VII. APPENDICES

APPENDIX A. LIST OF SCIENTIFIC AND COMMON NAMES OF PLANTS AND ANIMALS

Common name	Scientific name
adobe popcorn flower	*Plagiobothrys acanthocarpus*
Ahart's dwarf rush	*Juncus leiospermus* var. *ahartii*
Ahart's rush	*Juncus leiospermus* var. *ahartii*
alkali bulrush	*Scirpus maritimus*
alkali heath	*Frankenia salina*
alkali mallow	*Malvella leprosa* (= *Sida hederacea*)
alkali milk-vetch	*Astragalus tener* var. *tener*
alkali weed	*Cressa truxillensis*
awnless Orcutt grass	*Tuctoria greenei*
Baker's navarretia	*Navarretia leucocephala* ssp. *bakeri*
ball saltbush	*Atriplex fruticulosa*
bearded allocarya	*Plagiobothrys hystriculus*
bearded popcorn flower	*Plagiobothrys hystriculus*
bellflower family	Campanulaceae
bindweed	*Convolvulus arvensis*
black oak	*Quercus kelloggii*
blunt spikerush	*Eleocharis obtusa*
bog bulrush	*Scirpus mucronatus*
Boggs Lake dodder	*Cuscuta howelliana*
Boggs Lake hedge-hyssop	*Gratiola heterosepala*
borage family	Boraginaceae
bractless hedge-hyssop	*Gratiola ebracteata*
brass buttons	*Cotula coronopifolia*
broad-leaved pepper-weed	*Lepidium latifolium*
brome	*Bromus* spp.
Burke's goldfields	*Lasthenia burkei*
Butte County meadowfoam	*Limnanthes floccosa* ssp. *californica*
buttercup family	Ranunculaceae
California buckeye	*Aesculus californica*
California goldfields	*Lasthenia californica*
California lilac	*Ceanothus* species
California Orcutt grass	*Orcuttia californica*
California semaphore grass	*Pleuropogon californicus*
carrot family	Apiaceae (= Umbelliferae)
cattail	*Typha* species
chamise	*Adenostoma fasciculatum*
Chico grass	*Tuctoria greenei*
Clara Hunt's milk-vetch	*Astragalus clarianus*
coastal dunes milk-vetch	*Astragalus tener* var. *titi*
cocklebur	*Xanthium strumarium*
Colusa grass	*Neostapfia colusana*
common American hedge-hyssop	*Gratiola neglecta*
common coyote-thistle	*Eryngium castrense*
common mousetail	*Myosurus minimus*
common spikeweed	*Hemizonia pungens*
Constance's coyote-thistle	*Eryngium constancei*
Contra Costa goldfields	*Lasthenia conjugens*
coyote-thistle	*Eryngium* species
Crampton's Orcutt grass	*Tuctoria mucronata*
Crampton's tuctoria	*Tuctoria mucronata*

Common name	Scientific name
dense-flowered owl's-clover	*Castilleja densiflora*
Douglas fir	*Pseudotsuga menziesii*
Douglas' meadowfoam	*Limnanthes douglasii*
Douglas' pogogyne	*Pogogyne douglasii*
downingia	*Downingia* species
dwarf downingia	*Downingia pusilla*
dwarf peppergrass	*Lepidium latipes* var. *latipes*
dwarf woolly-heads	*Psilocarphus brevissimus*
false mermaid family	Limnanthaceae
Ferris's milk-vetch	*Astragalus tener* var. *ferrisiae*
few-flowered navarretia	*Navarretia leucocephala* ssp. *pauciflora*
field bindweed	*Convolvulus arvensis*
field owl's-clover	*Castilleja campestris* ssp. *campestris*
figwort family	Scrophulariaceae
filaree	*Erodium* species
fleshy owl's-clover	*Castilleja campestris* ssp. *succulenta*
foxtail	*Alopecurus saccatus*
foxtail mousetail	*Myosurus minimus* ssp. *alopecuroides*
frankenia	*Frankenia salina*
Fremont's goldfields	*Lasthenia fremontii*
Fremont's tidy-tips	*Layia fremontii*
fringed downingia	*Downingia concolor*
Gairdner's yampah	*Perideridia gairdneri* ssp. *gairdneri*
goldfields	*Lasthenia* species
goosefoot family	Chenopodiaceae
grass family	Poaceae
Great Valley gumplant	*Grindelia camporum*
Greene's legenere	*Legenere limosa*
Greene's Orcutt grass	*Tuctoria greenei*
Greene's orcuttia	*Tuctoria greenei*
Greene's popcorn flower	*Plagiobothrys greenei*
Greene's tuctoria	*Tuctoria greenei*
hairy checker-mallow	*Sidalcea hirsuta*
hairy Orcutt grass	*Orcuttia pilosa*
hairy orcuttia	*Orcuttia pilosa*
hard-stemmed tule	*Scirpus acutus* var. *occidentalis*
Hoover's spurge	*Chamaesyce hooveri*
Howell's quillwort	*Isoetes howelli*
hyssop-leaved bassia	*Bassia hyssopifolia*
inch-high dwarf rush	*Juncus uncialis*
Italian ryegrass	*Lolium multiflorum*
Jepson's button-celery	*Eryngium aristulatum*
Jepson's milk-vetch	*Astragalus rattanii* var. *jepsonianus*
juniper	*Juniperus* species
Kaweah brodiaea	*Brodiaea insignis*
Lake County stonecrop	*Parvisedum leiocarpum*
leafy common madia	*Madia elegans* ssp. *densifolia*
legenere	*Legenere limosa*
Lemmon's canary grass	*Phalaris lemmonii*
lippia	*Phyla nodiflora* (= *Lippia nodiflora*)
little mousetail	*Myosurus minimus* ssp. *apus*
Loch Lomond button-celery	*Eryngium constancei*
Loch Lomond coyote-thistle	*Eryngium constancei*
madrone	*Arbutus menziesii*
mannagrass	*Glyceria* species
many-flowered navarretia	*Navarretia leucocephala* ssp. *plieantha*

Common name	Scientific name
manzanita	*Arctostaphylos* species
mayweed	*Anthemis cotula*
meadowfoam family	Limnanthaceae
meadowfoams	*Limnanthes* species
Mediterranean barley	*Hordeum marinum* ssp. *gussoneanum*
medusahead	*Taeniatherum caput-medusae*
moss	class Musci
Mt. Hamilton stonecrop	*Parvisedum pentandrum*
mucronate tuctoria	*Tuctoria mucronata*
navarretias	*Navarretia* species
oak	*Quercus* species
Oregon oak	*Quercus garryana*
Oregon woolly-heads	*Psilocarphus oregonus*
Orcutt grasses	*Orcuttia* species
Otay Mesa mint	*Pogogyne nudiuscula*
owl's-clover	*Castilleja* species or *Triphysaria* species
pale spikerush	*Eleocharis macrostachya*
Parish's brittlescale	*Atriplex parishii*
pea family	Fabaceae
pennyroyal	*Mentha pulegium*
persistent-fruited saltscale	*Atriplex persistens*
phlox family	Polemoniaceae
pilose Orcutt grass	*Orcuttia pilosa*
pincushion navarretia	*Navarretia myersii* ssp. *myersii*
pink meadowfoam	*Limnanthes douglasii* ssp. *rosea*
plantain	*Plantago* species
pointed rush	*Juncus oxymeris*
ponderosa pine	*Pinus ponderosa*
popcorn flower	*Plagiobothrys* species
prostrate navarretia	*Navarretia prostrata*
pygmy stonecrop	*Crassula connata* (= *Tillaea erecta*)
Red Bluff dwarf rush	*Juncus leiospermus* var. *leiospermus*
rough-fruited popcorn flower	*Plagiobothrys trachycarpus*
rush family	Juncaceae
rushes	*Juncus* species
Russian thistle	*Salsola tragus*
ryegrass	*Lolium* species
Sacramento Orcutt grass	*Orcuttia viscida*
Sacramento orcuttia	*Orcuttia viscida*
Sacramento Valley milk-vetch	*Astragalus tener* var. *ferrisiae*
saltgrass	*Distichlis spicata*
San Diego button-celery	*Eryngium aristulatum* var. *parishii*
San Diego mesa mint	*Pogogyne abramsii*
San Joaquin Orcutt grass	*Orcuttia inaequalis*
San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*
San Joaquin Valley orcuttia	*Orcuttia inaequalis*
semaphore grass	*Pleuropogon* species
sessile mousetail	*Myosurus sessilis*
Shippee meadowfoam	*Limnanthes floccosa* ssp. *californica*
silver sagebrush	*Artemisia cana*
slender Orcutt grass	*Orcuttia tenuis*
slender orcuttia	*Orcuttia tenuis*
slender popcorn flower	*Plagiobothrys tener*
slender rattle-weed	*Astragalus tener* var. *tener*
small pincushion navarretia	*Navarretia myersii* ssp. *deminuta*
smooth goldfields	*Lasthenia glaberrima*

