

**CENTRAL VALLEY PROJECT IMPROVEMENT ACT**  
**Section 3406 (b)(1) “other”**  
**HABITAT RESTORATION PROGRAM**

**PROJECT PLAN**

*Recovering species and habitats in California’s Central Valley*



h and Wildlife Service and  
au of Reclamation

**AUGUST 2003**

# PROJECT PLAN

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**I. Project Title:** Central Valley Project Improvement Act (CVPIA) Habitat Restoration Program Section 3406(b)(1)“Other”

**II. Responsible Entities:**

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**III. Background**

While many of the actions required by the CVPIA address anadromous fish and migratory waterfowl, subsection 3406(b)(1) of the CVPIA requires that, "... the Secretary shall make all reasonable efforts consistent with the requirements of this section [Sec. 3406. Fish, Wildlife and Habitat Restoration] to address other identified adverse environmental impacts of the Central Valley Project . . .". This provision allows for establishment of the Habitat Restoration Program, and its purpose, to protect, restore, and mitigate for past fish and wildlife impacts of the Central Valley Project (CVP) not already addressed by the CVPIA.

Over the last half-century, the biological resources of the Central Valley Basin have been significantly altered with the development of the CVP, the State Water Project, and many local water development projects. These projects have cumulatively resulted in the inundation of thousands of acres of upland, seasonal wetland, and riparian habitats by reservoirs; further impacts to wetland, riparian, and aquatic habitats downstream of reservoirs due to changes in timing and extent of river flows; and the conversion of upland and seasonal wetland habitats to agricultural use and/or municipal and industrial development. Construction of the CVP alone included 17 storage dams, 3 diversion dams, 1,437 miles of canals, 54 pumping plants, and 243 miles of drains, pipelines and tunnels. These facilities have contributed to the alteration of over 600 stream miles (Bureau of Reclamation, Army Corps of Engineers, 1991), inundation of over 100,000 acres of bottomland wildlife habitat (Department of Interior 1980), and the loss of an estimated 250,000 acres of wetland habitat (Fish and Wildlife Service 1989). Despite the loss in fish and wildlife habitat quality and quantity throughout the Central Valley, the opportunity still exists through this and other programs to improve the biodiversity of the Central Valley.

The geographic boundary and the scope of the Habitat Restoration Program (HRP) include the areas and species that were directly or indirectly affected by construction or operation of the CVP, in addition to natural resources which were subject to secondary impacts from the use of CVP project water. Direct effects pertain to impacts attributed to CVP facilities such as storage or diversion dams, canals, or pumping plants. Indirect effects are attributed to changes in the ecosystem which are a result of these structures. For example, degradation of wetland and riparian habitat downstream of a CVP dam due to a change in hydrologic conditions or changes in surface and groundwater from an altered flooding regime. Secondary impacts occur within a service area and are attributed to alteration in habitat, primarily from development which receives CVP water.

The HRP recently funded a habitat trend analysis to examine historical habitat losses in the Central Valley. The HRP contracted with the California State University, Chico Research Foundation (Department of Geography and Planning and the Geographical Information Center) to develop a set of historic natural vegetation maps for the Great Central Valley of California (GCV). Natural vegetation in the GCV was divided into eight classification types: valley foothill hardwood, chaparral, grassland, riparian, alkali desert scrub, wetlands, aquatic and other floodplain habitat. Developing these maps is now assisting Program Managers in defining restoration priorities, but is consider broader context of other information related to CVP impacts to species and habitats. It is important to note that the CVP is only one contributor to these changes. Mining, transportation, as well as industrial and urban development were and continue to contribute to these changes. This trend analysis can, however, be used as one of many tools in developing program priorities.

The following table indicates the findings of this habitat trend analysis, using the defined habitat types throughout the Central Valley:

**Valley wide Land Cover Changes**

	<b>1900</b>	<b>1945</b>	<b>1960</b>	<b>PRESENT</b>
<b>LAND COVER</b>	<b>acres</b>	<b>acres</b>	<b>acres</b>	<b>acres</b>
urban\agriculture	0	6,346,459	8,169,169	9,690,262
riparian	1,021,584	368,989	246,429	132,586
wetlands	2,040,766	793,907	544,645	133,261
aquatic	241,168	141,974	89,627	261,683
grassland	7,085,483	3,946,049	3,283,692	3,198,301
valley/foothill hardwood	1,165,114	873,315	805,828	852,767
alkali desert scrub	1,755,724	1,545,084	1,120,461	431,196
chaparral	3,469	3,467	3,293	11,254
other floodplain habitat	1,424,137	718,201	474,355	
<b>TOTAL</b>	<b>14737445</b>	<b>14737445</b>	<b>14737499</b>	<b>14,711,310</b>

**IV. Objectives**

**Protect and restore native habitats** impacted by CVP that are not specifically addressed in the Fish and Wildlife Restoration Activities section of the CVPIA. Initial focus will be on habitats known to have experienced the greatest percentage decline in habitat quantity and quality since construction of the CVP, where such decline could be attributed to the CVP (based upon direct and indirect loss of habitat from CVP facilities and use of CVP water). These habitats include riparian, aquatic (riverine, estuarine, and lacustrine), alkali desert scrub, wetlands (including vernal pools), foothill chaparral, valley-foothill hardwood, and grassland.

**Stabilize and improve populations of native species** impacted by CVP that are not specifically addressed in the Fish and Wildlife Restoration Activities section of the CVPIA. Primary focus will be species, other non-listed State and Federal species of special and other native wildlife species associated with the habitat native herptofauna associated with riparian and/or valley-Valley, native raptor species dependent upon valley-foothill and neotropical species that use riparian corridors for

(photo: R. Fabion)



given to federally-listed, proposed or candidate concern including resident fish and migratory birds, types listed above. Examples of the latter include foothill hardwood habitat throughout the Central hardwood and grassland for nesting and foraging, migration, nesting, and foraging.

## V. Types of Actions

The following types of activities will be emphasized under the Habitat Restoration Program through the prioritization and planning process discussed in Section VI:



- Implement habitat restoration, maintenance, and protection in partnership with willing landowners of agricultural and municipal lands.
- Coordinate and participate with ongoing State and Federal habitat restoration activities including, but not limited to, the California Bay-Delta Authority Ecosystem Restoration (ERP) processes, existing Department of Fish and Game (DFG) operations, and other CVPIA provisions such as the Land Retirement Program and the Anadromous Fish Restoration Program.
- Form partnerships with other agencies and the public including watershed conservancies, conservation groups, water districts, non-profit entities and private landowners to assure the greatest overall program benefit.

*Primary focus will be given to funding the following types of projects:*

- Acquire areas of existing habitat through purchase of fee title or conservation easements for native species impacted by the CVP.
- Maintaining, restoring, and enhancing priority habitats and habitat for priority species.
- Performing studies necessary to determine appropriate species and habitat-specific actions. Studies will generally receive a lower priority than implementation actions unless the study is a necessary precursor to an implementation action or to develop management plans for species or habitats.
- Assist in funding captive breeding and/or reintroduction of listed species, such as the riparian brush rabbit.

**Appendix A** lists projects previously funded by both the HRP and the Central Valley Project Conservation Program (CVPCP).

## VI. Program Coordination and Development

Mitigating for impacts to other species and their habitat affected by the CVP will require development of partnerships, local involvement, public support, and adaptive management flexibility. Prioritization of habitat types and species will be coordinated with technical experts. Development of specific actions to address priority habitats and species and their stressors will be coordinated with agencies, local organizations, and CALFED. Opportunities will be sought for the public to assist in planning and implementing restoration actions.

When applicable, projects will be coordinated with other CVPIA programs including the Anadromous Fish Restoration Plan [3406(b)(1)]; the Spawning Gravel and Riparian Habitat Programs [3406(b)(13)]; the Ecological and Hydrologic Modeling effort 3406(g); the Land Retirement Program [3408(h)]; and the San Joaquin and Stanislaus River Planning efforts [3406(c)]. Applicable Habitat Restoration Program projects will also be integrated with California Bay-Delta Authority ERP activities.

Projects will also be coordinated with other Federal, State, and private interests that have similar protection and restoration goals. For example, there are potentially many opportunities to develop joint partnerships through the Service's Private Lands Program, Natural Resource Conservation Service's Wetland Reserve Program, Reclamation's Wetland Program, Conservation Resource Management Plan projects, the Sacramento River Conservation Area, the Wildlife Conservation Board and other programs within the state provided that proposed activities meet the objectives of the HRP.

The HRP has been, and will continue to be, highly integrated with the CVPCP. The two programs share common goals and are both centered on improving conditions for species impacted by the CVP.

## VII. Proposal Submission

The Fish and Wildlife Service and the Bureau of Reclamation will consider proposals from parties interested in participating in the HRP. These proposals may be submitted to Program Managers at the beginning of each fiscal year (October). However, proposals will be accepted throughout the years.

As a minimum, proposals being considered for funding through the HRP should contain the following (see **Appendix B** for "example" proposal):

- *Title of Project*
- *A detailed written legal description of the project location including size and a project map including local reference points. Detailed description of the proposed activities. When relevant, include managing entity and who will be responsible for maintenance and monitoring.*

- *Surrounding land use activities to project area.*
- *Relationship between proposed activities and the CVP.*
- *Species to benefit from project activity, including federal and state status species.*
- *Cost estimate and breakdown by tasks.*
- *Other potential funding sources being considered and collaborators.*
- *Projected time frame for project implementation and completion.*
- *Name of principal investigator(s), address, and phone number.*
- *Habitat requirements of target species.*
- *Describe any suitable habitat for the species of concern in the project vicinity.*
- *Existing baseline conditions of habitats and species within and adjacent to project area.*
- *Status of existing or planned biological surveys on the project area, especially as they relate to listed species.*

All submitted proposals will be ranked by a Technical Team and in accordance with the proposal ranking criteria described below.

