Summary Information

US Fish and Wildlife Service

Monitoring and evaluation of riparian habitat and floodplain restoration at San Joaquin River National Wildlife Refuge

Amount sought: $1,464,782

Duration: 36 months

Lead investigator: Mr. Dennis Woolington, US Fish and Wildlife Service − San Luis National Wildlife Refuge Complex

Short Description

This project will initiate a multidisciplinary monitoring and evaluation program on San Joaquin River floodplain lands protected and restored through previous CALFED Ecosystem Restoration Program funding on and adjacent to San Joaquin River National Wildlife Refuge. Part of the components of this monitoring will be new to the site while others will be a continuation of monitoring previously initiated as part of the restoration effort.

Executive Summary

MONITORING AND EVALUATION OF RIPARIAN HABITAT AND FLOODPLAIN RESTORATION AT SAN JOAQUIN RIVER NATIONAL WILDLIFE REFUGE

EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (FWS) is requesting $1,464,782 of CALFED−BAY DELTA funds to initiate a multidisciplinary monitoring and evaluation program on San Joaquin River floodplain lands protected and restored through previous CALFED Ecosystem Restoration Program funding. In 1997 the FWS and partners began a multi−phase project, using CALFED and other funding sources, to protect and restore over 12,000 acres of floodplain habitat, and to recover species on and adjacent to San Joaquin River National Wildlife Refuge in Stanislaus and San Joaquin Counties. To date, two CALFED restoration projects have been completed, one is nearing completion, and two are ongoing. Expenditures from these five projects total approximately $28,720,000 in CALFED funds and $13,620,000 in partner funds. A total of 6,950 acres of floodplain and other wildlife habitat have been protected through FWS fee title or perpetual conservation easement acquisition. An

additional 400 acres are currently under negotiation for fee−title acquisition. Almost 800 acres of floodplain lands have been planted to native riparian forest and 500 acres of wetlands are in the process of being restored. A multi−agency effort to breach the project flood control levee along the San Joaquin River is underway. Restoration planning for an additional 230 acres of floodplain habitat is ongoing. Riparian brush rabbits have been re−established on the Refuge. In addition, a baseline biological inventory was developed and over two years of biological monitoring to evaluate success of native plant establishment and wildlife response to restoration has been conducted.

The five completed or ongoing projects represent an investment of more than $42,340,000 in public funds (CALFED and match) in habitat protection and restoration, species recovery actions, and biological base−line inventory/monitoring. The native plant restoration component of these projects constitutes the largest riparian forest restoration project in the state of California. The planned breaching of COE project levees and resumption of natural hydrology and fluvial processes in a 3,000+ acre floodplain area is the first of any such projects in the Central Valley. The riparian brush rabbit re−introduction and monitoring effort on the refuge is a major recovery action that will directly contribute to the eventual delisting of the rabbit from endangered species status.

Monitoring and evaluation of the results of these efforts is critical in determining if the actions taken are meeting restoration/recovery objectives, and for guiding future work within the project area. In addition, information obtained through such monitoring will have great applicability to other CALFED funded restoration/recovery efforts elsewhere

The FWS and project partners propose to initiate the following monitoring and evaluation tasks on the restoration project site:

Task B.1 Valley Elderberry Longhorn Beetle Surveys

Task B.2 Riparian Brush Rabbit Use of Restored Habitats

Task B.3 Avian Distribution, Diversity, and Abundance in Restored Wetland Habitats

Task B.4 Avian Distribution, Diversity, and Abundance in Restored Riparian Habitats

Task B.5 Small Mammal Abundance and Use of Restored Habitats.

Task B.6 Primary Pollinator Diversity and Use of Restored Habitats

Task C.1 Fish Community Assessment

Task D.1 Success of Restored Vegetation on Restored Floodplain Habitats

Task D.2 Plant Communities Around Proposed Levee Breaches

Task D.3 Success of Invasive Weed Control Activities

Task E.1 Surface Water Flows

Task E.2 Floodplain Topography Changes

Task E.3 Groundwater Levels

Part of the components of this monitoring will be new to the site while others will be a continuation of monitoring previously initiated as part of the restoration effort. Non−FWS partners will include California State University–Stanislaus Endangered Species Program, Point Reyes Bird Observatory Conservation Science, California State University–Stanislaus Biology Department, University of California−Berkeley, River Partners, and Philip Williams and Associates, Ltd. FWS and project partners will be contributing $748,424 in cost share funds to support this project.

If fully funded, this proposed project will result in a large set of biological and physical data that measure the results of a major floodplain restoration project and evaluate if those results are meeting restoration goals. Permanent monitoring stations will be installed that will allow future data collection. The individual task reports and combined project completion report will provide a validation of restoration implementation actions and techniques, or prescribe modifications of those actions and techniques for continued restoration at this project site and to other CALFED funded restoration/recovery efforts elsewhere. The information gathered on the physical processes that occur after the levees are breached and floodwaters allowed to inundate the floodplain will greatly expand our knowledge about hydrological and fluvial processes on restored floodplain habitats and aid in future restoration efforts on the San Joaquin River system. FWS and project partners will present their findings in a variety of technical journals and scientific symposia to increase our understanding of restoration ecology and aid in future restoration efforts.

Furthermore, the findings of this monitoring project will directly contribute to meeting CALFED Bay−Delta Ecosystem Restoration Program goals by giving restoration ecologists and managers the informational tools to better implement : a) recovery of listed and at risk species such as valley elderberry longhorn beetle, riparian brush rabbit, Chinook salmon, and Sacramento splittail; b) rehabilitation of ecological processes such as plant/pollinator relationships, riparian forest community succession, and floodplain hydrology; c) maintenance of harvestable species such as waterfowl and salmon; d) protection and

restoration of habitats such as riparian forest communities and wetlands; and e) prevention of the establishment and spread of non−native invasive plant species.

MONITORING AND EVALUATION OF RIPARIAN HABITAT AND FLOODPLAIN RESTORATION AT SAN JOAQUIN RIVER NATIONAL WILDLIFE REFUGE

A. Project Description: Project Goals and Scope of Work

1. Problem, Goals, and Objectives The U.S. Fish and Wildlife Service (FWS) is proposing to initiate a multidisciplinary monitoring program on San Joaquin River floodplain lands protected and restored through previous CALFED Ecosystem Restoration Program funding. This would allow continuation of previously funded biological monitoring that was part of this restoration effort and additional biological and physical process monitoring needed to evaluate the success of this riparian habitat and floodplain restoration.

