruption of water quality or hydrological values, vandalism. Funds, therefore, are needed not only for land acquisition, but for managing, monitoring, and enhancing preserve sites. (Mechanisms for land acquisition are examined in greater detail in Appendix H of this report.)

7.1.1 Management

Management of a preserve system should involve ongoing activities such as monitoring valuable resources, maintaining the land, and managing buffer areas. Enhancement measures should also be considered, such as restoring on-site watersheds, developing agreements on neighboring properties that could serve as additional buffer zones, and possibly reintroducing species of concern within their historical range. Regular property maintenance should include trash removal, fence repair, and similar activities.

The managing entity can be a local, state, or federal agency, a specially-created public/private partnership, or a private preserve manager or entity operating under a memorandum of understanding with regulatory agencies. Although some agencies often have the appropriate

authority, knowledge, and expertise to manage preserves, staff availability to do so is usually limited. For this reason, use of an existing private entity such as the Sonoma Land Trust may be preferable.

An overall management plan should be developed between the regulatory agencies and the management entity, outlining responsibilities and activities. The management plan should stipulate goals for the preserve site and criteria for determining the need for potential remedial action, should site quality degrade. This includes not only on-the-ground activities, but also

- Tracking the overall progress of land and conservation easement acquisition and the progress of development in other areas with identified vernal pools and rare plant resources
- Tracking proposed projects on adjacent lands to ensure that indirect impacts due to adjacent development are taken into account in management of the preserves
- Searching for additional funding opportunities
- Setting up recreational or educational programs as desirable within the preserve system.

7.1.2 Monitoring and Maintenance

Monitoring and maintenance activities are important elements of successful preserve management. If left unmaintained, resources could be degraded by lack of vegetation management, disruption of hydrology either on-site or off-site, degradation of water quality as watershed changes occur upstream, or other factors. The following describes briefly some of the key year-round maintenance and monitoring components of a successful plan:

- **Vegetation Management**. Some level of vegetation management is highly desirable to avoid thatch build-up and displacement by exotic species in vernal pool and grassland systems. Measures could include controlled burns, mowing, or carefully managed grazing. Controlled burning may be complicated on the Santa Rosa Plain given the perceived risk to adjacent land uses and air quality considerations. Mowing can be an effective management tool, provided the site is neither too large nor too uneven. However, mowing must be scheduled late enough in the season to allow seed dispersal if endangered species are present. Grazing can also be effective, if its timing and intensity are planned in the light of the resources to be protected. Vegetation management should also include control of invasive exotic species that can outcompete native ones or interfere with the hydrological function of vernal pools. Fire and weed control regulations also should be taken into consideration, and plans should be developed with the local fire district.
- **Resource Monitoring**. This includes monitoring hydrological functioning, species of concern, community composition, and other characteristics of the vernal pool ecosystem. By monitoring resources to be protected, corrective

measures can be identified and implemented before resource degradation has proceeded too far. For instance, vegetation management measures may need to be modified, hydrological conditions corrected, debris removed, or additional restoration measures implemented to protect the resources.

- **Recreational or Educational Opportunities**. Additional support for the preserve system can be obtained through educational or recreational activities sponsored at selected preserve sites. Volunteers can provide a valuable source of labor.

- **Restoration or Enhancement Needs**. Within the potential preserve sites there could be low-quality areas that could benefit from some restoration or enhancement. These activities are very site- and species-specific, but can be planned within the context of regional improvement of the resources involved. The opportunity for reintroduction of species to historical locations should be explored, to increase the diversity and number of preserved occurrences. Any introduction of plant species into the preserve areas would only include native plants. Those native plants would not include sensitive plant species.

- **Routine Maintenance**. This includes removal of trash or debris; repair of fences, paths, or culverts; and monitoring for vandalism or other potentially damaging activities.

- **Monitoring Off-Site Activities**. While it is not the intent of the Plan to manage off-site agricultural practices, changes in off-site land use or agricultural practices could affect water quality, hydrology, or other on-site resources. Off-site activities could result in modifying the water supply to a preserve or to a swale system, either by cutting off flow or by redirecting it. Off-site activities that could affect on-site water quality include wastewater irrigation and intensification of agricultural practices involving herbicides and pesticides. Minor modifications could be made on-site to remedy these effects, or the preserve manager could negotiate with adjacent land owners to minimize them. Compensatory programs could provide necessary encouragement to these landowners.

7.2 Recommended Non-Regulatory Implementation Strategies

The following non-regulatory strategies are recommended to implement the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. As noted above, these strategies are recommended based on the results of the Task Force review of the Administrative Draft Plan and the current use, local appeal, and likely success of the strategies in the particular circumstances of the Santa Rosa Plain. The recommended non-regulatory strategies are not mutually exclusive; they may be implemented individually or in combination as appropriate to achieve protection of the vernal pool ecosystem and species of special concern as rapidly and effectively as possible. The order of the strategies presented below is not indicative of their relative importance; they are all viable options.

A variety of other resource preservation and management options and potential funding mechanisms is discussed in Appendix H. Many of the options in Appendix H could be considered as additional non-regulatory strategies. The recommended strategies listed below are, however, the most feasible and likely to achieve the goals of the Plan. Generally, non-regulatory strategies that involve acquisition of interests, as opposed to management agreements and similar programs, have greater potential for protection of valuable resources in perpetuity.

7.2.1 Conservation Easements

An easement confers on its owner some, but not all, of the property rights that pertain to a given piece of land. As used for conservation, easements usually prohibit the owner of the remaining rights from engaging in activities that would harm the property's natural resources. Conservation easements are already familiar in Sonoma County, as they are often required by the county as a condition of approval, and are recommended in the Sebastopol and Rohnert Park general plans. Indeed, both the Sonoma County Agricultural Preservation and Open Space Control (SCAPOSD) and the Sonoma Land Trust rely on conservation easements as their primary means for land and resource conservation and protection in the Santa Rosa Plain. To protect a vernal pool ecosystem effectively, such an easement should restrict any harmful development, cultivation, or irrigation. (Appendix H contains a fuller discussion.) The Task Force will work with the SCAPOSD to determine how protection of vernal pool ecosystem resources can be accomplished through acquisition of conservation easements or fee interests in accordance with the District's Acquisition Plan.

7.2.2 Market-Oriented Conservation Strategies

Landowner participation is important to the success of this plan, and the most appropriate way to gain this participation is by providing realistic and viable economic incentives for landowner participation.

A critical obstacle to natural resource preservation is the fact that the economic valuation of land does not usually take into account its ecological and social value. Simply put, what the land is worth to the market is usually not the same as what it is worth to the environment or to the people who inhabit and enjoy it. In fact, because of use limitations often imposed by preservation regulations, natural resources are often perceived as lessening the market value of land. To remedy this situation, and thereby offer incentives to landowners for them to assist in preserving the natural resources of their land, ways must be found to assign economic value to those resources. The following discussion presents some measures that would attain this goal.

7.2.2.1 Habitat Transaction Method

With this method, conservation objectives are not expressed in terms of the preservation of specific parcels of land, but of overall habitat. The area is analyzed for conservation values, and these are expressed in terms of standardized conservation units. Landowners who agree to conserve or enhance land receive credits based on the conservation value that they add to the preserve system. Landowners proposing projects that would affect the resources must first offer a number of credits based on the conservation value that would be lost due to the project.

The Habitat Transaction Method could be used to provide protection to vernal pool ecosystems in large development areas. Those property owners having the resources that should be preserved would receive Habitat Credits, which they could then sell to their neighbors who need mitigation in order to develop their land. The specific details of the Habitat Transaction Program for the Santa Rosa Plain Vernal Pool Preservation Project will be determined in Phase II.

This strategy relies primarily on the efficiency of the marketplace rather than on regulatory disincentives to ensure the conservation of species and habitats of concern. This can be done by allowing property owners to benefit economically from participation in conservation or enhancement of their property, by obtaining conservation credits through preservation or enhancement of portions of their property, and then selling those credits to developers as mitigation for impacts to vernal pools and associated species of concern. In this way, the demand for development and growth creates a corresponding demand in preservation and enhancement, and landowner conservation or enhancement efforts are rewarded through provision of economic value to the land. Landowners receiving credits for enhanced or preserved lands can either use these to develop elsewhere within the plan area or sell those credits to others with development proposals.

Credits can be secured through acquisition or dedication of property, granting of conservation easements, and restoration or enhancement of land to some pre-determined standard to be developed as part of the mitigation bank agreement. Development of standards and success criteria for restoration will be an important element.

The safety net concept (Kern County Valley Floor HCP Program, 1994) can be used to ensure that development does not outstrip mitigation efforts. In this concept, a maximum percentage of habitat loss is assigned within a given zone or area. To ensure that too much disturbance does not occur without corresponding conservation, a monitoring system is set up to track the percentage of disturbance relative to the percentage protected; when the percentage disturbance exceeds a pre-determined amount, such as 25 percent, further activities are not be permitted until additional protection occurs.

An advantage of the Habitat Transaction Method is that any owner of land with significant conservation value, even if the parcel or site is small, can set aside land or enhance land through a simplified, already established administrative process and receive credits that are valuable to others for mitigation. This facilitates setting aside land from multiple landowners.

7.2.2.2 Mitigation Banking

Mitigation banking is similar to the Habitat Transaction Method in that the right to diminish resources in one area is obtained in exchange for preserving resources in another. The difference is mitigation banks consist of replacement wetlands, created specifically for use in such arrangements. Mitigation banks can be created and/or managed by private individuals or entities, by public organizations, or by federal, state, and local governments. Once a bank is certified for use by regulators, it provides mitigation *credits* that can be traded for units of permitted wetland loss. When wetlands development and off-site mitigation are permitted by the regulatory agency, the permit applicant draws debits from the bank, reducing the bank's credit balance. The terms under which credits can be traded for units of permitted wetland loss—the *compensation ratio*—

are typically established as part of the banking agreement or permit and are set by regulators to achieve no net loss in habitat acres, functions, and values.

The major observable differences between project-specific mitigation and banking are the size and location of the replacement wetlands provided. Project-specific mitigation generally occurs in relatively small areas of replacement wetlands located close to the development projects. Because mitigation banks consolidate in one location the replacement wetlands for multiple development projects, they normally provide much larger replacement wetlands, and are usually located away from the development projects they serve.

Another difference between banking and project-specific mitigation is the timing of compensation relative to permitted wetland impacts. Mitigation banks often provide replacement wetlands in advance of permitted wetland impacts, while project-specific mitigation typically provides concurrent compensation. This is not, however, always the case. Although mitigation banking guidelines stress the establishment of replacement wetlands at bank sites in advance of project impacts, regulators have exercised flexibility regarding the timing of mitigation. Therefore, it is not fully consistent to characterize mitigation banks as advanced compensation and project-specific mitigation as concurrent. It is more accurate to characterize mitigation banks as providing planned compensations for future wetland impacts.

From the user's perspective, there are two general classes of mitigation banking arrangements currently in operation: single-user and general-user banks.

A **single-user bank** is developed and used exclusively by a single development entity to provide for its own future mitigation needs. These banks are the standard form of banking arrangement currently in use nationwide: 42 of the total 47 existing banks are single-user banks. Nearly 75 percent of these were developed by state transportation departments, port authorities, and county governments. Single-user banks are used by developers who have a sequence of highly certain wetlands development projects for which compensation must be provided. These banks are thus limited to large public and private developers who routinely undertake many independent or linear wetlands development projects and can afford the substantial up-front investment in mitigation.

General-user banks, on the other hand, are established to provide for the future mitigation needs of multiple clients, who might not include the bank developer. General-user banks produce mitigation credits for sale to entities other than the bank owner and thus involve an element of speculation concerning the future disposition of bank credits.

General-user banks can be publicly or privately owned and operated, or produced jointly through a combination of public and private interests. Public entities such as state resource agencies are motivated to produce general-user banks to ensure that high-quality compensatory mitigation is achieved. Private developers of general-user banks are motivated in whole or part by potential profits from the sale of credits to other entities in need of compensatory mitigation.

Mitigation banking will be the primary method of preserving high quality sites and enhancing or restoring low-quality sites.

Appendix F discusses the mitigation bank concept in detail, including its regulatory basis in federal and California policy, the principles of operation of a mitigation bank, and the advantages and disadvantages of this approach. Table F-1 summarizes the key institutional features of mitigation banks. These features should be thoroughly considered in establishing the mitigation bank mechanisms.

Many members of the Task Force have expressed support for the mitigation bank concept, recognizing the need for a stable, well-managed entity that understands preserve management and can handle compensation of land owners for banking their high-quality resources. The general-user bank that can accommodate multiple developers of low-quality resource areas is particularly recommended. The establishment of the bank needs to include a number of institutional features (see Appendix F). Additionally, a mechanism to ensure that the funds committed to the bank are adequate to preserve and/or restore the vernal pool ecosystem resources identified as part of the mitigation for allowed development must also be in place.

7.2.3 Wetlands Registry

A wetland registry lists land owners who pledge to preserve their wetlands/vernal pool ecosystem resources voluntarily. Registries can be administered by local governments or private conservation groups and can include a provision that gives the administering body the right of first refusal for the property. Asking land owners to participate in registries is one way to notify the landowners that there are vernal pool ecosystems on their property and that these ecosystems are valuable and worth preserving. In most registries, the participants are publicly recognized for their contributions to wetlands preservation.

The Sonoma Land Trust has expressed interest in managing a wetlands registry for the Santa Rosa Plain. Although the wetlands registry might not be a major mechanism for long-term preservation of the high-quality resources, it could function as an educational outreach program and help raise awareness of the value of vernal pool ecosystems in the more rural areas of the Santa Rosa Plain. (The wetlands registry concept is discussed in more detail in Appendix H.)

Chapter 8
Permitting Implementation Issues/Strategies

The purpose of this chapter is to describe a proposed streamlined regulatory process that will benefit many landowners in the Santa Rosa Plain. This process does the following:

- Gives regulatory authority to local agencies for landowners proposing development within sites verified as low-quality vernal pool ecosystem wetlands. This will remove the need to obtain some wetland permits and agreements from both federal and state agencies.
- Identifies the steps needed to proceed through the streamlined regulatory process.
- Identifies specific mitigation mechanisms that will take the burden of direct on-site mitigation from the landowner and allow off-site mitigation that will help preserve high-quality habitats and result in no net loss of wetlands

Compliance with laws and regulatory policies is the basis for the development of specific regulatory mechanisms, such as permits and agreements. Laws and regulations of particular importance for vernal pool ecosystems, other wetlands, and species of special concern include the federal Clean Water Act, Endangered Species Act, National Environmental Policy Act, and Food Security Act, the California Endangered Species Act and Environmental Quality Act, and local city and county plans and ordinances. The goal of meeting regulatory compliance through protection of vernal pool ecosystem resources, while at the same time recognizing local land use and development objectives, has resulted in structuring regulatory process options designed specifically for the Santa Rosa Plain.

The recommended regulatory process for the Santa Rosa Plain, described below and shown in Figure 8-1, complies with all the laws that protect wetlands and species of special concern. Regulatory policies, such as "no net loss of wetlands," have some inherent flexibility. The formulation of the process described here takes maximum advantage of this flexibility.

Key components of the proposed regulatory process (Figure 8-1) are

- Determining whether the landowner has low-quality habitats that include the seasonal vernal ecosystem wetlands
- Recognizing that not all properties in the Santa Rosa Plain have wetlands or other resource areas with special jurisdiction
- Determining whether the wetlands in question are seasonal. If they are not seasonal wetlands, such as riparian or freshwater marsh vegetation, they are not vernal pool ecosystem wetlands and are not covered by the streamlined regulatory process, but by existing regulation

Figure 8-1 shows the steps necessary to participate in the Plan through a streamlined regulatory process for obtaining permits. The primary permitting procedure will be through one or more General Permits authorized by the Corps (see Chapter 8.1). Therefore, the key to this Plan is cooperative participation to determine if a property is characterized as low- or high-quality vernal pool ecosystem habitat as described in Chapter 6.2. In addition to the streamlined General Permit process for low-quality sites, which will meet all requirements of sections 404 and 401 of the Clean Water Act and the Endangered Species Act, California and local agencies will participate in the Plan through their respective regulatory systems, which are discussed below.

8.1 Regulatory Process-Clean Water Act Regulations

8.1.1 Description of Streamlined Regulatory Process

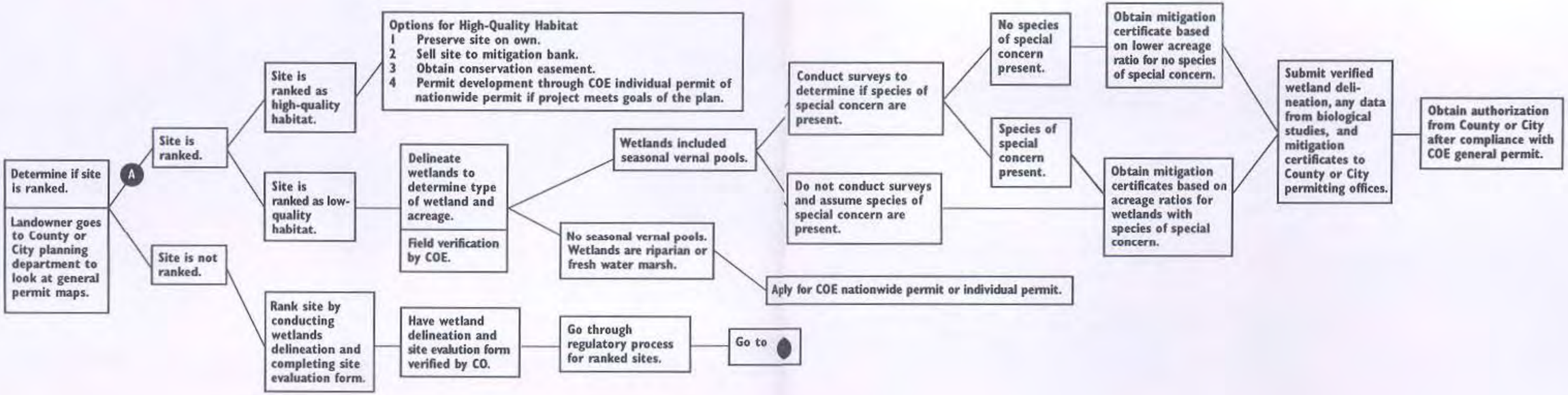
One of the major goals of this Plan is to make permitting under the Clean Water Act rapid and efficient for those projects which are consistent with the Plan. Appendix A provides a comparison of the current versus streamlined regulatory processes. This information was distributed as a handout at the May 10, 1995 public meeting.

Another goal of the Plan is to clarify, for those whose projects may have significant adverse effects on vernal pool ecosystems and other wetland/biological resources, what they will need to do to obtain permits, or whether such permits are even likely.

A General Permit, issued by the Corps to a local agency, is the proposed method for streamlining the regulatory process for the Santa Rosa Plain. This permit would allow more rapid permitting of projects which would affect vernal pool resources of low-quality (see Chapter 6 for complete description of ranking into high- and low-quality).

For sites ranked as low-quality, without connections to and not buffering more important sites, development projects may be authorized by the General Permit. Approval will be rapid and easy since the environmental impacts of the project are already known. The current situation requires each applicant to assess individually the environmental impacts of his project and the cumulative effects of other such projects. Mitigation required for fill activities under the General Permit will consist of both creation/restoration and of preservation; however, these mitigation requirements will be specified in the General Permit and will be accomplished by payments to mitigation bank(s). Currently each applicant must either perform on-site mitigation or buy land, develop a mitigation plan, and implement that plan individually. Endangered species coordination will have been completed for the General Permit so will not be required on a case-by-case basis. Water quality certification (as required by Section 401 of the Clean Water Act) by the Regional Water Quality Control Board, and authorization by the Natural Resources Conservation Service (formerly the Soil Conservation Service) for areas in agricultural lands, will also be covered by the General Permit and will not need to be obtained individually by the permit applicant, as they are at present.

The Plan designates areas with the highest quality resources as potential preserve sites. These are areas where there are high-quality vernal pool ecosystems and associated species of special concern. Such sites are considered so valuable for their vernal pool ecosystem resources that



COE = U.S. Army Corps of Engineers

Figure 8-1
Flow Diagram of Site Ranking and Regulatory Process

permits to fill them would be inconsistent with the Plan. Chapter 7 describes how landowners in such areas could be compensated, if they so choose, for protecting these areas from development and degradation.

It is understood that there may be some small portions of designated "high-quality" sites that do not have important resources and do not contribute to the protection of such resources. Agencies may allow some small acreage to be filled in these areas to achieve the goals of preserving valuable wetlands. This could be considered for some limited development inside urban boundaries. In such areas landowners could form coalitions to approach local planning agencies with a proposal for development and mitigation, with a strong emphasis on preservation. The proposal should include plans for compensating some landowners for preservation. The local planning agencies will work with landowners and the state and federal agencies to plan for limited development in such areas.

There are many areas in the Santa Rosa Plain that do not currently fit into the above categories because little or nothing is known about the existence or quality of their resources. Projects proposed for such areas will require a resource assessment similar to that performed for the known sites in this Plan. Only after such assessment will it be known if a site is in the high-quality resource category, or if it has low-quality resources and could qualify for the General Permit process, or if it has no wetlands resources and thus no Section 404 permit requirement. If landowners in areas of unknown resources have specific knowledge of the resource status of their lands, it is to their advantage to contribute that knowledge to the Task Force as part of the on-going second phase of the vernal pool preservation planning effort, so that their lands can be included in the Plan and the General Permit development process, if appropriate.

If, after the resource assessment, a site is found to have high-quality resources based on the criteria established in the Plan, then a project proposed at that site will need to pursue an individual Section 404 permit. The individual permit will require endangered species surveys, full endangered species coordination, a complete analysis of alternatives, and a complete review to ascertain if the project is in the public interest, with full consideration of the value of conservation and preservation of resources. Even if a project passes these reviews, it is likely that extensive mitigation will be required. Such mitigation will need to be developed on a project-by-project basis. (Mitigation approaches are discussed in more detail in Chapter 8.6 of this Plan.)

8.1.2 Specific issues for the General Permit

The Corps would issue one or more General Permits to cover fills into Waters of the United States, which include wetlands/vernal pools. Such General Permits could authorize fills in low-quality wetlands only. These permits might be authorized to another agency such as Sonoma County, Santa Rosa or other cities, or agencies responsible for special area plans or special districts.

8.1.2.1 Coordination with Other Agencies

Conferring with the following responsible agencies during development of a General Permit will obviate the need for their further review of individual cases. The U.S. Fish and Wildlife Service and the California Department of Fish and Game will review the General Permit application pursuant to the Fish and Wildlife Coordination Act.

U.S. Fish and Wildlife Service (USFWS). Under Section 7 of the federal Endangered Species Act of 1973, the USFWS must be consulted whenever proposed development might affect species covered under the act. Further such consultation would not be required for species populations specifically addressed in the Plan and specified in the General Permit.

Regional Water Quality Control Board (RWQCB). Section 401 of the Clean Water Act grants review authority over development that might affect water quality to the RWQCB. Sites identified in the Plan and General Permit as low-quality vernal pool wetlands would be considered certified automatically under Section 401.

National Resources Conservation Service (NRCS). Changes in use to wetlands in agricultural areas require approval by the NRCS. Such approval would be automatic for low-quality vernal pool ecosystems specified in the Plan and General Permit.

8.1.2.2 Process for incorporating areas of unknown resources into General Permit

Chapter 6 of this Plan describes how sites within the Santa Rosa Plain can be evaluated in terms of low- or high-quality habitats. The status of some areas that have not been identified, but are currently considered to be unknown-quality habitats, will require clarification using the following process (also diagrammed in Figure 8-1):

- If wetland or vernal pool resources are suspected, the landowner should contact the local planning agency to obtain a list of qualified biologists that can perform a wetland assessment or a jurisdictional determination. The wetlands assessment can first determine if vernal pool ecosystem wetland resources are present. If they are, a wetland delineation should be completed (including acreage and location of waters and wetlands). In addition, a site evaluation form obtained from the local agency can also be completed by the qualified biologist/wetlands ecologist. Parts of the evaluation form relating to land use and acquisition feasibility can be completed by the landowner.

- A biological survey for species of special concern is generally required. If the landowner agrees, however, to assume that species of special concern are present (site evaluation form for biological resources criterion for listed plants and animals given a rank of 3), then biological surveys, which may take up to two seasons, can be avoided. This does not automatically make a site high-quality.

- The completed wetland delineation and site evaluation form would be verified by the Corps as to whether the site is low- or high-quality habitat.

- If the site is verified as having only low-quality resources, then the General Permit would apply. The verified site evaluation form and wetland delineation would be provided by the landowner to the authorized agency. A mitigation certificate through a mitigation bank would be required for impacts to vernal pool ecosystem sites.

- If the completed resource assessment identifies the area as having low-quality resources generally but containing listed species, then the same approach would be taken but a higher mitigation ratio would be required.

- If the completed site evaluation form identifies the site as having high-quality resources, then the landowner should contact the Corps. High-quality sites cannot be processed through the General Permit. Still, some high-quality sites may be processed through a nationwide permit under a pre-discharge notification if the preservation goals of the Plan are met. Other high-quality sites, such as potential preserves, would require an individual permit process.

8.1.2.4 Mitigation

For sites covered under the General Permit(s), information on acreage and the presence of any special biological resources, such as endangered species or species of special concern, would be submitted with the General Permit application. The authorized agency for administering the General Permit would direct the applicant to the appropriate mitigation bank or banks. The applicant would pay a mitigation fee and receive a certificate of mitigation that would be provided to the General Permit agency, whereupon the applicant would be in compliance and would receive the General Permit. Mitigation guidelines are discussed in Chapter 8.6 of this Plan. The mitigation bank(s) would carry out the specified mitigation, such as creation/restoration of wetlands and purchase/protection of preserves. With a General Permit the goal of "no net loss of wetlands" could be accomplished on a regional basis rather than a strictly site-by-site basis. Table 8-1 gives potential mitigation ratios on an area of land (acres) basis. The mitigation ratios presented are an example. It is likely that mitigation banks established in Phase 2 will have different rations that will be evaluated by the Task Force. Low-quality habitat sites that do not have listed plant or animal species have lower mitigation ratios than sites that do.

8.2 Local Land Use Policy Compliance

It is important that the general plans, zoning, and other land use policies of local governments be consistent with the Vernal Pool Ecosystem Preservation Plan. General plans typically consist of maps, charts, and text that set out a jurisdiction's objectives and policies for the location, character, and timing of land development. California law stipulates that land planning, zoning, and subdivision ordinances, specific plans, and the provision of public facilities and services must all comply with the general plan. Revisions to any mandated element of the general plan are permitted up to four times each year. General plans are typically developed with 20-year planning

horizons and updated every few years (for example, 5 years in Santa Rosa), to reflect current conditions and to set new target dates. Proposed amendments require advertised public hearings, which provide an opportunity for citizens to play a part in the planning process. California law also requires that the status of the general plan and the progress in its implementation be reported by the local planning department to the local council (or board) annually.

Table 8-1
Potential Mitigation Ratios* for Vernal Pool Ecosystem Impacts under a General Permit Application

Resource Impacted	Mitigation Ratio Total	Type of Mitigation	
Habitat Quality	Acres Mitigated: Acres Impacted	Preservation	Restoration of Vernal Pools
Low-quality Habitat Known to have Primary Species of Special Concern	3:1	2:1	1:1
Low-quality Habitat Lacking Biological Surveys; Primary Species of Special Concern Assumed to Occur	3:1	2:1	1:1
Low-quality Habitat without Primary Species of Special Concern	2:1	1:1	1:1

* The mitigation ratios given represent a possible case. These ratios have not been finalized by the Task Force.

Note: High-quality habitat areas are not included in the table of mitigation ratios since different ratios will apply under a Section 404 individual permit or nationwide permit.

8.2.1 General Plan Revisions

Resource conservation policies, goals, and objectives could be added to existing general plans to recognize the value of the Santa Rosa Plain vernal pools, establish the intent to protect these resources, and authorize the development of regulations or the use of non-regulatory means to ensure their protection. The general plans of local jurisdictions, including Sonoma County, Santa Rosa, Rohnert Park, Cotati, and Windsor, already recognize the value of, and include policies for, preserving vernal pools and biotic resources. The general plans should reference the need to coordinate with the federal and state regulatory/resource agencies to avoid conflicts between local land use policies and federal/state regulations.

8.2.2 Special Area Plans/Master Plans

A comprehensive special area plan, similar to the Santa Rosa Southwest Area Plan, was considered by the Task Force as a mechanism to provide for vernal pool protection and reasonable economic development within the Santa Rosa Plain. (As noted in Chapter 4, the Southwest Area Plan already includes policies to establish preserve areas and "take" areas.) This type of plan would contain a detailed and comprehensive statement of policies, standards, and criteria to guide public and private uses of lands and waters, and mechanisms for timely implementation in specific geographic areas within the protection area. This Preservation Plan will provide guidance for developing such special area plans.

8.2.3 Combining or Overlay Zoning

A combining or overlay zone adds an additional level of restriction to the base zone. Combining zones have specific purposes: in this case, to protect natural resources. Several jurisdictions in the Santa Rosa Plain, including Sonoma County and the cities of Santa Rosa, Rohnert Park, and Cotati, have policies advocating combining zones as part of their general plans, and Santa Rosa has already incorporated a combining zone to protect natural resource values into its zoning code.

8.2.4 Wetlands and/or Endangered Species Protection Ordinances

Local governments could establish or revise ordinances as needed to incorporate the provisions of the Plan and General Permit.

8.2.5 Grading Ordinances

Local agencies could incorporate protection of vernal pools/wetlands and species of special concern into their grading ordinances.

8.3 CEQA/NEPA Compliance

The Santa Rosa Plain Vernal Pool Preservation Plan, as a document directing federal, state, and local government decision making, will require environmental review under the California Environmental Quality Act (CEQA), but the preparation of an environmental impact report (EIR) under CEQA is not part of the present study.

Any federal permit request from local agencies will require NEPA review. It is unlikely that NEPA review will find that an EIS is required. The Plan is consistent with the NEPA sequencing of mitigation planning: (1) avoiding the impact; (2) minimizing the impact; (3) rectifying the impact; (4) reducing or eliminating the impact over time and (5) compensating for the impact. Chapter 9 identifies how the CEQA and NEPA environmental review will be conducted.

8.4 Mitigation Measures

The Vernal Pool Ecosystem Preservation Plan recognizes three forms of mitigation:

- Preservation of existing high quality vernal pool and swales, some of which may also have species of special concern
- Restoration of areas that were formerly vernal pool and swale systems, but historically were filled and are no longer wetlands
- Enhancement of degraded low-quality wetlands

8.4.1 Preservation

Through the mitigation banking system, areas identified in the Plan as high-quality vernal pool ecosystem habitats should be obtained for preservation. Depending on the type of impact, particular areas might be targeted by the mitigation banks for preservation of the same type of resource. In the case of fills in vernal pool ecosystem wetlands that include species of special concern, mitigation would require purchase of land that includes that particular affected species. Lands that are identified strictly for preservation would not be modified; that is, creating additional wetlands, introducing seed of any plant species, or introducing animals would not be allowed in preservation areas. The amount of mitigation for the preservation component is given in Table 8-1.

8.4.2 Restoration

Restoration (see Appendix G.1.1 for detailed definition) of wetlands as mitigation would be conducted through a mitigation bank that has the technical capability to oversee the restoration of previously existing wetlands. Areas to be restored are by definition no longer wetlands and therefore would not include existing high-quality vernal pool ecosystem habitats. Still, some sites identified as high-quality habitat may have within their boundaries disturbed lands that could benefit from restoration activities. The national mitigation banking guidance developed by Federal agencies emphasizes restoration of wetlands as the first option considered when siting a mitigation bank. Restoration could and should be considered in areas adjacent to preserves of high-quality resources or to low-quality vernal pool ecosystem habitats that have been identified for enhancement. Potential mitigation ratios for restoration are given in Table 8-1.

8.4.3 Enhancement

Enhancement (see Appendix G.1.2 for a detailed definition) of low-quality vernal pool ecosystem wetlands would also be conducted through a mitigation bank that is technically capable of overseeing this technique. Enhancement is encouraged to recover wetlands that once supported higher-quality habitat or within the boundaries of high-quality sites where there has been disturbance. Enhancement, however, might have a lower quantitative amount of mitigation since existing wetlands cannot be included as mitigation due to the "no-net-loss" requirement. Enhancement can provide significant benefit to the overall preservation goals and objectives to

increase wetland habitat quality. Potential mitigation ratios for mitigation through enhancement are given in Table 8-1.

8.4.4 Creation

Creation (see Appendix G.1.3 for a detailed definition) is the development of wetlands in areas that are not known to have ever supported them. Under the Plan, creation of vernal pool and swale wetlands in areas that were not formerly wetlands or do not contain underlying hydric soils will not be allowed as mitigation. Creation of vernal pool and swale systems is a controversial process due to the recognized complexity of vernal pool and swale ecology including the hydrology, soils, and biological organisms associated with these systems (Holland and Dains, 1991; Hanes et al., 1990; Thorp, 1990; Zedler, 1990; Ferren and Gevirtz, 1990). Attempts to create vernal pools and swales have been documented to have had mixed success (Ferren and Gevirtz, 1990; DeWeese, 1994; Jokerst, 1993). Insufficient long-term studies have been completed to determine whether the techniques currently used to try to create vernal pools succeed. Those approaches that show some sign of potential success in vernal pool creation are expensive (Ferren and Gevirtz, 1990; Jokerst, 1993; Stromberg, 1994) and may not be worth the effort given the uncertainty of success. Appendix G provides a detailed approach to creating vernal pool habitats and demonstrates the level of technical skill and attention required.

8.4.5 Endangered Plant Species Mitigation

In the Santa Rosa Plain the loss of vernal pool ecosystem habitats has sometimes occurred with that of species of special concern. The Corps (Steven, 1993) identified 20 separate wetland fill projects in the plain that had affected endangered plant species or candidate plant species prior to 1993. These species included *Blennosperma bakeri* (Sonoma sunshine), *Lasthenia burkei* (Burke's goldfields), *Limnanthes vinculans* (Sebastopol meadowfoam), *Pogogyne douglasii* (Douglas' pogogyne), and *Ranunculus lobbii* (Lobb's buttercup).

Mitigation for the loss of populations of species of special concern has not always occurred or been successful in the Santa Rosa Plain. When mitigation has occurred, it has been dealt with on a case-by-case basis and has not addressed the cumulative impacts on the species involved. During the development of this Plan, data were evaluated on the existing populations of the plant species of special concern and the mitigation measures used to determine an appropriate mitigation process to prevent further cumulative loss of vernal pool species.

8.4.5.1 Mitigation Methods

Appendix G describes the details of some vernal pool translocation studies that have been carried out in the Santa Rosa Plain. Mitigation studies on vernal pool plants have been conducted in other parts of California (Zedler and Black, 1988). The results of studies on translocating vernal pool plant species both in and outside the Santa Rosa Plain have been mixed, but generally poor, and the cost to perform them expensive (Zedler and Black, 1988; Patterson, 1990; Waaland, 1994b). In general, translocation, sometimes called transplantation experiments, is not viewed by many professional biologists as an acceptable procedure (Fahselt, 1988; Zedler and Black, 1988) for preserving endangered species. The American, California, and Canadian botanical societies have

all adopted policies that recommend transplantation or translocation not be used to mitigate the loss of endangered plant species. Instead, all three recommend that preservation in natural habitats be the primary and preferred form of protection and mitigation.

8.4.5.2 Mitigation Requirements

Because of the inadequacy of translocation to guarantee the formation of a new long-term population the Plan does not include this technique for mitigation of species of special concern. The Plan recognizes only preservation of known, naturally occurring populations of species of special concern as mitigation compensation for these species.

In addition, populations of plant species of special concern that will be affected as a result of a permitted project will need to have a collection of their seed and detailed documentation of the site location, associated plant species, and soil type. The seed and the associated data will be placed in a seed bank. The University of California, Berkeley Botanical Garden should be contacted to act as the seed bank. Seed taken from a site that will be affected by a permitted project will not be placed in naturally occurring vernal pools or swales within the Santa Rosa Plain. Proposals to develop experimental populations by translocating seed from affected vernal pools systems will require explicit written approval from the Task Force, which in turn will involve Endangered Species Act Section 7 consultation and a California Department of Fish and Game memorandum of understanding.

Chapter 9

Tasks for Phase 2 of the Santa Rosa Plain Vernal Pool Preservation Project

The following tasks for Phase 2 were identified by the Task Force and the consultant at the June 14, 1995 Task Force meeting. Completion of these tasks is dependent upon securing funding in a timely manner.

9.1 Verify Habitat Quality

1) The consultant will determine the quality and boundaries of the high-quality and preserve sites.

2) Task Force members, specifically agency representatives, will review any *significant* findings related to the high-quality and/or preserve sites.

3) The consultant will map (at a scale of 1" = 500') the high, low, no resource, and unknown areas using high-resolution aerial photographs and ground-truthing.

4) The consultant will identify the quality of some of the unknown sites when sufficient information is available.

9.2 Mitigation Banks

1) The consultant will develop the theoretical or conceptual elements of developing mitigation banks, including developing criteria and guidelines under which preservation and restoration/enhancement mitigation banks will be established and operated.

2) Task Force members will focus on site-specific issues related to the establishment and operation of the mitigation banks.

3) The consultant will identify entities or individuals suitable for operating the mitigation banks, as well as develop memoranda of agreement (MOAs).

4) The Task Force will review the suitability of all entities or individuals identified as candidates for operating the mitigation banks, and will review the MOAs.

5) The consultant will develop, in coordination with Task Force members, management, maintenance, and monitoring guidelines and requirements for the mitigation banks.

6) The consultant will develop two to three scenarios under which preserve banks and restoration/enhancement banks could be established and operated. The scenarios will include economic analyses of land values to assess the cost of purchasing lands for preservation and mitigation/restoration, and determine the fee structure for the mitigation banks.

7) The Task Force will review and approve the scenarios.

9.3 U.S. Army Corps of Engineers General Permit

1) The consultant will assist the Corps in preparing the draft General Permit and application, with consultation from Task Force members, specifically federal and state agencies and local government.

9.4 General Plan Amendments

1) The consultant will coordinate with Sonoma County, the cities of Santa Rosa, Rohnert Park, Cotati, and Sebastopol, and the Town of Windsor to identify the necessary changes to their General Plans to meet the conditions of the General Permit.

2) Task Force members will draft language for the General Plan Amendments.

3) The consultant will incorporate the language for the General Plan Amendments into the General Permit.

9.5 Public Outreach and Incentives

1) The consultant will develop a Speaker's Bureau (presentation materials) about how the Sonoma County community can become involved in the vernal pool preservation program. The Speaker's Bureau will be tailored to meet the information needs and interests of targeted audiences, specifically, landowners, developers, and individuals interested in natural resource conservation.

2) Task Force members will conduct the Speaker's Bureau.

3) The consultant, in cooperation with Task Force members, will develop and conduct four workshops targeted at landowners, developers, and agricultural interests. The workshops will focus on (a) establishing a preserve, (b) creating and managing a mitigation bank, (c) incentives for participation in the preservation program, and (d) techniques to improve land stewardship.

4) The consultant will explore educational and volunteer program opportunities with local schools (including Sonoma State University) for the preserve or restoration areas.

9.6 Site Ranking Training Workshop and Handbook

1) The consultant will design and conduct a workshop (for biologists, botanists, and planners) in how to use the site ranking procedure to evaluate and categorize habitat quality. The consultant will develop the preliminary training design, leaders' guides, participants' manuals (handbooks), and instructional graphics.

2) Task Force members will review the preliminary training design, leaders' guides, participants' manuals (handbooks).

3) The consultant will pilot test the workshop.

9.7 Overall Preserve Design

1) The consultant will develop the overall preserve design.

2) The Task Force will review and approve the overall preserve design prior to the establishment of the preserves.

9.8 Environmental Review

1) Task Force members representing local and regional government will be responsible for conducting any environmental reviews necessary to meet the requirements of the California Environmental Quality Act (CEQA).

Chapter 10
References

American Water Works Association. 1994. Expediting Water Projects: Benefits Assessment and Wetland Mitigation Banking. Denver, Colorado.

Ashley, C. and M. Waaland. 1990. Petition to the State of California Fish and Game Commission: *Blennosperma bakeri*. May 4, 1990. 11 pp.

Balling, S.S. and V.H. Resh. 1982. Arthropod Community Responds to Mosquito Control Rercirculation Ditches in San Francisco Salt Marshes. Environmental Entomology. 11:801-808.

Barbour, M.G. and J. Major. 1988. Terrestrial Vegetation of California. California Native Plant Society. Special Publication No. 9.

Baskin, Y. 1994. California's Ephemeral Vernal Pools May Be a Good Model for Speciation. BioScience. 44(6): 384-388.

Bauder, E.T. 1986. Threats to San Diego Vernal Pools and a Case Study in Altered Pool Hydrology. Conservation and Management of Rare and Endangered Plants. Proceedings from a conference of the California Native Plant Society, November 5-8, 1986.

Bauder, E.T. 1987. Threats to San Diego Vernal Pools and a Case Study in Altered Pool Hydrology. pp. 209-213. In Conservation and Management of Rare and Endangered Plants. T. Elias, ed. California Native Plant Society, Sacramento. 630 pp.

Bauder, E.T. 1989. Enhancement and Restoration of Vernal Pools in San Diego. Proceedings from the Restoration and Creation of Vernal Pools Workshop.

Bonos, Dino. 1994 and 1995. Sonoma County Open Space and Agriculture District. Conversations with Sharon Weinberg.

Boyce, M.S. 1992. Population Viability Analysis. Annu. Rev. Ecol. Syst. 23: 481-506.

California Department of Fish and Game (CDFG). 1994. Annual Report on the Status of California State Listed Threatened and Endangered Animals and Plants. 1992. State of California. The Resources Agency, Department of Fish and Game. Sacramento, California. 203 pp.

California Native Plant Society (CNPS). 1994. (Ongoing). Collection of rare plant maps for California. On file at the California Natural Diversity Data Base, Department of Fish and Game, Sacramento, California.

California Natural Diversity Data Base (CNDDB). 1994. Endangered and Threatened Animals of California (list). April, 1994. California Department of Fish and Game, Natural Heritage Division, Natural Diversity Data Base, Sacramento, California.

CH2M HILL. 1994. Expediting Water Projects: Benefits Assessment and Wetlands Mitigation Banking. Handbook prepared for the American Water Works Association. Draft report, May 1994.

Cheetham, N.H. 1976. Conservation of Vernal Pools. In S.K. Jain. 1976. Vernal Pools, Their Ecology and Conservation.

City of Santa Rosa. 1993. General Plan, Santa Rosa 2010.

Collins, J.H. and V.H. Resh. 1982. Utilization of Natural and Man-Made Habitats by the Salt Marsh Song Sparrow, *Melospiza melodia samuelis* (Balid). California Fish and Game. 71(1):40-52.

Crawford, D.J. and R. Ornduff. 1989. Enzyme Electrophoresis and Evolutionary Relationships Among Three Species of *Lasthenia* (Asteraceae: Heliantheae). American Journal of Botany. 76:289-296.

D.W. Smith Consulting, ed. 1990. History, Land Uses, and Natural Resources of the Laguna de Santa Rosa. Prepared for the Santa Rosa Subregional Water Reclamation System, California.

DeWeese, J. 1994. An Evaluation of Selected Wetland Creation Projects Authorized Through the Corps of Engineers Section 404 Program. U.S. Fish and Wildlife Service, Ecological Services, Sacramento Field Office, Sacramento, California.

Dole, J.A. and M. Sun. 1992. Field and Genetic Survey of the Endangered Butte County Meadowfoam–*Limnanthes floccosa* subsp. *californica* (Limnanthaceae). Conservation Biology. 6(4): 549-558.

Eakins, D. 1994. Intraspecific Genetic Diversity in *Blennospema bakeri* Heiser (*Asteraceae*). Master of Arts Thesis in Biology, Sonoma State University.

EIP Associates. 1993. Southwest Santa Rosa Area Plan. Conceptual Wetlands Habitat Management Plan.

Elstrand, N.C. and D.R. Elam. 1993. Population Genetic Consequences of Small Population Size: Implications for Plant Conservation. Ann. Rev. Ecol. Syst. 24:217-242.

Eng, L.L., D. Belk and C.H. Ericksen. 1990. Californian Anostraca: Distribution, Habitat, and Status. Journal of Crustacean Biology. 10:247-277.

Environmental Law Institute. 1993. Wetland Mitigation Banking, An Environmental Law Institute Report. Washington, D.C.

Falk, D. and K. Holsinger, eds. 1991. Genetics and Conservation of Rare Plants. Oxford University Press, New York. 283 pp.

Falk, D.A. 1992. From Conservation Biology to Conservation Practice: Strategies for Protecting Plant Diversity. In P.L. Fielder and S.K. Jain, eds. Conservation Biology. The Theory and Practice of Nature Conservation Preservation and Management.

Ferren, Jr., W.R. and E.M. Gevirtz. 1990. Restoration and Creation of Vernal Pools: Cookbook Recipes or Complex Science? In D.H. Ikeda and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178 pp.

Fiedler, P.L. and S.K. Jain., eds. 1992. Conservation Biology. The Theory and Practice of Nature Conservation Preservation and Management.

Given, D.R. 1994. Principles and Practice of Plant Conservation. Chapman and Hall. New York, New York. 247 pp.

Hanes, W.T., B. Hecht and L.P. Stromberg. 1990. Water Relationships in the Sacramento Region, California. In D.H. Ikeda and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178 pp.

Harrison S. 1994. Lecture in Issues in Conservation Biology, ECL 208. February 4, 1994. Personal Communication.

Harrison, S. 1994. Metapopulations and Conservation. In P.J. Edwards, N.R. Webb, and R.M. May. 1994. Large-Scale Ecology and Conservation. Blackwell Scientific Publications, Oxford, England.

Hickman, J.C. 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley and Los Angeles, California.

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. Unpublished paper prepared for the Department of Fish and Game, Nongame Heritage Program, The Resources Agency, Sacramento, California.

Holland, R.F. and S.K. Jain. 1977. Vernal Pools. In Barbour and Major. 1988. Terrestrial Vegetation of California. California Native Plant Society. Special Publication No. 9.

Holland, R.F. and S.K. Jain. 1981. Insular Biogeography of Vernal Pools in the Central Valley of California. American Naturalist. 117:24-37.

Holland, R.F. and V. Dains. 1990. The Edaphic Factor in Vernal Pool Vegetation. In D.H. Ikeda and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178 pp.

Holsinger, K. and L. Gottlieb. 1991. Conservation of Rare and Endangered Plants: *Principles* and Prospects. pp. 195-208. In Genetics and Conservation of Rare Plants. D. Falk and K. Holsinger, eds. Oxford University Press, New York. 283 pp.

Hydro Science and L.P. Stromberg, Wetlands Consultant. 1990. Hydrologic Monitoring and Investigations: Report of Findings, Sunrise-Douglas Site, Sacramento County, California. 90 pp. Report submitted to The Sammis Company, Sacramento, California.

Ikeda, D.H. and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178 pp.

Jain, S. 1976. Vernal Pools, Their Ecology and Conservation.

Jokerst, J. 1990. Floristic Analysis of Volcanic Mudflow Vernal Pools. In D.H. Ikeda and R.A. Schlising. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178 pp.

Jones and Stokes Associates. 1990. Sacramento County Vernal Pools, Their Distribution Classification, Ecology, and Management. Prepared for County of Sacramento, Planning and Community Development Department.

Jones and Stokes Associates. 1992. Vernal Pool Master Plan for Sacramento County. Sacramento, California.

Jongman, R., C. ter Braak and O. van Tongeren. 1987. Data Analysis in Community and Landscape Ecology. Pudoc, Wageningen. 299 pp.

Keith, R. 1995. Letter to CH2M HILL from Marin/Sonoma Mosquito Abatement District.

Kern County Valley Floor HCP Program. 1994.

Lacy, Robert C. 1992. The Effects of Inbreeding on Isolated Populations: Are Minimum Viable Population Sizes Predictable? In P.L. Fiedler and S.K. Jain, eds. 1992. Conservation Biology. The Theory and Practice of Nature Conservation Preservation and Management.

Lande, R.L. 1988. Genetics and Demography in Biological Conservation. Science. 241: 1455-1460.

McCarten, N. 1985a. A Survey of *Navarretia pauciflora* and *Navarretia plieantha* (Polemoniaceae): Two Rare Endemic Plant Species from the Claypan Vernal Pools of the California North Coast Ranges. Technical Report submitted to the California Endangered Plant Program.

McCarten, N. 1985b. A Survey of *Lasthenia burkei* (Asteraceae): A Rare Endemic Plant Species from the Claypan Vernal Pools of the California North Coast Ranges. Technical Report submitted to the California Endangered Plant Program.

Menges, E.S. 1986. Predicting the Future of Rare Plant Populations: Demographic Monitoring and Modeling. Natural Areas Journal. 6: 13-25.

Menges, E.S. 1992. Stochastic Modeling of Extinction in Plant Populations. In P.L. Fiedler and S.K. Jain, Conservation Biology. The Theory and Practice at Nature Conservation Preservation and Management.

Norwick, S.A. 1991. Vernal Pools and Other Seasonal Bodies of Standing Water. Fremontia. Vol. 19, No. 3.

Olson, T.G., D.D. Murphy and R.D. Thornton. 1993. The Habitat Transaction Method: A Proposal for Creating Tradable Credits in Endangered Species Habitat. Pp. 27-36. In Building Economical Incentives into the Endangered Species Act. Defenders of Wildlife, Washington. 124 pp.

Ornduff, R. 1969. *Limnanthes vinculans*, a New California Endemic. Brittonia. 21: 11-14.

Ornduff, R. 1969b. The Origin and Relationships of *Lasthenia burkei* (Compositae). American Journal of Botany. 56: 1042-1047.

Patterson, C. 1990. Vernal Pool Creation and Rare Plant Translocation in Sonoma County, California. Unpublished report by C. Patterson, July 4, 1990.

Patterson, C.A., B. Guggolz and M. Waaland. 1994. Seasonal Wetland Baseline Report for the Santa Rosa Plain, Sonoma County. Prepared for Ann Howald, California Department of Fish and Game. June 30, 1994.

Resh, V.H. and S.S. Balling. 1983a. Ecology Impact of Mosquito Control Recirculation Ditches on San Francisco Bay Marshlands: Study Conclusions and Management Recommendations. Proceedings of the California Mosquito and Vector Control Association. 71(1):40-52.

Resh, V.H., and S.S. Balling. 1983b. Tidal Circulation Alteration for Salt Marsh Mosquito Control. Environmental Management. 7(1):79-84.

Rieger, J. 1986. Establishment of a Vernal Pool Preserve in San Diego County. Pp 615-618. In Conservation and Management of Rare and Endangered Plants. T. Elias, ed. California Native Plant Society, Sacramento. 630 pp.

Schaffer, H.B., R.N. Fisher and S.E. Stanley. No Date. Status Report: The California Tiger Salamander (*Ambystoma californiense*). Final report to the California Department of Fish and Game, Inland Fisheries Division. Contracts FG 9422 and FG 1383.

Shafer, C.L. 1990. Nature Reserves: Island Theory and Conservation Practice. Smithsonian Institution Press, Washington, D.C.

Shafer, C.L. 1990. Single Large, or Several Small Reserves (SLOSS) and Beyond. In C.L. Shafer. Nature Reserves: Island Theory and Conservation Practice. Smithsonian Institution Press, Washington, D.C.

Simberloff, D. and J. Cox. 1987. Consequences and Costs of Conservation Corridors. Conservation Biology. (68)1, pp. 63-71.

Skinner, M.W. and B.M. Pavlik. 1994. Inventory of Rare and Endangered Vascular Plants of California. California Native Plant Society Special Publication No. 1 (Fifth Edition).

Soil Conservation Service. 1972. Soil Survey of Sonoma County, California.

Soulé, M.E. and B. A. Wilcox. 1980. Conservation Biology, An Evolutionary-Ecological Perspective. Sinauer Associates, Sunderland, Massachusetts.

Sonoma County Agricultural Preservation and Open Space District. 1995. Location maps and general descriptions of district properties within the Santa Rosa Plain.

Sonoma County Planning Department. 1989. Sonoma County General Plan.

Stinebaugh, S., Deputy Director of Utility Operations Santa Rosa Subregional Water Reclamation System. 1994. Personal Communication.

Stone, D.R. 1990. California's Endemic Vernal Pool Plants: Some Factors Influencing Their Rarity and Endangerment. In D.H. Ikeda and R.A. Schlising. 1990. Studies from the Vernal Pool Plants, Their Habitat and Biology. Herbanium. California State University, Chico, No. 8. The University Foundation. 178 pp.

Stromberg, L.P., Hanes, T. and O'Connor, M. (No date.) The Role of Soils and Hydrology in the Creation of Vernal Pools.

ter Braak, C. 1988. A FORTRAN Program for Canonical Community Ordination by Partial Detrended Canonical Correlation Analysis, Principal Components Analysis and Redundancy Analysis (version 2.1). Microcomputer Power, Ithaca, New York.

Thompson, R.M., M.E. Waaland, and J. Vilms. 1989. Santa Rosa Plains Endangered Plant Protection Program Report. Prepared by Circuit Rider Productions for Sonoma County Planning Department, Santa Rosa, California, and the Endangered Plant Program, California Department of Fish and Game.

Thorp, R.W. 1990. Vernal Pool Flowers and Host-Specific Bees. In D.H. Ikeda and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology—Studies from the Herbarium, California State University, Chico, No. 8, The University Foundation. 178 pp.

U.S. Army Corps of Engineers, Institute for Water Resources. Wetlands Mitigation Banking Concepts. 1992. IWR Report 92-WMB-1 Case Building, 7701 Telegraph Road, Fort Belvoir, Virginia.

U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual.