## **VIII. Proposal Ranking Criteria**

The following criteria are used to rank proposals:

### **CVP Nexus**

The criteria considers whether a “nexus” exist between the project proposal and the CVP. Generally a nexus is determined based on two factors:

1. Will benefits to a CVP affected species or resource occur within a CVP contract service area, or in an area where CVP water is delivered.
2. Is there a strong linkage between and affected habitat (i.e. vernal pools) and the CVP? This would allow, in some cases, for a project area to be outside a CVP Service Area as long this linkage between habitat types exist.

It is important to bear in mind that opportunities to most cost-effectively recover a species may not all be found within water districts, but, at the same time, there are recovery actions specifically identified within the CVP service area that should get preference when there are willing sellers or the conditions necessary to move forward are otherwise suitable for implementation of such tasks, and other considerations are equally beneficial to the resource.

### **Listed Species/Baseline Benefits:**

This criterion is used to distinguish between projects that have specific benefits to species that are currently Federally listed, as opposed to proposals with broader ecological benefits. The criterion asks the following question: Does the proposal provide a major, moderate, or minimal benefit to the baseline for CVP-affected species and especially for High Priority Action Species? The more listed species, and the greater the benefit, the higher the score the proposal is given.

Existing Recovery Plans should be consulted to determine whether an action within a proposal can be correlated with Recovery Plan tasks. This correlation can be used as a tool for determining the scale of benefit that would result from implementation of the proposal.

A "major" benefit to baseline would be an activity whereby species numbers or habitats are markedly improved, such as a restoration project which targets listed species (creating giant garter snake habitat), a captive breeding (riparian brush rabbit), or a seed banking program, etc... A "moderate" benefit may be a general habitat restoration that has some real but not significant benefits to listed species (a riparian restoration project in which elderberry are planted in conjunction with other riparian species). A project with "minimal" or "maintenance" affects on a species baseline might be a project such as a fee title or easement acquisition, absent of restoration or active management, where known populations are protected from encroaching land uses.

This criterion has the particular merit of highlighting projects that represent rarer opportunities over other projects that benefit resources that can wait longer (or be funded by other sources).

### **Proposed/Candidate**

This criterion is used to distinguish between projects that have benefits to species that are currently being considered for listing, in addition to any other kind of ecological benefit.

### **Targeted Species**

This criterion is used to distinguish between projects that have benefits to other native species of concern that may become listed in the future due to their situation, as opposed to any other kind of ecological benefit. Please note that there were several non-listed species that were considered to have a high priority for conservation funding due to the effects of the CVP. These included the California red-legged frog, which is now listed, the California tiger salamander, the status of which is being investigated at this time, and the tri-colored blackbird, which has undergone serious and continuing declines, though it is not considered by the Service to be threatened with extinction at this time.

### **Multiple Habitats**

This criterion is used to distinguish between projects that have benefits to ecosystems that currently support a habitat matrix composed of habitat components that complement each other in ways that increase their value to conserving native species beyond what each habitat would do separately, as opposed to projects that would not have that kind of benefit.

### **Cumulative Benefit**

This criterion is similar to project connectivity, but indicates that the project will provide benefits that are even more valuable because they cross a threshold such as enabling fire management of a preserve to become markedly less difficult due to ease of establishing an appropriate rotation of controlled burns, providing space enough to ensure that the ecosystem will supply sufficient resources of some kind that are necessary to a species, allow a population to withstand an epizootic or epiphytotic disease event more safely, or otherwise can support enough individuals to assure long-term viability of a population or species.

### **Long-term Benefit**

This criterion is used to distinguish between projects that have benefits that are expected to continue in perpetuity, as opposed to projects that address an immediate problem, but may become superfluous to the long term conservation of Central Valley ecosystems and native species due to later projects and conservation measures.

### **Project Connectivity**

This criterion is used distinguish between projects that have synergistic benefits because it benefits habitats that are in proximity to other protected habitat areas, rather than isolated at this time.

### **Partners**

This criterion distinguishes projects where there will be contributions of cash or in-kind services toward the total cost of the project.

### **Maintain/Enhance Biodiversity**

This criterion is used to distinguish between projects that have benefits to ecosystems that currently support a large proportion of the native species expected in the habitats to be benefitted, particularly in habitats that have greatly declined elsewhere, in addition to other kinds of ecological benefit.

The criterion relates to the array of native species on the proposal's project site, and is not limited to listed species. It can apply to proposals that would protect a diverse area and/or increase diversity through restoration.

### **CVP Impacts**

This criterion serves to indicate whether a species, habitat, or ecosystem has been affected by the CVP. For endangered species it includes direct, and indirect, effects. Basically, the CVPCP and CVPHRP are charged with addressing these effects in proportion to the degree of effect, and to share responsibility with other persons and agencies appropriate to the resource in question.

### **Cost Effectiveness**

This gauges the relative magnitude of benefits per dollar spent by the program. All other things being equal, a project with more “bang for the buck” will be favored over another with less benefits.

### **Immediacy(degree of imminent threat)**

This criterion is used to distinguish projects that have some factor which will imminently change the likelihood of recovery of an ecological value substantially, either beneficially or detrimentally. This includes such factors as buyers who are interested in converting habitat; the opportunity to establish a “seed” preserve in an area that has been identified as important to recovery; and management measures that offset threats that may extinguish a species, extirpate an important population, or result in large declines in numbers. This criterion can also be applied to the immediate threats facing a particular species, and poses the question: “Will a proposal protect a species from an imminent threat to its existence?”

## **IX. HRP Budget**

This is a continuing program initially commenced in FY96. It will have a continuing Department of Interior budget of approximately \$1-\$2 million/year for project implementation.

## **X. Funding Sources - Including But Not Limited To:**

*Federal* - Reimbursable funds including the Department of the Interior's Restoration Fund within section 3407 of the CVPIA, Category III under the Delta/Bay Accord, CALFED

*State* - DFG, Wildlife Conservation Board, Department of Water Resources as appropriate

*Other* - National Fish and Wildlife Foundation, private cost share

Funding sources will be specified in each proposed project.

## **XI. Estimated Benefits of this Program**

Successful implementation of this program will assist in the restoration, protection, and mitigation for wetland, upland, and riparian habitats throughout the Central Valley Basin; provide an increase in fish and wildlife populations dependent on these habitats; and, assist in the maintenance of ecological functions and biodiversity of associated ecosystems. The program will serve to avoid possible future listings under the Endangered Species Act, possibly assist in the de-listing or down-listing of species dependent on these habitat types, and facilitate future Endangered Species Act compliance activities. Each project proposal will specify how program objectives and benefits will be met.

## **XII. Measure of Success/Monitoring**

All actions undertaken within this program will be monitored for results. Each action proposal will contain a proposal for monitoring affects and will allow for program modifications as a result of monitoring to insure desired benefits. It may be necessary for local entities, including NRCS, BLM, and DFG to assist in the measurement of success of any action item.

## References

U.S. Army Corps of Engineers, 1991. Aerial Atlas: Collinsville to Shasta Dam.

U.S. Bureau of Reclamation. San Joaquin River Atlas.

U.S. Department of the Interior, Water and Power Resources Service. 1980. Draft Environmental Statement on the Reauthorization of the CVP and the Coordinated Operating Agreement for CVP-SWP.

U.S. Fish and Wildlife Service. June 1989. Wetlands of the California Central Valley: Status and Trends - 1939 to Mid-1980's. 29 pp.

U.S. Water Resources Council. June 1971. Comprehensive Framework Study – California Region. Appendix 5: Water Resources.

**APPENDIX A**

**CVPCP and (b)(1) "other" Projects**

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd	
96	Valensin Ranch	Sacramento	10,750,000	FWS		1,250,000 <sup>1</sup>	4,356  (580 Fee Title, 180 Conservation Easement)	GL HW RI VP	VPFS VPTS CTS	ACQ RS	TNC, NAWC, BDCP, CDPR, CWCB, CalTrans, FHA, NFWF DFG, NRCS, AFT, CUWA			
97	Buena Vista Lake Shrew	Tulare		USBR	53,500 <sup>1</sup>					BVLS	SUR	ESRP, CDFG		
97	California Red-Legged Frog	Sierra	37,500	FWS		37,500 <sup>1</sup>				CRLF	SUR RS			
97	Doyens Dune Weevil	Kings		USBR	10,000 <sup>1</sup>					DDW	SUR	ESRP, CalTrans	8/98	X
97	Giant Garter Snake	Colusa	486,500	FWS		201,500 <sup>1</sup> 200,000 <sup>1</sup> 5,000 <sup>1</sup>	450	WL UP	GGG	RS SUR SU	DU, CWA, SCI, SacNWRC, USGS-BRD (50,000)	1/1/99 1/1/00 12/31/00		
97	Jensen Ranch	Fresno	5,273,250	USBR	3,168,250 <sup>1</sup> 200,000 <sup>1</sup>		167	RI	VELB	ACQ RS	FWUA, CTC, WCB (200,000), SJRC, TPL, SJRPCT, CalTrans (1,700,000)			
97	Keck's Checkerbloom & Vasek's clarkia	Kings	22,000	USBR	22,000 <sup>1</sup>					KC VC	SUR	SFC, ESRP, BLM		
97	Large Flowered Fiddleneck (Lawrence Livermore Nat'l Lab)	Contra Costa Alameda	158,500	FWS		73,500 <sup>1</sup>	50'x50' Native Site  100'x100' Exp Site		LFF	MON RS	DOE	3/15/98 9/15/98 4/15/99 9/30/99 1/15/00	X X X X	
97	Livermore Hydrology Study (Palmate-bracted)	Alameda	80,000	USBR	50,000 <sup>1</sup>			AKS	PBBB	RES SU	City of Livermore, Alameda County	9/30/98 12/31/98	X X	