Historically, the floodplain of the San Joaquin River was dominated by riparian forest. The plant community was comprised of tree species such as willows *(Salix spp.)*, Fremont's cottonwood *(Populus fremontii)*, valley oak *(Quercus labata)*, and box elder *(Acer negundo)*, and shrub/forbs such as buttonwillow *(Cethalanthus occidentals)*, elderberry *(Sambucus mexicanus),* rose *(Rosa californicus)*, and blackberry *(Rubus ursinus)*. This riparian forest served many important ecological functions such as providing high quality wildlife habitat for resident and migratory species; supplying shaded riverine aquatic habitat as a source of shelter and forage for fish species; improving water quality by acting as a sediment filter for upslope areas; and reducing downstream flooding by providing transient storage for floodwaters.

This floodplain has undergone extensive clearing for conversion to agricultural use. Only six percent of the historic riparian forest communities now remain in the San Joaquin Valley (CALFED 1999). Lands within the project area currently support narrow riparian corridors, typically ranging from 10 to 50 meters wide. Consequently, fish and wildlife species which utilize these habitats have declined dramatically (USFWS 1998). Population levels of some species, such as riparian brush rabbit *(Sylvilagus bachmani riparia)*, San Joaquin Valley woodrat *(Neotoma fuscipes riparia)*, yellow-billed cuckoo *(Coccyzuz americanus)*, and valley elderberry longhorn beetle *(Desmocerus californicus dimorphus)* have become so low that they are now listed as Federal and/or State threatened or endangered species. In recognition of these losses, restoration of riparian and seasonal wetlands in the San Joaquin valley is considered to be a high priority of all State and Federal resources agencies. The San Joaquin River National Wildlife Refuge (NWR) was established in 1987 as a unit of the San Luis NWR Complex to aid in the recovery of endangered species and to protect and restore floodplain riparian habitat.

In 1997 the FWS and partners began a multi-phase project, using CALFED and other funding sources, to provide long term protection and the restoration of over 12,000 acres of fish and wildlife habitat on and adjacent to San Joaquin River NWR. Completed CALFED restoration projects to date include: ERP 97-B04 San Joaquin River NWR Riparian Habitat Protection and Floodplain Restoration Project – Phase I (land acquisition, biological inventory, and restoration Planning, $10,827,000), and ERP 98-F21 Lower San Joaquin River Floodplain Protection and Restoration Project (land acquisition, $1,100,000). Ongoing CALFED restoration projects include: ERP 01-N08 San Joaquin River NWR Riparian Habitat Protection and Floodplain Restoration Project – Phase II (land acquisition, habitat restoration, monitoring, $7,646,253), ERP-01-N11 Habitat Acquisition for Riparian Brush Rabbit and Riparian Woodrat (land

acquisition, $2,720,085) and 230 DA Recovery Implementation for Riparian Brush Rabbit and Riparian Woodrat on the Lower Stanislaus River (land acquisition, monitoring, habitat restoration, $6,427,131).

Expenditures from these five completed and ongoing projects total approximately $28,720,000 in CALFED funds and $13,620,000 in partner funds. A total of 6,950 acres of floodplain and other wildlife habitat have been protected through FWS fee title acquisition (3,338 ac.) or enrollment in FWS perpetual conservation easements (3,512 ac.). An additional 400 acres are currently under negotiation for fee-title acquisition by FWS. Almost 800 acres of floodplain lands have been planted to native trees, shrubs, forbs and grasses. Approximately 500 acres of permanent and seasonal wetlands are in the process of being restored. A multi-agency effort to breach the project flood control levee along the San Joaquin River is underway. Restoration planning for an additional 230 acres of floodplain habitat is ongoing. The completed and ongoing projects have funded development of a baseline biological inventory, monitoring of the riparian brush rabbit recovery (re-establishment) project, and over two years of biological monitoring to evaluate success of native plant establishment and wildlife response to restoration. Project partners with FWS have included US Army Corps of Engineers (COE), Natural Resources Conservation Service (NRCS), California Department of Water Resources (DWR), California Department of Fish and Game (CDFG), Sacramento River Partners ([now River Partners] RP), California State University–Stanislaus Endangered Species Recovery Program (ESRP), and Point Reyes Bird Observatory Conservation Science (PRBO).

2. Justification - The five completed or ongoing projects represent an investment of more than $42,340,000 in public funds (CALFED and match) in habitat protection and restoration, species recovery actions, and biological base-line inventory/monitoring. The native plant restoration component of these projects (plus future planned restoration plantings using CALFED and other funds) constitutes the largest riparian forest restoration project in the state of California. The planned breaching of COE project levees and resumption of natural hydrology and fluvial processes in a 3,000+ acre floodplain area is the first of any such projects in the Central Valley. The riparian brush rabbit re-introduction and monitoring effort on the refuge is a major recovery action that will directly contribute to the eventual delisting of the rabbit from endangered species status.

Monitoring and evaluation of the results of these efforts is critical in determining if the actions taken are meeting restoration/recovery objectives, and for guiding future work within the project area. In addition, information obtained through such monitoring will have great applicability to other CALFED funded restoration/recovery efforts elsewhere. Monitoring of the physical processes that occur after the levees are breached and floodwaters allowed to inundate the floodplain provides a unique opportunity that is not found elsewhere in the San Joaquin Valley. Information obtained would greatly expand our knowledge about hydrological and fluvial processes on restored floodplain habitats and aid in future floodplain restoration efforts on the San Joaquin River system.

The base line biological inventory and monitoring conducted/scheduled in the one completed and two ongoing CALFED-funded projects at San Joaquin NWR have provided

information on pre-restoration conditions, the initial results of restoration, and species recovery actions. However, these inventory/monitoring efforts are limited to the three-year performance period of the individual grants, and are either completed, will end within one year, or are focused on one monitoring task (riparian brush rabbit recovery). Continued monitoring and evaluation is necessary to determine the sustained success of riparian forest plantings beyond the first two-three years of establishment (performance period of initial restoration grant) and the response of wildlife and plant communities to this floodplain restoration over time. Just as importantly, a monitoring program must be put in place that documents and helps us better understand the effects of the hydrological and fluvial processes associated with flood events upon floodplain restoration ecology. In addition, knowledge gained from this monitoring and evaluation will be used in an adaptive manner to guide continued restoration efforts at San Joaquin River NWR, and will aid in the implementation of CALFED and other-funded riparian/floodplain projects elsewhere in the Central Valley.