U.S. EPA Region IX Wetlands. 1991. Mitigation Banking Guidance. Memo, December 20, 1991.

U.S. Fish and Wildlife Service. 1988. Endangered and Threatened Wildlife and Plant; Determination of Endangered Status for the California Freshwater Shrimp. Federal Register 53:43884-43889.

U.S. Fish and Wildlife Service. 1991. Federal Register. Volume 56, No. 1. December 2, 1991. 61173-61182 pp.

U.S. Fish and Wildlife Service. 1991a. Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species. Federal Register 56:58804-58836.

U.S. Fish and Wildlife Service. 1992. Endangered and Threatened Wildlife and Plants; Proposal to Determine Endangered Status for Four Fairy Shrimp and the Vernal Pool Tadpole Shrimp in California. Federal Register 57:19856-19863.

U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Proposal Rule to List Fairy and Tadpole Shrimp as Endangered or Threatened Species. Federal Register: 58-48136.

Waaland, M.E. 1989. Section A: Rare Plant Ecology. In R.M. Thompson, Santa Rosa Plains Endangered Plant Protection Program. Prepared by Circuit Rider Productions for Sonoma County Planning Department, Santa Rosa, California, and the Endangered Plant Program, California Department of Fish and Game.

Waaland, M.E. 1990. History of the Human Use and Modification of the Laguna Ecosystem. In D.W. Smith Consulting, ed. History, Land Uses, and Natural Resources of the Laguna de Santa Rosa. Prepared for the Santa Rosa Subregional Water Reclamation System, California.

Waaland, M.E., M. Fawcett, J. Neilsen, and D.W. Smith. 1990. Current Condition and Ecology of the Laguna Ecosystem. In D.W. Smith Consulting, ed. History, Land Uses, and Natural Resources of the Laguna de Santa Rosa. Prepared for the Santa Rosa Subregional Water Reclamation System, California.

Waaland, M.E. 1994a. Hydrologic and endangered species monitoring at the Mills irrigation site. Prepared for Santa Rosa Subregional Water Reclamation System.

Waaland, M.E. 1994b. Sebastopol Meadowfoam Translocation Experiment at Brown Farm. Prepared under contract to CH2M HILL for Santa Rosa Subregional Water Reclamation Project.

Wagner, K. 1994. Fire Marshall, City of Santa Rosa Fire Department. Personal Communication.

Weber, R. 1994. Environmental Compliance Head, Sonoma County Water Agency. Personal Communication.

Whittaker. 1975. Communities and Ecosystems, Second Edition. MacMillan Publication Co., Inc., New York, New York.

Wilcox, B.A. 1980. Insular Ecology and Conservation. In Soule, M.E. and B.A. Wilcox. 1980. Conservation Biology, an Evolutionary–Ecological Perspective. Sinauer Associates, Inc., Sunderland, Massachusetts.

Zedler, P.H. 1987. The Ecology of Southern California Vernal Pools: A Community Profile. Technical Report for National Wetlands Research Center, U.S. Fish and Wildlife Service. 136 pp.

Zedler, P.H. 1990. Life Histories of Vernal Pool Plants. In D.H. Ikeda and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178 pp.

Appendix A
Public Participation

Public participation has been an integral part of developing the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan by ensuring that the Plan reflects the diverse needs and interests of in Sonoma County. Public participation provides opportunities for all residents and interested parties to learn about this conservation and planning effort, voice their concerns, and participate in developing solutions. Public participation also helps identify conflicts and provides a forum for diverse viewpoints to come together to understand and resolve problems.

A Task Force composed of representatives from federal, state, and local agencies, as well as agricultural, resource conservation, development, and landowner interests, has been in existence for the past 4 years. New Task Force members are appointed by the Sonoma County Board of Supervisors and the Santa Rosa City Council. The original Task Force members were appointed by former Congressman Frank Riggs and retained by Congresswoman Woolsey, when she replaced Congressman Riggs.

The Task Force has developed, reviewed, and approved this Preservation Plan, which will preserve vernal pool ecosystems while streamlining the permit process. Decisions are made by consensus, and Task Force members are committed to developing a Preservation Plan that meets the goals and objectives that they have approved. The groundrules under which the Task Force operates are included in this appendix. The Task Force meets monthly at the Federal Building in Santa Rosa, and meetings are open to the public.

In addition to outreach conducted with and through the Task Force, several other outreach activities have occurred during this project to ensure that the needs and concerns of the diverse interests in Sonoma County are reflected in the Plan. A fact sheet (enclosed as part of this appendix) describing the project and identifying public participation activities, including announcing the public meeting, was distributed to all on the project mailing list, as well as sent to over 2,000 individuals on Congresswoman Woolsey's mailing list. Fact sheets were given to Task Force members for them to distribute to their organizations. Fact sheets and meeting notices were also placed in local libraries throughout Sonoma County.

A public meeting and open house was conducted on August 17, 1994 at the Santa Rosa Veterans Memorial Building during which the project's purpose, scope, and schedule, as well as the Draft Annotated Outline, were presented. A public notice announcing the public meeting was published in the *Press Democrat* on August 10, 1994. Feedback received during the meeting was used to modify the annotated outline. Furthermore, during the open house following the public meeting, several individuals identified that they would like to have small group discussions with project staff to ensure that their interests and concerns were clearly understood. Small group meetings were conducted in September and October 1994 with landowners, developers, and conservation representatives to accurately ascertain their concerns and needs.

The Administrative Draft Plan was submitted to the Task Force in February 1995 and their comments, as well as comments from members of the public who reviewed the Plan were incorporated into the Draft Plan which was released for public review on May 1, 1995.

The public comment period (April 27 to June 7, 1995) and public meeting for the Draft Plan were announced in the *Press Democrat* in a public notice on April 27, 1995. A second public notice extending the public comment period to June 7 was published in the *Press Democrat* on May 30. A fact sheet summarizing the key findings and strategies identified in the Draft Plan and announcing the public comment period and public meeting was distributed to approximately 500 individuals. Fact sheets were distributed to Task Force members for them to disburse to members of their organizations. Fact sheets and copies of the Draft Plan were placed in the Sonoma County Central Library, the Sebastopol Regional Library, and the Petaluma Regional Library. The fact sheet is provided as part of this appendix.

A public meeting and open house to present the key findings of the Draft Plan and receive comments was held on May 10, 1995 at the Santa Rosa Veterans Memorial Building. Approximately 150 people attended the meeting. The meeting was formally recorded by a court transcriptionist. Comments and responses given at the public meeting can be reviewed in Appendix I and copies of the public meeting transcript are available for review at the Sonoma County Central Library, the Sebastopol Regional Library, and the Petaluma Regional Library. Oral and written comments received during the public comment period were used to modify the Plan and are reflected in the Final Plan. Responses to written comments can be reviewed in Appendix I. The handouts from the public meeting are included in this appendix.

Public participation will continue in Phase 2 of the Santa Rosa Plain Venal Pool Ecosystem Preservation Project. Chapter 9 outlines the outreach activities identified for Phase 2.

Groundrules for the Santa Rosa Plain Vernal Pool Task Force

Approved by consensus June 15, 1994

Decision Making

1) The Task Force will work to reach agreements based on consensus. Lacking unanimity, the Task Force will reach agreements based on substantial consensus. Substantial consensus occurs when given the range of possible courses of actions benefits, tradeoffs, current conditions and circumstances, the Task Force has reached the best obtainable agreement. Absence or silence by Task Force members will be construed as assent.

   With substantial consensus, the Task Force acknowledges that best obtainable agreements may not fully meet the *specific* needs of each Task Force member, but that all *major* interests and concerns will have been considered and are satisfactorily addressed (i.e., the agreements made are ones that Task Force members can live with, will support, and work to implement).

   All consensus agreements reached during the negotiations are assumed to be tentative agreements until the Task Force agrees to make them final agreements. Dissenting opinions will be recorded in all final agreements.

2) Smaller work groups or subnegotiation groups may be formed to address specific issues and to make recommendations to the Task Force. Work groups are open to any member of the Task Force or his/her designee. Work groups are not authorized to make decisions for the Task Force as a whole. Work group meetings may be held between the full sessions and each Task Force member will be notified of all work group meetings.

3) The City of Santa Rosa and Sonoma County will act as conveners and facilitators and will be responsible for developing an agenda for all meetings of the Task Force. This agenda will be developed in consultation with the members of the Task Force.

4) Caucuses for the purposes of internal consultation and decision making can be requested of the facilitators at any time by any member of the Task Force.

5) Previous agreements reached by the Task Force will not be reconsidered or revised at a later date unless new and significant information substantially changes the Task Force's understanding of a given issue or affects the ability of implementing a final agreement.

The Task Force must agree, by substantial consensus, to reopen an issue before a given issue can be reconsidered and renegotiated.

6) Task Force members will make a commitment to search for opportunities to make the decision-process work.

7) All issues identified by any Task Force member must be addressed by the Task Force.

8) Task Force members are committed to supporting the agreed upon plan and implementation activities.

Participation

9) Each Task Force member shall identify a principle spokesperson and an alternative. Spokespersons will represent the member for purposes of determining consensus. Alternatives will serve as spokesperson for the member when the spokesperson is absent.

If neither the spokesperson nor the alternate can be present at a Task Force meeting, then either the spokesperson or the alternate shall submit his/her ideas or comments in writing before the meeting.

10) Task Force members are encouraged to seek the best advice from individuals outside the Task Force. However, only Task Force Members have the authority to negotiate at group or work sessions.

11) The Task Force can recommend new members to join the Task Force. The Sonoma County Board of Supervisors and the Santa Rosa City Council will review and appoint new Task Force members.

12) Task Force members agree to carefully review all materials provided them for consideration and discussion at upcoming meetings.

13) Task Force members accept the responsibility to keep their groups and associates informed of the progress of the discussions.

Task Force Meetings

14) If the Task Force reaches a final consensus on the issues before it, this consensus shall be expressed in the form of a written statement (agreement), with assistance provided by the facilitators as needed and appropriate.

Dissenting opinions will be recorded in the final agreements.

15) Task Force meetings will be open to all members of the public. The Task Force will meet with members of the public to inform and involve them in developing the plan. The annotated outline and the draft plan will be available for public review and comment.

Safeguards for the Members

16) All members must act in good faith in all aspects of these negotiations. This includes respecting the comments and contributions of other members and the public and giving the same priority to addressing others' issues and concerns as you give to your own.

Task Force members will make a commitment to listen carefully and openly, to ask questions in order to understand others, and to make statements that explain or educate others about their needs, perceptions, and interests.

17) Any member may withdraw from the negotiations and the Task Force at any time without prejudice, but only after telling the group why and allowing the Task Force the opportunity to solve the problem or address the issue of concern.

18) Task Force members shall refrain from characterizing or commenting publicly on the negotiating positions taken by any other Task Force members.

All private communications with the media by Task Force members will be as representatives of their specific organizations and not as representatives of the Task Force. Official Task Force statements to the media will be made by co-chairpersons.

Schedule

19) Task Force meetings will be scheduled with sufficient time and adequate notice between meetings to provide members with an opportunity to conduct work group meetings and to consult with and obtain advice, direction and instructions from their organizations to enable them to present proposals and make commitments at future Task Force meetings.

20) Task Force meetings will begin at the published time; it is essential that all Task Force members arrive on-time. In fairness to those who arrive on-time, items covered in the meeting will not be repeated for latecomers. Latecomers will need to get missed information from other Task Force members after the meeting.

Meeting Facilitation

21) The facilitators will be responsible for helping to ensure that the process runs smoothly, developing meeting agendas, preparing draft and final minutes, and helping the parties resolve their differences and achieve consensus on the issues to be addressed by the Task Force.

22) The facilitators will provide logistical support to the Task Force and be available to facilitate all full Task Force and work group negotiation sessions.

23) Members of the Task Force will have the responsibility to share supportive functions which include, but are not limited to, logistics coordination and clerical duties.

Published in the Press Democrat on August 10, 1994

COMMUNITY MEETING & OPEN HOUSE

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Project

Wednesday, August 17, 1994
7:00 - 9:00 p.m.

Santa Rosa Veterans Memorial Building, Lodge Room
1351 Maple Avenue, Santa Rosa, CA

Topics to be discussed:

- Project purpose, scope, and schedule
- Draft Annotated Outline for the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan

A question and answer session will follow the meeting. During the open house, members of the Santa Rosa Plain Vernal Pool Task Force will be available for informal discussions. If you have any questions, please call Chuck Regalia (Task Force Chairperson) at (707) 543-3189 or Jim Olmsted (Task Force Co-Chairperson) at (707) 527-1920.

Published in the Press Democrat on April 27, 1995.

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan
Opportunities for Community Involvement

PUBLIC MEETING and OPEN HOUSE

May 10, 1995 from 7 to 9:30 p.m.

You are invited to a meeting regarding the preservation of vernal pool ecosystems in the Santa Rosa Plain. The U.S. Army Corps of Engineers will present the key elements and recommendations of the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan at:

Santa Rosa Veterans Memorial Building
Lodge Room
1351 Maple Avenue
(at Brookwood Avenue)
Santa Rosa, California

You will have the opportunity to ask questions and provide comments on the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan.

PUBLIC COMMENT PERIOD

May 1 - May 31, 1995

Give us your two cents! We encourage you to comment on the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan during the public comment period. Comments may be submitted verbally or in writing at the public meeting, or you can send written comments, ***postmarked no later than May 31, 1995*** to:

Niall McCarten
CH2M HILL
P.O. Box 12681
Oakland, CA 94604-2681

All comments will be considered and addressed in the Final Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan.

Where Can I Review the Draft Plan?

Copies of the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan are available for review at the following locations:

Sonoma County Central Library
Reference Desk
3rd and E Streets, Santa Rosa
Mon. 12:00 p.m. - 9:00 p.m.
Tues, Thurs, Fri, Sat. 9:30 a.m. - 6:00 p.m.
Wed. 9:30 a.m. - 9:00 p.m.
Sun. 2:00 p.m. - 6:00 p.m.

Sebastopol Regional Library
Reference Desk
7140 Bodega Avenue
(at High Street)
Sebastopol
Mon, Tues. 9:30 a.m. - 9:00 p.m.
Wed. thru Sat. 9:30 a.m. - 6:00 p.m.

Petaluma Regional Library
Reference Desk
100 Fairgrounds Drive
(at East Washington)
Petaluma
Mon, Thurs, Fri, Sat. 9:30 a.m. - 6:00 p.m.
Tues, Wed, 9:30 a.m. - 9:00 p.m.

Published in the Press Democrat on May 30, 1995.

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan
Public Comment Period Extended Until June 7, 1995

Give us your two cents! We encourage you to comment on the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan during the public comment period. Please send written comments, ***postmarked no later than June 7*** to:

Niall McCarten , CH2M HILL , P.O. Box 12681, Oakland, CA 94604-2681

All comments will be considered and addressed in the Final Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan.

WHERE CAN I REVIEW THE DRAFT PLAN?

Copies of the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan and a factsheet are available for review at the following locations.

Sonoma County Central Library
Reference Desk
3rd and E Streets, Santa Rosa
Mon 12:00 p.m. - 9:00 p.m.
Tues, Thurs, Fri, Sat 9:30 a.m. - 6:00 p.m.
Wed 9:30 a.m. - 9:00 p.m.
Sun 2:00 p.m. - 6:00 p.m.

Sebastopol Regional Library
Reference Desk
7140 Bodega Avenue,
(at High Street)
Sebastopol
Mon, Tues 9:30 a.m. - 9:00 p.m.
Wed thru Sat 9:30 a.m. - 6:00 p.m.

Petaluma Regional Library
Reference Desk
100 Fairgrounds Drive
(at East Washington)
Petaluma
Mon, Thurs, Fri, Sat 9:30 a.m. - 6:00 p.m.
Tues, Wed 9:30 a.m. - 9:00 p.m.

You can also get a copy of the Draft Plan by calling the Co-Chairmen of the Sonoma County Vernal Pool Task Force:
Chuck Regalia (707) 543-3189 or Jeremy Graves(707) 894-5798.

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Project

FACT SHEET 1
AUGUST 1994

What it is and how you can become involved

For the past century, agricultural uses such as dairy farms, pastures, orchards, and vineyards occupied much of the Santa Rosa Plain. Commercial and residential development of the Santa Rosa Plain has increased in the past 30 years, leaving relatively few natural areas. The loss of wetlands and subsequent difficulties in getting permits for development are the primary reasons for needing a preservation plan.

The U.S. Congress is funding the development of a Vernal Pool Ecosystem Preservation Plan for the Santa Rosa Plain. The Corps of Engineers is administering the funds and contract for the project. The specially appointed Sonoma County Vernal Pools Task Force is responsible for developing the Plan. The general goals of the Plan are: to preserve the diverse plants and animal life that live in Santa Rosa Plain vernal pool ecosystems and their related watersheds; to develop methods that resolve conflicts between landowners, agency, and conservation interests in an effective and timely manner; and to simplify the permitting process.

Community Meeting and Open House August 17, 1994 For details see back page.

What and where is the Santa Rosa Plain?

The Santa Rosa Plain is an area that at one time was covered in valley oak woodlands and savannas, grasslands, and wetlands. A savanna is an oak woodland with the trees widely spaced apart, with few understory shrubs. The vegetation, wildlife, soils, local climate, waterways, and basins all interact to form a unique ecosystem. The Santa Rosa Plain is located in Sonoma County, within the jurisdictions of the County and the Cities of Santa Rosa, Rohnert Park, Cotati, Sebastopol, and Windsor (see Figure 1 below).

Two types of wetlands occur within the Santa Rosa Plain: perennial (year-

(continued on page 2)

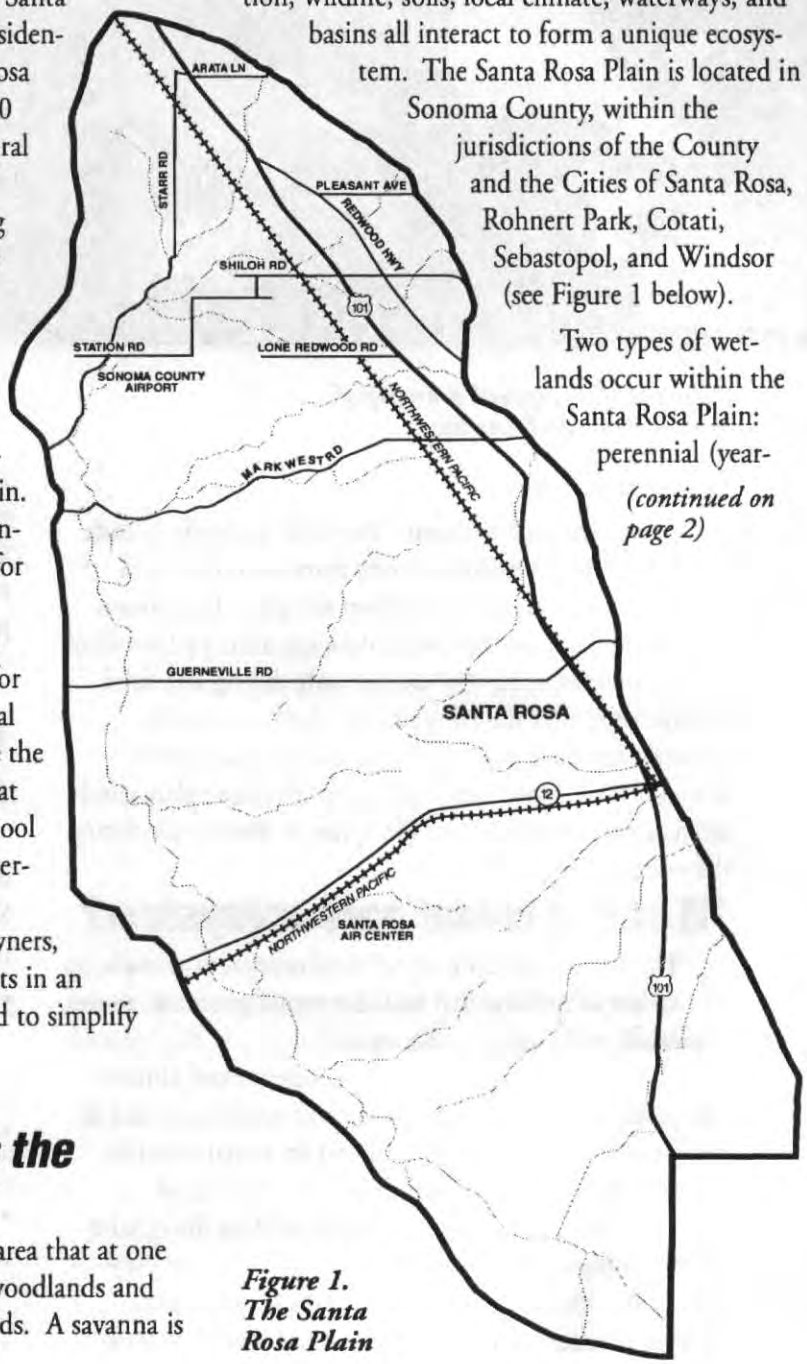


Figure 1. The Santa Rosa Plain

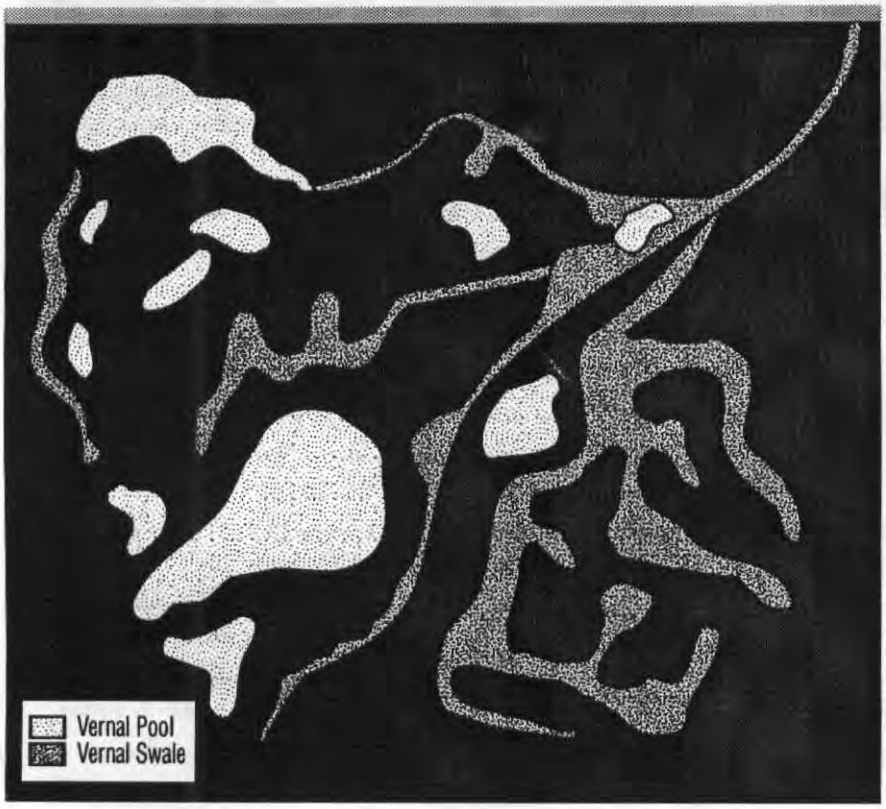


Figure 2. Conceptual drawing of Vernal Pools and Swales.

(continued from page 1)

round) and seasonal wetlands. Perennial wetlands include the Laguna de Santa Rosa, creeks, marshes, ponds, and other areas that are wet throughout the year. In contrast, seasonal wetlands include small drainage areas and localized areas of ponded water that are wet only during and for a variable time after the rainy season. Some seasonally ponded areas have generally been referred to as vernal (spring) pools, based on the presence of unique plants and animals that complete their life-cycles in these pools during the wet season.

What is a vernal pool ecosystem?

The Santa Rosa Plain vernal pool ecosystem is made up of a variety of habitats that includes vernal pools and swales, grasslands, valley oak woodlands and savannas; the types of soils that support vernal pools; the landform and climate components that contribute to wetland conditions; and all plant and animal species that depend on vernal pools or swales for all or a part of their life-cycle. Associated uplands, creeks and the Laguna de Santa Rosa floodplains are also components of the Santa Rosa Plain vernal pool ecosystem. Much of the Santa Rosa Plain vernal pool ecosystem occurs on agricultural lands as well as in areas planned for rural residential or urban development.

What are vernal pools and vernal swales?

There is no widely accepted standard definition for the term "vernal pools." It is generally used to refer to areas that pond in the springtime and support primarily native annual vegetation often growing in a pattern of concentric rings. For this preservation plan, a definition for vernal pools reflective of the Santa Rosa Plain has been developed and is as follows:

"Vernal pools of the Santa Rosa Plain are seasonal wetlands that form in depressions as a result of a shallow, relatively impermeable soil layer that restricts downward movement of water and along with an outlet barrier, causes seasonal ponding. Although the vegetation composition varies as a result of land use practices, annual rainfall, and temperature variation, the vegetation in relatively undisturbed vernal pools is typically characterized by native annual species... many of which are usually found in vernal pools or vernal pool/swale complex."

Vernal swales are different from vernal pools because of their lack of an outlet barrier that would create standing water. The characteristics of the swales vary depending on the topography, watershed, and underlying soils. Some plant and animal species commonly thought of as vernal pool species will be found in swales as well. Figure 2 is a conceptual drawing of vernal pools and swales.

Why are vernal pool ecosystems important?

Vernal pool wetlands are important because they are one of the most prolific environments in the world. The Santa Rosa Plain Vernal Pool Ecosystem represents an important freshwater wetland system because of its:

- high level of plant and wildlife diversity, including species known only from the Santa Rosa Plain;
- capacity as a natural reservoir for flood waters;
- level of productivity that supports native plants and animals, including several endangered plant species;
- capacity to be used for some agricultural practices;
- seasonal and perrenial wetlands capacity to act as a biological filter for stormwater; and
- the high quality of greenbelt open space that improves the quality of life in the region.

What is the Sonoma County Vernal Pool Task Force?

The Sonoma County Vernal Pool Task Force is made up of representatives from federal, state and local agencies, and agricultural, resource conservation, development, and land owner interests. New Task Force members are appointed by the Sonoma County Board of Supervisors and the Santa Rosa City Council. The original Task Force members were appointed by former Congressman Frank Riggs and retained by Congresswoman Woolsey, when she replaced Congressman Riggs.

The Task Force's role is to develop, review, and approve a preservation plan which will preserve vernal pool ecosystems while streamlining the permit process. Decisions are made by consensus and Task Force members are committed to developing a preservation plan that meets the goals and objectives that they have approved. The Task Force meets monthly at the Federal Building in Santa Rosa and meetings are open to the public. Community meetings will be held at the completion of the Draft Annotated Outline and the Draft Vernal Pool Ecosystem Preservation Plan.

Preservation Plan Implementation Strategies

The Preservation Plan will be implemented from a resource conservation standpoint and also through a streamlined permitting process for activities, including development, which may affect wetlands or endangered species. The following are some of the potential implementation options that will be considered by the Task Force.

- Management and Conservation Programs
  - Management agreements and mutual covenants
- Acquisition of Interests
  - Land leases, conservation easements, deed restrictions, donations, and sales/purchases
- Various Options for Potential Funding
- General Plan/Local Ordinance Modifications
  - General Plan revisions, special area plans,rezoning/ overlay zoning, transferable development rights

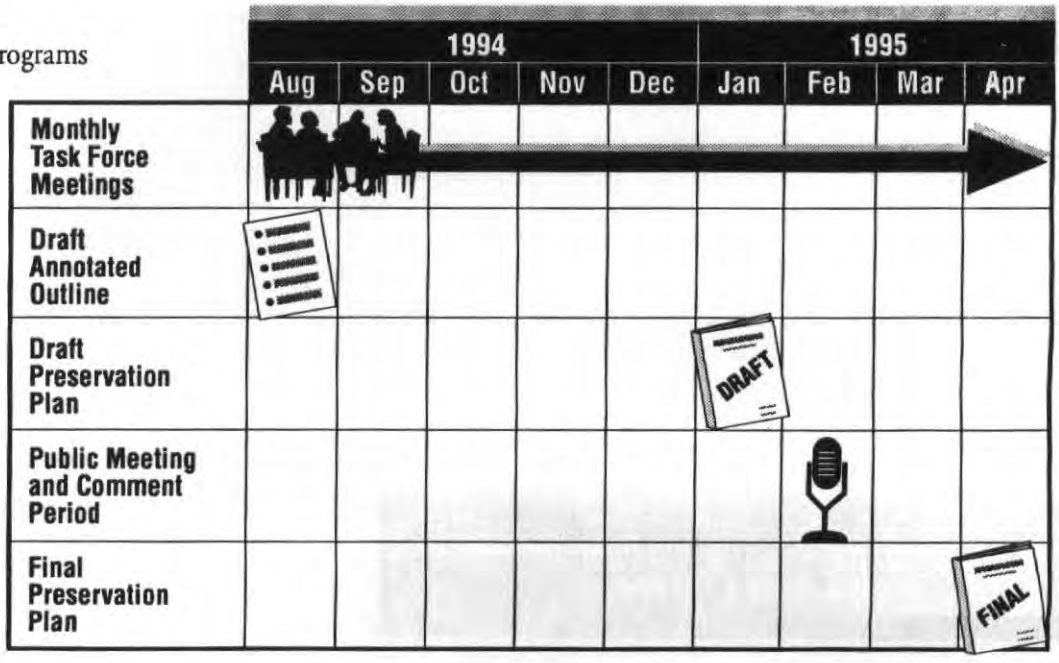
How can I get involved ?

Public participation is an integral part of developing a vernal pool ecosystem preservation plan that effectively meets the needs of the diverse interests located in Sonoma County. Your participation is needed to ensure that the plan that is developed and implemented reflects your interests.

The following is a brief list of steps you can take to become involved in this decision-making process:

- Ask the Corps of Engineers (the Lead Agency) to add your name to its project mailing list for fact sheets and public notices.
- Review project materials, like the Annotated Outline and the Draft Vernal Pool Ecosystem Preservation Plan and provide input to the Task Force.
- Go to the Task Force and other public meetings and talk about your issues and concerns. Identify preservation and mitigation measures you think the plan should address.
- Talk to one or more of the Task Force members and ask them to keep you informed.
- Involve other concerned citizens and organizations and share information.
- Review the Final Vernal Pool Ecosystem Preservation Plan to make sure that your concerns have been adequately addressed.

What Happens next?



Community Meeting and Open House

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Project

Wednesday, August 17, 1994, 7:00 - 9:00 p.m.

Santa Rosa Veterans Memorial Building, Lodge Room

1351 Maple Avenue, Santa Rosa, California

Topics to be discussed:

- Project purpose, scope, and schedule
- Draft Annotated Outline for the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan

There will be a question and answer session following the presentations and during the open house, members of the Santa Rosa Plain Vernal Pool Task Force will be available for informal discussions. If you have any questions, please call Chuck Regalia at (707) 543-3189 or Jim Olmsted at (707) 527-1920.

Information Repository

An information repository containing project information has been established at the **Sonoma County Central Library** • 3rd and E Streets • Santa Rosa • CA • (707) 545-0831.
Audrey Herman (Reference Librarian)
Hours: Mon 12:00 p.m. - 9:00 p.m.; Tues, Thurs, Fri, Sat 9:30 a.m. - 6:00 p.m.;
Wed 9:30 a.m. - 9:00 p.m.; Sun 2:00 p.m. - 6:00 p.m.

For more information

If you have questions or would like more information about the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan, please contact:

Chuck Regalia
(Chairman of Santa Rosa Plain Vernal Pool Task Force)
Santa Rosa Department of Community Development
P.O. Box 1678,
Santa Rosa, CA 95402
(707) 543-3189
or

Jim Olmsted
(Co-Chairman of Santa Rosa Plain Vernal Pool Task Force)
Sonoma County Planning Department
575 Administration Drive, Room 105A
Santa Rosa, CA 95403
(707) 527-1920

Would you like to be on our mailing list?

If you would like to be added to the project mailing list and receive future fact sheets and meeting notices, please call or write to:
Chuck Regalia • Santa Rosa Department of Community Development • P.O. Box 1678 • Santa Rosa, CA 95402 • (707) 543-3189

Chuck Regalia
Santa Rosa Department of
Community Development
P.O. Box 1678
Santa Rosa, CA 95402

Community Meeting and Open House
August 17, 1994

Printed on Recycled Paper

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan Project

Fact Sheet #2 *April 1995*

Draft Ecosystem Preservation Plan Available for Public Review

Since August 1994, the Santa Rosa Plain Vernal Pool Task Force has been developing a plan to preserve the vernal pool ecosystems located throughout the Santa Rosa Plain. The Preservation Plan, now available in draft for public review, is designed to protect the diverse plant and animal life of the vernal pool ecosystems while still allowing development to occur. The Plan lays the groundwork for resolving conflicts among landowners, regulatory agencies, and conservation interests and simplifies the now complicated and cumbersome wetland and endangered species permitting process.

What does the Plan do?

Now available for public review, the Plan proposes the following:

- A system for evaluating the habitat quality of vernal pool ecosystems in the Santa Rosa Plain
- A strategy for implementing a preserve system for some high-quality habitat sites
- A streamlined regulatory process for permitting development in low-quality habitat sites by giving authority to local agencies
- Incentives for encouraging property owners with vernal pool ecosystem resources to participate in the Plan

Does the Plan apply to everyone?

No. Many areas within the Santa Rosa Plain do not have vernal pool ecosystem wetlands and therefore may not require permits from the U.S. Army Corps of Engineers (Corps). *Participation in the Plan is voluntary.* Taking part in Phase II of the project, by helping determine whether your land has high- or low-quality or no vernal pool ecosystem resources, will allow you to proceed more quickly with your plans for your land. Landowners with low-quality habitat areas who wish to participate in the new regulatory process can do so; others who don't want to participate will be able to apply for the necessary permits through the existing procedures.

How can I get involved?

Copies of the Draft Plan are available for your review at the libraries listed on the back of this fact sheet. At these libraries, some copies have been set aside for reference review, while others can be checked out for review in your home or office. Your participation is needed to ensure that the Plan reflects your needs and interests.

A public meeting will be held on Wednesday, May 10, at the Santa Rosa Veterans Memorial Building. The Corps will present the key elements and recommendations of the Plan. Please come to the meeting, bring your friends and neighbors, and share your thoughts. Your response is important to us. If you do not wish to speak at the meeting, you can submit written comments at the meeting or send them to

Community Meeting and Open House May 10,1995. For details see back page.

(continued on page 2)

(Continued from page 1)

the address listed on the back of this fact sheet by May 31, 1995.

You can also stay involved in the development and implementation of the Plan by talking with one or more of the Sonoma County Vernal Pool Task Force members. A list of the Task Force members is provided on page 5 of this fact sheet.

How was the Plan developed?

The Draft Plan was developed by the Sonoma County Vernal Pool Task Force, with the help of a consultant. The Task Force is made up of representatives from federal, state, and local agencies and agricultural, resource conservation, development, and landowner interests. The Task Force met monthly to identify the goals and objectives of the Plan, draft ground rules, discuss biological, land use, and regulatory issues, and develop criteria for evaluating how high-quality vernal pool ecosystems within the Santa Rosa Plain would be ranked and preserved. The Task Force also identified market-oriented strategies to be used to achieve the goals of the Plan. Decisions were made through "substantial consensus," meaning that when agreement on issues is not unanimous, the agreement that best addresses all major interests and concerns is accepted. In addition, silence by or absence of Task Force members was taken to mean agreement.

A subcommittee composed of Task Force members representing federal, state, and local agencies and governments also met monthly to discuss and resolve regulatory issues. Since one of the primary goals of the Plan is to streamline the permitting process, it was important to ensure that potential regulatory changes proposed and discussed at Task Force meetings were legal and did not compromise the mandates and responsibilities of the various agencies and governments.

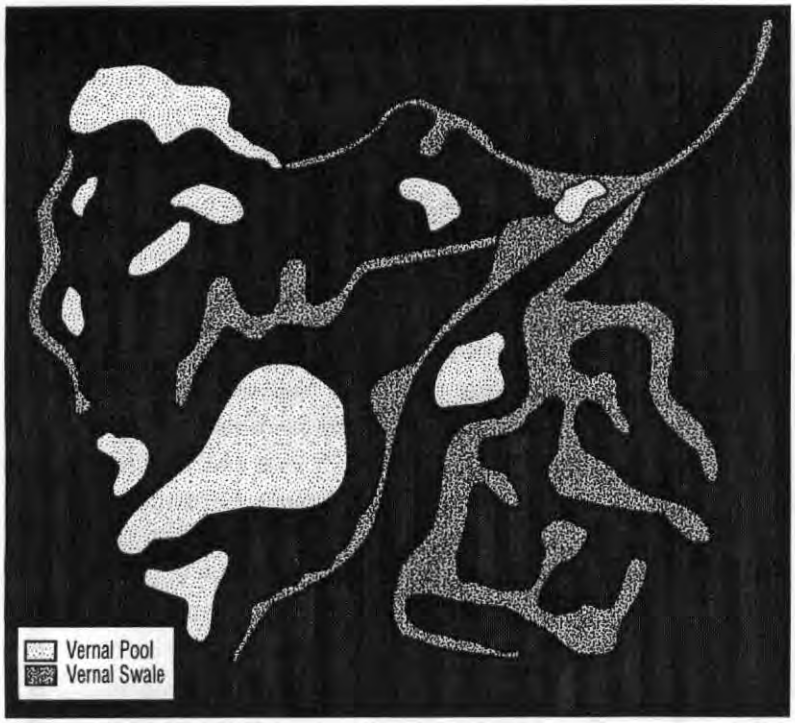
When will the Plan be implemented?

This project is divided into two phases. Phase I is development of the Preservation Plan; Phase II is its implementation. Phase I is the "what" will be done; Phase II is the "how" and "when" it will be done. As part of Phase II, the Corps will provide Sonoma County, the cities of Santa Rosa, Cotati, and Rohnert Park, and the Town of Windsor with a General Permit allowing them to give authorization to landowners who want to make changes to their land that will impact vernal pool ecosystem wetlands. The General Permit will identify the criteria landowners must meet to receive approval from the county or cities and specify the mitigation process in which they will have to participate to offset the impacts to the vernal pool ecosystems on their property.

Phase II will begin in late June 1995, when the Final Plan is completed, approved, and accepted by the Task Force.

During Phase II, the following activities will take place:

1. At least two mitigation banks will be developed, one for preserves and one for vernal pool restoration sites.
2. Criteria and guidelines for other mitigation banks will be developed.
3. Market-oriented conservation strategies will be developed.
4. Maps identifying high- and low-quality areas will be developed.
5. Tax incentives for landowners will be further investigated.
6. Conservation easements may be obtained for some potential preserve sites and other portions of the vernal pool ecosystem.
7. County and city General Plans will be amended to facilitate the Plan.
8. The Corps will develop a General Permit and Public Notice authorizing the county and cities to allow filling of low-quality vernal pool wetlands without additional agency review.



Conceptual Drawing of Vernal Pools and Swales

What is a vernal pool ecosystem and why is it important?

"Vernal pools" is a term used to refer to areas that pond water in the springtime and support primarily native annual vegetation, often growing in a pattern of concentric rings. The Santa Rosa Plain vernal pool ecosystem is made up of vernal pools and swales, grasslands, valley oak woodlands, and savannas. There are plants and animals that depend on vernal pools (or swales) for all or a part of their life cycle. Aside from sustaining a high level of native plant and wildlife diversity, vernal pool ecosystems also act as a natural reservoir for flood waters and a biological filter for stormwater.

How are potential preserve sites evaluated?

A "site" can be a single parcel of land or a contiguous area containing multiple parcels. A site does not have to be owned by one person. The purpose of the site selection process is to provide a means of objectively evaluating the wetland and biological information, land use information, and acquisition feasibility.

Sites were ranked on a scale from 1 to 5 in relation to a single criterion. A score of 5 represents the highest value for a criterion, while a score of 1 represents the lowest value for a criterion. This ranking provides valuable information about which sites are strongest for a given criterion.

The Task Force identified three evaluation categories: biological resources, land use, and acquisition feasibility. Within these three categories are criteria that have been assigned a weight according to their importance in determining the value of habitat quality. Each criterion was assigned a weight reflective of its importance (from 1 to 10, with 10 being the most important). For example, plants and animals considered endangered, threatened, or rare on federal and state lists received a weight of 10, while zoning received a weight of 2. The table on page 4 provides the evaluation criteria and their associated weights.

What is the difference between high- and low-quality sites?

The site evaluation process characterized two types of sites: high-quality habitat sites, including some that could become potential preserve areas; and low-quality habitat sites, which would not be considered as potential preserve areas and could be directed into a streamlined regulatory process. High-quality sites have a biological resources value of at least 125 and a total weighted value of at least 200. Low-quality sites have a biological resources value of less than 125 and a total weighted

(continued on page 4)

Evaluation Criteria for Potential Vernal Pool Preserves

Evaluation Criteria	Weight
BIOLOGICAL RESOURCES	
Listed Plants and Animals	10
Plant Species of Special Concern	6
Wildlife Species of Special Concern	6
Habitat Quality of Vernal Pool Ecosystem	10
Other Types of Habitat Values	5
Integrity of Resource/Levels of Disturbance	6
Habitat Size, Shape, and Defensibility	7
LAND USE	
Zoning	2
Existing On-Site Land Use	5
Land Use Designation	4
Adjacent Land Use	4
Land Use Policies	4
ACQUISITION FEASIBILITY	
Soil Suitability	6
Watershed Integrity	5
Restoration Effort Needed	6

(Continued from page 3)

value of less than 200. Areas for which there are incomplete data are grouped into an unknown category.

Twenty-seven sites have been identified as being potentially high-quality based on a preliminary review of information provided by the U.S. Fish and Wildlife Service and the California Department of Fish and Game. The 27 sites received total weighted values from 204 to 344. Although these sites are clearly high-quality sites, they will not automatically become potential vernal pool ecosystem preserves. Some are already vernal pool preserves, some will remain simply open space or agricultural land, and some may be used in vernal pool restoration efforts.

These may not be the only high-quality sites in the Santa Rosa Plain. There may be other areas that are high quality, but because of insufficient information about the biological resources present, they were not evaluated. A few low-quality sites were compared to high-quality sites to evaluate the degree of difference between them and determine the low-quality/high-quality threshold with respect to biological resources, land use, and acquisition feasibility.

So far, we know that about 5,400 acres within the Santa Rosa Plain may be high-quality habitat sites. The majority of the 27,000 acres determined to be potentially low-quality sites may not have vernal pool ecosystems. This determination was made based on an analysis of existing land uses. Existing land uses were determined by reviewing aerial photographs. Land uses that are urban, residential, industrial, rural residential, vineyard/orchard, or row crop/hayfield were considered to provide habitat incompatible with the characteristics of high-quality vernal pools. However, some of the low-quality sites will need to have their status verified and may be important for restoration.

High-quality habitat sites usually occur in open space areas characterized as oak woodland or grassland/rural. In addition, about 23,000 acres of the Santa Rosa Plain are of unknown habitat quality. With additional study during Phase II, specific sites in this category will be identified as potential preserves of high or low quality. During Phase II of the project, sites currently identified as being of low or unknown quality will be evaluated further.

What is the current regulatory process?

The Clean Water Act (CWA) protects wetlands, rivers, streams, estuaries, the territorial seas, ponds, and lakes. Section 404 of the CWA regulates the placement of fill (e.g., soil, sediment) into waters and establishes a permit program to ensure that such fill meets environmental requirements and the purpose of the Act. The Corps administers the Section 404 permit program.

The Corps can issue either an individual permit or a General Permit. An individual permit is issued after a case-by-case evaluation. Pursuing an individual permit requires a public notice, an analysis of alternatives, an environmental assessment, and a review to determine if the project is in the public interest. Mitigation of unavoidable impacts from the project may be required. Processing individual permits is costly and time-consuming for landowners and developers. On the other hand, a General Permit is issued on a nationwide or regional basis for a category of activities that are similar in nature and have minimal environmental impacts. A General Permit can be issued to a state or local regulatory authority when that authority is duplicating the Corps' regulatory program.

Nationwide Permits (NWPs) are General Permits issued anywhere in the United States. NWP 26 is a permit that allows landowners or developers to fill up to 10 acres of certain types of water and wetlands if environmental impacts are minimal. In September 1991, the Corps proposed to add a regional condition to NWP 26 for the Santa Rosa Plain, requiring permit applicants to submit a pre-discharge notification prior to undertaking any work. The proposed condition was motivated by concern over impacts to the unique wetland systems in the area and the proposed endangered species listing of three plants found only in the Santa Rosa Plain. In March 1994, the Corps set conditions on NWP 26 to prevent further impacts to wetlands on the Santa Rosa Plain.

Permits for the placement of fill in wetlands within the Santa Rosa Plain must also meet the requirements of the following laws and policies:

1. *Food Securities Act (Swampbuster Provision),* which withholds federal farm program benefits from persons who plant crops on a wetland that was converted by drainage, dredging, or any other means after December 23, 1985
2. *Section 401 of the CWA,* regulating discharges that could affect water quality
3. *California Wetlands Resources Policy,* which seeks to protect, preserve, restore, and enhance wetlands in California
4. *Federal Endangered Species Act,* protecting plants and wildlife species listed as endangered or threatened
5. *State Endangered Species Act,* which conserves, protects, restores, and enhances any endangered or threatened species and its habitat as defined by the California Department of Fish and Game
6. *California Native Plant Protection Act,* which defines rare and endangered plants and requires notification of impacts to those species
7. *California Environmental Quality Act (CEQA),* requiring state and local agencies to consider impacts to the environment in reviewing projects submitted for their approval
8. *National Environmental Policy Act (NEPA),* which requires federal agencies to consider impacts to the environment in reviewing projects submitted for their approval
9. *City and county plans, policies, and ordinances* which must also be observed

How will the Pla

The goals of the Plan will be accomplished through conservation easement, market-oriented, and regulatory strategies. The following strategies can be implemented prior to or in the absence of a development proposal or in response to a development proposal or activity. The strategies recommended in the Draft Plan reflect the needs and interests of landowners, local government, environmental concerns, and regulatory agencies.

Existing Preserves

The success of the Plan depends as much on the proper management of existing preserves as on the identification and selection of new ones. Managing existing preserves will involve periodic monitoring of the resources, maintaining the land, and managing buffer areas to protect key resources. Enhancement measures, such as developing agreements with neighboring properties that could serve as additional buffer zones, will be an integral part of the management strategy. Preserves can be managed by a local or regulatory agency, a specially created public/private partnership, or a private preserve manager or entity operating under a Memorandum of Understanding with regulatory agencies.

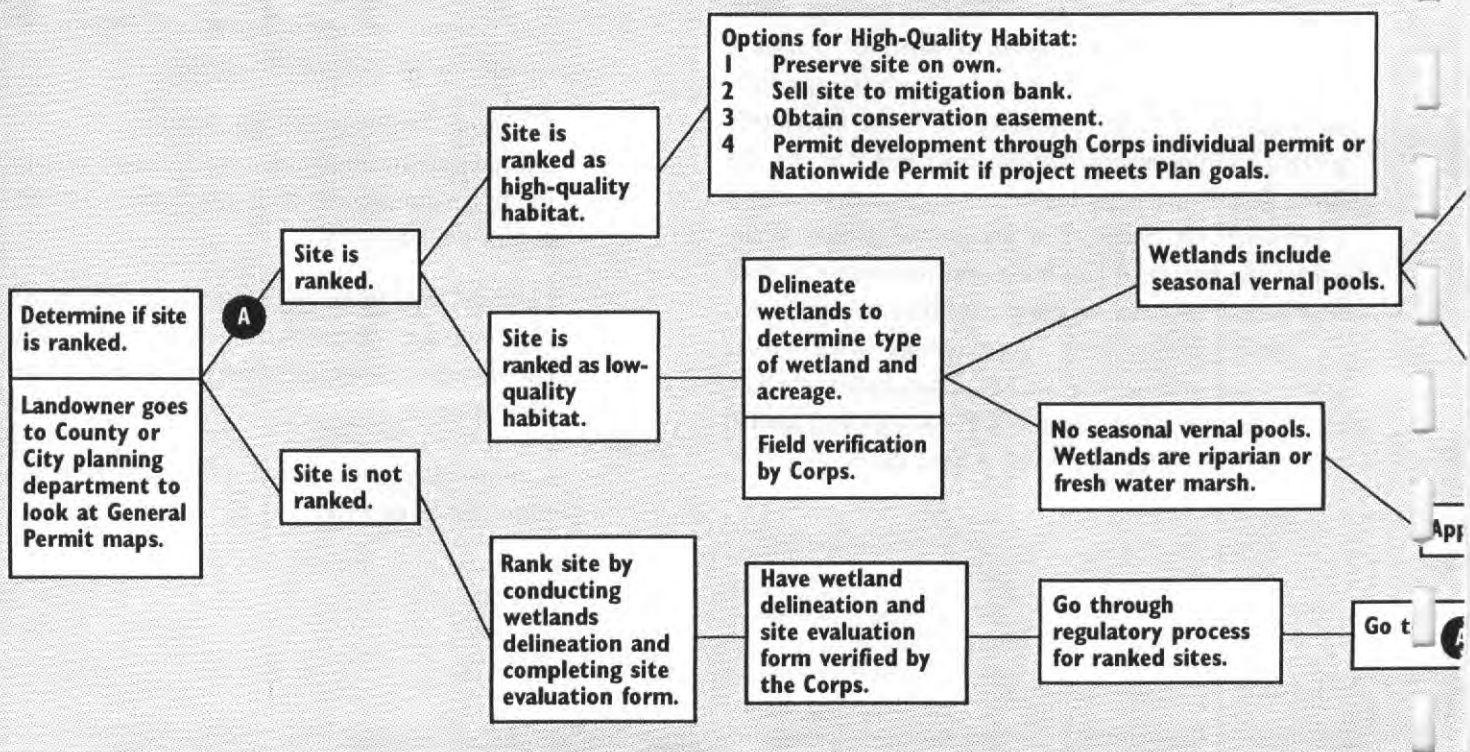
Conservation Easements

Conservation easements are a familiar method of land an resource conservation and protection in the Santa Rosa Plain. Conservation easements have been administered by the Sonoma County Agricultural Preservation and Open Spac District and the Sonoma Land Trust. An easement gives its owner some ("less-than-fee interest") but not all of the prop erty rights. Use of a conservation easement to preserve a ver nal pool ecosystem limits the landowner's ability to develop the property, grow crops, irrigate, or undertake activities tha might damage the vernal pool resources.

Permitting Implementation Strategies

A major goal of the Plan is to streamline the permitting pro cess so that low-quality vernal pool wetlands can be developed while high-quality vernal pool resources are protected Currently, landowners with development projects on sites wit high- or low-quality vernal pool ecosystem resources must pursue a CWA Section 404 individual permit with the Corps The figure below illustrates the current and streamlined permitting processes.

Flow Diagram of Site Ranking and Regulatory Process

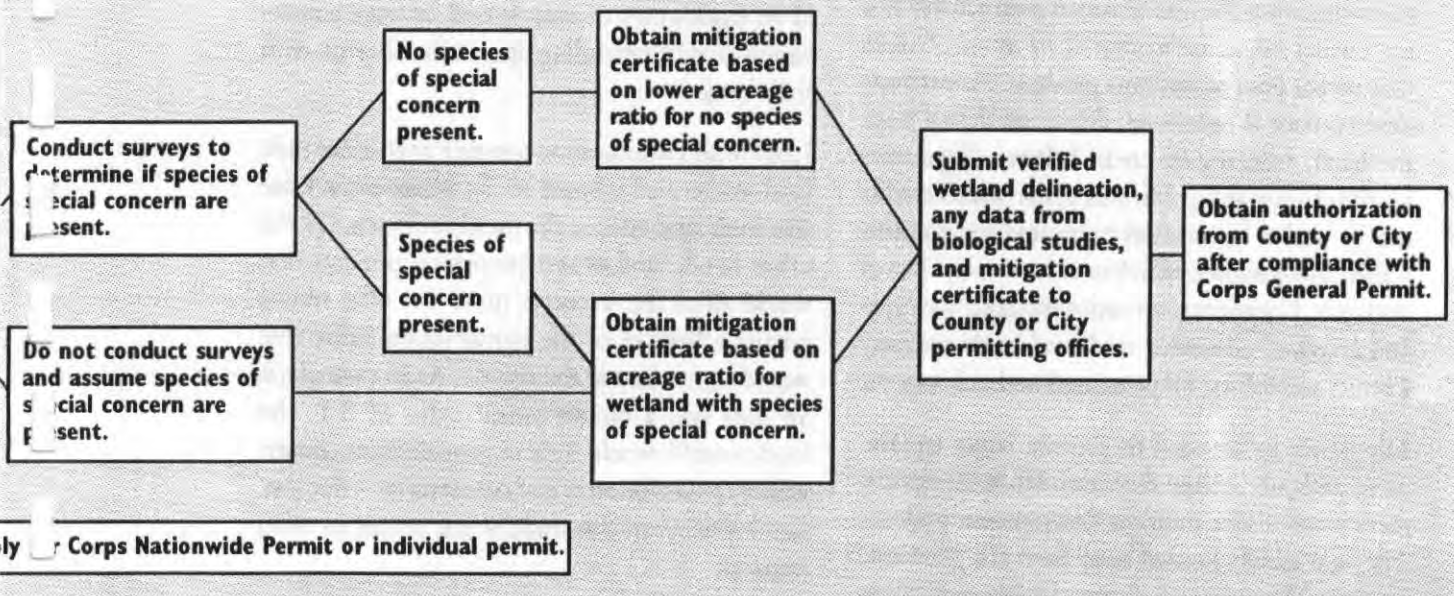


b implemented?

