

## V. IMPLEMENTATION SCHEDULE

The following implementation schedule outlines actions and estimated costs for this recovery plan. It is a guide for meeting the objectives discussed in Chapter III. This schedule describes and prioritizes actions, provides an estimated timetable for performance of actions, indicates the responsible agencies, and estimates costs of performing actions. These actions, when accomplished, should further the recovery and conservation of the covered species.

### Key to terms and acronyms used in the Implementation Schedule:

Definition of action priorities:

- Priority 1-** an action that must be taken to prevent extinction or to prevent a species from declining irreversibly in the foreseeable future.
- Priority 2 -** an action that must be taken to prevent a significant decline in the species population/habitat quality or some other significant negative impact short of extinction.
- Priority 3 -** all other actions necessary to meet recovery or conservation objectives.

Definition of action durations:

- Continual -** An action that will be implemented on a routine basis once begun.
- Ongoing -** An action that is currently being implemented and will continue until action is no longer necessary.
- Unknown -** Either action duration or associated costs are not known at this time.

Total costs:

- TBD -** to be determined

Responsible Parties:

<b>ALL-</b>	All Applicable Entities
<b>BIA-</b>	Bureau of Indian Affairs
<b>BLM -</b>	U.S. Bureau of Land Management
<b>CARCD -</b>	California Association of Resource Conservation Districts
<b>CDFG -</b>	California Department of Fish and Game
<b>CDPR-</b>	California Department of Parks and Recreation
<b>CNPS -</b>	California Native Plant Society
<b>CONS-</b>	Land Conservation Organization
<b>DOD -</b>	Department of Defense (Includes U.S. Army Corps of Engineers)
<b>DWR -</b>	Department of Water Resources
<b>LOC-</b>	County, City or Other Local Government
<b>NRCS-</b>	Natural Resource Conservation Service
<b>OR-</b>	Oregon State
<b>PVT-</b>	Private Contractor
<b>OWN -</b>	Agency or organization that administers or owns each site
<b>STO -</b>	Organization to Store/Propagate Seeds or Cysts ( <i>e.g.</i> , Rancho Santa Ana Botanic Garden)
<b>SLC -</b>	State Lands Commission
<b>TEAM-</b>	Vernal Pool Recovery Team
<b>TNC -</b>	The Nature Conservancy
<b>UFID-</b>	Utility, Flood or Irrigation District
<b>UNIV -</b>	University
<b>USBR -</b>	U.S. Bureau of Reclamation
<b>USFS-</b>	U.S. Forest Service
<b>USFWS -</b>	U.S. Fish and Wildlife Service

Responsible parties are those agencies who may voluntarily participate in any aspect of implementation of particular actions listed within this recovery plan. Responsible parties may willingly participate in project planning, funding, staff time, or any other means of implementation.

\* - Lead Agency

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	1.1	Develop standardized vernal pool habitat site assessment guidance.	1 year	USFWS, CDFG, BLM, CNPS	32.21	32.21					
1	1.2	Conduct data analysis using Geographic Information Systems, remote sensing, and other techniques to facilitate vernal pool habitat protection efforts.	Every 5 years until delisting or downlisting	USFWS	747.39	64.43					Assumes 58 years for delisting or downlisting
1	1.3.1	Conduct standardized vernal pool habitat site assessments for Carrizo vernal pool region	3 years <sup>2</sup>	BLM, USFWS, OWN, CDFG, CNPS, LOC, CONS, DWR	308.46		102.82	102.82	102.82		Cost estimate for 23,721 hectares ( 58,614 acres)
1	1.3.2	Conduct standardized vernal pool habitat site assessments for Central Coast vernal pool region	7 years <sup>2</sup>	BLM, OWN, USFWS, CDFG, CNPS, LOC, DOD, DWR, USFS	739.72		105.67	105.67	105.67	105.67	Cost estimate for 56,886 hectares ( 140,565 acres)
1	1.3.3	Conduct standardized vernal pool habitat site assessments for Klamath Mountains vernal pool region	1 year <sup>2</sup>	USFWS, OWN, LOC, DOD	36.82		36.82				Cost estimate for 2,832 hectares (6,998 acres)
1	1.3.4	Conduct standardized vernal pool habitat site assessments for Lake-Napa vernal pool region	2 years <sup>2</sup>	USFWS, OWN, LOC, DOD, CDFG, CNPS	161.11		80.56	80.56			Cost estimate for 12,390 hectares ( 30,614 acres)

3-V

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	1.3.5	Conduct standardized vernal pool habitat site assessments for Livermore vernal pool region	1 year <sup>2</sup>	USFWS, CDFG, CNPS, LOC, CONS, OWN	33.79		33.79				Cost estimate for 2,599 hectares ( 6421 acres)
1	1.3.6	Conduct standardized vernal pool habitat site assessments for Mendocino vernal pool region	1 year <sup>2</sup>	USFWS, CDFG, CNPS, OWN, DOD	12.81		12.81				Cost estimate for 985 hectares ( 2,434 acres)
1	1.3.7	Conduct standardized vernal pool habitat site assessments for Modoc vernal pool region	1 year <sup>2</sup>	USFWS, USFS, OWN, LOC, DOD, CNPS, CDFG, BLM, PVT, UNIV	19.79		19.79				Cost estimate for 1,521 hectares ( 3,760 acres)

V-4

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	1.3.8	Conduct standardized vernal pool habitat site assessments for Northeastern Sacramento Valley vernal pool region	5 years <sup>2</sup>	USFWS, CNPS, TNC, OWN, LOC, DOD, BLM, CDFG, PVT, UNIV, CONS, USFS, DOD, DPR, USBR	477.33		95.47	95.47	95.47	95.47	Cost estimate for 36,707 hectares ( 90,704 acres)
1	1.3.9	Conduct standardized vernal pool habitat site assessments for Northwestern Sacramento Valley vernal pool region	4 years <sup>2</sup>	USFWS, CDFG, DOD, DPR, CONS, OWN, PVT, UNIV, LOC, USBR	345.23		86.31	86.31	86.31	86.31	Cost estimate for 26,549 hectares ( 65,602 acres)
1	1.3.10	Conduct standardized vernal pool habitat site assessments for San Joaquin Valley vernal pool region	1 year <sup>2</sup>	ALL	114.33		114.33				Cost estimate for 8,792 hectares (21,725 acres)
1	1.3.11	Conduct standardized vernal pool habitat site assessments for Santa Barbara vernal pool region	1 year <sup>2</sup>	ALL	88.93		88.93				Cost estimate for 6,839 hectares (16,898 acres)