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
	birds beak)											3/31/99	X
97	Pine Hill Ecological Reserve Gabbroic Northern Mixed Chaparral	El Dorado	4,500,000 (13,220,000 for entire Reserve System)	FWS		1,007,800 <sup>1</sup> 500,000 <sup>1</sup>	180 acres  (5,000 acre Cameron Park)	CH HW	LB PHC PHF SMG	ACQ	DFG,EID, ELDCounty, NFWF, BLM, CalTran, ARC (2,286,000)		
97	Riparian Brush Rabbit/ Riparian Wood Rat	San Joaquin Valley		USBR	85,000 <sup>1</sup> 30,000 <sup>1</sup>		258	HW RI	RBR RWR	SUR RS	DFG, ESRP, CDPR, CDF, Ripon Fire Dept		
97	Sacramento River Modeling	Glenn Colusa	40,614	FWS		40,614 <sup>1</sup>				SU			X
97	San Joaquin Kangaroo Rat	Kings		USBR	10,000 <sup>1</sup>				SJKR	SUR	CDFG	1/00	X
98	Allensworth Ecological Reserve	Tulare Kern	On-going	USBR	160,000 <sup>1</sup>		~200 ~200	AKS VP	SJKF BNLL SJKR	ACQ	DFG, WCB	Mgmt Plan	
98	Buttonwillow Ecological Reserve	Kern	3,500	USBR	3,500 <sup>1</sup>		1,200			SU		7/1/99 7/1/00 9/1/00	
98	Fresno Kangaroo Rat Lemoore Naval Air Station	Kings	20,000	USBR	20,000 <sup>1</sup>				FKR	SUR	DOD, BLM, ESRP		
98	Howard Ranch	Sacramento	14,300,000	FWS		101,500 <sup>1</sup>	13,000	VP WL HW GL	VPFS VPTS CTS	ACQ	SWRCB, Packard, WCB (100,000), TNC(1,900,000)	Mgmt Plan	
98	Livermore Palmate-bracted Birds Beak	Alameda	1,270	USBR	1,270 <sup>1</sup>			AKS	PBBB	SU			
98	Retrospective Habitat Trend Analysis (GIS)	CVP-Wide	83,000	FWS		25,000 <sup>2</sup>				RES	California State University, Chico	Bimonthly Maps 5/30/99 7/1/99 8/15/99	X X X
98	Spivey Pond Red-Legged Frog	El Dorado	310,000 (purchase price) 379,269 (acq. &	USBR	100,000 <sup>1</sup> 50,000 <sup>4</sup> 31,000 <sup>3</sup>		54	RI CF WL	CRLF	ACQ RS	NFWF (49,000), WCB, ARC,USFS BLM, ELDCounty, EID, DFG	Mgmt Plan	

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
			restore)										
98	Springtown Alkali Sink Unit (Livermore)	Alameda	On-going	USBR	70,000 <sup>1</sup>		Unknown	AKS		ACQ	City of Livermore (1,000,000)		
98	Wells Fargo (Simon-Newman & Romero Ranches)	Stanislaus Santa Clara Merced	19,100,000	USBR	1,300,000 <sup>2</sup>		61,043 SN=32,997 R = 28,046	RI GL HW	SJKF VELB	CE	TNC, DWR, WCB, NFWF (17,800,000)	2/28/99 CE	
99	Allensworth Ecological Reserve	Tulare Kern	on-going	USBR	150,000 <sup>3</sup>			AKS VP	SJKF BNLL SJKR	ACQ	DFG, WCB	Mgt. Plan	
99	Denny Ranch/Inks Creek	Tehama	1,460,074	USBR	480,000 <sup>3</sup>		13,000	VP RI HW GL	VPFS VPTS CTS	CE	NFWF, Packard, TNC	Report every 3 years	
99	Effie Yeaw Endangered Species Exhibit	Sacramento	60,000	USBR	10,000 <sup>2</sup> 5,000 <sup>3</sup>					D&D	ARNHA		
99	Herbert Ranch	Tulare	1,250,000	USBR	400,000 <sup>2</sup> 10,000 <sup>4</sup> 30,000 <sup>3</sup>		725	VP GL	CTS VPFS VPTS	ACQ	FCLT, WCB (215,000), Packard (625,000) EPA, WDP		
99	Howard Ranch	Sacramento	14,300,000	FWS		198,500 <sup>2</sup>	13,000	VP WL HW GL	CTS VPFS VPTS	ACQ	SWRCB, Packard, WCB, TNC	Mgt. Plan	
99	King's River Ranch-Tivy Mtn Keck's Checkerbloom	Fresno	74,500	USBR	72,000 <sup>3</sup>		40	GL	KC	ACQ	SFC		
99	Knapton-Sheilds -Tivy Mtn Keck's Checkerbloom	Fresno	103,402.88	USBR	103,402.88 <sub>3</sub>		40	GL	KC	ACQ	SFC		
99	Large-flowered fiddleneck	Contra Costa Alameda		USBR	25,000 <sup>3</sup>			GL	LFF	MON RS	DOE	9/30/99 1/15/00	X
99	Nickell Property Sand Ridge	Tulare	1,430,220	USBR	173,000 <sup>2</sup>		455	AKS GL	SJKF BNLL	ACQ	BLM, LRP		
99	Retrospective Habitat Trend Analysis (GIS)	CVP-Wide	83,000	FWS		54,000 <sup>2</sup>				RES	California State University, Chico	Bimonthly Maps	

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
												5/30/99 7/1/99 8/15/99	X X X
99	Riparian Brush Rabbit	Stanislaus	358,000	USBR	82,000 <sup>2</sup> 276,000 <sup>3</sup>			HW RI	RBR	SUR MGT CST	CDFG, DWR, CDPR		
99	Sacramento River Modeling <b>(Transferred to Allensworth Fy00)</b>		40,000	FWS		49,932 <sup>2</sup>		RI		MOD	CDFG		
99	Silva Property Vernal Pools (Sacramento Valley Open Space Conservancy)	Sacramento	800,000	FWS		400,000 <sup>2</sup>	80 (160 total, 80 mitigation bank)	VP	VPFS VPTS	ACQ	Packard (300,000) Sac County ( 90,000) Great Valley Ctr (10,000)		
99	Simon-Newman & Romero Ranches (Wells Fargo)	Stanislaus Santa Clara Merced	19,100,000	USBR	500,000 <sup>3</sup>		61,043 SN=32,997 R = 28,046	RI GL HW	SJKF VELB	CE	TNC, DWR, WCB, NFWF (17,800,000)	2/28/99 CE	
99	Spivey Pond Red-Legged Frog	El Dorado	1,505,000 <i>not fully funded</i>	USBR	8,205 <sup>2</sup>		54	RI DF RH	CRLF	ACQ RS	NFWF (49,000), WCB, ARC,USFS BLM, ELDCounty, EID, CDFG	Mgt. Plan	
99	Stillwater Ecological Reserve	Shasta		USBR	310,000 <sup>3</sup>			VP GL	VPFS VPTS	ACQ	WCB, CDFG		
99	Vernal Pool Poster	CVP-wide	15,000	USBR	5,000 <sup>3</sup>	2,000 <sup>2</sup>				D&P	SCCAO		
00	Allensworth	Tulare Kern	on-going	USBR	200,000 <sup>3</sup>	49,932 <sup>2</sup>		AKS GL	SJKF BNLL SJKR	ACQ	CDFG, WCB	Mgt. Plan	
00	Folsom O & M Manual	Sacramento El Dorado Placer Stanislaus		USBR	15,000 <sup>3</sup>					D & D			
00	Foor Ranch	Tehama	~2,500,000	USBR	450,000 <sup>3</sup>		10,000	VP GL	VPFS VPTS	CE	TNC		
00	Furey Ranch	Merced		USBR	350,000 <sup>3</sup>		391 (250 ac. GL/VP med-hi density)	VP GL	VPFS VPTS	CE	TNC, MCFOST, Great Valley Center	Yearly 8/31/00-05 Every 3 years 2008-2020	8/00

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
00	George Dairy	Sacramento		USBR	360,000 <sup>3</sup>		109.82	WL	GGs	CE RS	TNC, CDFG	CE 9/2001 Rest. & Mgmt Plan due 12/31/01 Yearly reports 2000-2005	
00	Giant Garter Snake Census	Colusa	38,000	FWS		38,000 <sup>2</sup>		WL	GGs	SUR	Sacramento NWR		
00	Herbert Ranch	Tulare	1,250,000	USBR	125,000 <sup>2</sup>		725	VP	VPFS VPTS CTS	ACQ	FCLT, WCB (215,000), Packard (625 ,000) EPA, WDP		
00	Hunt Property – Tivy Mtn Keck's Checkerbloom	Fresno	38,000	USBR	38,000 <sup>3</sup>		40	GL	KC	CE			
00	DeLeon Property –Tivy Mtn Keck's Checkerbloom	Fresno	100,000	USBR	100,000 <sup>3</sup>		50	GL	KC	ACQ	SFC		
00	Llano Seco Riparian Restoration	Colusa	400,000	FWS		150,000 <sup>2</sup>	206	GL WL	VELB YBC	RS			
00	Pine Hill Preserve	El Dorado		USBR	750,000 <sup>2</sup>		90	UP CH	LB PHC PHF SMG	ACQ			
00	Retrospective Habitat Trend Analysis (GIS)	CVP-wide	83,000	FWS		4,000 <sup>2</sup>				SU	California State University, Chico		
00	Riparian brush rabbit genetic study	Stanislaus	92,257	USBR	92,257 <sup>2</sup>			HW RI	RBR	SU SUR			
00	Riparian brush rabbit pen construction	Stanislaus	167,500	USBR	126,000 <sup>3</sup> 41,500 <sup>2</sup>				RBR	D&D			
00	Riparian brush rabbit Christman Island Refugia (move fill)	Stanislaus	101,000	USBR	101,000 <sup>3</sup>			RI	RBR	RS			
00	Schneider	Sacramento	400,000	USBR	292,000 <sup>2</sup> 108,000 <sup>3</sup>		1,136 total	VP GL	VPFS VPTS	CE	TNC, WCB		