a) Conceptual Model – Figure 1 is linear model which represents the actions and processes that would take place under this proposed monitoring and evaluation of the ongoing riparian habitat/floodplain restoration project. Under this model, the results of the restoration project will be monitored and evaluated to determine if restoration objectives are being met, and that information used adaptively when implementing further restoration on this and other project areas. Three categories of results: 1) response of selected fish, wildlife, and invertebrate species, 2) response of vegetation, and 3) resultant physical processes would be monitored and evaluated to see if ERP and Refuge restoration objectives are being met. If objectives are being met, current restoration actions and techniques would be continued within the restoration area. If objectives are not being met, current restoration actions and techniques will be modified and then implemented. Results of those modifications (require future monitoring proposal) would then be monitored and evaluated to see if restoration objectives are met. Information obtained from the monitoring and evaluation would be made available to others to help future restoration of other CALFED funded riparian/floodplain projects elsewhere in the Central Valley.

b) Hypotheses being Tested - A total 13 different monitoring tasks would be conducted by FWS and partners under this proposal. Task specific hypotheses are listed in the individual study plans (Appendices 1 - 11). These are consolidated into the following proposal hypotheses:

1) Restored habitats will receive use by threatened and endangered species (riparian brush rabbit, valley elderberry longhorn beetle, Chinook salmon, Sacramento splittail) thus contributing to species recovery.
2) Riparian/wetlands dependent wildlife species will increase their use of restored habitats over time.
3) Active restoration as applied to the project area will result in diverse, functioning riparian plant communities.
4) Breaching of project levees and periodic inundation of the floodplain will result in topographic changes (channel cutting) within the restored floodplain and restore more natural hydrological and fluvial processes in the project area.
5) Active re-vegetation and weed control will limit the establishment and expansion of non-native invasive weeds within the project area.

3. Previously Funded Monitoring

ERP 97-B04 - San Joaquin River NWR Riparian Habitat Protection and Floodplain Restoration Project Phase I – FWS conducted a baseline biological inventory on the San Joaquin River NWR as part of this restoration project. Biological resources surveyed and inventoried included avian species, small mammal populations, herptiles, and vegetation communities. Inventory results were compiled in Chouinard et al. 1999.

ERP 01-N08 - San Joaquin River NWR Riparian Habitat Protection and Floodplain Restoration Project Phase II – FWS and project partners initiated the following monitoring tasks as part of this restoration project.

Project Implementation Success – Initiation and completeness of project tasks is being monitored by FWS.

Restoration of Native Riparian Vegetation – Survival, growth, and density of each species in the planting sites is being monitored by River Partners.

Reduction in Dominance by Non-Native Plant Species –Changes over time in cover by non-native species is being monitored weed by River Partners (planting sites) and FWS (elsewhere).

Increase in Avian Populations – Standardized survey methodologies are being used to monitor neotropical landbirds (PRBO) and waterbirds (FWS).

Effectiveness of Natural vs. Cultivated Restoration – Tree survival, density, and diversity are being compared between passive and active restoration sites by River Partners and FWS.

Success of Riparian Brush Rabbit Reintroduction – Percent survival, dispersal, and recruitment of rabbits released on the refuge are being monitored by ESRP.

Monitoring has been ongoing since 2002. Status of the individual monitoring tasks is summarized regularly in the quarterly project progress reports. Results of monitoring will be presented in the final project accomplishment report in 2005.

230 DA - Recovery Implementation for Riparian Brush Rabbit and Riparian Woodrat on the Lower Stanislaus River - FWS and ESRP will be monitoring the success of riparian brush rabbit re-introduction efforts as well as studying habitat use and population ecology of these species as part of this restoration project. Rabbit re-introduction/monitoring and woodrat studies are scheduled to begin in 2005 and continue for three years. Monitoring activities will be limited to the Stanislaus River area and that part of the San Joaquin River adjacent to that tributary.

4. Approach and Scope of Work - The proposed project is entirely on and adjacent to the San Joaquin River NWR, within Stanislaus and San Joaquin Counties along the floodplain of the San Joaquin River. This lies in Ecozones 12.1 (San Joaquin River - Vernalis to Merced) and 13.1 (Stanislaus River).

FWS will be the grant recipient and responsible for directing the overall multi-disciplinary monitoring program and providing reports to the CALFED Bay Delta Authority. The individual partners function as contractors and will be responsible for conducting their specific monitoring tasks as described below. Implementation of monitoring tasks will be coordinated, wherever

possible, so that data collected will complement each other (i.e., avian, small mammal, and other monitoring could be conducted in the same locations and vegetation monitoring is conducted).

Task A. Project Management – This task will be conducted by staff of San Luis NWR Complex. Activities include providing fiscal and programmatic reports to CALFED following the end of each quarter (January, April, July, and October). Contract oversight, budget tracking, meetings, and coordination with project partners are also included in this task.

Task B. Mammals, Birds, and Invertebrate Monitoring

B.1 *Valley Elderberry Longhorn Beetle Surveys* - This subtask will be conducted by FWS and will be a new component of monitoring for this restoration project. Over 27,000 elderberries have been planted since 2002 as part of the San Joaquin River floodplain riparian restoration being done by RP. Transects will be established in the reforestation areas and surveys conducted in May-September for the presence of adult beetles and emergence holes in elderberry stems using techniques described in USFWS (1991). In addition, mature riparian habitat along the San Joaquin River and Stanislaus River in areas protected (acquired) by this project will be surveyed to map suitable habitat and determine species presence. A more detailed study plan for this monitoring is provided in Appendix 1.

B.2 *Riparian Brush Rabbit Use of Restored Habitats* – This subtask will be conducted by ESRP and is an expansion of monitoring that has been done or is ongoing elsewhere in the project area. Live-trapping will be conducted along transects to measure use of recently re-forested riparian areas twice each year. Riparian brush rabbits will be fitted with radio telemetry and monitored. Vegetation of use areas will be measured to determine habitat preferences. A more detailed study plan is provided in Appendix 2.

B.3 *Avian Distribution, Diversity, and Abundance in Restored Wetland Habitats* This subtask will be conducted by FWS and is a continuation of pre-restoration monitoring begun under ERP 01-N08. Waterbird abundance and distribution on restored seasonal wetlands will be determined through biweekly censuses, and waterbird productivity measured through surveys and monitoring of nesting. Results will be compared with that of pre-restoration surveys to determine waterbird response to restoration efforts. A more detailed study plan for this monitoring is provided in Appendix 3.

B.4 *Avian Distribution, Diversity, and Abundance in Restored Riparian Habitats* This subtask will be conducted by PRBO and is a continuation of monitoring that has been ongoing since the initial planting of the areas being restored to riparian forest as part of ERP 01-N08. PRBO will establish transects and monitor avian species diversity and habitat use within restoration sites as the vegetation in those areas mature. Point counts, nest searching and monitoring, territory mapping, and mist netting, and other standardized methodologies as described in Ralph et al. (1993) will be used to conduct this monitoring. A more detailed study plan is provided in Appendix 4.