S-V

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	1.3.12	Conduct standardized vernal pool habitat site assessments for Solano-Colusa vernal pool region	3 years <sup>2</sup>	USFWS, CDFG, LOC, OWN, CNPS, UNIV, TNC	331.26		110.42	110.42	110.42		Cost estimate for 25,475 hectares ( 62,948 acres)
1	1.3.13	Conduct standardized vernal pool habitat site assessments for Southeastern Sacramento Valley vernal pool region	5 years <sup>2</sup>	ALL	489.20		97.84	97.84	97.84	97.84	Cost estimate for 37,621 hectares ( 92,960 acres)
1	1.3.14	Conduct standardized vernal pool habitat site assessments for Southern Sierra Foothills vernal pool region	24 years <sup>2</sup>	ALL	2483.30		103.47	103.47	103.47	103.47	Cost estimate for 190,970 hectares ( 471,886 acres)
1	1.3.15	Conduct standardized vernal pool habitat site assessments for Western Riverside County vernal pool region	2 years	ALL	145.91		72.95	72.95			Cost estimate for 11,220 hectares ( 27,726 acres)
1	1.3.16	Conduct standardized vernal pool habitat site assessments for San Diego vernal pool region	4 years <sup>2</sup>	USFWS, CDFG, OWN, PVT, UNIV, CONS	394.05		98.51	98.51	98.51	98.51	Cost estimate for 30,302 hectares ( 74,878 acres)
1	1.4.1.1	Ensure Federal agencies use their authority to protect species occurrences and their vernal pool habitat in Zone 1 core areas.	Until recovery goals obtained	USFWS, BLM, DOD, USBR, BLM,	36,098.84	622.4	622.4	622.4	622.4	622.4	To implement 7(a)(1), 7(a)(2) and other obligations

9-A

<sup>1</sup> Suggested primary participants listed.

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
1	1.4.2.1	Ensure State and local agencies use their authority to protect species occurrences and their vernal pool habitat in Zone 1 core areas.	Until recovery goals obtained	CDFG, CPR, SLC, LOC	59,133.58	1,019.19	1,019.19	1,019.19	1,019.19	1,019.19	To implement section 10 and other obligations
1	1.4.3.1	Ensure existing conservation areas on private lands are managed to protect vernal pool species and habitat in Zone 1 core areas.	Until recovery goals obtained	OWN, CONS, TNC,	14,356.16	247.52	247.52	247.52	247.52	247.52	To implement section 10 and other obligations
1	1.4.4.1	Protect remaining species occurrences and habitat, not currently protected on private land in Zone 1 core areas.	Ongoing	ALL	597,890						Maximum cost based on fee title acquisition for approximately 234,256 hectares (578,838 acres)
1	2.1.1.1	Ensure Federal agencies conduct interim habitat management on lands in Zone 1 core areas.	5 years	USFWS, BLM, DOD, NRCS, USBR	3,111.88	622.4	622.4	622.4	622.4	622.4	Assumes long term management plan is developed and implemented in 5 years
1	2.1.2.1	Ensure State and local agencies conduct interim habitat management on lands in Zone 1 core areas.	5 years	CDFG, CPR, SLC, LOC	5,095.95	1,019.19	1,019.19	1,019.19	1,019.19	1,019.19	Assumes long term management plan is developed and implemented in 5 years
1	2.1.3.1	Ensure private land owners with conservation agreements conduct interim habitat management on lands in Zone 1 core areas	5 years	OWN, CONS, TNC	4,973.92	994.78	994.78	994.78	994.78	994.78	Assumes long term management plan is developed and implemented in 5 years

V-7

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
1	2.3.2.1	Ensure Federal agencies develop or improve existing management and monitoring plans.	5 years	USFWS, BLM, DOD, USBR, NRCS, USFS, BIA	8,201.68	1640.34	1640.34	1640.34	1640.34	1640.34	Concurrent with interim management
1	2.3.2.2	Ensure State and local agencies develop or improve existing management and monitoring plans.	5 years	CDFG, LOC, DWR, DPR, UNIV, UFID	5,039.58	1007.92	1007.92	1007.92	1007.92	1007.92	Concurrent with interim management
1	2.3.2.3	Ensure private land owners with existing conservation agreements develop or improve existing management and monitoring plans.	5 years	OWN, TNC, CONS	1,856.40	371.28	371.28	371.28	371.28	371.28	Concurrent with interim management
1	2.3.2.4	Ensure responsible parties of newly protected lands develop or improve existing management and monitoring plans.	TBD	ALL							
1	2.3.3.1.1	Ensure Federal agencies implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 1 core areas.	Every year until delisting or downlisting	USFWS, BLM, DOD, NRCS, USBR	9,024.42	155.59	155.59	155.59	155.59	155.59	Based on assumed time in field to conduct habitat management each field season
1	2.3.3.2.1	Ensure State and local agencies implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 1 core areas.	Every year until delisting or downlisting	CDFG, CPR, SLC, LOC	13,142.22	226.59	226.59	226.59	226.59	226.59	Based on assumed time in field to conduct habitat management each field season

8-V

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	2.3.3.3.1	Ensure private land owners with existing conservation agreements implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 1 core areas.	Every year until delisting or downlisting	OWN, TNC, CONS	3,589.04	61.88	61.88	61.88	61.88	61.88	Based on assumed time in field to conduct habitat management each field season
1	2.3.3.4.1	Ensure responsible parties of newly protected lands implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 1 core areas.	Every year until delisting or downlisting	ALL		TBD					This action will be additive to Actions 2.1.1.1 through 2.3.3.3.5.
1	2.5.1.1	Review existing seed bank collections, as needed, to determine need to collect seeds and the number of seeds necessary.	3 months	USFWS, CDFG, STO, UNIV	32.21	32.21					
1	2.5.1.2	Conduct Priority 1 seed collection and banking as identified in <b>Table IV-2</b> .	6 months spread over 3 years	STO, UNIV	255.00		85	85	85		Assumes \$15,000 for collection in each region
1	2.5.2.1	Review existing shrimp cyst collections, as needed, to determine need to collect cysts and the number of cysts necessary.	3 months	USFWS, UNIV	32.21	32.21					
1	2.5.2.2	Conduct Priority 1 cyst collection as identified in <b>Table IV-4</b> , if necessary.	3 months	UNIV	TBD depends on method						
1	2.5.3.1	Prepare a controlled propagation plan for Priority 1 reintroductions and introductions indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	2 years	USFWS, CDFG	32.21		16.11	16.10			Assumes 1/4 of year to develop first controlled propagation plan.
1	2.5.3.5	Propagate plants for Priority 1 reintroductions and introductions indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months	USFWS, STO	4.00			4.00			Assumes \$2,000 x 2 species

6-9

<sup>1</sup> Suggested primary participants listed.