Under the Plan, development projects at sites having low-quality resources and no connection to high-quality sites may be rapidly approved and permitted under a General Permit given by the Corps for the Santa Rosa Plain and administered by Sonoma County, the cities of Santa Rosa, Rohnert Park, and Cotati, and the Town of Windsor. The General Permit will specify mitigation measures required for wetland fill activities at low-quality sites. The General Permit will also coordinate all requirements for federal and state protection of endangered species, provide the necessary water quality certification and authorization by the Regional Water Quality Control Board, and allow for coordination with the Natural Resources Conservation Service and the U.S. Department of Agriculture.

Landowners who want to pursue development projects on sites known to have high-quality vernal pool ecosystems will need to apply for a Section 404 individual permit from the Corps. The individual permit will require endangered species surveys, full endangered species coordination, analysis of project alternatives, and determination of whether the project is in the public interest, with the assumption that conserving and preserving these resources is in the public interest. If a project passes these reviews, it is likely that extensive mitigation will be required. The necessary mitigation measures will be developed on a project-by-project basis.

Projects proposed in areas where little or nothing is known about the quality of any vernal pool ecosystem habitat will be required to perform a resource assessment to determine whether vernal pool resources are present and whether they are of high or low quality. If, after the resource assessment, a site is found to have high-quality resources based on the criteria established in the Plan, then the proposer will need to pursue a Section 404 individual permit. If, however, the site contains low-quality vernal pool resources, it could qualify for the General Permit process. Finally, if no vernal pool resources are located on the property, the landowner will need to meet the Section 404 permit requirements.



Market-Oriented Strategies

The presence of sensitive plant and animal resources can increase the value of a parcel of land. By offering realistic and viable economic incentives, the Plan provides benefits to owners of the land with high resource values, in return for preserving or balancing those resources.

Three market-oriented strategies are recommended in the Draft Plan: mitigation banking, the Habitat Transaction Method, or HTM, and wetlands registry.

These strategies can be developed and implemented by individual, non-profit, and for-profit organizations and by federal, state, and local government.

Mitigation Banking

Mitigation banks are areas where wetlands are preserved, restored, or created to satisfy future compensation requirements when wetlands are filled. Once a bank is certified by regulatory agencies, it provides mitigation *credits* that can be traded for units of permitted wetland loss. The value of the credits is based on the bank- and area-specific wetland goals. For example, if a bank is established to compensate for the loss of vernal pool ecosystems, the credits might be measured in terms of units that vernal pool ecosystems produce. As wetlands development is permitted, debits are drawn from the bank, reducing its credit balance. Regulators set the criteria and guidelines under which credits can be traded for units of permitted wetland loss (called *compensation ratios*) to ensure no net loss of wetlands. Compensation ratios establish the types and levels of allowable trades of bank currency (credits and debits) for permitted wetland impacts.

Mitigation banks tend to provide larger replacement wetlands because they consolidate the replacement wetlands for multiple development projects. They are usually located away from the permitted projects. There are two classes of mitigation banks currently in operation: single-user banks and general-user banks. A single-user bank is one developed and used exclusively by a single development entity to provide for its own future mitigation needs. General-user banks provide for the future mitigation needs of multiple clients and produce mitigation credits for sale to entities other than the bank owner.

A stable, well-managed entity that understands preserve management and can compensate land owners for banking their high-quality resources will be needed for the Santa Rosa Plain. In addition, a general-user bank accommodating multiple developers of low-quality resource areas is also recommended. Integral to the success of the mitigation banks will be a mechanism to ensure that funds committed to the bank are adequate to preserve and/or restore the vernal pool ecosystem resources identified as part of the mitigation for permitted development.

Habitat Transaction Method

The HTM involves acquiring habitat reserves that meet specified conservation criteria by compensating landowners who preserve valuable habitat and requiring other landowners to mitigate project impacts. The criteria specified in the Plan will allow landowners to earn, spend, or trade conservation credits depending upon what they do with their land.

Landowners who agree to conserve or enhance their land receive credits based on the conservation value that their land adds to the preserve system. On the other hand, landowners proposing projects that would affect the resources must first offer several credits reflective of the conservation value that would be lost due to the project. As an example, if an area has a conservation ratio of 3:1, the landowner(s) would have to provide three conservation credits for every one conservation value lost. Landowners can also trade or sell credits to offset impacts.

With HTM, no arbitrary boundary lines are used to divide landowners into those who benefit from the Plan and those who do not. HTM efficiently

mitigates impacts because landowners can set aside land of sufficient conservation value or purchase credits from other landowners who have set aside habitat. By translating valuable habitat into economic value, landowners can realize the fair market value of their land. Landowners control their own destiny because they are not forced to preserve land or prevented from developing it.

HTM can be used to protect vernal pool ecosystems in large development areas. Property owners who have high-quality resources that should be preserved would receive conservation credits and be compensated by their neighbors who need to mitigate their impacts to develop their land.

Wetlands Registry

A wetlands registry would involve landowners who voluntarily pledge to preserve their wetlands or vernal pool ecosystems. Registries can be administered by local governments or private conservation groups. Participants in wetlands registries are publicly recognized for their contribution to wetlands preservation. Although wetlands registries may not be a major mechanism for long-term preservation of high-quality resources, they can be excellent mechanisms for educating and raising public awareness about the value of vernal pool ecosystems.

Santa Rosa Plain Vernal Pool Ecosystem Preservation Project Task Force

Member	Affiliation	Telephone
David Bannister	Sierra Club	(707) 578-3364
Charles Carson	Building Industy Association	(707) 584-9133
Jim Chaaban	Congresswoman Woolsey's Office	(707) 542-7182
Grant Davis	Congresswoman Woolsey's Office	(415) 507-9554
Carolyn Dixon	Sonoma County Wetland Watch	(707) 526-0820
Jeremy Graves	Sonoma County Planning Dept.	(707) 894-5798
Betty Guggolz	California Native Plant Society	(707) 524-7360
David Hansen	Sonoma Co. Agricultural Preservation & Open Space	(707) 944-5529
Ann Howald	California Dept. of Fish & Game	(707) 544-5575
Judy James	Sonoma County Farm Bureau	(707) 575-1409
Richard King	Soil Conservation Service	(916) 979-2120
Jan Knight	U.S. Fish & Wildlife Service, Endangered Species Branch	(415) 744-1974
Suzanne Marr	U.S. Environmental Protection Agency	(415) 744-3318
Sharon Moreland	U.S. Army Corps of Engineers	(707) 585-2195
Bob Muelrath	Sotoyome - Santa Rosa	(707) 527-1920
Charles Patterson		(510) 938-5263
Ruth Pratt	U.S. Fish & Wildlife Service, Wetlands Branch	(916) 978-4866
Chuck Regalia	City of Santa Rosa, Dept. of Community Development	(707) 543-3189
Scott Stinebaugh	Subregional Utility Division, Laguna Wastewater	(707) 543-3350
Nicholas Tibbetts	Habitat Mitigation Committee	(707) 523-2972
Tux Tuxhorn	Benjamin-Tuxhorn	(707) 545-1810
René Thériault Weber	Sonoma County Water Agency	(707) 526-5370
Carl Wilcox	California Dept. of Fish & Game	(707) 944-5525

What kinds of mitigation measures are proposed in the Plan?

The Plan recommends three kinds of mitigation: (1) preservation of existing high-quality vernal pool ecosystems; (2) restoration of areas that once had vernal pools and swales but were filled; and (3) enhancement of degraded low-quality wetlands. Each of these forms of mitigation can be conducted by an individual or a public or private organization. Compensation ratios for preservation, restoration, and enhancement activities are given in the table below.

Preservation

Through the mitigation banking system, high-quality vernal pool ecosystems identified in the Plan could be purchased and preserved. Restoration and enhancement may occur on some portions of the preserves. Pristine areas of preserves, however, would not be modified in any way.

Restoration

Areas to be restored were once wetlands. Restoration of wetlands would most likely occur through mitigation banks established for this purpose. Restoration will be considered in areas adjacent to preserves of high-quality resources or low-quality vernal pool ecosystem habitats.

Enhancement

Enhancement is encouraged to recover wetlands that once supported higher-quality habitat. Enhancement of low-quality vernal pool ecosystem wetlands would be conducted by a mitigation bank familiar with this method. Enhancement can benefit the overall preservation goals and objectives by increasing the quality of wetlands.

Creation

Creation of vernal pool wetlands in areas not known to have ever supported vernal pools is an experimental and controversial process because of the complexity of vernal pool and swale ecology. To date, attempts to create vernal pools have rarely been successful. Creation is not considered a mitigation option in the Plan.

Mitigation Ratios for Vernal Pool Ecosystem Impacts under a General Permit Application

Resource Impacted	Mitigation Ratio Total	Type of Mitigation	
HABITAT QUALITY	ACRES OF MITIGATION • ACRES IMPACTED	PRESERVATION	RESTORATION/ENHANCEMENT OF VERNAL POOLS
Low-Quality Habitat with Primary Species of Special Concern	3:1	2:1	1:1
Low-Quality Habitat with Biological Surveys Not Conducted*	3:1	2:1	1:1
Low-Quality Habitat without Primary Species of Special Concern	2:1	1:1	1:1

High-quality habitat areas are not included in the table of mitigation ratios since different ratios will apply under a Section 404 individual permit.

***Species of special concern assumed present.**

What happens next?

For the Plan to be implemented, a variety of activities need to take place. We have divided the activities into five categories that will be initiated simultaneously once the Plan has been finalized.

Confirm the configuration of the preserves

The habitat quality of each of the preserves will be verified to determine whether land uses have changed. During this assessment, species of special concern will be verified, and the specific boundaries of potential preserve areas will be mapped. The suitability for wetland mitigation of land adjacent to the preserves will also be assessed.

Design and establish mitigation banks and implement the Habitat Transaction Method

During Phase II, the criteria and specifications for the different types of mitigation banks will be developed, and agencies or organizations that will conduct and oversee the mitigation banks will be identified. Preserve management criteria and specifications will be developed, and a strategy for implementing the HTM will be defined.

Implement the regulatory process

One or more General Permits under CWA Sections 404 and 401 will be developed, and a public notice will be published. Approval of the General Permit conditions will be coordinated with all federal agencies. City and county General Plan Amendments will be developed, and an EIR/EIS will be prepared to meet the requirements of CEQA/NEPA.

Establish conservation easements

The Task Force will work with the Sonoma County Agricultural Preservation and Open Space District to determine how protection of vernal pool ecosystem resources can be accomplished through acquisition of conservation easements or fee interests in accordance with the District's Acquisition Plan.

Continue public outreach activities

Critical to the success of Phase II is designing a public outreach program that supports development of mitigation banks and implementation of the streamlined permitting process. Potential outreach activities include conducting workshops about mitigation banking; writing a quarterly newsletter about preservation efforts; and creating a mobile visual display of preservation efforts and successes. The Task Force will also assist the appropriate entities in developing a wetlands registry that could function as an outreach program. Educational and volunteer opportunities at preserve and restoration areas will also be explored.

Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan
Opportunities for Community Involvement

PUBLIC MEETING and OPEN HOUSE
May 10, 1995, from 7 to 9:30 p.m.

You are invited to a meeting regarding the preservation of vernal pool ecosystems in the Santa Rosa Plain. The U.S. Army Corps of Engineers will present the key elements and recommendations of the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan at

Santa Rosa Veterans Memorial Building
Lodge Room
1351 Maple Avenue (at Brookwood Avenue)
Santa Rosa, California

You will have the opportunity to ask questions and provide comments on the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan.

PUBLIC COMMENT PERIOD
May 1 - June 7, 1995

Give us your two cents! We encourage you to comment on the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan during the public comment period. Comments may be submitted verbally or in writing at the public meeting, or you can send written comments, *postmarked no later than June 7,* to

Niall McCarten
CH2M HILL
P.O. Box 12681
Oakland, CA 94604-2681

All comments will be considered and addressed in the Final Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan.

Where Can I Review the Draft Plan?

Copies of the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan are available for review at the following locations:

Sonoma County Central Library
Reference Desk
3rd and E Streets, Santa Rosa
Mon. 12:00 p.m. - 9:00 p.m.
Tues, Thurs, Fri, Sat 9:30 a.m. - 6:00 p.m.
Wed 9:30 a.m. - 9:00 p.m.
Sun 2:00 p.m. - 6:00 p.m.

Sebastopol Regional Library
Reference Desk
7140 Bodega Avenue
(at High Street)
Sebastopol
Mon, Tues 9:30 a.m. - 9:00 p.m.
Wed through Sat 9:30 a.m. - 6:00 p.m.

Petaluma Regional Library
Reference Desk
100 Fairgrounds Drive
(at East Washington)
Petaluma
Mon, Thurs, Fri, Sat 9:30 a.m. - 6:00 p.m.
Tues, Wed 9:30 a.m. - 9:00 p.m.

Chuck Regalia
Santa Rosa Department of
Community Development
P.O. Box 1678
Santa Rosa, CA 95402

Printed on Recycled Paper

Santa Rosa Plain Vernal Pool Ecosystem Preservation Project

Welcome

Public Meeting

May 10, 1995

Santa Rosa Veterans Memorial Building

How are potential high-quality sites evaluated?

- **How are potential high-quality sites evaluated?**
- **Sites evaluated using 15 criteria selected by the Task Force.**
- **Sites are ranked from 1 to 5 in relation to a single criterion.**
  Why? To demonstrate which sites are strongest for a given criterion.
- **Each criterion assigned a weight according to importance**
  Weights from 1 to 10 (10 being the most important).

Evaluation Criteria for Potential Vernal Pool Preserves

Evaluation Criteria	Weight
BIOLOGICAL RESOURCES	
Listed Plants and Animals	10
Plant Species of Special Concern	6
Wildlife Species of Special Concern	6
Habitat Quality of Vernal Pool Ecosystem	10
Other Types of Habitat Values	5
Integrity of Resource/Levels of Disturbance	6
Habitat Size, Shape, and Defensibility	7
LAND USE	
Zoning	2
Existing On-Site Land Use	5
Land Use Designation	4
Adjacent Land Use	4
Land Use Policies	4
ACQUISITION FEASIBILITY	
Soil Suitability	6
Watershed Integrity	5
Restoration Effort Needed	6

What is the difference between high- and low-quality sites?

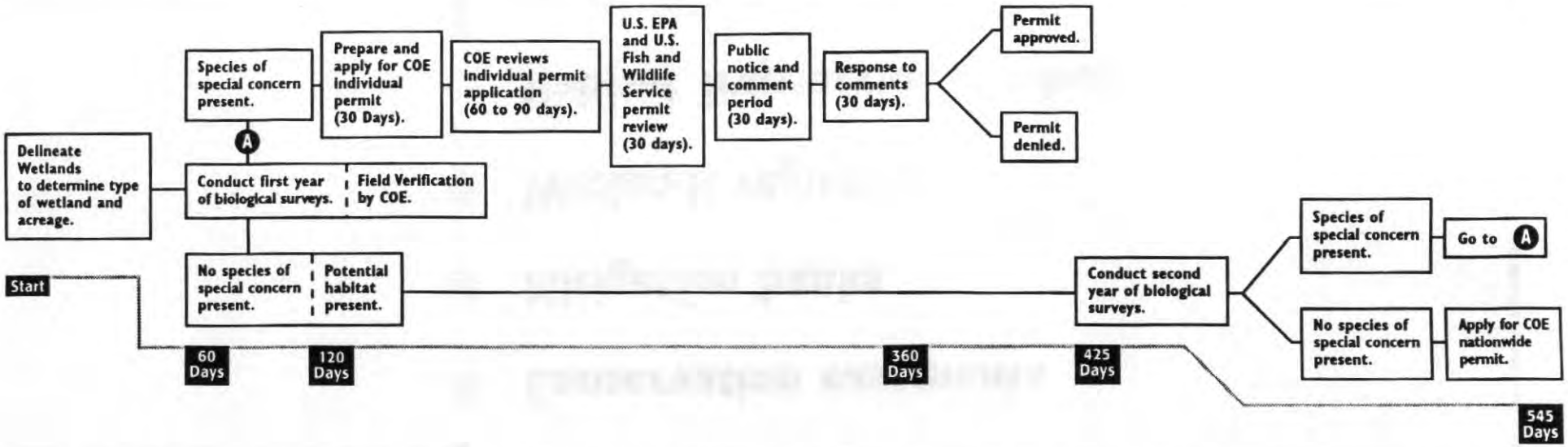
HIGH-QUALITY SITES

- **Could become potential preserve areas.**
- **Biological resource value of at least 125.**
- **Total weighted value of at least 200.**

LOW-QUALITY SITES

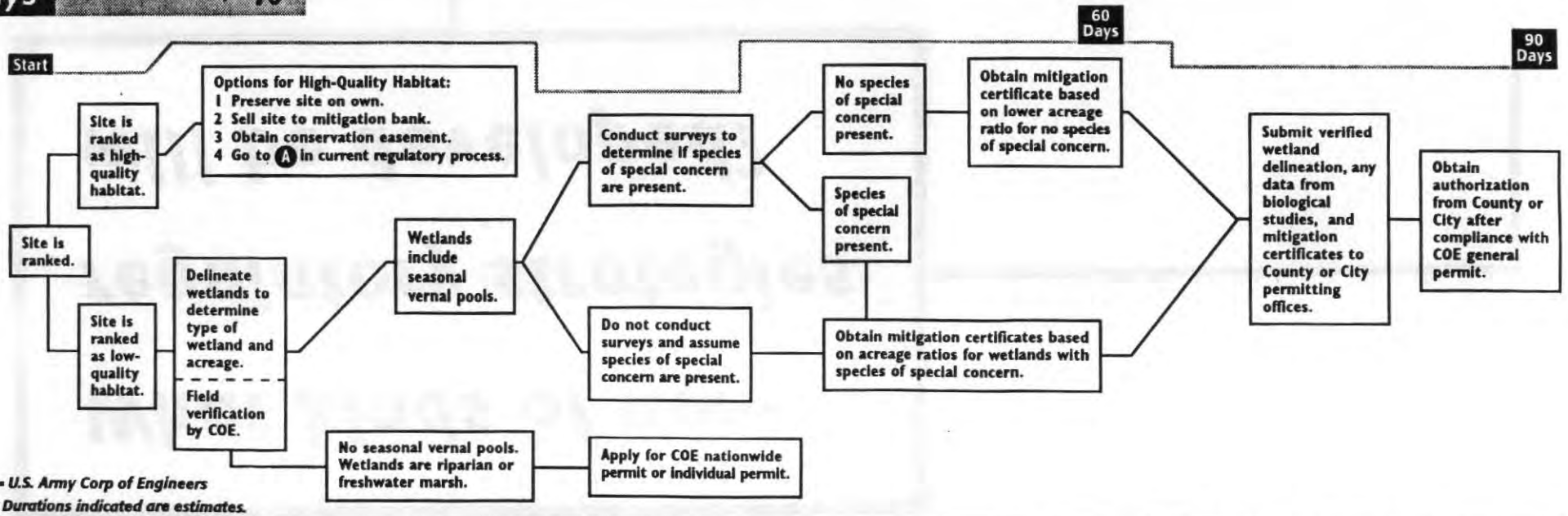
- **Sites that can be directed into the streamlined permitting process.**
- **Biological resource value of less than 125.**
- **Total weighted value of less than 200.**

Current Regulatory Process



Time in Days → 545

Streamlined Regulatory Process



COE = U.S. Army Corps of Engineers

Note: Durations indicated are estimates.

What kinds of non-regulatory strategies will be developed?

- **Conservation easements**
- **Mitigation banks**
- **Wetlands registries**
- **Habitat Transaction Method**

What mitigation measures are acceptable to the regulatory agencies?

- **Preservation**
- **Restoration**
- **Enhancement**

Mitigation Ratios for Vernal Pool Ecosystem Impacts under a General Permit Application

Resource Impacted	*Mitigation Ratio Total*	*Type of Mitigation*	
HABITAT QUALITY	ACRES OF MITIGATION : ACRES IMPACTED	PRESERVATION	RESTORATION/ENHANCEMENT OF VERNAL POOLS
Low-Quality Habitat with Primary Species of Special Concern	3:1	2:1	1:1
Low-Quality Habitat with Biological Surveys Not Conducted*	3:1	2:1	1:1
Low-Quality Habitat without Primary Species of Special Concern	2:1	1:1	1:1

High-Quality habitat areas are not included in the table of mitigation ratios since different ratios will apply under a Section 404 individual permit.

***Species of special concern assumed present.**

What happens next?

- **Confirm the configuration of the potential preserves.**
- **Design and establish two mitigation banks.**
- **Implement the regulatory process.**
- **Prepare maps of high- and low-quality areas.**
- **Amend county and city General Plans.**
- **Develop General Permit(s).**
- **Continue public outreach activities.**

Contents

Section		Page
B.1	Plant Species of Special Concern	B-1
	B.1.1 Primary Plant Species of Special Concern	B-1
	B.1.2 Secondary Plant Species of Special Concern	B-4
B.2	Wildlife Species of Special Concern	B-6
B.3	Conservation Biology Principles	B-8
	B.3.1 Reproductive Biology	B-9
	B.3.2 Genetic Variability	B-9
	B.3.3 Life History Strategy	B-11
	B.3.4 Population Biology	B-11
	B.3.5 Metapopulation Models and Distribution of Plant Species of Special Concern	B-13
	B.3.6 Population Viability Analyses and Minimum Viable Populations	B-13
	B.3.7 Special Plants/Animals	B-14
	B.3.8 Habitat Specificity	B-14
	B.3.9 Watershed Integrity	B-14
	B.3.10 Endemism in Vernal Pool Species	B-15
	B.3.11 Threats to Population of Vernal Pool Species of Special Concern	B-15
B.4	Preserve Design	B-16
	B.4.1 Island Biogeography and the Design of Reserves	B-16
	B.4.2 Spatial Pattern and Correctivity	B-16
	B.4.3 Shape	B-17
	B.4.4 Size	B-17
B.5	Soils	B-18
	B.5.1 Clear Lake Clays	B-19
	B.5.2 Huichica Loam	B-21
	B.5.3 Wright Loam	B-21
	B.5.4 Zamora Silty Clay Loam	B-21
	B.5.5 Haire Clay Loam	B-22
	B.5.6 Cotati Fine Sandy Loam	B-22
	B.5.7 Pajaro Clay Loam	B-22
B.6	References	B-23

Figures

Number		
B-1	Vernal Pool Soils	B-20

Appendix B

Additional Biological Data

B.1 Plant Species of Special Concern

Several plant species of special concern are known to occur in the seasonal wetland habitats (vernal pools, vernal swales, and vernal swale/pool complexes) within the Santa Rosa Plain. Three species—Sonoma sunshine (*Blennosperma bakeri*), Burke's goldfields (*Lasthenia burkei*), and Sebastopol meadowfoam (*Limnanthes vinculans*)—are federal- and state-listed as endangered. Another species, the many-flowered navarretia (*Navarretia leucocephala* ssp. *plieantha*), is proposed to be federally listed as endangered and is state listed as endangered. In addition to the above federally or state listed endangered species, additional plant species of concern known from the Santa Rosa Plain are described briefly below as secondary species of concern.

Because endangered species are considered most important during the vernal pool ranking process, these four endangered species are described in detail. Species with special status (federal candidates for listing and species included in the California Native Plant Society lists) that are found in vernal pools are taken into consideration during ranking; however, they are not considered as important to preserve design as those that are federally or state listed as endangered. Five species included in Section 3 of this report as Primary and Secondary Species of Special Concern found mostly in non-seasonal wetlands or uplands are not discussed further in this appendix.

Where possible, this discussion includes the historical distribution of the species, the number of populations thought extirpated or severely degraded, and the approximate number of populations believed extant, if known. The general distribution of extant populations relative to the Santa Rosa Plain is provided, and where possible, the number of extant populations protected is summarized. It is important to note that the acreage of protected areas includes only a small portion of land actually occupied by the species.

B.1.1 Primary Plant Species of Special Concern

Blennosperma bakeri

Blennosperma bakeri is distributed primarily in the central and southern part of the Santa Rosa Plain, west of the City of Santa Rosa. Populations of this species are generally segregated into two main groups, with one group north of Highway 12, and a second group south of Highway 12. Historically, about 50 populations were known within the Santa Rosa Plain Study Area (Patterson et al., 1994). Of these sites, about one-third are either extirpated or support habitat that is severely degraded. Many of the remaining extant populations are threatened by development or have not supported confirmed populations of *Blennosperma bakeri* in recent years. The southernmost population is located in habitat of unknown quality, just north of the Laguna de Santa Rosa. Adjacent sites range from minor topographically altered to significantly

historically altered. Only six populations are protected. The amount of protected *Blennosperma bakeri* habitat includes 120 acres designated as preserve area, but the amount of habitat containing the species is probably less than two acres (Guggolz, 1995). An additional 150 acres in easements also include some potential habitat for *Blennosperma bakeri*.

Of the six protected sites, only the CDFG Todd Road Ecological Preserve is publicly owned. The remainder of the protected sites are protected by conservation easements. One of these six protected sites is located in the central portion of the Santa Rosa Plain Study Area, northeast of the Sonoma County Airport. Three additional sites are located in the central portion of the Plain, north of Highway 12, with two sites located in the southwest portion of the plain, south of the Santa Rosa Air Center (Patterson et al., 1994).

Lasthenia burkei

Lasthenia burkei is distributed mostly in the northwestern and central areas of the plain. Two populations occur south of Highway 12, near the Laguna de Santa Rosa. Historically, *Lasthenia burkei* was well represented in the northern section of the Plain in the vicinity of Windsor (McCarten, 1985), but has since been nearly extirpated from that area (NDDB, 1994). Many populations within the central portion of the Santa Rosa Plain have also been extirpated due to urbanization and conversion of land to row crops. Outside of the Santa Rosa Plain, this species occurs at two locations in Lake County: Manning Flat and Steurmer Winery (McCarten, 1985; NDDB, 1994; USFWS, 1991). Within Lake County, extensive gully erosion at Manning Flat is destroying habitat for this species. These Lake County populations have been observed to differ morphologically (McCarten, 1985) and genetically (Crawford and Ornduff, 1989) from the Sonoma County populations.

About 85 populations of *Lasthenia burkei* are known currently or historically from the Santa Rosa Plain Study Area (Patterson et al., 1994). Of these, about half are either extirpated or the site quality is severely degraded. Of the remaining extant populations, many are small, or have not been seen for several years, and it is unknown if the species still occurs at the site. A total of 10 sites have been preserved in about 65 acres of habitat. Populations are afforded protection in the northwest, the central, and the southwest portion of the Santa Rosa Plain. These populations have been protected at the Sonoma County Airport south of Windsor by means of a memorandum of understanding between the airport and CDFG. This species is also afforded protection in the southwest portion of its range, where it is found at the CDFG Todd Road Ecological Preserve. In the central portion of this species' range, populations are found at the Bainbridge Preserve, and four other sites are protected by means of conservation easements. Of these protected populations, *Lasthenia burkei* has not been sighted at the Todd Road Preserve since 1987 (Patterson et al., 1994). Currently, only a few populations are located north of Windsor, and these are threatened by development (Patterson et al., 1994). Based solely on the distribution of protected extant populations, priority of future conservation efforts should be given to populations located in the northernmost and southern portions of this species range.

Limnanthes vinculans

Limnanthes vinculans is primarily distributed in the central and southern part of the Santa Rosa Plain. This endemic species is narrowly restricted in range, with populations almost exclusively restricted to the southwestern portion of the Cotati Valley, in Sonoma County (USFWS, 1991). This *Limnanthes* species was first collected in 1946, but was not described until 1969 by Ornduff (USFWS, 1991). Many populations previously occurred near the City of Santa Rosa, but most of these have been extirpated (Patterson et al., 1994). Outside of the Santa Rosa Plain, one population of this species was recently discovered in Napa County. However, this population is thought to have been introduced (CNPS, 1994).

Historically, about 49 populations were known from the study area; of these, slightly greater than one-quarter have either been extirpated or severely degraded (Patterson et al., 1994). Many of the remaining extant populations of this species are small and severely threatened. Of the extant populations, eight sites have been preserved in about 170 acres of habitat (excluding acreage of easements) (Patterson et al., 1994). However, only a small portion of this acreage is habitat for *Limnanthes vinculans*. Two of the eight protected sites are publicly owned: the CDFG Todd Road Ecological Preserve, and the Federal Emergency Management Authority (FEMA) site near the Santa Rosa Air Center. The remaining six sites are protected by means of conservation easements. Of the extant populations not currently protected, about eight potentially could be considered preserve sites, provided adjacent hydrology and land use are compatible. Of these eight sites, seven are known to support more than one of the four endangered plant species (Patterson et al. 1994).

Navarretia leucocephala ssp. *plieantha*

Navarretia leucocephala ssp. *plieantha* is found within the Santa Rosa Plain in one location only, south of the City of Windsor partially within the Shiloh Road West Potential Preserve Site. It is extremely limited in distribution, occurring only in Lake and Sonoma counties. Within these two counties, this *Navarretia* species is found only in moist habitats in volcanic ash vernal pool systems (CNPS, 1994; NDDB, 1994). Within Lake County, about half of the four extant occurrences are protected. One population at Bogg's Lake is owned by the Nature Conservancy. Another Lake County population located at Loch Lomond has been purchased by the Wildlife Conservation Board. Two other Lake County occurrences are located on private land and are not protected (CDFG, 1994).

Historically, within Sonoma County, this species occurred at Ledson Marsh (Bennett Mountain Lake), east of the City of Santa Rosa, and outside the Santa Rosa Plain (McCarten, 1985). The lake margin was severely affected by horseback riders and wild pigs, and was also affected by a *Eucalyptus* eradication program (NDDB, 1994). No plants were observed at this population during 1985 surveys, and this occurrence may be extirpated. There are no protected populations of this species within Sonoma County (Patterson et al., 1994).

B.2 Wildlife Species of Special Concern

The following section describes the special-status wildlife species found in vernal pools and swales within or near the Santa Rosa Plain Vernal Pool study area.

Syncaris pacifica

Syncaris pacifica (California freshwater shrimp) is endemic to gentle gradient, freshwater streams. Although is was historically common in portions of Marin, Napa, and Sonoma counties, more recently it has been found in only a few dozen streams, primarily in Napa and Sonoma counties. For this reason, the shrimp is recognized as an endangered species at both the federal (USFWS, 1988) and state levels.

This shrimp is frequently associated with tree-lined streams that have underwater vegetation and exposed tree roots, and whose beds and banks have not been altered or realigned. It does not tolerate brackish water. Full-grown adult shrimps may reach five centimeters (2.5 inches) in length. In perennial streams, the shrimp have been observed throughout most months of the year.

In Sonoma County, this shrimp is known from various streams and creeks in the Coast Range, west of Sebastopol and Graton, and in the vicinity of Cazadero. In the southeastern portion of the county, it is known from several drainages in the Sonoma Mountains between Sonoma and Glen Ellen.

There are no known occurrences of this shrimp in the study area. However, because the study area lies between two areas that support the shrimp and the shrimp occurs in a tributary to the Laguna de Santa Rosa, it could potentially occur within the study area wherever appropriate habitat is found.

Linderiella occidentalis

Linderiella occidentalis (California linderiella) is a sensitive species of fairy shrimp. This species is among the most characteristic inhabitants of temporary ponds and pools of water, especially vernal pools or other ephemeral bodies of water that form after winter rains. This species is absent from running waters.

California linderiella have been found in vernal pools within the study area during surveys conducted in the greater Santa Rosa area.

Ischnura gemina

Ischnura gemina (San Francisco fork-tailed damselfly). The San Francisco fork-tailed damselfly is typically found in shallow ponds and sluggish streams but has also been found in pools of faster-flowing water. Both the adults and aquatic immature stage are predaceous on other insects and invertebrates. Adults have been observed from late February through mid-November.

The San Francisco fork-tailed damselfly occurs in portions of Alameda, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties. In Sonoma County, this species has been found in the vicinity of the Sonoma State campus, and in several creeks that are tributaries to the Russian River. This species has been found in Washoe Creek, in the southern part of the study area.

Ambystoma tigrinum californiesne

Ambystoma tigrinum californiense (California tiger salamander). The California tiger salamander inhabits annual grasslands and oak savannahs in the valleys and low hills of central and coastal California. Extensive habitat conversion has eliminated this species from much of its former range. Adults spend most of their lives underground, typically in burrows of badger, gopher, and other animals. During winter rains, typically between November and March, adults emerge from these burrows to feed, travel toward breeding habitat, and court and breed. Vernal pools and quiet, semi-permanent waters such as ponds are preferred sites for egg-laying. After hatching in 2 to 3 weeks, the larvae are only a few inches long. The young salamanders continue to develop for 3 to 4 months until they metamorphose. Following transformation, juvenile salamanders seek out mammal burrows or deep cracks in the ground in which they remain until the next winter rains. The California tiger salamander is currently listed as a Category 1 species following a ruling by the USFWS (1994) that found endangered status "warranted but precluded" by higher-priority species. A ruling must, therefore, be published annually by USFWS regarding the species' status.

Rana aurora draytoni

Rana aurora draytoni (California red-legged frog). The California red-legged frog is found primarily in quiet pools of wetlands and streams in coastal drainages of California. Adult frogs require dense, shrubby or emergent riparian vegetation associated with deep still or slow moving water for foraging and breeding. Breeding typically occurs during early spring through July. Eggs are laid below the surface of the water in large clusters attached to shoreline vegetation.

There are no known occurrences of the red-legged frog in the study area. However, habitat exists within the study area that could potentially support this species.

Rana boylii

Rana boylii (foothill yellow-legged frog). The foothill yellow-legged frog is found in a variety of habitats, ranging from rocky streams and wet meadows to valley-foothill hardwood. Adults often bask on exposed rock surfaces near streams and take refuge under submerged rocks or sediments. This species rarely travels far from permanent water. Breeding occurs from mid-March to May, depending upon water conditions. Eggs are typically attached to gravel or rocks in moving water or near stream margins. Tadpoles require water for at least three or four months while completing their aquatic life stage.

The foothill yellow-legged frog has been found near Copeland Creek, south of the study area.

Clemmys marmorata marmorata

Clemmys marmorata marmorata (western pond turtle). The western pond turtle typically inhabits areas with permanent or semi-permanent sources of water, such as freshwater marsh, streams, drainage canals, and irrigation ditches with rocky or muddy bottoms and aquatic vegetation. They require basking sites, such as partially submerged logs, vegetation mats, rocks, and mud banks. Breeding occurs in early spring, with eggs laid from March to August predominantly in nests located in moist soil.

The western pond turtle has been found in the southern part of the study area in Washoe Creek.

Coccyzus americanus

Coccyzus americanus (western yellow-billed cuckoo). The western yellow-billed cuckoo is a secretive bird, inhabiting dense riparian habitat dominated by willows. Returning from their wintering areas in June, breeding occurs between June and July, with eggs laid between June and August. Nests are typically made in densely vegetated trees and shrubs, preferably willow. In California, nests have also been found in walnut and almond orchards. Once abundant in California, the western yellow-billed cuckoo has suffered a severe decline in population due to the loss of riparian habitat and diversion and channelization of rivers and streams.

According to records in the California Natural Diversity Data Base (CNDDB, 1995), the western yellow-billed cuckoo has historically been found in the riparian habitat within the study area. However, no observations of this species have been recorded since 1975.

B.3 Conservation Biology Principles

The development of a conservation plan that includes a long-term strategy for the survival of plant and animal species ideally involves recognizing and evaluating information on the following:

- Species life histories, such as annual versus perennial plants
- Reproduction, including ability to self-fertilize or the availability of pollinators for outcrossing species
- Population genetics and the understanding of genetic variability such as within and between vernal pools
- Species population distribution, such as whether the species is a narrow endemic or a rare, but broadly distributed taxon
- Population sizes

- Ecological genetics and habitat specificity, such as whether the species is restricted to particular soil types

Much of this type of information is not often known about most species, and best estimates need to be made or professional judgement used to evaluate the best conservation strategy. This section discusses these issues in general and as they apply to the Santa Rosa Plain vernal pool plants and animals.

B.3.1 Reproductive Biology

Many plants rely upon pollination vectors such as insects, birds or mammals to carry pollen or to disperse seeds to sites where they may then germinate (Ashley and Waaland, 1990). A mutualistic relationship between insect pollinators and vernal pool flowers demonstrates the inseparability of the vernal pool and upland ecosystems. Insect pollinators of vernal pool flowers include host specific (oligolectic) bees and generalist bees, syriphid flies, bee flies, and beetles (Zedler, 1987). Strong ecological and evolutionary associations have been shown between the oligolectic bees and the vernal pool flowers that they help pollinate.

Several species of the Adrenidae family are associated with *Blennosperma, Lasthenia*, and *Limnanthes*. Life cycles of the bees and flowering periods of the pollen host are synchronized. During drought years, when the host plants do not germinate or flower, the bees do not emerge. Some bees exhibit behavioral adaptations that increase the likelihood that they will pick up pollen and transfer it to a stigma. Because bees tend to forage within a single pool or a part of a large pool, pollen flow, and therefore gene flow, is restricted. This may explain why floral diversity is small among pools but large between pools (Thorp, 1990).

One example of this unique relationship between a pollinator and a vernal pool plant is seen in *Blennosperma bakeri. Blennosperma bakeri* is pollinated by a bee species, *Andrena (Diandrena) blennospermatis,* that is host-specific, meaning that this bee species collects pollen only from genus *Blennosperma* (Ashley and Waaland, 1990). Other insects also pollinate *Blennosperma bakeri*, and the proximity of other native plant species that serve as alternate sources of pollen or fruit may help attract and maintain populations on the site (Ashley and Waaland, 1990). Pollinators act as agents for gene dispersal, a critical element for long-term survival of a population or species, and also for pollen dispersal and seed set, which is critical for short-term survival. Therefore, proximity to other vernal pools or other native habitats that could support pollinators will be considered during the vernal pool preserve site selection process.

B.3.2 Genetic Variability

The maintenance of genetic diversity in a species is desired because it allows for adaptation to changes in the environment. Utilizing genetic data, if available, can be beneficial to developing a preservation strategy for a species. This has been found to be particularly true for small localized plant species (Ellstrand and Elam, 1993). In particular, species-specific information about inbreeding rate and the degree of tolerance to inbreeding is critical to the understanding of a rare species. Inbreeding is the expression of homozygous deleterious recessive alleles that

range, from different soils types, and those that have different micro-habitats will be included to maximize the potential for capturing the most amount of genetic variability within each species.

B.3.3 Life History Strategy

Most taxa present in vernal pools possess an annual life cycle. This strategy has probably evolved due to the need to quickly germinate and reproduce before the soil moisture has dried out (Stone, 1990). In addition, vernal pool soils are classified as hydric, meaning they are inundated or saturated until anaerobic conditions are developed in the upper soil horizons. Upon saturation, microbial activity rapidly consumes available oxygen in the water. Similar to many wetland plants, vernal pool species have developed alternative strategies for surviving in anaerobic environments, including tissue specialization.

In intermittently wet habitats, many species persist during the winter in a dormant form such as a bulb or rhizome. Alternatively, they may germinate in early fall and winter as "quasi-dormant rosettes" (Norwick, 1991). Growth is resumed when the water level begins to recede with the onset of warming temperatures. Vernal pool plants may also be aquatic, and thus be able to germinate under a cover of standing water. These species may either complete their life cycle as aquatics, or they may transition to a non-aquatic stage as the pool dries.

The pooling winter rains effectively "drown" out many species, including aggressive non-native grass species, but allows aquatic species to proliferate (Holland and Jain, 1981; Zedler, 1987). By late spring, these vernal pools will have completely dried up, leaving only a bare mud flat. The combined regime of pooling with water during the winter and complete desiccation by summer allows only those species adapted to amphibious conditions to persist. To survive in a vernal pool, a species must be capable of tolerating a wide range of environmental conditions (for example drought to extreme rainfall conditions), and also capitalize on the availability of favorable conditions and rapidly grow and reproduce (Zedler, 1987).

B.3.4 Population Biology

B.3.4.1 Vernal Pool Endemic Plant Populations

Historically, a vernal pool endemic plant population would have covered a considerably larger geographic area than it does currently. Previously, a population may have encompassed as much as 1,000 acres of land. Due to historic and recent land use changes, the extensive areas of vernal pool and swale complexes became fragmented, resulting in smaller, more isolated populations of the vernal pool endemic species. Populations of species of special concern that were considered in addressing the conservation biology goal and objectives included only naturally occurring populations and did not include populations that became established through translocation of seed or plants.

In order to identify specific geographic locations where vernal pool plant species of special concern occur, and address the conservation goals and objectives, a working definition of a vernal pool plant species population was needed. Populations of many different plant species are found growing in vernal pools and swales. Some of these plant species have populations

that grow only in vernal pools and are referred to as vernal pool endemic species. The plant species of special concern discussed in this plan are vernal pool endemics. Some plant species *populations* that occur in vernal pools and swales also occur in a broad range of wetland *habitats* such as freshwater marshes. Other species populations more often grow in the upland grassland and oak woodland habitats may invade the vernal pool areas during years having less rainfall. Due to these differences in the range of habitat requirements between the vernal pool endemic plants and the other species which occur in vernal pools and swales a clear distinction could be made through a definition. The definition allowed detailed analyses of the available biological data for the plant species of special concern.

Section 3.6.2 of the Plan gives a non-technical definition of plant populations. A more detailed concept was derived strictly for application to the Santa Rosa Plain with respect to the vernal pool endemic plants in the vernal pools and swales.

Technical Definition: A vernal pool endemic plant population—

> A group of individual plants of the same species that occupy a geographic area where the habitat of the vernal pool and swale complex are fully integrated as a hydrological unit whereby the majority of the seed dispersal would be from seasonal water movement through the vernal pools and swales. All populations of an endemic vernal pool plant species are restricted to vernal pool and swale complexes. Subpopulations within a population are recognized as specific vernal pools and swales where there are local areas of higher plant density. Some of the subpopulations may only be connected with other subpopulations during years when rainfall is sufficiently high to allow complete integration with all vernal pools and swales in a system.

The working definition above provided a framework to develop a conservation strategy for identifying the plant species of special concern, specifically the four endangered plant species. Based on the sets of data received from a study by Patterson, Guzzolz, and Waaland (1994) funded by the CDFG and USFWS, information on three endangered plant species was given specifically by parcel. Information taken from the Patterson et al. (1994) study and compiled by the California Natural Diversity Data Base (CNDDB) combined adjacent parcels in many cases to develop a mapping unit CNDDB refers to as an "element occurrence." An element occurrence (EO) presents a localized area of plants or groups of plants that occur within a 0.25-mile area. The mapping unit of EOs can take the form of a circular polygon or a complex polygon mapped onto USGS 7.5 minute scale topographic maps. For the purposes of achieving the conservation goals of the Plan, the conservation strategy used the CNDDB concept of EOs and those mapping units to identify strategic endangered plant locations. Overlays of CNDDB EOs were made onto potential preserve maps to identify areas that could be included in those preserves. A table (E-2) is presented in Appendix E, Potential High Quality Habitat Sites and Potential Preserve Sites, that identifies the EOs that are included in each of the potential preserve areas.

B.3.4.2 Population Size

The population size of vernal pool plants can fluctuate widely from year to year in response to rainfall and other environmental variables, while other populations of vernal pool plants remain seemingly consistent over the course of several years. Population sizes for the four listed species vary from populations with less than a dozen plants annually to consistently over 10,000 plants estimated at some populations. Based on a genetic study of *Limnanthes floccosa* ssp. *californica* (Dole and Sun, 1992), population size may have little relationship with genetic diversity, and a conservation plan for this species recommended preserving some small populations at the expense of some larger ones in order to have the highest level of genetic diversity. Some special status plant species with small population sizes have disappeared recently (Patterson et al., 1994). In the light of this type of information, small population size should not be considered to be an overriding factor in eliminating smaller populations from potential preserves.

B.3.5 Metapopulation Models and Distribution of Plant Species of Special Concern

The patchy spatial arrangement of the populations of *Blennosperma bakeri, Lasthenia burkei,* and *Limnanthes vinculans* is indicative of a metapopulation (the distribution of these species and other species of special concern within the study area is discussed above). The classical description of metapopulations is that of "populations persisting in a balance between extinction and colonization" (Harrison, 1991). A more recent definition suggests that "a metapopulation is any set of conspecific populations, possibly but not necessarily interconnected"(Harrison, 1994). Few examples of the classic metapopulation model could actually be found in nature. Other models include mainland-island metapopulations in which the mainland may be a single large or high-quality habitat patch which supplies propagules to the smaller patches and upon which the species fate rests alone; patchy populations in which patches are fragmented at so fine a scale that it may just include individuals and in which high dispersal rates link populations; and non-equilibrium metapopulations in which "conspecific populations are virtually or completely isolated from one another" (Harrison, 1994).

B.3.6 Population Viability Analyses and Minimum Viable Populations

Population viability analyses (PVA) can be used to determine the extinction probability (EP) and the minimum viable population (MVP) of small populations. Conservation strategies and reserve design make use of the information derived from PVAs. There are primarily two types of models for performing a PVA: stochastic and deterministic. There are four factors which may be included in stochastic models: genetic, demographic, and environmental stochasticity, and natural catastrophes (Menges, 1986).

Deterministic models are simpler than stochastic models. Using a matrix projection, equilibrium finite rate of increase (lambda), equilibrium age or stage structure, and reproductive values can be calculated. In an annual plant the dormant seed can be considered a separate stage. The major assumption in this type of model is that conditions do not change. This results in "unrealistic long-term predictions of exponential growth at stable age structure, leading to

either an infinite population size or certain extinction, depending on whether lambda is greater than or less than one" (Menges, 1992). Most of the plants in vernal pools are annuals; therefore, deterministic models are not recommended for use in this study.

B.3.7 Special Plants/Animals

The occurrence of species of primary concern (plant and animal species that are federally listed as endangered) is included during the application of the vernal pool rankings. The presence or absence of other secondary species of concern is also taken into consideration but is assigned less weight. For example, if two sites were ranked equal in value in all respects except that one site supported one secondary animal species, the site that supported the secondary animal species of concern would be considered to have a higher value. Also, sites that support significant populations of several plant or animal species of concern, or support both special status animals and plants would generally be considered of higher quality than a site that only supports one species of concern.

B.3.8 Habitat Specificity

Little is currently known about specific soil or other habitat requirements for the four endangered species. However, soils types within the Santa Rosa Plain appear to be somewhat correlated with the distribution of these species. *Lasthenia burkei* and *Blennosperma bakeri* grow mostly on Huichica loam, with a few populations occurring on Wright loam. A few populations of *Lasthenia burkei* also occur on Clear Lake clay loam in the southwestern part of the plain. *Limnanthes vinculans* grows mainly on Wright loam, with some populations on Clear Lake clay loam. It is generally accepted that preserves for vernal pools should be located in as many geographically diverse habitats as possible (Zedler, 1987) in order to capture the most genetic variation within a species. Although there are no data to suggest that genetically different individuals within a species are supported on different soils types, it would be prudent to include populations from different soil series during the Preservation Plan process. Also, many vernal pools differ at the level of microhabitat, and preserves should include as much variation at this level as feasible.

B.3.9 Watershed Integrity

Vernal pools occur in virtually all topographic settings on the Santa Rosa Plain. They are perched and isolated atop the small divides between watersheds that drain toward the vernal swales and the network of creeks that drain the Plain. They also occur on the vernal swales themselves. Although some of the vernal pools appear to be isolated hydrologically from even the smallest nearby drainages, most "spill" when they are filled to their capacities. When they spill, water finds the quickest routes downhill and flows over the ground surface into the vernal swales. Some vernal pools and vernal swales may exchange water through subsurface flow (Hanes, Hecht, and Stromberg, 1990).

This hydrologic connectedness is one of the fundamental bases for ecological relationships between vernal pools and other wetlands as well as the surrounding grassland habitats. The water carries nutrients, seed, soil, and small aquatic invertebrate organisms between vernal

pools and between vernal pools and the other wetlands and aquatic features on the Plain. In effect, the vernal pools and other wetlands function as a system that was originally linked without interruption. Today, drainage ditches, roads, orchards, housing developments, and other human features have severed many of the connecting links but the fragments of the original natural system still possess internal connections that remain intact and are critical to their continued function.

Given the importance of intact hydrology to the vernal pool ecosystem, the preserve planning and selection process will consider the integrity of the watershed a critical component in ensuring the long-term perpetuation of a vernal pool preserve.

B.3.10 Endemisim in Vernal Pool Species

Vernal pools and the associated swale complexes have been recognized as having the highest plant species diversity in terms of endemic plants relative to other habitats (Stone, 1990). Endemic plants are those that have evolved and only occur in particular habitats such as vernal pool and swale complexes. Many of the plant species that are known to only occur in vernal pools and swales are recognized as rare plants, many of which have special status (Stone 1990, Skinner and Pavlik, 1994). In addition to the high level of endemism, many native California vernal pool and swale plants are found primarily in vernal pools and swales and form a distinct flora (Stone 1990, Holland, 1986). At least six genera are restricted primarily to the California Floristic Province: *Downingia, Legenere, Limnanthes, Neostapfia, Orcuttia, and Pogogyne*. The diversity of plant species within individual pools is usually quite low, while the diversity among pools is generally high (Holland and Jain, 1977). These pools may be compared to individual islands surrounded by inhospitable habitat that are forced to apply a non-dispersal strategy, to avoid exporting seed into areas in which they would not germinate.

B.3.11 Threats to Populations of Vernal Pool Species of Special Concern

Threats can encompass a broad range of variables that could exert a negative influence on rare species. These can include: anthropogenic alteration or disturbance to habitat that supports a rare species (discing, wildlife harassment, off-road vehicle use); catastrophic events such as drought; long-term threats to the gene pool (inbreeding or loss of genetic diversity); fluctuations in the demographic makeup of the population; and stochastic or random events.

During the design of the preserve system, potential threats such as these listed above will be considered. In general, small preserves may have a higher risk of impact or endangerment from external influences (threats physically outside the preserve) (Shafer, 1990). One means of addressing this is to place buffers around preserves where possible so that land uses with the potential for high impact (those capable of altering the hydrology, severely compacting or otherwise negatively influencing wetland soils, or urban development), do not abut preserves.

B.4 Preserve Design

B.4.1 Island Biogeography and the Design of Reserves

Island biogeography is the study of isolates (Wilcox, 1980). Over the past 20 years or so there has been much debate regarding island biogeography and the design of nature reserves. Issues include the number, size, and shape of reserves. Because so much habitat has been fragmented, we are often dealing with isolates when we try to preserve a habitat. In his chapter on single large, or several small reserves (SLOSS) in *Nature Reserves: Island Theory and Conservation Practice*, Shafer (1990) concludes that "there may be no absolute hierarchy of conservation goals, or any 'right' list of reserve selection guidelines." However, for specific ecosystems and taxonomic groups there are better and worse approaches.

For example, where rare plants occur on limestone outcrops, several small reserves were considered to be the best arrangement (Shafer, 1990). Plants in vernal pool(s) may be considered similar to plants on limestone outcrops in that they are located in small areas with special edaphic or hydrologic conditions.

B.4.2 Spatial Pattern and Connectivity

Spatial pattern (how populations are distributed), and connectivity of populations should be considered during the vernal pool preserve design selection process. In general, populations of rare species should be located such that immigration and emigration of individuals may flow between populations, thereby reducing the effects of inbreeding depression to some degree. If no flow of individuals between populations is possible because of biological limitations (seed dispersal distance for example), or by anthropogenic or environmental barriers, each small population must be large enough to buffer itself from environmental and demographic threats in the short-term, and from the potential for inbreeding over the long-term.

Also, species have different reproductive strategies, and may periodically go extinct and then recolonize (wink), or they may be persistent (fixed). In general, populations that are fixed are likely to have increased genetic contribution over those that wink. Metapopulation connections (via corridors) have been widely regarded as a means to link populations, but have not been widely studied. In the case of the white-footed mouse, modeling studies predicted that metapopulations of the mouse that received no immigration were more likely to go extinct [than those that did receive immigrants] (Simberloff et al., 1987). It is generally believed that populations that are isolated will recolonize more slowly than those that are connected: however, species utilize corridors differently. Just because metapopulations are "linked" by corridors of habitat does not mean that this will effectively increase immigration between populations for all species.

To increase the chance of establishing and maintaining functional corridors between vernal pool preserves, variables such as the presence of pollinator agents, hydrological connections, anthropogenic or environmental corridor barriers, and land use will be considered during the preserve selection process.

B.4.3 Shape

The shape of a preserve can have a dramatic influence on the elements contained within it. For example, a narrow, linear-shaped preserve has a greater proportion of edge to interior than a round preserve. Thus, the linear-shaped preserve would be influenced more by factors present at the preserve edge. For example, an incompatible land use practice (such as heavy grazing or cropping) would have a greater negative influence upon the linear-shaped preserve, because there is less interior present to act as a buffer against negative influences. For example, some vernal pool ecosystem elements, such as swales, naturally follow a linear pattern, and these may need to have a larger buffer than rounded ones to compensate for the greater edge to interior ratio.

Within the Santa Rosa Plain, vernal pool buffers would most likely comprise upland grassland habitat. The shape of these buffer areas may affect the ability to protect rare elements located within the preserve. For example, the California tiger salamander, an aquatic wildlife species of concern, is known to breed within vernal pools and then oversummer in subterranean burrows within adjacent grassland habitat. The grassland buffer area would need to provide for the protection of the upland habitat of this species.

In particular, small preserves may have a higher risk of impact or endangerment from external influences (threats physically outside the preserve) (Shafer, 1990). Buffers should be placed around small preserves so that land uses with potential for high impact, such as urban development, do not abut these preserves.

B.4.4 Size

Preserve size is of great importance in the design process for several reasons. Preserve size may be correlated with population size of a rare species and also to species diversity. Large populations of rare species may be less susceptible to loss of genetic diversity and negative effects associated with inbreeding. However, data exist that conflict with the belief that larger population sizes are automatically better than small population sizes. According to a genetic study of *Limnanthes floccosa* ssp. *californica* (Dole and Sun, 1992), population size may have little relationship with genetic diversity. A conservation plan for this species recommended the preservation of some small populations at the expense of some larger ones in order to have the highest level of genetic diversity.