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
00	Southam Property	Colusa	on-going	USBR	300,000 <sup>3</sup>		73	RI	VELB CTS	RS	TNC...	on-going	
00	Stone Corral Ecological Reserve	Tulare	405,780	USBR	200,000 <sup>3</sup> 100,000 <sup>2</sup> 100,000 <sup>3</sup>		96	VP UP	VPFS VPTS CTS	ACQ	WCB, CDFG	w/in 30 days of closing	
00	Stone Lakes National Wildlife Refuge - Samra Property	Sacramento	1,982,470	FWS		939,698 <sup>2</sup>	100	Vineyard	GGG	ACQ	Packard (693,500) NFWF (201,050) City of Sacramento	Mgt. Plan	
01	Fenwood Property	Shasta	1,500,000	USBR	300,000 <sup>3</sup> 300,000 <sup>2</sup>		2,160	RI	VELB	RS	TPL, Shasta Land Conservancy, EPA, NRCS, CalTrans, NFWF		
01	Carter Property – Tivy Mtn Keck's checkerbloom	Fresno	62,500	USBR	62,500 <sup>3</sup>		40	GL	KC	ACQ	SFC		
01	Mount Hamilton Fencing	Merced	375,000	USBR	175,000 <sup>3</sup>			RI	VELB	RS	TNC, FWS, Grove Foundationn Lemmox Foundation		
01	Cunningham Ranch	Merced	1,800,000	USBR	480,000 <sup>3</sup>		3,800	GL VP	VPFS VPTS CTS	CE	TNC, CRT, WCB,		
01	Pine Hills Ecological Reserve	El Dorado	896,000	USBR	250,000 <sup>3</sup>		49	CH	LB PHC PHF SMG	ACQ	ARC, BLM		
01	Riparian Woodrat	Stanislaus	89,654	USBR	89,654 <sup>3</sup>			RI	RWR	SU	ESRP		
01	Farmington Property	San Joaquin	On-going	USBR	325,000 <sup>3</sup> 300,000 <sup>2</sup>		960	GL VP	N/A	CE	SJCOG, Inc.		
01	Giant Garter Snake Monitoring	Colusa		FWS		67,570 <sup>2</sup>		WL	GGG	SU	USGS		
01	GIS Habitat Trend Analysis	CVP-wide		FWS		14,656 <sup>2</sup>				SU	Chico State Univ.		
01	Herbert Ranch Management Plan and Restoration	Tulare	25,000	USBR	25,000 <sup>2</sup>		100	GL VP	VPFS VPTS CTS	MGT RS	SLTLT NRCS		
01	Llano Seco Restoration	Colusa	158,721	FWS		158,721 <sup>2</sup>	206 (see '00 project)	RI	VELB	RS	Sac River Partners		
01	Beach 47 Property –	Fresno	122,000	USBR	122,000 <sup>3</sup>		57	GL	KC	ACQ	SFC		

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
	Tivy Mtn Keck's checkerbloom												
01	Ben Brown Ranch	Sacramento	406,800	USBR	20,000 <sup>2</sup> 10,000 <sup>4</sup>		370	GL VP	VPFS VPTS CTS	CE	TNC, private funding		
01	Allensworth Ecological Reserve Fencing materials	Tulare Kern	12,000	USBR	12,000 <sup>3</sup>			AKS	SJKF BNLL SJKR	MGT	CDFG		
01	Riparian Brush Rabbit	Stanislaus		USBR	23,000 <sup>3</sup>			RI	RBR	MGT	ESRP		
01	Sac River Properties Boeger (150k) and Ward	Colusa		FWS		345,220 <sup>2</sup>	129 (B) 238 (W)	RI	VELB YBC	ACQ	TNC		
02	Bakersfield Cactus	Kern		USBR	\$16,985 <sup>3</sup>			AKS	BC	MGT	ESRP		
02	Ben Brown Ranch	Sacramento	\$406,800	USBR	\$70,000 <sup>3</sup>		370 (see '01 project)	GL VP	VPFS VPTS CTS	ACQ	TNC, Private		
02	Butte Co. Vernal Pools -Schmidbauer Property	Butte		FWS	\$325,000 <sup>3</sup>	\$161,000 <sup>2</sup>	264	GL VP	BCM VPFS VPTS	ACQ	Nor Cal Reg. Land Trust		
02	Chico Landing	Butte		USBR	\$256,917 <sup>3</sup>		161	RI	VELB	RES	TNC		
02	Cowell Ranch	Contra Costa	13,500,000	USBR	\$495,000 <sup>3</sup>		3,650	GL VP RI	SJKF CRLF	ACQ	TPL, CDPR, California Coastal Conservancy, WCB		
02	Deer Creek Hills	Sacramento		USBR	\$250,000 <sup>3</sup> \$200,000 <sup>2</sup>		2,054	GL HW	VELB	ACQ	SVOSC, WCB, CalTrans, Sac Co. Regional Parks, CalFed		
02	Giant Garter Snake - Grasslands Water District	Merced		FWS		\$157,760 <sup>2</sup>		WET	GGG	SU	GWD		
02	Giant Garter Snake – San Luis NWR (Grasslands)	Merced		FWS		\$53,200 <sup>2</sup>		WET	GGG	SU	FWS		
02	Giant Garter Snake – Colusa NWR	Colusa		FWS		\$38,060 <sup>2</sup>		WET	GGG	MON	USGS		
02	GIS Habitat Trend Analysis	Cent. Valley		FWS		\$20,000 <sup>2</sup>				SU	CSU Chico		
02	Kit Fox Grazing Study	Kern		USBR	\$60,000 <sup>3</sup>			GL	SJKF	SU	ESRP, USGS, CalTrans		

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
02	Large-Flowered Fiddleneck – Habitat Suitability Study	San Joaquin		USBR	\$40,000 <sup>3</sup> \$25,000 <sup>3</sup>			GL	LFF	SU	DOE		
02	Llano Seco	Colusa	\$74,995	FWS		\$74,995 <sup>2</sup>	Maintenance	RI	VELB YBC	RS	Sac River Partners		
02	Pine Hills Ecological Reserve	El Dorado	\$1,044,000	FWS	\$400,000 <sup>2</sup>		157	CH	LB PHC PHF SMG	ACQ	ARC		
02	Riparian Brush Rabbit –Captive Reproduction	Stanislaus		USBR	\$ 53,000 <sup>3</sup> \$218,000 <sup>2</sup>			RI	RBR	RS	ESRP		
02	Riparian Brush Rabbit –Caswell	Stanislaus		USBR	\$155,320 <sup>3</sup>			RI	RBR	RS	CDPR		
02	Sun River Wetland Restoration	Sacramento	\$2 million +	USBR	\$285,000 <sup>3</sup>		537	WET UP	GGs	RS	WCB, CWA		
02	Toledo Basin – Tricolored Blackbirds	Tulare		USBR	\$28,000 <sup>3</sup>		40	WET	TCB	MGT	LTRID, WDP, CDFG, FWS		
03	Zee Enterprises	El Dorado		USBR	\$450,000 <sup>3</sup>		229	CH HW	LB PHC PHF SMG	ACQ	EID, WCB, Private		
03	Seed Collection-Endemic Gabbro Soil Plants	El Dorado		USBR	\$25,000 <sup>3</sup>			CH	LB PHC PHF SMG	PROP			
03	Wong Property	Sacramento		USBR	\$378,000 <sup>3</sup>		146		GGs VPFS VPTS				
03	Pine Creek Restoration	Butte		USBR	\$100,000 <sup>3</sup>		65	RI	LB PHC PHF SMG	RES			
03	Riparian Brush Rabbit – Captive Breeding and Reintroduction - 2004	Stanislaus		USBR	\$400,000 <sup>3</sup>			RI	RBR	PROP			
03	Effects of grazing on at-risk species in the San Joaquin Valley	Kern		USBR	\$45,000 <sup>3</sup> \$45,000 <sup>3</sup>			GL	SJKF BNLL SJKR				