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**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	2.5.4.1	Conduct Priority 1 reintroductions and introductions of plants as indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months (site preparation)	USFWS	50.00				50.00		Assumes \$25,000 x at least 2 sites
1	2.5.4.4	Monitor Priority 1 reintroductions and/or introductions of plants.	Minimum 5 years per site	USFWS, ALL	169.9	33.98	33.98	33.98	33.98	33.98	Assumes 24 days of monitoring per year per site
1	2.5.5.1	Determine appropriate locations for reintroduction/introduction of shrimp.		USFWS, ALL	TBD						Sites identified by recovery team
1	2.5.5.2	Conduct Priority 1 reintroductions and introductions of shrimp as indicated in <b>Table IV- 4</b> .		USFWS, UNIV	TBD						Cost will vary depending on no. of sites
1	2.5.5.5	Monitor Priority 1 reintroductions and introductions of shrimp.	Minimum 5 years per site		TBD						Cost will vary depending on no. of sites; may be added to 2.5.4.4
1	3.1.1	Review existing species survey guidance to determine whether such guidance is adequate	3 months	USFWS	32.21	32.21					Assumes cost of one biologist for 1/4 time
1	3.1.2	If necessary, revise existing guidance or develop new standardized, scientifically based, and species-specific survey guidance.	3 months	USFWS	32.21	32.21					Assumes cost of one biologist for 1/4 time
1	3.2.1	Identify and prioritize areas within each vernal pool region, starting with core areas, to conduct standardized status surveys.	6 months	ALL	64.43		64.43				Assumes cost of one biologist for ½ time
1	3.2.2	Conduct standardized status surveys within each vernal pool region, starting with core areas.	10 years	ALL	3,742.41	374.24	374.24	374.24	374.24	374.24	See 1.3.1-1.3.17 above

01-V

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
1	4.1.3.3.1	Implement research on dispersal mechanisms of listed fairy shrimp and vernal pool tadpole shrimp.	1 year	UNIV, PVT	TBD	TBD					
1	4.1.3.4	Implement research on dispersal mechanisms of delta green ground beetle.	1 year	UNIV, PVT	TBD	TBD					
1	4.3.2.2	Investigate methods for remediating contamination by herbicides, salt, and industrial chemicals at Davis Communications Annex.	3 years	DOD	800	266.67	266.67	266.67			CERCLA & BRAC responsibility
1	4.3.7.1	Investigate methods to control the following invasive plants: <i>Crypsis schoenoides</i> , <i>Glyceria declinata</i> , <i>Lepidium latifolium</i> , <i>Phyla nodiflora</i> , <i>Salsola</i> spp.	5 years	PVT, UNIV	375	75	75	75	75	75	Assumes \$ 15,000 per species per year
1	5.1	Form a single vernal pool recovery implementation team.	3 months	USFWS, TEAM	32.21	32.21					Assumes staff time cost to organize an implementation team
1	5.2.1	Form individual working groups for each vernal pool region.	1 year	TEAM	32.21	16.11	16.11				Assumes compensation to team members to establish working groups
1	5.2.5.1.1	Develop tools such as Candidate Conservation Agreements, Memoranda of Understanding, or other appropriate documents for Priority 1 conservation of taxa of concern on public lands.	3 months	USFWS	32.21		10.74	10.74	10.74		Cost assumes 1 month of work over the course of one year to complete each agreement.

II-V

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**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
2	1.4.1.2	Ensure Federal agencies use their authority to protect species occurrences and their vernal pool habitat in Zone 2 core areas.	Until recovery goals obtained	USFWS, USBR, USFS, DOD, NRCS, BLM, BIA	144,245.87	2,486.99	2,486.99	2,486.99	2,486.99	2,486.99	To implement 7(a)(1), 7(a)(2) and other obligations
2	1.4.2.2	Ensure State and local agencies use their authority to protect species occurrences and their vernal pool habitat in Zone 2 core areas.	Until recovery goals obtained	CDFG, SLC, UNIV, OR	36,924.9	636.64	636.64	636.64	636.64	636.64	To implement section 10 and other obligations
2	1.4.3.2	Ensure existing conservation areas on private lands are managed to protect vernal pool species and habitat in Zone 2 core areas.	Until recovery goals obtained	OWN, CONS, TNC,	21,534.24	371.28	371.28	371.28	371.28	371.28	To implement section 10 and other obligations
2	1.4.4.2	Protect remaining species occurrences and habitat, not currently protected on private land in Zone 2 core areas.	Ongoing	ALL	804,795						Maximum cost based on fee title acquisition for approximately 259,434 hectares (641,052 acres)
2	2.1.1.2	Ensure Federal agencies conduct interim habitat management on lands in Zone 2 core areas.	5 years	USFWS, USBR, USFS, DOD, NRCS, BLM, BIA	12,434.95	2,486.99	2,486.99	2,486.99	2,486.99	2,486.99	Assumes long term management plan is developed and implemented in 5 years
2	2.1.2.2	Ensure State and local agencies conduct interim habitat management on lands in Zone 2 core areas.	5 years	CDFG, SLC, UNIV, OR	3,183.2	636.64	636.64	636.64	636.64	636.64	Assumes long term management plan is developed and implemented in 5 years