In vernal pools, the size of a population can fluctuate widely from year to year in response to rainfall and other environmental variables; however, some populations may also remain within a consistent range over the course of several years. Estimated population size for the four endangered plant species in the Santa Rosa Plain varies from populations with less than a dozen plants annually to consistently over 10,000 plants. Little species-specific data are available regarding the correlation of genetic fitness to population size, but it is generally thought that larger populations have higher genetic diversity than smaller population sizes.

It is believed that the smaller the population, the more difficult it is to counter the effects of inbreeding depression. The number of individuals required in a population to prevent

inbreeding in the short-term, and most important, over the long term, is simply not known. Because small populations are vulnerable to stochasticities, they are also more susceptible to "bottleneck events" (severe decrease in population size). During the initial crash in population size, a high amount of allelic variation may be retained; however, the longer that a population remains small, the more genetic variation is lost. In models of the effect of genetic drift on variation and allelic diversity, a constant population size of 50 individuals with 99 percent genetic variance remaining at year one had 36 percent remaining genetic variation after 100 generations. With smaller population sizes, genetic variation is lost at a more rapid rate. A constant population size of 10 individuals that possesses 95 percent variation at year one will have lost almost all genetic variation (less than 1 percent remaining) after 100 generations. For annual plants, a generation equals 1 year.

Also, small populations are particularly susceptible to extremes in chance events and are vulnerable to precipitous declines in population number. In addition, because their population number is already small, any decline in number may cause a drop below a safe threshold number and cause a species' extirpation (Falk, 1992). Each population lost out of only a *few* extant is a serious cause for alarm because it may lead to its eventual extinction. Within the Santa Rosa Plain, it has been noted that some special status plant species with small population sizes appear to be able to persist; however, other sites that support populations small in size have disappeared recently (Patterson et al., 1994).

The CDFG has emphasized that, for management purposes, preserves should be between 8 to 10 acres in size at minimum (Patterson et al., 1994). However, some plant and animal species of concern may be able to persist in smaller-sized preserves. Little information is available regarding the minimum preserve size needed to sustain species in the long-term. Also, the minimum viable population size for the four endangered species needed to establish self-sustaining populations has not been determined. Because some small isolated preserves may capture small pockets of genetic diversity, large population size should not automatically override the inclusion of small populations in the preserve selection process.

B.5 Soils

Most soils in vernal pools have been formed in alluvial materials and are heavily weathered. The parent material is variable, ranging from gravelly alluvium to sand dunes (Zedler, 1987). This variation in parent material means that a variety of soil types underlie vernal pools and swales in California as well as in Sonoma County. Despite this variation, all vernal pool soils have in common a surface or subsurface layer that restricts the movement of water and results in ponding during the wet season. The restrictive layer is usually a claypan or hardpan (Jones and Stokes, 1990). Most of the vernal pools and swales in the Santa Rosa Plain are underlain by dense clay, and a few have a cemented alluvium. Very few pools have a hardpan.

Vernal pool soils are referred to as hydric soils because they are "saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation" (U.S. Army Corps of Engineers, 1987). This ponding must occur for 7 to 30 days to be considered long enough. Hydric soils have an aquic soil moisture regime. This means that under the saturated conditions little or no oxygen is

dissolved in the soil (reduced environment). Hydric soils are usually classified in aquic suborders or subgroups.

Soil, along with climate, source biota, and site history are the primary factors that determine what vegetation is present in a particular area. In vernal pools, the depth and duration of standing water are the most important factors that affect vernal pool vegetation. Hydrology may work in combination with soil types to determine vegetation in vernal pools. According to a study by Holland and Dains (1990), local soil properties, such as depth to an impervious layer, may control the distribution of individual species within vernal pools.

Seven soil series have been mapped in Sonoma County that support vernal pools and swales: Clear Lake clay and Clear Lake clay loam, Huichica loam, Wright loam, Zamora silty clay loam, Haire clay loam, Cotati fine sandy loam, and Pajaro clay loam (Soil Conservation Service, 1972). Figure B-1 shows vernal pool soils. These soils comprise approximately 80 percent of the total acreage of the study area. It should be noted that vernal pool plant species are not restricted to the seven soil series described herein nor should it be construed that such species can be observed on all portions of these soil types. Most species actually occur on only a small portion of this area.

The following descriptions discuss the principal physical and chemical properties of these soils as they affect hydrology. The vegetation that is commonly associated with these soils is also discussed. Plant species of special concern that are found in the study area and the soils with which they are associated are discussed above under Habitat Specificity.

B.5.1 Clear Lake Clays

The surface layer ranges from dark gray to black, and is a medium to slightly acid clay (pH 6.0), about 39 inches deep. This is underlain by a dark gray, moderately alkaline clay (pH 8.0). At a depth of 46 inches is a gray and light brownish-gray, moderately alkaline clay. At depths of 60 to 72 inches, the soil ranges from light brownish gray to gray to light gray and white in color and from clay to sandy clay loam in texture. Lime is often found in the upper part of this horizon. The gravel content is variable, but not by more than 15 percent (Soil Conservation Service, 1972).

The dull-colored grays of this soil are caused by reduction of iron and manganese under anoxic conditions, and indicate regular and prolonged inundation of the soil profile. Permeability and runoff are slow, and soil nutrient levels are moderately high (Soil Conservation Service, 1972).

Riparian forest, perennial marshes, and season wetlands were originally associated with Clear Lake Clays (Patterson et al., 1994). In more recent times, these soils have usually been used for growing oat vetch hay and oat hay, with small areas used for irrigated pasture and row crops. Where not cultivated, the remaining vegetation is primarily annual or perennial grasses and forbs. Approximately 14 percent of the study area includes Clear Lake clay. It is commonly found in the vicinity of Cotati, Rohnert Park, and southern Santa Rosa.

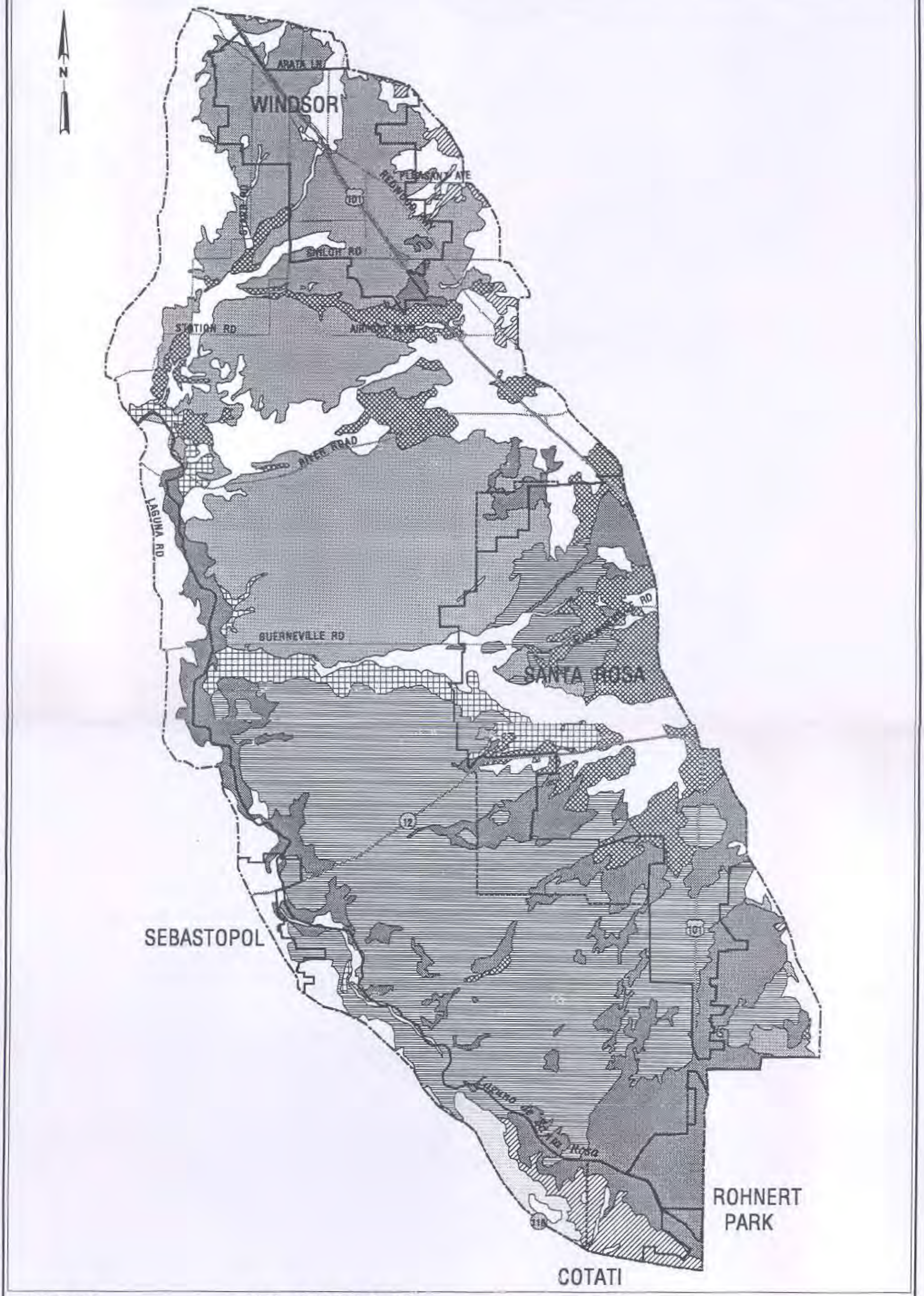


Figure B-1

Vernal Pool Soils

/gis/wbl/nadeem/rosa/maps/small/figs-1.aml
21 Feb 95 10:45:26 Tuesday

Plotted by CH2M HILL

B.5.2 Huichica Loam

The surface layer is a light brownish-gray to pale-brown or brown, strongly acid loam (pH 5.4) about 14 inches deep, underlain by a light-gray, strongly acid light sandy clay loam. At a depth of 23 inches, the light brownish-gray medium acid clay subsoil is about 7 inches thick. At a depth of 30 inches, the substratum is strongly cemented mixed sandy clay loam, loam sand, and sandy clay loam. Permeability is very slow, and runoff is slow. Soil nutrient levels are moderate; some moisture is slowly available from the clay subsoil (Soil Conservation Service, 1972).

Nearly all of this soil has been cultivated and is used mainly for vineyards, orchards, and pastures. In uncultivated areas, the vegetation is chiefly annual and perennial grasses, forbs, and scattered oaks (Patterson et al., 1994). Huichica loam and Wright loam are the most common soils in the study area, comprising approximately 26 and 27 percent of the study area, respectively. Huichica loam occurs mostly from northwestern Santa Rosa to Windsor.

B.5.3 Wright Loam

The surface layer ranges from 20 to 30 inches in depth and from very fine sandy loam to sandy clay loam in texture. The dry color of this horizon ranges from light brownish gray to light gray, with a pH range of 5.5 to 6.0. The subsoil ranges from 20 to 70 inches in depth, is a light brownish-gray clay and has a pH range of 5.5 to 7.0 (strongly acid to neutral). It ranges from weak to strong coarse or very coarse prismatic structure. A manganese stained incipient hardpan occurs below the subsoil. The substratum ranges from sandy loam to clay in texture. It is slightly acid to mildly alkaline. Some gravel may occur in the lower part of the substratum (Soil Conservation Service, 1972).

Permeability is very slow in the subsoil, drainage is somewhat poor, and runoff is very slow. Small amounts of water are available to plants from the clay subsoil. A water table develops above the clay subsoil as a result of heavy rain or irrigation, and persists well into the growing season (Soil Conservation Service, 1972).

Historically, vernal pool and swale vegetation grew in depressions among valley oak savannah containing bunchgrass (Waaland, 1990). The native vegetation was replaced first by pasture or prune orchard, and, in recent times, by dry and irrigated pasture and hay crops (Patterson et al., 1994). Wright soils are found in approximately 27 percent of the study area between western Santa Rosa and the Laguna de Santa Rosa.

B.5.4 Zamora Silty Clay Loam

The surface layer ranges from a slightly acid (pH 6.2) silty clay loam to a dark grayish-brown, neutral clay loam, about 29 inches deep. The subsoil ranges from dark grayish brown or dark brown to dark yellowish brown in color, and from clay loam to silty clay loam in texture, to a depth of 60 inches. The lower subsoil may be clay or gravelly clay. The pH ranges from neutral to slightly acid throughout the subsoil. Permeability is moderately slow in the subsoil, and runoff is slow (Soil Conservation Service, 1972).

The native plant communities consisted primarily of grassland and oak savannah. This soil is used mainly for orchards, vineyards, and pasture. Where not cultivated, the existing vegetation reflect its origins and is primarily annual and perennial grasses, forbs, and scattered oak trees (Patterson et al., 1994). Approximately 7 percent of the study area contains Zamora silty clay loam. It is found in Santa Rosa in the vicinity of Santa Rosa Creek and to the north near Mark West Creek.

B.5.5 Haire Clay Loam

The surface layer is grayish-brown, neutral, and slightly acid clay loam about 24 inches deep. The subsurface is about 12 inches thick and consists of pale-brown, strongly acid clay. The substratum reaches to a depth of 60 inches or more. It is a pale-yellow or pale-brown, strongly acid, very gravelly and cobbly clay loam (Soil Conservation Service, 1972).

Permeability is slow in the subsoil, and runoff is slow to medium. The available water capacity is 6 to 8 inches (Soil Conservation Service, 1972).

Haire clay loams are used primarily for dryland pasture, sheep, and cattle. Near Healdsburg, these soils are used for vineyards. Haire clay loams comprise 2 percent of the study area. It can be found in the southwestern and northeastern portion of the study area.

B.5.6 Cotati Fine Sandy Loam

The surface layer is light brownish-gray, grayish-brown, and light-gray, strongly acid fine sandy loam to a depth of about 22 inches. The subsoil is approximately 33 inches thick and is grayish-brown to light-gray. The subsoil is very strongly acid and extremely acid clay. The substratum reaches a depth of 55 inches and is light-gray, very strongly acid clay and softly consolidated marine sediment and sandstone (Soil Conservation Service, 1972).

Permeability is slow in the subsoil, runoff is medium, and the available water capacity ranges from 4 to 6 inches (Soil Conservation Service, 1972).

Dryland and irrigated pasture are commonly found on Cotati soils (Soil Conservation Service, 1972). This soil covers about 1 percent of the study area. It is located to the west of Haire clay loam in the southwestern portion of the study area.

B.5.7 Pajaro Clay Loam

The surface layer is grayish-brown, medium acid clay loam to 12 to 18 inches. Other layers reach a depth of 60 inches or more and are gray and grayish-brown, mottled, slightly acid and neutral. This soil contains a somewhat higher organic matter content than other Pajaro soils, resulting in a very dark surface layer when wet (Soil Conservation Service, 1972).

Runoff is very slow, or the surface is ponded and the available water capacity is 9 to 11 inches (Soil Conservation Service, 1972).

This soil is used mostly for pasture, but some areas have corn (Soil Conservation Service, 1972). Pajaro clay loam covers 3 percent of the study area and is found primarily along the Santa Rosa Flood Control Channel.

B.6 References

Ashley, C. and M.E. Waaland. 1990. A petition to the State of California Fish and Game Commission. *Blennosperma bakeri*. May 4, 1990. 11 pp.

Barbour, M.G. and J. Major. 1988. Terrestrial Vegetation of California. California Native Plant Society. Special Publication No. 9.

Boyce, M.S. 1992. Population Viability Analysis. Annu. Rev. Ecol. Syst **23**: 481-506.

California Department of Fish and Game. 1994. Annual Report on the Status of California State Listed Threatened and Endangered Animals and Plants. 1992. State of California. The Resources Agency, Department of Fish and Game. Sacramento, California. 203 pp.

Dole, J.A. and M. Sun. 1992. Field and genetic survey of the endangered Butte County Meadowfoam - *Limnanthes floccosa* subsp. *californica* (Limnanthaceae). Conservation Biology **6**(4): 549-558.

Falk, D.A. 1992. From Conservation Biology to Conservation Practice: Strategies for Protecting Plant Diversity. In: P.L. Fiedler and S.K. Jain, Eds: Conservation Biology. The Theory and Practice of Nature Conservation Preservation and Management..

Hanes, W.T., B. Hecht and L.P. Stromberg. 1990. Water Relationships in the Sacramento Region, California. In D.H. Ikeda and R.A. Schlising, 1990. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation.

Harrison, S. 1994. Metapopulations and Conservation. In: P.J. Edwards, N.R. Webb, and R.M. May. 1994. Large-Scale Ecology and Conservation. Blackwell Scientific Publications, Oxford, England.

Hickman, J.C. 1993. The Jepson Manual, Higher Plants of California. University of California Press, Berkeley and Los Angeles, California.

Holland, R.F. and S.K. Jain. 1977. Vernal Pools. In: Barbour and Major, 1988. Terrestrial Vegetation of California. California Native Plant Society. Special Publication No. 9.

Holland, R.F. and S.K. Jain. 1981. "Insular biogeography of vernal pools in the Central Valley of California". American Naturalist. 117:24-37.

Holland, R.F. and V.I. Dams. 1990. The edaphic factor in vernal pool vegetation. In: D.H. Ikeda and R.A. Schlising, 1990. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation.

Ikeda, D.H. and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation.

Jones and Stokes Associates, 1990. Sacramento County Vernal Pools, Their Distribution Classification, Ecology, and Management. Prepared for County of Sacramento, Planning and Community Development Department.

Jones and Stokes Associates. 1992. Vernal Pool Master Plan for Sacramento County. Sacramento, California.

Lacy, R.C. 1992. The effects of inbreeding on isolated populations: Are Minimum Viable Population Sizes Predictable? In: P.L. Fiedler and S.K. Jain, Eds. 1992. Conservation Biology. The Theory and Practice of Nature Conservation Preservation and Management.

Lande, R.L. 1988. Genetics and demography in biological conservation. Science **241**: 1455-1460.

Menges, E.S. 1986. Predicting the future of rare plant populations: demographic monitoring and modeling. Natural Areas Journal **6**: 13-25.

Menges, E.S. 1992. Stochastic modeling of extinction in plant populations. In: P.L. Fiedler and S.K. Jain. 1992. Conservation Biology. The Theory and Practice of Nature Conservation Preservation and Management.

Norwick, S.A. 1991. "Vernal Pools and Other Seasonal Bodies of Standing Water". Fremontia. Vol. 19, No. 3.

Patterson, C.A., B. Guggolz, and M.E. Waaland. 1994. Seasonal Wetland Baseline Report for the Santa Rosa Plain, Sonoma County. Prepared for Ann Howald, California Department of Fish and Game. June 30, 1994.

Schaffer, H.B., R.N. Fisher, and S.E. Stanley. No Date. Status Report: The California tiger salamander (Ambystoma californiense). Final report to the California Department of Fish and Game, Inland Fisheries Division. Contracts FG 9422 and FG 1383.

Shafer, C.L. 1990. Single large, or several small reserves (SLOSS) and beyond. In: Shafer, C.L. 1990. Nature Reserves: Island Theory and Conservation Practice. Smithsonian Institution Press, Washington, D.C.

Shafer, C.L. 1990. Nature Reserves: Island Theory and Conservation Practice. Smithsonian Institution Press, Washington, D.C.

Simberloff, D. and J. Cox. 1987. Consequences and Costs of Conservation Corridors. Conservation Biology. (68)1, pp. 63-71.

Soil Conservation Service. 1972. Soil Survey of Sonoma County, California.

Soulé, M.E. and B.A. Wilcox. 1980. Conservation Biology. An Evolutionary–Ecological Perspective. Sinauer Associates, Sunderland, Massachusetts.

Stone, D.R. 1990. California's endemic vernal pool plants: Some Factors Influencing their Rarity and Endangerment. In: D.H. Ikeda and R.A. Schlising, Editors. 1990. Vernal Pool Plants, their Habitat and Biology. California State University Chico Herbarium Publication No. 8. The University Foundation. 178pp.

Thorp, R.W. 1990. Vernal pool flowers and host-specific bees. In: D.H. Ikeda and R.A. Schlising. 1990. Vernal Pool Plants, Their Habitat and Biology. Studies from the Herbarium, California State University, Chico, No. 8. The University Foundation. 178pp.

U.S. Army Corps of Engineers. 1987. Corps of Engineers Delineation Manual.

U.S. Fish and Wildlife Service (USFWS), 1991. Federal Register. Volume 56, No. 1. December 2, 1991. Pp 61173-61182.

Wilcox, B.A. 1980. Insular ecology and conservation. In: Soule, M.E. and B.A. Wilcox. 1980. Conservation Biology, An Evaluation–Ecological Perspective. Sinauer Associates, Sunderland, Massachusetts.

Zedler, P.H. 1987. The Ecology of Southern California Vernal Pools: A Community Profile. Technical Report for National Wetlands Research Center, U.S. Fish and Wildlife Service. 136pp.

Personal Communication

Eakins, D., graduate student, Sonoma State University.

Harrison, S., Lecture in Issues in Conservation Biology, ECL 208, February 4, 1994.

SOUTH PACIFIC DIVISION
SAN FRANCISCO DISTRICT

US Army Corps
of Engineers

PUBLIC NOTICE

NUMBER: 93-4 (Final) DATE: 28 March 1994

Regulatory Branch
211 Main Street
San Francisco, Ca. 94105-1905

I HISTORY AND BACKGROUND

On September 13, 1991 the Corps of Engineers (Corps) issued Public Notice No. 91-3, proposing to add a regional condition to Nationwide Permit 26 (NWP 26) for the area of the Santa Rosa plain. The proposed condition would have required submission of a Pre-discharge notification prior to undertaking any work under the provisions of the nationwide permit. The Corps would then make a determination (a) that the work could be authorized under NWP 26, or (b) that an individual permit authorization would be required. The amount of acreage involved would not have been a determining factor in this decision.

The proposed condition was motivated by the growing concern over impacts to the unique wetland systems of the area, and by the proposal to list three plant species endemic to those wetlands (Blennosperma bakeri, Baker's sticky-seed; Limnanthes vinculans, Sebastopol meadowfoam; and Lasthenia burkei, Burke's goldfields) as endangered species under the federal Endangered Species Act (16 U.S.C. 1531).

On December 2, 1991 the United States Fish and Wildlife Service listed the plants as Endangered. On December 20, 1991 the Corps again issued a Public Notice to inform anyone placing fill Corps jurisdiction in the Santa Rosa plain that, because of the listing, all work both ongoing or proposed, must be reviewed by the Corps. This requirement was imposed to ensure that the newly listed species were adequately considered and protected.

On March 11, 1993 the Corps issued Public Notice No. 93-4 relaying the Corps' intent to suspend NWP 26 in the Santa Rosa plain. This additional step was initiated because of a developing awareness of the unique biology of the wetlands of the Santa Rosa plain, an increased appreciation for the difficulties of mitigating for those complex systems, and an increased awareness of the cumulative adverse impacts which have been imposed on those systems.

Many respondents to that Public Notice asked for a public hearing to express their views on the proposed suspension.

II PUBLIC HEARING

In response to requests the Corps held a public hearing on June 9, 1993. More than two hundred people attended the meeting and many testified. Several speakers provided comments that seemed to reflect misunderstandings of the Corps program and misconceptions about the wetlands of the Santa Rosa plain.

Several commenters suggested that vernal pools in urban areas should be filled and mitigated at the Laguna de Santa Rosa where there were "real" wetlands. While restoration at the Laguna could be an important ecological benefit, such restoration cannot replace the values of vernal pools. The wetlands at the Laguna and vernal pools are different types of wetlands, each with their own plant and animal species, and each with their own unique values. Because of the different soil types at the Laguna, it would be not be possible to reproduce true vernal pools there. Furthermore the Corps holds the view producing wetlands of another type is not appropriate mitigation for the loss of vernal pools.

Many commenters suggested a size limit below which vernal pools could be filled under NWP 26. Many vernal pools are small but their size does not always correspond with their ecological value or their importance to an overall wetland system. Some small wetlands include

important biological functions which cannot be reliably reproduced. The Corps feels it necessary to provide more protection for even these small pool areas.

Other commenters suggested that wetlands within the urban boundaries could be filled and mitigation obtained outside the urban areas. The urban boundaries were not drawn with sufficient consideration of the important biological resources found in wetlands. There are clearly wetland areas of very high values within urban boundaries in the Santa Rosa plain. An urban setting does not necessarily reduce the values of a wetland nor imply that they are not valuable wetland resources.

Several commenters raised the issue of natural, "pristine" wetlands versus man-made or artificial wetlands. It should be noted that the Clean Water Act does not differentiate between natural and altered wetlands. Corps regulations require that wetlands be evaluated on the basis of identifiable functions and values, regardless of the wetland's history. The Corps recognizes that there are few, if any wetlands that have not been affected by human activity. Furthermore the relative degree of disturbance does not necessarily define the value of a wetland.

Several commenters represented that the proposed suspension of NWP 26 was "unprecedented". This is not the case. The Corps New England Division has revoked NWP 26 for the entire state of New Hampshire. Both the Sacramento District and the Los Angeles District have taken action to suspend or condition NWP 26 in two separate areas in California. There are precedents across the nation for modification and/or suspension of nationwide permits on a local, regional or statewide basis.

III. DECISION PROCESS

San Francisco District has considered several options regarding the use of NWP 26 in the Santa Rosa plain. One option is the one described in the Public Notice No. 93-4, the complete suspension of NWP 26. A complete suspension would be unambiguous, both to the regulated public and to other agencies. Such an action would require that all fills within jurisdictional areas be authorized through the individual permit process and insure full consideration of wetland resources. However, the Corps recognizes that some jurisdictional areas may include lands which do not have important wetland resources and which could reasonably be authorized for filling by an abbreviated process.

The Corps also considered the option of retaining NWP 26 in its current status, i.e. with the required pre-discharge notification and subsequent review by the Corps. We would continue to use our discretionary authority to require individual permits to protect important resources. This option retains the flexibility of the NWP program but imposes additional review requirements and does not define the criteria for decision making.

The Corps has also considered a third option of imposing stricter conditions on NWP 26 than those currently in place. We have decided that strict conditions can ensure appropriate resource protection, will provide the public with understandable criteria, and will still allow easy permitting of projects that include fill of wetland areas that have only minimal resource value. We have, therefore, decided to retain NWP 26 and to impose strict conditions on its use in the Santa Rosa Plain.

Upon the recommendation of the San Francisco District Engineer and in conformance with the Corps' regulations, the Division Engineer, South Pacific Division, is promulgating the following Special Conditions applicable to Nationwide Permit #26 within the geographic area of the Santa Rosa Plain (see attached map). These conditions are effective as of the date of this Public Notice.

IV. CONDITIONS FOR NWP 26 IN THE SANTA ROSA PLAIN

1. The Corps retains complete discretion to determine the appropriate form of authorization for any fill or excavation proposed in Corps jurisdiction on the Santa Rosa plain. All proposals must be submitted to the Corps for review and for the Corps' decision on the appropriate mechanism for authorization. There is no minimum size of fill that is exempt from this requirement. Fill placed without the Corps' review and authorization constitutes a violation of the Clean Water Act.

2. Fill in wetlands which have all of the following characteristics may be authorized by NWP 26:

a. Lack of past or present evidence that rare or endangered plant or animal species, or their habitat, are present supported by appropriate surveys being done); and

b. Are dominated in all seasons by perennial plants or exotic annual plants; and

c. Are not contiguous with or hydrologically connected with wetlands described at 3, below; and

d. The fill of which would not affect wetlands described at 3, below.

The Corps retains the discretion to make final decisions on whether or not a particular project qualifies for NWP 26. Any recent change in management activities, or any other activities which could be interpreted as degrading/changing the plant community will be considered reason to require an individual permit.

3. Fill of wetlands which have one or more of the following characteristics can be authorized only with an individual permit:

a. Contain a more than minimal component of native wetland plant species (at any season) based on appropriate measures of either density, frequency or abundance which are derived from scientifically sound sampling methods; or

b. Would contain such a component of native wetland plant species without recent or on-going human intervention; or

c. Are contiguous with wetlands so dominated; or

d. Support, or have a history of supporting any federally proposed or listed threatened or endangered species.

Milton Hunter
Brigadier General, U. S. Army
Division Engineer

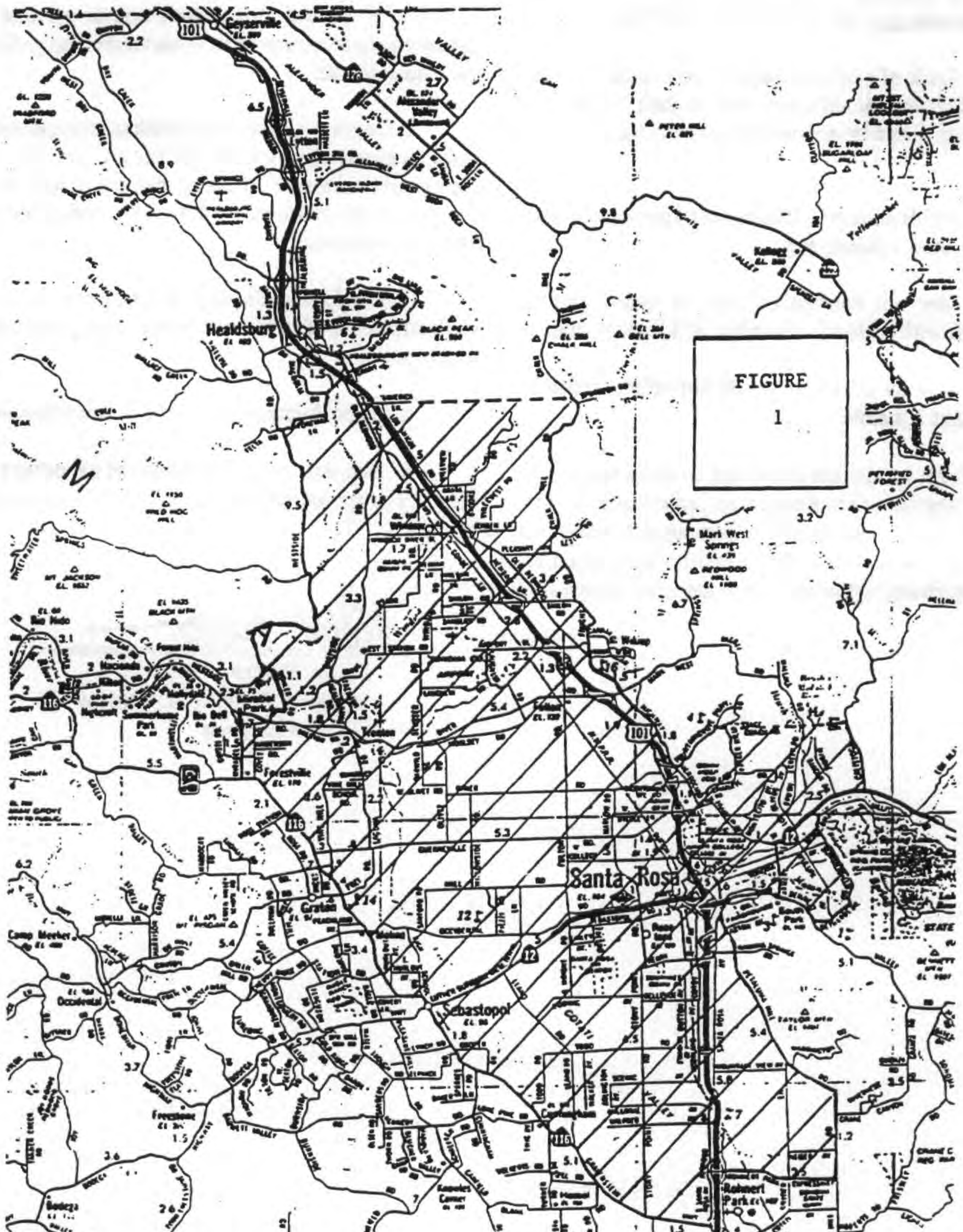

Geyserville
Alexander Valley
Healdsburg
Kellogg
Mark West Springs
Forestville
Graton
Santa Rosa
Sebastopol
Camp Meeker
Occidental
Freestone
Bodega
Valley Ford
Bloomfield
Rohnert Park
Cotati

FIGURE 1

Table D-1
Habitat Quality Site Evaluation Criteria

ISSUE	low<<		RANK		>>high	WEIGHT
	1	2	3	4	5	1 - 10
Biological Resources						
Listed Plant Species	No occurrences and no potential habitat.	No occurrences but potential habitat.	Known occurrences.	Occurrence of Significant populations; edge of distribution.	Significant populations of more than one listed species	10
Plant Species of Special Concern	No occurrences and no potential habitat.	No occurrences but potential habitat.	Known occurrences.	Occurrence of significant populations.	Significant populations of more than one special species.	6
Wildlife Species of Special Concern	No occurrences and no potential habitat.	No occurrences but potential habitat for one species.	Significant Amount of Habitat for One species. Known occurrences for significant portion of life cycle.	Some Habitat for Several Species. Significant populations for a significant portion of life cycle.	Significant habitat for more than one special species.	6
Habitat Quality[a] of Vernal Pool Wetlands	None Present or Severely degraded vernal pool/swale wetlands.	Marginal, Somewhat disturbed vernal pool/swale wetlands.	Moderate quality vernal pool/swale wetlands.	High quality vernal pool/swale wetlands.	Pristine vernal pool/swale w/ no degradation.	10
Other Types of Habitat Other Than Vernal Pool Wetlands	Habitats present are of limited value.	Habitats present are of significant value.	Habitats present include other terrestrial habitats of interest.	Habitats present contain rare or unusual habitats or plant communities.	Other wetland or riparian habitats of interest present. Multiple habitats.	5
Integrity of Resource/Level of Disturbance	Significant disturbance to a degree that no habitat remains.	High levels of disturbance. Grading, Irrigation, or heavy grazing over most of site.	Intermediate Levels of Disturbance, Irrigation and/or heavy grazing. No discing or grading.	Low Levels of Disturbance. Compatible grazing, not irrigated or graded over most of site.	No Disturbance. Site not cropped, or graded over most of the site.	6
Habitat Size, Shape, and Defensibility	Low value.[b]	n/a	Moderate value.	n/a	High value.	7

Table D-1
Habitat Quality Site Evaluation Criteria

ISSUE	low<<		RANK		>>high	WEIGHT
	1	2	3	4	5	1 - 10
Land Use						
Zoning	Zoned industrial, commercial, intensive development.	Zoned for limited development (e.g., rural residential).	n/a	Zoned for agricultural use.	Zoned for open space.	2
Existing On-Site Land Use	Site is intensely developed.	Site has scattered development.	Site is intensive agricultural (e.g., vineyard/orchard).	Site is low-intensity agriculture (e.g., irrigation/cropping).	Site is open space, or is non-irrigated, grazed or dry farmed.	5
Land Use Designation	Industrial, commercial, and dense residential.	n/a	Agricultural, rural residential.	n/a	Open space.	4
Adjacent Land Use	Intensely developed.	Scattered or widely-spaced development.	Intensive agricultural use.	Low-intensity agricultural.	Open space, non-irrigated, or dry-farmed.	4
Land Use Policies	Site is within urban boundaries of a municipality not having vernal pool protection policy.	Site is within sphere of influence of a municipality not having vernal pool protection policy.	Site is within boundaries of a municipality having vernal pool protection policies.	Site is within sphere of influence of a municipality having vernal pool protection policies.	Site lies within the county.	4
Acquisition Feasibility						
Conservation Easements	No known easement.	Proposed easement or Resource Management Area.	Conservation easement or preserve nearby.	Conservation easement or preserve adjacent.	Conservation easement or preserve on-site.	5
Land Ownership and Management	More than 4 privately-owned parcels on-site.	Between 2 and 4 privately-owned parcels on-site.	Large, single ownership.	n/a	Public ownership, land trust, or known willing seller or conservation participant.[(c)]	5
Relevancy with Other Preservation Plans	The site has not been identified by any agency as a potential reserve.	Interest for acquisition of fee or conservation easements by SCAPOSD.	The site is mapped as Category 3 by the SCAPOSD Acquisition Plan[(d)].	The site is mapped as Category 2 by the SCAPOSD Acquisition Plan.	The site is mapped as Category 1 by the SCAPOSD Acquisition Plan; or is identified as a potential endangered plant preserve.	4

Table D-1
Habitat Quality Site Evaluation Criteria

ISSUE	low<<		RANK		>>high	WEIGHT
	1	2	3	4	5	1 - 10
Restoration						
Soil Suitability	No on-site data; soil series not compatible.	On-site data; soils are not compatible.	No on-site data; soil series compatible.	On-site soils data shows compatible hydric soils, high clay soils, or other pan forming soils.	On-site soils data shows highly compatible soils, such as Clear Lake, Huichi, Wright, and Zamora series.	6
Watershed Integrity	Extensive off-site watershed highly disturbed.	Off-site watershed only moderately developed/disturbed.	Off-site watershed shows little disturbance.	n/a	Contributing watershed largely contained within site.	5
Restoration Effort Needed[c]	Most difficult (e.g., major earthwork, no historic vernal pools/swales, highly disturbed hydrology).	>>	>>	>>	Least difficult (no irrigation, minor earthwork, historic pools present, intact areas nearby).	6

[a] Quality is determined by the following factors (as available):
- Hydrological integrity.
- Native species diversity.
- Unique features (e.g., best site with all three endangered plants).

[b] Value will integrate the following:
- Proximity.
- Connectivity (consideration of barriers to movement of resources, e.g., animals, pollinators, wind-borne seed).

[c] Conservation participant is defined as a land owner who manages his land either through a management agreement with a conservation agency, or a mutual covenant with neighboring land owners.

[d] Sonoma County Agricultural Preservation and Open Space District.

[e] Criteria would include consideration of the following:
- Grading requirements.
- Fill removal.
- Restorability of hydrology
- Historic occurrences of vernal pools indicative of soil suitability
- Seed sources nearby.
- Suitability of vegetation.

Appendix E
Table E-1
Potential Preserve Evaluation

CRITERIA		1. Todd Road		2. Southwest SR		3. Piner Rd. S.		4. Laguna de SR		5. Piner Rd. N.	
	Weight	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*
Listed Plants and Animals	*10*	5	*50*	4	*40*	5	*50*	2	*20*	5	*50*
Other Plants	*6*	5	*30*	5	*30*	5	*30*	3	*18*	2	*12*
Wildlife	*6*	2	*12*	5	*30*	2	*12*	5	*30*	2	*12*
Habitat Quality of VPs	*10*	4	*40*	4	*40*	4	*40*	4	*40*	4	*40*
Other Habitat Values	*5*	5	*25*	5	*25*	5	*25*	5	*25*	3	*15*
Integrity of Resource	*6*	3	*18*	3	*18*	3	*18*	3	*18*	3	*18*
Habitat Size, Shape, Defense	*7*	5	*35*	5	*35*	5	*35*	3	*21*	5	*35*
Subtotal Biological Resources	***50***	**29**	***210***	**31**	***218***	**29**	***210***	**25**	***172***	**24**	***182***
Zoning	*2*	4	*8*	2	*4*	2	*4*	4	*8*	4	*8*
Existing On-site LU	*5*	4	*20*	5	*25*	2	*10*	5	*25*	5	*25*
LU Designation	*4*	3	*12*	3	*12*	3	*12*	3	*12*	3	*12*
Adjacent LU	*4*	4	*16*	3	*12*	2	*8*	2	*8*	5	*20*
LU Policies	*4*	5	*20*	5	*20*	5	*20*	5	*20*	5	*20*
Subtotal Land Use	***19***	**20**	***76***	**18**	***73***	**14**	***54***	**19**	***73***	**22**	***85***
Conservation Easements	*5*	5	*25*	5	*25*	5	*25*	5	*25*	1	*5*
Land Ownership	*5*	5	*25*	3	*15*	5	*25*	5	*25*	2	*10*
Consistency with Other Plans	*4*	2	*8*	2	*8*	1	*4*	1	*4*	1	*4*
Subtotal Acquisition Feasibility	***14***	**12**	***58***	**10**	***48***	**11**	***54***	**11**	***54***	**4**	***19***
Total	***83***	**61**	***344***	***59***	***339***	**54**	***318***	**55**	***299***	**50**	***286***

Appendix E
Table E-1
Potential Preserve Evaluation

CRITERIA		6. Wright Rd. N.		7. Alton Lane		8. SC Airport		9. Brown Farm		10. Hall Road	
	Weight	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*
Listed Plants and Animals	*10*	5	*50*	5	*50*	4	*40*	3	*30*	5	*50*
Other Plants	*6*	5	*30*	3	*18*	4	*24*	1	*6*	3	*18*
Wildlife	*6*	4	*24*	2	*12*	2	*12*	4	*24*	2	*12*
Habitat Quality of VPs	*10*	3	*30*	4	*40*	4	*40*	2	*20*	4	*40*
Other Habitat Values	*5*	3	*15*	2	*10*	3	*15*	4	*20*	3	*15*
Integrity of Resource	*6*	4	*24*	1	*6*	1	*6*	3	*18*	3	*18*
Habitat Size, Shape, Defense	*7*	3	*21*	3	*21*	3	*21*	5	*35*	3	*21*
Subtotal Biological Resources	***50***	**27**	***194***	**20**	***157***	**21**	***158***	**22**	***153***	**23**	***174***
Zoning	*2*	4	*8*	4	*8*	4	*8*	4	*8*	2	*4*
Existing On-site LU	*5*	5	*25*	5	*25*	5	*25*	4	*20*	5	*25*
LU Designation	*4*	3	*12*	3	*12*	3	*12*	3	*12*	3	*12*
Adjacent LU	*4*	2	*8*	2	*8*	1	*4*	4	*16*	2	*8*
LU Policies	*4*	5	*20*	5	*20*	5	*20*	5	*20*	5	*20*
Subtotal Land Use	***19***	**19**	***73***	**19**	***73***	**18**	***69***	**20**	***76***	**17**	***69***
Conservation Easements	*5*	1	*5*	5	*25*	5	*25*	3	*15*	1	*5*
Land Ownership	*5*	2	*10*	5	*25*	5	*25*	5	*25*	3	*15*
Consistency with Other Plans	*4*	1	*4*	1	*4*	1	*4*	1	*4*	1	*4*
Subtotal Acquisition Feasibility	***14***	**4**	***19***	**11**	***54***	**11**	***54***	**9**	***44***	**5**	***24***
Total	***83***	**50**	***286***	**50**	***284***	**50**	***281***	**51**	***273***	**45**	***267***

Appendix E
Table E-1
Potential Preserve Evaluation

CRITERIA		11. Llano de SR		12. Shiloh Rd. W.		13. Spurgeon Rd.		14. Waltzer Rd.		15. Wood Rd.W.	
	Weight	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*
Listed Plants and Animals	*10*	5	*50*	4	*40*	4	*40*	5	*50*	4	*40*
Other Plants	*6*	4	*24*	5	*30*	5	*30*	5	*30*	2	*12*
Wildlife	*6*	2	*12*	2	*12*	2	*12*	2	*12*	2	*12*
Habitat Quality of VPs	*10*	3	*30*	3	*30*	3	*30*	3	*30*	3	*30*
Other Habitat Values	*5*	3	*15*	5	*25*	2	*10*	2	*10*	2	*10*
Integrity of Resource	*6*	3	*18*	3	*18*	3	*18*	3	*18*	3	*18*
Habitat Size, Shape, Defense	*7*	3	*21*	3	*21*	3	*21*	3	*21*	3	*21*
Subtotal Biological Resources	***50***	**23**	***170***	**25**	***176***	**22**	***161***	**23**	***171***	**19**	***143***
Zoning	*2*	4	*8*	4	*8*	4	*8*	1	*2*	2	*4*
Existing On-site LU	*5*	4	*20*	2	*10*	2	*10*	5	*25*	5	*25*
LU Designation	*4*	3	*12*	3	*12*	3	*12*	1	*4*	3	*12*
Adjacent LU	*4*	2	*8*	2	*8*	3	*12*	2	*8*	3	*12*
LU Policies	*4*	5	*20*	4	*16*	5	*20*	3	*12*	5	*20*
Subtotal Land Use	***19***	**18**	***68***	**15**	***54***	**17**	***62***	**12**	***51***	**18**	***73***
Conservation Easements	*5*	1	*5*	1	*5*	1	*5*	1	*5*	1	*5*
Land Ownership	*5*	2	*10*	2	*10*	3	*15*	3	*15*	3	*15*
Consistency with Other Plans	*4*	1	*4*	1	*4*	1	*4*	1	*4*	1	*4*
Subtotal Acquisition Feasibility	***14***	**4**	***19***	**4**	***19***	**5**	***24***	**5**	***24***	**5**	***24***
Total	***83***	***45***	***257***	**44**	***249***	**44**	***247***	***40***	***246***	**42**	***240***

Appendix E
Table E-1
Potential Preserve Evaluation

CRITERIA		16. Windsor S.		17. Occidental Rd.		18. Wood Rd. E.		19. Alder Ave.		20. Shiloh Rd. E.	
	Weight	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*
Listed Plants and Animals	*10*	4	*40*	5	*50*	5	*50*	4	*40*	4	*40*
Other Plants	*6*	2	*12*	2	*12*	2	*12*	3	*18*	4	*24*
Wildlife	*6*	2	*12*	2	*12*	2	*12*	2	*12*	2	*12*
Habitat Quality of VPs	*10*	3	*30*	3	*30*	3	*30*	3	*30*	2	*20*
Other Habitat Values	*5*	3	*15*	3	*15*	2	*10*	2	*10*	3	*15*
Integrity of Resource	*6*	3	*18*	1	*6*	3	*18*	5	*30*	2	*12*
Habitat Size, Shape, Defense	*7*	3	*21*	3	*21*	1	*7*	3	*21*	3	*21*
Subtotal Biological Resources	***50***	**20**	***148***	**19**	***146***	**18**	***139***	**22**	***161***	**20**	***144***
Zoning	*2*	4	*8*	4	*8*	4	*8*	1	*2*	2	*4*
Existing On-site LU	*5*	3	*15*	4	*20*	5	*25*	5	*25*	4	*20*
LU Designation	*4*	4	*16*	3	*12*	3	*12*	1	*4*	3	*12*
Adjacent LU	*4*	2	*8*	3	*12*	3	*12*	2	*8*	2	*8*
LU Policies	*4*	5	*20*	5	*20*	3	*12*	1	*4*	4	*16*
Subtotal Land Use	***19***	**18**	***67***	**19**	***72***	**18**	***69***	**10**	***43***	**15**	***60***
Conservation Easements	*5*	1	*5*	1	*5*	1	*5*	1	*5*	1	*5*
Land Ownership	*5*	3	*15*	1	*5*	3	*15*	3	*15*	2	*10*
Consistency with Other Plans	*4*	1	*4*	1	*4*	1	*4*	1	*4*	2	*8*
Subtotal Acquisition Feasibility	***14***	**5**	***24***	**3**	***14***	**5**	***24***	**5**	***24***	**5**	***23***
Total	***83***	**43**	***239***	**41**	***232***	**41**	***232***	**37**	***228***	**40**	***227***

Appendix E
Table E-1
Potential Preserve Evaluation

CRITERIA		21. San Miguel		22. Wright Rd. S.		23. Biaggi Rd.		24. Faught Rd.		25. Windsor N.	
	Weight	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*	Raw	*Weighted*
Listed Plants and Animals	*10*	5	*50*	4	*40*	4	*40*	2	*20*	4	*40*
Other Plants	*6*	3	*18*	2	*12*	2	*12*	2	*12*	4	*24*
Wildlife	*6*	2	*12*	2	*12*	2	*12*	2	*12*	2	*12*
Habitat Quality of VPs	*10*	4	*40*	3	*30*	3	*30*	4	*40*	3	*30*
Other Habitat Values	*5*	3	*15*	2	*10*	2	*10*	2	*10*	4	*20*
Integrity of Resource	*6*	1	*6*	5	*30*	3	*18*	3	*18*	3	*18*
Habitat Size, Shape, Defense	*7*	3	*21*	2	*14*	1	*7*	3	*21*	3	*21*
Subtotal Biological Resources	***50***	**21**	***162***	**20**	***148***	**17**	***129***	**18**	***133***	**23**	***165***
Zoning	*2*	2	*4*	1	*2*	4	*8*	2	*4*	2	*4*
Existing On-site LU	*5*	2	*10*	2	*10*	2	*10*	5	*25*	2	*10*
LU Designation	*4*	2	*8*	1	*4*	3	*12*	3	*12*	1	*4*
Adjacent LU	*4*	3	*12*	2	*8*	3	*12*	2	*8*	2	*8*
LU Policies	*4*	3	*12*	4	*16*	5	*20*	5	*20*	1	*4*
Subtotal Land Use	***19***	**12**	***46***	**10**	***40***	**17**	***62***	**17**	***69***	**8**	***30***
Conservation Easements	*5*	1	*5*	1	*5*	1	*5*	1	*5*	1	*5*
Land Ownership	*5*	1	*5*	5	*25*	3	*15*	0	*0*	1	*5*
Consistency with Other Plans	*4*	1	*4*	1	*4*	1	*4*	1	*4*	1	*4*
Subtotal Acquisition Feasibility	***14***	**3**	***14***	**7**	***34***	**5**	***24***	**2**	***9***	**3**	***14***
Total	***83***	**36**	***222***	**37**	***222***	**39**	***215***	**37**	***211***	**34**	***209***

Appendix E
Table E-1
Potential Preserve Evaluation

CRITERIA		26. Old Redwood H.		27. Alves Rd.	
	Weight	Raw	*Weighted*	Raw	*Weighted*
Listed Plants and Animals	*10*	3	*30*	4	*40*
Other Plants	*6*	4	*24*	2	*12*
Wildlife	*6*	2	*12*	2	*12*
Habitat Quality of VPs	*10*	3	*30*	3	*30*
Other Habitat Values	*5*	3	*15*	3	*15*
Integrity of Resource	*6*	2	*12*	2	*12*
Habitat Size, Shape, Defense	*7*	2	*14*	3	*21*
Subtotal Biological Resources	***50***	**19**	***137***	**19**	***142***
Zoning	*2*	1	*2*	2	*4*
Existing On-site LU	*5*	2	*10*	2	*10*
LU Designation	*4*	1	*4*	3	*12*
Adjacent LU	*4*	1	*4*	2	*8*
LU Policies	*4*	1	*4*	1	*4*
Subtotal Land Use	***19***	**6**	***24***	**10**	***38***
Conservation Easements	*5*	4	*20*	1	*5*
Land Ownership	*5*	3	*15*	3	*15*
Consistency with Other Plans	*4*	2	*8*	1	*4*
Subtotal Acquisition Feasibility	***14***	**9**	***43***	**5**	***24***
Total	***83***	**34**	***204***	**34**	***204***

Table E-2 Most Recent Recorded Observations of Federally Endangered Plant Species			
Lasthenia burkei **Burke's Goldfields**			
Element Occurrence (EO) Number	**Portion of EO Within Potential Preserve(s)**	**Potential Preserve Name**	**Year Last Observed**
EO 1	Entire	Todd Road	1994
EO 7	Small Part	Sonoma County Airport	1993
EO 8	Part	Shiloh Road West	1993
EO10	Entire	Shiloh Road East	1994
EO 12	Entire	Windsor North, Alves Road	1993
EO 13	Entire	Piner Road South	1992
EO 14	Entire	Todd Road	1990
EO 15	Entire	Occidental Road, Biaggi Road	1988
EO 17	Entire	Hall Road	1994
EO 18	Part	Old Redwood Highway	1989
EO 19	Entire	San Miguel Road, Piner Road North, Waltzer Road*	1994
EO 21	Entire	Piner Road South*	1991
EO 22	Entire	Windsor South	1988
EO 23	Entire	Piner Road North, Wood Road West	1990
EO 24	Entire	San Miguel Road, Wood Road East	1992
EO 25	Entire	Alton Lane,* Piner Road North*	1994
EO 26	Entire	Piner Road North*	1991
EO 28	Entire	Wright Road	1993
Blennosperma bakeri **Sonoma Sunshine**			
EO 6	Entire	Spurgeon Road, Piner Road North	1993
EO 7	Entire	Todd Road	1988
EO 8	Entire	Todd Road	1993
EO 9	Entire	Piner Road South	1994
EO 10	Part	San Miguel Road	1993
EO 11	Part	Piner Road South	1990
EO 12	Entire	Todd Road	1986
EO 15	Entire	Piner Road South	1991
EO 17	Entire	Llano de Santa Rosa	1988
EO 24	Entire	Piner Road North	1992
EO 26	Entire	San Miguel Road	1992
EO 27	Entire	Alton Lane	1994
EO 28	Entire	Todd Road	1993

Table E-2 Most Recent Recorded Observations of Federally Endangered Plant Species			
Limnanthes vinculans Sebastopol Meadowfoam			
Element Occurrence Number		**Potential Preserve Name**	**Year Last Observed**
EO 1	Entire	Todd Road	1994
EO 2	Entire	Wright Road South*	1994
EO 3	Entire	Wright Road North	1988
EO 5	Entire	Southwest Santa Rosa*	1980
EO 6	Entire	Todd Road*	1988
EO 8	Entire	Southwest Santa Rosa*	1994
EO 10	Entire	Todd Road	1988
EO 11	Entire	Todd Road	1994
EO 14	Entire	Llano de Santa Rosa	1990
EO 15	Entire	Laguna de Santa Rosa	1992
EO 18	Entire	Piner Road South*	1983
EO 21	Entire	Piner Road North*	Unknown
EO 22	Entire	Wright Road North	1988
EO 25	Entire	Todd Road	1988
EO 26	Entire	Llano de Santa Rosa	1987
EO 27	Entire	Occidental Road	1988
EO 28	Entire	Wood Road West	1983
EO 30	Entire	Hall Road	1994
EO 32	Entire	Todd Road	1994
EO 33	Entire	Todd Road*	1992
EO 35	Entire	Alder Avenue*	1994
EO 37	Entire	Todd Road	1988
*Population (EO) needs to be verified at this potential preserve site.			