Common name	Scientific name
snapdragon family	Scrophulariaceae
Solano grass	*Tuctoria mucronata*
Sonoma sunshine	*Blennosperma bakeri*
spikerush	*Eleocharis* species
spiny-sepaled button-celery	*Eryngium spinosepalum*
spreading navarretia	*Navarretia fossalis*
spurge family	Euphorbiaceae
sticky Orcutt grass	*Orcuttia viscida*
stonecrop family	Crassulaceae
Stony Creek spurge	*Chamaesyce ocellata* ssp. *rattanii*
succulent owl's-clover	*Castilleja campestris* ssp. *succulenta*
swamp grass	*Crypsis schoenoides*
sweet clover	*Melilotus indica*
thistle	*Cirsium* species
thread-like mousetail	*Myosurus minimus* ssp. *filiformis*
three-colored monkey flower	*Mimulus tricolor*
thyme-leaved spurge	*Chamaesyce serpyllifolia*
toad rush	*Juncus bufonius*
turkey mullein	*Eremocarpus setigerus*
two-horned downingia	*Downingia bicornuta*
valley downingia	*Downingia pulchella*
valley oak	*Quercus lobata*
Vasey's coyote-thistle	*Eryngium vaseyi*
vernal pool layia	*Layia chrysanthemoides*
vernal pool popcorn flower	*Plagiobothrys stipitatus* (= *Allocarya stipitata*)
vernal pool saltbush	*Atriplex persistens*
vernal pool smallscale	*Atriplex persistens*
vinegar weed	*Trichostema lanceolatum*
water shamrock	*Marsilea vestita*
whiteflower navarretia	*Navarretia leucocephala*
white meadowfoam	*Limnanthes alba*
white tumbleweed	*Amaranthus albus*
wild barley	*Hordeum* species
winecup clarkia	*Clarkia purpurea*
woolly meadowfoam	*Limnanthes floccosa* ssp. *floccosa*
yampah	*Perideridia* species
yellow carpet	*Blennosperma nanum*
yellow pine	*Pinus ponderosa*
yellow star-thistle	*Centaurea solstitialis*
yerba golondrina	*Chamaesyce ocellata* ssp. *ocellata*
ANIMALS	
alkali fairy shrimp	*Branchinecta mackini*
backswimmers	order Hemiptera; family Notonectidae
bee flies	order Diptera; family Bombyliidae
bees	order Hymenoptera, superfamily Apoidea
beetles	order Coleoptera
black-tailed deer	*Odocoileus hemionus*
Blennosperma-specialist bee	*Andrena blennospermatis*
bullfrog	*Rana catesbeiana*
burrowing bee	*Andrena* and *Panurginus* species
burrowing owl	*Athene cunicularia*
butterflies	order Lepidoptera
California fairy shrimp	*Linderiella*
California ground squirrel	*Spermophilus beecheyi*

Common name	Scientific name
California tiger salamander	*Ambystoma californiense*
cliff swallow	*Petrochelidon pyrrhonata*
Colorado fairy shrimp	*Branchinecta coloradensis*
Conservancy fairy shrimp	*Branchinecta conservatio*
crab spiders	order Araneae; family Thomisidae
crane flies	order Diptera; family Tipulidae
cryptic tadpole shrimp	*Lepidurus cryptis*
delta green ground beetle	*Elaphrus viridis*
dragonflies and damselflies	order Odonata
elk	*Cervus elaphus*
flies	order Diptera
golden-haired dung fly	*Scatophaga stercoraria*
ground squirrel	*Spermophilus* species
honeybee	*Apis mellifera*
horned lark	*Eremophila alpestris*
lesser nighthawk	*Chordeiles acutipennis*
Limnanthes-specialist bees	*Andrena limnanthis* and *Panurginus occidentalis*
longhorn fairy shrimp	*Branchinecta longiantenna*
mayflies	order Ephemeroptera
midges	order Diptera; family Chironomidae
midvalley fairy shrimp	*Branchinecta mesovallensis*
mosquitoes	order Diptera; family Culicidae
moths	order Lepidoptera
pocket gopher	*Thomomys* species
pronghorn	*Antilocapra americana*
saldid bugs	order Hemiptera; family Saldidae
solitary bees	order Hymenoptera; family Andrenidae
springtails	order Collembola
true bugs	order Hemiptera
tule elk	*Cervus elaphus nannoides*
vernal pool fairy shrimp	*Branchinecta lynchi*
vernal pool tadpole shrimp	*Lepidurus packardi*
wasps	order Hymenoptera
water boatmen	order Hemiptera; family Corixidae
waterfowl	family Anatidae
water striders	order Hemiptera; family Gerridae
western spadefoot toad	*Spea hammondii*

APPENDIX B. GLOSSARY OF TECHNICAL TERMS

Term	Definition
achene	a dry, single-seeded *fruit* that does not split open; the fruit wall is thinner than that of a *nutlet*
adaptive management	a long-term repeated process of gradually modifying management techniques based upon the results of modeling and research
allele	a form of a gene
alluvial fan	the fan-shaped area of sediment deposited where a mountain stream first enters a valley or plain
alluvium	sediment deposited by flowing water
anaerobic	lacking oxygen
annual	a plant that lives less than 1 year; the entire life cycle from seed germination to *seed set* is completed in a single growing season
anther	the pollen-producing portion of a *stamen*
axil	the angle between the base of a leaf and the stem
banner	the outermost petal in flowers of the pea family; it often curves upward away from the other petals
beak	a narrow projection
biennial	a plant that lives for 2 years, flowering only in the second year
bisexual	flowers containing functional male and female reproductive structures
blade	the flattened portion of a leaf
bottleneck	a situation occurring when a population is reduced to only a few individuals, which then reproduce to create a larger population over time; although the population may continue to increase in size, its genetic diversity remains low
bract	a leaf-like structure located in the *inflorescence*
bractlet	a tiny *bract* occurring below an individual flower
breeding system	a plant's strategy for reproduction; examples are outcrossing and inbreeding
calyx	the set of *sepals* in a single flower
capsule	a type of dry *fruit* that splits open at maturity
caryopsis	the *fruit* of a grass; also known as a grain
Category 1 candidate	a species for which sufficient information is on file with the Fish and Wildlife Service to list it as endangered or threatened, but which is awaiting publication of a formal listing proposal
Category 2 candidate	a species for which listing possibly may be appropriate, but for which insufficient information is available to make a determination; this category is no longer used by the Fish and Wildlife Service
compatible use	activities and practices that contribute to population stability
competition	the simultaneous demand by two or more organisms or species for an essential common resource that is actually or potentially in limited supply

Term	Definition
colony	a group of plants separated by a short distance from other groups of the same species, but not far enough apart to qualify as separate *occurrences*
compound leaf	a leaf composed of several to many separate segments (*leaflets*), which share a common *petiole*
conservation easement	a contract or deed restriction that specifies the type of land uses that may occur in the designated area
corolla	the set of petals in a single flower
cyathium	the complex flowering structure found in spurges, which resembles a single flower
decumbent	a stem laying on the ground, with the tip turned upward
deflexed	pointing downward
demographic monitoring	a process for determining population trends and identifying and evaluating the factors responsible for lack of population stability; consists of *trend analysis* and *factor resolution* (see Pavlik 1994)
demography	the study of populations with reference to birth and death rates, size and density, distribution, migration, and other vital statistics
diploid	the number of chromosomes found in the non-reproductive cells of an organism; designated by 2*n*
disk flowers	the tiny, tubular flowers at the center of a flower head in some members of the Asteraceae
distichous	arranged in two opposing rows
ecomorph	A group of individuals of a species that have a unique appearance because of where they live, rather than due to genetic differences.
element occurrence	the unique number assigned to an *occurrence* by the California Natural Diversity Data Base
elytra	first pair of wings which, in beetles, are hardened and act as a protective covering
endemic	restricted to a particular area
enhancement	manipulating a species or its habitat to increase population size above current levels or improve habitat conditions; one example is adding seed to an existing population
entire	not divided (referring to a leaf margin or flower part)
entomologists	people who study insects
enzyme system	a group of related proteins; analysis of these proteins provides clues as to the genetic relatedness of individuals because the genetic code for each protein is carried on a different gene
extant	still in existence
extirpated	eliminated from a particular area
extrinsic	due to external factors; for example, habitat loss due to urban development is an extrinsic threat
exudate	aromatic, sticky fluid
factor resolution	identifying and evaluating the factors responsible for lack of population stability

Term	Definition
fecundity	the number of offspring produced by an animal or the number of seeds produced by a plant
filament	the stalk that supports an *anther*
final rule	the document published in the Federal Register in which a species is officially designated as threatened or endangered
floret	a single flower of a grass plant, including the *stamens*, *pistil*, *lemma* and *palea*
frequency	the proportion of samples in which a given species occurs
fruit	the plant structure that bears seeds; may be fleshy or dry
genera	plural of genus
generalist (pollinator)	an animal, usually an insect, that pollinates flowers of a wide variety of plant species from many families
germination	sprouting (of a seed)
glume	the scale-like structures at the base of a grass *spikelet*
grain	the *fruit* of a grass; also known as a *caryopsis*
hemiparasite	a plant that obtains water and nutrients from the roots of other plants but manufactures its own food through photosynthesis
herbivore	an animal (invertebrate or vertebrate) that eats plants
host	the source of water and nutrients for a *hemiparasite*
hydrology	patterns of water movement
in litt.	abbreviation for the Latin phrase *in litteris*, meaning "in a letter"; also applies to unpublished references, such as internal agency reports
incompatible uses	activities or practices that contribute to the decline of a population
indeterminate	growth pattern in which the stem continues elongating as long as the plant is alive
inflorescence	the entire flowering structure of a plant, often consisting of many separate flowers, their associated *bracts*, and the *rachis*
intergrades	plants intermediate in *morphology* between two recognized *taxa*
intrinsic	not due to external factors; for example, low levels of genetic diversity within a species is an intrinsic threat
introduce/introduction	to seed or transplant into a site that is not known to have been occupied by a particular species but is within a vernal pool region, pool type, and set of ecological conditions from which the species was known to occur
juvenile leaves	the cylindrical leaves of Orcuttieae that form underwater
keel	the innermost, boat-shaped pair of fused petals in flowers of the pea family
lacustrine	originating in lakes
leaflet	one of the distinct segments of a *compound leaf*