V-12

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

SI-V-13

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
2	2.1.3.2	Ensure private land owners with conservation agreements conduct interim habitat management on lands in Zone 2 core areas.	5 years	OWN, CONS, TNC	5,752.85	1,150.57	1,150.57	1,150.57	1,150.57	1,150.57	Assumes long term management plan is developed and implemented in 5 years
2	2.2.1	Develop standardized monitoring techniques to evaluate ecosystem function and response, species response, and threat response to interim management activities.	3 months	USFWS, CDFG	32.21	32.21					
2	2.2.2	Implement standardized monitoring to document ecosystem and species responses to interim habitat management activities.	5 years	ALL	TBD	TBD					
2	2.3.1	Compile, review, and analyze existing long-term, comprehensive habitat management and monitoring plans, or pertinent information from those plans, as necessary.	5 years	USFWS, OWN	161.05	32.21	32.21	32.21	32.21	32.21	Concurrent with interim management
2	2.3.3.1.2	Ensure Federal agencies implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 2 core areas.	Every year until delisting or downlisting	USFWS, USBR, USFS, DOD, BLM, DOD	36,060.35	621.73	621.73	621.73	621.73	621.73	Based on assumed time in field to conduct habitat management each field season
2	2.3.3.2.2	Ensure State and local agencies implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 2 core areas.	Every year until delisting or downlisting	CDFG, SLC, UNIV, OR	7,647.82	131.86	131.86	131.86	131.86	131.86	Based on assumed time in field to conduct habitat management each field season

<sup>1</sup> Suggested primary participants listed.

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
2	2.3.3.3.2	Ensure private land owners with existing conservation agreements implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 2 core areas.	Every year until delisting or downlisting	OWN, TNC, CONS	5,383.56	92.82	92.82	92.82	92.82	92.82	Based on assumed time in field to conduct habitat management each field season
2	2.3.3.4.2	Ensure responsible parties of newly protected lands implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 2 core areas.	Every year until delisting or downlisting	ALL		TBD					This action will be additive to Actions 2.1.1.1 through 2.3.3.3.5.
2	2.5.1.3	Conduct Priority 2 seed collection and banking as identified in <b>Table IV-2</b> .	6 months over 3 yrs	STO, UNIV	255.00		85	85	85		Assumes \$15,000 for collection in each region
2	2.5.2.3	Conduct Priority 2 cyst collection as identified in <b>Table IV-4</b> , if necessary.	3 months	UNIV	TBD depends on method						
2	2.5.3.2	Prepare a controlled propagation plan for Priority 2 reintroductions and introductions of plants indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months	USFWS, CDFG	64.42		64.42				Assumes ½ of year to develop controlled propagation plan for the collective priority 2 plants
2	2.5.3.6	Propagate plants for Priority 2 reintroductions and introductions indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months	USFWS, STO	8.00			8.00			Assumes \$2,000 x 4 species
2	2.5.4.2	Conduct Priority 2 reintroductions and introductions of plants as indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months (site preparation)	USFWS	150.00				150.00		Assumes \$25,000 x at least 6 sites

VI-14

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
2	2.5.4.5	Monitor Priority 2 reintroductions and/or introductions of plants.	Minimum 5 years per site	USFWS, ALL	509.76	101.95	101.95	101.95	101.95	101.95	Assumes 24 days of monitoring per year per site
2	2.5.5.3	Conduct Priority 2 reintroductions and introductions of shrimp as indicated in <b>Table IV- 4</b>		USFWS, UNIV	TBD						Cost will vary depending on no. of sites
2	2.5.5.6	Monitor Priority 2 reintroductions and introductions of shrimp	Minimum 5 years per site		TBD						Cost will vary depending on no. of sites; may be added to 2.5.4.5
2	2.5.6.1	Reintroduce delta green ground beetle at appropriate sites.	1 year	USFWS, CDFG, CONS, UNIV	30.6	30.6					Assumes labor cost to locate beetles for translocation
2	2.5.6.2	Monitor delta green ground beetle reintroductions.	Minimum of 5 years	CONS, UNIV	44.2		8.84	8.84	8.84	8.84	Assumes monitoring of one site during survey season
2	3.3.1	Compile most recent status reviews, or comparable evaluations, for each species and develop a prioritized list for status reviews of the species addressed in this recovery plan.	Every 5 years until recovery	ALL	354.31			32.21			Assumes data compilation can be completed for all species can be completed in 3 months
2	3.3.2	Conduct status reviews of listed species by vernal pool region.	Every 5 years until recovery	USFWS	14,947.3			1288.56			Assumes 6 months review based on cost per species

SI-V

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
2	4.1.1.1	Conduct genetics analysis on species slated for reintroductions and introductions, as listed in <b>Tables IV-3</b> and <b>IV-4</b> ( <i>i.e.</i> , species requiring seed or cyst banking).	5 years	USFWS, UNIV, PVT	8,000	1600	1600	1600	1600	1600	Assumes \$ 100,000 per year per species
2	4.1.1.3	Conduct genetic research on remaining vernal pool species, as necessary.	1 year	UNIV, PVT	TBD	TBD					
2	4.1.2.1	Conduct biosystematics research on <i>Limnanthes floccosa</i> ssp. <i>californica</i> .	1 year	UNIV, PVT	100	100					Assumes combined cost for researcher, equipment, <i>etc.</i>
2	4.1.3.1	In conjunction with the priorities listed below for specific plant categories or species, develop a prioritized list, by species, of additional research needs on dispersal mechanisms.	3 months	USFWS, UNIV, PVT	48.32	48.32					Based on collaboration between agency staff and researchers
2	4.1.3.2.1	Implement research on dispersal mechanisms of annual herbs (Table IV-7)	1 year	UNIV, PVT	TBD	TBD					
2	4.1.3.2.2	Implement research on dispersal mechanisms of annual grasses (Table IV-7)	1 year	UNIV, PVT	TBD	TBD					
2	4.1.3.2.3	Implement research on dispersal mechanisms of biennial and perennial plants (Table IV-7).	1 year	UNIV, PVT	TBD	TBD					
2	4.1.3.5	Implement research on dispersal mechanisms of western spadefoot toad.	1 year	UNIV, PVT	TBD	TBD					
2	4.1.4.1	Determine and prioritize biology and ecology research needed to inform management and habitat protection decisions.	3 months	USFWS, ALL	32.21		32.21				Assumes staff time costs to review and prioritize
2	4.1.4.2	Conduct biology and ecology research, based on priorities.	TBD	ALL	TBD			TBD			