Appendix E
Potential Preserve Sites

Site Number	Site Name	Total Weighted Value	Page Number
1	Todd Road	344	11
2	Southwest Santa Rosa	339	14
3	Piner Road South	318	16
4	Laguna de Santa Rosa	299	18
5	Piner Road North	286	20
6	Wright Road North	286	22
7	Alton Lane	284	24
8	Sonoma County Airport	281	26
9	Brown Farm	273	27
10	Hall Road	267	28
11	Llano de Santa Rosa	257	30
12	Shiloh Road West	249	32
13	Spurgeon Road	247	33
14	Waltzer Road	246	34
15	Wood Road West	240	35
16	Windsor South	239	37
17	Occidental Road	232	38
18	Wood Road East	232	40
19	Alder Avenue	228	41
20	Shiloh Road East	227	42
21	San Miguel Road	222	43
22	Wright Road South	222	44
23	Biaggi Road	215	46
24	Faught Road	211	48
25	Windsor North	209	49
26	Old Redwood Highway	204	51
27	Alves Road	204	53

Note to the Reader of Appendix E

The information contained in the data sheets for each of the potential preserve sites is as complete and accurate as possible at this time. In Phase 2, additional information will be gathered on the potential preserve sites and detailed maps will be developed. Upon review of the additional information, the weighted value of some potential preserve sites may change. Some of the unknown areas may become potential preserves when more information is collected about them and they are evaluated and their weighted values are determined.

Each of the potential preserves includes one or more parcels and property owners. Parcel specific information will be developed during Phase 2.

The following provide some explanation of certain categories on the data sheets:

CDFG/USFWS Map Code Number: These map code numbers refer to sites identified on maps compiled by the California Department of Fish and Game and the U.S. Fish and Wildlife Service. These codes also were used in the *Inventory of Rare Plant Locations and Sites Surveyed for Wetland Resources on the Santa Rosa Plain, Sonoma County*, prepared for the California Department of Fish and Game (Patterson, Guggolz, and Waaland, 1994). The sites these map codes correspond to are within potential preserve sites as indicated. However, these sites sometimes comprise only a portion of a particular potential preserve.

Primary, Secondary, and Adjacent Populations of Plant Species of Concern: The five digit numbers are derived from maps of the California Department of Fish and Game Natural Diversity Data Base. EO refers to the Element Occurrence and has an additional two digit number.

The information for the other categories was obtained primarily from the Patterson, Guggolz, and Waaland (1994) document. The level of information for areas of potential preserve sites for which there was no map code to refer to this 1994 report is less complete than for parcels which did have a map code. When available, additional information was obtained regarding these areas of the sites.

1. TODD ROAD
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26F 01, 06, 07, 08, 09, 10, 13, 17, 18, 27, 34. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north of Todd Road, west of Ludwig Road, southwest of Llano Road, and east of Highway 116. This potential preserve site includes a large CDFG preserve. Northwestern portion is south of Highway 12, near the corner bounded by the junction of Highways 116 and 112, and south of the Railroad tracks.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: Vernal pool plants are scattered throughout this entire preserve site. The following primary species of concern are found in the northwestern portion of this potential preserve:

08121 (EO 12) *Blennosperma bakeri.* Located on the north side of the Laguna de Santa Rosa, about one mile east southeast of Santa Rosa, and about 3,000 feet west south west of the Carinelli Ranch Barn. Few plants were observed at this site in 1974; and later surveys found little suitable habitat and no plants. Suitable habitat may occur farther west (CNDDB 1994).

08107 (EO 25) *Limnanthes vinculans.* Located on either side of the Laguna de Santa Rosa, about 0.7 mile south of the Sebastopol Grange. About 800 plants were observed in two colonies in 1983; about 300 were sighted in the southern colony in 1988. CDFG owns a portion of this site (CNDDB 1994; Guggolz 1995).

08097 (EO 10) *Limnanthes vinculans.* Located at the east side of the Laguna de Santa Rosa along the south side of the Railroad tracks. Two colonies are within this occurrence, one on either side of the northern boundary of Section 1. This population was observed in 1979, 1980, and 1988, and in all years the size remained small and stable (CNDDB 1994).

08128 (EO 6) *Limnanthes vinculans.* This occurrence is located at the Carnialli property (Draper Horse Ranch) on Llano Road, about one mile south of the town of Llano. About 10,000 plants were observed at this site in 1983; about 10,000 were observed in this site combined with EO 25 in 1988. This site is partially included in a CDFG easement (CNDDB 1994).

In the central portion of this potential preserve site, the following species of primary concern occur:

08128 (EO 07) *Blennosperma bakeri.* Two colonies are included in this occurrence. About 1,000 plants were seen in 1985, 100 in 1986 (late in season), and 7,500 in 1988 (CNDDB, 1994).

08146 (EO 08) *Blennosperma bakeri.* This occurrence is located along either side of Todd Road, from Llano Road west to the "elbow" in the road. About 75,000 plants were seen in 1976; about 10,000 plants were seen in 1988; and about 5,000-10,000 plants were seen in 1994 (CNDDB 1994; Patterson, Guggolz, and Waaland, 1994). The northern portion of the this occurrence is within the CDFG preserve. This occurrence includes former EO 14 (CNDDB 1994).

26253 (EO 01) *Lasthenia burkei.* This is the southernmost population of *Lasthenia burkei* in the study area. It is located at Todd Road, about 0.5 mile west of Llano Road, and north of the "elbow" in the road. Fewer than 100 plants were seen in 1974 and 1987. No plants were seen in 1985. About 5,000-10,000 plants were seen in 1988, and no plants were observed in 1990, 1991, and 1994. This site is within the CDFG preserve (CNDDB 1994).

26251 (EO 33) *Limnanthes vinculans.* West of Laguna de Santa Rosa about 0.7 mile southwest of the "elbow" on Todd Road, southeast of Sebastopol. No population information (CNDDB 1994)

26254 (EO 1) *Limnanthes vinculans.* Located on either side of Todd Road, from Llano Road west to the "elbow" in the road. This is the type location for this species. More than 10,000 plants were seen in 1983; 5,000-10,000 were seen in 1988 [These 1988 numbers are questionable based on survey in the preceeding and following years (Guggolz 1995)]; and about 1,000-5,000 plants were seen in 1994 (CNDDB 1994; Patterson, Guggolz, and Waaland, 1994). This site includes former EO's 4 and 19 (CNDDB 1994).

The following species of primary concern are found in the eastern and southeastern portion of the potential preserve site:

26255 (EO 28) *Blennosperma bakeri.* Located between Ludwig Road and Todd Road, just south of the end of Butler Road. About 10,000-100,000 plants were seen here in 1988 and 1993 (CNDDB 1994).

26256 (EO 32) *Limnanthes vinculans.* Located about 0.3 mile southwest of the intersection of Ludwig Avenue and Wright Avenue. No information is available for this site (CNDDB 1994).

08194 (EO 11) *Limnanthes vinculans.* Located west of Phillips Road between Todd Road and Butler Avenue. Several colonies are present at this site in a north-south trending network of swales and pools. About 10,000 plants seen in 1988 (CNDDB 1994). A total of 9.5 acres of this site were supposed to be preserved in 1979 as mitigation, but the landowner did not sign the easment. Although the area was avoided during project construction, it is not protected (Guggolz 1995).

EO 14 *Lasthenia burkei.* This EO may also occur within this potential preserve.

Secondary Plant Species of Concern Present: *Ranunculus lobbii, Downingia humilis.*

08141 (EO 2) *Navarretia leucocephala* ssp. *bakeri* is found in the central portion of this potential preserve site. This occurrence is located at the Todd Road vernal pools, within the Laguna de Santa Rosa drainage (CNDDB, 1994).

Perideridia gairdneri ssp. *gairdneri* (associated with EO 2, above).

Adjacent Populations of Species of Concern: 26257 (EO 37) *Limnanthes vinculans.* Located near Todd Road, about 0.7 mile east of Llano Road, at the Colgan Creek Pasture. This population is southeast of the potential preserve site. About 100-500 plants were seen in 1988 (CNDDB 1994).

Wildlife Species of Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Major and minor vernal pools and swales

Other Types of Habitat Values: Perennial marsh, wet meadow, oak savanna, oak savanna, native grassland, floodplain, other wetlands.

Integrity of Resource/Level of Disturbance: Natural, with minor alterations; commercial/industrial, weeds, disked, junk, cultivated, thatch, irrigated, mowed, grazed.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels; <20 ac. significant adjacent land, 4 or more adjacent significant parcels, >20 ac. significant adjacent land.

LAND USE

Zoning: A1-B6, AE-B6 (Patterson, Guggolz, and Waaland, 1994).

Existing On-site Land Use: Commercial/industrial, public conservation, pasture, irrigated agriculture.

Land Use Designation: 3/4 Land Extensive Agriculture, 1/4 Land Intensive Agriculture, small areas of Rural Residential.

Adjacent Land Use: Rural residential, pasture, hayfield, irrigated agriculture.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: CDFG.

Land Ownership and Management: CDFG, Wildlife Conservation Board (75 ac.); Carinalli/CDFG (? ac.), 7 private.

Consistency with Other Preservation Plans: NW portion of the preserve is adjacent to Sebastopol Railroad Forest (7.5 ac.).

2. SOUTHWEST SANTA ROSA POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26F 02, 04, 12, 14, 23, 24. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; southwest Corner of Santa Rosa Air Center, south of the west runway, east of Wright Avenue, north of Ludwig.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08172 (EO 5) *Limnanthes vinculans.* Located between Pyle Avenue and Kirby Lane, south of the Santa Rosa Air Center. No field surveys have been conducted at this site since 1980 (CNDDB 1994).

08178 (EO 8) *Limnanthes vinculans.* Located at the southern half of the Santa Rosa Air Center, east of Wright Avenue and north of Ludwig Road. Many colonies are mapped south of the east-west runway, along both sides of this runway. Many colonies are present at this occurrence, some of which are among the largest populations known. Colonies range in size from a few hundred plants to hundreds of thousands of plants. Portion of this site is an airport reserve (CNDDB 1994).

Secondary Plant Species of Concern Present: *Ranunculus lobbii, Pogogyne douglasii* var. *parviflora*

Adjacent Populations of Species of Concern: None.

Wildlife Species of Special Concern: California tiger salamander; *Linderiella occidentalis.*

Habitat Quality of Vernal Pool Ecosystem: Major and minor vernal pools and swales, created vernal pools and swales.

Other Types of Habitat Values: Riparian, creek, perennial marsh, dry meadow, oak savanna, native grassland.

Integrity of Resource/Level of Disturbance: Natural, with minor alterations, historically significantly altered; rural residential, vehicles, hydrologically altered, grading, weeds, disked, thatch, mowed, grazed.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels, <20 ac. significant adjacent land, 4 or more adjacent significant parcels, >20 ac. significant adjacent land.

LAND USE

Zoning: No information.

Existing On-site Land Use: Vacant, public conservation.

Land Use Designation: 1/2 Resources and Rural Development, 1/2 Residential, Urban.

Adjacent Land Use: Urban and rural residential, vacant, agriculture.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: Santa Rosa Schools.

Land Ownership and Management: City of Santa Rosa Schools (Broadmoor Acres North, 14.29 ac.), Broadmoor Acres South (13.49 ac.), 5 private owners.

Consistency with Other Preservation Plans: NW portion of the preserve is adjacent to Sebastopol Railroad Forest (7.5 ac.)—Category 2.

3. PINER ROAD SOUTH
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Numbers: 26B 06a, 06b, 06c, 08, 09, 10, 11, 12, 13, 20, 26, 27, 28, 29, 60. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north and south of Piner Road, and east of Hartman Road, north of Guerneville Road, west of Fulton Road, T7N, R8W, SW1/4 of Section 7. This site includes Piner School.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08134 (EO 15) *Blennosperma bakeri.* Located throughout the site, extending northeast to southwest. About 50,000 individuals were observed in 1986, 13,000+ in 1988 (CNDDB 1994).

26270 (EO 24) *Blennosperma bakeri.* Located between Hartman Road and the end of Alton Road, northwest of Santa Rosa. Several thousand plants were observed in 1988. The southern portion of the occurrence may have been extirpated due to vineyard construction around 1990.

26275 (EO 9 (includes former EO's 19 and 21) *Blennosperma bakeri.* Located about 0.7 miles southwest of the Piner Elementary School. A total of about 38,000 plants were observed in 1988, and more than 100,000 were sighted in 1991 (CNDDB 1994).

26277 (EO 13) *Lasthenia burkei.* This EO refers only to the northernmost parcel on Abramson Road. Three colonies are mapped by NDDB. One is along Abramson Road, about 0.7 miles north of Guerneville Road. The second and third colonies are located about 0.2 miles southwest and south-southwest from the first colony. No plants have been observed in the two colonies closest to Abramson Road since 1990. Between 1-5000 plants were observed in the southwest colony in 1992. Seed salvage may have occurred at one of the colonies for mitigation purposes (CNDDB 1994).

26274 (EO 21) *Lasthenia burkei.* Located at the northern tip of the site. Hundreds of plants were observed from 1988 through 1991 (CNDDB 1994).

26263 (EO 18) *Limnanthes vinculans.* Located in the grounds around the Piner Elementary School, northwest of Santa Rosa. The area around the school was searched in 1983, and *Limnanthes vinculans* was not observed; however, a different species of *Limnanthes* was sighted. This record may have been confused with a record of *Blennosperma bakeri* (CNDDB 1994).

Secondary Plant Species of Concern Present: *Pogogyne douglasii* var. *parviflora*, *Navarretia leucocephala* ssp. *bakeri*, and *Downingia pusilla.*

Adjacent Populations of Species of Concern: 08144 (EO 11) *Blennosperma bakeri.* Located in two vernal pools just west of Abramson Road, south of the "elbow" in the road. A few plants also occur across the road in the horse pasture. In 1986, about 1,000 plants were observed in two very small colonies. Only about 300 plants were observed in 1988, and about 100-500 in 1990 (CNDDB 1994). In 1995 it was reported that only one colony existed in a degraded swale (Guggolz, 1995)

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Significant and minor vernal pools and swales, created vernal pools.

Other Types of Habitat Value: Oak woodland, oak savanna, native grassland, minor riparian; the area includes the best example of oak woodland in the upper Laguna de Santa Rosa drainage (CNDDB, 1994).

Integrity of Resource/Level of Disturbance: Natural topography more or less unaltered, natural with minor alterations, historically significantly altered, but stable; rural residential, vehicles, junk, fill, grading, cultivated, disking, grazing, irrigation, manure, weeds, thatch.

Habitat Size, Shape, and Defensibility: Undeveloped land, but no significant wetlands; 1-3 significant adjacent parcels and <20 ac. significant adjacent land; 4 or > significant adjacent parcels or >20 ac. significant adjacent land.

LAND USE

Zoning: RR-B5, A1-B6, A1-B7 (Patterson, Guggolz, and Waaland, 1994); Extensive Agriculture, Rural Residential, Intensive Agriculture (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Urban and rural residential, vacant, public wastewater pond, public conservation, vineyard, pasture.

Land Use Designation: Mostly Diverse Agriculture, Land Intensive Agriculture, Rural Residential, Community Facility, Parks and Recreation.

Adjacent Land Use: Urban and rural residential, commercial/industrial, public utility, public park or recreation, public conservation, vineyard, pasture, hayfield.

Land Use Policies: County, except SE corner (approximately 1/8 of preserve) within Santa Rosa.

ACQUISITION FEASIBILITY

Conservation Easements: City of Santa Rosa scenic easement (49.10 ac.), CDFG? (8 ac.).

08134 (EO 15). The colony north of Piner Road is in a 100' x 650' conservation easement with CDFG.

26274 (EO 21). The site is preserved though a conservation easement between the landowner and CDFG. Southern colonies are unprotected.

Land Ownership and Management: City of Santa Rosa, CDFG, 11 private owners.

Consistency with Other Preservation Plans: None.

4. LAGUNA DE SANTA ROSA POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 32B 01 and 02. This Preservation Plan does not include any maps with these code numbers.

Location: Two Rock quadrangle; northeast of Highway 116, and east and west of Llano Road, extending in a northwest to southeast direction paralleling the Laguna de Santa Rosa.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 08155 EO15 *Limnanthes vinculans.* A population is located in the Laguna de Santa Rosa are, east of Conningham, near Llano Road, about 0.4 mile north of Highway 116. This stable population has been known since 1966 (Guggolz 1995). More than 10,000 plants were observed in 1983 and again in 1990 (CNDDB 1994).

Secondary Species of Concern: 08160 (EO 2) *Alopecurus aequalis* var. *sonomensis.* This site historically supported this species of secondary concern; however, this species has not been observed since 1974 (CNDDB 1994) and may be extirpated.

A second species of secondary concern, *Ranunculus lobbii* is known from the privately owned parcel (Patterson, Guggolz, and Waaland, 1994).

Adjacent Populations of Plant Species of Concern: 30251 (EO 38) *Limnanthes vinculans.* This occurrence is located northwest of this potential preserve site. This species was extirpated from this site after it was turned into a turf farm in 1991. An emergency salvage of about 10,000 plants was conducted. These plants were transplanted at Brown Farm near Highway 12 and Llano Road (EO 29) (CNDDB 1994). However, this translocation was not successful (see Appendix G, Sebastopol Meadowfoam Translocation Study).

26250 (EO 34) *Limnanthes vinculans.* This occurrence is adjacent to the northern boundary of the potential preserve. It is located along Colgan Creek and includes an unmapped population to the east near the intersection of Scenic Avenue and Arlington Avenue. Thousands of plants were observed in the western colony in 1984 and 1988; fewer than 100 plants were seen in the eastern colony in 1988 (CNDDB, 1994).

08214 (EO 20) *Blennosperma bakeri.* Two colonies are included in this occurrence; one on either side of Stony Point Road between Wilfred Road and the Laguna. About 100 plants were seen in 1987. The colony located west of Stony Point Road was extirpated (CNDDB, 1994).

Wildlife Species of Special Concern: California tiger salamander and California linderiella are known from the City of Santa Rosa Property (Stony Point Mitigation Site) (Patterson, Guggolz, and Waaland, 1994).

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales; includes the Stony Point mitigation site.

Other Types of Habitat Value: Significant and minor riparian, significant meadow, creek, perennial marsh.

Integrity of Resource/Level of Disturbance: Some natural topography, other significantly altered, but stable with grazing, minor grading, major disking, minor fill, major hydrologic alteration.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels or <20 ac. of significant adjacent land.

LAND USE

Zoning: A1-B5-F2 (Patterson, Guggolz, and Waaland, 1994). Diverse Agriculture, Extensive Agriculture (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Vacant at City of Santa Rosa Property (Stony Point Road Mitigation Site); with rural residential and pasture land use categories present on the private property. City of Santa Rosa property is proposed for use as a park or an other type of recreational use.

Land Use Designation: 3/4 Land Extensive Agriculture, 1/4 Diverse Agriculture, small area of Rural Residential.

Adjacent Land Use: Rural residential, agriculture, public utility.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: City of Santa Rosa (Stony Point Road Mitigation Site).

Land Ownership and Management: City of Santa Rosa (Stony Point Road Mitigation Site); Private Ownership (Gundelfinger Property).

Consistency with Other Preservation Plans: None.

5. PINER ROAD NORTH
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26B 04 and 05. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; south of Wood Road, north of Piner Road, and east of Hartman Road, west of Fulton Road, and north of the Alton Lane Preserve.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08147 (EO 6) *Blennosperma bakeri.* Three colonies are located within the Wood Road elbow. One colony is located along the south side of Wood Road before the elbow, the others are located 0.1 mile and 0.25 mile northeast of the elbow. Many colonies were observed in 1978; the southern colonies were searched for and not seen in 1986 and 1988. The northern colony supported between 1,000-5,000 plants in 1993 (CNDDB, 1994).

26270 (EO 24) *Blennosperma bakeri.* Several colonies are present mostly within the southeast 1/4 of the southwest 1/4 of Section 6. A small portion is within the northeast corner of the northwest 1/4 of Section 7. This population includes an unusual occurrence in oak woodland habitat. Several thousand plants were observed in 1988; the southern portion of this occurrence may have been extirpated due to vineyard construction in 1990 (CNDDB, 1994).

26267 (EO 25) *Lasthenia burkei.* This species was transplanted at this location in 1988-89 as mitigation for the San Miguel Estates development. A total of 5,000-10,000 plants were observed between 1989 and 1994 (CNDDB, 1994).

26269 (EO 26) *Lasthenia burkei.* Several colonies located about 0.5 mile east of Hartman Road and 0.5 mile north of Piner Road. These colonies straddle the line between Sections 6 and 7. Hundreds of plants were observed in 1988; thousands in 1989. The southern portion of the site was severely damaged by conversion of habitat to vineyards. Only about 100 plants in the northern portion of the occurrence were seen in 1988 (CNDDB, 1994).

26271 (EO 23) *Lasthenia burkei.* Three colonies are located southwest of the southern elbow of Wood Road, north of the northeast elbow, and south of the northwest elbow. A total of 1-5,000 plants were observed in the northwest pool in 1988; and 200 plants were observed in the southern pool in 1990. The site quality ranges from slightly altered to very degraded (CNDDB, 1994). Note the CNDDB overlay placed EO 23 within this mapped preserved area, that corresponds to at least Marco Parcels 4 and 5, but this EO number is not mentioned in either of these parcel numbers in Marco's report.

08173 (EO 21) *Limnanthes vinculans.* This area was searched for this species in 1983 and it was not found (CNDDB, 1994).

EO 19 *Lasthenia burkei.* This EO may also occur within this potential preserve.

Secondary Plant Species of Concern Present: *Ranunculus lobbii* was observed in Marco Parcel 7.

Adjacent Populations of Species of Concern: None.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Significant and minor vernal pools and swales.

Other Types of Habitat Value: Oak woodland.

Integrity of Resource/Level of Disturbance: Natural with minor alterations; grazing.

26267 (EO 25). Some natural pools may have been damaged during construction of artificial pools (CNDDB, 1994).

08173 (EO 21). This area is open land that is mostly pasture and no appropriate habitat exists (CNDDB, 1994).

Habitat Size, Shape, and Defensibility: Four or > significant adjacent parcels or >20 ac. significant adjacent land

LAND USE

Zoning: AE, B6 (Patterson, Guggolz, and Waaland, 1994); Intensive Agriculture (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Pasture, hayfield.

Land Use Designation: Diverse Agriculture, Land Intensive Agriculture.

Adjacent Land Use: Pasture, hayfield.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Two or more private owners.

Consistency with Other Preservation Plans: None

.

6. WRIGHT ROAD NORTH POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26D 03, 04. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; located adjacent to and north of Highway 12, west of Fulton Road, south of Hall Road.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26259 (EO 28) *Lasthenia burkei.* Three colonies are located within the potential preserve area. About 300 plants were observed in 1988; and about 500-1,000 were seen in 1991 through 1993 (CNDDB 1994).

08138 (EO 3) *Limnanthes vinculans.* Hundreds of plants were seen in 1979, 1983, and 750 were observed in 1988.

08166 (EO 22) *Limnanthes vinculans.* Many colonies are located at this preserve. 10,000 plants were observed in northern colonies in 1988-1994. Southern colonies were apparently eradicated by road work. Remaining colonies represent one of the largest concentrations of this species in the county.

Secondary Plant Species of Concern Present: *Pogogyne douglasii* var. *parviflora*; *Ranunculus lobbii;* and *Navarretia leucocephala* ssp. *bakeri.*

Adjacent Populations of Species of Concern: None.

Wildlife Species of Concern: California tiger salamander.

Habitat Quality of Vernal Pool Ecosystem: Major and minor vernal pools and swales.

Other Types of Habitat Values: Dry meadow, oak savanna, native grassland.

Integrity of Resource/Level of Disturbance: Natural, with minor alterations.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels, <20 ac. significant adjacent land.

LAND USE

Zoning: A1 (Patterson, Guggolz, and Waaland, 1994); Extensive Agriculture, Rural Residential, and Diverse Agriculture (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Pasture.

Land Use Designation: 2/3 Land Extensive Agriculture; Diverse Agriculture, Rural Residential.

Adjacent Land Use: Urban, rural residential, pasture, hayfield.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Two private owners.

Consistency with Other Preservation Plans: None.

7. ALTON LANE
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26B 31. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; Alton Road mitigation site. T7N, R8W, N 1/2 SW 1/4 of Section 5.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26267 (EO 25) *Lasthenia burkei*. This species was transplanted here in 1988-89 as mitigation for the San Miguel Estates development. Between 5,000-10,000 plants were observed between 1989 and 1994. Some natural pools may have been damaged during construction of artificial pools (CNDDB, 1994).

26267 (EO 27) *Blennosperma bakeri*. Located at Alton Road Vernal Pool Preserve. 160,000+ plants seen in 1989, prior to creation of artificial habitat and seeding. Site seeded with *Blennosperma bakeri* and *Lasthenia burkei* from the destroyed San Miguel Estates site. Population 100,000+ 1990-1994. To be deeded to CDFG (CNDDB, 1994).

Secondary Plant Species of Concern Present: *Pogogyne douglasii* var. *parviflora* was observed (Patterson, Guggolz, and Waaland, 1994).

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Significant swales, created vernal pools and swales.

Other Types of Habitat Value: None.

Integrity of Resource/Level of Disturbance: Created topography.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels and <20 ac. significant adjacent land.

LAND USE

Zoning: No information.

Existing On-site Land Use: Public conservation.

Land Use Designation: Land intensive agriculture.

Adjacent Land Use: Public conservation, rural residential, vineyard.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: CDFG?

Land Ownership and Management: CDFG?

Consistency with Other Preservation Plans: None.

8. SONOMA COUNTY AIRPORT POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 20E 01. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; adjacent to the Sonoma County Airport.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 08105 (EO 7) *Lasthenia burkei.* A total of seven small populations are mapped in the vicinity of the Sonoma County Airport. Only one is within the mapped potential preserve area. A total of 10,000 plants were observed in this population in 1988; and 140,000 estimated in 1989 (CNDDB, 1994). This area is now part of a rare plant preserve.

Secondary Species of Concern: *Pogogyne douglasii* ssp. *parviflora* was observed at the potential preserve site (Patterson, Guggolz, and Waaland, 1994).

Adjacent Populations of Species of Concern: Six populations of *Lasthenia burkei* are adjacent to the southwest, east, and southeast of the mapped potential preserve site.

Habitat Quality of Vernal Pool Ecosystem: Good; significant and minor created vernal pools and swales.

Wildlife Species of Special Concern: None known.

Other Types of Habitat Values: Native grassland.

Integrity of Resource/Level of Disturbance: Major grading and hydrologic alteration; treated sewage water disposal, mowing, fuel spills.

Habitat Size, Shape, and Defensibility: Undeveloped land adjacent, but no significant wetlands.

LAND USE

Zoning: A1 (Patterson, Guggolz, and Waaland, 1994).

Existing On-site Land Use: Public conservation.

Land Use Designation: Community facility.

Adjacent Land Use: Commercial/industrial, irrigated agriculture, hayfield.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: County.

Land Ownership and Management: Public.

Consistency with Other Preservation Plans: None.

9. BROWN FARM
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: to be added

Location: Sebastopol quadrangle; south of Highway 12, west of Laguna de Santa Rosa, north of the Todd Road Potential Preserve Site.

BIOLOGICSL RESOURCES

Primary Plant Species of Concern Present: Known occurrences.

Secondary Plant Species of Concern: None known.

Adjacent Populations of Species of Concern: See Todd Road Potential Preserve Site.

Wilflife Species of Special Concern: Significaant populations for a significant portion of life cyce.

Habitat Quality of Vernal Pool Ecosystem: Marginal vernal pool/swale ecosystem.

Other Types of Habitat Value: Habitats present contain rare or unusual habitats or plant communities.

Integrity of Resource/Level of Distribution: Irrigation, heavy grazing or discing.

Habitat Sixe, Shape, and Defensibility: Large, adjacent to Todd Road Preserve Site.

LAND USE

Zoning: No information.

Existing On-site Land Use: Low-intensity agriculture (row crop/hayfield).

Land Use Designation: Land extensive agricultural.

Adjacent Land Use: Mostly grassland/ruderal Urban and rural residential, vacant, agriculture.

Land Use Policies: County

ACQUISITION FEASIBILITY

Conservation Easements: CDFG properly adjacent.

Land Ownership and Management: Large single ownership.

Consistency with Other Preservation Plans: No identified as a potential preserve by any agency.

10. HALL ROAD
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26D 19. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle adjacent to and east of Piezzi Road, north of Occidental Road, south of Hall Road, and west of Irwin Lane, across from Hall School.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08130 (EO 17) *Lasthenia burkei.* This occurrence is located northwest and southeast of the intersection of Hall and Piezzi Roads, northeast of Sebastopol. Hundreds of plants were seen at this site in 1986; about 3,000 were sighted in 1988; and 10,000 to 100,000 were seen in 1991 and 1992. Only hundreds were observed in 1994 after discing (CNDDB 1994).

26260 (EO 30) *Limnanthes vinculans*. This occurrence is located southeast of the Intersection of Piezzi and Hall Road, west of the City of Santa Rosa. Fewer than 100 plants were observed at this site in 1991, 1992, and 1994 (CNDDB 1994).

Secondary Plant Species of Concern Present: *Ranunculus lobbii.*

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Major and minor swales, minor vernal pools.

Other Types of Habitat Value: Oak savanna.

Integrity of Resource/Level of Disturbance: Natural topography, hydrologically altered, grazed, manure, thatch.

Habitat Size, Shape, and Defensibility: Undeveloped land adjacent, but no significant wetlands.

LAND USE

Zoning: RR-B5 (Patterson, Guggolz, and Waaland, 1994); RR (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Pasture, vacant.

Land Use Designation: Rural residential.

Adjacent Land Use: Rural residential, pasture.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

11. LLANO DE SANTA ROSA POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 27E 01, 02, and 03; 33A 01 This Preservation Plan does not include any maps with these code numbers.

Location: Santa Rosa quadrangle; Todd Road at Primrose. West side of Whistler Ave, 0.1 mile north of Junction with Scenic Avenue, south of Santa Rosa.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 08231 (EO 17) *Blennosperma bakeri.* A total of 1,000 plants seen in one colony in 1986; 15,000 seen in four colonies in 1988; Colonies range in size from 50 to 7500 plants (CNDDB). Fewer than 10 plants seen during 1990 (Patterson, Guggolz, and Waaland, 1994). Rare plant populations are mapped as a large "U" shape extending from the northwest corner to the southeast corner of this mapped preserve area.

08219 (EO 26) *Limnanthes vinculans.* About 10 plants were observed at this location in 1987 (CNDDB 1994).

08258 (EO 14) *Limnanthes vinculans.* Population Size: 750 plants seen in 1988; fewer than 50 seen in 1990 (CNDDB, 1994).

Secondary Species of Concern: *Ranunculus lobbii.*

Adjacent Populations of Plant Species of Concern: 30233 (EO 36) *Limnanthes vinculans.* This population is located about 500 feet south of the potential preserve site. This population is distributed in a crescent shaped swale about 60-120 yards east of Primrose Ave. Thousands of plants were observed here in 1993 (CNDDB 1994).

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Site quality ranges from good to poor.

Other Types of Habitat Value: Oak savanna.

Integrity of Resource/Level of Disturbance: Grazing, weeds, thatch build-up, disking, fill.

Habitat Size, Shape, and Defensibility: One to three adjacent significant parcels; <20 ac. significant adjacent land.

LAND USE

Zoning: Rural Residential, Diverse Agriculture (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Agriculture, vacant.

Land Use Designation: B6.

Adjacent Land Use: Rural residential, pasture, hayfield.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Three privately-owned parcels and one owned by SCAPOSD.

Consistency with Other Preservation Plans: None.

12. SHILOH ROAD WEST POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 20F 07 and 08. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; west of Shiloh, between Shiloh Road and Airport Boulevard, northeast of the Sonoma County Airport.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 08126 (EO 8) *Lasthenia burkei*. Many colonies reported, mapped mostly to the west of the Railroad tracks and from Shiloh Road south about 0.7 mile. Shiloh Road, Saunders Road, and Skyline Boulevard Area. Fewer than 100,000 plants seen in 1984; 10,000 seen in 1989/1992. Numbers were only in the hundreds in 1993. Two of the eleven original colonies (reported in 1984) were extant in 1993. Most natural areas destroyed, but protected pools are apparently maintaining as of 1989 (CNDDB, 1994). One of the properties associated with EOO9 contains *Navarretia leucocephala* ssp. *plieantha.*

Secondary Plant Species of Concern: *Navarretia leucocephala* ssp. *bakeri* (Patterson, Guggolz, and Patterson, Guggolz, and Waaland, 1994).

Adjacent Populations of Species of Concern: None.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Fair; minor vernal pools and swales.

Other Types of Habitat Value: Creek, riparian.

Integrity of Resource/Level of Disturbance: Some pools graded and filled. Other threats include development, grazing, agriculture, disking, and wastewater ponds.

Habitat Size, Shape, and Defensibility: One to three adjacent significant parcels; <20 ac. significant adjacent land.

LAND USE

Zoning: A1, B5 (20 ac. min.)

Existing On-site Land Use: Rural residential, pasture, irrigated agriculture.

Land Use Designation: Diverse Agriculture.

Adjacent Land Use: Rural residential, hayfield, pasture.

Land Use Policies: County, except NE corner (approx. 1/5 of preserve) in Windsor.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Two private owners.

Consistency with Other Preservation Plans: None.

13. SPURGEON ROAD
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26B 30. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north of Wood Road, east of the elbow in Wood Road, south of Mark West Creek, and west of the Railroad tracks.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08147 (EO 6) *Blennosperma bakeri.* Three colonies are located within the Wood Road elbow. One colony is located along the south side of Wood Road before the elbow, the others are located 0.1 mile and 0.25 mile northeast of the elbow. Many colonies were observed in 1978; the southern colonies were searched for and not seen in 1986 and 1988. The northern colony supported between 1,000-5,000 plants in 1993 (CNDDB, 1994).

Secondary Species of Concern: *Ranunculus lobbii* and *Downingia pusilla* (Patterson, Guggolz, and Waaland, 1994).

Adjacent Populations of Plant Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Major and minor vernal pools and swales.

Other Types of Habitat Value: None known.

Integrity of Resource/Level of Disturbance: Natural topography; grazing, disking, hyrdrologically altered, manure, grading.

Habitat Size, Shape, and Defensibility: Four or more significant adjacent parcels; >20 ac. significant adjacent land.

LAND USE

Zoning: DA B6 (Patterson, Guggolz, and Waaland, 1994).

Existing On-site Land Use: Rural residential, pasture.

Land Use Designation: Diverse agriculture.

Adjacent Land Use: Rural residential, pasture.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

14. WALTZER ROAD
POTENTIAL PRESERVE SITE

***CDFG/USFWS* Map Code Number:** 26B 43. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north of Piner Road, south of San Miguel Avenue, southwest of the Railroad tracks, and northwest of Santa Rosa.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26276 (EO 19) *Lasthenia burkei.* A total of 21 colonies were reported from this occurrence in 1988 and 1990. Only nine of these were reported as extant in 1993 and 1994 surveys. Many remaining sites apparently have very good to excellent site quality (CNDDB 1994). *Blennosperma bakeri* is found within many of these colonies at this site (CNDDB 1994). This occurrence of *Lasthenia burkei* extends into the San Miguel Preserve.

Secondary Species of Concern: None known.

Adjacent Populations of Plant Species of Concern: *Lasthenia burkei* known from the San Miguel Preserve.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales.

Other Types of Habitat Values: None known.

Integrity of Resource/Level of Disturbance: Significantly altered but stable.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels; <20 ac. significant adjacent land.

LAND USE

Zoning: No information from Patterson, Guggolz, and Waaland, 1994.

Existing On-site Land Use: Grassland/ruderal (proposed residential).

Land Use Designation: Residential, Urban.

Adjacent Land Use: Rural residential, urban, pasture.

Land Use Policies: Santa Rosa.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: No information from Patterson, Guggolz, and Waaland, 1994

15. WOOD ROAD WEST
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26B 25. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; south of Wood Road, south of Mark West Creek, west of the Railroad Tracks, and southwest of the city of Fulton.

BIOLOGICAL RESOURCES:

Primary Plant Species of Concern Present: 26271 (EO 23) *Lasthenia burkei.* This occurrence is mapped as three colonies southwest of the southern elbow of Wood Road, north of the northeast elbow, and south of the northwest elbow. A total of 1,000-5,000 plants were sighted in 1988; and about 200 plants were observed in 1990 (CNDDB 1994).

26272 (EO 28) *Limnanthes vinculans.* This occurrence is known only from a report given to Ornduff in 1976; and was not observed during a search in 1983. This species may be present in small areas away from the road (CNDDB 1994).

Secondary Species of Concern: None known.

Adjacent Populations of Plant Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales.

Other Types of Habitat Values: None known.

Integrity of Resource/Level of Disturbance: Topography somewhat altered (Patterson, Guggolz, and Waaland, 1994); disturbance ranges from slightly altered to very degraded (CNDDB 1994); grazed.

Habitat Size, Shape, and Defensibility: Undeveloped land adjacent, but no significant wetlands.

LAND USE

Zoning: No information.

Existing On-site Land Use: Pasture.

Land Use Designation: Rural Residential.

Adjacent Land Use: Rural residential, agriculture, pasture, vacant.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

16. WINDSOR SOUTH
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 20C 08. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; southwest of Windsor River Road and southwest of and adjacent to the Grange Hall.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 30234 (EO 22) *Lasthenia burkei.* Population observed in a large swale in a horse pasture within the northeast 1/4 of the northwest 1/4 of section 14. A total of 750 plants were observed in 1988 in a dense colony in a large swale, and in other smaller patches.

Secondary Plant Species of Concern: None.

Adjacent Populations of Species of Concern: None.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales.

Other Types of Habitat Value: Oak savanna, native grassland.

Integrity of Resource/Level of Disturbance: Heavy habitat disturbance due to grazing.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels or < 20 ac. significant adjacent land.

LAND USE

Zoning: A1, B5 (5 acre minimum).

Existing On-site Land Use: Vineyard/orchard, grassland/ruderal.

Land Use Designation: Residential, urban.

Adjacent Land Use: Rural residential, urban residential, agriculture.

Land Use Policies: County, adjacent to Windsor.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

17. OCCIDENTAL ROAD POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26C 02 and 26D 21. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north of Occidental Road and south of Hall Road, and adjacent to and east of Laguna de Santa Rosa.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26262 (EO 27) *Limnanthes vinculans*. This occurrence is located between Occidental Road and Hall Road west of the Golf Course and north of Sebastopol. Three small populations are present in the northern part of the potential preserve site. The first is east of Cahill Lane, the second is south of Cahill Lane, and the third is west of the end of Cahill Lane. Only 50 plants were observed in the western colony in 1988 (CNDDB 1994).

08106 (EO 15) *Lasthenia burkei*. Located at the north side of Occidental Road, between Sanford Road and Piezzi Road, northeast of Sebastopol. This occurrence consists of three small colonies located immediately east of Rancho Caballo Lane, about 0.15 mile east of the lane, and about 0.15 mile west of the lane. These colonies occur in the southeastern tip of the potential preserve area. Hundreds of plants were observed at this location in 1986 and 1988 (CNDDB 1994). Since the most recent survey was done about seven years ago, another should be conducted to verify locations and numbers of populations.

Secondary Plant Species of Concern Present: None known.

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Significant and minor vernal pools and swales.

Other Types of Habitat Value: Oak savanna, native grassland, floodplain, riparian.

Integrity of Resource/Level of Disturbance: Natural topography, grading.

Habitat Size, Shape, and Defensibility: No other significant sites adjacent. This is a large preserve with a corridor connecting the northwest and southeast portions. However, there is a large area of urban, residential, industrial to west and north of the preserve; other adjacent land is mostly grassland/ruderal.

LAND USE

Zoning: A1-B6-F2 (Patterson, Guggolz, and Waaland, 1994); mostly Diverse Agriculture, some Extensive Agriculture, and Other (D.W. Smith Consulting, 1990).

Existing On-site Land Use: Mostly grassland/ruderal, some rural residential, alittle vineyard/orchard and urban, residential, industrial.

Land Use Designation: 2/3 diverse agriculture, small areas of extensive agriculture, park and recreation.

Adjacent Land Use: Grassland/ruderal, rural residential, vineyard/orchard.
Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: More than one private owner.

Consistency with Other Preservation Plans: None.

18. WOOD ROAD EAST
POTENTIAL PRESERVE SITE

CDFG/USFWS Preliminary Map Code Number: 26B 55. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north of Wood Road, west of Wright Road, south of Mark West Creek, west of the Railroad tracks.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26266 (EO 24) *Lasthenia burkei.* Three colonies total are included in this occurrence. One colony is west of Fulton Road on the north site of Wood Road. The others are east of Fulton Road on either side of Francisco Avenue. Hundreds of plants were seen at each of these sites (CNDDB, 1994).

Secondary Plant Species of Concern: None known.

Adjacent Populations of Plant Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools.

Other Types of Habitat Value: None known.

Integrity of Resource/Level of Disturbance: Minor topographic alterations, rural residential, grazing.

Habitat Size, Shape, and Defensibility: Isolated, no other significant parcels adjacent.

LAND USE

Zoning: No information from Patterson, Guggolz, and Waaland, 1994.

Existing On-site Land Use: Pasture.

Land Use Designation: Diverse agriculture.

Adjacent Land Use: Rural residential, pasture, hayfield.

Land Use Policies: Santa Rosa?

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

19. ALDER AVENUE
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 33A 12. This Preservation Plan does not include any maps with these code numbers.

Location: Cotati quadrangle; southwest of Hellman Road, north of Highway 116, and west of the Redwood Highway, south of the Laguna de Santa Rosa.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 30232 (EO 35) *Limnanthes vinculans.* Fewer than 100 plants were observed during 1993 and 1993 surveys (CNDDB 1994). One colony is mapped about 400 feet north of the Gravenstein Highway (Highway 116), and about 900 feet west of the Redwood Highway (Highway 101) (CNDDB 1994). This occurrence was part of an off-site mitigation plan whixh involved acquisition of a large population of *Limanthes vinculans* and an additional wetland creation on a parcel adjacent to the mitigation site east of Walker Road.

Secondary Plant Species of Concern: *Ranunculus lobbii.*

Adjacent Populations of Plant Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Significant and minor vernal pools and swales; 2.5 ac. wetlands confirmed by Corps of Engineers.

Other Types of Habitat Value: None known.

Integrity of Resource/Level of Disturbance: Minor alterations, historically significantly altered.

Habitat Size, Shape, and Defensibility: Undeveloped land adjacent, but no significant wetlands.

LAND USE

Zoning: Commercial.

Existing On-site Land Use: Vacant.

Land Use Designation: Residential, urban.

Adjacent Land Use: Rural residential, commercial/industrial.

Land Use Policies: Approximately 4/5 of preserve in Cotati, 1/5 in Sphere of Influence of Cotati.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Four parcels, one private owner.

Consistency with Other Preservation Plans: None.

20. SHILOH ROAD EAST
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: None (20F). Note: EO 10 also corresponds to Map Code Numbers 20F 05 and 06. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; south of and east of Shiloh Road, west of the Old Redwood Highway, and adjacent to Highway 101.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26247 (EO 10) *Lasthenia burkei.* Junction of Highway 101 and Shiloh Road, Shiloh. Colonies are mapped northeast, southwest, and southeast of the Interchange. More than 10,000 plants were observed in Huichica soil in more than 20 vernal pools in 1985; 13,000 plants were observed in 1988; and between 10-40,000 were observed in 1990. Only one colony was reported as extant in 1994, and fewer than 100 plants were observed (CNDDB, 1994).

Secondary Species of Concern Present: None known.

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: No information.

Other Types of Habitat Value: Pruitt Creek divides the north and sourh portions of this site.

Integrity of Resource/Level of Disturbance: No information.

Habitat Size, Shape, and Defensibility: Faught Road site is nearby to the east.

LAND USE

Zoning: None.

Existing On-site Land Use: Row crop/hayfield, grassland/ruderal.

Land Use Designation: 3/5 Diverse Agriculture, Community Facility, Land Intensive Agriculture, Rural Residential.

Adjacent Land Use: Urban, residential, industrial; rural residential, grassland/ruderal.

Land Use Policies: County, NE corner (approximately 1/4 of preserve) in Windsor

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: None.

Consistency with Other Preservation Plans: None

21. SAN MIGUEL ROAD POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26B 1, 18, 33, 34, 35, 38, 40, 47, 64, 66, 67, 68, 69. This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; east of Fulton Road, west of the Railroad tracks, and adjacent to and north of San Miguel Road. T7N, R8W, NE 1/4 of Section 5.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 26264 (EO 26) *Blennosperma bakeri.* This occurrence is south of the elbow of Francisco Road, about 0.1 mile east of Fulton Road. About 750 plants were observed here in 1988; and between 5,000-10,000 seen in 1992 (CNDDB 1994).

26266 (EO 24) *Lasthenia burkei.* Three colonies total are included in this occurrence. One colony is west of Fulton Road on the north site of Wood Road. The others are east of Fulton Road on either side of Francisco Avenue. Hundreds of plants were seen at each of these sites (CNDDB, 1994).

26276 (EO 19) *Lasthenia burkei.* A total of 21 colonies were reported from this occurrence in 1988 and 1990. Only nine of these were reported as extant in 1993 and 1994 surveys. Many remaining sites apparently have very good to excellent site quality (CNDDB 1994).

08173 (EO 21) *Limnanthes vinculans.* This occurrence is along Fulton Road between San Miguel Avenue and Francisco Avenue. This area was searched in 1983, but no plants were observed. [This occurrence is T7N, R8W, SE 1/4 Section 5.]

EO 10 *Blenosperma bakeri.* This EO may also occur at this potential preserve.

Secondary Plant Species of Concern: *Ranunculus lobbii.*

Adjacent Populations of Plant Species of Concern: 25898 (EO 23) *Blennosperma bakeri.* Is at the northeast boundary of the potential preserve site, and a portion of this occurrence may be within the site. This occurrence is located at Francisco Road, about 0.6 miles north of San Miguel Road, on the northeast side of the road between the roadway and the railroad. A total of 74, 000 plants were seen in 1991 at this site (CNDDB 1994).

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Major vernal pools, minor vernal pools and swales.

Other Types of Habitat Value: Native grassland.

Integrity of Resource/Level of Disturbance: Natural, natural topography, with minor alterations, rural residential, cultivated, grazed, thatch, manure, weeds.

26264 (EO 26): The degree of disturbance at this site is high, and vegetation is cropped low due to sheep grazing (CNDDB, 1994).

08173 (EO 21): This area is open land that is mostly pasture, and no appropriate habitat exists (CNDDB, 1994).

Habitat Size, Shape, and Defensibility: Undeveloped land, but no significant wetlands; one to three significant adjacent parcels and <20 ac. significant adjacent land; 4 or > significant adjacent parcels or >20 ac. significant adjacent land.

22. WRIGHT ROAD SOUTH POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26D 06 This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; northwest of Santa Rosa Air Center, south of Highway 12, and east of Wright Road.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08169 (EO 2) *Limnanthes vinculans.* Hundreds of plants were sighted at this occurrence during 1983 surveys. About 750 were observed in 1988; fewer than 100 were seen in 1990, and hundreds were seen during years 1991-1994 (CNDDB 1994). This population has remained reletively stable since 1974, at which time it was considerability larger (Guggolz 1995).

Secondary Species of Concern: *Ranunculus lobbii* (Patterson, Guggolz, and Waaland, 1994); *Pogogyne douglasii* ssp. *parviflora, Navarretia. leucocephala* ssp. *bakeri*, and *Hemizonia congesta* ssp. *leucocephala* (Guggolz, 1995).

Adjacent Populations of Plant Species of Concern: None known.

Wildlife Species of Special Concern: California tiger salamander.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools.

Other Types of Habitat Values: Oak savanna.

Integrity of Resource/Level of Disturbance: Natural topography, mowed, thatch, vehicles (patterson, Guggolz, Waaland, 1994); Site is unfenced and is subject to vandalism; this field is mowed by the Army with few precautions (CNDDB 1994).

Habitat Size, Shape, and Defensibility: Undeveloped land adjacent, but no significant wetlands (Patterson, Guggolz, and Waaland, 1994).

LAND USE

Zoning: No information from Patterson, Guggolz, and Waaland, 1994.

Existing On-site Land Use: Rural residential.

Land Use Designation: Residential, urban.

Adjacent Land Use: Rural residential.

Land Use Policies: Santa Rosa Sphere of Influence.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: U.S. Army Reserve.

Consistency with Other Preservation Plans: None.

LAND USE

Zoning: A1, B6 (Patterson, Guggolz, and Waaland, 1994).

Existing On-site Land Use: Rural residential, hayfield, pasture vacant.

Land Use Designation: Residential, urban; area identified for potential wetlands and rare plants (City of Santa Rosa, 1993).

Adjacent Land Use: Rural residential, hayfield, pasture, vacant.

Land Use Policies: Santa Rosa.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Fourteen private owners.

Consistency with Other Preservation Plans: NW Annexation.

23. BIAGGI ROAD
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 26C 03 This Preservation Plan does not include any maps with these code numbers.

Location: Sebastopol quadrangle; north of Occidental Road, adjacent to and west of Piezii Road.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08106 (EO 15) *Lasthenia burkei.* Located at the north side of Occidental Road, between Sanford Road and Piezzi Road, northeast of Sebastopol. This occurrence consists of three small colonies located immediately east of Rancho Caballo Lane, about 0.15 mile east of the lane, and about 0.15 mile west of the lane. These colonies occur in the southeastern tip of this potential intermediate quality preserve area. Hundreds of plants were observed at this location in 1986 and 1988 (CNDDB 1994).

Limnanthes vinculans was observed at this site in 1986; population size unknown (Patterson, Guggolz, and Waaland, 1994).

Secondary Species of Concern: None known.

Adjacent Populations of Plant Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales.

Other Types of Habitat Values: Oak savanna.

Integrity of Resource/Level of Disturbance: Significantly altered, but stable; grazed (Patterson, Guggolz, and Waaland, 1994); site is heavily grazed (CNDDB 1994).

Habitat Size, Shape, and Defensibility: Isolated, no other significant sites adjacent.

LAND USE

Zoning: Diverse agriculture (D.,W. Smith Consulting, 1990).

Existing On-site Land Use: Rural residential.

Land Use Designation: Diverse agriculture.

Adjacent Land Use: Grassland/ruderal, rural residential.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

24. FAUGHT ROAD
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: None. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; west of Faught Road, east of Highway 101, east of the Old Redwood Highway, and south of Shiloh Road East Preserve.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: None known.

Secondary Species of Concern Present: None known.

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Significant vernal pools and swales.

Other Types of Habitat Value: No information.

Integrity of Resource/Level of Disturbance: No information.

Habitat Size, Shape, and Defensibility: Undeveloped land adjacent; fairly large preserve.

LAND USE

Zoning: No information.

Existing On-site Land Use: Grassland/ruderal.

Land Use Designation: Land intensive agriculture.

Adjacent Land Use: Vineyard/orchard, rural residential, grassland/ruderal.

Land Use Policies: County.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: No information.

Consistency with Other Preservation Plans: None

25. WINDSOR NORTH
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 20C 05, 06, 07, 15, 21. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; Starr Road, west side of railroad tracks, about 1.1 miles NW of Windsor (CNDDB, 1994).

BIOLOGICAL RESOURCES

Primary Plant Species of Concern: 08093 (EO 12) *Lasthenia burkei.* Several colonies found scattered from just east of the northern end of Herb Road to northeast of where Starr Road crosses the railroad tracks. Mostly within northwest 1/4 of Section 11. A total of 1,000 plants were observed in 1985; about 8,000 were seen in many colonies in 1988; and 110,000 plus plants were seen in 1989 (Patterson, Guggolz, and Waaland, 1994). CDFG/USFWS Map Code Number 20C 07 contained approximately 5,000 plants in 1992 and 1993 (Guggolz, 1995).

08094 (EO 18) *Lasthenia burkei.* This population is the northernmost population of *Lasthenia burkei* within the study area. It is located on the east side of old Redwood Highway, 0.2 miles north of Arata Lane, northwest of the end of Starr Road. A total of 2,500 plants were seen in 1986; 3,000 in 1988, and hundreds in 1989. This site has been observed since 1960, and is considered "to be one of the most stable in Sonoma County" (CNDDB, 1994).

Secondary Plant Species of Concern Present: *Navarretia bakeri* and *Downingia pusilla* were observed in Map Code No. 20C 07 (Patterson, Guggolz, and Waaland, 1994; Guggolz 1992 and 1992a). According to CNDDB (1994) it was also observed in Map Code No. 20C 05, 06, 15, 21.

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Fair (08094) to good (08093); minor vernal pools and swales.

Other Types of Habitat Value: Oak woodland (blue oak), oak savanna, native grassland.

Integrity of Resource/Level of Disturbance: Grazing, disking, altered hydrology, weeds, and orvs.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels or < 20 ac. significant adjacent land.

LAND USE

Zoning: Rural residential, B5 (Patterson, Guggolz, and Waaland, 1994).

Existing On-site Land Use: Rural residential, hayfield, irrigated agriculture.

Land Use Designation: Residential, urban.

Adjacent Land Use: Urban and rural residential, commercial/industrial, pasture, irrigated agriculture.

Land Use Policies: Windsor.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: Five private owners.

Consistency with Other Preservation Plans: None.

26. OLD REDWOOD HIGHWAY POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 20C 01, 10. This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; west of Highway 101, south of Old Redwood Highway, and east of the Windsor North Preserve.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08094 (EO 18) *Lasthenia burkei.* This population is located on the east side of old Redwood Highway, 0.2 miles north of Arata Lane, northwest of the end of Starr Road. A total of 2,500 plants were seen in 1986; 3,000 in 1988, and hundreds in 1989. This site has been observed since 1960, and is considered "to be one of the most stable in Sonoma County" until recently. Due to partial filling and draining in the past few years, the habitat quality has declined (CNDDB, 1994; Guggolz 1995). Extant 1993: 10-100 plants (Patterson, Guggolz, and Patterson, Guggolz, and Waaland, 1994).