Term	Definition
lemma	a scale-like structure that encloses the *palea*, *stamens*, and *pistil* in a grass flower
ligule	the flattened, strap-shaped portion of the *corolla* in *ray flowers* of the aster family; also the appendage commonly found at the junction of the *sheath* and *blade* in grasses
lips	two or more groups of fused petals that occur within a single *corolla* but differ in appearance
List 1B	plants considered by the California Native Plant Society to be "rare, threatened, or endangered in California and elsewhere" (California Native Plant Society 2001)
lobes	free tips of fused plant parts that are partially fused, such as petals, *sepals*, or leaf tissue
male-sterile	flowers that lack functional anthers
marginal	a population believed to be too small for long-term persistence without *enhancement*
median	in a set of data, the value for which half of the observations are smaller and half are greater
metapopulation	separate colonies that function as a single population by exchanging of genetic material at least once a year
microhabitat	localized areas with unique conditions due to small-scale variations in physical features of the landscape
mitigation	actions undertaken to compensate for impacts to endangered species populations or wetlands
mitigation bank	an area important for conservation in which developers of unrelated projects may buy a share to compensate for their impacts to a similar suite of endangered species or wetlands that will be destroyed due to project development in another area
molecular taxonomy	studying similarities among *taxa* by comparing proteins, DNA, and other molecules
morphology	external form and structure
node	the point where a leaf or branch attaches to the stem
nomenclature	a system of naming rules in the biological sciences, thus plant species are named according to the rules of botanical nomenclature
nutlet	one of several small, dry, single-seeded *fruits* with a hard covering that are produced within a single flower; nutlets have thicker walls than do *achenes*
obsidian	volcanic glass
occurrence	an occupied area at least 0.4 kilometers (¼ mile) away from the next occupied area; see also *element occurrence, population*
order	a taxonomic rank below class and above family
order of magnitude	a factor of 10; for example 1,000 is three orders of magnitude greater than 1
outcrossing	fertilization of an ovary by pollen from a different plant

Term	Definition
oviposition	egg-laying
palea	a papery scale that encloses the stamens and *pistil* in a grass flower
pappus	the hair-like or scale-like structures attached to an *achene*, which assist in dispersal (e.g., the tufts visible on dandelions gone to seed)
perennial	a plant that lives for many years
petiole	leaf stalk
phenology	the timing of various stages in the life cycle of a plant
phyllary	one of the *bracts* below the flower head in members of the Asteraceae
pilose	covered with long, soft hairs
pinnately compound	divided into distinct segments, which are arranged feather-like on either side of a *rachis* (see also *compound leaf*)
pinnately lobed	a leaf that has projections (*lobes*) arranged in a feather-like pattern but is not completely divided into distinct segments
pistil	the female reproductive structure of a flower
pistillate	a flower containing only female reproductive parts
pith	the tissue at the core of a plant stem
population	a group of individuals of the same species that occupy an area small enough to permit interbreeding regularly (herein used interchangeably with *occurrence* or to represent a group of individuals that is not included in the California Natural Diversity Data Base)
pubescent	covered with short hairs
pupation	a nonmobile stage in which larvae transform to adults
race	a group of plant populations that share distinct genetic or morphological traits
rachis	the central stalk of an *inflorescence* or *compound leaf*
ray flowers	tiny flowers with flattened, fused petals that occur near the margin of a flower head in some members of the aster family (e.g., the “petals” of a common daisy)
reintroduce/reintroduction	to seed or transplant a species into a specific site from which it has been extirpated
root graft	a connection between the water-conducting tissues in root systems of two plants
rosette	a cluster of leaves near the ground
scape	a leafless flowering stem
seasonal wetlands	areas that hold or carry water for only a portion of the year; herein refers to *vernal pools* and *swales*
section 6	the section of the Federal Endangered Species Act through that allows for states to receive Federal funding for programs to conserve listed species

Term	Definition
seed bank	stored seeds; may be dormant seeds in the soil (see *soil seed bank*) or those stored in a facility for conservation purposes
seed set	production of mature seeds
self-compatible	capable of setting seed when pollen reaches *pistils* on the same plant
self-incompatible	requiring fertilization by pollen from a different plant in order to set seed
sepal	one of several leaf-like structures beneath the petals of a flower
sheath	the narrow, tubular portion of a grass leaf that surrounds the stem
sites necessary for conservation	specific sites necessary to prevent the extinction of species that are not formally listed as endangered or threatened; equivalent to *important habitat* for listed species
soil seed bank	viable seeds that remain dormant in the soil
solitary	a structure or organism that occurs individually, rather than in groups or clusters (e.g., solitary flowers, solitary bees)
specialist pollinator	an animal (usually an insect) that pollinates only flowers of a single genus or species
spikelet	in grasses, the structure consisting of one or more *florets*, the tiny stems that connect the florets, and the *glumes*
spur	a tubular projection from a sepal or petal
stable	remaining at the current level; (for *annual* plants, this takes into account not only above-ground plants but also seeds present in the soil; see Pavlik 1994, p. 329)
stamen	the male reproductive structure of a flower, consisting of an *anther* and a *filament*
status survey	identifying all historical localities of a species, predicting additional likely sites where the species may occur, visiting all of the historical and likely sites, and evaluating population size and threats at those sites
stigma	the part of the *pistil* that receives pollen
stocking rate	the number of livestock per acre
stomates	pores in the surface of a leaf that facilitate gas exchange
stratification	exposure to cold, submersion, or other treatment that is necessary for certain seeds to germinate
swale	a shallow drainage that carries water seasonally; differs from a vernal pool in that it has an outlet
tarsus	terminal leg segments
taxa	plural of *taxon*
taxon	a term used to denote a taxonomic entity of any rank; often used to refer to an assorted group consisting of species, subspecies, and varieties
terrace	a flat-topped soil formation bordering a river or stream

Term	Definition
terrestrial	growing on dry land as opposed to water
terrestrial leaves	the flat-bladed leaves of Orcuttieae that develop after water has evaporated from the pools (as opposed to *juvenile leaves*)
thatch	a matted layer of dead vegetation on the soil surface
translocation	moving a species from one site to another; may involve *enhancement, introduction,* or *reintroduction*
trend analysis	the process of determining whether a population is increasing, declining, or remaining stable
tribe	a taxonomic rank below family and above genus
tube	the fused portion of a *calyx* or *corolla*
tubercle	a wart-like projection
tuffaceous	porous, such as rock formed from cemented volcanic ash
type locality	the site from which the *type specimen* was collected
type specimen	the individual, preserved plant or animal that the original author designated to represent a new species
vernal pool	a depression that retains water seasonally due to a shallow, impermeable soil layer beneath the surface and the absence of a drainage outlet
viscid	sticky
wings	the pair of petals inside the *banner* of a flower in the pea family; these petals are very narrow at their bases
> is the symbol for 'greater than'; < is the symbol for 'less than'	

APPENDIX C. RECOVERY PRIORITY AND FEDERAL REGISTER NOTICE REFERENCE AND DATES

Species Name	Recovery Priority[1]	Federal Register Notice, Date Listed
Castilleja campestris ssp. *succulenta* (Fleshy owl's clover)	9	62:14338-14352, March 26, 1997
Chamaesyce hooveri (Hoover's spurge)	2c	62:14338-14352, March 26, 1997
Eryngium constancei (Loch Lomond button-celery)	14	51:45904-45907, December 23, 1986
Lasthenia conjugens (Contra Costa goldfields)	5c	62:34029-34038, June 18, 1997
Limnanthes floccosa ssp. *californica* (Butte County meadowfoam)	2c	57:24192-24199, June 8, 1992
Navarretia leucocephala ssp. *pauciflora* (few-flowered navarettia)	3	62:34029-34038, June 18, 1997
Navarretia leucocephala ssp. *plieantha* (many-flowered navarettia)	3	62:34029-34038, June 18, 1997
Neostapfia colusana (Colusa grass)	2c	62:14338-14352, March 26, 1997
Orcuttia inaequalis (San Joaquin Valley Orcutt grass)	8	62:14338-14352, March 26, 1997
Orcuttia pilosa (hairy Orcutt grass)	2c	62:14338-14352, March 26, 1997
Orcuttia tenuis (slender Orcutt grass)	8	62:14338-14352, March 26, 1997
Orcuttia viscida (Sacramento Orcutt grass)	5c	62:14338-14352, March 26, 1997
Parvisedum leiocarpum (Lake County stonecrop)	2c	62:34029-34038, June 18, 1997
Tuctoria greenei (Greene's tuctoria)	2c	62:14338-14352, March 26, 1997
Tuctoria mucronata (Solano grass)	2	43:44810-44812, September 28, 1978
Conservancy fairy shrimp (*Branchinecta conservatio*)	8	59(180):48136-48152, September 19, 1994
Longhorn fairy shrimp (*Branchinecta longiantenna*)	8	59(180):48136-48152, September 19, 1994
Vernal pool fairy shrimp (*Branchinecta lynchi*)	2c	59(180):48136-48152, September 19, 1994
Delta green ground beetle (*Elaphrus viridis*)	8	45:52807-52810, August 8, 1980
Vernal pool tadpole shrimp (*Lepidurus packardi*)	2c	59(180):48136-48152, September 19, 1994

[1] Appendix D describes how we determine recovery priority for each species.