91-V-16

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
2	4.1.5.1	Determine and prioritize research on effects of environmental factors needed to inform management and habitat protection decisions.	3 months	ALL	32.21			32.21			Assumes staff time costs to review and prioritize
2	4.1.5.2	Conduct research on the effects of environmental factors, based on priorities.	TBD	ALL	TBD			TBD			
2	4.1.6.1	Develop a prioritized list of species that would benefit the most from conducting a population viability analysis.	3 months	USFWS, UNIV	32.21	32.21					Assumes staff time costs to review and prioritize
2	4.1.6.2	Conduct population viability analyses as sufficient data is accumulated and apply results to refine recovery actions and criteria, habitat management, and threat reduction actions.	6 months	UNIV	825		825				Assumes cost of \$25,000 per species
2	4.3.1	Research the effects of environmental contaminants on vernal pools, ecosystem function, and individual species.	3 years	USFWS, UNIV	800	266.67	266.67	266.67			Based on comprehensive contaminants research
2	4.3.2.1	Investigate methods for remediating contamination by lead at the former Castle Air Force Base.	3 years	DOD	800	266.67	266.67	266.67			CERCLA responsibility
2	4.3.2.3	Investigate methods for remediating contamination by poultry manure at Arena Plains Unit of Merced National Wildlife Refuge.	3 years	USFWS, OWN	800	266.67	266.67	266.67			Based on comprehensive contaminants research
2	4.3.2.4	Investigate methods for remediating contamination at other vernal pool sites identified through threats monitoring activities.	2 years	ALL	TBD	TBD	TBD				

V-17

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
2	4.3.5	Determine pollinators and their habitat requirements of vernal pool plants. Incorporate results into reserve design and habitat protection and management strategies.	5 years	PVT, UNIV	500	100	100	100	100	100	Assumes combined cost for researcher, equipment, etc.
2	4.3.6.1	Determine degree of threat from, and identify factors contributing to, excessive grasshopper foraging on <i>Neostapfia colusana</i> and develop remedies.	1 year	PVT, UNIV	100	100					Assumes combined cost for researcher, equipment, etc.
2	4.3.6.2	Determine degree of threat from, and identify factors contributing to, excessive grasshopper foraging on <i>Orcuttia inaequalis</i> and develop remedies.	1 year	PVT, UNIV	100	100					Assumes combined cost for researcher, equipment, etc.
2	4.3.6.3	Determine degree of threat from, and identify factors contributing to, excessive grasshopper foraging on <i>Tuctoria mucronata</i> and develop remedies.	1 year	PVT, UNIV	100	100					Assumes combined cost for researcher, equipment, etc.
2	4.3.7.2	Investigate methods to control the following invasive plants: <i>Centaurea solstitialis</i> , <i>Convolvulus arvensis</i> , <i>Eleocharis macrostachya</i> , <i>Hordeum</i> spp., <i>Lolium multiflorum</i> , <i>Medicago polymorpha</i> , <i>Taeniatherum caput-medusae</i> , <i>Xanthium strumarium</i> , and other invasive plants.	5 years	PVT, UNIV	600	120	120	120	120	120	Assumes \$ 15,000 per species per year
2	5.2.5.1.2	Develop tools such as Candidate Conservation Agreements, Memoranda of Understanding, or other appropriate documents for Priority 2 conservation of taxa of concern on public lands.	3 years	USFWS	32.21		10.74	10.74	10.74		Cost assumes 1 month of work over the course of three years to complete each agreement.

81-V

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	1.4.1.3	Ensure Federal agencies use their authority to protect species occurrences and their vernal pool habitat in Zone 3 core areas.	Until recovery goals obtained	BLM, DOD	9,715.29	167.51	167.51	167.51	167.51	167.51	To implement 7(a)(1), 7(a)(2) and other obligations
3	1.4.1.4	Ensure Federal agencies use their authority to protect species occurrences and their vernal pool habitat that do not occur within a core area, but do occur within a vernal pool region.	Until recovery goals obtained	USFWS, USBR, USFS, DOD, NRCS, BLM, BIA	TBD						To implement 7(a)(1), 7(a)(2) and other obligations
3	1.4.1.5	Ensure Federal agencies use their authority to protect all other species occurrences and their vernal pool habitat that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Until recovery goals obtained	USFWS, USBR, USFS, DOD, NRCS, BLM, BIA	TBD						To implement 7(a)(1), 7(a)(2) and other obligations
3	1.4.2.3	Ensure State and local agencies use their authority to protect species occurrences and their vernal pool habitat in Zone 3 core areas.	Until recovery goals obtained	CDF, CPR, LOC, SLC	27,445.58	473.20	473.20	473.20	473.20	473.20	To implement section 10 and other obligations
3	1.4.2.4	Ensure State and local agencies use their authority to protect species occurrences and their vernal pool habitat that do not occur within a core area, but do occur within a vernal pool region.	Until recovery goals obtained	CDFG, CPR, DWR, UNIV, UFID, LOC, SLC, OR	TBD						To implement section 10 and other obligations
3	1.4.2.5	Ensure State and local agencies use their authority to protect all other species occurrences and their vernal pool habitat that does not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Until recovery goals obtained	CDFG, CPR, DWR, UNIV, UFID, LOC, SLC, OR	TBD						To implement section 10 and other obligations

61-V

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	1.4.3.3	Ensure existing conservation areas on private lands are managed to protect vernal pool species and habitat in Zone 3 core areas.	Until recovery goals obtained	OWN, TNC	7,178.08	123.76	123.76	123.76	123.76	123.76	To implement section 10 and other obligations
3	1.4.3.4	Ensure existing conservation areas on private lands are managed to protect vernal pool species and habitat that do not occur within a core area, but do occur within a vernal pool region.	Until recovery goals obtained	OWN, CONS, TNC,	TBD						To implement section 10 and other obligations
3	1.4.3.5	Ensure existing conservation areas on private lands are managed to protect vernal pool species and habitat that does not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Until recovery goals obtained	OWN, CONS, TNC,	TBD						To implement section 10 and other obligations
3	1.4.4.3	Protect remaining species occurrences and habitat, not currently protected on private land in Zone 3 core areas.	Ongoing (breakdown given for completion in 5 years)	ALL	123,710						Maximum cost- based on fee title acquisition for approximately 15,256 hectares (37,698 acres)
3	1.4.4.4	Protect species occurrences and their vernal pool habitat that do not occur within a core area, but do occur within a vernal pool region.	As needed	ALL	TBD						
3	1.4.4.5	Protect all other species occurrences and their vernal pool habitat that does not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	As needed	ALL	TBD						