B.5 *Small Mammal Abundance and Use of Restored Habitats* This subtask will be conducted by Dr. Anne Kohlhaas, CSU Stanislaus. Although this would be a new component of

CALFED-funded monitoring, this would be an expansion of surveys of small mammal use of the restoration sites that was initiated on the Refuge by Dr. Kohlhass in 2004. Transects will be established in newly reforested and mature riparian habitat in the project area to monitor species diversity, how populations re-populate restored areas, and impacts of small mammals to the success of riparian forest plantings. Live-traps, track plates, camera traps, and other standardized small mammal study methodologies will be used to conduct this monitoring. A more detailed study plan is proved in Appendix 5.

B.6 *Primary Pollinator Diversity and Use of Restored Habitats* This subtask will be conducted by Dr. Gordon Frankie, UC Berkeley, and represents a new component of monitoring for this restoration project. Bee populations will be monitored to determine how bees colonize newly established riparian habitat and describe the role of restored pollinator populations in the restoration of riparian plant communities. Fluorescent pan traps, light aerial netting, trap nest blocks and other standardized methods will be used to sample bee populations and plant monitoring employed to determine habitat use. A more detailed study plan is provided in Appendix 6.

Task C. Fisheries Monitoring

C.1 *Fish Community Assessment* – This subtask will be conducted by staff of the FWS Stockton Fisheries Office, and represents a major expansion of the initial fish community surveys (non-CALFED funded) conducted by that office on the Refuge. Standardized sampling techniques will be used to assess native and non-native species composition and relative abundance on the restoration site, fish communities relative to other sites on the San Joaquin River, and predation on listed fish species within the channel and floodplain habitats. A more detailed study plan is provided in Appendix 7.

Task D. Vegetation Monitoring

D.1 *Success of Restored Vegetation on Restored Floodplain Habitats* - This subtask will be conducted by River Partners and is a continuation and expansion of plant survival monitoring that has been ongoing as part of the riparian vegetation re-establishment component of ERP 01-N08. The intent of this monitoring is to determine if the active restoration of riparian vegetation has met project and ERP goals. Monitoring will focus on three hypotheses: 1) Planting design appropriately met site conditions, 2) Planting design resulted in diverse vegetative structure within the restoration project, and 3) Riparian restoration limits the establishment of non-native invasive species. Permanent monitoring plots will be established to measure survival, recruitment, density, height, cover, understory cover, and species composition of restored vegetation. Additional permanent plots will overlay avian, riparian brush rabbit, and small mammal transects to estimate habitat quality of the restored vegetation. A more detailed study plan is provided in Appendix 8.

D.2 *Plant Communities Around Proposed Levee Breaches* This subtask will be conducted by FWS and will be a new component of monitoring for this restoration project. The vegetation communities on the levees and floodplain immediately adjacent to the proposed levee breach locations will be measured and described. Transects will be established and data collected prior to levee breaching and after any flood events. Vegetation sampling as described

in Elzinga et al. 1998 will be used to monitor changes in vegetation communities over time. A more detailed study plan is provided in Appendix 9.

D.3 *Success of Invasive Weed Control Activities* This subtask will be conducted by FWS and is a continuation monitoring that was begun under ERP 01-N08. Results of ongoing weed control activities one six species of non-native plants outside the active re-vegetation areas will be measured and compared against mapped coverage of initial infestations. A more detailed study plan is provided in Appendix 10.

Task E. Physical Processes Monitoring

E.1 *Surface Water Flows* This subtask will be conducted by Philip Williams & Associates, Ltd., (PWA) of Sacramento, and represents a new component of monitoring for this restoration project. Surface water flows will be monitored with respect to flows in the main channel of the San Joaquin River, depth, area, duration, timing, flow patterns, temperatures, and ponding on the floodplain between the San Joaquin River and the project levee prior to breaching and on the floodplain of the Refuge after breaching. This information is important to assess the suitability of the site for various life stages of native fishes and for riparian succession. A more detailed monitoring study plan and individual budget are present in Appendix 11.

E.2 *Floodplain Topography Changes* This subtask will be conducted by PWA, and represents a new component of monitoring for this restoration project. Changes in the floodplain topography and configuration after the levee breaching will be monitored using a combination of aerial photography and ground reconnaissance. In addition, up to twenty-five monitoring transects will be established on the Refuge and on the floodplain between the San Joaquin River and the project levee. Ground surveys will be undertaken along these transects both pre-breach and post-flooding during the monitoring period. The purpose of monitoring the site evolution is to identify areas of scour and deposition of sediments conveyed onto the floodplain during flood events. Varied topography on the floodplain is important for terrestrial and aquatic habitat diversity. A more detailed monitoring study plan is included with that of task E.1 in Appendix 11.

E.3 *Groundwater Levels* – This subtask will be conducted by River Partners and is a continuation of ongoing monitoring. River Partners installed 27 ground water monitoring wells throughout the project site since 2002 as part of the CALFED project ERP 01-N08. Results from this extended monitoring will be used to evaluate success of native plant community restoration success in relation to ground water levels and to build a long term dataset examining changes in groundwater levels as the restored project site develops into a functioning floodplain. A more detailed study plan and individual budget are included with that of task D.1 in Appendix 8.

It is understood that a number of these tasks are dependent on a flood event inundating the floodplain of the project site during the performance period of this grant. The FWS anticipates that, working with the COE, the river levee will be breached by the time this grant would be started. Previous modeling conducted by PWA for the FWS indicates that once the levees are breached, the floodplain would be inundated on an average, every 3.5 years. If a flood event

does not occur during the 3 year performance period of the grant, FWS will seek a time extension amendment to the grant to allow completion of flood dependent monitoring tasks.

5. Feasibility - This project has a high certainty of success and can be implemented as soon as funding becomes available. The San Luis NWR Complex staff has a proven track record in successfully completing CALFED funded projects. These include land acquisition, habitat restoration, and biological inventory/monitoring. Normal management activities by FWS on national wildlife refuges, including monitoring and evaluation, are covered under the National Environmental Protection Act documentation requirements as categorical exclusions through Departmental Manual 516 DM Appendix 1.4 B. ESRP already holds the appropriate State and Federal endangered species recovery permits to cover any allowable take associated with their riparian brush rabbit re-introductions and subsequent monitoring. San Luis NWR Complex staff would apply for any necessary State or Federal endangered species recovery permits necessary to accomplish their monitoring tasks. All monitoring activities will be conducted on San Joaquin River NWR so there will be no issues involved with accessing private lands.