APPENDIX D. PRIORITIES FOR RECOVERY OF THREATENED AND ENDANGERED SPECIES

Degree of Threat	Recovery Potential	Taxonomy	Priority	Conflict
High	High	Monotypic Genus	1	1C 1
	High	Species	2	2C 2
	High	Subspecies	3	3C 3
	Low	Monotypic Genus	4	4C 4
	Low	Species	5	5C 5
	Low	Subspecies	6	6C 6
Moderate	High	Monotypic Genus	7	7C 7
	High	Species	8	8C 8
	High	Subspecies	9	9C 9
	Low	Monotypic Genus	10	10C 10
	Low	Species	11	11C 11
	Low	Subspecies	12	12C 12
Low	High	Monotypic Genus	13	13C 13
	High	Species	14	14C 14
	High	Subspecies	15	15C 15
	Low	Monotypic Genus	16	16C 16
	Low	Species	17	17C 17
	Low	Subspecies	18	18C 18

APPENDIX E. POTENTIAL CONTAMINANTS ASSOCIATED WITH WESTERN SPADEFOOT TOAD HABITAT

The chemicals of greatest concern for which data on amphibians, fish, or their food supply could be found are:

acephate
azinphos-methyl
carbaryl
chlorpyrifos
diazinon
dicofol
disulfoton
endosulfan
esfenvalerate
fenamiphos
glyphosate
malathion
mancozeb
methamidophos
methoprene
naled
paraquat
permethrin
phosmet
polycyclic aromatic hydrocarbons
pyrethrins
rotenone
strychnine
triclopyr
trifluralin

Glossary of Terminology and Units for Contaminants

LC50-lethal concentration to 50 percent of test organisms
mg/kg-milligrams per kilogram
mg/L-milligrams per liter
ng/L-nanograms per liter
:g/L-micrograms per liter
PAH-Polycyclic Aromatic Hydrocarbons

APPENDIX F. CONSERVATION TOOLS AND STRATEGIES

Rights and Interests in Land that Can be Acquired

Right or Interest	Explanation	Advantages	Disadvantages
Fee simple ownership	Full title to land and all rights associated with land.	Owner has full control of land. Allows for permanent protection and public access.	Most costly. Ownership responsibility includes liability and maintenance.
Conservation easement / development rights (Access to monitor species populations should be added to conservation easement)	A partial interest in property transferred to an appropriate nonprofit or governmental entity either by gift or purchase. As ownership changes, the land remains subject to the easement restrictions.	Less expensive than fee simple. Landowner retains ownership and property is taxed at a lower rate. Easement may allow for some development. Potential income and estate tax benefits from donation.	Public access may not be guaranteed. Easement must be enforced. Restricted use may lower resale value. If the easement has a "sunset" then permanent protection is not guaranteed.
Fee simple / leaseback	Purchase of full title and leaseback to previous owner or other lessee. May impose land use restrictions.	Allows for comprehensive preservation program of land banking. Income through leaseback. Liability and management responsibilities assigned to lessee.	Public access is not guaranteed. Land must be appropriate for leaseback (e.g., agricultural).
Lease	Short or long-term rental of land.	Low cost for use of land. Landowner receives income and retains control of property.	Does not provide equity and affords only limited control of property. Temporary.
Undivided Interest	Ownership is split between different owners, with each fractional interest extending over the whole parcel. Each owner has equal rights to entire property.	Prevents one owner from acting without the consent of the others.	Several landowners can complicate property management issues, especially payment of taxes, future sale, land uses, and access.
Deed Restriction	Voluntary or imposed restriction on land use placed on title by landowner.	Can prevent impacts to or protect habitat and/or open space values as long as landowner retains the restriction.	Is easily removed from property title by property owner without government. knowledge. Does not guarantee even short-term protection.

Ways that Title Can Be Acquired

Technique	Explanation	Advantages	Disadvantages
Fair market value sale*	Land is sold at its highest and best use value.	Highest income (cash inflow) to seller.	Most expensive. Greatest capital gains.
Bargain Sale*	Part donation/part sale - property is sold at less than fair market value.*	Tax benefits to seller since difference between fair market value and sale price is considered a charitable contribution. Smaller capital gains tax.	Seller must be willing to sell at less than fair market value.
Charitable Gift	A donation by landowner of all interest in property.*	Allows for permanent protection without direct public expenditure. Tax benefits to seller since property's fair market value is considered a charitable contribution.	Seller must be willing to donate.
Bequest	Landowner retains ownership until death.*	Management responsibility usually deferred until donor's death.	Date of acquisition is uncertain. Donor does not benefit from income tax deductions. Landowner can change will, will may contain land use conditions unfavorable to open space/ habitat use.
Donation with reserved life estate	Landowner donates during lifetime but has lifetime use.	Landowner retains use but receives tax benefits from donation.	Date of acquisition is uncertain.
Land exchange	Exchange of developable high habitat/open space land for land with equal development potential but less habitat/open space value.	Low-cost technique if trade parcel is donated. Reduces capital gains tax for original owner of protected land.	Properties must be of comparable value. Complicated and time consuming.
Eminent domain (government)	The constitutional police power of government to take private property for public purpose upon payment of just compensation.	Provides government with a tool to acquire desired properties if other acquisition techniques are not workable.	Can be expensive. Can have negative political consequences. Can result in expensive and time consuming litigation.
Tax foreclosure (government)	Government acquires land by tax payment default.	Limited expenditure. If land is not appropriate for public open space, it can be sold or exchanged.	Competitive sealed bidding risk.
Purchase of a Deed of Trust (1st)	Government acquires land by defaulted loan (private institution) payment and subsequent foreclosure.	Land can be acquired at a distressed sale price.	Can be complicated and result in conflict with local Tax Collector/Assessor
Agency transfer (government)	Certain government agencies may have surplus property inappropriate for their needs that could be transferred to a parks agency for park use.	Limited expenditure.	Time consuming with possible conflicts with local government.

Technique	Explanation	Advantages	Disadvantages
Restricted auction (nonprofit)	Government restricts the future use of property to open space, then sells.	Property sold to highest bidder but restriction lowers price and competition.	It may be difficult for a nonprofit to convince government that a restriction will serve to benefit the general public. Can be expensive.

* There are different ways of financing, i.e.: cash, mortgaged, owner financed, lease/option, etc. with some means having greater tax benefits than others for the seller and some means more easily financed by government than others. Conservation easements also can be acquired by these means.

Management and Ownership Options Following Purchase by Nonprofit Organization

Technique	Explanation	Advantages	Disadvantages
Conveyance to public agency	Nonprofit organiza-tion acquires and holds land until public agency is able to purchase.	A nonprofit organization can enter the real estate market more easily than government, and can often facilitate a sale when the government agency would be unable.	Must have a public agency willing and able to buy within a reasonable time frame. Private fund raising can be difficult.
Conveyance to another nonprofit organization	Nonprofit organization acquires and holds land until another nonprofit organization has been established or is able to finance acquisition.	Allows immediate acquisition even though acquiring group cannot or is not willing to hold property.	Requires existence or establishment of ultimate land holder that has solid support, funding and the ability to manage land.
Management by nonprofit organization	Nonprofit organization retains ownership and assumes management responsibilities.	Ownership remains within the community; local citizens can provide responsible care and management.	Land must fit criteria of acquiring organization. Organization must assume long-term management responsibilities and costs.
Saleback or leaseback	Nonprofit organization purchases property, limits future development through restrictive easements or covenants, and resells or leases back part or all of property. May involve subdivision of property.	Acquisition is financed by resale or leaseback. Resale at less than fair market value (because of restrictions) makes land affordable for buyer. Sale can finance preservation of part of site.	Complex negotiations. A leaseback means the nonprofit organization retains responsibility for the land.

Financing Options for Government

Financing Option	Explanation	Advantages	Disadvantages
General fund appropriation	Appropriation from primary government funds.	Avoids interest and debt service cost.	Budget allocations unpredictable. Might not provide sufficient funds, and competes with other programs.
Bond act	Borrowing money through insurance of bonds. Usually approved through local or statewide referendum.	Distributes cost of acquisition. Does not impact general funds.	Requires approval of general public. Can be expensive - interest charges are tacked on to cost of project.
Land and Water Conservation Fund	Federal funds provided to local governments on a 50/50 matching basis for acquisition and development of land for public use.	Cost of acquisition for local government is lowered by subsidy.	Federal release of these funds is uncertain and has been extremely limited to date. Competition is extreme.
State grant/low interest loans	States provide matching grants or low interest loans for municipalities to acquire open space.	Encourages localities to preserve open space by leveraging local funds. Donated lands may be used as a match.	Localities must compete for limited funds and be able to match state funds.
Real estate transfer tax	Acquisition funds obtained from a tax on property transfers. Percentage and amount exempted varies with locality.	Growth creates a substantial fund for open space acquisition. Enables local communities to generate their own funds for open space protection.	Places greater burden on new residents than on existing residents. Can inflate real estate values. Effective only in growth situations.
Land gains tax	Capital gains tax on sale or exchange of undeveloped land held for a short period of time. Tax rate varies depending on holding period.	Discourages speculative development. Has a regulatory and revenue impact.	Can inflate real estate values and slow market.
Payment in lieu of dedication	Local government requires developers to pay an impact fee to a municipal trust fund for open space acquisition.	New construction pays for its impact on open space.	Acquisition funds depend on development. May be lack of accountability for funds. Legality of method depends on relationship of open space to new development.
Special assessment district	Special tax district for area benefitted by a public benefit project.	Users finance acquisition and management.	Increases taxes. Timely and costly to implement. Requires 2/3 voter approval in California.
Tax return check off	On state income tax forms, a filer may appropriate a small amount of taxes owed toward revenues for natural lands acquisitions.	Convenient and successful means of generating funds.	Vulnerable to competition from other worthwhile programs.

Financing Option	Explanation	Advantages	Disadvantages
Other funds/taxes	Taxes on cigarettes, sales, gasoline, and natural resource exploitation; revenue from fees and licenses for boat, off-road vehicle, and snowmobile use, park entry, hunting, etc.	Income from fees and licenses pays for resources.	Revenues from taxes can be diverted for other uses unless dedicated to open space. Fees create pressures for money to be spent on special interest uses.
Sale or transfer of tax default property	Sale of tax default property can provide a fund for open space acquisition. Also, if site meets criteria, it can be transferred to appropriate agency for park use.	Funds for acquisition are acquired with little cost to taxpayers.	Need to assure that sale proceeds are specially allocated to open space acquisition. Might not provide a significant income. Very political process.

Financing Options for NonProfit Organizations

Financing Option	Explanation	Advantages	Disadvantages
Loan from institutional or private lender	Conventional loan from bank or savings and loan or private source, such as a foundation or corporation.	Less time-consuming process than fund raising.	Long-term financial commitment for nonprofit organization. Higher interest costs than owner financing. Mortgage lien.
Installment sale	Buyer pays for property over time.	If seller financed, can lower taxes for seller. Buyer can negotiate better sale terms (lower interest rates).	Long-term financial commitment for nonprofit organization. Mortgage lien.
Fundraising	No- or low-interest loans are acquired through program related investments from foundations, nonstandard investments from corporations, or charitable creditors (community members).	Community fundraising creates publicity and support.	A long, uncertain, and time consuming process.
Revolving fund/loans or grants	A public or private organization makes grants to localities or nonprofit organizations for land acquisition based on a project's revenue generating potential.	Encourage projects with revenue generating potential.	Projects with low revenue- generating potential have lower priority.
Partial development/ saleback or lease	Nonprofit organization purchases property, limits future development through restrictive covenants, and resells or leases back part or all of property.	Acquisition is financed by resale or leaseback. Sale can finance preservation of part of site.	Complex negoti-ations. If leaseback, nonprofit organi-zation retains responsibility for land. Finding buyer for restricted pro-perty may be difficult, and land value will be low-ered by restrictions.