V-20

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
3	2.1.1.3	Ensure Federal agencies conduct interim habitat management on lands in Zone 3 core areas.	5 years	DOD, BLM	837.55	167.51	167.51	167.51	167.51	167.51	Assumes long term management plan is developed and implemented in 5 years
3	2.1.1.4	Ensure Federal agencies conduct interim habitat management on lands that do not occur within a core area, but do occur within a vernal pool region.	5 years	USFWS, USBR, USFS, DOD, NRCS, BLM, BIA	TBD						Assumes long term management plan is developed and implemented in 5 years. Cost TBD because area and price unknown.
3	2.1.1.5	Ensure Federal agencies conduct interim habitat management on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	5 years	USFWS, USBR, USFS, DOD, BOR, NRCS, BLM, BIA	TBD						Assumes long term management plan is developed and implemented in 5 years Cost TBD because area and price unknown.
3	2.1.2.3	Ensure State and local agencies conduct interim habitat management on lands in Zone 3 core areas.	5 years	CDF, CPR, LOC, SLC	2,366	473.20	473.20	473.20	473.20	473.20	Assumes long term management plan is developed and implemented in 5 years

V-21

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	2.1.2.4	Ensure State and local agencies conduct interim habitat management on lands that do not occur within a core area, but do occur within a vernal pool region.	5 years	CDFG, CPR, DWR, UNIV, UFID, LOC, SLC, OR	TBD						Assumes long term management plan is developed and implemented in 5 years
3	2.1.2.5	Ensure State and local agencies conduct interim habitat management on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	5 years	CDFG, CPR, DWR, UNIV, UFID, LOC, SLC, OR	TBD						Assumes long term management plan is developed and implemented in 5 years
3	2.1.3.3	Ensure private land owners with conservation agreements conduct interim habitat management on lands in Zone 3 core areas.	5 years	OWN, CONS, TNC,	669.52	133.9	133.9	133.9	133.9	133.9	Assumes long term management plan is developed and implemented in 5 years
3	2.1.3.4	Ensure private land owners with conservation agreements conduct interim habitat management on lands that do not occur within a core area, but do occur within a vernal pool region.	5 years	OWN, CONS, TNC,	TBD	TBD					Assumes long term management plan is developed and implemented in 5 years
3	2.1.3.5	Ensure private land owners with conservation agreements conduct interim habitat management on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	5 years	OWN, CONS, TNC,	TBD	TBD					Assumes long term management plan is developed and implemented in 5 years

V-22

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
3	2.3.3.1.3	Ensure Federal agencies implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 3 core areas.	Every year until delisting or downlisting	USFWS, USBR, USFS, DOD, BLM, DOD	2,491.22	42.95	42.95	42.95	42.95	42.95	Based on assumed time in field to conduct habitat management each field season
3	2.3.3.1.4	Ensure Federal agencies implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a core area, but do occur within a vernal pool region.	Every year until delisting or downlisting	USFWS, USBR, USFS, DOD, BLM, DOD	TBD						
3	2.3.3.1.5	Ensure Federal agencies implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Every year until delisting or downlisting	USFWS, USBR, USFS, DOD, BLM, DOD	TBD						
3	2.3.3.2.3	Ensure State and local agencies implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 3 core areas.	Every year until delisting or downlisting	CDF, CPR, LOC, SLC	6,861.39	118.30	118.30	118.30	118.30	118.30	Based on assumed time in field to conduct habitat management each field season
3	2.3.3.2.4	Ensure State and local agencies implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a core area, but do occur within a vernal pool region.	Every year until delisting or downlisting	CDFG, CPR, DWR, UNIV, UFID, LOC, SLC, OR	TBD						

V-23

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	2.3.3.2.5	Ensure State and local agencies implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Every year until delisting or downlisting	CDFG, CPR, DWR, UNIV, UFID, LOC, SLC, OR	TBD						
3	2.3.3.3.3	Ensure private land owners with existing conservation agreements implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 3 core areas.	Every year until delisting or downlisting	OWN, TNC, CONS	1,794.52	30.94	30.94	30.94	30.94	30.94	Based on assumed time in field to conduct habitat management each field season
3	2.3.3.3.4	Ensure private land owners with existing conservation agreements implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a core area, but do occur within a vernal pool region.	Every year until delisting or downlisting	OWN, TNC, CONS	TBD						
3	2.3.3.3.5	Ensure private land owners with existing conservation agreements implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Every year until delisting or downlisting	OWN, TNC, CONS	TBD						

V-24

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	2.3.3.4.3	Ensure responsible parties of newly protected lands implement long-term, comprehensive habitat management and monitoring plans on lands in Zone 3 core areas.	Every year until delisting or downlisting	ALL	TBD						This action will be additive to Actions 2.1.1.1 through 2.3.3.3.5.
3	2.3.3.4.4	Ensure responsible parties of newly protected lands implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a core area, but do occur within a vernal pool region.	Every year until delisting or downlisting	ALL	TBD						This action will be additive to Actions 2.1.1.1 through 2.3.3.3.5.
3	2.3.3.4.5	Ensure responsible parties of newly protected lands implement long-term, comprehensive habitat management and monitoring plans on lands that do not occur within a vernal pool region, but do contribute to recovery and long-term conservation of species addressed in this recovery plan.	Every year until delisting or downlisting	ALL	TBD						This action will be additive to Actions 2.1.1.1 through 2.3.3.3.5.
3	2.4.1.1	Review existing enhancement, restoration, and creation mechanisms and projects, success criteria and degree of success.	6 months	USFWS	64.42	64.42					
3	2.4.1.2	As necessary develop scientifically based and site-specific mechanisms and success criteria for enhancement, restoration and creation of vernal pools	3 months	USFWS, ALL	80.21	80.21					In coordination with Sacramento Fish and Wildlife Office
3	2.4.2.1	Review existing shrimp collection, storage, and application mechanisms and success criteria	6 months	USFWS	64.42	64.42					