The San Luis NWR Complex staff includes professional biologists who have conducted field research and produced peer reviewed publications. Similarly, the FWS Stockton Fisheries Office staff includes biologists who routinely monitor aspects of fish populations and have produced peer reviewed publications. Staff of River Partners have successfully conducted monitoring and evaluation as part of their previous riparian restoration projects at San Joaquin River NWR and elsewhere in the Central Valley. Staff of Point Reyes Bird Observatory have a long record of demonstrated expertise in monitoring avian populations and are recognized as authorities in avian ecology. Research staff of ESRP have a long established record of conducting endangered species research in the San Joaquin Valley and routinely collect monitoring data as part of their ongoing studies on the riparian brush rabbit. Dr. Anne Kohlhaas, a professor at CSU Stanislaus, is an experienced mammalogist who is currently monitoring small mammal populations on the Refuge. Dr. Gordon Frankie, a professor at UC Berkeley, has been conducting long-term native ecological studies in California and Central America, and is recognized as an authority on native bee populations. PWA is a private consulting firm whose staff has expertise in hydrological studies, and recently conducted an investigation, funded through the FWS Anadromous Fish Restoration Program, which modeled flood regimes on San Joaquin River NWR which would result from proposed levee beaches

6. Expected Outcomes and Products – If fully funded, this proposed project will result in a large set of biological and physical data that measure the results of a major habitat restoration project and evaluate if those results are meeting restoration goals. The individual task reports and combined project completion report will provide a validation of restoration implementation actions or prescribe modifications of those actions and techniques for continued restoration at the project site as well as other locations. As has already been done on this restoration project area, the information obtained through monitoring will also be published by the FWS and non-FWS partners in a variety of technical journals and presented in scientific symposia to assist in future restoration efforts.

Permanent monitoring stations and reference points will be established that will allow future monitoring to be conducted as the restoration site evolves into mature riparian forest.

7. Data Handling, Storage, and Dissemination - Data entry, analysis, and storage of the individual monitoring components will be handled by the project partner that has the lead on the specific monitoring task. Monitoring data collected by USFWS refuge staff will be stored in computer files and worksheets at the San Luis NWR Complex office in Los Banos, California. Planting, survival, and other data will be maintained by SRP on computer in Microsoft Excel worksheets at the SRP office in Chico, California. Avian monitoring data will be maintained by PRBO in computer files using formats and protocols detailed in Ralph et al. (1993) and Nur et al. (1999). Data associated with the riparian brush rabbit re-introduction will be maintained in computer files by ESRP. Data associated with the primary pollinator monitoring will be maintained by Dr. Frankie at UC Berkeley, and that from the small mammal monitoring maintained by Dr. Kohlhaas at CSU Stanislaus.

Progress reports with summary data and findings will be prepared by project partners and submitted to the FWS. Project partners, including FWS, will disseminate findings by submitting publications to scientific journals or other venues, and making presentations at symposia and workshops. The San Luis NWR Complex will act as the official repository for all data reports, summaries, and publications generated by this project. Such reports and summaries will be provided to the public upon request.

8. Public Involvement and Outreach – The San Luis NWR Complex is active in its outreach in Stanislaus County. Refuge staff have hosted quarterly "Community Forums" and sent out "Refuge Update" newsletters to inform neighbors, stakeholders, the Community Planning Director, and agencies of actions being considered throughout the land acquisition and restoration planning/implementation phase of this project. Field trips and on-site meetings are held on a recurring basis to allow local, state, and federal agencies to see first hand the value of the Refuge and status of restoration efforts. The brush rabbit recovery effort has been publicized by inviting agency staff, local landowners, and the media to rabbit re-introductions. In addition, the Refuge directly participates in the local Riparian Brush Rabbit Festival, assists a local rotary club in school class tours of the refuge and an adjacent ranch (under FWS conservation easement), and organizes tree planting events with local school and scout groups.

This proposal is not expected to generate any controversy because all monitoring and evaluation activities will be conducted on lands currently owned by FWS. Much of the proposed monitoring is consistent with monitoring and evaluation tasks that are planned for implementation in the San Joaquin River NWR Draft Comprehensive Conservation Plan which is currently out for public comment. If this proposal is selected for funding, the monitoring tasks and role of CALFED will be publicized through ongoing outreach efforts and high-lighted in agency field trips/meetings.

9. Work Schedule – Estimated Start Date = California Bay Delta Authority action plus four months to sign funding agreement with CDFG (October 2005); Estimated Completion Date = three years from start date (October 2008).

Task	Work Schedule
A. Project Management	Project coordination and reports years 1-3
B.1 VELB Surveys	Field surveys years 1-3, report year 3
B.2 Riparian Brush Rabbit	Field surveys years 1-3, report year 3
B.3 Waterbird Monitoring	Field surveys years 1-2, report year 2
B.4 Landbird Monitoring	Field surveys years 1-3, report year 3
B.5 Small Mammal Monitoring	Field surveys years 1-3, report year 3
B.6 Primary Pollinator Surveys	Field surveys years 1-3, report year 3
C.1 Fish Community Assessment	Field surveys years 1-3, report year 3
D.1 Survival of Restored Vegetation	Field surveys years 1-3, report year 3
D.2 Levee Breach Vegetation	Field surveys years 1, 3, report year 3
D.3 Invasive Weed Monitoring	Field surveys years 1-3, report year 3
E.1 Surface Water Flows	Monitoring years 1-3, report year 3
E.2 Floodplain Topography	Monitoring years 1-3, report year 3
E.3 Groundwater Levels	Data collection years 1-3, report year 3

B. Applicability to CALFED Bay-Delta Program ERP Goals, the ERP Draft Stage I Implementation Plan, and CVPIA Priorities

1. ERP and CVPIA Priorities - The restoration efforts implemented in the completed or ongoing CALFED projects at San Joaquin River NWR directly address all six of the ERP Goals (CALFED 2000) by actively protecting and restoring riparian floodplain habitat; re-introducing riparian brush rabbits as part of a multi-agency recovery action; enhancing other at risk species, migratory birds, and harvestable species; restoring floodplain functions by breaching levees; reducing non-native invasive weeds; and improving water quality. The applicability of the different components of this monitoring proposal to meeting CALFED goals is presented below:

Goal 1 Recover Endangered and Other At-Risk Species and Native Biotic Communities

a) Valley elderberry longhorn beetle surveys (B.1) will aid in species recovery by providing a better understanding of how this Federal and state endangered species repopulates and uses recently restored habitats. Understanding habitat use patterns will aid in the design of restoration plantings that maximize benefits to the species

b) Monitoring riparian brush rabbits (B.2) will directly measure the success of a species recovery action (re-introduction on Refuge) and provide information on the suitability of recently restored habitat to support rabbit populations.

c) Monitoring of waterbird use of restored wetlands (B.3), landbird use of restored riparian forest (B.4), and small mammal use of restored habitats (B.5) will directly measure the success of habitat restoration efforts in recovering riparian/wetlands associated wildlife communities, and help guide design of future restoration.

d) Monitoring native bee populations (B.6) will ascertain how primary pollinators disperse from adjacent habitats and re-populate newly restored areas.

e) Fish population studies (C.1) will determine if the floodplain restoration as designed does enhance listed anadromous fish populations such as Chinook salmon, steelhead, and Sacramento splittail through providing rearing habitat and minimizing entrapment. This

information will aid in recovery efforts by helping guide design of future floodplain restoration projects and subsequent management of the restored habitats in flood and nonflood years both on the Refuge and elsewhere in the Central Valley.

Goal 2 - Rehabilitate Ecological Processes

a) Monitoring native bee populations (B.6) will provide a better understanding of primary pollinator/plant community relationships and aid restoration ecologists in planning of ongoing and future re-establishment of natural floodplain riparian forest.

b) Monitoring success of riparian vegetation restoration (D.1) will measure the success in re-establishing a functional floodplain riparian forest community, and provide information to aid in the planning and implementation of ongoing and future floodpain restoration projects.

c) Monitoring plant communities near proposed levee breaches (D.2) and physical processes (E.1, E.2, and E.3) associated with breaching of flood control levees and subsequent over-bank flooding of the floodplain will measure the success in re-establishing floodplain hydrology and fluvial processes within the project site, provide information to restoration ecologists that will aid in the planning of additional floodplain restoration/levee breaching projects elsewhere on San Joaquin River system.

d) Monitoring groundwater levels (E.4) will provide information on the relationships between groundwater depth and riparian plant community establishment and development, and document changes in groundwater depth resulting from changing the site from intensively farmed/drained agricultural lands to a functioning floodplain with riparian forest and wetlands.

Goal 3 – Maintain or Enhance Harvestable Species

a) Monitoring waterbird use of restored wetlands (B.3) will measure the effectiveness of the restoration efforts in enhancing populations of waterfowl such as wood ducks and mallards. Information obtained will help guide design of future restoration projects.

b) Fish population studies (C.1) will determine if the floodplain restoration as designed does enhance Chinook salmon and steelhead populations through providing rearing habitat and minimizing entrapment. This information will aid in recovery efforts by helping guide design of future floodplain restoration projects and subsequent management of the restored habitats in flood and nonflood years both on the Refuge and elsewhere in the Central Valley.

Goal 4- Protect and Restore Habitats

a) Monitoring success of riparian vegetation restoration (D.1) will measure the success of planting 14 plant associations to re-establish a diverse community of floodplain tree/shrub and grass/forb habitats, and provide information to aid in the planning and implementation of ongoing and future habitat restoration projects.

b) Monitoring of floodplain topographical changes (E.2) will document how habitat features such as meandering channels and sediment depositions develop across the floodplain as a result of flood events that occur after the levee breaching, and provide information to aid in the planning and implementation of ongoing and future floodplain restoration projects.

Goal *5* – Prevent Establishment of and Reduce Impacts From Non-Native Invasive Species

a) Monitoring success of riparian vegetation restoration (D.1) within past planting sites will examine whether restored woody and herbaceous native vegetation are effective in limiting

establishment of non-native invasive weeds, and provide information to aid in the planning and implementation of ongoing and future habitat restoration projects.

b) Monitoring success of weed management activities (D.3) on non-planted sites will examine effectiveness of past (CALFED) and ongoing (non-CALFED) weed control actions on levee banks and other areas within the project area. Results will be used in adaptive manner to limit or prevent re-establishment of non-native invasive weeds.

Goal 6- Improve or Maintain Water and Sediment Quality

a) Although the restoration project will reduce direct inputs of pesticides and sediments from the project site into the San Joaquin River and provide a natural filter for such inputs from upslope of the project site, no direct water quality monitoring is included in this proposal. Other monitoring efforts in the area are currently ongoing, and future CALFED-funded water quality monitoring proposal submissions are anticipated.

2. Relationship to Other Ecosystem Restoration Actions, Monitoring Programs, or System-wide Ecosystem Benefits - The San Joaquin River NWR riparian habitat protection and floodplain restoration project builds on and is closely linked to existing conservation programs. As such, this monitoring proposal to evaluate the results and effectiveness of the restoration project will provide information that will aid in the continued implementation of the following programs:

a) FWS – San Joaquin River NWR: The Refuge was established in 1987 and is actively acquiring new lands, restoring habitats, and conducting operational management. This proposal is consistent with meeting the monitoring and evaluation needs identified in the Refuge's draft Comprehensive Conservation Plan.

b) FWS - Anadromous Fish Restoration Program: This FWS initiative is aimed at restoring salmon and other anadromous fish populations in the Central Valley rivers, and is funded through CVPIA. The Stockton Office of this program acquired 30 acres of land in 1999 along the Stanislaus River *(3.5* miles from project site) to protect riparian and shaded riverine aquatic habitats and transferred that land to the San Joaquin River NWR. That office also contracted PWA to model and evaluate the effects of floodplain restoration project at the Refuge (ERP 01-N08) upon anadromous fish populations. The physical processes monitoring of this proposal will build upon the hydrological modeling of that contract.

c) North American Waterfowl Management Plan: The FWS was awarded a North American Wetlands Conservation Act grant in 2003 to restore and enhance 2,470 acres of wetlands, forested riparian habitat, and associated uplands at San Joaquin River NWR and nearby private lands along the San Joaquin River. Restoration is ongoing. Information obtained through this proposal will aid in the subsequent management of those lands.

d) State of California Drinking Water, Clean Water, Watershed Protection, and Flood Protection Bond Act of 2000: The State of California awarded a grant to the Refuge in 2002 to protect 842 acres of critical floodplain lands through fee acquisition (91 ac.) and perpetual conservation easements (751 ac.). Information obtained through this proposal will aid in the subsequent

management of those lands.

e) California Department of Water Resources – Floodplain Corridor Protection Program: The State of California awarded River Partners a grant in 2004 to restore 511 acres of riparian forest and wetlands on San Joaquin River NWR adjacent to the ongoing CALFED restoration project. Restoration planning is ongoing and restoration activities will begin in spring 2005. Plant survival monitoring incorporated into the restoration work plan is the same as was done in ERP 01-N08. Information obtained through this proposal will directly aid in the restoration planting design, restoration implementation, and subsequent management of the restored floodplain.

f) CDFG conservation easement programs: The state of California is acquiring easements on private lands along the San Joaquin River floodplain near the town of Westley through the Presley Program.

g) NRCS easement programs: Flood prone private lands along the San Joaquin, Stanislaus, and Tuolumne Rivers in Stanislaus County are being protected by conservation easements through the Wetland Reserve Program and other programs.

h) Grayson Ranch Project: A riparian restoration project on the Tuolumne River being conducted by the East Stanislaus Resource Conservation District and Friends of the Tuolumne through funding from CALFED (98-F07) and NRCS.