24731 (EO 06) *Navarretia leucocephala* ssp. *bakeri.* The status of this population is unknown; it was collected in 1938 and no other information is available.

Secondary Species of Concern Present: *Pogogyne douglas* ssp. *Parviflora, Hemizania cangesti* ssp. *leucocephala.*

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales.

Other Types of Habitat Value: Meadow, ditch, native grassland.

Integrity of Resource/Level of Disturbance: Disked, junk, vehicles.

Habitat Size, Shape, and Defensibility: One to three significant adjacent parcels; <20 ac. significant adjacent land.

LAND USE

Zoning: M1.

Existing On-site Land Use: Vacant, commercial/industrial.

Land Use Designation: Residential, urban.

Adjacent Land Use: Commercial/industrial.

Land Use Policies: Windsor.

ACQUISITION FEASIBILITY

Conservation Easements: Adjacent to or near (south) of DeLoach Vineyards— Category 1.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: Adjacent to or near (south) of DeLoach Vineyards— Category 1.

27. ALVES ROAD
POTENTIAL PRESERVE SITE

CDFG/USFWS Map Code Number: 20C 04 This Preservation Plan does not include any maps with these code numbers.

Location: Healdsburg quadrangle; east of Starr Road, southeast of the Windsor North Preserve.

BIOLOGICAL RESOURCES

Primary Plant Species of Concern Present: 08093 (EO 12) *Lasthenia burkei.* Several colonies found scattered from just east of the northern end of Herb Road to northeast of where Starr Road crosses the railroad tracks. Mostly within northwest 1/4 of Section 11. A total of 1,000 plants were observed in 1985; about 8,000 were seen in many colonies in 1988; and 110,000 plus plants were seen in 1989. At least two colonies are now extirpated including the largest colony reported in this area. Less than 10 plants seen in 1991 (Patterson, Guggolz, and Waaland, 1994). In 1988, 500-1,000 plants were observed at CDFG/USFWS Map Code Number 20C 04 and the species was observed at the site again in 1991, but no counts were recorded that time (Guggolz 1995).

Secondary Species of Concern Present: 24731 (EO 06) *Navarretia leucocephala* ssp. *bakeri*. The status of this population is unknown; it was collected in 1938 and no other information is available.

Adjacent Populations of Species of Concern: None known.

Wildlife Species of Special Concern: None known.

Habitat Quality of Vernal Pool Ecosystem: Minor vernal pools and swales.

Other Types of Habitat Value: Native grassland.

Integrity of Resource/Level of Disturbance: Urban and rural residential, minor hydrologic alteration, thatch, and weeds.

Habitat Size, Shape, and Defensibility: No significant adjacent parcels.

LAND USE

Zoning: R2.

Existing On-site Land Use: Rural residential.

Land Use Designation: Residential, urban.

Adjacent Land Use: Urban and rural residential.

Land Use Policies: Windsor.

ACQUISITION FEASIBILITY

Conservation Easements: None.

Land Ownership and Management: One private owner.

Consistency with Other Preservation Plans: None.

Appendix F

Mitigation Banks

F.1 Mitigation Banking Concepts

At least eight states (Colorado, Florida, Lousiana, Minnesota, New Jersey, North Dakota, Oregon, and Wyoming) have laws governing mitigation banking. In addition, for those states which do not curently have legislation in place, the regulatory agencies have developed policies, guidelines and memorandums of agreement that are used to administer the concept of mitigation banking, mostly on a case-by-case basis. In the absence of statutes and regulations, the policies and guidance must be interpreted in light of the proposed banking concept and considerable effort is usually expended in applying these policies to the proposed bank. Most mitigation banking has been set up for wetland mitigation, and the following discussion therefore primarily addresses wetland banks.

A primary issue in the permitting review for water supply projects is unavoidable impacts on wetlands regulated under the Section 404 program. The issue of wetland mitigation is particularly significant when interpreting the Corps' goals to offset unavoidable adverse impacts and to achieve no overall net loss of wetland values and functions. The Corps follows the Council of Environmental Quality's NEPA definition of wetland mitigation, but, in practice, it combines mitigation into three general types: avoidance, minimization, and compensatory mitigation. The concepts of mitigation banking (under specific criteria to ensure success) and preservation of existing wetlands (in exceptional circumstances) are considered acceptable forms of compensatory mitigation. Figure F-1 is a schematic of the compensatory mitigation process.

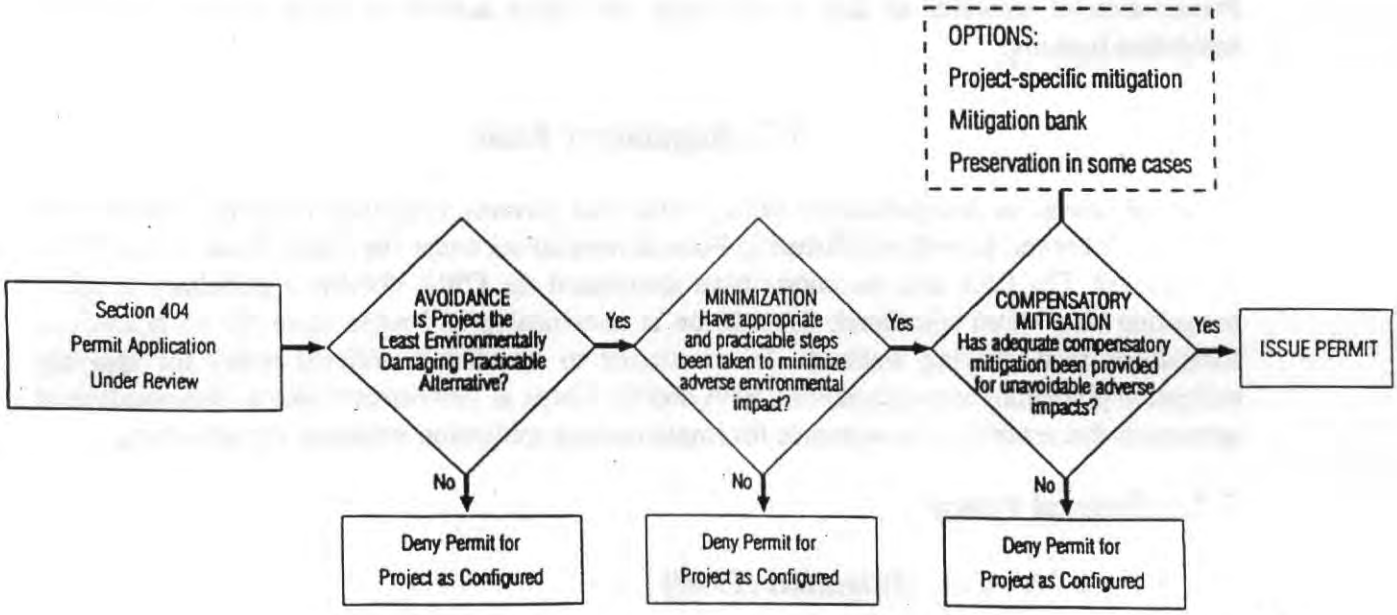


Figure F-1
Compensatory Mitigation Sequencing

A mitigation bank has assets in the form of estimated tangible and intangible values (or credits) of resources, usually within a relatively large tract of wetlands. Developers or others that need mitigation can consider using mitigation bank options. In the single client bank, credits may be acquired and banked by restoring or creating functional ecosystems before the impact that may cause a loss of resources. The credits are then used to compensate for losses (or debits) of comparable value, normally within the same watershed. For wetland mitigation banking, before debits can occur, the Corps must determine that the following conditions have been met:

- Wetland losses cannot be prevented
- Proposed project design and construction plans have been developed to minimize wetland losses to the extent practicable
- Mitigating wetland losses onsite is not feasible

The objective of wetland mitigation banking is to compensate for wetland losses due to development in one area through establishing or enhancing wetlands in another area of the same watershed. Permits for particular projects may still be required and they are determined by the Corps on a case-by-case basis, irrespective of participation in a wetlands mitigation bank.

F.1.1 Definitions

Mitigation banking can be defined as the creation, restoration or enhancement of habitats and their functional values expressly for the purpose of providing compensatory mitigation. Mitigation can occur in advance of proposed impacts to the waters of the United States, including wetlands, or other biological resources, where mitigation cannot be achieved at the site of impact (USEPA Region IX Wetlands Mitigation Banking Guidance Memo, December 20, 1991). Preservation of wetlands in lieu of any other mitigation activity is rarely viewed as part of mitigation banking.

F.2 Regulatory Basis

As stated above, no comprehensive policy exists that governs mitigation banking. Protection of wetlands, however, is well established in Federal regulations under the Clean Water Act of 1977, as amended. The EPA and the courts have interpreted the CWA 404(b)(1) guidelines to allow mitigation only when significant degradation is unavoidable and when there are no practicable alternatives to destroying wetlands. In an attempt to establish a uniform policy for applying mitigation guidelines among agencies, EPA and the Corps in 1990 entered into a memorandum of agreement that established a sequence for implementing mitigation strategies for permitting.

F.2.1 Federal Policy

Corps-EPA MOA on Mitigation (1990)

The Corps and the EPA entered into a memorandum of agreement (MOA) on November 15, 1989 and amended on February 6, 1990 to provide general guidance on the level of mitigation

necessary to demonstrate compliance with the EPA Guidelines. Under the MOA, the Corps's 404 (b)(1) permit review process considers "sequencing" of avoidance of wetland impacts, minimization of unavoidable wetland impacts, and compensatory mitigation for the unavoidable wetland impacts.

In addition to compensatory wetland mitigation, the MOA generally recognizes mitigation banking:

> Mitigation banking is an acceptable form of compensatory mitigation under specific criteria designed to ensure an environmentally successful bank. Where a mitigation bank has been approved by EPA and the Corps for the purposes of providing compensatory mitigation for specific identified projects, use of that mitigation bank for those particular projects is considered as meeting the objectives of Section II. C. 3 of this MOA (the section on compensatory mitigation), regardless of the practicability of other forms of compensatory mitigation. Additional guidance on mitigation banking will be provided. Simple purchase of "preservation" of existing wetlands resources may in only exceptional circumstances be accepted as compensatory mitigation. EPA and Army will develop specific guidance on preservation in the context of compensatory mitigation at a later date.

EPA Region IX Mitigation Banking Guidance (1991)

EPA Region IX issued a guidance document on December 20, 1990 that identifies the policies concerning wetland mitigation banking. Criteria for the use of mitigation banks, identification of types of both appropriate and inappropriate projects, and general procedures for organizing and implementing mitigation banks in Region IX were included in the guidance document.

Corps-EPA Memorandum to Field (1993)

The Corps and EPA issued a memorandum to the field on August 23, 1992 that outlined the procedures for establishment and use of wetland mitigation banks in the 404 regulatory program.

Clinton Administration Policy (1993)

As part of the Clinton Administration's efforts to improve the federal wetlands regulatory program, the memorandum to the field issued by the Corps and EPA was included in the policy statement.

EPA Draft Mitigation/Monitoring Guidelines for Vernal Pool Habitat (due in 1994)

F.2.2 California Policy

Within California, no official policy exists at the present time, except for the Central Valley area as noted below.

CDFG Draft Guidelines For Mitigation Banking (1990)

The California Department of Fish and Game issued draft Guidelines for the Establishment and Use of Mitigation Banks in 1989. The policy was revised further in 1990, but has not yet been adopted by the legislature or the CDFG.

Sacramento-San Joaquin Valley Wetlands Mitigation Bank Act (1993)

A wetlands mitigation bank was authorized by the legislature in 1993 for the Sacramento and San Joaquin Valley area.

Wilson Administration Policy (1993)

The California Wetlands Conservation Policy was announced on August 23, 1993 by Governor Wilson to support the concept of wetlands mitigation banking. The policy supports mitigation banking as a means to foster a coordinated approach and to avoid fragmentation of wetland mitigation efforts. The policy also stated that California would develop and adopt guidelines for wetland mitigation banks that addressed regional concerns, contain flexible mitigation ratios, be consistent with federal policy and encourage decisions to locate banks in the context of local or regional plans. Further guidance has not yet been promulgated.

F.3 Principles of Operation

A wetland mitigation bank is typically created when a property owner, under formal agreement, acquires a long-term interest in a degraded wetland or upland site and restores or creates a functional wetland ecosystem.

F.3.1 Types of Banks

Mitigation banks may be developed in a variety of forms. Banks can be owned and operated by private entities, public agencies, and non-profit or for-profit organizations, including land trusts. The majority of the 46 wetland mitigation banks operating in 1992 were operated by state or local governmental agencies for their own projects (Environmental Law Institute, 1993). Only four private or entrepreneurial banks had been established in the United States offering credits for sale.

Most banks are established for urban area developments. Mitigation areas for small isolated projects can still suffer loses of functions and values through conversion of surrounding lands. Mitigation banks offer an opportunity to preserve these functions and values with reduced risk of future losses. The limited available urban area land suitable for banks and high costs of land dictate the mitigation banks are established in farming or other land near urban centers.

F.3.2 Organization and Management

Most mitigation banks have been set up by public agencies to support highway, port, or industrial land development projects by providing advance wetland mitigation for the bank operator's own projects. In a few cases, banks have been established by entrepreneurial bankers to provide credits for sale to other project proponents.

The process of establishing a mitigation bank can be separated into four phases as shown in Figure F-1, prepared for the American Water Works Association (CH2M HILL, 1994 draft report).

- **Feasibility Determination Phase.** This phase is used to (1) identify the need for a mitigation bank and (2) determine if a mitigation bank can be established to fulfill the needs. Regulatory constraints, site availability, conceptual planning-levels analysis of design, costs and long-term operation are established.

- **Bank Setup Phase.** For potentially feasible bank concepts, the background work needed to establish the banking agreement is conducted, negotiations and signatures on the banking instrument are obtained. Site acquisition, final design, and permits are secured for the bank to commence construction and operations.

- **Construction and Startup.** Performance standards and ecological success criteria are established. Construction activities for specific aspects of the mitigation bank are implemented.

- **Bank Operation Phase.** Banking operations including tracking and accounting for transactions (credits and debits), compliance monitoring in accordance to permits and agreements. Long-term operation maintenance and monitoring activities are conducted.

An overview of the key features of the institutional components of a mitigation bank is presented in Table F-1.

F.3.3 Allowable Compensation

Compensation is determined on a project specific basis in an attempt to achieve full function values for the resources being lost. Credit is given for functional values and acreage for mitigation when the debit and credit are most closely balanced. This concept is often difficult to achieve without extensive analysis and negotiation.

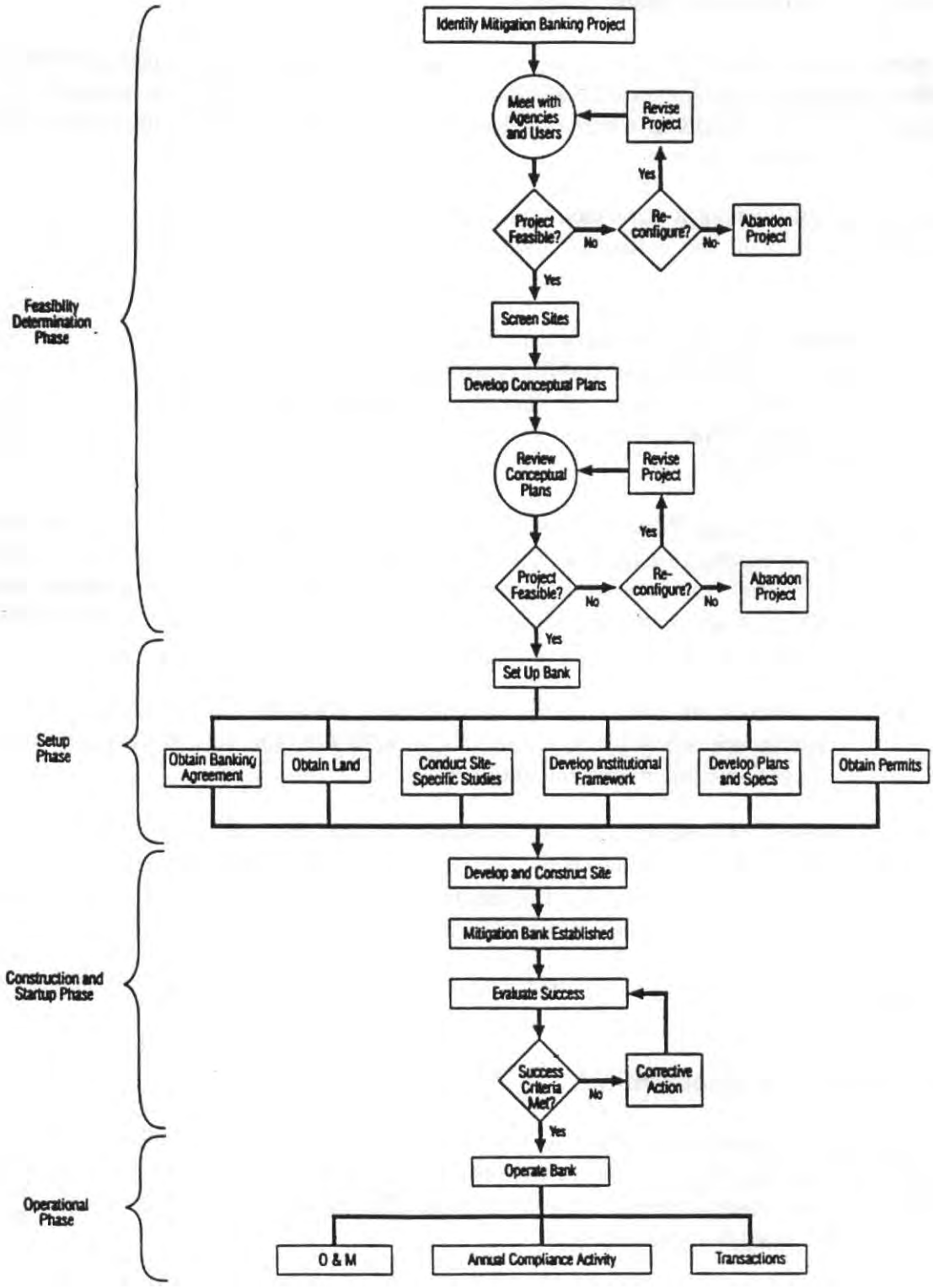


Figure F-2
Mitigation Banking Project Activity Flow Chart

Source: CH2M HILL, 1994

Preservation as a sole method of compensation is generally discouraged, as this concept does not meet the 404 Guidance Criteria for sequencing established by the Corps and EPA. Regulatory agencies will direct banks to meet the no net loss goal by increasing the habitat through restoration, enhancement or creation of wetland habitat wherever possible.

F.3.4 Credit and Compensation Ratios

Generally, mitigation banks have similar operating characteristics:

- Mitigation banks are located in the same watershed or other defined geographical area as the loss being compensated
- Compensation ratios are usually in the range of 1:1 to 3:1 ratio, unless specifically negotiated in advance of incurring the loss. Success rates and quality of the replacement resources may affect the actual compensation ratio
- Credits are accounted for in "units" which are determined by the regulatory agencies to include a measure of acreage, function and value. Units may be substantially smaller than one acre in size, but must be mappable quantities of land area

F.4 Considerations in Establishing and Managing a Mitigation Bank

There is a strong interest within the development community, both private and public entities, in the use of mitigation banks to provide compensatory area for mitigation of losses attributable to project development actions. There are a number of perceived benefits that may accrue through the use of mitigation banks.

F.4.1 Funding Considerations

Cost. Large mitigation developments can offer economies of scale to developers that result in lower costs per acre and potentially greater habitat values. Long-term management and monitoring responsibilities are transferred to a custodial entity, making small mitigation projects more economically viable. The costs associated with individual design and implementation are integrated with others in the development of larger scale projects. Competing uses for and the cost of suitable land may make it difficult or infeasible to establish a bank.

Financial Management. Oversight and management of large, valuable habitat is more easily demonstrated and assured than for individual mitigation projects. Professional planning, management, and monitoring can be provided with banks that are difficult to achieve for individual sites. A bank established by a stable, well-moneyed concern will remain so over the long-term.

Public Funding Costs. Mitigation banks have the potential for incurring costs borne by the public (agency staff time for monitoring, review, public hearings), in planning, land

acquisition, long term management and monitoring phases of a mitigation bank. It is important to identify how agencies will be compensated for their involvement. Public lands taken or included in mitigation banks should be compensated at full market value by bank users.

Financial Incentives. Developers may need financial incentives to be willing to invest in mitigation banks.

Perpetuity Guarantee. Financial assurances and deed restrictions need to be established to guarantee the future ownership, management and maintenance of the bank.

Valuation Issues. The value of mitigation is established by the development market forces, not the bank operator. Establishing credits and debits must be well defined, to avoid controversy about the allocation of assets. Compensation for lost opportunity of the land should be defined.

F.4.2 Site Selection Considerations

Development Site Uses. Banking off-site may allow greater use of land and increase the planning flexibility within the project site.

Restoration Opportunities Limited. Within a watershed or hydrologic unit, the opportunities to restore degraded habitats may be limited. Creation of artificial wetlands and rare plant translocation is an evolving science. Habitat values and functions of banked areas determines the range of mitigation uses for the bank. Not all functions or values may be compensated for in an individual bank.

F.4.3 Institutional Considerations

Compliance with Sequencing Goals. A fundamental concern with banking is to demonstrate that "no practicable" alternative exists that would have a less environmental damaging effect. Demonstrating the no upland alternative exists for "non-water dependent" actions would be a prerequisite to wetland loss and use of a mitigation bank. Compensatory mitigation should be used after efforts to avoid and minimize wetland loss have been exhausted. Demonstrating compliance with sequencing may significantly affect the value of wetland mitigation banking by developer interests.

Institutional Issues. Consensus between multiple regulatory agencies is often difficult but not impossible to achieve. Tradeoffs will be necessary. Agencies will need to be willing and have the authority to interpret their policies and guidelines in ways that allow them to make decisions and commitments. Regulatory staff will need assistance and understanding, in completing the administrative and legal requirements of banks.

Regulatory Flexibility and Certainty. Both the agencies and developers needs for flexibility in permit actions and the certainty of mitigation efforts are increased with mitigation banks. The bank operators are responsible for ensuring the continued success of the mitigation, relieving developers of demonstrating their long-term obligations.

Habitat Conservation Planning Goals. Regional conservation planning goals may be integrated with other park, open space, and land use planning to meet wildlife habitat preservation objectives.

Probability of Success. Hydrologic, geologic and ecological integrity of the site can be balanced and managed better when larger contiguous areas are integrated as a unit. Creating and measuring habitat values in advance of debits would ensure users that mitigation is fully compensated for in advance of incurring a loss. Uncertainties associated with agency approval of site selection and measurements of mitigation success is significantly reduced.

Goals and Performance Standards. It is crucial to establish goals and performance standards for all functions, values and acreage within a mitigation bank. Wetland and habitat conservation science is evolving, and the habitats themselves are dynamic systems; therefore, it is difficult for agencies and interested parties to define a static, compensatory formula for every mitigation debit.

Timing Issues. Projects may be more viable with the certainty that compensatory mitigation can be achieved and planned for in a manner to resolve other project development issues.

F.4.4 Ecological Considerations

Consolidation. Banks may achieve greater ecological benefits by offering larger, contiguous tracts, with important wildlife habitat values, in place of the fragmentation and isolation often associated with small, dispersed areas of limited habitat value. Regional conservation and ecologically important goals can be achieved. Larger habitat patches may offer reduced chance of local extinctions, genetic mixing, and access to refugia in the face of changing environmental conditions. Banks can avoid the creation of on-site habitat islands. When added to existing refuges and open space area, additional value may accrue to the bank through connection of regional units.

Temporary Habitat Gains. Compensation can be completed at a bank before losses are incurred at project sites.

Probability of Success. The creation-before-use basis used in the banking concept requires regulatory agencies to certify and categorize that enhanced, restored or created habitats have demonstrated success in achieving functions and values. The long period between taking action to increase habitat values and measuring the achievement is often difficult to fully document. Seasonal and annual variability can limit the true measurement of values achieved.

Increased Risk. Having mitigation concentrated in a bank can incur risk of greater losses due to habitat failure, fire, flood, drought or other natural and human factors. Unnaturally high concentrations of wetland functions or units (vernal pools), or an unnatural mix of wetland types can compound the severity of losses.

Limited Applications. Some types of habitats cannot be mitigated for in advance within reasonable development timeframes, for example, demonstrating long-term viability of rare plant translocations.

Habitat Values Lost. Out-of-kind mitigation is a controversial concept. It is difficult in many cases to justify the ecological basis for mitigation in other areas or trading of functions and values. Lost functions and net gains in wetlands accounting concepts remain controversial and difficult to defend scientifically. In-kind, onsite mitigation may have the greatest chance for maintaining functions and values, with the least risk of failure.

Table F-1
Key Features of Institutional Components

Institutional Component	Features
Bank Instrument	
The success of a mitigation bank depends on two things: (1) the way in which a mitigation bank is established, and (2) the roles various participants play in managing bank activities.	To establish a mitigation bank, the parties who will participate in the bank must enter into a formal, written agreement, referred to as a banking instrument, presents the guidelines for establishing and using the bank. In many circumstances, a mitigation bank also may be established as a condition of a Section 404 permit. The banking instrument or the Section 404 permit should address bank location, bank goals and objectives, bank sponsors and participants, development and maintenance plan, geographic area of bank, monitoring requirements and responsibilities, remedial action responsibilities and funding, provisions for bonding, and the methodology for establishing bank credits and complying with project goals.
Bank Management and Debiting	
Bank management and debiting is a two-step process. First, bank credits are evaluated for use in particular projects. Then, the resulting transactions are recorded.	For dedicated or single-user banks, the permitting process for bank management and debiting is often inseparable. The bank sponsor and regulatory agencies agree in advance on issues relating to the establishment and use of bank credits for future permitted projects. If the impacts to be compensated for are known in advance and specified in the bank instruments, the bank manager can handle bank management. For commercial or general-user banks, regulatory agencies must exercise bank management oversight separately from the permitting process. In addition, because wetland impacts are unknown, regulators determine the allowable trades for specific projects on a case-by-case basis.
Bank Siting Process	
Regulators typically expect mitigation banks to be located in the same watershed as the wetland impacts they will be used to compensate for. The banks should be as close as possible to those impacts to replace important area-specific wetland functions and values that would be lost to development.	Regulators prefer bank sites near areas free from development uses that might threaten bank wetlands functions and values. Regulators also prefer banks to be located in areas that will allow biological integration with surrounding areas. Sites that can be used to create large areas of replacement wetlands are preferred because they avoid habitat fragmentation and promote biodiversity and the establishment of complete, self-regulating ecosystems.
Allowable Compensation	
The success of a bank is affected by the type of mitigation and by the timing of compensation and the geographical range of the permitted projects.	Mitigation Type. Regulators favor restoration of former or severely degraded wetland areas where hydric soils already exist and where the underlying hydrology is intact or can be restored relatively easily. All other mitigation methods (enhancement, creation, and preservation) are generally viewed as useful supplemental features of restoration plans.

Table F-1 Key Features of Institutional Components	
Institutional Component	**Features**
Compensation for each mitigation bank is based on wetland functions lost as determined during the Corps review. The Corps permit will specify how much mitigation is required after avoidance and minimization have been considered.	Mitigation Timing. Federal regulatory guidance for mitigation banking required that bank replacement wetlands be "in place and functional" before they can generate usable bank credits. But such "advanced" mitigation can mean anything from completing mitigation activity to providing wetlands that are mature enough to have achieved full functional values before credits are tradable.
Credit Valuation and Compensation Ratios	
Credit valuation involves the definition and evaluation of a mitigation bank's currency; compensation ratios establish the types and levels of allowable trades of bank currency for permitted wetland impacts.	The method used to evaluate bank credits (as well as wetland development impacts) is tied closely to bank- and area-specific wetland goals. For example, if banks are established to compensate for the loss of a particular wetland function, the credits might be measured in terms of units of that function produced. In general, the best credit valuation method for any particular bank is to use the simplest method that can achieve bank- and area-specific goals. Regulators generally expect compensation ratios to account for risk and uncertainty. Typical compensation ratios have been in the range of 1:1 to 2:1. Sometimes the compensation ratio is adjusted to reflect differences in success rates or the quality of replacement wetlands generated by different mitigation methods.
Quality Controls	
Several levels of quality controls must be developed for each mitigation bank as part of the overall bank establishment process. These are:	
Performance Standards and Success Criteria. A methodology that is acceptable to all parties involved must be established to assess the success of a mitigation bank. This methodology should identify the credits that will be issued at each stage of development and the range of wetland functions to be assessed. The Mitigation bank's functions, and the bank's credits and debits, should be evaluated	Success criteria can serve one or more purposes. For examples, they may be used to: (1) Determine when credits can be used; (2) Adjust compensation ratios at the time of credit use; (3) Guide monitoring and maintenance requirements on mitigation banks after they have generated usable credits; and (4) Define when mitigation failure has occurred after credit use. Success criteria may be defined in terms of wetland delineation criteria (relating to soils, hydrology, and vegetation); vegetation and biodiversity goals (survivability of planted vegetation and control of exotics); or some qualitative or quantitative measure of the functional achievement of replacement wetlands.

Appendix G

Assessment of Compensation Techniques

G.1 Definitions

Compensation for direct and indirect impacts on vernal pools, vernal swales, and other seasonal wetland habitats can take the form of restoration, enhancement, and/or creation of the same types of habitats. The distinction between restoration and enhancement versus creation is based on the historic conditions and type of habitat at the compensation site. If a wetland was present historically, it can be restored or enhanced; if the site was historically an upland habitat, compensation requires creation.

G.1.1 Restoration

Restoration is the reestablishment or recovery of preexisting wetland conditions, the implication being that past damage or disturbance destroyed or modified valued wetland properties at the site. The wetland conditions may have been altered by changes in topography or filling of a wetland or, less likely, placement of fill within in its proximate watershed.

On the Santa Rosa Plain, vernal pools have been destroyed by filling and ditching designed to redirect surface runoff and/or prevent water from flowing onto one's property, or to raise the grade, eliminate ponding, and create drier conditions for crops or grazing livestock. Drainage patterns have been disrupted many ways, one of which has been filling at property lines. Vernal pools and swales have also been filled as land as been levelled. Levelled ground is not typically completely flat. Soil from mounds and higher ground pushed into the depressions and swales raises the low areas and permits use of irrigation equipment, but minimal relief still remains.

Vernal pool restoration in such instances could involve excavation of the soils pushed into the depressions and swales, exposure of the buried soils, and replacement of the excavated soil on the mounds and other high ground. Effectively, restoration involves the recreation of the original microtopography.

G.1.2 Enhancement

Enhancement is the process of increasing or augmenting the level of one or more recognized wetland values. Because augmentation is also possible through restoration, enhancement and restoration are not always mutually exclusive. However, enhancement begins with an intact wetland where restoration may not. One of the most obvious methods of enhancing vernal pools and swales on the Santa Rosa Plain would be the reestablishment of the original drainage function. All but the smallest, lowest-order (headwater) drainages have been crossed by roads over much of the Santa Rosa Plain. Roadside ditches carry water away from some swales and release it in others or in the flood control channels where it is no longer available to vernal pools or other seasonal wetlands. To return water to their properties, landowners have breached ditch banks, allowing water to flow from the ditches into swales and other ditches that cross their properties.

The small-parcel character of much of the Santa Rosa Plain has severely affected the vernal pools and swales. Vernal pools that straddle lands in different ownership often have one straight boundary segment, typically along a fence line on the downslope side of the vernal pool. While the upstream portion of the vernal pool remains topographically intact, water is prevented from draining through the vernal pool, and it is ponded longer and deeper than it was prior to the fill. In some instances, a ditch is excavated along the fence line, and the vernal pool is drained. Typically, the filled surface is not perfectly level and may be slightly depressional. Also, with time the uncompacted fill may settle. As a result, lateral subsurface movement of water into the fill can produce conditions wet enough to support a degraded seasonal wetland, but the filled area no longer functions as a vernal pool.

Farming activities, i.e., plowing and discing, also have altered the vernal pool outlet barriers and changed the periods and depths of inundation. In the middle of a cropped field, discing perpendicular to the direction of flow from a pool can breach the barrier, decreasing the depth and period of inundation. At the margin of fields, long-term accumulations of sidecast material can serve as higher outlets and increase the period of inundation. Enhancement may be possible with little more than renaturalized vernal pool outlets.

Termination of irrigation is an example of enhancing vernal pools through the removal of water. Cessation of irrigation may alone be inadequate to reestablish the desired floristic values. Years of irrigation probably result in a heavy accumulation of thatch and well-above-normal biomass in vernal pools. Enhancement may also require removal of the live plants and thatch as well as the top 0.2 feet of soil, which includes a bank of unwanted seed, and reinoculation with topsoil and seed from existing vernal pools.

Removal of existing undesirable plant species, and reseeding or "inoculating" with seed collected in vernal pools with desirable vegetation may be appropriate even where irrigation has not been part of the land use history. Other possible means of enhancement include the establishment of compatible grazing regimes. In some instances, the hydrologic function may be adequate but the combination of past land use practices may have permitted the establishment of dense stands of perennial ryegrass and other grasses, eliminated the vernal pool species (possible when pigs or horses overgraze vernal pools).

G.1.3 Creation

Vernal pool and vernal swale creation is the establishment of vernal habitat at a site that was historically upland habitat. Creation amounts, therefore, to a form of habitat-type conversion requiring modification of the physical site characteristics, primarily soils and topography. Creation follows physical site and, where necessary, hydrologic investigations to determine whether or not a site is suitable and how the soils and topography must be modified to yield the required hydrologic function.

G.2 Case Studies and Local Experience

G.2.1 Vernal Pools

On the Santa Rosa Plain, vernal pool and vernal swale compensation have mostly taken place in the form of creation. Only a few pools or swales have been restored or enhanced. The feasibility of vernal pool creation is suggested by the large number of incidentally created wetlands throughout the region-in agricultural fields, along roadsides, in vacant lots, in excavations, and virtually wherever surface runoff is impeded.

Vernal pool creation has been attempted at several sites in the region. These sites include the Alton Road and Airport Business Center mitigation sites and test pools at the Northpoint Village site and in Windsor. Agency reviews of these attempts at compensation are mixed. Monitoring results suggest that success is possible (Patterson 1990a, Patterson 1990b, Patterson 1990c) even when detailed hydrologic and physical site investigations have not been undertaken and design was relatively simple.

Considerably more experience in vernal pool creation exists in the Central Valley. Vernal pools have been constructed for dozens of projects, particularly in Sacramento and Placer Counties. In the late 1980s, approaches to design and construction of vernal pools in that region were simple and often flawed. More recently they have become more sound and sophisticated with time. Vernal pool creation has been viewed skeptically by state and federal resource agency personnel. The primary reasons for this skepticism are poor site selection, poor vernal pool design, unsupervised construction and the short time since most vernal pool creations have been implemented. For example, vernal pools have been constructed on steep slopes, on soils with no impervious subsoil, on fill, and virtually abutting active channels. They have been designed with insufficient topsoil, outcropping hardpans, no outlet barriers, eroding outlets, excessively leaky or completely sealed side slopes, adjacent spoil disposal, and with other physical characteristics that result in hydrologic functions that differ grossly from that of native vernal pools.

Created vernal pools are often larger than their natural counterparts and have been constructed at considerably greater areal densities. Some have been constructed on slopes that are too steep and therefore do not fit into the landscape.

Differences in hydrology and other factors between created and natural pools have resulted in created pools providing breeding habitat for mosquitos which carry viruses, while natural pools do not provide this habitat. Therefore, natural pools do not require treatment or any intervention by the Mosquito Abatement District, whereas altered or created pools need to be treated, in some cases as often as every 7 to 10 days because some mosquito species, such as *Calex tarsalis*, complete their life cycle from egg to adult in as short as five days.

However, vernal pool creation in the Sacramento Valley is not without successes. Many pools have become vegetated with vernal pool plant species early in the 5-year monitoring periods and were characterized by hydroperiods that closely mimic those of natural pools. These pools

have been well-sited and well-inoculated. Some pools recently constructed in the City of Roseville, Placer County, virtually mimic natural pools in every physical aspect.

Of 57 vernal pools constructed in 1993 on the Sun City site in Roseville, rigorous vegetation success criteria were satisfied in the first year. However, the observed hydrologic function departed from that of the reference pools (controls) in the first year. Such poor performance should be expected in the first few years following construction. Newly constructed vernal pools fill earlier and hold water later than natural pools. They fill earlier because the new side slopes are not yet vegetated and no thatch is present. Runoff from the unvegetated slopes, which are the steepest part of the contributing watersheds, begins with the first rains. Also, clay liners have not yet developed structure and the native clays are often compacted during construction because they are typically moist.

The hydrologic response of the Sun City's Roseville vernal pools much more closely paralleled the response of the natural pools in the second year. The early rains (0.78 in.) completely filled vernal pools that were just completed in the summer of 1994 as well as those that were still under construction. But, in the 57 pools (3.41 acres) constructed in 1993, the area of ponded water was less than 0.03 acres. A similar area of the natural control pools was ponded (Stromberg personal observation).

G.2.2 Plant Translocation Methods

Mitigation for impacts to plant species of special concern associated with vernal pools have generally involved translocations. The translocations have included translocating either seed collected from the plants and/or from vernal pools that have a seed bank into naturally developed vernal pools, as well as vernal pools that were created from upland sites.

In the Santa Rosa Plain, three primary species of special concern, *Blenosperma bakeri* (Sonoma sunshine), *Lasthenia burkei* (Burke's goldfields), *Limnanthes vinculans* (Sebastopol meadowfoam), and two secondary species of special concern, *Pogogyne douglasii* (Douglas' pogogyne), and *Downingia humilis* (dwarf downingia), have been involved in translocation mitigation experiments (Patterson 1990, Waaland 1994).

A specific case study of a mitigation translocation of *Limnanthes vinculans* is given below (Section G.2.2.1). In addition to this study approximately five additional translocation studies have occurred. Some of these studies, mostly involving *Lasthenia burkei*, are summarized in Patterson (1990).

G.2.2.1 Sebastopol Meadowfoam Translocation

The following is a discussion on the purpose, methods, and results of an endangered plant translocation study for Sebastopol meadowfoam in the Santa Rosa Plain:

As part of mitigation required by the Department of Fish and Game, CH2M Hill and Marco Waaland of Golden Bear Biostudies cooperated in a vernal pool translocation study (Waaland, 1994b). In 1989 a colony of the endangered Sebastopol Meadowfoam (*Limnanthes vinculans*)

had to be moved from the source area, a site that was in the path of farming activities that would be incompatible with vernal pool resources at a site in the Santa Rosa Plain, Sonoma County.

The objective of this translocation was to salvage an endangered plant species (state listed at the time), and also to enhance a degraded vernal pool area that could be managed as an ecological reserve. In addition, monitoring of the endangered plant species, associated plants, and vernal pool hydrology data were collected to determine the success of the translocation.

Methods. A 3-inch layer of the upper soil horizon was salvaged as a seed bank source and transported to Brown Farm, a site owned by the City of Santa Rosa and managed by the Subregional Water Reclamation System as irrigated hayfield. The collected soil was spread into seven vernal pools. Hydrologic monitoring stations were established along transects in several of the pools. Irrigation at the site was permanently terminated. An additional vernal pool that had a naturally occurring Sebastopol meadowfoam population was monitored as a control site.

Results. In April 1990 the control vernal pool had an estimated 164 Sebastopol meadowfoam plants scattered throughout. Sebastopol meadowfoam was not observed in any of the inoculated pools prior to treatment. Two vernal pools were inoculated prior to the growing seasonal in 1991, but no Sebastopol meadowfoam were observed in either pool in 1991. Inoculation of the remaining pools occurred the following summer. By April, 1992, plants of Sebastopol meadowfoam were observed in six of the seven vernal pools inoculated. A total of 145 plants of Sebastopol meadowfoam plants were estimated for the inoculated vernal pools. The control vernal pool had an estimated total of 144 plants.

By the end of the second growing season (1993) no Sebastopol meadowfoam were observed in the inoculated pools. The reference vernal pool had 38 individuals, a 74 percent decrease from the previous year. No Sebastopol meadowfoam have been observed in inoculated vernal pools in 1994 (Dixon, personal communication).

An unexpected event that could affect plant species composition was the spreading of composted sludge onto the study area in 1991, which greatly increased the nutrient loading of the ponded water. However, Sebastopol meadowfoam were present in the impacted pools the following year and native species have increased since the Sebastopol meadowfoam have disappeared. The extirpation of the 1992 Sebastopol meadowfoam colonies may have been due to a combination of a lack of pollinators and competition, although no data are available to identify the causal factor(s).

Hydrological Observations. The observations of vernal pool ponding made at the Brown Farm sites correspond to observations of ponding made at two nearby control sites: the Mills site on Ludwig Ave. (Waaland, 1994a) and Baum Farm on Occidental Rd.

Date	Water Depth (ft)
1/11/93	0.46
2/11/93	0.50
3/18/93	0.50
4/15/93	0.00

This pattern of inundation by early winter was observed in three of the vernal pools. Water levels remained relatively high in mid-March, but between April 6 and April 16, the remaining standing water had been completely drawn down in the vernal pools.

Plant Community Observations. Vegetation samples (releves) were made prior to inoculation in the control pool and at inoculated vernal pools. Subsequent monitoring was done at various times thereafter to track plant species compositional changes.

The total number of species increased by a factor of 2 in one vernal pool and by a factor of 4 in another after inoculation. The number of species observed in the control vernal pool increased by a factor of 3. This correspondence of increased species richness may be attributable to the end of a drought period in 1992, and changes in land management (i.e. cessation of irrigation). The number of native species also increased at all vernal pools, but the relative percentage of native species was higher in inoculated pools.

G.2.2.2 General Conclusions

The translocation mitigation of *Limnanthes vinculans* at Brown Farm was found not to be successful. Other studies within the Santa Rosa Plain and in vernal pool and swale habitats outside the Santa Rosa Plain have had mixed results (Zedler and Black 1988, Patterson 1990, Waaland 1994b). Patterson (1994) indicates that some mitigation translocations using *Lasthenia burkei* have been successful in terms of numbers of plants observed during monitoring studies. However, it was noted that most mitigation studies have not involved long-term quantitative monitoring; did not involve reseeding during monitoring; and did not involve regrading of the created vernal pools (Patterson 1990). Many of the problems in the mitigation studies included: 1) poor understanding of the ecology and biology of the species involved, 2) poor experimental design and development of realistic goals with respect to year-to-year rainfall variation, 3) poor monitoring techniques that did not involve consistent quantitative evaluation using permanent plots, and 4) poor data analyses and reporting.

Experimental translocation studies on vernal pool plants appear to be inconclusive to the point that this method cannot be used to guarantee the long-term survival of vernal pool endemic plant species. A broader view of the use of rare plant translocations to conserve these species, and one that does not limit the evaluation of the technique to vernal pools, has indicated that translocation should not be used (Fahselt 1988). Beyond the technical aspects of translocation mitigation are issues of cost to benefit. Several studies have indicated that the cost of mitigation

by translocation can be very expensive, taking into consideration the initial experiment plus a minimum of 5 years of monitoring to determine success (Fahselt 1988, Zedler and Black 1988).

G.2.3 Wildlife Mitigation

G.2.3.1 General Wildlife

Vernal pools support a variety of wildlife, such as waterfowl, shorebirds, raptors, upland game birds, mammals, reptiles, and amphibians. Vernal pools are important for breeding, cover, or foraging areas for many wildlife species, and are important for amphibian reproduction.

Enhancement or restoration of existing vernal pool habitat may benefit the wildlife that use vernal pools for foraging or as breeding habitat. Plantings can be placed to emphasize wildlife use, such as creating breeding habitat for waterfowl and shorebirds. Plants can also be selected on the basis of providing food and cover for various wildlife. Placement of material (wood, concrete) to serve as basking sites can be integrated into the enhancement and restoration of existing wetlands and vernal pools to benefit amphibians. and reptiles.

G.2.3.2 Fairy Shrimp

Vernal pool restoration, enhancement, or creation has not occurred solely as mitigation for impacts on fairy shrimp or tadpole shrimp. Vernal pools, considered by the U. S. FWS to be the primary habitat for these invertebrate species, have been created to compensate for vernal pool impacts and, as a part of the mitigation process, steps have been taken to establish the fairy shrimp in the constructed vernal pools as part of the process.

Fairy shrimp species, including the vernal pool fairy shrimp (*Branchinecta lynchi*), now listed as a threatened species by the federal government, and the California linderiella (*Linderiella occidentalis*), have been found in created vernal pools. The typical approach has been to salvage the soil from vernal pools that were to be affected by a proposed project and spread in the created pools. In effect, the process by which resting stages of the fairy shrimp would be introduced to created pools is the same process used most commonly to inoculate new pools with topsoil and seed.

In Roseville, California, the vernal pool fairy shrimp was known to occur in three natural vernal pools on a 1225-acre site. Two were filled before the listing; the third will be protected. As one of the first steps in construction, soil from vernal pools was salvaged in two lifts with a front-end loader, the first lift 0.1 to 0.2-foot thick, the second lift taking an additional 0.4 to 0.5 feet of topsoil. The soil was stockpiled for approximately four months and then spread in pools in an order reversing the salvage process. The soil from the pools known to support the vernal pool fairy shrimp was stockpiled separately and spread in two pools. After the first year, the vernal pool fairy shrimp were present in four of the constructed pools (Stromberg 1994a).

At Byron Airport in eastern Contra Costa County, the County was required to construct alkali and seasonal wetlands, vernal pools, and California tiger salamander breeding ponds as

compensation for airport expansion impacts. Vernal pool fairy shrimp and California linderiella occurred in a variety of natural and man-made habitats (the latter including a stock pond), some of which were filled as part of the expansion. Soil salvaged from the vernal pools and alkali wetlands was spread in-kind created habitats, and soil from the stock pond was spread in the salamander ponds. Following the first year of monitoring, vernal pool fairy shrimp were found in two created alkali wetlands, one created vernal pool, and one deep pond constructed as breeding habitat for the California tiger salamander. California linderiella was observed in two created alkali wetlands and one created seasonal wetland. No quantitative abundance estimates were attempted in the first years of monitoring, but both species were frequently encountered in each created wetland in which they were observed.

In both of the above examples, topsoil from existing habitat was placed in the created habitats. On another site near Rancho Cordova in Sacramento County, 24 vernal pools were constructed in 1989, well in advance of project impacts. Because no permit had been obtained, no soil from existing vernal pools was spread in the bottoms of the created vernal pools; because of faulty design, the side slopes were not topsoiled. Nevertheless, California linderiella was found in several created pools during the first three years of monitoring (Stromberg 1992). These pools were hydrologically isolated from swales or other drainage, and the site was not grazed following pool construction. Therefore, the fairy shrimp colonized the created habitat without being carried into it by either water or cattle.

G.2.3.3 California Tiger Salamander

Tiger salamander mitigation requires establishment of breeding habitat in an upland habitat matrix where the salamanders can estivate. Tiger salamanders spend most of the year underground in holes, dens, and burrows excavated by other animals. Habitat creation for the tiger salamander requires consideration of both the breeding and non-breeding habitat.

No examples of habitat creation solely for the California tiger salamander exist on the Santa Rosa Plain. Known mitigation projects have taken place at only two sites, one for the Ruby Hills project in Livermore, the other for the Byron Airport expansion mentioned previously. At Ruby Hills, two ponds were constructed in the vicinity of a known breeding pond and both were used for breeding (Brode U.S. FWS, personal communication). Whether these ponds can be considered successful is undetermined.

At Byron Airport, 20 salamander breeding ponds with a total area of 1.44 acres were constructed in a much larger and more complex mitigation project. The ponds were constructed in an area known to support ground squirrel populations and to contain a large number of ground squirrel dens, both active and abandoned, so that estivation sites would be available nearby. The breeding ponds were constructed with a compacted clay liner and a sloping bottom so water would be retained into the late spring and would collect at one end to buffer the effects of rising evapotranspiration in the late spring and early summer in a dry, hot, and windy area. The objective for the compacted clay liner is for the ponds to hold water through May.

All wetlands constructed at Byron Airport, including the breeding ponds, the alkali and seasonal wetlands, and vernal pools, were sampled for the tiger salamander during both 1993

and 1994. Known breeding habitat, including a reservoir on a defined drainage near the constructed ponds, was also sampled.

California tiger salamander larvae were observed in only one of the constructed breeding ponds in 1993. The larvae were slightly smaller than those in the native habitats in mid-May and they were thin and underweight by comparison. In 1993 rainfall was above normal and most of the breeding ponds held water well into May; however, because the ponds had not yet been inoculated with topsoil salvaged from the stock pond, they did not contain adequate food to support the developing larvae.

In 1994, salamander larvae were observed again in several natural habitats. Larvae were also observed in five of the breeding ponds, one vernal pool, and in part of one seasonal wetland that was ponded for an exceptionally long period. By 1994, the food supply in the breeding ponds had improved; however, because rainfall was well below normal, the ponds did not hold water long enough for salamander larvae to metamorphose. Ponds must hold water for at least three months; in 1994, they did not fill until February 6 and were dry by the middle of April. In 1994 unauthorized early-spring grazing also resulted in the concentration of a large number of cattle in the ponds. Cattle consumed so much water that they severely shortened an already limited period of ponding.

The survey results of the constructed tiger salamander breeding sites during 1993 and 1994 are encouraging but inconclusive. Salamanders have laid eggs which developed into larvae in seven of the ponds. Although some full metamorphosis is possible, field observations suggest that many of the larvae were unable to fully metamorphose in either 1993 or 1994. The habitat may have to mature further before it is fully suitable. Observations of ground squirrel holes near the constructed ponds reveal that they were used as estivation habitat by adult salamanders.

G.3 Assessment of Feasibility

Each of the compensation techniques or methods is feasible on the Santa Rosa Plain. They all rely on the establishment or reestablishment of suitable physical and hydrologic conditions, and the techniques to accomplish this are available.

G.3.1 Restoration

Restoration ecologists generally argue that restoration at a site that once supported wetlands is more likely to succeed than construction of wetlands in historically upland habitats. Restoration ecologists consider restoration to be superior to construction of artificial wetlands on upland sites. Some ecologists define restoration as "a return to the exact pre-existing conditions" (Zedler 1984, Shaller and Sutton 1978, cited in Lewis 1990).

A return to the exact pre-existing conditions on the Santa Rosa Plain is not expected. Short of such an exacting standard, the probability that vernal pool and swale restoration can be successful is extremely high, particularly where the soil water-restricting horizon remains intact. Where fill has occurred during land levelling, the A horizon soils have been pushed from higher ground into nearby vernal pools and swales, often without compaction of the type associated

with engineered fills. On levelled ground, the existing soil profile was probably most affected in the upland areas where the productive A1 horizon was removed and subsequent plowing destroyed the structure of the exposed A2 horizon. The soils in the areas where wetlands previously existed were less affected. These soils may possess virtually the same texture and structure as they did before they were buried and the original nutrient-and water-storage functions should recover quickly.

Unless the soils have been deep-ripped, the claypan and underlying hardpan in cropped and levelled lands are also likely to remain intact. Therefore, water can again be perched within the exhumed A horizon, and the original saturation pattern can be reestablished when the overburden is removed and the adjacent upland topography is recreated. Placement of the excavated soils back onto the surrounding uplands will also reestablish the original mounded topography and the original depth of soil bodies in the proximate watersheds of the newly restored wetlands. This action will create redevelopment of A1 horizon structure and the original on-site upland-wetland hydrologic relations. Failure due to problems with soils and hydrologic function in the restored wetlands is extremely remote.

Depending upon the position in the local watershed, restoration can take place without the reestablishment of hydrologic connections with sections of drainages outside the parcel where restoration takes place. Where headwater vernal pools and first-order swales that terminate on-site are to be restored, the original hydrologic function may be reestablished without the need for improvements to off-site drainages.

If the swales once extended off-site and are now crossed by roads, drainage ditches, etc., or have been filled, it may be impossible to fully restore the original hydrologic function. Culverts can be installed beneath roads at some cost. Failing cross-road connections, it may still be possible to increase the periods over which water flows or is ponded by recreating the original topography and increasing hydraulic gradients in the proximate watersheds. Partial restoration of the original hydrologic function is a direct consequence of restoring the wetland soil profiles and lateral topography.

G.3.2 Enhancement

Enhancement primarily involves improving the hydrologic regime, either through the addition or removal of water. The addition of water to a vernal pool, the objective of which would be to increase the depth and period of inundation, can be achieved by reestablishing flow in an entering swale, raising an outlet barrier that has been lowered by discing or draining.

Reestablishment of flow in an entering swale directly enhances the hydrologic function of downstream pools. Flow can be reestablished by returning previously diverted flow to the original drainage that supplies a downstream network of wetlands or as a direct product of upslope wetland restoration, which might include repair of a filled drainage.

Although the average annual rainfall in the Santa Rosa Plain exceeds 30 inches, the period of inundation can decline when surface inflow is blocked. Even if the fill settles with time, the slopes into swales from adjacent upland habitat remains reduced and the volume of above-

ground and the rate of below-ground flow decline. As a result, downstream wetlands can be expected to be drier than they were prior to the upstream fill. Reestablishment of flow or restoration through the removal of fill would, therefore, be expected to directly enhance the hydrologic function in these wetlands. Unless it occurs on an isolated property, restoration should increase the area of contiguous wetland networks, attenuating the impacts of incompatible surrounding land uses. Also, the larger upland-wetland habitat mosaic produced by upstream restoration would be expected to display greater ecological stability and resiliency due to the movement of water and materials, and the exchange of plant materials.