Government Financial Incentives for Conservation

Incentive	Explanation	Advantages	Disadvantages
Preferential assessment	Under state laws, agricultural and forest districts can be established to assess land as farmland or forestland rather than at its highest and best use.	Promotes resource conservation and management. Especially benefits landowners in areas with development pressure. Tax base loss can be partially reclaimed through penalty tax on landowners who terminate enrollment.	Voluntary participation. Does not provide long-term protection. Minimum acreage for entry. Strength of program depends on penalty from withdrawals. Local government bears burden of reduced tax base.
Purchase of development rights	Local or state government purchases development rights to maintain land in farm use.	Landowner can derive income from selling development rights and continue to own land. Lower property value should reduce property taxes.	Can be costly, particularly in a community with high real estate values.
Land conservation grants	State programs pay or otherwise enable landowners to preserve land, enhance wildlife, and provide public access.	Landowners derive revenues from preserving land without selling interests in land.	Provision of public expenditures.

Safe Harbors Agreements

Incentive	Explanation	Advantages	Disadvantages
Create incentives by removing restrictions under section 9 of Endangered Species Act. Allows "take" of listed species beyond baseline conditions (i.e., those lands or animals protected at time of signing of agreement).	Private landowners and non-Federal property owners encouraged to restore, enhance and maintain habitats for listed species in return for assurances that additional land-use restrictions as a result of voluntary conservation actions will not be imposed.	Could garner non-Federal landowner's support for species conservation on non-Federal lands. By reducing fear of future additional property use restrictions under Endangered Species Act, landowners may enhance their lands for listed species. Could reduce habitat fragmentation and increase population numbers of listed species.	Could adversely affect populations by serving as biological sink for species attracted to enhanced habitat, only to have habitat later lost to development. May not be adequate incentives other than public relations value, and may not offer value over traditional Habitat Conservation Plans. Opportunities may be few in states with strong coastal protection regulations.

Regulatory Techniques - Growth Control

Technique	Explanation	Advantages	Disadvantages
Phased growth	Permits a limited amount of growth each year.	Effective as a comprehensive planning strategy.	There must be an equitable system to approve development. Future development pressures difficult to predict.
Moratorium	Legal postponement or delay of land development.	Useful as an interim measure during the formulation of a master development plan.	Provides only a temporary solution and can create a rush on land development prior to taking effect.
Transfer of development rights	An owner of publicly-designated land can sell development rights to other landowners whose property can support increased density.	Cost of preservation absorbed by property owner who purchases development rights.	Difficult to implement. Preservation and receiving areas must be identified.

Regulatory Techniques - Zoning and Subdivision Provisions

Technique	Explanation	Advantages	Disadvantages
Large lot zoning	Large minimum lot sizes restrict the density of the development.	An established land use control used as part of a comprehensive plan.	Since zoning is subject to change, not effective for permanent preservation. Can increase real estate values and infrastructure costs can foster urban sprawl.
Performance zoning	A zone is defined by a list of permitted impacts (based on natural resource data and design guide-lines) as opposed to permitted uses.	Directs development to appropriate places based on a compre-hensive, environ-mentally-based plan. Can be implemented through cluster development.	Difficulties in implementation since environmental impacts can be hard to measure and criteria are hard to establish. Plan can be expensive to prepare.
Carrying capacity zoning	Based on the ability of an area to accommodate growth and development within the limits defined by existing infrastructure and natural resource capabilities. Often called Current Planning Capacity.	Zoning is based on an area's physical capacity to accommodate devel-opment. Can be implemented through cluster development.	Requires a comprehensive environmental inventory for implementation. Determining carrying capacity can be a difficult process, subject to differing opinions, quality-of-life assumptions, and changing technologies.
Cluster Zoning/planned unit development (PUD)	Maintains regular zoning's ratio of housing units to acreage but permits clustered development through undersized lots, thus allowing for open space preservation. A PUD provision allows clustering for a large, mixed-used development.	Flexibility in siting allows preservation of open space areas within development site. Can reduce construction and infrastructure costs.	Open space often preserved in small separate pieces, not necessarily linked to a comprehensive open space system. May increase processing time for development approval. Lack of infrastructure can inhibit technique.
Preservation overlay zoning	At discretion of municipality, overlay zones with development restrictions can be established to protect agricultural and natural areas, scenic views, and historic neighbor-hoods.	Special zones have regulations specific to the needs of a unique area and may be subject to mandatory clustering, performance standards, special permits, and site plan and architectural review.	Language in special district ordinance must be specific enough to avoid varying interpretations.

Technique	Explanation	Advantages	Disadvantages
Exaction	As a condition of obtaining subdivision approval, local government requires developers to pay a fee or dedicate land to a municipal trust fund for open space. Also, states can require open space set-asides as part of environmental review.	New construction pays for its impact on open space.	Acquisition funds dependent on residential development. Commercial development often not subject to exaction fees. Difficult to calculate developer's fair share of costs. New case law restrictions.
Conservation density subdivisions	Permit developers an option of building roads to less expensive specifi-cations in exchange for permanent restrictions in number of units built. Roads can be public or private.	Increases open space and reduces traffic. Discourages higher densities to pay for the higher cost of road building.	Requires enforcement of easements. Private roads limit public access and require homeowner association maintenance.

Regulatory Technique - Conservation/Mitigation Banks

Technique	Explanation	Advantages	Disadvantages
Conservation/ mitigation banks	Wildlife habitat areas are restored and permanently protected by selling credits to offset development impacts elsewhere.	Could advance regional habitat conservation by allowing mitigation credits at sites recognized to be high priority for regional conservation in exchange for areas of minimal habitat value.	If not carefully considered and development projects are not consistent with all Federal and state laws, could facilitate habitat loss. Environmentally controversial.

APPENDIX G. INFORMATION AND EDUCATION MATERIALS

TABLE OF CONTENTS

INTRODUCTION

Public awareness of the plight of California's vernal pool ecosystems is a significant component of its recovery. Increased awareness can lead to greater acceptance and compliance with management measures. Increased awareness may also inspire advocates and volunteers to assist with monitoring and habitat restoration. This Information and Education Plan describes current interpretation activities along with actions and ideas for future work. Key messages, target audiences, strategies, costs, and volunteer management are among some of the elements addressed.

This plan provides direction for an expanded and continuing effort to reach all those who have a stake in the recovery of vernal pool ecosystems. At the broadest level, this effort extends to the public-at-large as concern for endangered species increases. Attention will also be focused upon groups and individuals who have a particular interest in vernal pool recovery.

Activities and demographics vary greatly throughout communities containing vernal pool habitat. Therefore, this plan has been written as a programmatic document; to be used for overall guidance and to generate ideas for regional plans. Ideally, interpretive strategies should be written for specific locations or land ownerships. At a minimum, individualized plans should be developed for the vernal pool regions described in this draft recovery plan.

While several of the described actions may already be in motion, it is recommended that the remaining actions be initiated as soon as possible. These actions are an integral part of recovery, and funding for implementation must be supported accordingly. Although budget constraints may prevent development of a complete program, some recommended actions can still be pursued even where budgets are limited.

The Draft Vernal Pool Ecosystem Recovery Plan calls for the development and implementation of public information and education programs. This Information and Education Plan provides guidance regarding the information and education activities described therein. Specific activities outlined in the recovery plan include: (1) development of a participation plan and submission to the recovery implementation team for review; (2) development of a participation and outreach programs for private landowners; (3) establishment of a mechanism (*e.g.*, funding, *etc.*) to initiate an effective participation and outreach program for private landowners; (4) compilation and review of existing outreach material targeted for private landowners; (5) if necessary, revision of existing outreach materials, or development of new outreach materials for private landowners; (6) distribution of outreach materials to private landowners through existing outreach mechanisms (*i.e.* newsletters, the Internet,

annual meetings of organizations, public meetings); (7) identification of private landowners interested in pursuing recovery and conservation efforts on their lands and prioritization of a list of potential participants; (8) work with private landowners to develop Safe Harbor Agreements, Candidate Conservation Agreements, Memoranda of Understanding, habitat conservation banks, or other appropriate tools for conserving listed species or species of concern on their lands; (9) development of specialized programs to facilitate cooperation and information dispersal/exchange to target audiences (*e.g.*, California Farm Bureau, California Cattlemen's Association, University of California Cooperative Extension, Resource Conservation Districts, County and City Planners, California Builders Association, professional societies, *etc.*); (10) development and implementation of cooperative programs and partnerships with Federal, State, and local agencies to ensure they utilize their authorities to the fullest extent possible to promote the recovery of listed species and the long-term conservation of the species of concern addressed in this draft recovery plan.

PLAN GOALS

The primary goal of this Information and Education Plan is:

- To enhance compliance with management efforts to protect and enhance vernal pool species and their habitat.

Secondary goals are:

- To stimulate public interest, understanding, and support of research and management actions which in turn will increase compliance levels.

- To provide land managers, private landowners, and recreational interest groups with guidance to implement a vernal pool recovery program.

- To stimulate public concern and understanding of unique vernal pool ecosystems that support numerous and diverse species, including special status species.

- To develop internal and external support necessary for funding vernal pool management programs.

These goals will be accomplished through the information and education program described in subsequent sections.

EFFECTIVE OUTREACH TOOLS

Partnerships

Partnerships can include working groups and cost share programs. Cooperation between resource and land management agencies, researchers, interest groups, and private individuals increase effectiveness of outreach efforts and bring more resources - both expertise and money - to the table.