V-25

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	2.4.2.2	As necessary develop scientifically based and site-specific mechanisms and success criteria for shrimp cyst collection, storage, and application	3 months	USFWS, ALL	80.21	80.21					In coordination with Sacramento Fish and Wildlife Office
3	2.4.3.1	Develop a prioritized list of sites from which shrimp cysts need to be collected to further the recovery and long-term conservation of vernal pool species.	3 months	USFWS, ALL	TBD						In coordination with Sacramento Fish and Wildlife Office
3	2.4.3.2	Implement introduction of cysts to restored or created habitat	Ongoing	ALL	TBD based on need						Estimates earthwork, soil collection and application, staff time at ~\$25,000 [need to verify] per acre.
3	2.4.3.3	Apply success criteria in a monitoring program to determine success of shrimp cyst introduction effort.	5 years minimum per site during 10-year monitoring period		TBD						Post-creation/restoration monitoring
3	2.4.4.1	Develop a prioritized list of sites that need to be enhanced, restored, and/or created to further the recovery and long-term conservation of vernal pool species.	3 months	USFWS, ALL	80.21	80.21					In coordination with the Sacramento Fish and Wildlife Office
3	2.4.4.2	Develop a prioritized list of which aspects of the vernal pool ecosystem function need to be enhanced, restored, and/or created.	3 months	USFWS, ALL	80.21	80.21					In coordination with the Sacramento Fish and Wildlife Office

V-26

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	2.4.4.3	Implement vernal pool enhancement, restoration, and creation activities based on scientifically sound and site-specific appropriate mechanisms.	Ongoing	ALL	TBD Based on Need						Estimates soil pits, earthwork, soil disposal, staff time at ~\$25,000 per acre.
3	2.4.4.4	Apply success criteria in a monitoring program to determine if species and ecosystem respond positively to the enhancement, restoration, and/or creation effort.	5 years minimum per site	ALL	TBD						Post-creation/restoration monitoring
3	2.5.2.4	Conduct Priority 3 cyst collection as identified in <b>Table IV-4</b> , if necessary.	3 months	UNIV	TBD depends on method						
3	2.5.3.3	Prepare a controlled propagation plan for Priority 3 reintroductions and introductions of plants indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months	USFWS, CDFG	64.42		64.42				Assumes ½ of year to develop controlled propagation plan for the collective priority 3 plants
3	2.5.3.4	If necessary, conduct germination trials for reintroductions and introductions.	6 months	USFWS, STO	22.00			22.00			Assumes \$2,000 x 11 species
3	2.5.3.7	Propagate plants for Priority 3 reintroductions and introductions indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months (growing time)	USFWS, STO	12.00			12.00			Assumes \$2,000 x 6 species
3	2.5.4.3	Conduct Priority 3 reintroductions and introductions as indicated in <b>Table IV-5</b> and <b>Table IV-6</b> , respectively.	6 months (site preparation)	USFWS	650.00				650.00		Assumes \$25,000 x at least 26 sites
3	2.5.4.6	Monitor Priority 3 reintroductions and/or introductions of plants.	Minimum 5 years per site	USFWS, ALL	2,208.96	441.80	441.80	441.80	441.80	441.80	Assumes 24 days of monitoring per year per site

V-27

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	2.5.4.7	As necessary apply success criteria to reintroductions and/or introductions and modify techniques to achieve recovery and long-term conservation of vernal pool plants.	Ongoing	ALL	TBD						Costs will vary depending on actions necessary to obtain success criteria
3	2.5.5.4	Conduct Priority 3 reintroductions and introductions of shrimp as indicated in <b>Table IV- 4</b>		USFWS, UNIV	TBD						Cost will vary depending on no. of sites
3	2.5.5.7	Monitor Priority 3 reintroductions and introductions of shrimp	Minimum 5 years per site		TBD						Cost will vary depending on no. of sites; may be added to 2.5.4.6
3	2.5.5.8	As necessary, apply success criteria to reintroductions and/or introductions and modify techniques to achieve recovery and long-term conservation of vernal pool shrimp species.	TBD		TBD						Costs will vary depending on actions necessary to obtain success criteria
3	2.5.6.3	Apply success criteria to reintroductions and modify techniques as necessary to achieve recovery and long term conservation of the delta green ground beetle.	TBD		TBD						Costs will vary depending on actions necessary to obtain success criteria
3	3.3.3	Conduct status reviews of species of concern by vernal pool region.	Every 5 years until recovery	USFWS	9,715.7			837.56			Assumes 6 months review based on cost per species
3	3.4	Conduct post-delisting monitoring for recovered species.	5 years	ALL	TBD						Value depends on number of monitoring points for each species

V-28

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	4.1.1.2	Compile and review existing information on genetic and population structure of remaining vernal pool species, and develop a prioritized list of species requiring additional genetics studies to assist in making management decisions.	5 months	USFWS, UNIV, PVT	48.32	48.32					Based on collaboration between agency staff and researchers
3	4.1.2.2	Conduct biosystematics research on <i>Navarretia leucocephala</i> spp. <i>plieantha</i>	1 year	UNIV, PVT	100	100					Assumes combined cost for researcher, equipment, etc.
3	4.1.2.3	Conduct biosystematics research on <i>Astragalus tener</i> var. <i>tener</i> and <i>A. t.</i> var. <i>ferrisiae</i>	1 year	UNIV, PVT	100	100					Assumes combined cost for researcher, equipment, etc.
3	4.1.2.4	Conduct biosystematics research on <i>Eryngium spinosepalum</i>	1 year	UNIV, PVT	100	100					Assumes combined cost for researcher, equipment, etc.
3	4.1.2.5	Conduct biosystematics research on <i>Myosurus minimus</i> var. <i>apus</i>	1 year	UNIV, PVT	100	100					Assumes combined cost for researcher, equipment, etc.
3	4.1.3.3.2	Implement research on dispersal mechanisms of non-listed fairy shrimp.	1 year	UNIV, PVT	TBD	TBD					
3	4.2.1	Conduct research to determine minimum reserve size in order to maintain ecosystem function and population viability of vernal pool species.	5 years with monitoring	USFWS, UNIV, PVT	500	100	100	100	100	100	Assumes combined cost for researcher, equipment, etc.
3	4.2.2	Determine the role and effects of fire in functioning vernal pool ecosystems in relation to component native species.	2 years	USFWS, TNC, UNIV, PVT, CONS	150	75	75				Estimate based on contemporary research proposal