Removal of water from a vernal pool, the objective of which would be to decrease the depth and/or period of inundation, can be accomplished by removing fill that causes back-water ponding, lowering artificially raised outlet barriers, or removing blockages in exiting swales. The application of this water has resulted in the establishment of freshwater perennial marsh and other non-vernal pool vegetation in the vernal pools and the loss of values associated with the native vernal pool flora. Vernal pool species are adapted to a drought phase; when irrigated, the pools remain wet virtually year-round. Also, as they become established, sedges, rushes, tall fescue, dog fennel, ryegrass, and other large native and non-native species produce conditions within which the smaller vernal pool annuals cannot persist.

Numerous landowners irrigate several thousand acres with wastewater from the subregional wastewater system from April 15 through October 15 each year. Application of wastewater introduces nutrients and extends the period of inundation through the summer. Termination of irrigation would return hydrologic conditions to which the smaller annuals are adapted. Reestablishment of vernal pool vegetation might, however, require removal of undesired vegetation and reinoculation with seed collected in native pools and control of grazing animals.

G.3.3 Creation

In spite of known problems identified above, creation is feasible and can be as successful as restoration. The average annual rainfall on the Santa Rosa Plain can saturate more than five feet of soil; the vernal pool soils such as the Wright and Huichica soils have a water-restricting horizon that is, on the average, within two feet of the surface even in the uplands. The texture and thickness of the A horizon as well as the thickness of the B horizon do vary, however. Trenches excavated in buried Wright loams on two sites in the southwest Santa Rosa area indicate that: the depth of the claypan varies from 7 to 51 inches, a claypan is not universally present, and the potential for a high coarse fragment content in the claypan increases with proximity to higher-order drainages.

Created vernal pools and swales can quickly mimic their native counterparts under two conditions: (1) site investigations during design result in the selection of creation sites with suitable soils, and (2) design takes into account the effects of microtopography.

In the cases of both restoration and creation, supervision of construction by the individual that designs the wetlands is mandatory. Past failures and some of the problems mentioned above can be attributed to the wetland biologist's absence during construction. Supervision of pool allows

construction modification of potentially fatal site conditions not encountered or identified during the design phase.

Design and construction practices are critical for other reasons as well. Once a 404 permit is issued, the Corps and the resource agencies must turn their attention to other permit applications. The likelihood of catching failures and requiring rectification declines quickly. The best way to prevent failures and avoid an after-the-fact reliance on monitoring to ensure successful vernal pool and seasonal wetland creation is to require rigorous investigations of physical (i.e., soils, topography) conditions at each site where compensation is proposed and to design pools to accommodate those conditions.

G.4 Restoration Techniques

G.4.1 Aerial Photographs and Past Land Use

Historic and recent aerial photographs provide the best available tools for identifying areas where wetland restoration is possible. Historic aerial photographs, such as the 1942 photographs available through the Soil Conservation Service, and the 1953 photographs housed at the Public Library in downtown Santa Rosa, provide a picture of wetlands 40 to 50 years ago. Although much of the natural habitat on the Santa Rosa Plain was converted to agriculture prior to 1942, much additional disturbance has occurred since. Today's aerial photographs indicate what areas have been filled, levelled, currently irrigated, or have been disturbed in other ways. They also reveal properties on which the original vernal pool-swale network remains physically intact. Together, the current and historic photos can be used to identify restorable wetlands and to estimate approximately the restorable acreage.

The signatures on the historic photographs provide a portrait of the original drainage alignments and the location of hydrologically isolated vernal pools situated on watershed divides. They also may show where vernal pools occur on swales because ponded areas in winter and bare areas in summer (indicting very deep ponding) are visible and sometimes distinct. However, the apparent wetland area on the historic photographs probably exceeds the actual original area. Wetlands developed on the fill pushed into swales and other depressions are likely to be wider, broader, or larger than the buried wetlands. The original swale widths and pool dimensions should be determined on the ground through a physical site investigation to avoid inflated area estimates.

Interviews with land owners are also important. They can sometimes provide information about pre-levelling conditions. If they can remember the type of equipment used, some implications can be drawn about the amount of material moved and the extent to which the terrain was modified. Unfortunately, if the levelling occurred too long ago, the individuals who did the work may no longer be alive and their children may have been too young at the time to supply details of any real value.

G.4.2 Physical Site Investigations

Historic aerial photographs show the original swales and vernal pools. Temporary benchmarks (steel rebar) should be established at a network of locations. These benchmarks, enlargements of the aerial photographs, and standard surveying procedures are then used to mark the approximate locations of the pool and swale bottoms and margins. It is unlikely that the thickness of the fill and the depth of the original A horizon can be determined accurately. Typically, the levelling was done without before-and-after topographic maps and the original surface grade cannot be established; levelling was not a highly technical operation and the result was not an engineered fill produced according to plans. Also, subsequent discing and plowing mixed the fill with the buried soils, obliterating buried organic layers, and making determination of the original grade even more difficult.

Although the surface soil texture and depth have been modified, the lower wetland soil profile is likely to be intact. Therefore, unlike creation, for which physical site investigations are designed to determine whether or not sites are suitable, physical site investigations that precede restoration are intended to provide the data necessary to remove the fill, exhume the original wetland soils, and reestablish the original drainage system and hydrologic connections. Where it is not possible to perfectly reestablish flow directions in pool outlets and swales, the physical site investigations will allow design of a drainage system that is either internally sensible and permits confluence with adjacent natural drainages with at-grade connections and the consistent gradients.

The physical site investigation begins with the excavation of a series of trenches across the assumed axes of the swales and through the pools, extending into the upland habitat on both sides. The trenches should extend into the claypan, a depth which may vary from 20 inches at the margins of the swales and pools to over 48 inches in the centers of some swales.

Partial soil profile descriptions are made at several points along each trench. Soil texture and structure and the presence of mottles and buried organic matter (if present, the latter indicates the top of the buried A1 horizon) should be noted. Standard surveying methods are used to obtain the elevations of native soil horizons and cross-sectional profiles of the original topography.

Trenches and standard surveying methods should also be used on nearby ungraded mound-and-swale topography to obtain soil profile data and swale gradients and cross-sectional profiles. The topographic and soils data provide models and guides for interpreting findings on the restoration site.

The initial physical site investigations permit an estimate of the restorable area and possibly determination of the direction of flow in swales. Because the ground is relatively flat and the thickness of the A horizon varies as much as 0.5 feet, and because historic photographs may not conclusively show the direction of flow from vernal pools and in swales, choices will be available to the restorationist. Additional site investigations will be the basis for such choices and design decisions on the slopes (length and percent) between the uplands and wetlands, the widths and shapes of swale bottoms, the shapes of vernal pools, drainage (swale) gradients and

the outlet elevations of vernal pools "embedded" in the swales, and the general pattern of original wetland and upland habitats.

G.5 Enhancement Techniques

Enhancement fundamentally involves modification of the hydrologic function. The techniques are essentially the same as those involved in restoration and creation described below, but may also include the exercise of determining how to restore natural flow patterns across roads on properties where past land use activities have been designed to control water, prevent the flow from ponding, or get it offsite quickly. That exercise involves public relations, research, and hydrologic analysis.

The hydrologic analysis is simple. Field observations and standard surveying techniques provide the data necessary to determine the depth of standing water, the height of outlet barriers, the direction water flows currently, the action that must be taken to change that direction, and what changes can be expected in the depth of inundation.

G.6 Creation Techniques

Vernal pool and vernal swale creation is more complex than restoration and enhancement and requires physical and hydrologic site investigations of soils, adjacent microtopography, and current and future drainage conditions.

G.6.1 Design Factors

G.6.1.1 Soils

The texture and depth of A horizon soil over the water-restricting horizon are different in upland and wetland settings. The argillic horizon is typically 12 inches deeper in the uplands and the soil is not as fine-textured. The clay content in the A horizon is higher in vernal pools and swales and clay loams are found more frequently than on the mounds and adjacent uplands. Because creation takes place in an upland habitat, excess lower A horizon must be excavated and hauled away, leaving an appropriate surface soil depth. The claypan and hardpan do not perfectly parallel the surface topography; the concept of parallelism is only a gross approximation.

G.6.1.2 Micro-topography

Mounds, vernal pools, and swales occur in rolling terrain and in terrain characterized by a unique type of microrelief referred to as "hogwallows". The latter occurs on natural landscapes on the Santa Rosa Plain where the soils are Huichica and Wright loams.

Intermound depressions that do not support wetlands are ideal sites for vernal pools creation but construction should be undertaken with every effort to leave the mounds intact. The mounds function hydrologically like sponges, receiving water from pools early in the season, returning

it later, buffering water level fluctuations, and extending the drying process. The slope of the ground between the inundated part of the pool and the unsaturated annual grassland is an important determinant of the character of the wetland-upland transition. It should be mimicked to the extent possible in constructing pools. Because excavation is necessary and the grade will be ordinarily lowered in pool compensation sites, retention of gentle side slopes and preservation of mounds are conflicting objectives.

On the Byron Airport site, vernal pools, seasonal wetlands, and California tiger salamander breeding ponds were constructed in habitat to be managed for the San Joaquin kit fox, a federally listed endangered species. In that area, ground squirrels are the primary excavators of holes and tunnels that eventually become kit fox dens and tiger salamander estivation sites. Ground squirrel holes typically occur both on the top and at the toe of the slope of mounds in hogwallow terrain. A dozen acres of wetlands were sited in the terrain, shaped and sized to minimize impacts on squirrel holes because of their importance to the kit fox and tiger salamander. Buffers of 10 to 25 feet were retained between the holes and areas where construction equipment could be operated.

G.6.1.3 Current and Future Drainage Conditions

Pools near the developed properties can be affected if the contributing watershed is significantly truncated and an inadequate hydrologic buffer is not left. If landscaped areas are irrigated, excess water may flow above or below ground into the pool, eliminating the drought phase and encouraging development of perennial, non-vernal pool plant species. Pools constructed in floodplains may be ponded longer than is desired and may function more like pass-through seasonal wetlands.

G.6.2 Existing Vernal Pool Fields as Models

Existing vernal pools and pool fields should be used as design models. Characteristics of existing vernal pools and vernal pool fields should guide site selection and vernal pool design. These characteristics include size class distribution, areal density, pool shape and side slope, landscape profile, pool outlets, and a variety of other features.

The size distribution of constructed pools should at least approach that of the pools they replace. For example, ten 5,000-square-foot pools should not be constructed to compensate for 50 1,000-square-foot pools. The cost of constructing small pools (those under 500 square feet) on other than volcanic substrates, where the water-restricting horizon is just a few inches below the surface, is greater than the cost of constructing large pools. A strong economic disincentive, therefore, exists to construct small pools. Small pools can also look extremely artificial where the water-restricting horizon is deep and excessive grading is necessary to produce remotely typical side slopes.

Large pools, on the other hand, may also be hard to construct because critical soil properties and microtopography vary over sufficiently short distances to complicate design or make excessive engineering necessary. Level ground with good soils are very tempting but just because large pools can be constructed does not mean that they should be.

Vernal pool density varies widely. Pools occur as scattered, isolated individuals and in dense fields. On the Santa Rosa Plain, pool density ranges from only a few percent to over 30 percent. If pools are constructed among native pools it is, of course, impossible to maintain the original density, but overall pool densities should be kept as close as possible to natural densities and the wetland-upland habitat balance should be retained for ecological reasons.

Few natural vernal pools have 2:1 and 3:1 side slopes; they range from these uncommonly steep examples to more than 20:1. Some pools are flat-bottomed but others possess slightly concave, sloping, or multi-levelled bottoms. Pool side slopes should be similar to those of nearby pools. When construction is complete, the created pools should fit into the landscape and the general relief outside the pools should remain essentially unchanged; excavated soils should not be disposed of within the area where the pools have been created.

Some vernal pools sit so deeply in the surrounding landscape that in most years there is no surface outflow. They are the exception. Most pools have surface outlets. When pools are constructed, they will have outlets, unless they are also exceptions. Because outlet locations and elevations affect pool hydrologic function, they should be determined during design rather than be the result of construction. If the location and depth of an outlet are not "engineered" or at least considered during pool design, erosional problems can develop outside the pool, one outcome of which can be that the pool itself is undermined. A "dry hole" may be left after the monitoring period has closed.

Drainage relations (i.e., hydrologic connections with other pools), the presence of other wetlands, the proximity of oaks (which can affect pool drying and plant establishment), and the presence of sensitive upland resources (i.e., burrowing owl dens, rare plant colonies, unusual plant associations) should also be considered during the design and construction of vernal pools.

G.6.3 Physical Site Investigations

Physical site investigations are conducted using an aerial photograph and/or site (topographic) map, a backhoe or excavator, and a level. A laser level introduces efficiency because one person can use it to obtain the data, whereas two people would be required with an optical level.

The first step in the physical site investigation is the location of an existing benchmark of known elevation or the establishment of a network of temporary benchmarks and an arbitrary datum. Candidate creation sites are then identified and marked on the aerial photograph or the site map. Typically, even one-foot contours and a dense grid of spot elevations on engineering drawings are inadequate where the land rolls gently or contains hogwallow terrain. Denser, higher-resolution topographic data are necessary to clearly see the rolling hills and depressions in vernal pool ecosystems.

A backhoe is used to excavate a pit or trench in the center of each candidate site. The soil profile in the pit or trench is described. The data collected include the thickness and texture of the A horizon soils; the presence of mottles or iron and manganese concretions, coarse fragments, and small and large root pores, the presence of claypan or hardpan (the water-

restricting horizons), and the thickness of the claypan. Tree roots are a signal to abandon the site. The laser level is used to obtain elevations at the ground surface directly above the section of the pit wall in which the profile is described. Absolute elevations are as important if not more important than depths. The elevation data are used to set the depth of excavation, the final grade (pool bottom), and the outlet elevation (given a desired depth of inundation), and to determine the grade of the slope below the outlet and where water will flow naturally when the pool spills.

Even if the ground is virtually flat, at least two pits should be excavated at each candidate site. If the profile data in the two pits show that the water-restricting horizon is present and that its depth, thickness, and elevation are similar or vary within acceptable limits, no more pits are needed. If variation is observed, additional pits should be excavated elsewhere within and around the candidate site. The collected data in the full set of pits are used to set the elevational parameters as well as to design the size, shape, and location of the proposed pool. If soil conditions vary excessively, the site should be abandoned.

If the site slopes more than three percent, it is critical to excavate pits "across the contours" to determine how the surface of the water-restricting horizons varies. The top of the water-restricting horizon does not parallel the ground surface. On sloping ground, excavation to rough grade for a level-bottomed pool may leave insufficient clay or breach the hardpan on the upslope part of the pool. On the other hand, the water-restricting horizon may also dip unexpectedly. If it dips excessively and the pool is built without knowledge of this condition, deep-rooted perennial species (including cattails, willows, and cottonwoods) may become established, a particularly significant problem after the monitoring period has ended and no eradication of these unwanted species is discontinued.

The products of the physical site investigations should be a set of construction specifications for each pool (rough grade, topsoil depth, final grade, maximum water depth capacity, side slope length and percent, outlet location and elevation, etc.), and a map showing the pools to be created, the directions of flow for spilling water, and connecting swales.

G.7 General Construction Practices

G.7.1 Plans and Specifications

Restoration or creation should not occur without plans. Public works departments and local grading ordinances may require them anyway. Ordinarily, the plans show the locations of the pools and swales and a set of typical cross-sections. Plans should also show the locations of each pool and other wetlands from which topsoil and seed is to be salvaged.

In most construction projects, specifications have been no more than a set of notes on the plans. The inclusion of more detailed specifications can prevent misunderstandings and minimize change orders and conflict between the applicant or landowner responsible for the construction, the wetland biologist observing construction, and the construction contractor.

A schedule of details that contains most of the relevant designs for each vernal pool or swale section is also valuable. It provides on one or two sheets all the details to which the contractor

must refer to complete the work correctly. The schedule also indicates how the design varies between pools. Just as the native soil profiles vary place to place, so do pool and swale design. As one would expect, a single typical drawing cannot be used at every compensation site without some undesirable outcomes.

Rigorous design, the schedule of details, and the biologist's freedom to modify design during construction can prevent problems that may arise from outcrops or breaches of the hardpan, absence of clay, highly permeable subsoils or parent materials, low areas on the downslope sides of pool creation sites that can result in low outlet barriers, etc. They result in pools that fit into the landscape.

G.7.2 Construction in Creation

The type of equipment and methods used in construction depends upon the final design, access, control over hauling to disposal sites, etc. The choice of equipment is usually left to the contractor although a contractor doing such work for the first time will solicit the advise of the wetland biologist.

Figure G-1 shows how vernal pool construction sequence took place on a site in the Central Valley.

The steps are:

1. Location and marking of the pool margins and the limits of excavation (which are where the pool side slopes meet existing grade).

2. Location and marking of haul routes. Haul roads can be laced through pool construction sites so that most of the disturbance occurs within the limits of graded areas.

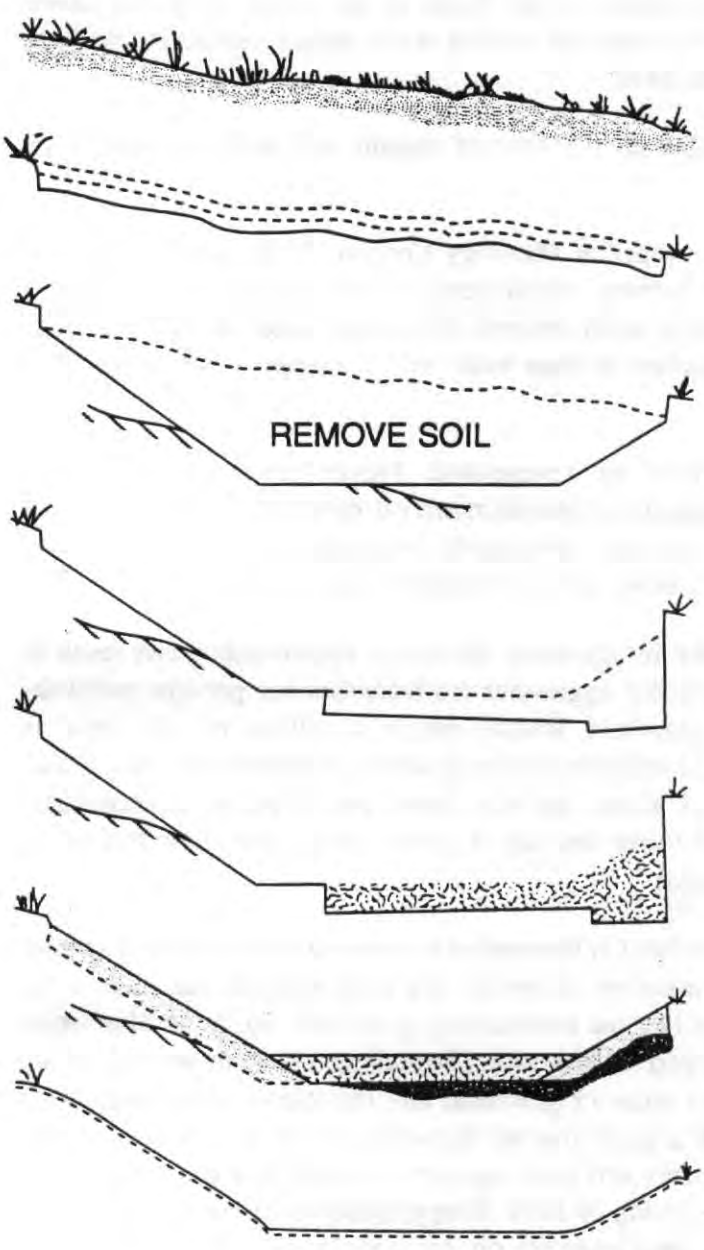
3. Removal and stockpiling of topsoil. Topsoil is removed to the limits of excavation and stockpiled for replacement on the side slopes and, depending upon the soil texture, the pool bottoms.

4. Excavation to rough grade in the area of the pool bottom and excavation of side slopes to the desired rough grade. In this step, the pool bottom and side slopes are cut to approximately 0.6 foot below the desired final grades to allow for the replacement of topsoil.

5. Disposal of excess topsoil and subsoil material at designated spoil disposal sites outside the vernal pool creation area.

6. Overexcavation if and where a clay liner is required (in which case the elevation of the bottom of the clay liner is specified as the rough grade) and excavation of a vertical "wall" if a subsurface flow barrier is to be constructed. Clay liners and subsurface flow barriers are not likely to be necessary on the Santa Rosa Plain because of the high rainfall and almost universally moderate slopes.

Figure G-1
VERNAL POOL COMPENSATION
SEQUENCE OF CONSTRUCTION STEPS



No Scale
Vertical Dimension Exaggerated

Original, initial natural grade.

Initial removal and stockpiling of topsoil (top 0.3 feet and then the next 0.3 feet in two separate lifts). To the limits of excavation (the extent may ultimately be modified), topsoil is stripped in this two-step process. Stripped topsoil can be piled nearby in areas where pool construction is delayed or hauled outside the preserve to temporary stockpiles.

Excavation to rough grade in the area of the pool bottom and excavation of side slopes to the desired rough grade. In this step, the pool bottom and side slopes are cut to approximately 0.6 foot below the desired final grades.

Disposal of excess topsoil and subsoil material at designated soil disposal sites outside the preserves (i.e., should not be piled around site).

Overexcavation where a clay liner is required (in which case the elevation of the bottom of the clay liner is specified as the rough grade) and excavation of the keyway and a vertical "wall" if a subsurface flow barrier is needed.

Placement of the clay liner (typically 0.6 feet thick) and construction of the subsurface flow barrier on the downslope side of the pool. Partial clay liner shown here.

Rough shaping of the bottom of the vernal pool, spreading of topsoil along the slopes of the pool, and import and spreading of vernal pool topsoil.

Spreading of grassland inoculant on the pool slopes and minor adjustments of the grade to obtain the desired outlet barrier elevation and naturalization of the graded areas. Inoculation of vernal pool with 0.1 foot of topsoil and seed salvaged from existing pools.

(Optional) spraying of tackifier (Ecology Controls M-Binder, Sentinel, or equivalent) over the pool bottom. Application of a tackifier to the finished surface can prevent wind removal of applied materials and minimize turbidity due to splash erosion of bare soils before ponding begins. * e.g., large piles of dirt can suck up early available water; and piled up mounds are not part of native vernal pool landscape.

BAE70411.AD.AD 12/19/94 GFJ

7. Placement of the clay liner (typically 0.6 feet thick) and construction of the subsurface flow barrier.

8. Rough shaping of the bottom of the vernal pool, spreading of topsoil along the slopes of the pool, and spreading of vernal pool topsoil.

9. Spreading of grassland inoculant on the slopes of the vernal pool and minor adjustments of the grade to obtain the desired outlet barrier elevation and final naturalization of the graded areas.

10. Inoculation of vernal pool with 0.1 foot of topsoil and seed salvaged from existing pools.

11. (Optional) Spraying of soil tackifier (Ecology Controls M-Binder, Sentinel, or equivalent) over the pool bottom. Application of this sealant to the finished surface is intended to prevent wind removal of applied materials and minimize turbidity due to splash erosion of bare soils with the onset of the first rainy season.

The slopes of created vernal pools must be revegetated. Proper revegetation requires reapplication of topsoil to the slopes; vegetation establishment on relatively infertile subsoils left exposed on the slopes can be slow and poor, increasing the period over which turbidity interferes with plant establishment and colonization by invertebrates and amphibians.

Hydroseeding is one approach to side slope revegetation. However, hydroseeding can result in the introduction of unwanted species, including aggressive cultivars that can prevent establishment of the species in the surrounding grassland. Blando brome, a cultivar of soft chess, is much larger and robust than its naturalized relatives, and it possesses a larger seedhead. It can prevent the regrowth of the "natural" soft chess and also looks out of place, unnecessarily betraying the artificial nature of created pools because it grows taller, therefore producing unnaturally tall bands wherever it was seeded.

The annual grassland in which pools are created is dominated by non-native naturalized species which may be viewed as less-than-ideal invaders. However, the pool margins and other areas disturbed during construction should look like the surrounding grassland. So, as an alternative to hydroseeding, an approach was developed in Roseville (Stromberg 1994) in which the top four inches of soil were disced over large areas of grassland and the topsoil and mulch were mixed and spread on the side slopes with a grade tractor. Experience with this new technique shows unexpectedly good results. Haul roads and pool margins treated this way in the fall of 1993 were virtually fully vegetated by the spring of 1994. Reapplication of at least six inches of topsoil was primarily responsible for the rapid recovery on the side slopes, but the application of this grassland inoculant provided a significant boost. In addition, because of the long and difficult access, the result was less expensive than hydroseeding.

G.7.3 Construction in Restoration

The same types of equipment used in creation are used in restoration. Restoration also takes place in several similar steps, as follows:

1. Removal and stockpiling of the topsoil from the entire site (the removal can take place in phases).

2. Excavation and removal of fill soil from swales and topographic depressions.

3. Spreading the excavated soil over the exposed upland soils to the depth necessary to reestablish a representative range in depth of the original A1 horizon.

4. Replacement of the stockpiled topsoil over the upland areas and slopes of vernal pools and swales to the margin of the anticipated wetland depth or to the anticipated depth of inundation.

Together, the excavated and stockpiled soils will reestablish the original soil depth.

5. Inoculation of the exhumed surfaces in the pools and swales wetlands with seed collected from natural wetlands on the same or similar soil types dominated by desirable species typically found in wetlands of the type to be restored.

6. Final slope configuration and naturalization (a finish-grading activity).

G.7.4 Construction Supervision

Construction can proceed without supervision. The probability that problems will arise is inversely related to the amount of effort put into pre-construction design. If design phase is rigorous, the problems and unanticipated conditions are much reduced. However, supervision is still highly justified for several aspects of the work:

1. Salvage of seed (and topsoil) from wetlands to be filled. The locations and boundaries of existing wetlands are not readily identifiable by a construction contractor and conditions may have changed substantially between the delineation and salvage. The desired salvage boundaries should be flagged in the field and adjusted to reflect the changes. Deletions, substitutions, and mixing of materials may also be found necessary during salvage. Salvage from some wetlands may also be undesirable (i.e., where curly dock or other aggressive weedy species are abundant).

2. Encounters with unanticipated soils conditions (i.e., where no water-restricting horizon is present, where it is discontinuous or dives steeply, or where it is too shallow and would be breached). With supervision, many of these causes of potential problems can be spotted and rectified or the site can be abandoned.

3. Adjustments in the size and shape of the pool to avoid unsuitable conditions. Where soils are poor, the pool can be reduced in size; where conditions permit, the pool can be enlarged.

4. Changes involving clay liners and subsurface flow barriers. A clay liner can be added where the clay is thin, the hardpan is weakly cemented or discontinuous, or true clay is not present.

5. Adjustments in the thickness of topsoil spreading. Adjustments can be made to accommodate changes in the amount of salvage originally expected (as would be possible after a series of wet years).

Appendix H
Non-Regulatory Implementation Strategy Options

H.1 Management and Conservation Programs

There is a variety of management and conservation programs that can be used to protect and preserve vernal pool ecosystems but that do not require the outright acquisition of property rights. Areas within the Santa Rosa Plain identified as suitable for preservation or restoration could be managed through voluntary efforts. In response to the realization that sensitive vernal pool ecosystems in the Santa Rosa Plain face a management crisis, especially with limited funding available through the federal and state governments, citizen or property-owner partnerships provide a reasonable means to protecting these sensitive resources. Some of the possible mechanisms are discussed below.

H.1.1 Management Agreement

A management agreement is a legal contract between a land owner and conservation organization requiring the owner to manage the property in a specific way for a determined amount of time. These agreements work best for owners who have already been managing their land for conservation purposes. There are many circumstances in which agricultural practices may continue under management agreements. An incentive for this type of conservation method might be a preferential assessment for the land owner from the County.

The following is an example of the type of mutual responsibility that may be present within an agreement:

> "The landowner agrees...
>
> ...not to take any intentional action which could destroy or degrade the existing (vernal pool) habitat.
> ...to notify the Trust should I observe any significant change in the condition of the area or any of the elements therein.
> ...to allow the Trust the opportunity to restore the vernal pool habitat to its full health...at the Trust's expense.
> ...to notify the Trust at least 60 days before transferring, by any means, any title of interest in the property before withdrawing from this agreement."

The Sonoma Land Trust has stated its willingness to oversee a mitigation banking system for the protection of vernal pools. Funds raised for this effort could be applied to restoration efforts on lands participating in management agreements. Participation could be encouraged through financial incentives. One option would be to charge an assessment fee for all land owners having properties identified as Preserve Areas. Fees could be waived for land owners participating in a management agreement.

Advantages

- Many agricultural practices may continue
- Results in relatively low operation costs for both the trust and the land owner
- Tends to be politically popular
- Discourages land owners from harming vernal pools
- Encourages landowners to monitor their vernal pools for degradation
- May lead to future commitments by landowners for vernal pool protection
- Allows minor restoration activity to be achieved by the land trust
- Advances public education

Limitations

- The duration of the commitment to protect vernal pools is limited to the terms of the legal agreement
- Incentives other than resource conservation may be necessary to attract a broad range of participants
- Landowners may need to be educated in plant identification to be able to recognize potentially significant changes in the management areas.

The feasibility of using management agreements as an implementation tool for the Preservation Plan is good based on the availability of mapped resources, willing managers, and the opportunity to provide financial incentives.

H.1.2 Mutual Covenant

A mutual covenant does not involve an agency, but rather nearby or adjacent landowners who are interested in protecting their land. Landowners enter into an agreement controlling the future use of their land through restrictions agreed upon by all the participating landowners. Such agreements are permanent and could be enforced by any of the landowners or future landowners of the involved properties.

Lands to be protected under a mutual covenant could be identified by mapping showing Preserve Areas and areas of Intermediate Quality Resource Areas. This mapping could be incorporated into the County's "Biotic Resources" data maps and into the Land Use Element Maps for other jurisdictions. Under the County's open space policies, critical habitats

should be included in this biotic resource designation. Sonoma County and the City of Santa Rosa currently protect biotic resources through a combining district to the zoning ordinances. Therefore, there are mechanisms currently in place, and new mechanisms that could easily be implemented to forewarn land owners of the sensitivity of their land and the need to protect such land.

Similar to management agreements, participation in mutual covenants could be encouraged through financial incentives. Assessment fees could be imposed for all land owners having properties identified as Preserve Areas. Fees could be waived for land owners participating in a mutual covenant.

Advantages

- Knowing that all their neighbors are aware of what can or cannot be done on their property is usually enough to keep landowners from breaking the terms of the agreement.
- Many agricultural practices may continue.
- May lead to future commitments by landowners for vernal pool protection.
- May reduce property taxes and estate taxes for the land owners by lowering the market value of the land given its protected status.

Disadvantages

- Any associated loss in market value cannot be claimed as a charitable deduction on income tax returns.
- Does not provide long-term protection; protection duration subject to the terms of the agreement.
- May involve administrative costs for the County or another entity to monitor and assure that land practices comply with assessment fee waiver criteria.

The feasibility of using mutual covenants as an implementation tool for the Preservation Plan is less than the feasibility of using management agreements. Mutual covenants do not include any monitoring by a professional organization to ensure that vernal pools are being managed as planned. Mutual covenants are currently not a common conservation tool in the Santa Rosa Plain.

H.1.3 Wetland Registry

A wetland registry is an association of landowners who pledge to preserve their wetlands voluntarily. Registries can be administered by local governments or private conservation groups (e.g., Sonoma Land Trust) and can include a provision that gives the administrative body the right of first refusal (the right to match any purchase offer) for the property. Asking landowners to participate in registries is one way for local governments to notify landowners that there are vernal pools on their property and that these ecosystems are valuable and worth preserving. In most registries, participants are publicly recognized for their contributions to wetlands preservation.

An example of such a registry is the Bucks County Register of Significant Natural Areas managed in Southeastern Pennsylvania by the Bucks County Conservancy, a private, non-profit conservation organization. The registry, developed in 1988, was established to help implement the County Natural Resources Plan, a plan which identifies significant natural areas as high priorities for protection. In this example, owners of registered areas agree to: protect the property and maintain the natural features to the best of their abilities; notify the Conservancy of any threat to the area, including pollution, drainage, or encroachment by development; and notify the Conservancy of any intent to sell or transfer property ownership. In addition, Conservancy personnel request permission to visit the site annually and monitor any changes in the area's natural features. Participating owners receive award plaques honoring their commitment to conservation and a written report explaining the natural significance of their property and recommendations for site management. For a fee, the Conservancy provides further land management assistance, including detailed management plans and natural resource inventories.

Sonoma Land Trust has stated its willingness to manage a wetland registry. Similar to Bucks County, Sonoma County could include vernal pools as critical habitats on the Biotic Resources maps included in the County's Open Space Element. A registry managed by Sonoma Land Trust could help implement the Vernal Pool Ecosystem Preservation Plan in the same way that one was used to implement Bucks County's Natural Resources Plan.

Advantages

- Can be operated at relatively low cost
- Tends to be politically popular
- Publicly recognizes landowners for preserving vernal pools, and discourages them from harming vernal pools
- Encourages landowners to monitor their vernal pools for degradation
- May lead to future commitments by landowners for vernal pool protection

- Advances public education

Limitations

- A landowner's pledge is non-binding and provides no guarantee of *permanent* protection
- May create additional responsibilities for local administrative body
- May require financial incentives to attract a variety of participants

Similar to management agreements and mutual covenants, wetland registries work best when land owners are already interested in land conservation. Implementing a wetland registry may require financial incentives, such as a waiver from possible resource assessment fees or preferential property tax assessments, as described in the following section.

H.1.4 Preferential Property Tax Assessment

A technique potentially available to Sonoma County is to offer preferential property tax assessments to landowners who preserve natural areas as vernal pools. Typically, counties assess property at a rate which reflects its fully developed value. Counties may, however, offer a reduced property tax assessment to landowners who maintain their property in its open, natural state. This type of preferential treatment may be limited to those landowners operating their land under a preservation agreement called a covenant. In exchange for agreeing to preserve the land, the owner's property is assessed on the value of the land as "covenanted." Covenants are usually for terms of 10 years. If a landowner breaks the covenant, the county would be able to recover the amount of the tax benefit (approximately, the difference between the taxes that would have been collected has the land been developed freely, plus compound interest). The Williamson Act is an example of a preferential property tax assessment for agricultural lands.

Preferential property tax assessments could be applied to lands designated as Preserve Areas according to the Preservation Plan.

Advantages

- Eliminates a major disincentive (continued high taxes) for landowners who may be willing to voluntarily preserve vernal pools on their property
- May be more acceptable politically than regulation

Limitations

- Forfeit tax revenue for the county, local municipality, and/or school district

- Does not provide permanent protection

- Is less effective where there are intense development pressures, since the penalties for breaking the covenant would be small compared to the financial incentives to develop

The feasibility of using preferential tax assessments as an implementation tool is being pursued by Sonoma County. To date, the County has never applied such a tax incentive.

H.1.5 Deed Restrictions

Deed restrictions are like conservation easements in most respects, except that there usually is not a third party assuming the monitoring and enforcement responsibility. Deed restrictions allow a landowner to define the future use of its property at the time the property is transferred. To better enable enforcement of the deed restriction, it is wise to transfer the land to a conservation organization or agency, then have the transferee include the deed restrictions as a part of any sale. The conservation agency, not the landowner, then holds the right to enforce the covenants.

A conditional transfer and reverter clause adds more tenacity to a deed restriction by placing a penalty on violating the deed restrictions. The penalty is the automatic reversion of title to the land to the original landowner and heirs or to a conservation agency, depending on who would be in the best position to protect the land and enforce the restrictions.

To encourage the use of deed restrictions as an implementation measure to preserve vernal pools in the Santa Rosa Plain, an educational program will need to be developed. The Sonoma Land Trust, as well as the Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), could take an active role to contact owners of those properties identified as Preserve Areas and to describe the potential application and benefits of using deed restrictions. County and municipal staff could also participate in an awareness program by providing information on the use of deed restrictions each time a deed is registered with the proper authorities.

Advantages

- May affect the market value of the land if the restrictions severely limit development potential, thus lowering tax assessments.

- Has the potential to provide long-term protection of sensitive resources.

Limitations

- It is often difficult to enforce deed restrictions, especially if the landowner does not live near the property that was transferred and deed-restricted.

- The market value of the land may be affected if the restrictions severely limit development potential.

- Restrictions may lower the price if the property is sold or lower the value of the gift if the land is donated to a conservation agency.

- The IRS does not allow the loss in value resulting from deed restrictions as a charitable deduction.

While deed restrictions are common in the Santa Rosa Plain, the feasibility of using deed restrictions as an effective implementation tool is dependent upon the success of an outreach program.

H.2 Acquisition of Interests

In addition to mutual actions taken by parties to restrict certain kinds of land activities within resource protection areas, agencies have the option of acquiring property interests directly through the leasing of land use rights, the purchase of land use rights, land donations from private parties, or the outright purchase of land. Although acquisition may be an expensive conservation implementation measure, it may provide the most complete protection for a vernal pool ecosystem. Acquisition affords vernal pool preservation without regulation and can guarantee permanent protection. Although there is a financial *impact* involved with preserving land through acquisition, there are also economic benefits which should not be overlooked. Protecting vernal pool ecosystems in the Santa Rosa Plain can improve the quality of life within the region, raise the property value of land located near these natural areas, and increase opportunities for recreation and tourism.

In today's economy, it is almost the exception if significant land acquisition is accomplished without a partner from the private sector and one from the public sector, if not more than one from each side (Endicott, 1993). Partnerships typically involve a land trust. Local government can turn to land trusts for information and assistance with acquisition. Land trusts, such as the Nature Conservancy and the Sonoma Land Trust, are private, non-profit organizations whose purpose is to acquire and manage land for conservation of natural values. Land trusts can raise private funds for acquisition, aid local governments in applying for state and federal grants, identify rare and endangered species, and help develop management plans and educational programs. Since non-profit organizations do not have the authority to condemn land, landowners typically are more comfortable working with them than with government agencies. In any public-partnership, all involved must realize that land conservation works best when economic interests and ecological values are mutually supportive, and that both public and private sectors must work hard to ensure that this happens (Endicott, 1993).

There are two options for acquiring rights to a parcel of land (see Figure H-1). All of the property rights may be acquired ("fee simple" or "fee title" acquisition), or only certain

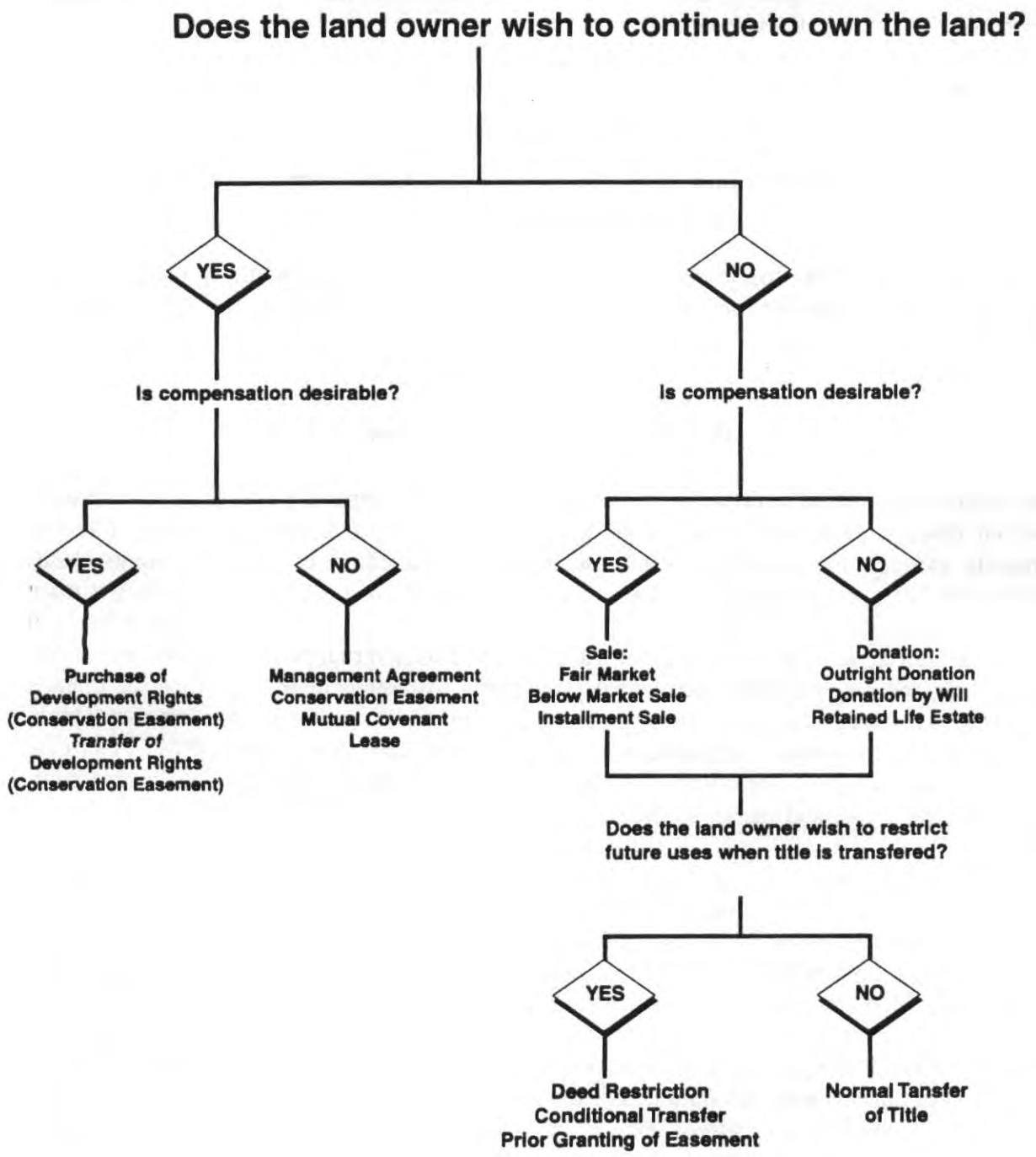


Figure H-1
Nonregulatory Options for Land Conservation

8AE70411.AD.AD 12/20/84 SKK

rights may be acquired (a conservation easement) that restricts future uses of the land. Acquiring a conservation easement preserves natural values without requiring full ownership of the land. As shown in Figure 7-1, easements or land can either be purchased or received through donations. A conservation easement that is purchased is referred to as "purchase of development rights" or PDR.

Any landowner who donates a vernal pool or buffer lands to a local government or private, non-profit conservancy or land trust may be eligible for federal income tax benefits. These benefits are available to individuals, corporations, and estates. Those wishing to donate land should consult with an experienced lawyer, realtor, accountant or conservation agency to ensure that the trust or conservancy is a "qualified organization" that can receive tax-deductible land gifts. Typically, the tax deduction for a donation equals the assessed value of the property. Federal income tax benefits may also apply to the sale of a vernal pool to a government or qualified organization at less than its assessed value, known as a "bargain sale."

The sale or donation of a conservation easement may also be tax deductible if it satisfies the U.S. Internal Revenue Service's definition of a qualified conservation contribution. A qualified conservation contribution must (a) restrict in perpetuity the use that may be made of the property, and (b) be made exclusively for conservation purposes. Conservation purposes include enhancing natural habitat. To qualify, a gift of a conservation easement to preserve open space must be part of a clearly delineated federal, state, or local governmental conservation program.

H.2.1 Fee Simple Acquisition

This type of acquisition provides a government agency or private agency full property rights to a vernal pool ecosystem and the responsibility for managing it. The cost to the local government or non-profit agency varies, depending on whether it pays full price, whether it receives outside funding, whether it needs to commit long-term funds to maintain the land, or whether the land is donated. While fee simple acquisition can be expensive, it may be warranted for the following reasons:

- To protect significant vernal pools
- To protect vernal pools subject to development pressure
- To maintain a vernal pool for the benefit of the community

Lands identified by the Plan as Preserve Areas would be targeted for acquisition, based on the availability of funds. Given the known limited funding of both the state and federal government, both the Sonoma Land Trust and the Sonoma County Agriculture and Open Space District could likely be the primary organizations involved in fee simple acquisition.

Advantages

- Can guarantee permanent protection
- Provides direct control over a vernal pool for public purposes
- Allows government or non-profit private agencies to manage the use of the vernal pool
- Allows government or non-profit private agencies to tailor conservation efforts to the characteristics of the individual resource
- May be more politically acceptable than regulation
- May increase the value of surrounding private property

Limitations

- May be costly
- Reduces local tax revenues by removing property from the tax rolls
- May be less politically acceptable because of its cost if public dollars are involved

Fee title may be acquired through private donation or sale. The advantages and disadvantages, particularly from an economic interest, are outlined in the discussions of each donation or sale scenario.

H.2.1.1 Donations

Outright Donation. Giving land to a nonprofit conservation organization or to a government agency is the simplest way for a landowner to protect his or her land. No financing or negotiations about price are necessary. However, approval must be obtained from the agency or organization to whom the landowner intends to donate prior to deeding the land to them. Donation incentives may include federal income tax deductions, potential estate tax benefits, and relief from property taxes. If a landowner wishes to donate land but does not want to give up the use of it immediately, he has two options to choose from: donation by will or donation with a reserved life estate.

- **Donation by Will.** Land may be donated through a will entitling the landowner to retain full use of the land during his lifetime. Discussing the gift with the government agency or private conservation organization prior to inclusion of the donation in the will allows the landowner to develop a plan for the future care of his land. Full control of the land is retained during the landowner's lifetime, and he is assured that it will be cared for when he is gone. Removing the land from an owner's estate reduces the estate or

inheritance taxes. However, the owner will still be responsible for paying real estate and income taxes for the property during his lifetime.

- **Donation with a Reserved Life Estate.** To avoid paying real estate and income taxes for the full property during a landowner's lifetime, a donation with a reserved life estate should be considered. With this option, the landowner donates the property to a government or conservation agency while the owner and the other members of the family retain the use of all or part of the land during the owner's lifetime or their lifetimes. A reserved life estate ensures that the land is accepted by someone suitable to the landowner and that it is protected in perpetuity, yet the owner is able to continue to reside on the land.

If the donated land qualifies for treatment as a charitable deduction, the landowner may take an income tax deduction for the value of what was actually given up. This value, and hence the deduction, is determined by the IRS actuarial tables based on the life expectancies of those who have a reserved life interest in the property. This deduction would not include the value of the retained life estate. The tax advantages with a retained life estate are less than those advantages with an outright donation but greater than those with a donation by will.

Donations by will or with a reserved life estate may be preferred if the organization or agency receiving the land would like to own the property but does not wish to accept the responsibilities of immediate ownership.

H.2.1.2 Land or Easement Sale/Purchase Arrangements

In cases where land or property right donation is not feasible and preservation is desired, land may need to be purchased. Land may either be purchased at fair market value, at a bargain price, or in installments.

Fair Market Value. Sale at fair market value is the sale of property for the price a knowledgeable buyer will pay for the land. Most conservation agencies are often unable to purchase land at fair market value because they have insufficient funds available and therefore must be frugal about their purchases. If land is sold at fair market value, and the price of the land has appreciated in value since the time it was purchased, then the landowner will be liable for income tax on the capital gain. This can significantly affect the net profit from a sale.

Bargain Sale. In a bargain sale, a government or conservation agency purchases property for a price less than fair market value. By offering the property at a lower price, the landowner is likely to find a willing buyer and he can claim a charitable deduction on his income tax for the difference between the bargain price and the fair market value. This deduction, together with the smaller capital gains to be taxed from the reduced selling price, can offset some of the monetary loss caused by not selling at fair market value.

Installment Sale. An installment sale allows an agency to purchase property over a period of several years. The use of the land and the responsibility for payment of property taxes until the sale is complete are negotiable terms of the agreement. The landowner benefits financially by spreading the income and the taxable gains over several years and the purchasing agency benefits by buying the time needed to generate sufficient funds. The amount of taxable gains depends on whether the land is sold at fair market value or not.

Sale with a Reserved Life Estate. If property is sold with a reserved life estate, the landowner and his family may continue to use the land during their lifetimes. He will have to continue to pay the real estate taxes on the land while retaining use of the property. Capital gains will depend on whether or not the sale is at fair market value.

It is unlikely that many vernal pools will be preserved through land acquisition, given the cost of acquisition. Both the Sonoma Land Trust and the SCAPOSD primarily use conservation easements for preserving sensitive resources. To date, SCAPOSD has acquired three properties within the Santa Rosa Plain with fee simple purchase. Additional properties are being considered for purchase, but the terms have not been concluded thus far. Except for the several parcels in the Laguna de Santa Rosa Area which were acquired by the Sonoma Land Trust and then transferred to CDFG, the SLT has not acquired any other land within the Santa Rosa Plain. SLT uses both conservation easements and fee title acquisitions for conserving open space; easements are most often used. The SLT has discovered that easements work best in areas outside urban boundaries; whereas fee title acquisition typically works best within urban boundaries. The feasibility of acquiring land as an implementation tool is dependent on available funding and the location of the subject vernal pool.

H.2.2 Conservation Easements

Full ownership is not always necessary to protect a vernal pool's natural values. Generally less costly than fee simple acquisition is the purchase of an easement. Both the SCAPOSD and the Sonoma Land Trust (SLT) use conservation easements as their primary means for land conservation and resource protection acquisition in the local area. The Sebastopol General Plan and the Rohnert Park General Plan advocate conservation (preservation) easements as a means of preserving valuable resources. For the SLT, the majority of its conservation easements are obtained through private donation rather than purchased. An easement gives its owner a "less-than-fee" interest in property, that is, some, but not all, of the property rights. The easement deed specifies which property rights are transferred to the buyer. In the case of a vernal pool ecosystem, a conservation easement can be purchased that can limit the landowner's future ability to develop the property, grow crops, or irrigate, or can simply restrict the level of development acceptable. As with fee simple acquisition, federal income tax incentives can be used to encourage donations of easements.

Easements often contain provisions granting the easement owner access to the property to ensure that its terms are being met. Easement holders can enforce the terms of the

easement in court, when necessary. Easements can also include management plans for preserving the vernal pool ecosystem.

A vernal pool protection strategy can combine easements with fee simple acquisition. For example, it may be cost-effective to purchase a vernal pool itself in fee simple and to acquire easements on the surrounding areas to protect against indirect impacts, such as erosion and runoff. Likewise, it would be more prudent to purchase vernal pools in urban boundaries through fee simple acquisition, rather than through easements. Development pressures and higher land values in urban areas often deter a landowner from voluntarily releasing most of his development rights.

A greater participation in conservation easements could be gained by assuring that gifts of conservation easements qualify as a tax deductible charitable contribution. Designating vernal pools in Sonoma County and municipal open space plans helps qualify donations as tax deductible.

Advantages

- Generally less expensive than purchasing land in fee simple
- Unlike land in fee simple, the property remains on the tax rolls
- Reduction of property value can reduce estate and inheritance taxes
- If easement is donated for conservation, it can be claimed as an income tax deduction
- May reduce annual property taxes if land becomes assessed at a lower value given the restrictions on development

Limitations

- If the easement is sold, the amount received as payment would be taxable by the IRS
- Gives the easement holder less control over the vernal pool than does fee simple acquisition
- An easement usually decreases the market value of the land as it limits the potential development and use of the property

H.2.3 Land Lease

Land leases are rental agreements that provide an alternative to transferring land to a conservation agency or organization. A land lease allows an owner to protect the land for

a period of years by leasing the land to a conservation agency or organization. A lease allows unrestricted and exclusive use of the land by the agency for a given number of years; certain use restrictions may be incorporated within the lease agreement. Lease agreements may include provisions that terminate the lease if the conservation agency or organization does not use the property as directed.

Advantages

- Affords conservation management at a typically more affordable cost.
- Any impact of the lease on the value of the land would be taken into account when estate taxes are calculated.

Disadvantages

- Donated leases are not tax deductible contributions

Similar to using deed restrictions, the use of land leases is dependent upon the success of an educational outreach program. Not all landowners are aware of such conservation options.

H.3.3 Transferable Development Rights

In addition to market-oriented strategies such as the Habitat Transaction Method (described in Section 7) and Mitigation Banking (described in Section 7 and Appendix F) the concept of Transferable Development Rights has been used to provide incentives for landowners. Under the TDR approach, a landowner in a designated "sending" area receives TDR credits for preserving or enhancing the land, and may sell these to a landowner or developer wishing to develop in a designated receiving area to allow increased development density. This approach has the advantage of being a fairly simple system administratively, once the process is set up. However, defining the sending and receiving areas can be controversial. TDRs and purchase of development rights are advocated in the Sebastopol and Sonoma County General Plans as mechanisms for preserving valuable natural resources.

H.4 Options for Potential Funding

There are a variety of options for funding feasible implementation strategies. Given limited budgets of federal, state, and local government, a combination of the funding mechanisms described below will be necessary. For each of the funding options identified, there is a discussion concerning the potential availability of funds, the process used for obtaining the funds, and specific requirements imposed for obtaining the funds (e.g., public participation requirements).

H.4.1 Federal Grants/Funds

- Annual natural resources/wetlands stamp revenues (Duck Stamps)
- Land and Water Conservation Fund–funds are given to the state to buy open space lands which may contain wetlands.
- U.S. Fish and Wildlife Service grants under the Pittman-Robertson Act - funds are given to the state for acquisition of wildlife areas and wildlife restoration. Funds are from a tax on ammunition and weapons.
- Potential for reauthorization of the Federal Endangered Species Act to include compensation for voluntary preservation of listed and/or candidate species.