Multi-Disciplinary Outreach

Effective management of vernal pool habitat requires cooperation between different and often divergent interests working together using a positive, unified approach. Vernal pool habitat management needs to incorporate input from biologists, land managers, interpretation specialists, and various interest and user groups to reach recovery goals.

Dedicated Conservationists

The exceptional commitment of professional and volunteer conservationists has been, and should continue to be, an important factor in vernal pool ecosystem recovery.

Communications Techniques

The key to increased public understanding and awareness is using a variety of communication techniques and methods of distribution, including a variety of techniques such as videos, brochures, posters, on-site programs, slide presentations, and news releases.

OUTREACH NEEDS

Targeted Audiences

Key audiences and their primary interests should be determined for specific program objectives. Different groups of people will view vernal pool habitat management in different ways. The ranges of vernal pool species includes a large geographic area that incorporates both small towns and large cities with diverse political views, economic bases, ethnic and socioeconomic groups, literacy levels, environmental values, attitudes about government regulations, etc. Communications intended for different groups and geographic areas need to be designed to address their different perspectives.

Information

Little information is available on how the various target audiences feel about vernal pool habitat management. Experiences of agency personnel indicate that public sentiment varies considerably. An increased understanding will help managers design effective interpretive signs and programs.

Decreased Use of Jargon
Many communications products to date contain a large amount of technical jargon. This not only fails to communicate with readers or viewers, but may even make them antagonistic.

Increased Personalized Communication
The most effective communications, particularly with those directly impacted, are those delivered via a "one-on-one" approach . Although many outreach strategies such as brochures and videos are cost effective and reach wide audiences, they may not sufficiently capture attention or promote understanding.

Improved Internal Communications
Many people within resource management agencies are not getting information about the vernal pool program and the role they can or should play. Improved dissemination of information and coordination between all levels of staff is needed.

Coordination
When agencies, groups, and individuals work independently, work is not done in an efficient, cost effective, or cohesive manner. Working as a team can alleviate inconsistent messages and prevent redundancy in work.

KEY MESSAGES

Different audiences have different questions, concerns, and values that need to be addressed to effectively meet the goals of this plan. Knowing the audience(s) will enable the design of a practical outreach strategy and product specifically tailored to their issues. The following key messages address some of the most frequently asked questions. Although many of the following key messages apply to all target audiences, several may be site- or zone-specific. Individual plans should choose key messages appropriate to their audience(s). Sentences within parentheses reflect considerations to tailor messages to individual plans or outreach materials.

Primary Message

Vernal pool ecosystem recovery can be achieved with minimal disruption of landowner interests through cooperation in the voluntary Vernal Pool Ecosystem Recovery Plan.

Secondary Messages

1. All species, no matter how small or seemingly insignificant, are a critical component of the earth's biodiversity. Maintaining native species diversity is key to sustaining healthy ecosystems capable of adapting to constant change.

2. Vernal pool species and other endangered species are like the miner's canary -- they are a barometer of the health of the ecosystem.

3. The vernal pool ecosystem includes unique and increasingly rare habitats. Several species are found in this system and no other.

4. All wildlife have distinct habitat needs. Specialized species, like vernal pool species, have specific adaptations, and therefore live only in vernal pools.

5. Habitat destruction is the main cause of vernal pool ecosystem decline. Habitat has been lost from urbanization and agricultural conversion, and introduction of nonnative plant species. Loss of vernal pool habitat also affects other plants and animals linked to this unique landform, such as California red-legged frog and California tiger salamander. Managing for vernal pool species requires controlling invasive species and maintaining hydrologic function. Appropriate levels of livestock grazing can play an important role in achieving these management goals

6. Guidelines for using vernal pool habitat in a way that protects species it supports should be specific. Recreationists need to understand that by their very presence, wildlife may be disturbed.

7. Specific sites and types of recreation affect vernal pool species in different ways. Develop key messages targeted to a specific audience explaining how their activity impacts vernal pool species and how modifying their activity can reduce or eliminate these impacts.

8. Your cooperation will help preserve vernal pool ecosystems. You can help by <u>fill in the blank</u>…(e.g., respecting restricted areas; leaving your pets at home or keeping them on a leash; keeping kites, fires and camping sites well away from nesting areas; observing birds at a distance; and keep beaches litter free).

9. Information for off-road vehicle users will focus on off-road vehicle-related impacts, ways to coexist (primarily through land allocation initiatives).

10. Get Involved. Your participation can help lead to vernal pool ecosystem recovery, thus decreasing the need for further restrictions. Contact your state and federal wildlife agencies for further information.

TARGET AUDIENCES

Audiences who have a stake in vernal pool ecosystem conservation and who should be the target of outreach efforts are described below. Each of these target groups influences or has the potential to influence vernal pool management in a significant way. Audiences include those who will be affected by vernal pool management actions.

Regional and site-specific planning teams need to first evaluate audiences particular to their location. Strategies and key messages can then be tailored to these audiences.

Public at Large
In general, this alludes to a national constituency, although on a practical level it primarily includes people who live within the Central Valley. Coordination of recovery efforts for vernal pool ecosystems in California and Oregon may bring attention of vernal pool ecosystem issues to a national audience. However, the activities in this plan are targeted toward the Central Valley.

General Interest Groups
Particular groups which may prove most receptive to information and education efforts include: civic organizations, scouts and other service organizations; environmental education and outdoor learning centers; and conservation groups.

Local Communities
Local communities have a strong and direct interest in local vernal pool recovery efforts. There are often many different voices speaking on behalf of the community, including those focused on the local economy, those concerned with the quality of the environment, and those who support less tangible values such as individual freedom and community self-rule. While these interests can be found among the public-at-large, they are generally felt and expressed much more cogently in the vicinity of the "action." The local community thus comprises not one audience, but a conglomeration of different audiences related by proximity. However, regional or individual outreach programs may want to develop specific messages targeting user groups within a given community or surrounding area.

Schools
School age children may help reach out to other household members with their knowledge and enthusiasm. Provide buttons, posters, pencils, litter bags and other materials.

Public Officials and Land Managers
Through their role as public servants these individuals often represent the myriad interests of the preceding audiences. However, most are required to bring in the added perspective of stewardship responsibilities, including land use decisions. They may also be interested in related issues, such as predator control and habitat restoration.

Private Landowner
The support of these individuals is essential for the successful recovery plan. Many landowners have cooperated by allowing research and management to proceed on their lands. Others need to be educated and supported in maintaining vernal pools on their property. Reaching this audience is extremely critical, but can be a time-consuming process.

Conservation/Environmental Groups
These groups will generally be strong advocates of vernal pool ecosystem recovery. They constitute an audience in their own right, but they can also be a conduit of information and education to more general audiences.

INFORMATION AND EDUCATION GUIDELINES

The following guidelines should be considered in developing regional or site specific information and education. Evaluation is fundamental to the success of all plans. Be sure to incorporate routine assessment.

Biological

- Ensure the biological requirements of vernal pool species, as identified in the recovery plan, are the focus of outreach activities.

- Emphasize the importance of the entire vernal pool ecosystem.

- Incorporate and highlight with current and national issues such as biodiversity, neotropical migrants, human population growth, international conservation, Western Hemisphere Shorebird Reserve Network and Watchable Wildlife.

Logistical

- Incorporate evaluation. Develop questions to assess effectiveness of program and individual materials.

- Use a team approach. Establish a regional working group if one is not in existence. Utilize this combined expertise and additional resources for an effective and coordinated method.

- Communicate consistently to all land management agencies and the public. Education is a process, not a single event. Target audiences, issues, management activities, and vernal pool ecosystem recovery actions are constantly changing.

- Land management agencies should include staff in all outreach efforts.

Specific Tips (Messages)

- Discuss negative aspects, concerns, and failures as well as successes. Be honest with people.

- Reward and acknowledgment of effort is important to consider when developing messages. Be sure to provide the reasoning behind compliance and provide alternatives.

Specific Tips (Methods)

- Communicate alternatives to restrictions imposed by vernal pool ecosystem management.

- Communicate with local people “face to face” to the extent possible.

- Communicate in a way that is understandable to target audiences.

- Incorporate other languages if needed.

- Avoid jargon and don’t put too many messages in one medium.

- Identify your target audience and be sure your methods and messages are targeted for that audience.

- Involve local people in the process of communicating vernal pool ecosystem information. Invite participation in a regional working group.

MATERIALS AND FORUMS

Direct Contact
Land managers have found one-on-one interaction with beach-users to be the most effective and well received of any outreach method. On-site interpreters can provide explanation to sometimes confusing restrictions. They also provide valuable feedback to the program and provide answers to questions from the public.

Brochures
Brochures can furnish basic facts about vernal pool species and habitat and the need for it's protection. They lend themselves to modification for more specific audiences, such as owners of land containing vernal pool habitat.

Brochures are well suited to on-site audiences. Brochures can also be distributed through commercial outlets, incorporated into presentations and interpretive programs, or mailed.

Fact Sheets/Flyers/Trading Cards
One-page fact sheets (or multi-page pamphlets) involve minimal production effort and cost. They consist primarily of typed information in a format that can be easily copied. Along with standard information, fact sheets and flyers can address points of concern for particular audiences and locales. They can also be used as summaries updating vernal pool ecosystem recovery efforts. Fact sheets can be handed out at distribution points that serve user groups, used in meetings, or mailed.

Restaurant Placemats and Table Tents
While waiting for their meal at a restaurant, many people will read materials placed on tabletops. Advertisers take advantage of this vulnerability by placing ads on tri-fold "table-tents" and placemats. Information could be condensed from brochures onto these formats. This forum would be especially useful for tourists and communities near vernal pool ecosystems.

Posters
Attractive posters illustrating vernal pool ecosystems have been developed. Use of these posters in displays is eye-catching. New posters could be developed to complement videos or other materials.

Maps
Colored maps showing vernal pool species and their habitat can be useful in meetings and publications. Large maps that can be reduced could serve both purposes. Maps may be most useful in conjunction with fact sheets and signs.

Curriculum
Curriculum could be developed for different age groups. Supplemental teacher packets and hand-outs could focus on biodiversity using the vernal pool ecosystem as a case study.