In addition, this proposal will provide information and an understanding of restoration processes that helps fulfill the objectives of federal directives from the Council of Environmental Quality and the Office of Management and Budget, and helps meet numerous state and federal agency goals such as non-structural flood protection projects, the Governor's Flood Emergency Action Team (FEAT) report, the San Joaquin River Management Plan, Central Valley Habitat Joint Venture, Riparian Habitat Joint Venture, and the FWS Multi-species Recovery Plan for Upland Species of the San Joaquin Valley, California.

3. Additional Information for Proposals Containing Land Acquisition: Not applicable. No new land will be acquired nor easements/rights of way purchased as part of this monitoring proposal.

C. Qualifications

Kim Forrest (Project Oversight) is the Refuge Manager for the San Luis NWR Complex, and is responsible for planning , guiding, and administering a large and complex operation in accordance with established management plans, policies, and prescribed objectives. This includes formulating comprehensive plans for the various Refuge programs, developing Refuge policy, coordination of programs with various partners, directing operations and maintenance activities, and fiscal and personnel administration Previous work experience includes 28 years with the FWS, including as Refuge Manager of Humboldt Bay NWR (California), Deputy Project Leader for the Sacramento NWR Complex (California) and assistant refuge manager positions at San Luis NWR Complex, Charles M Russell NWR Complex (Montana), and Fish Springs NWR (Utah). She received a B.S. in Wildlife Management at the Utah State University.

Dennis Woolington (Lead Investigator – Project Coordinator) is the Supervisory Wildlife Biologist at the San Luis NWR Complex. He serves as a staff advisor to the project leader on biological and management issues, and oversees the biological program on three National Wildlife Refuge totaling more than 47,000 acres. Mr. Woolington's responsibilities include developing and overseeing operational surveys and monitoring efforts, coordinating research, designing and obtaining funding for major habitat restoration projects, implementing riparian restoration efforts, and preparing National Environmental Policy Act documents and Section 7 Consultations. He has 28 years of professional resource management experience with state and federal agencies including 23 years with the FWS at the Aleutian Islands NW.R (Alaska), National Wetlands Research Center (Louisiana) and the San Luis NWR Complex (California). He held a position as an FWS research biologist during 1986-1991, and during his career has authored or co-authored 8 peer-reviewed publications. Mr. Woolington received a B.S. in Wildlife Sciences from Purdue University and a M.S. in Wildlife Management from Humboldt State University.

River Partners (Riparian Restoration Monitoring) is a non-profit organization dedicated to the protection and restoration of natural resources of the Central Valley. It is composed of a team of experienced professionals with expertise in biotic principles and applied field techniques of restoration ecology. The group has a proven track record for implementing cost effective restoration. Since its incorporation in 1998, it has restored more than 2,000 acres of riparian habitat for Federal, State, County, and private clients. Dr. Tom Griggs will oversee the River Partner's vegetation monitoring activities for this project. Dr. Griggs has 23 years of experience in riparian restoration and monitoring. He developed the original riparian restoration efforts on the Sacramento River, directed the restoration of 800 acres on San Joaquin River NWR, and has authored over 16 publications on riparian ecology and restoration. He earned a B.S. in Biology from California Polytechnic University, Pomona, a M.S. in Botany from CSU Chico, and a Ph.D. in ecology from UC Davis.

PRBO (Landbird Monitoring) is a non-profit organization that since its establishment in 1965 has been dedicated to the conservation of birds and preservation of the natural communities on which they depend. They maintains a permanent research station in Marin County and conducts avian monitoring research throughout the state in conjunction with Federal, State, and private partners. PRBO is internationally recognized as a center of excellence for avian research and a leader in bird conservation initiatives. Geoff Geupel, Director of Terrestrial Ecology Programs, will oversee PRBO's participation in the monitoring phase of this project. He has 20 years of professional experience in private sector bird conservation. Mr. Geupel co-authored a handbook that has standardized field techniques for monitoring of neo-tropical migratory landbirds. He has authored/co-authored over 30 peer-reviewed publications on bird resources/conservation topics. Mr. Geupel received a B.S. in Biology from Lewis and Clark College, Washington.

ESRP (Riparian Brush Rabbit Re-introduction Monitoring) is a cooperative program of the FWS and BOR administered by C.S.U. Stanislaus, Stanislaus Foundation. It consists of a team of biologists whose mission is to conduct field research, compile life history data, and conduct management activities that aid in the recovery of San Joaquin Valley species that are listed under

the federal Endangered Species Act ESRP produced a multi-species Recovery Plan for Upland Species of the San Joaquin Valley, California for the USFWS in 1998. ESRP has been conducting research and monitoring of riparian brush rabbits for the past 9 years. Patrick Kelly, PhD is the Coordinator for ESRP and is leading the re-introduction and monitoring activities. Dr. Kelly received his Doctorate from UC Berkeley and has published numerous articles in scientific and popular publications.

PWA (Physical Processes Monitoring) is a private consulting firm based in San Francisco. Chris Bowles, PhD, who will oversee PWA's participation in this proposed project, is a civil engineer specializing in hydraulics, hydrology, water resources, and environmental restoration. Dr. Bowles has 16 years experience in these fields with positions ranging from land surveyor to project manager. During 2001-2004 he was project manager of a FWS-funded study involving hydrodynamic modeling to evaluate effects of levee beaching for ecological restoration at San Joaquin River NWR. Dr. Bowles received his Doctorate from Nottingham Trent University, England, and has published more than 15 peer reviewed publications.