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
03	Southam Restoration	Glenn		USBR	\$192,609 <sup>3</sup>		65	RI	VELB	RS			
03	Effie Yeaw Nature Center Wetlands Exhibit	Sacramento		USBR	\$2,833 <sup>3</sup>			WL		EX			
03	Endangered Species Conservation Opportunities in the Central Valley Conference	Valley Wide		FWS		~\$10,000 <sup>2</sup>				CONF			
03	Giant Garter Snake Surveys (Colusa NWR)	Colusa		FWS		\$70,900 <sup>2</sup>		RI WL	GGs	SUR			
03	Giant Garter Snake Surveys Cottonwood Creek	Tehama Butte		FWS		\$40,000 <sup>2</sup>		RI WL	GGs	SUR			
03	Giant Garter Snake Surveys San Luis NWR	Merced		FWS		\$45,000		RI WL	GGs	SUR			
03	Southern Water Snake Surveys	Sacramento El Dorado Placer		FWS		\$70,000 <sup>2</sup>		RI WL	GGs	SUR			
03	Forster Property	San Joaquin		FWS	\$179,585 <sup>2</sup> \$ 80,000 <sup>3</sup>	\$294,000 <sup>2</sup>	2,865	VP GL	VPFS VPTS CTS	CE	WCB, Packard, TNC, FWS		
03	Riparian Brush Rabbit	Stanislaus		USBR	\$230,000 <sup>2</sup>			RI	RBR	SU SUR	CDFG, FWS, CALFED		
03	Palmate-bracted birds beak demographic monitoring	Fresno Alkali Sink ER		USBR	\$50,000 <sup>2</sup> \$46,000 <sup>2</sup>			AKS	PBBB	SU SUR			
03	Pond Construction for Red-legged Frog	El Dorado		USBR	\$130,000 <sup>2</sup>			WL CF RI	CRLF	CST	BLM		
03	Buena Vista Lake Shrew Surveys and genetics	Kern, Tulare, Kings, Fresno		USBR	\$52,800 <sup>2</sup>			RI WL UP	BVLS	SU SUR	SCAO		
04	Bron Conservation Easement	Fresno		USBR	\$48,000 <sup>3</sup>		20	GL	KC	CE	SFC		
04	Ansin Property	Kern		USBR	\$460,000 <sup>3</sup> \$372,000 <sup>2</sup>	\$169,000 <sup>2</sup>	5,810	AKS GL VP	SJKF BNLL	ACQ	BLM, TNC		

YR	Project	County	Total Cost	Lead	USBR	FWS	Acres	Habitat Type	Focus Species	Action	Partners	Report Due Date	Rec'd
04	Bayou Vista Property	Tulare		USBR	\$456,000 <sup>3</sup>		515	AKS GL	SJKF TKR	ACQ	SRT, USFWS		
04	Coyote/Kit Fox Grazing Study	Kern		USBR	\$44,409 <sup>3</sup>			AKS GL	SJKF	SU	ESRP, USGS, CalTrans		
04	Kit Fox Reintro Study			USBR	\$76,012 <sup>3</sup>			GL	SJKF	SU			
04	Pine Hills Preserve Manager	El Dorado		USBR	\$100,000 <sup>3</sup>			CH	LB PHC PHF SMG	MGT	ED County, EDWD		
04	Giant Garter Snake Surveys San Luis NWR	Merced		FWS		\$237,879 <sup>2</sup>		RI WL	GGs	SUR	USFWS, CDFG		
04	Giant Garter Snake Surveys (Colusa NWR)	Colusa		FWS		\$88,619 <sup>2</sup>		RI WL	GGs	SUR	USFWS		
04	Adaptive Veg Mgmt. on Serpentine soils	Santa Clara		FWS		\$32,300 <sup>2</sup>		GL (serp)	BCB	SU			
04	Ohm Unit Restoration	Tehama		USBR	\$62,500 <sup>2</sup>		206	RI	VELB	RS	USFWS		
04	Drumheller Unit Restoration	Glenn		USBR	\$325,000 <sup>2</sup>		226	RI	VELB	RS	USFWS		
04	Fine Gold Creek Property	Madera		USBR	\$350,000 <sup>2</sup>		708	RI HW	VELB	ACQ	CDFG, PG&E WCB		
04	Joint Venture Web Page			USBR	\$31,000 <sup>2</sup>					D&D	CVJV		

## **Funding Program**

<sup>1</sup>(b)(1) [other] and Conservation Program

<sup>2</sup> (b)(1) [other]

<sup>3</sup>Conservation Program

<sup>4</sup> Wetlands Program

## **Partners**

AFT- American Farmlands Trust  
ARC - American River Conservancy  
ARNHA-American River Natural History Association  
BDCP-Bay-Delta California Program  
BLM-Bureau of Land Management  
BOR-Reclamation  
CalTrans- California Transportation Department  
CDFG-California Department Fish and Game  
CDPR-California Department of Parks and Recreation  
CF-Conservation Fund (Herbert)  
CRT – California Rangeland Trust  
CTC- California Transportation Commission  
CUWA-California Urban Water Agencies  
CWA - California Waterfowl Association  
CVJV-Central Valley Joint Venture  
CWCB-California Water Conservatin Board

DOE- Department of Energy  
DU - Ducks Unlimited  
DWR- Department of Water Resource  
EID-El Dorado Irrigation District  
ELDCounty- El Dorado County  
EPA – Environmental Protection Agency  
ESRP- Endangered Species Recovery Program  
FCLT- Four Creeks Land Trust  
FHA-Federal Highway Administration  
FWS-Fish and Wildlife Service  
FWUA-Friant Water Users Association  
LTRID – Lower Tule River Irrigation District  
MCFOST-Merced County Farmland and Open Space Trust  
NAWC-North American Wetlands Council  
NFWF- National Fish and Wildlife Foundation  
NRCS-Natural Resource Conservation Service

Packard-Packard Foundation  
SacNWRC-Sacramento National Wildlife Refuge Complex  
SCCAO – South Central California Area Office (USBR)  
SCI- Safari Club International  
SJCOG, INC. –San Joaquin Council of Governments  
SFC- Sierra Foothil Conservancy  
SJRC-San Joaquin River Conservancy  
SJRPCT-San Joaquin River Parkway and Conservancy Trust  
SNWRC-Sacramento National Wildlife Refuge Complex  
TNC-The Nature Conservancy  
TPL-Trust for Public Land  
USFS- United States Forest Service  
USGS-BRD United States Geological Survey - Bioloical Resource Division  
WCB-Wildlife Conservation Board  
WDP- Wetland Development Program

## **Habitat Types**

AKS-Alkalai Sink  
CF- Coniferous Forest  
CH- Chapparral

GL-Grassland  
HW - Hardwood  
RI - Riparian

UP - Uplands  
VP – Vernal Pool  
WL – Wetland

## **Focus Species**

BCB-Bay Checkerspot Butterfly  
BC-Bakersfield Cactus  
BCM-Butte Co. Meadowfoam  
BNLL-Blunt nosed Leopard Lizard  
BVLS-Buena Vista Lake Shrew  
CRLF-California red-legged frog  
CTS-California Tiger Salamander  
DDW-Doyen's Dun Weevil  
EDB-El Dorado Bedstraw  
FKR-Fresno Kangaroo Rat

LFF-Large-flowered fiddleneck  
LB-Layne's butterweed  
PBBB-Palmate-bracted birds beak  
PHC-Pine Hill Ceanothus  
PHF-Pine Hill Flannelbush  
RBR-Riparian Brush Rabbit  
RWR-Riparian Woodrat  
SMG-Stebbins Morning Glory  
SJKR-San Joaquin Kangaroo Rat

TKR-Tipton Kangaroo Rat  
VELB-Valley Elderberry Longhorn Beetle  
VC-Vasek's Clarkia  
VPFS-Vernal Pool Fairy Shrimp  
VPTS-Vernal Pool Tadpole Shrimp  
YBC-Yellow-billed Cuckoo

GGG-Giant Garter Snake  
KC-Keck's Checkerbloom

SJKF-San Joaquin Kit Fox  
TCB-Tri-colored Blackbird

**Action**

ACQ - Acquire  
CE - Conservation Easement  
CONF - Conference  
CST- Construction  
D&D - Development & Design  
D&P - Design & Print  
EX - Exhibit Design and Construction  
MGT - Management  
MON - Monitoring  
PROP - Propagate/Collect seeds  
RES - Research  
RS - Restoration  
SU - Study  
SUR - Survey

**APPENDIX B**

**RESEARCH PROPOSAL  
FOR FISCAL YEAR 2003**

**Effects of Livestock Grazing on a Community of Species at Risk of  
Extinction in the San Joaquin Valley, California.**

**Submitted to:**

**Central Valley Project Conservation Program  
Sacramento, CA**

**by**

**Dr. David Germano**

**Department of Biology  
California State University, Bakersfield  
9001 Stockdale Highway  
Bakersfield, CA 93311-1099**

**January 13, 2003**

## PROJECT SUMMARY

This research project is designed to determine whether annual grasslands in the San Joaquin Valley can be managed with livestock grazing for the benefit of several endangered and threatened species. Species targeted in this study include the blunt-nosed leopard lizard (*Gambelia sila*), giant kangaroo rat (*Dipodomys ingens*), short-nosed kangaroo rat (*Dipodomys nitratooides brevinasus*), San Joaquin antelope squirrel (*Ammospermophilus nelsoni*), and Kern mallow (*Eremalche kernensis*). Abundances of these and other species will be compared between grazed treatment plots and ungrazed control plots in the Lokern Natural Area of western Kern County, California. The study has been in progress since 1997 and is expected to continue for at least 2 more years. We request \$45,000 from the Central Valley Project Conservation Program to cover small mammal trapping and vegetation monitoring during 2003. Other costs are being covered by partner agencies, including the California Department of Fish and Game. Agricultural conversion facilitated by the Central Valley Project has contributed to the decline of all the animal species targeted in this study. The Central Valley Project could contribute to recovery of these and other listed and rare species of the San Joaquin Valley by helping to fund this project. This research will be directly applicable to the management of species at risk and annual grasslands within the greater San Joaquin Valley ecosystem, not just in the Lokern area.