Newsletters/Postcards
Newsletters are useful during important decision-making processes, especially those that actively consider public input. A standard newsletter format that can be modified for particular purposes could expedite public information and involvement. Postcards can also be used as a modified version of a newsletter. Planning and conflict mediation processes may benefit from information exchange through newsletters. Recovery status is well-suited to a newsletter format.

Interpretive Exhibits and Portable Displays
An interpretive exhibit can convey a variety of information about vernal pool ecosystem recovery efforts. A standard exhibit could be designed for both indoor and outdoor display. This display could be permanent or portable for use in schools and at conferences and meetings. A more elaborate exhibit could incorporate slide-tape or video displays. Ideally, this type of exhibit could be built into interpretive facilities.

Signs
High-quality interpretive signs explaining seasonal aspects of vernal pool habitat can be used in high traffic areas.

Media Releases
Public notices and news articles informing the public of vernal pool issues, planning efforts, habitat restoration projects, recovery successes, etc. are issued as an ongoing effort. Unofficial stories and features can also be used to solicit interest. The use of press releases in connection with conservation planning will be a significant aspect of recovery efforts in the future.

Radio Messages
Public service messages on commercial and public radio stations could also promote protection of vernal pool habitat and elicit general support for such protection among a variety of general audiences.

Web Sites/CD-ROM
Access to the Internet is an effective means of communication that can reach a variety of audiences at relatively low cost. Updates and other site maintenance require an investment of time. A master web site could be developed and operated by the U.S. Fish and Wildlife Service with links to other agency vernal pool homepages. These local homepages can also be area- and site-specific. A CD-ROM could include portions of a video program, ideally with interactive elements.

Video Programs
Video programs can allow the distribution of accurate information in a popular form. These videos can be used in a variety of settings, including interpretive facilities, public meetings, classrooms, and for television broadcast. Regional- or site-specific videos addressing vernal pool ecosystem needs and variable local audiences which have an interest in vernal pool conservation are recommended.

Slide-Tape Program
In situations where video display terminals are not available, a slide-tape program could be used, both as part of exhibits and during presentations. The slide-tape program could potentially be customized for certain audiences. Slide programs with a script instead of a tape back-up could provide a cheaper alternative.

Speaking Engagements
Articulate and persuasive speakers could be engaged to address various groups, either in conjunction with audio-visual programs or on their own. Presentations to general interest and advocacy groups could introduce a forum for constructive dialogue and education. Participation in Fourth of July festivities or other summer activities could provide outreach opportunities.

Private Meetings
Meetings held during the course of consultations and negotiations regarding habitat protection can provide a forum for education as well as information exchange about vernal pool species and their habitat.

Public Meetings
Public meetings may occur during the course of conservation planning processes, education, and through environmental review. These meetings could be used to air various concerns about land use conflicts and to gather support for habitat protection. Ultimately, strategies to protect vernal pool species and habitat with the least possible impact on other interests may develop from the discussions in these meetings.

STRATEGIES FOR REACHING AUDIENCES

This Information and Education Plan is designed to use two means to disseminate information and gain support. The first strategy is to reach general target audiences through a variety of methods. The second strategy is to reach affected parties through official planning and consultation processes. To this end, actions developed for this plan consider the following:

- A variety of activities will be directed toward stimulating the interest and support of the general public, including specific target audiences, for the vernal pool ecosystem's protection and recovery; and

- Planning, consultation, and negotiation processes will be used to elicit the cooperation of affected parties such as, landowners, growers, ranchers, developers, and managers. Particular emphasis will be placed on public information as a component of the consultation process.

Materials and programs that can effectively increase understanding of vernal pool issues among local communities are an immediate priority. These materials will be developed and distributed by land managers, the U.S. Fish and Wildlife Service, and regional working groups as funds allow. Materials such as annual updates of recovery activities, information packets focusing on vernal pool habitat protection, and teaching packets will be developed for specific audiences.

Distribution of materials and programs will "fan out" from key areas of concern. In addition, major media contacts and visitor centers will be identified for initial contacts. In this way, the vernal pool information and education program will reach both the key target audiences and the broadest possible segment of the general public in as short a time as possible.

As an adjunct effort, a fairly standardized public involvement process will be followed during the course of planning and consultation processes for vernal pool species, in order to expedite education of the involved parties.

Whenever possible, information and education activities for vernal pool habitat will also be used as an opportunity to stimulate public concern for broader or less-prominent endangered species issues. Using "spin-off" techniques to raise awareness of other endangered species issues during vernal pool ecosystem recovery activities could prove beneficial in gathering broad-based support.

ACTIONS

The following actions should be undertaken to achieve the goals of this Information and Education Plan. The list is in general order of priority. For each action, the target audience(s) and a brief description are provided.

INITIAL ACTIVITIES (First year)
In the short term, these activities lay the groundwork for future outreach efforts, or are already underway and need to be completed (varies regionally).

Action 1. Develop regional vernal pool ecosystem information and education working groups.

Audience: Biological resource and land management agencies, conservation/environmental groups, other interested parties.

Description: Establish a working group dedicated to the implementation of an information and education program for each region described in the recovery plan. These groups will coordinate and customize outreach efforts to their local needs. Regional resources will then be combined to accomplish tasks, develop a regional communication strategy, and apply for grant opportunities.

Each working group will coordinate vernal pool outreach efforts by maintaining current information on the programs of other working groups. In review, they will seek to identify areas of overlap; and possibly combine efforts to effectively reach a broader, even national audience. This could prove particularly true for activities such as widely-circulated articles, public service announcements, curriculum, exhibits, and press releases.

To the maximum extent feasible, the working group will draw other agencies and individuals into this effort to inform and educate the public. They will assist any agency or individual involved or interested in vernal pool ecosystem recovery to design a program that draws from or augments strategies in this plan. Especially encouraged is coordination with individuals representing law enforcement, recreation, interpretation, management, and other disciplines.

Action 2. Develop a master mailing/contact list for each region.

Audience: All

Description: Include the following for each region:

- Affected landowners
- Media contacts
- Chambers of Commerce and similar groups
- Local farming and ranching organizations
- Local building development organizations
- Affected businesses
- Special interest groups
- Conservation groups
- Local government elected officials
- Federal, state, county and city land management agencies, planning agencies, and others with land management responsibilities
- Civic groups
- Schools
- Other interested individuals or groups

Initiate development of the mailing list by defining target areas and providing field personnel, refuge managers, outdoor recreation planners, and others with this plan and/or other instructions for compiling their contacts. Consolidate the lists into a sortable, automated data base. Update/expand the list on a continual or periodic basis.

Action 3. Implement a media relations campaign.

Audience: Public at large, landowners, local communities.

Description: Use various opportunities for exposure of vernal pool issues and successful partnerships. Development of many of these action items will also provide a chance for media exposure or assistance in disseminating information to target audiences through television, radio, newspaper, and magazines. News releases on specific stories or a general information package can be developed to generate media interest. Consider public service announcements and paid programming (commercials or ads) if needed.

Action 4. Develop customized materials for key target audiences.

Audience: The highest priorities, in order, are:

- Landowners and managers
- Affected communities
- Agency personnel

Description: Materials will summarize reasons for implementation of management measures and how users can help in vernal pool ecosystem recovery. General flyers could be developed with inserts available for explanations of site specific circumstances (e.g. maps or messages to particular user groups). As funding allows, develop customized fact sheets or pamphlets (using a standard question and answer format), brochures, slide tape programs, and/or videos for special audiences.

Active involvement of these groups in information development will assure responsiveness to questions and concerns about what effect vernal pool ecosystem recovery efforts will have on their pursuits. Solicit ideas from the various user groups about how protection of the vernal pool ecosystem can be achieved while still allowing individuals to pursue their interests. Incorporate feedback in a question/answer or discussion format to address specific concerns of each user group in the most direct way possible.

Develop annual updates regarding the progress made in vernal pool ecosystem recovery and future needs in terms of both research and management. Distribute these to landowners and land management agencies, either during consultation and negotiation procedures or via the mailing list, as appropriate. Use these updates to invite feedback about their current concerns and any support they may want to offer.

Develop customized brochures, flyers, signs, posters, and other materials. Augment this effort with customized presentations and video showings. Post interpretive signs where appropriate.

When appropriate, bring into play the bigger picture of endangered species. Pursue these efforts within environmental education and interpretive settings where it is likely that the vernal pool ecosystem will be one among a variety of topics.

Action 5. Develop customized regional displays.

Audience: All

Description: Develop a standard display that can be exhibited in visitor centers, on kiosks, on portable stands for use in meetings, classrooms, etc. When possible, erect kiosks with the display in high traffic areas. When feasible, incorporate a video display or slide-tape program into the exhibit.

Action 6. Establish coordinated clearinghouse for vernal pool ecosystem outreach materials.

Audience: Agency personnel, local governments, conservation/environmental groups.

Description: Provide repository of existing materials for use as templates or to be copied to prevent "reinventing the wheel." Announce the availability of new materials to interested individuals and agencies identified on the mailing list.

ONGOING OR PERIODIC ACTIVITIES (After first year)
Activities which occur on a continuing basis or at different times throughout the year need to be pursued in as timely a manner as possible over the foreseeable future.

Action 7. Continue or expand initial efforts to distribute customized materials to key target audiences.

Audience: All

Description: Expand distribution to include various groups on the mailing list, update lists as appropriate, and distribute outreach materials at local town and land use planning meetings.

Distribute outreach materials to local and visitor audiences.

Action 8. Follow a standardized public outreach process during recovery plan release, agency planning and large section 7 consultations.

Audience: All

Description: Continue to use the following planning guidelines for public outreach to gather comments and understanding of the process and decision:

- Update the project-specific mailing/contact list, using the master mailing list as the basic source. Include government officials, agency and organization representatives, affected landowners, media contacts, and interested individuals.

- Issue press releases informing the general public about the progress of the recovery effort.

- Distribute a periodic fact sheet/pamphlet/newsletters to all interested parties. Use maps when appropriate.