H.4.2 State Grants/Funds

- Wildlife Conservation Board/State Coastal Conservancy
- Wetlands/natural resources/parks bond measure

H.4.3 Local Government Funds

- Sonoma County Agricultural Preservation and Open Space Trust
- Sales tax
- Wetlands/natural resources/parks bond measure

H.4.4 Private, Non-profit Organization Funds/Programs

H.4.4.1 Land Trusts

Land trusts can provide seed money enabling it to compete effectively in real estate markets for particularly desirable parcels; it can act quickly to advance funds in instances in which government money to buy a particular piece of land is committed but not immediately available, as when bonds have been authorized but not yet sold or when a particular annual source of funding has not yet come through. Land trusts can purchase options, giving the government agency the time it needs to complete its paperwork; land trusts are flexible; many key tracts of land come up for sale at auction and may be cheaply bought there, but government agencies generally are prohibited from bidding at auction; land trusts may use their loan funds to purchase land in advance and then convey it to the government agency in undivided fractional interests as the agency's installment payments are made. A land trust or another private partner can counsel landowners on the tax benefits of bargain sales,

showing them how deductions associated with charitable donations of land value may offset in some measure a lower selling price. Some land trusts are described below.

The Trust for Public Land–is a national, nonprofit land acquisition and conservation organization that works with community groups, landowners, and public land management agencies to preserve open space and to develop new methods for community ownership of land. TPL carries out cooperative projects only; it does not own or manage land of its own. The TPL has many skills and abilities, including: the tools of flexibility; speed; knowledge or the tax code and of the public funding process, including innovative sources such as mitigation funding; and lots of experience in working with private landowners.

American Farmland Trust–The American Farmland Trust is a national, private, nonprofit organization dedicated to protecting farmland. Since 1980, the organization has promoted the conservation of agricultural resources and the economic conditions essential to their sustained, productive use. In the process, AFT has become a leader in efforts to resolve the conflicts between long-term conservation needs and the short-term economic pressures that threaten farmland resources

The Nature Conservancy–TNC is an international, nonprofit organization committed to the global preservation of natural diversity. Its mission is to find, protect, and maintain the best examples of plant and animal communities and ecosystems in the natural world. The organization has protected over 3.6 million acres of habitat in the U.S., Canada, Latin America, and the Caribbean.

Sonoma Land Trust–The SLT is a private, nonprofit organization that has been active in Sonoma County since 1976 in providing permanent protection of land and its resources, offering stewardship, education, and advice for the preservation and enhancement of agricultural, natural, scenic, and open space lands. The SLT typically works directly with willing landowners who act voluntarily to keep their lands intact.

H.4.5 Volunteer Programs

H.4.5.1 Gifts of Other Properties

Even if a particular property does not possess outstanding natural resources, it is still possible to donate it to a conservation organization who can than accept tax deductible donations of developed rural estate or other property. An organization can accept a gift or little or no biological value, sell it on the open market, and use the money for preservation of other ecologically significant lands. The landowner still enjoys the same tax benefits had he/she donated exceptional conservation land.

H.4.5.2 Preservation Cooperative

A preservation cooperative is a relatively new concept in land management. A preservation cooperative demands stewardship, concern, expertise, and time from concerned individuals,

involving them in caring for areas in their communities with which they are familiar. A preservation cooperative asks citizens to take an active part in monitoring and maintaining sites, studying populations and making inventories, building trails and access locations. That is, it essentially involves them to be stewards of a site. This type of cooperative is typically managed through the leadership of a land trust. The trust prepares a management plan before a Cooperative is undertaken and before volunteers, under the trust's leadership, implement those plans. Citizens are thus invited to become a vital force in the effort to preserve the natural heritage of the Santa Rosa Plain.

H.4.6 Impact Fees

- Development fees, including potentially a one-time development fee and property assessments (such as noted in the Southwest Santa Rosa Specific Area Plan within the "take" areas)
- Stormwater user fees
- Vernal pool impact fee for approved wetland fills
- Wetland Assessment District (charge assessment tax for construction in areas defined as potential or known vernal pools)

H.4.7 In Lieu of Mitigation Fees

- Payment in lieu of onsite or offsite mitigation (pay into acquisition/ management fund). Note, however, that payment in lieu could result in the loss of several endangered species populations or smaller vernal pools to accrue sufficient funds to acquire/protect larger populations or vernal pool ecosystems.

Appendix I
Response to Comments on April 28, 1995 Draft Vernal Pool Plan

During the public comment period for the Draft Plan, we received many comments from members of the Task Force, business leaders and interests, conservation organizations, and the public. Most of the comments have been incorporated directly into the text of the Plan and are not addressed in this appendix. Comments pertaining to activities that will take place in Phase 2 or those requiring greater explanation are presented here. Comments and responses provided at the public meeting are provided in this appendix, after the divider.

If you feel we have not accurately understood the intent of your comments, we (CH2M HILL) and members of the Task Force would be happy to discuss your comments with you.

Agencies

California Department of Fish and Game, Ken Aasen, Region 3, Yountville, CA
June 6, 1995

Chapter 6 (and Appendix E)

Comment: The designation of nine sites was changed from potential preserve to potential high-quality. One site, Aviation Boulevard, is no longer identified as a potential preserve or high-quality site and another site, Brown Farm was added as a potential high-quality site. The Final Plan should retain all sites identified in the previous document (February 22, 1995 draft) as potential preserves.

Response: The Task Force agreed at their meeting on June 14, 1995 that all high-quality sites should be identified as potential preserves in the Final Plan. They also decided that Aviation Boulevard should remain unknown habitat quality, as in the April 28, 1995 draft. As a high-quality site, Brown Farm is a potential preserve in the Final Plan. All tables, including Table 6-2, text, and figures which address potential preserves were modified to reflect these changes approved by the Task Force.

Chapter 8

Comment: The Plan should focus on the preservation component. It is unclear what the mitigation ratios mean, and how would someone determine how many acres will need to be purchased for mitigation and are they only wetlands?

Response: The preservation component will be major focus in Phase 2. The mitigation ratios in the Plan were proposed as a possible scenario for achieving the preservation and no-net-loss goals of the Plan. Final mitigation ratios will not be determined until Phase 2 and these ratios may be mitigation bank dependent. Phase 2 proposes to complete an economic analysis to aid in determining what can realistically be requested in terms of mitigation through paying only for wetland acreage or simply buying into the total land available in a preserve bank.

Comment: We are concerned that enhancement is identified as a component of mitigation. Enhancement will not meet the no-net-loss of wetlands objective and will divert away from preservation.

Response: It is correct that enhancement does not increase wetland acreage and is stated so in the Plan (Chapter 8.4.3). It is anticipated that proposals for increasing the size of preserves that have high-quality habitat through adding adjacent low-quality habitat will include enhancement as a component.

Comment: Resolution of unknown-quality habitat sites cannot be adequately addressed through remote sensing and limited ground truthing.

Response: Correct, many areas cannot be adequately resolved as to habitat quality based on remote sensing and casual field investigation. The Phase 2 analysis of properties through the use of high resolution color aerial photographs will be restricted to determining if potential habitat exists. In particular, some additional potential high-quality habitats may be found through the use of better aerial photos. Many of the biological criteria for site evaluation cannot be determined based on aerial photographs or satellite images, or through limited field studies.

Appendix D

Comment: Rank definitions provided in Appendix D need additional clarification to ensure accurate interpretation and understanding by all biologists who may be using this evaluation system in the future.

Response: During Phase 2, a workshop to train biologists/wetland scientists/botanists on how to use the site ranking procedure will be developed and conducted. Participants' manuals will include a handbook for conducting site rankings.

Natural Resources Conservation Service, Richard King, Santa Rosa, CA
June 2, 1995

Phase 2

Comment: Will there be an opportunity to have a category of seasonal wetlands not requiring mitigation, such as the Minimal Effects determinations used by NRCS and the US Fish and Wildlife Service for Farm Bill determinations?

Response: Seasonal wetlands that are determined to be low-quality habitat may be able to receive the Minimal Effects determinations. This will be determined as part of Phase 2 and development of the General Permit.

Comment: Will the costs of mitigation be uniform on a per acre basis, or will they vary with the quality of the wetland proposed to be altered? Will mitigation fees be different for construction sites versus agricultural conversions?

Response: The costs of mitigation will be further evaluated and defined during Phase 2, including assessing whether mitigation fees will be different for construction sites and agricultural conversions.

Comment: The Corps should spot check or be notified of determinations in delineations and be given the opportunity for quality control, rather than field verifying each determination or delineation.

Response: During Phase 2, the Corps, USFWS, CDFG will identify the most efficient and reliable procedure to verify determinations and delineations.

U.S. Fish and Wildlife Service, Joel A. Medlin, Sacramento, CA
June 6, 1995

Chapter 6 (and Appendix E)

Comment: The change in designation for several sites from potential preserve to high-quality habitat only should be discussed with regard to meeting the conservation biology and regulatory compliance objectives of the Plan. We recommend that the potential preserve classification be retained for all known high quality sites.

Response: The Task Force agreed at their meeting on June 14, 1995 that all high-quality sites should be identified as potential preserves in the Final Plan. They also decided that Aviation Boulevard should remain unknown habitat quality, as in the April 28, 1995 draft. As a high-quality site, Brown Farm is a potential preserve in the Final Plan. All tables, including Table 6-2, text, and figures which address potential preserves were modified to reflect these changes approved by the Task Force.

Comment: We recommend that you include the term "avoidance" in the preservation form of mitigation, due to its importance in complying with NEPA and Section 404 guidelines of the Clean Water Act.

Response: Avoidance is an important part of mitigation.

Chapter 8

Comment: How will high-quality habitats be incorporated into a "safety net" to ensure that loss rates of these areas do not exceed protection and mitigation rates.

Response: The Task Force agency committee has discussed the safety net issue and proposed to try and address it after developing a more detailed preservation design plan that will be based on updated information gathered in the early stages of Phase 2.

Comment: We recommend that a rationale be given for the mitigation ratios in the Plan based on comments from the public at the May 10, 1995 public meeting. It seems that mitigation ratios are generally mitigation bank specific.

Response: The Task Force discussed the mitigation ratios and recognized that it is true that individual mitigation banks will ultimately have specific ratios based on the type of bank and land values. The Phase 1 Plan has been amended to indicate that the mitigation ratios indicated are only one possible scenario that identifies how the preservation goals of the Plan and the no-net-loss policies of the agencies can be achieved. Phase 2 development of mitigation banks will include an economic analysis that will consider mitigation ratios.

Appendix B

Comment: The figures (Figure A1-1 through A1-4) from the previous draft which show the distribution of plant species of concern within the Santa Rosa Plain should be reincorporated into this appendix.

Response: The Task Force decided to not include these figures or more detailed figures showing locations of rare plants.

Comment: A discussion of characteristics, habitat requirements, and distribution of the California tiger salamander (*Ambystoma californiense*) should be included in this section of the Plan.

Response: The requested information on the California tiger salamander was added to Appendix B.

Appendix D

Comment: Table D-1 (Habitat Quality Site Evaluation Criteria) needs to be more usable.

Response: During Phase 2, a workshop to train biologists/wetland scientists/botanists on how to use the site ranking procedure will be developed and conducted. Participants' manuals will include a handbook for conducting site rankings.

Appendix E

Comment: Discrepancies were noted between Element Occurrences (EOs) listed in Table E-2 and those referenced in the individual site narratives. A list of discrepancies for each of the listed species followed in the letter.

Response: When the table indicated that an EO would be found within a potential preserve but the narrative did not list this EO, a note was added to the narrative for the appropriate potential preserve that the EO may be found within the potential preserve in addition to those already listed. EOs that were described in the narrative, but not included in the Table, were added with a footnote that the population needs to be verified.

Local Government

City of Santa Rosa, James E. Pedgrift, Mayor, Santa Rosa, CA
June 7, 1995

Chapter 6

Comment: City Council recommends that Figures 6-2 and 6-3 be amended to exclude properties that have Corps of Engineers permits or properties that are documented to be other than preserve quality resources.

Response: The Phase 1 Plan developed a set of criteria to evaluate the resource quality of a site based on existing information on the biological resources, land use, and acquisition feasibility. The Task Force did not include within those criteria the issuance or holding of any type of federal, state, or local permit. Further, Corps of Engineers permits are revocable and have a limited period of authorization by the permit holder. Thus, holding a permit was not considered to be a factor in determining habitat quality. Regarding habitat quality, some sites have been corrected, through amendments to Figures 6-2 and 6-3, in the Final Phase 1 Plan to remove portions of parcels that have been documented to not have high-quality resources. Phase 2 of the Plan will focus on the high-quality sites to more accurately determine habitat conditions within the potential high-quality sites.

City of Sebastopol Planning Department, Richard Spitler, Sebastopol, CA
June 6, 1995

General

Comment: "In some instances the Vernal Pool Plan should conform to the local general plan and not have the reverse."

Response: Many of the general plans currently in effect in the study area specify objectives of enhancing and protecting wetlands, including vernal pools. The Vernal Pool Plan specifies in Subsection 4.4.1.9 that Sebastopol already has such an objective identified Policy 51 (Vernal Pools and Endangered Species) of its Conservation, Open Space, and Parks Element, and therefore, is consistent with the goals of the Vernal Pool Plan.

Furthermore, Subsection 8.2.4 of the Vernal Pool Plan specifies that "local governments could establish or revise ordinances as needed to incorporate the provisions of the Plan and the General Permit. Since General Plan policies can change (in some cases up to four times a year)it will be important that the General Plans are consistent with the Vernal Pool Plan to ensure that the Corps will issue a General Permit and that there is regional consistency in terms of how vernal pools and endangered species are protected.

Comment: Will the General Permit issued by the U.S. Army Corps of Engineers apply to the City of Sebastopol and will local participation be voluntary or compulsory?

Response: The General Permit will apply to the cities of Sebastopol, Rohnert Park, Cotati, Santa Rosa, the Town of Windsor, and Sonoma County. Participation by landowners in the Plan is voluntary.

Comment: Do vernal pools exist within Sebastopol or is there no detailed information available?

Response: The Plan states that "no known vernal pools have been identified within the limits of Sebastopol." In some cases, there is not enough information to adequately determine whether vernal pools exist in a given area. During Phase 2, some areas currently identify as "unknown resource value" will be further evaluated using high-resolution, color aerial photographs taken this spring and by ground-truthing. If landowners in Sebastopol or local government officials know of areas within Sebastopol with vernal pools, providing the Task Force with that information will be appreciated.

Sonoma County Board of Supervisors, Ernie Carpenter, Santa Rosa, CA
June 13, 1995

Phase 2

Comment: The Corps should spot check or be notified of determinations in delineations and be given the opportunity for quality control, rather than field verifying each determination or delineation.

Response: During Phase 2, the Corps, USFWS, CDFG will identify the most efficient and reliable procedure to verify determinations and delineations.

Chapter 3 and Appendix B

Comment: The Plan should either delete discussion of species which are neither listed nor candidates for listing; indicate the legislative mandate to address these species; or clearly indicate the sites which are rated solely on the basis of the occurrence of these species.

Response: Plants listed in Chapter 3 and Appendix B that are neither listed nor candidates for listing are included in the California Native Plant Society inventory. The California Environmental Quality Act Section 15380 recognizes all plants meeting the CEQA definition of "rare" should be considered. Text has been added to Chapter 3 explaining this legislative mandate.

Town of Windsor, Rick Jones, Windsor, CA
June 8, 1995

General

Comment: Establish a screening committee of local experts to facilitate determinations about the quality of habitat currently identified as unknown.

Response: During Phase 2, some habitat currently identified as unknown will be evaluated and determined to be of no resource value, low-quality, or high-quality habitat. This will be accomplished through review of new high quality color aerial maps, ground truthing, and information provided by municipalities, local experts, and the public.

Comment: The Plan may want to provide an "out" clause allowing for off-site mitigation or mitigation banking.

Response: The existing regulatory process and the Plan provides for off-site mitigation. Areas designated as "potential" preserve sites will not automatically become preserves; rather they may become preserves.

Chapter 6

Comment: Amend Figure 6-2 to create another category of "Developed" properties. And create another category of "No resource value."

Response: Phase of the Plan (Chapter 6) has been amended to include a definition of "no resource value" as a new category. The new category will appear on future maps, but there was insufficient time and information to amend the existing figures. "Developed properties" will be included within the no resource value category.

Comment: Facilitate determinations within unknown-quality habitat by using the no resource value category and establishing a screening committee.

Response: The Phase 1 Plan (Chapter 6) identifies procedures for resolving unknown-quality habitat. In addition, in Phase 2 (Chapter 9) an objective will be to resolve unknown-quality habitat through use of no resource categories and more detailed evaluation of areas within the Santa Rosa Plain.

Environmental Organizations

California Native Plant Society, Betty Guggolz, Cloverdale, CA
June 4, 1995

Chapter 6

Comment: The Aviation Boulevard potential preserve was removed from the administrative draft Plan. This location includes the rare plant Burke's goldfields (*Lasthenia burkei*). This area should be retained in the Plan.

Response: Based on additional information regarding the Land Use criteria of the Aviation Boulevard site. The overall score for the site was below the threshold of 200 points and could not be retained as a high-quality site. However, due to the potential significance of the rare plants on some portion of the site the biological score may have been incorrect.

Therefore, the site was recategorized as unknown-quality habitat which will require a parcel-based evaluation for habitat quality which will occur during Phase 2 of the Plan.

Appendix E

Comment: Updated information on most of the potential preserves is provided within this letter from CNPS.

Response: This information will be further researched and included in the Phase 2 when more background information is gathered and detailed maps are created for potential preserve sites.

Sonoma County Wetlands Watch, Carolyn Dixon, Santa Rosa, CA
June 5, 1995

Chapter 3

Comment: The description on page 3-2 should include better characterization of percent uplands to wetlands. "We have sent data showing the typical pool to uplands balance is 1:4 or 75% uplands (Golden Bear Biostudies 1990 survey of 77 pools on 3 sites)."

Response: There is insufficient data provided by the study cited or from any other study to come to a conclusion about the ratio of area of vernal pools to uplands for the entire Santa Rosa Plain.

Comment: Include precipitation data on page 3-7.

Response: The available precipitation data is too broad to apply to the Santa Rosa Plain.

Comment: Include micro-climate information on page 3-9.

Response: There is too much variation within the microclimates of the Santa Rosa Plain to include a discussion in the Plan.

Comment: Mention cumulative fill and horticultural influences on page 3-22.

Response: Cumulative fill is addressed in 3.8.1 Land Conversion and 3.8.2 Filling of Wetlands. Horticultural influences are specifically referred to in Chapter 3.8.1, "... standard urban landscaping (introduction of seed from horticultural gardens, which greatly reduce or eradicate some endemic populations)."

Chapter 6

Comment: There is disagreement regarding evaluation criteria. Proximity should carry more weight.

Response: The Task Force reviewed and commented on the site evaluation criteria for 3 months during August, September, and October, 1994. Following substantial discussion and changes the Task Force finalized the criteria at the Task Force meeting in October, 1994. Proximity to other vernal pool habitats was evaluated as one of an original 9 *criteria of* biological resources for consideration. However, a consensus that proximity had limited value as a site criterion eliminated it from the set of criteria used. The specific reasoning was that the high degree of fragmentation in the Santa Rosa Plain, and the fact that the four plant species of special concern may not be affected by the fragmentation due to their dispersal by birds and wind, reduced the importance of proximity. However, adjacent land is a criterion under the land use category.

Comment: Two areas need to be identified: preserve areas and areas with restoration potential.

Response: Potential preserve areas have been identified in Figure 6-3 of the Plan and more detailed studies will be included in Phase 2. Potential restoration areas will require more information than was available during Phase 1, particularly regarding site specific soil compatibility of low-quality habitats. Phase 2 will identify potential restoration areas based on additional information and these areas will be mapped.

Business Associations

Economic Development Board, Scot Stegeman, Santa Rosa, CA
June 6, 1995

General

Comment: If a site has a delineation and verification from the Corps, the applicant should be able to mitigate through a pre-set system through the local agencies rather than the Corps.

Response: The purpose of this Plan was to identify a preserve program for high-quality vernal pool habitat while providing a process for more efficiently, in terms of time and money, allowing the development of sites with low-quality habitat. The streamlined regulatory process identified in the Plan does not make it simpler for high-quality sites because landowners will still be required to obtain an Individual Permit from the Corps if they wish to develop or alter wetlands on their land. However, when the General Permit is in place, landowners with low-quality sites will be able to use the streamlined process to receive approval for their land modifications.

Chapter 6

Comment: Under the Plan there is a potential for restrictive requirements on low- and no quality sites based on buffer.

Response: As stated in Chapter 6.4, buffer areas will be included within preserve sites. Property owners of land adjacent to preserves will not be subject to any additional regulations or restrictions as a result of this Plan beyond those which currently exist.

Chapter 8

Comment: Concern about inequitable replacement ratio regardless of site quality.

Response: Table 8-1 of the Plan provides potential mitigation ratios for low-quality habitat with and without Species of Special Concern and/or lacking biological surveys. The mitigation ratios are not finalized. High-quality habitat sites are not included in the table because the ratios that apply to these sites would be determined on an individual basis. The Plan clearly provides a system for determining which wetland are high-quality and which are low-quality, and the mitigation ratios required by federal and state agencies will reflect this.

Sonoma County Realtors Association, Mike Kelly, Santa Rosa, CA
June 6, 1995

General

Comment: What will be required to enable development of mid-range sites?

Response: The purpose of this Plan was to identify a preserve program for high-quality vernal pool habitat while providing a process for more efficiently, in terms of time and money, allowing the development of sites with low-quality habitat. The Task Force determined that a category of medium quality habitat would be too difficult to identify and mitigate for and therefore it has not been included as part the Plan.

Comment: A property owner is responsible for only his own site and not an adjacent site.

Response: As stated in Chapter 6.4, buffer areas will be included within preserve sites. Property owners of land adjacent to preserves will not be subject to any additional regulations as a result of this Plan beyond those which currently exist.

Businesses/Developers/Consultants

Georgia Kelley & Associates, Georgia Kelley, Petaluma, CA
June 5, 1995

General

Comment: The plan does not indicate how long and costly the current regulatory process is.

Response: The length and cost of obtaining permits under the current regulatory process varies on a case-by-case basis and it is difficult to generalize. However, it is true that the proposed streamlined regulatory process will substantially reduce the time and expense for obtaining permits for fills of wetlands in low-quality habitats. One of the handouts distributed at the public meeting (at the end of Appendix A) shows one comparison between the current regulatory process and the proposed regulatory process.

Comment: A Corps verified wetlands delineation is currently good for 3 years, will that change under the proposed regulatory process?

Response: The process and duration for Corps jurisdictional wetlands delineations will not change with proposed regulatory process.

Comment: The Plan states that mitigation banks will carry out the mitigation.

Response: The mitigation banks are one of several alternatives for mitigation under the proposed regulatory process. On-site mitigation is still an option if the regulatory agencies agree that the on-site mitigation fulfills the preservation goals of the Plan and the no-net-loss policies of federal and state agencies.

Phase 2

Comment: It appears that mitigation for filling low-quality wetlands is accomplished by preservation of existing habitat. How is no-net-loss accomplished on a regional basis.

Response: Mitigation, such as through mitigation banks, is proposed to include both preservation of high-quality habitat and development of additional wetlands to account for the no-net-loss issue. Therefore, both preservation and wetland development are involved. Low-quality wetland habitats will be replaced through the mitigation banks that have restoration and enhancement. Creation is defined in the Plan to specifically involve upland areas not suitable for vernal pool development. However, restoration will add additional vernal pool acreage through restoration of former wetland areas and lowland habitats that have suitable soil and hydrological conditions. Through restoration and a concomitant increase in vernal pool wetlands there will be sufficient acreage for wetland fills.

Comment: It appears that an EIR will be required and the cost and time will be considerable prior to implementation.

Response: The local agencies do not believe an EIR would be necessary, but an initial study will be completed. Implementation of Phase 2 is proposed to be completed within 12 months after release of the final Phase 1 Plan (Chapter 9). Implementation will require establishment of at least one preservation and one restoration mitigation bank, identifying the specific boundaries of potential preserve and restoration sites, finding willing landowners, mapping in greater detail the high- and low-quality habitat areas, writing the Corps' general permit, and amending the County and Cities General Plans to accommodate application for the General Permit. Those tasks are perceived by the Task Force as realistically being completed within the 12 months proposed.

Comment: Creation of vernal pools is not acceptable due to uncertainty and cost. If the price of land increases in the future the cost limitation may make creation an option if better methods for creation are developed.

Response: Creation is defined as occurring in upland habitats; lowland, low-quality former vernal pool habitats exist that can be restored without the need for creation. As technologies are developed, new methods can be incorporated if acceptable to the involved agencies.

Comment: The agencies must agree in writing to the proposed regulatory process stating that they will approve the General Permit.

Response: The General Permit will include general and specific conditions that will be based on additional information gathered during Phase 2. Therefore, the agencies cannot agree to the proposed permit without knowing the conditions. However, the agencies that are on the Task Force consider the general permit process viable and have participated in these types of regulatory process previously under different circumstances.

Comment: There appears to be not enough acres of high-quality vernal pools to be preserved and lower-quality vernal pools within the high-quality habitat sites to be restored or enhanced to cover the corresponding mitigation acreage for filling the low-quality vernal pools.

Response: Currently, approximately 40 percent of the land within the study area is of unknown resource value. During Phase 2, the unknown areas will be mapped and will be identified as either high-quality, low-quality, or no resource value habitat. How much of the unknown areas are mapped and categorized will depend on available funding.

Comment: The streamlined regulatory process seems to contradict the Memorandum of Agreement (MOA) in terms of identifying preservation, restoration , and/or enhancement as the acceptable forms of mitigation, while the MOA states that "simple purchase of 'preservation' of existing wetlands resources may in only exceptional circumstances be accepted as compensatory mitigation."

Response: Purchase of existing wetlands is just one possible mitigation measure that would be used in conjunction with other methods to meet the MOA's goals. Mitigation may also occur through on-site and off-site restoration and enhancement. Mitigation ratios, acreages, and approaches will be determined in Phase 2.

Comment: Landowners and future developers in receiving areas (for transfer development rights, or TDRs) will need to be protected from future voter initiatives or lawsuits to limit the density of a project.

Response: True. This issue, as well as a host of other issues related to establishing and implementing landowner incentive programs will be evaluated in Phase 2.

Comment: It is likely that assessing impact fees on top of mitigation requirements will make projects economically infeasible. Has this been considered?

Response: Impact fees may replace or fulfill a portion of mitigation requirements, as long as a mechanism is in place to use those fees for preservation, restoration, or enhancement of

wetlands. During Phase 2, an economic analysis of the incentives, fees, and mitigation banking costs will be conducted.

Comment: Under the Plan, will the calculation for the amount of fill be based on the destruction of habitat or the acreage of vernal pools only?

Response: The mitigation acreage requirements will be determined during Phase 2.

Comment: Would landowners' failure to comply with mitigation plans restrict the rights of other landowners, specifically in relation to the Habitat Transaction Method and the "safety net" concept?

Response: As part of Phase 2, the Habitat Transaction Method and the safety net concept will be further evaluated and any limitations or restrictions in terms of implementation will be identified and reviewed by the Task Force.

Comment: What happens to the Plan if landowners with high-quality habitat adjacent to city boundaries do not want to preserve their sites or participate in a mitigation bank?

Response: Participation in the Plan is completely voluntary. No landowner with high- or low-quality habitat will be obligated to participate in the preservation or mitigation strategies outlined in the Plan. Landowners with high-quality habitat who wish to develop their land can pursue such endeavors using the current regulatory framework by applying to the Corps for a Clean Water Act Section 404 individual permit.

Comment: Although currently the creation of vernal pools is not acceptable for mitigation due to the uncertainty of success, how will the Plan address the possibility that in the future, a cost-effective successful creation approach could be developed?

Response: New wetlands management, restoration, and creation approaches will be reviewed by Federal and state regulatory agencies. If approved, there is no reason why such strategies or methods could not be used in the Santa Rosa Plain.

Comment: If a landowner has different types of wetlands, including vernal pools and must go through the existing regulatory process, can he/she purchase credits in one of the vernal pool mitigation banks? And, if the preserve has a combination of wetlands, can the landowner purchase credits for the other wetlands as well?

Response: The landowner can purchase credits in the vernal pool mitigation banks if the mitigation is for vernal pools. Additionally, if the preserve has a combination of wetlands, the landowner can purchase credits for the other wetlands if the mitigation bank includes non-vernal pool wetlands.

Comment: How is the requirement for Section 106 (cultural resources) clearance affected?

Response: Section 106 requirements will be addressed when the General Permit is developed.

Comment: Can a landowner do both on-site and off-site mitigation to meet the mitigation requirements?

Response: During Phase 2, the mitigation options will be further evaluated, including the possibility of combining mitigation activities to meet mitigation requirements.

Comment: If a landowner must purchase land which includes the species being destroyed or degraded and the species cannot be introduced for mitigation purposes, what happens if there is not enough land with the species to purchase?

Response: During Phase 2, the high quality sites will be evaluated further, including an examination of whether sufficient land will be available for the species of if other mitigation measures must by considered.

Comment: Have any economic studies been completed to see if this plan is economically feasible for landowners?

Response: No. However, economic analyses are proposed for Phase 2.

Northpoint Management Company, Inc., Woodrow C. Ersted, San Carlos, CA
June 7, 1995

Chapter 2

Comment: Objective 2.3 of Chapter 2 (Goals and Objectives) that development of proposed preserve systems include areas where development can proceed where no mitigation is required. We would like this implication to be removed or that it be acknowledged that the proposed preserve systems will not include any land other than that which contains jurisdictional wetland features or endangered plant or animal species.

Response: The intent of objective 2.3 is to recognize that the preservation "program" (although we used the word "system") will include (1) areas suitable for preservation, enhancement, or restoration (i.e., high-quality habitat sites and some low-quality habitat sites); (2) areas were impacts to wetlands are minimal and can be off-set by mitigation (i.e., low-quality habitat sites); and (3) areas with no resource value and can be developed or altered with no mitigation.

Chapter 6

Comment: The Plan (Figure 6-2 and 6-3) identifies an area that contains a significant amount of acreage of concrete and asphalt associated with the Auxiliary Air Station and areas not identified in a Corps of Engineers wetlands delineation. This area should be removed as potential high-quality habitat and potential preserve.

Response: The Phase I final Plan has been amended to reflect the existence of the Airfield runway and based on the existing land use maps (Figure 5-1) the areas have be changed in

Figures 6-2 and 6-3. Phase 2 will utilize the detailed mapping information provided by the commentator to more accurately identify the high- and low-quality habitats in the Southwest Santa Rosa area.

Appendix E

Comment: "Since the proposed SSR [Southwest Santa Rosa Preserve] contains several properties, it is difficult to determine if certain portions of pages E-14 and E-15 are accurate." Specific examples are cited regarding confusing or incomplete data.

Response: Additional data will be gathered during Phase 2 which will allow parcel specific information to be obtained. Reference to this issue was added to the "Note to the Reader of Appendix E" on page E-10. The specific examples and data provided will be considered in Phase 2.

Wesco, Brad Olson, San Rafael, CA
June 6, 1995

Chapter 4

Comment: Add "burrowing owl" and California badger" to the list of listed or other sensitive plant and animal species noted in the third paragraph on page 4-1.

Response: The species specified in this paragraph are only those currently listed as federal or state endangered plant or animal species. Plant and animal Species of Special Concern, which include the burrowing owl and the American badger, are identified in Subsection 3.6.2.

Chapter 8

Comment: The Plan needs to be more action-oriented and propose a timely process for regulatory implementation.

Response: Chapter 8 presents the streamlined regulatory process for sites identified as having low-quality habitat. Under the General Permit which will be developed during Phase 2, landowners with low-quality habitat sites will be able to proceed quickly through the streamlined process and receive approval for proceeding with the development or alterations they have planned for their land. Landowners who wish to quicken the process even more so will be able to forgo conducting a second year of (confirmation) biological studies if they are willing to assume that species of special of concern are present and willing to mitigate to the higher ratio. At the back of Appendix A is graphic of the current and proposed regulatory process. This was distributed at the public meeting. Landowners with high-quality habitat and wanting to develop or alter it (in ways that affect their wetlands) would still have to apply for an Individual or Nationwide Permit.

Appendix E

Comment: Put the weighted score after each evaluation criteria for each potential preserve site in Appendix E.

Response: The weighted scores for each criterion are provided in Table E-1 and summarized on page E-9 and in Table 6-2. When more detailed narratives are developed during Phase 2, the scores may be included within the narratives.

Comment: Additional information is provided regarding the Shiloh Road East site.

Response: The data provided will be considered in Phase 2.

Phase 2

Comment: There is no detailed map showing the precise boundaries of the vernal pool preserve sites.

Response: Detailed maps will be developed during Phase 2, as noted in the Executive Summary, Chapter 6.2.2.4, Chapter 9.1, and on page E-10 of the draft and final plans.

Comment: Additional baseline is needed for identification of preserve sites. WESCO has performed surveys within the Santa Rosa Plain and "much of this is available for your review at our offices."

Response: Additional data will be collected during Phase 2, as described in the Executive Summary, Chapter 6.2.2.4, Chapter 9.1, and on page E-10 of the draft and final plans. You will be contacted during Phase 2 regarding the information you have available.

Mitchell & Heryford, Jane W. Marx, Santa Rosa, CA
May 19, 1995

Comment: Property owners who have gone through the existing process with the Corps should not be required to provide a preservation area.

Response: Participation in the Plan is entirely voluntary. Property owners who are in the process of obtaining permits or have already obtained permits are not required to provide additional mitigation. In addition, property owners have the choice in the future to participate in the Plan or apply for permits through the existing process.

Response to Comments from the May 10, 1995 Public Meeting

The following is a summary of the comments and responses stated at the May 10, 1995 public meeting on the Draft Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. Unless otherwise noted, comments are from members of the public whose names were not recorded. Comments of similar nature have been grouped together for brevity. The individual(s) who responded to the comments is noted in parentheses. Additional explanation not provided at the public meeting has been added and is in **bold** type. The numbers indicated after each response specify the page (p) and line (l) where the comments and responses can be found in the formal public meeting transcript.

The formal transcript from the public meeting is available for review at the City of Santa Rosa Department of Community Development (100 Santa Rosa Avenue, Santa Rosa), the Sonoma County Central Library - Reference Desk (3rd and E Streets, Santa Rosa), and the Sonoma County Permit and Resource Management Department (575 Administration Drive, Santa Rosa).

Comment (M. Kerkvliet): Are these low-quality sites suitable for waste water storage ponds, such as another Delta pond, one to three times as big as the current one?

Response (S. Stinebaugh): No, there will not be another Delta Pond in the low-quality areas in the Santa Rosa Plain. [p. 35, l. 24-26; p. 36, l. 1; p. 100, l. 23-26; p. 101,l. 1-19; p. 102, l. 1-8]

Comment: Can a property owner find out from the city or county whether their property is high- or low-quality? If the property has not been evaluated, does the city or county take over and send someone to the property to do the evaluation? If you have, for example, ten or 20 acres of high-quality habitat, what kind of mitigation is necessary? Is the land owner then require to provide the money for mitigation? How much money is required? How is this amount determined, for example, by the average of the property values? How do the mitigation banks work? Can the city or county take you through the process and give you a rating within 90 days?

Response (C. Regalia): This comment includes a couple questions. First, the city or county will look at your property. Detail maps will be kept in the city or county offices. These maps may indicate that your property is either high- or low-quality. If your property is not shown on the maps, its status is unknown and you would have to do the evaluation. You would have to look at the wetlands and make a determination whether or not they are high- or low-quality using the ranking system described in the Plan.

Your other question was, isn't the process of doing a mitigation just another way of getting money? That's exactly what it is. That's probably the biggest change from the current process to the proposed process. Under the current process, if you have a site with wetlands and rare plants, you must either avoid the wetlands and rare plants, not develop your property, or find a site yourself where you can make up for the loss of the wetlands.

"What we are proposing, and it is a new concept, is that people can basically buy their way out of the problem." People can go to a bank, pay a fee, ... and do what's necessary according to the

Plan, rather than having to do all of it on their own. [p. 36, l. 14-22 and 24-26; p. 37, l. 2-9; pp. 7-39]

Response (C. Patterson)

The Plan should be reviewed in comparison to the status quo. For example, if you have a piece of property, and you want to develop it, subdivide it, change the land use, change your farming use, you are already subject to a number of rules and regulations. You are expected to find out whether you have wetlands or rare plants and what the significance of those are. Typically, a landowner will hire a consultant to survey your property. Sometimes you have to do two years of botanical surveys before you can say you don't have rare plants. It is your responsibility to do this base-line work. Then, you have to seek approval from the responsible agencies independently.

The Plan will consolidate a lot of this work. Wetland area, rare plant assessment, and habitat quality can be determined at the same time. If your property contains only low-quality habitat, you need to go only to the city or county rather than the agencies individually. Your cost and associated time is significantly reduced if your property is evaluated as low-quality habitat. If your property is in high-quality habitat, your cost to develop or alter it will be similar to that under the existing process, but you will be provided greater predictability about the cost and time required. In addition, you have the potential to make money by selling an easement to your property and becoming a mitigation bank. This Plan is not adding more bureaucracy or regulation, but rather it provides people with better choices and opportunities to resolve existing problems. [pp. 39-43]

Comment: Who evaluates property as high- or low-quality?

Response (C. Regalia): You can hire a biologist to do the evaluation or consult with one of the agencies. In addition, the maps of the high- and low-quality areas will be created based on existing information and additional information that members of the public are willing to provide. If you think it is to your advantage to share information with the preparers of the Plan, then you should. If you don't think it's to your advantage or you don't plan to make changes to you land, then it's not necessary to provide information.

Other comments regarding property rights appear on pp. 55, 56, 57, 59-62, 78-80 (J. LaMantia, J. King, S. Denner, and L. Cardnelli). The response below addresses all of these comments unless otherwise noted. [p. 37, l. 24; p. 44, l. 22-26; p. 45, l. 1-26;, p. 47, l. 1-12]

Comment: Why are land owners not compensated under this Plan for their land, when vernal pools are an asset which benefits everyone? For example, the Corps is required to pay land owners for construction of a project, such as a road or dam, which benefits the whole and is located on their property.

Response (C. Regalia): It is correct that if land is needed by the government for some public purpose and the entire value of the property is taken, the government must compensate the land owner for the value of the property. The courts have determined that this applies only if the government takes all of the value of the property. In the case of this Plan and other regulatory

processes, the courts have found that regulation is not a taking of all of the value, and, therefore, the governmental agency doesn't purchase the property. [pp. 46-47]

The Plan is designed to be wholly voluntary. Landowners who do not wish to participate will follow the existing regulatory process if they want to alter wetlands on their land. Therefore, this Plan does not create any additional burdens for landowners.

Comment: That really wasn't my question, and I think you have tried hard. My question was, did the Task Force discuss and deliberate on the issue of equity? We are preserving something not only for Sonoma County, but for the world. We have something here that is a precious asset.

Response (C. Regalia): No, we did not deliberate on the question of equity. Rather, we looked at existing rules that Congress and the government have passed and worked within those frameworks. [p.47, l. 14-21]

Comment: The government has the right to purchase property and the rights into gratuity for the benefit of the community. Perhaps no one thought enough money could be raised by the government for purchase of the land. So instead, the burden is placed on the property owner.

Response (A. Howald): The Task Force considered options other than having property owners pay for land preservation, and is interested in continuing to pursue other options. Specifically, the Task Force discussed the possibility of agencies purchasing property to become preserves. The California Department of Fish and Game (CDFG) has already established preserves within the Santa Rosa Plain by purchasing property in fee or maintaining conservation easements. The CDFG is interested in purchasing additional properties for preservation, depending on funding. [p. 48, l. 7-14]

Chapter 5.1.3 (Land Ownership) on page 5-7 of the April Draft of the Plan includes acreages of land in public ownership. This includes four parcels totaling 227 acres owned by the CDFG. As stated in Chapter 6.3.2 Preserve System Site Identification and Evaluation on page 6-11, 302 acres of the 4,831 acres identified as potential preserves in the Plan are already preserved or protected under conservation easements, and under management by the CDFG, City of Santa Rosa, the Sonoma County Agricultural Preservation and Open Space District, or various private individual and organization.

Comment: Under the current regulatory program, mitigation for wetland acreage loss is accomplished through creation of an equal number of acres of wetlands, rather then purchase and preservation of an existing acre of wetlands. In the future, a property owner can pay a mitigation bank to do the same - to create an equal amount of wetland acreage for that which is lost rather than purchasing an existing wetland. Is this correct?

Response (N. McCarten): You're correct that currently under the no net loss system, you must create an equal number of acres for those that are filled. Under the system proposed by the Plan, for low-quality habitat, a mitigation bank that does creation and restoration will create an equal acreage for the which is lost and a preservation bank will also purchase an equal acreage. [p. 50, l. 17-26, p.51, l. 1-3]

Comment: Under the Plan, is the ratio for low-quality areas 2:1? For example, for an acre of wetland lost, one acre must be created and one must be preserved. However, under the current system, is the ratio only 1:1, in which one acre is created for one acre lost? (M. Luzaich): If a piece of property has only a few plants that are listed species, would mitigation be required at 3:1 for the entire property or 2:1 on part of it? (G. Kelley): Under the current process, the mitigation ratio is not 1:1 because 50 foot buffers are required, and you have to provide uplands. so, it's much greater than 1:1 currently.

Response (R. Pratt): Currently, the ratio varies from project to project, but the resource agencies oftentimes recommend a higher ratio than 1:1, such as 2:1 or 3:1 or more. The agencies typically recommend higher ratios because it takes time to replace the functions and values of a wetland that is filled. It could take three or four years for a created wetland to replace the functions and values of the wetland that was filled. When you create wetlands you don't always get in your mitigation bank everything you expect you are going to create. "With this proposal we would recommend that minimum replacement of one to one. Therefore, the mitigation ratios for wetland creation and restoration that are currently required are actually higher than those proposed in this Plan.

(C. Patterson): For listed plant species, under the Plan and under the current system, you need to compensate 3:1 for just the habitat in which the plant grows. If you have an acre of wetlands and a tenth of an acre has the rare plants, you are responsible for replacing only that one-tenth at 3:1 and the other nine-tenths at 1:1 or 2:1. Although this Plan suggests a new system for determining ratios, the fact is that the agencies already oftentimes require greater than 1:1, and will continue to in the future. The Plan would allow you to mitigate at the same ratios much more easily by buying the credits at a mitigation bank that is established on cheaper land in a larger area, so that it would essentially come out cheaper than doing the 2:1 or 3:1 on your own. However, you always have the option to not participate in the Plan and follow the existing system of mitigation ratios.

(C. Regalia): Yes, based on what I've been told of what the agencies are requiring, you're correct that currently the ratio is much greater than 1:1. [p.51, l. 15-24, p.52 l. 1-2; p. 91, l. 11-16; p. 93, l. 14-25; p. 95, l. 10-22; p. 99, l. 8-14]

Comment: Under the current and proposed system, do we actually have a net gain of wetlands rather than no net loss? [p. 53, l. 23-24]

Response: The purpose of no net loss is to have no net loss of the functions and values of wetlands, rather than simply no net loss of acreage. The resource agencies oftentimes require that acreages to be replaced are two or more times the acreage lost because wetland creation, and especially that of vernal pool creation, is still a developing field and there are no guarantees that the functions and values will be fully replaced. See also R. Pratt's response to the comment on pp. 51 and 52.

Comment (Mr. King): Are there any private property owners on the Task Force?

Response (C. Regalia; A. Howald): Tux Tuxhorn was appointed to the Task Force because he is a landowner and he was meant to represent landowners. There are four or five people on the Task Force out of about 23 who are representatives of landowners, either individuals or groups.

Congressman Riggs appointed the Task Force members with the idea that they were representative of the stakeholders who deal with the issues covered by the Plan. [p. 56, l. 14-26; also p. 96, l. 11-14]

Comment (Mr. King): $500,000 was put up by the federal government to survey this area and chart it. Only a portion of the area has been charted and in low-quality areas it has to be charted by land owners.

Response (C. Regalia): The unknown areas will require additional mapping to identify the habitat quality. However, low-quality habitat sites have been identified in the Plan. [p.56, l.24-26; p.57, l. 1-2]

The $500,000 is for Phase 1 and Phase 2 of the Plan. So far, only about $200,000 have been spent for Phase 1, and only a portion of this was allocated to identification of habitat quality sites. None of it was allocated to field surveys.

Comment (J. Cobble): Has it been shown that you can create a vernal pool that will be a functioning ecosystem, or is it like trying to create a virgin redwood forest?

Response (C. Patterson): Most biologists would agree that a pristine vernal pool cannot be exactly duplicated. That's why the high-quality areas are proposed for preservation. [p. 57, l. 23-26, p. 58, l. 1-3.]

Comment: The Plan should focus on one large area as a preserve so that people can develop elsewhere. The people voted for the Open Space District to provide this.

Response (C. Regalia): The Plan does focus on preserving as large areas as possible. The Sonoma County Agricultural Preservation and Open Space District has a representative on the Task Force and has been providing input to the Plan. [p. 62, l. 24-26, p. 63, l. 1-20]

Establishment of one single large preserve would not accomplish a primary goal of the Plan. Goal 1 on page 2-1 of the April Draft of the Plan states that the full range of diversity of the Santa Rosa Plain vernal pool ecosystem and associated biological resource should be preserved. To obtain the full range, several potential preserve sites were chosen. For example, certain listed plant species are found only in the northern portions of the Plain, while others are found only in the central and southern portions of the Plain (see Chapter 3, pp. 3-10 through 3-13).

Comment (N. Botwinik): How does one start a mitigation bank? What agency should be contacted?

Response (Patterson): The first mitigation bank in this area should be running in about a month, after two years of coordination with the agencies. This should establish a precedent that others with suitable land can follow. The first step is to identify whether or not the site is suitable for a creation or restoration bank or a preservation bank. The agencies to contact would be the U.S. Army Corps of Engineers, the California Department of Fish and Game, or perhaps, the Task Force.

(Regalia): The Task Force will be addressing the issue of setting up mitigation banks during Phase 2 and would be willing to assist anyone in this process. [p. 64, l. 2-6; p. 65, l. 14-15]

Comment: I have a marginal wetland, about 36 square feet and two inches deep with "nothing in it", but now I understand that I will have to replace this wetland at a ratio of 2:1 or 3:1. I don't understand why this ratio is necessary. A copy of the information regarding the site was provided to the City of Santa Rosa.

Response (C. Regalia): I will send a copy of this information to our consultants to review it. [p. 66, l. 12-26, p. 67, l. 1-6; 14-16]

Comment (B. Pisenti): Vernal pools are "mosquito pools" and should be filled because they are a health hazard. [pp. 68-72]

Response: As noted by Niall McCarten at the beginning of the public meeting, a representative from the Mosquito Abatement District informed him that natural vernal pools do not support ensephalitis or pest mosquitoes. However, degraded wetlands with longer ponding periods than natural vernal pools and high organic content do provide breeding habitat for mosquitoes (see p. 17 of the transcript and p. 3-23 of the April Draft).

Comment (D. Sohl): Will the general permit come into place after Phase 2 of the Plan? What is the time frame for Phase 2 and the cost of the study?

Response (C. Regalia): Yes, the general permit will follow completion of Phase 2. The cost of the Phase 2 study is about $200,000, about the same as has been spent on Phase 1. The time frame is probably a year to 18 months or sooner, if possible. [p. 72]

Comment: The Plan implies that the entire Plain will be divided into low-quality and high-quality sites. Are there any areas with "no quality"; where there are no vernal pool resources at all, and, therefore, no need to follow any of the regulatory process?

Response (N. McCarten): Currently, areas with no wetlands are grouped under the low-quality category. Much of the unknown areas may also contain no wetlands. (Patterson): Area with no wetlands will not require permits or mitigation. In addition, if you can demonstrate that an area which meets the definition of a wetland, but does have any of the functions or values of a wetland, mitigation is not necessary. However, proving that may be difficult. **CHECK THIS?** (Patterson and McCarten): The Plan is designed to improve the current regulatory process. No new layer of regulation for areas with degraded wetlands has been added. [pp. 72-73]

Comment (R. Rocchia): How is the value of land determined per acre? How is a fair price determined? (T. Guggiana): I own a piece of property, and I'm not sure if I want to be a buyer or a seller. Who establishes the price? (member of the public): Is there a range that has been developed on a per acre cost before preservation and creation? (M. Luzaich): I've heard the cost of mitigation land will be ten to $20,000 per tenth of an acre. Can the city or county buy a large parcel so the people who have to mitigate can get it at a decent price?

Response (C. Regalia): We haven't determined prices in this Plan, and I don' know how compensation has been determined by others in the past. My experience with this is that the

market establishes what the price is. (N. McCarten) The issues of cost and maintenance will be looked at in depth in Phase 2. (C. Regalia) I've never heard a price as high as ten to $20,000 per acre for mitigation land. (C. Patterson) The market will determine the price. Part of the goal of the Plan is to set aside large pieces of property where the land is less expensive. Mitigation on small parcels that has been occurring within the city boundaries does not make sense. The prices are going to vary and people are going to be willing to pay different amounts. [p. 75, l. 18-26; p. 76, l. 1-3; p. 76, l. 8-13; p. 80, l. 10-14; p.87, l. 16-19, p. 89, l. 5-20, 24-26; p.90, l. 1-3, 7-8, 12-13, 19-21]

Comment (L. Cardnelli): Is land devalued after an initial landowner receives compensation for mitigation? Can you receive property tax relief on the land? Has anyone spoken with the assessor about this?

Response (C. Wilcox): Jim Olstead, who was the previous county representative on the Task Force, the assessor, and the local legislators discussed ways to encourage preservation and provide property tax relief for a commitment to protect vernal pools. (C. Regalia) Sounds like a question that needs to be answered a little further. [p. 76, l. 19-26]

Comment (L. Cardnelli): Once land is set aside for vernal pool preservation, can the land still be grazed or can crops be grown on it, or will all the value be taken away? [p. 77, l. 25-26; p. 78 l. 1-20]

Response: Certain uses will be allowed on preserve land. For example, grazing intensity and timing determines whether or not grazing is compatible with vernal pool preservation (for more information see Chapter 6-4 on pp. 6-11 and 6-14 of the April Draft of the Plan).

Comment (J. Coble): Has a mitigation bank ever been established and was it effective? In addition, is there any provision to ensure that the mitigation bank remain financially viable for as many years as required for vernal pools to become established?

Response (C. Patterson): Successful mitigation banks have been set up. When a mitigation bank is established, an entity is selected to be responsible for the long-term management of the bank. For example, the Sonoma County Agricultural Preservation and Open Space District could provide this function on the Santa Rosa Plain. Part of the setup costs include an endowment, such that when the monitoring of created or restored pools is completed at the end of five years or so, the responsible agency determines whether or not the pools meet their success criteria and whether they need any remediation in attaining the functions for which they are designed. Natural vernal pools do not require maintenance. Therefore, the goal of mitigation is to establish pools which do not require maintenance in the long-term. The endowment fund provides for certain types of maintenance, such as repair of fences and garbage removal. [p. 80, l. 23-25]

Comment (G. Kelley): Can landowners continue to mitigate on-site under the Plan? If you mitigate on-site, is it correct that you do not have to buy into a mitigation bank?

Response (C. Regalia): Yes, landowners may mitigate on-site under the Plan. Additional options are included in the Plan because it is oftentimes difficult for landowners to mitigate on-

site. Landowners who mitigate on-site do not have to buy into a mitigation bank. [p. 83, l. 8-13; l. 15, 25-26]

Comment (S. Bliss): The Plan should state that wetland restoration and creation is not a sure science and there are ample examples of failed mitigation restoration and creation projects. A report from the National Academy of Sciences stated that scientists do not know enough about wetlands ecologically to make ranking of high- and low-quality sites reliable. Again, the Plan should express some caution about using these rankings. [pp. 84-86]

Response: The Plan states in Chapter 8.4.4 Creation on pages 8-8 and 8-9 that creation of vernal pools and swales is controversial due to the complexity of these resources and that attempts to do this have had mixed success.

Comment (S. Bliss): How will preserve sites be protected and restrictions enforced?

Response (C. Patterson): Enforcement can be a problem, but the large contiguous areas of preserves proposed in the Plan would be easier to police than the small scattered individual preserve sites that are being created under the existing system. [p.84, l. 6 to p. p.87, l. 10]

Comment: Who will certify the banks that would be created for monitoring the habitat? Would that be the bank manager?

Response (N. McCarten): Issues of ratios, cost per acre, and management will be studied in detail during Phase 2. [p. 87, l. 11-15]

Comment (B. Rains): Would the higher quality sites, especially those with rare plants, be preserved or at least have easements on them? Would the people who have to mitigate be able help pay for the mitigation bank?

Response (C. Regalia): Yes, a focus of the Plan is to preserve the high-quality wetlands and let development or agriculture occur on the low-quality sites. [p. 88, l. 10-19]

Comment (B. Montini): Why should vernal pools in the Santa Rosa Plain be preserved? Are there any concrete examples of some benefits they provide, such as habitat for a plant that will cure a rare disease? [p. 96, l. 15-25]

Response: N. McCarten addressed the question of why are the Santa Rosa Plain vernal pool ecosystems important at the beginning of the public meeting (pp. 16-17). The significance of the vernal pool ecosystem and the reasons for preserving plant and animal species of concern are discussed on pages 3-7 through 3-9 of the Plan.

Comment (D. Crockett): Has the City provided the City Council and the Planning Commission with copies of the Plan so the annexations that are proposed in the southwest will be consistent with the Plan?

Response (C. Regalia): All of the agencies that have a role to play in this for the City of Santa Rosa, including the Planning Commission, the Board of Utilities, and the City Council were given copies of the first Draft Plan, and they will be given copies of this

Draft. However, they won't implement it until is adopted by a general permit. [p. 98, l. 17-24]

Comment (R. Rains): Is it true that if you develop a piece of land, whether it's ten acres or 1,000 acres, without going through the wetland regulatory process as long as you don't touch the vernal pools on the land.

Response (C. Regalia): Yes, that's true. [p. 103] The development must avoid impacts to the vernal pools completely. For example, the sediment from adjacent work areas cannot wash into the vernal pools.