## PROJECT DESCRIPTION

### Introduction

The San Joaquin Valley of central California has a rich endemic flora and fauna. However, much of the desert shrub and arid grasslands that once covered this region have been displaced by agricultural and urban development following the completion of the Central Valley Project and the California Water Project in the early 1970s (U.S. Fish and Wildlife Service 1998).

The largest remnant blocks of relatively undisturbed habitat in the southern San Joaquin Valley occur on the western side. This region still provides habitat for several declining animals and plants, including blunt-nosed leopard lizards (*Gambelia sila*), giant kangaroo rats (*Dipodomys ingens*), San Joaquin kangaroo rats (*Dipodomys nitratooides*), San Joaquin antelope squirrels (*Ammospermophilus nelsoni*), San Joaquin kit foxes (*Vulpes macrotis mutica*), and Kern mallow (*Eremalche kernensis*). Because these species are endemic to this region and they have experienced significant declines in distribution and numbers, they are protected by state or federal endangered species regulations.

The composition of arid plant communities of the San Joaquin Valley has changed remarkably since European settlement. Historically, the plant community was probably a relatively open saltbush (*Atriplex* spp.) habitat with much open ground between bushes and patches of annual native grasses and forbs during the spring. Today, the habitat is either dense grassland dominated by non-native species or shrubland with a dense non-native grass understory. Some biologists believe that the domination of these arid habitats by non-native annual grasses has resulted in a shift in habitat type, which has contributed to the decline of native species (Germano et al. 2001). Small terrestrial vertebrates, such as lizards and kangaroo rats, probably

can no longer effectively forage and escape predators on the grass-choked ground. Native annual plants possibly are out competed by the more aggressive annual non-native grasses.

Livestock grazing is the principal use of most of the undeveloped lands in the southwestern San Joaquin Valley. Overgrazing of vegetation by livestock has been cited as detrimental to populations of vertebrates inhabiting arid regions, and this is undoubtedly the case in sensitive habitats such as riparian corridors. However, well-managed grazing may offer an effective way of controlling the non-native annual grasses in upland habitats to the benefit of some or all of the endemic plants and animals.

The *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998) indicates that determining appropriate land management practices is among the most important recovery actions needed for San Joaquin Valley species. The objective of this research is to meet this recovery need by determining whether non-native annual grasslands in the southwestern San Joaquin Valley can be managed with livestock grazing for the benefit of this suite of listed species.

## Study Area

### *Location*

Our study site is in the Lokern Natural Area of western Kern County, California, between the communities of Buttonwillow and McKittrick (Figure 1). The Lokern Natural Area encompasses approximately 17,800 hectares (44,000 acres). Chevron is the largest single landowner with approximately 7,300 hectares (18,000 acres). Some portions of the area are being managed for their natural resource values, including those owned by the U.S. Bureau of Land Management (BLM), the California Department of Fish and Game, and the Center for Natural Lands Management. Our study plots are located in Township 29 South, Range 22 East, Sections 21, 27, 29, and 33 (Mount Diablo baseline and meridian) on Chevron land. This study is being conducted with Chevron's permission and cooperation.

### *Landscape*

Much of the Lokern Natural Area is composed of a gently sloping alluvial plain that is dissected by numerous small arroyos. At the southern and western margins of the area, the topography becomes more rugged where it joins Elk Hills and the Temblor Range, respectively. Elevations in the Lokern Natural Area range from approximately 80 meters (255 feet) on the plain to 260 meters (850 feet) at the margins. Cultivated lands border the natural area on the north and east, and active oil fields are located in the western portion of the area. The California Aqueduct, numerous electric transmission lines, buried pipelines, and an abandoned railroad bed traverse the area. Our study plots are located in the gently sloping, central portion of the natural area between California Highways 33 and 58 and Lokern Road.

Research proposal: Effects of Livestock Grazing on a Community of Species at Risk of Extinction

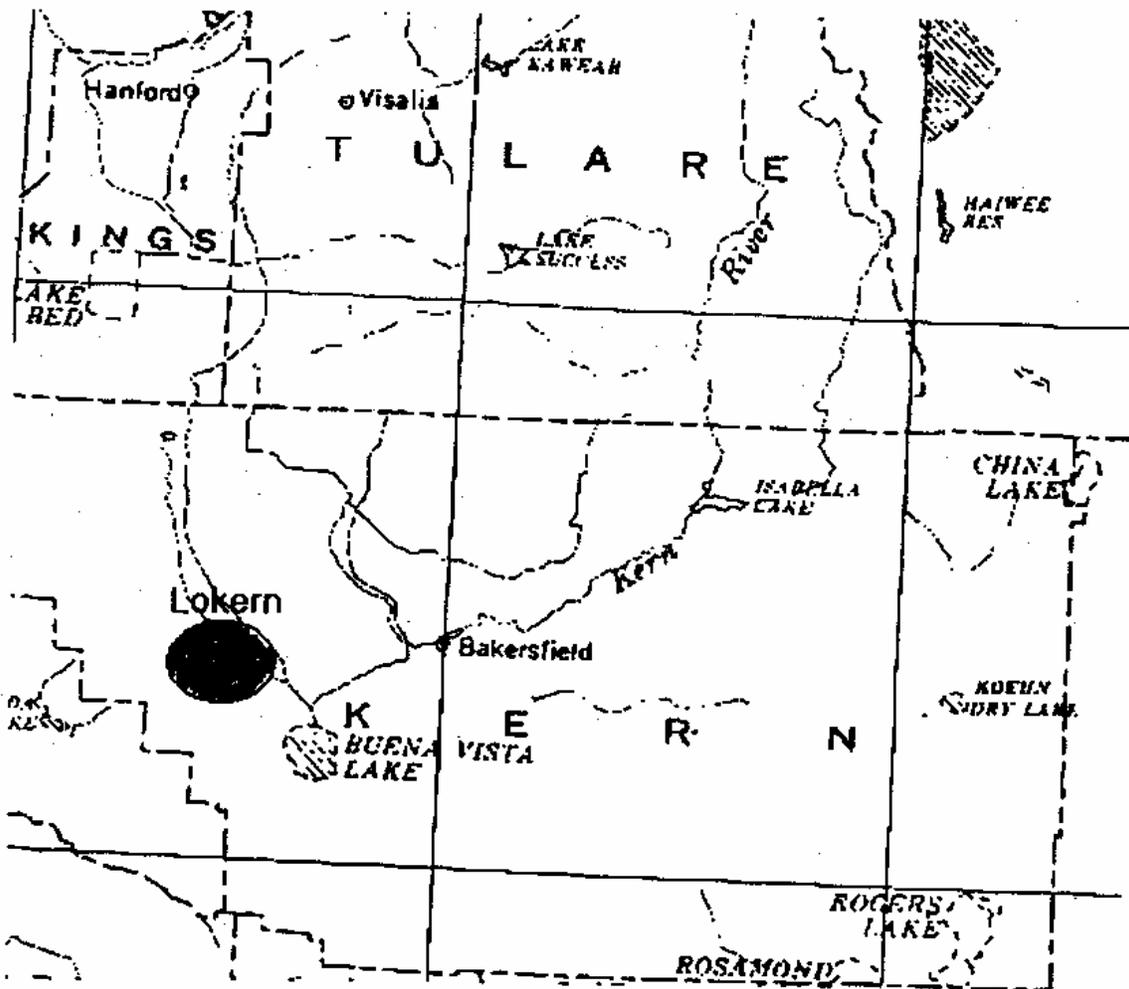


Figure 1. Location of the Lokern Natural Area in Kern County, California.

### *Plant Communities, Habitat, and Wildlife*

The study area consists of Valley Saltbush Scrub intermixed with patches of Non-Native Grassland. The dominant shrubs are common saltbush (*Atriplex polycarpa*) and spiny saltbush (*A. spinifera*) with an understory of both native and non-native herbs. Grasslands are present because repeated wildfires have eliminated the shrubs and type-converted much of the area (see 2001 annual report for this study, <http://www.werc.usgs.gov/sandiego/lokern/lokern.htm>). The grasslands are dominated by non-native species including red brome (*Bromus madritensis* ssp. *rubens*), red-stemmed filaree (*Erodium cicutarium*), and foxtail barley (*Hordeum murinum*). Elsewhere in the Lokern Natural Area, the plant communities include Alkali Sink Scrub, which is dominated by iodine bush (*Allenrolfea occidentalis*) and bush seepweed (*Suaeda moquinii*), and Interior Coast Range Saltbush Scrub, which is dominated by common saltbush, Mormon tea (*Ephedra californica*), and bladderpod (*Isomeris arborea*) (Holland 1986, Presley 1994).

Eighty species of plants have been recorded in the Lokern Natural Area (E. Cypher, unpublished data) but more are likely to occur. Among the 80 known plant species, 50 (62.5%) are native. At least 48 types of wildlife are known or suspected to occur in the Lokern Natural Area, including 2 amphibian, 8 reptile, 21 bird, and 17 mammal taxa (Presley 1994). These range from common species such as coyotes (*Canis latrans*) and gopher snakes (*Pituophis melanoleucus*) to endangered and other special-status species (see below).

### *Special Status Species*

Numerous rare and endangered animals and plants are known from the Lokern Natural Area (Table 1). Species that are being monitored in the context of this study are blunt-nosed leopard lizard, giant kangaroo rat, short-nosed kangaroo rat, San Joaquin antelope squirrel, and Kern mallow.

## **METHODS**

### *Study Design*

Our basic design is to compare the abundance of animals and plants on grazed treatment plots and ungrazed control plots. We have four replicated pairs of treatments and controls, which were established in 1997. Each treatment plot is a section (2.6 square kilometers or 1 square mile). The four sections are arranged in a four-leaf clover pattern, with a fifth section enclosed in the middle of the clover-leaf. The middle section serves as a pasture to hold livestock while moving them into or out of the four surrounding treatment pastures. The four control pastures are 25 hectares (62 acres) each and are located inside each treatment pastures, in a corner to save fencing costs (Figure 2).