V-29

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	4.2.3	Determine the role and effects of livestock grazing in functioning vernal pool ecosystems in relation to component native species.	2 years	USFWS, UNIV, OWN, CONS	150	75	75				Estimate based on contemporary research proposal
3	4.2.4.1	Compile and review existing literature on vernal pool enhancement, restoration, and creation	3 months	USFWS	32.21						Assumes staff time of 1/4 of year to compile and review information
3	4.2.4.2	Modify ecologically-based success criteria for enhancement, restoration, and creation (Action 2.4) that define functional vernal pool ecosystems, as necessary, as results from research and monitoring become available.	3 months	USFWS	48.32	48.32					Based on collaboration between agency staff and researchers
3	4.2.4.3	Develop hydrologic models to predict effects of hydrologic modifications in various situations.	6 months	USFWS, UNIV, PVT, DOD	40		40				Assumes costs for data collection and modeling
3	4.2.4.4.1	Investigate methods for restoring vernal pool ecosystems that have been degraded by alterations in topography or hydrology.	5 years	ALL	500	100	100	100	100	100	Monitoring time not included
3	4.2.4.5	Conduct research on use of human-made vernal pool wetlands by vernal pool species and compare with natural wetlands.	5 years	USFWS, UNIV, PVT, DOD	500	100	100	100	100	100	Monitoring time not included
3	4.3.3	Study impacts of low frequency noises and vibrations on the western spadefoot toad.	5 years	PVT, UNIV	200	100	100				Assumes combined cost for researcher, equipment, etc.

V-30

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)						Comments/Notes
					Total Costs	FY 1	FY 2	FY 3	FY 4	FY 5	
3	4.3.4	Determine influence of nonnative aquatic vertebrate predators on population dynamics and determine habitat protection and management strategies across full geographic range of vernal pool branchiopods, delta green ground beetle and the western spadefoot toad.	5 years	PVT, UNIV	500	100	100	100	100	100	Assumes combined cost for researcher, equipment, etc.
3	5.2.2	Develop a participation plan and submit to recovery implementation team for review.	1 year	TEAM, USFWS	547.64		547.64				Assumes shared staff costs to develop participation plan
3	5.2.3.1	Identify private landowners interested in pursuing recovery and conservation efforts on their lands and prioritize a list of potential participants.	3 months to ongoing	TEAM, USFWS	32.21			32.21			Estimate based on staff time to identify and compile list of known willing participants
3	5.2.3.2	Assist private landowners in identifying sources of funding for pursuing conservation easements on their land	3 months to ongoing	USFWS	TBD						
3	5.2.3.3	Work with private landowners to develop Safe Harbor Agreements, Candidate Conservation Agreements, Memoranda of Understanding, Habitat Conservation Plans, or other appropriate tools for conserving listed species or species of concern on their lands.	3 months per agreement	USFWS, PVT, CONS	1,835.97		32.21	32.21	32.21	32.21	Cost assumes 3 months of work over the course of one year to complete each agreement, per year until recovery.
3	5.2.3.4	Work with cities, counties, and owners of large amounts of natural lands to develop Habitat Conservation Plans	58 yrs	USFWS, PVT	TBD						Number of Plans is unknown.

13-A  
V-31

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	5.2.4.1	Initiate cooperative programs with audience organizations.	3 months	USFWS	32.21	32.21					Assumes staff time involved in initiating cooperative programs
3	5.2.4.2	Develop Safe Harbor Agreements, Candidate Conservation Agreements, Memoranda of Understanding, or other appropriate documents for conserving taxa of concern on conservancy lands.	3 months	USFWS	32.21		10.74	10.74	10.74		Cost assumes 1 month of work over the course of one year to complete each agreement.
3	5.2.5.1.3	Develop tools such as Candidate Conservation Agreements, Memoranda of Understanding, or other appropriate documents for Priority 3 conservation of taxa of concern on public lands.	3 months	USFWS	32.21		10.74	10.74	10.74		Cost assumes 1 month of work over the course of one year to complete each agreement.
3	5.2.5.2	Assist lead agencies and districts in incorporating provisions of this recovery plan in local decision-making.	3 months	USFWS	32.21	8.05	8.05	8.05	8.05		Ongoing
3	5.2.6	Develop trained personnel to facilitate protective measures for vernal pool habitat, provide public education, and respond to emergency situations.	Continuous	TBD	TBD						Need to secure funds for volunteer coordinator and staff to train volunteers.
3	5.3.1	Periodically review progress toward recovery of all listed species and identify those species that require a change in status (downlisting, delisting, uplisting) or emergency actions.	3 months	USFWS	373.64					32.21	Cost assumes review every five years until recovery.
3	5.3.2	Revise maps of suitable species habitat and core area boundaries as new information becomes available.	Ongoing	USFWS	TBD						

V-32

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.

**Implementation Schedule for Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon**

Action Priority	Action Number	Action Description	Action Duration	Responsible Parties <sup>1</sup>	Cost Estimate (in \$1,000 units)					Comments/Notes	
					Total Costs	FY 1	FY 2	FY 3	FY 4		FY 5
3	5.3.3	Periodically review the status of species of concern and identify those species that require a change in status ( <i>e.g.</i> , listing).	3 months	USFWS	373.64					32.21	Cost assumes review every five years throughout life of recovery plan.
3	5.3.4	Evaluate progress towards completing recovery actions and adjust recovery implementation efforts accordingly.	3 months	USFWS	373.64					32.21	Cost assumes evaluation every five years throughout life of recovery plan.
Priority 1 actions subtotal: \$ 774,193,730											
Priority 2 actions subtotal: \$ 1,107,421,800											
Priority 3 actions subtotal: \$202,926,340											
Total Estimated Cost of Recovery through 2064: \$ 2,084,541,870 + additional costs that cannot be estimated at this time											

V-33

<sup>1</sup> Suggested primary participants listed.

<sup>2</sup> Action duration based on size of vernal pool region and the amount of time it might take one biologist to conduct a standardized survey of that area.