- Actively solicit public input via newsletters, public scoping meetings, and meetings with involved parties.

- Distribute available educational materials to involved groups. Give presentations upon request.

Action 9. Conduct "by invitation" tours.

Audience: All

Description: There is no better way to communicate why vernal pool ecosystem recovery is significant than to have people accompany a knowledgeable, enthusiastic expert into the field. A significant effort should be made to get key people on the tours. Groups to include are: chambers of commerce, agency employees, community leaders, legislators, media, school groups, and conservation organization leaders.

Action 10. Enlist corporate support for vernal pool ecosystem protection.

Audience: All

Description: Large landowners or developers can be approached for providing support in specific situations. If this strategy is pursued, a prospectus-type brochure should be prepared explaining the public service aspects and the marketing advantages that could be gained by promoting an image of environmental responsibility. Corporate support could range from underwriting recovery projects to making a simple statement of support in their advertisements or on their packaging (the milk carton route). Regional working groups should research and solicit grant opportunities as an avenue to corporate support.

Action 11. Develop educational curriculum, presentations and speakers bureau.

Audience: Schools, environmental educators, interpreters, youth clubs, civic groups.

Description: Develop curriculum with lesson plans and activities targeted to grade levels. Utilize materials from other activities, such as brochures, posters, fact sheets, maps, videos, or a slide-tape program.

Modify the above teaching package into a standardized presentation for civic and school groups, and other general interest organizations. Inform key groups of the availability of such a program through the mailing list or through notices in brochures.

Action 12. Produce videos.

Audience: All

Description: Produce video for target audiences. Ideally, several videos could be produced; each targeted to a different audience. Otherwise, produce a 15-minute video to use primarily in educational and planning settings; and a 30-second public service announcement to use in informational and commercial contexts.

Announce availability of the videos to field office staff and through the mailing list. Provide press releases to distribute them to the media, commercial outlets, and for public and private functions. Also, distribute copies of the videos to key visitor contact points, including Federal and state facilities. In particular, distribute the educational video to individuals whose property contains vernal pool habitat.

RESPONSIBILITIES

Assistance to agencies who manage vernal pool habitat is an ongoing activity that occurs primarily under section 7 of the Endangered Species Act. In particular, the U.S. Fish and Wildlife Service works closely with state and local agencies to implement vernal pool protection and recovery plans, and other management actions to protect vernal pool habitat.

State agencies also play a role in vernal pool management in their oversight of state wildlife regulations. Although these Federal and state agencies provide oversight and support to vernal pool ecosystem management, ultimately responsibility lies with individual land managers. Local land managers need to ensure that vernal pool ecosystem information and education efforts are appropriately and adequately implemented to support protection of vernal pool habitat at sites under their jurisdiction.

Vernal pools extend across multiple counties in California and Oregon, making a coordinated outreach effort difficult and complicated. Regional working groups will ideally reduce some of this complication. However, there needs to be a means for

connection between these groups. The U.S. Fish and Wildlife Service is best suited to play a leadership role in providing advice and coordination and can also be valuable clearinghouse for existing materials. The U.S. Fish and Wildlife Service should assure that long-term funding is allocated to support a staff position to coordinate outreach efforts as part of other recovery plan implementation duties. Partnerships will be the key to employing an effective information and education program aimed at recovering the vernal pool ecosystem.

APPENDIX H. GUIDANCE TO MINIMIZE THE POTENTIAL TRANSMISSION OF DISEASE AND OTHER PATHOGENS BETWEEN AQUATIC SYSTEMS

In order to minimize the potential transmission of disease and other pathogens, the following guidance has been developed for disinfecting equipment and clothing after surveying a wetland and before entering a new wetland, unless the two wetlands are hydrologically connected to one another. These recommendations are adapted from the Declining Amphibian Population Task Force's Code which can be found in their entirety at: http://www.mpm.edu/collect/vertzo/herp/daptf/fcode.html.

a. All dirt and debris, including mud, snails, plant material (including fruits and seeds), and algae, should be removed from nets, traps, boots, vehicle tires and all other surfaces that have come into contact with water. Cleaned items should be rinsed with clean water before leaving each study site.

b. Boots, nets, traps, etc., should then be scrubbed with either a 70 percent ethanol solution, a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water), QUAT 128 (quaternary ammonium, use 1:60 dilution), or a 6 percent sodium hypochlorite 3 solution and rinsed clean with water between study sites. Cleaning equipment in the immediate vicinity of a pond or wetland should be avoided. Care should be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

c. When working at sites with known or suspected disease problems, disposable gloves should be worn and changed between handling each animal.

d. Used cleaning materials (liquids, etc.) should be disposed of safely, and if necessary, taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

Appendix I. Threats to the listed Vernal Pool Species and Steps Within The Recovery Plan for Threat Reduction or Elimination.

SPECIES	LISTING FACTOR$_1$	THREAT	TASK NUMBERS	RECOVERY CRITERIA$_2$
All listed vernal pool species	A	Habitat loss (due to urban development, agricultural conversion, mining)	1.4, 5.1, 5.2	1A, 1B, 1D, 5A, 5B, 5C, 5D
All listed vernal pool species	A	Habitat degradation (erosion, siltation, soil disruption)	1.4, 2.1, 2.3, 2.4, 4.1.4, 4.1.5, 4.2.4, 5.1, 5.2	1E, 2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A	Altered hydrology	2.1, 2.3, 2.4, 4.1.4, 4.1.5, 4.2.4, 5.1, 5.2	1E, 2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A	Inappropriate fire regime	2.1, 2.3, 2.4, 4.1.4, 4.2.2, 4.2.4, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A, C	Inappropriate livestock grazing regime	2.1, 2.3, 2.4, 4.1.4, 4.2.3, 4.2.4, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A, E	Habitat fragmentation	1.4, 4.1.3, 4.1.4, 4.1.5, 4.2.1, 5.1, 5.2	1A, 1B, 1D, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A, E	Trash dumping	2.1, 2.3, 2.4, 4.2.4, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A, E	Recreational use (off-road vehicles, bicycling)	2.1, 2.3, 2.4, 4.2.4, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	A, E	Vandalism	2.1, 2.3, 2.4, 4.2.4, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
Delta green ground beetle	B	Overcollection	2.1, 2.3, 2.4, 4.2.4, 5.1, 5.2	2A, 2B, 3B
All listed vernal pool crustaceans	C	Predation by nonnative aquatic species	2.1, 2.3, 2.4, 4.1.4, 4.2.4, 4.3.4, 5.1, 5.2	1E, 2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
Neostapfia colusana *Orcuttia inaequalis* *Tuctoria mucronata*	C	Herbivory by grasshoppers	2.1, 2.3, 2.4, 4.1.4, 4.2.4, 4.3.6, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
Vernal pool tadpole shrimp possibly others	C	Disease	4.1.4, 4.1.5	3B
All listed vernal pool species	D	Lack of adequate protection from State and Federal legislation	beyond scope of recovery plan	N/A
All listed vernal pool species	D	Need for management planning	1.4, 2.3	1A, 1B, 1D, 2A, 2B

SPECIES	LISTING FACTOR[1]	THREAT	TASK NUMBERS	RECOVERY CRITERIA[2]
All listed vernal pool species	E	Loss of genetic diversity	4.1.1	3B, 4B
All listed vernal pool species	E	Contaminants	2.1, 2.3, 2.4, 4.1.4, 4.2.4, 4.3.1, 4.3.2, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
Castilleja campestris ssp. *succulenta* *Chamaesyce hooveri* *Eryngium constancei* *Lasthenia conjugens* *Limnanthes floccosa* ssp. *californica* *Navarretia leucocephala* ssp. *pauciflora* *Navarretia leucocephala* ssp. *plieantha* *Parvisedum leiocarpum*	E	Loss of pollinators	2.1, 2.3, 2.4, 4.1.4, 4.2.4, 4.3.5, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	E	Inadequate monitoring/survey information	1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5.4, 2.5.5, 2.5.6, 3.1, 3.2, 3.3, 3.4, 4.1.3, 4.2.4, 5.1, 5.2	1D, 1E, 2C, 3A, 3B, 4A, 5A, 5B, 5C, 5D
All listed vernal pool species	E	Stochastic events	2.5.1, 2.5.2, 2.5.3, 2.5.4, 2.5.5, 2.5.6, 4.1.6	1A, 1B, 1C, 2D, 3A, 4C
All listed vernal pool plants	E	Competition from invasive plants	2.1, 2.3, 2.4, 4.1.4, 4.2.4, 4.3.7, 5.1, 5.2	2A, 2B, 2C, 3B, 4A, 5A, 5B, 5C, 5D

1. Listing factors are:
   (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
   (B) overutilization for commercial, recreational, scientific, or educational purposes;
   (C) disease or predation;
   (D) the inadequacy of existing regulatory mechanisms; or
   (E) other natural or manmade factors affecting its continued existence.
2. Recovery criteria are:
   1A: Suitable vernal pool habitat within each prioritized core area for the species is protected.
   1B: Species occurrences distributed across the species geographic and genetic range are protected.
   1C: Reintroductions and introductions must be carried out and meet success criteria.
   1D: Additional occurrences that are determined essential to recovery are protected.
   1E: Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained.

2A: Habitat management and monitoring plans that ensure maintenance of vernal pool ecosystem function and population viability have been developed and implemented for all habitat protected.
2B: Mechanisms are in place to provide for long-term management and monitoring.
2C: Monitoring indicates ecosystem function has been maintained in the areas protected.
2D: Seed banking actions have been completed.
3A: Status surveys, status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable.
3B: Status surveys, status reviews, and habitat monitoring show that threats have been ameliorated or eliminated.
4A: Research actions on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into management plans.
4B: Research on genetic structure has been completed and results incorporated into management plans.
5A: Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.
5B: Vernal Pool Region working groups are established and functioning to oversee regional recovery efforts.
5C: Participation plans for each Vernal Pool Region have been completed and implemented.
5D: Vernal Pool Region working groups have developed and implemented outreach and incentive programs that develop partnerships.