Research proposal: Effects of Livestock Grazing on a Community of Species at Risk of Extinction

Table 1. Special-status species reported from the Lokern Natural Area, Kern County (U.S. Fish and Wildlife Service 1998, California Natural Diversity Data Base 2002).

Common Name	Scientific Name	Status
<b>PLANTS</b>		
Kern mallow	<i>Eremalche kernensis</i>	Federally endangered, CNPS List 1B
Hoover's woolly-star	<i>Eriastrum hooveri</i>	Federally threatened, CNPS List 4
recurved larkspur	<i>Delphinium recurvatum</i>	CNPS List 1B
<b>ANIMALS</b>		
blunt-nosed leopard lizard	<i>Gambelia sila</i>	Federally endangered, State endangered
giant kangaroo rat	<i>Dipodomys ingens</i>	Federally endangered, State endangered
San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	Federally endangered, State threatened
San Joaquin antelope squirrel	<i>Ammospermophilus nelsoni</i>	Federal species of concern, State threatened
Short-nosed kangaroo rat	<i>Dipodomys nitratoides brevinasus</i>	Federal species of concern
Tulare grasshopper mouse	<i>Onychomys torridus tularensis</i>	Federal species of concern
San Joaquin LeConte's thrasher	<i>Toxostoma lecontei lecontei</i>	Federal species of concern

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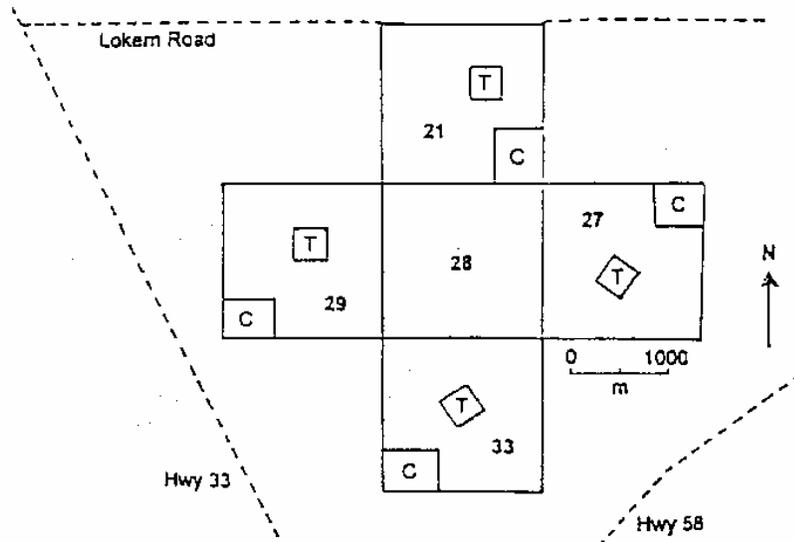


Figure 2. Lokem Study Area showing location of treatment pastures (with section numbers) and control plots (C). Trapping grids on treatment pastures = T.

Cattle are being used on the treatment plots to maintain residual dry matter (RDM) at 560 kilograms per hectare (500 pounds per acre). Grazing begins by 1 December each year, later if new grass growth is not at least 5 centimeters (2 inches) high by that date. If grass growth does not attain the minimum standard in any given year, then pastures are not grazed during that year. Our objective is to obtain the minimum dry mulch rate by at least 1 April each year, when the livestock are removed. The livestock operators and property managers in the Lokern Natural Area ensure that the enclosures and livestock are adequately maintained, and that stocking rates result in desired grazing effects (weather and growing season allowing).

Our study must be carried out long enough to reduce the confounding effects of several environmental factors, including a wildfire in 1997, the El Niño winter of 1998, very low populations of terrestrial vertebrates in 1997 and 1998, and year-to-year variation in environmental conditions in the San Joaquin Valley. We expect the study will require approximately 10 years to complete. Our sampling results after 5 years of grazing are inconclusive, primarily due to the low rainfall during the growing seasons of 1999 through 2002. However, we believe our experimental design and sampling protocols are robust enough to accomplish our objective. Demonstrable results are likely after 2 consecutive years of average or above-average rainfall, which we hope will occur beginning in 2003.

#### ***Blunt-nosed leopard lizard sampling***

Relative abundance is estimated using a set of 16 parallel transect lines, 300 meters (984 feet) long and spaced 20 meters (66 feet) apart. The sample plots are placed about in the middle of each control pasture and at least 100 meters (328 feet) from treatment plot fences. Censusing of lizards consists of walking the transects, and for each sighting the approximate location, sex and age-class are recorded (Degenhardt 1966, Germano et al. 1994). Each set of transects is walked 10 times within 4 to 8 weeks; the maximum count is used as the abundance estimate for that plot. Each plot is censused from May to June. The treatment/control plot pair in Section 27 is being used to gather demographic data. The more intensive effort required on these two plots includes capturing all leopard lizards by noosing or pitfalls. Standard morphometrics are taken from all individuals, including reproductive condition. All lizards are toe clipped, and juveniles and adults implanted with a PIT tag (using protocol described in Germano and Williams 1993), before being released at their capture sites.

#### ***Antelope squirrel sampling***

Abundance is obtained on one 8 x 8 live-trapping grid per study plot, with 64 traps at 40-meter (131-foot) intervals. The grid is superimposed on the transect grid set up for sampling leopard lizards. The grid of traps is run for 6 consecutive days once a year, during July and August. We run four grids at once; the entire sampling procedure takes about 2 weeks each year. Trapping protocols have been approved by state permitting authorities. Tomahawk live traps covered with burlap are opened at dawn and closed at noon or when ambient temperature exceeds 35°C (95°F), or whichever occurs first. Traps are checked about every two hours while open. Each squirrel captured is located on the grid, sexed, weighed, and injected subcutaneously with a PIT tag between the shoulder blades (protocol as in Schooley et al. 1993), and released. Mark-recapture models will be used to derive and compare population estimates for the treatment and

control pastures. In 2002, 20 squirrels were radio-collared for a month to assess differences in home range sizes between the control and treatment areas.

### *Kangaroo rat sampling*

Relative abundance of all small, nocturnal mammals (mostly kangaroo rats) is obtained by live-trapping. Square trapping grids (12 x 12 grid pattern) with 144 traps at 10-meter (33-foot) intervals are positioned within and in line with the antelope squirrel grid. The traps are run for 6 consecutive nights in July and August each year, during the same time the squirrel traps are run. Trapping methods are the same as those used by Williams et al. (1993), which have been approved by federal and state permitting agencies. Extra-long folding aluminum Sherman traps are set in late afternoon and checked the next morning. Each animal trapped is located on the grid, sexed, weighed, temporarily marked on the fur with a felt-tipped pen, and released. Each kangaroo rat is permanently marked with a passive integrated transponder (PIT) tag injected subcutaneously between the shoulder blades (protocol following that of Schooley et al. 1993) and a monel size #1 ear tag is attached to each pinna. The PIT tags and ear tags enable us to collect demographic information and estimate and compare abundance with mark-recapture models. Identical procedures are used concurrently on both the treatment and control plots, which will allow us to make valid comparisons of relative abundance for each species between the control and experimental pastures.

### *Kern mallow sampling*

Reproductive density (i.e., the number of flowers produced per square meter) is determined for Kern mallow to incorporate plant density, survival, and reproduction into a single index of abundance. The total number of flowers is estimated in approximately March of each year on quadrats located through stratified random sampling. Quadrats are oriented with their long axes parallel to any obvious gradient in Kern mallow densities due to environmental factors or grazing intensity. Sampling begins with 10 quadrats of 20 meters by 0.25 meters (66 feet by 0.8 foot) per study plot. Additional quadrats are sampled as necessary until the running mean density for each study plot stabilizes (Mueller-Dombois and Ellenberg 1974). A single estimate of reproductive density is obtained for each study plot by pooling tallies from the 10 or more quadrats.

### *Vegetation cover and composition sampling*

Vegetation cover and composition is assessed annually in early April on four 50-meter (164-foot) transects per study plot located in stratified-random fashion. Vegetation is sampled via the point-intercept method (Mueller-Dombois and Ellenberg 1974, Bonham 1989). A narrow rod with a sharpened tip is lowered from a point frame (Bonham 1989) at 50-centimeter (20-inch) intervals along each transect, in a modified version of the method used by the California Native Plant Society (1995). Cover estimates are averaged over all transects within a given study plot, resulting in a single value per pasture. Detecting changes in vegetation cover and composition due to the treatment is secondary to determining the effects of grazing on listed species abundance. Thus, the vegetation sampling is proposed simply to obtain estimates of overall cover, cover of non-native plants versus natives, and to identify the dominant plants in each study plot. The sampling is not designed to detect differences in individual species.

### *Invertebrate Sampling*

Each control and treatment plot has an array of 10 pitfall traps for sampling invertebrates. These are located 10 meters (33 feet) outside each trapping grid, with five pitfalls spaced at 40-meter (131-foot) intervals on two adjacent sides of the grid. Pitfall arrays are opened and sampled for 6 consecutive days each year during the July and August small mammal trapping. Invertebrates are identified at least to ecological group, as indicated by common names (crickets, scorpions, ants, etc.).

### *Bird Surveys*

Bird use of the control and treatment plots is determined by point-count censuses. Each point-count census consists of standing at a corner of the lizard/squirrel plot and searching and listening for birds for 5 minutes that occur within 300 meters (984 feet) and which are using the plot (not flying overhead). Two corners of each plot are used (equating 16 census points for treatments and 16 for controls). Separately, we record birds detected during point-count censuses that fly overhead. Additionally, we census birds by recording species found within a 300 by 300 meter (984 feet by 984 feet) area beyond point-count plots. This method adds larger species of birds to the list because the area of detection is larger than the other two census methods.

### *Pasture assessment*

The treatment sections are evaluated using a comparative estimation of vegetative yield technique modified from Haydock and Shaw (1975), which BLM currently uses to assess range readiness. The evaluation is done beginning immediately prior to livestock placement in enclosures (November) and at intervals thereafter until the minimum residual dry matter of 560 kilograms per hectare (500 pounds per acre) is attained, when the cattle are removed. The date of cattle removal varies from year to year, but is usually no later than 1 April each year.

### *Statistical analyses*

The null hypothesis in this study is  $H_0$ : relative abundances (or densities) of animals and plants are the same in grazed and ungrazed plots. Rejection of the null hypothesis will occur at the  $P = 0.05$  level. Analysis of variance will be used to test for differences in the relative abundances of each animal species between plots and across years. Paired T-tests will be used to compare reproductive density of Kern mallow, overall cover of vegetation, and cover of non-natives between grazed and ungrazed plots.

### Objectives

Our overall objective is to determine whether annual grasslands in the San Joaquin Valley can be managed with livestock grazing for the benefit of several species at risk. Benefit is measured in

terms of relative abundances and densities, and thus we have posed the following specific questions:

1. Are the relative abundances of small mammals and the blunt-nosed leopard lizard the same on grazed and ungrazed experimental plots?
2. Is the reproductive output of Kern mallow the same on grazed and ungrazed experimental plots?
3. Do percent cover and composition of dominant plants differ between grazed and ungrazed experimental plots?

## **PROJECT RATIONALE AND BENEFITS**

### **Justification**

Agricultural conversion facilitated by the Central Valley Project has contributed to the decline of all the animal species targeted in this study. Habitat degradation caused by non-native grasses is one of the primary factors that continues to threaten the survival of these species (U.S. Fish and Wildlife Service 1998). The Central Valley Project could contribute to recovery of blunt-nosed leopard lizards, giant kangaroo rats, and other listed and rare species of the San Joaquin Valley by helping to fund this project. This study partially implements recovery task #4.11 in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (U.S. Fish and Wildlife Service 1998).

The research outlined in this plan is designed to evaluate the effects of livestock grazing on several species at risk in the Lokem area. However, this research also will be directly applicable to the management of species at risk and annual grasslands within the greater San Joaquin Valley ecosystem, including the entire Carrizo Plain National Monument and Cuyama Valley. This encompasses nearly 162,000 hectares (400,000 acres) of BLM lands in seven counties and over 810,000 hectares (over 2 million acres) of private land dominated by annual grasses. The results of this research would also be applicable to the management of over 3.25 million hectares (over 8 million acres) of annual grasslands throughout California and adjoining states.

### **Central Valley Project Selection Criteria**

This project meets numerous Central Valley Project Conservation Program (CVPCP) selection criteria as identified in the request for proposals dated August 21, 2002 and the CVPCP framework document dated August 2001:

- **Priorities for Fiscal Year 2003:** The project is to be conducted in alkali scrub and grassland habitat in the Central Valley. It will result in habitat management recommendations for blunt-nosed leopard lizards and other species dependent upon this habitat complex.
- **Relationship to CVP:** Agricultural conversion caused the animal species to become endangered. The Central Valley Project provided much of the water that allowed cultivation of much of their former habitat (U.S. Fish and Wildlife Service 1998).

- **Presence of Listed Species:** The project targets two federally and state-listed endangered animal species (blunt nosed leopard lizard and giant kangaroo rat), the federally-listed endangered plant Kern mallow, and the state-listed threatened San Joaquin antelope squirrel.
- **Presence of Special Status Species:** The short-nosed kangaroo rat, a federal species of concern, is one of the target species. Another federal species of concern, the Tulare grasshopper mouse, will benefit even though it is not a primary target of the study because abundances will be determined in the course of trapping for kangaroo rats.
- **Multiple Species:** The Lokern area supports many other native plant and animal species in addition to the rare species. Competition from non-native grasses is likely reducing the populations of these other native species, which would benefit from our management recommendations.
- **Multiple Habitats:** The study area consists of valley saltbush scrub and grassland communities. Other natural communities in the Lokern Natural Area are Valley Sink Scrub and Interior Coast Range Saltbush Scrub.
- **Cumulative Benefit:** A study of blunt-nosed leopard lizard and San Joaquin antelope squirrel movement patterns relative to grazing also is being conducted in the Lokern area in conjunction with the current study. The former is being funded by Occidental Petroleum. Kit fox movement patterns relative to grazing are being determined through a cooperative effort with a road effects study funded by the California Department of Transportation. This project also complements research being conducted by the California State University, Stanislaus Endangered Species Recovery Program regarding grazing impacts on giant kangaroo rats and blunt-nosed leopard lizards on the Elkhorn Plain and Pixley National Wildlife Refuge. In addition, it complements research being conducted on the Carrizo Plain by the U.S. Bureau of Land Management and The Nature Conservancy.
- **Long-Term Benefit:** This project provides long-term benefit because it will identify which management strategy results in the greatest abundance of the target species. Application of the recommended strategy will contribute to the long-term survival and recovery of these species.
- **Project Connectivity:** The project area is adjacent to Elk Hills and constitutes part of a core area (western Kern County) for recovery of upland species in the San Joaquin Valley (U.S. Fish and Wildlife Service 1998).
- **Partners:** Cost-share funding of \$10,000 is being provided by the California Department of Fish and Game during 2003. In-kind services are being provided by the U.S. Geological Survey, the U.S. Bureau of Land Management, the Endangered Species Recovery Program, and the Center for Natural Lands Management. Other agencies and organizations have contributed approximately \$310,000 since 1997.
- **Maintain or Enhance Biodiversity:** Data collection associated with this study will indicate which management strategy is most beneficial for promoting diversity of native plants, invertebrates, and birds, in addition to the target species.
- **Within CVP Service Area:** The project site is located within the impact area for the Central Valley Project. It is not in an area directly served by federal water because these species have been extirpated from the areas that have been irrigated and cultivated.
- **Cost Effectiveness:** The majority of the costs of this project (\$189,000) were incurred in the first year for construction of livestock fencing and watering facilities. The cost for a single year's monitoring is minimal. Our request for 2003 is for only \$45,000 due to cost-sharing by partner agencies and organizations.

## PROJECT COST

### Long-term Costs

We have raised nearly \$310,000 in cash for this research since 1997. This figure does not include nearly an equal amount of in-kind contributions from cooperators. It costs about \$65,000 in cash per year (see below) to maintain the study site and carry out the sampling, which does not include on-going commitments for in-kind support.

### Amount Requested

Funding in the amount of \$45,000 is requested from the Central Valley Project Conservation Program to cover small mammal trapping and vegetation monitoring during 2003. Current funding from the California Department of Fish and Game is sufficient to pay for blunt-nosed leopard lizard (BNLL) monitoring during 2003. Kern mallow (KM) monitoring is anticipated to cost \$10,000 but is not included in this proposal because Kern mallow has not been impacted by the Central Valley Project.

Item	Total Cost	Amount contributed by other cooperators	Amount requested from CVPCP
Personnel (field monitoring of animal and plant populations)	\$57,000	\$10,000 (BNLL) \$10,000 (KM) + in-kind services	\$37,000
Vehicle	\$3,000	\$0	\$3,000
Travel (for out-of-town cooperators)	\$3,000	\$0	\$3,000
Field supplies & repairs	\$2,000	\$0	\$2,000
<b>Total</b>	<b>\$65,000</b>	<b>\$20,000</b>	<b>\$45,000</b>

### Partners

Numerous partners have been involved in this study since its inception. The principal investigators are Dr. David Germano, California State University, Bakersfield; Dr. Galen Rathbun, California Academy of Sciences; Dr. Ellen Cypher, Endangered Species Recovery Program; and Mr. Larry Saslaw and Mr. Sam Fitton, U.S. Bureau of Land Management. The agencies employing the principal investigators have contributed their time annually since 1997.

The U.S. Fish and Wildlife Service; U.S. Geological Survey – Western Ecological Research Center; California Department of Fish and Game; Center for Natural Lands Management; National Fish and Wildlife Foundation; California Department of Water Resources; Great Valley Center; and Occidental of Elk Hills, Inc. have provided funding, in-kind services, or materials during the course of the study. The lands used for the grazing study were made available through the cooperation of the Chevron and ARCO oil companies. Additional cooperators

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include the University of California at Davis, Safety Kleen Environmental Services, and the Eureka Livestock Company.

## **PRODUCTS AND SCHEDULE**

Products will include an annual report for the funding agencies; peer-reviewed publications in scientific journals; presentations at professional meetings, seminars, and workshops; and informal presentations and consultations with land managers and colleagues. Past annual reports are available on the Lokern Project web page:

<http://www.werc.usgs.gov/sandiego/lokern/lokern.htm>

### **Project Scope of Work**

Task 1: Monitor target animals and vegetation.

- 1.1 Monitor kangaroo rats and other small mammals.
- 1.2 Monitor San Joaquin antelope squirrels.
- 1.3 Monitor blunt-nosed leopard lizards.
- 1.4 Assess vegetation composition.

Task 2: Report Preparation.

- 2.1 Prepare annual report.

### **Project Completion Schedule**

- Monitoring completed by August 31, 2003.
- Annual report by December 31, 2003.

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