UC Berkeley – Gordon Frankie, Ph.D. (Bee/Primary Pollinator Monitoring) is a professor of Insect Biology in the Department of Environmental Science, Policy, and Management at UC Berkeley. He has been a faculty member at that institution since 1976 and is recognized as an expert in insect ecology, environmental science, applied conservation biology, and plant reproduction ecology. He has been conducting a long-term ecological study on native bee/pollinators in the Central Valley of California since 1989. Dr. Frankie received his Doctorate in entomology from UC Berkeley and has published over 140 articles in scientific and popular journals.

CSU Stanislaus – Anne Kohlhaas, PhD (Small Mammal Monitoring) is an Associate Professor and currently Chair of the Department of Biologicla Sciences at CSU Stanislaus. She has taught classes there since 1993 and has conducted research on mammals in California, Texas, Bolivia, and Indonesia. Dr. Kohlhaas received her Doctorate from the University of Colorado, Boulder, and has authored five scientific publications.

D. Cost

1. Budget – A detailed budget table broken down by year and task is provided on the on-line budget form included as part of this proposal submission package. A total project grant request budget itemized by task is provided below:

Task	Cost
A. Project Management	$194,113
B.1 VELB Surveys	$ 21,113
B.2 Riparian Brush Rabbit	$119,150
B.3 Waterbird Monitoring	$ 48,250
B.4 Landbird Monitoring	$160,242
B.5 Small Mammal Monitoring	$108,045
B.6 Primary Pollinator Surveys	$171,731
C.1 Fish Community Assessment	$355,220

D.1 Survival of Restored Vegetation	$117,389
D.2 Levee Breach Vegetation Survey	$ 7,331
D.3 Invasive Weed Monitoring	$ 14,590
E.1 Surface Water Flows	$ 96,965
E.2 Floodplain Topography	$ 43,587
E.3 Groundwater Levels	$ 7,056

Total Grant Funds Requested $1,464,782

2. Cost Sharing – FWS and project partners will contribute a total of $748,424 in cost share funds to support this project. FWS contributions ($522,071) will consist of salary expenditures for permanent Refuge and Stockton Fisheries Office staff to oversee and implement this monitoring project, use of bunkhouse facilities for partner field crews, and costs of operating/maintaining facilities. Contributions from PRBO ($21,733), CSU Stanislaus ($14,340), and UC Berkeley ($190,280) are primarily in the form of salary costs for principal investigators. Cost share contributions are detailed in the individual task study plans (Appendices 1-11).

3. Long Term Funding Strategy – The project site is all within the San Joaquin River NWR, and as such, will be managed on a permanent basis as part of the FWS National Wildlife Refuge System. The FWS has a strong commitment to science-based management. Much of the monitoring tasks included in this proposal are also identified as long-term monitoring needs in the Refuge's draft Comprehensive Plan, species recovery plans, and other FWS conservation initiatives. Habitat and wildlife population monitoring will be conducted by FWS staff as part of the base operations of the Refuge. The Refuge staff has a long term working relationship with the research community and has been successful in obtaining funds to conduct research on the Refuge. We will continue to work with such partners in seeking out funding through CALFED, Federal initiatives, and other sources to conduct additional monitoring of floodplain processes, riparian-associated species, and riparian restoration ecology.

E. Compliance with Standard Terms and Conditions - The FWS cannot agree to a standard clause requested for State funded projects Attachment D, Terms and Conditions for State Proposition 204 Funds, Section 3, states 'Performance Retention Disbursement shall be made on the basis of costs incurred to date, less ten percent of the total invoice amount Disbursement of the ten percent retention shall be made either (1) upon the Grantee's satisfactory completion of a discrete project task (ten percent retention for task will be reimbursed), or (2) upon completion of the project and Grantee's compliance with project closure requirements specified by CALFED (ten percent retention for entire project will be disbursed)".

FWS's authorization to enter into agreements with non Federal entities was changed in FY2000. Our FY2000 Appropriations bill authorizes FWS to enter into contracts with State agencies when advance payment to FWS is not possible. In accordance with the requirements imposed by Congress in the FY2000 Appropriations bill and report language, the Director of FWS must approve a project when advance payment is not possible and certify that payments will be made in full by the State within 90 days after the Service issues an invoice

Specifically, the ten percent retention clause cannot allow timely payments for the following reasons:

In our Federal Financial System (FFS) accounting program, a periodic invoice (either quarterly or monthly depending on the terms of the contract) is automatically issued form our finance center based on actual expenditures of the FWS on a project. Invoices include a payment due date on the invoice and when payment is not received in full by that due date, the system automatically shows the unpaid balance as delinquent. Depending on how delinquent the payment is, interest, penalty and administrative charges may also accrue. With ten percent retention withheld on each invoice, the ten percent retention amount then causes applicable invoice record in FFS to be partly delinquent and remain delinquent until the project or individual tasks identified in the contract are completed and the retention is released.

The FWS's Finance Center must report to the Department of Treasury if the Service is owed funds by any entity. Therefore, when accounts remain delinquent due to the ten percent retention of payments owed the FWS, that delinquency continues to be reported to the Treasury.

The FWS has previously entered into agreements with the State of California that do not contain the ten percent retention clause. We have asked the States Deputy Attorney General to provide clarifying guidance to the Department of Water Resources that is general in scope, which can also be applied to contracts related to the CALFED program.

Our offices will continue to work with the State closely on State funded projects. If the State is not satisfied with the work performed by the Service, the State project manager should contact the FWS project manager to correct the performance problem. If needed, upon notification interim billings can be canceled until the State is satisfied with the FWS's performance.

We can comply with all other State and Federal standard clauses.

G. Literature Cited

CALFED Bay-Delta Program. 1999. Ecosystem Restoration Program Plan. Volume 1. Draft Programmatic EIS/EIR Technical Appendix. June 1999. Sacramento, CA

Chouinard, T., V. Lyon, B. Barbour, and D. Woolington. 1999. San Joaquin River NWR Riparian Habitat Protection and Floodplain Restoration Project Biological Inventory and Monitoring. 1998. Report prepared for CALFED Bay-Delta Program. U.S.Fish and Wildlife Service, Los Banos, California. 49 pages.

Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and Monitoring Plant Populations. U.S. Bureau of Land Management Technical Reference 1730-1. 477 pp.

Griggs, F. T. 2000. Pre-restoration Plan for the West Unit of the San Joaquin River National Wildlife Refuge. Unpublished report. U.S. Fish and Wildlife Service, San Luis NWR Complex, Los Banos, CA. 51 pp.

Nur, N., S. L. Jones, and G. R. Geupel. 1999. A Statistical Guide for Data Analysis of Avian Monitoring Programs. Biological Technical Publication BTR-R6001-1999. U.S. Fish and Wildlife Service, U.S. Department of Interior. Washington, D.C. 46 pp.

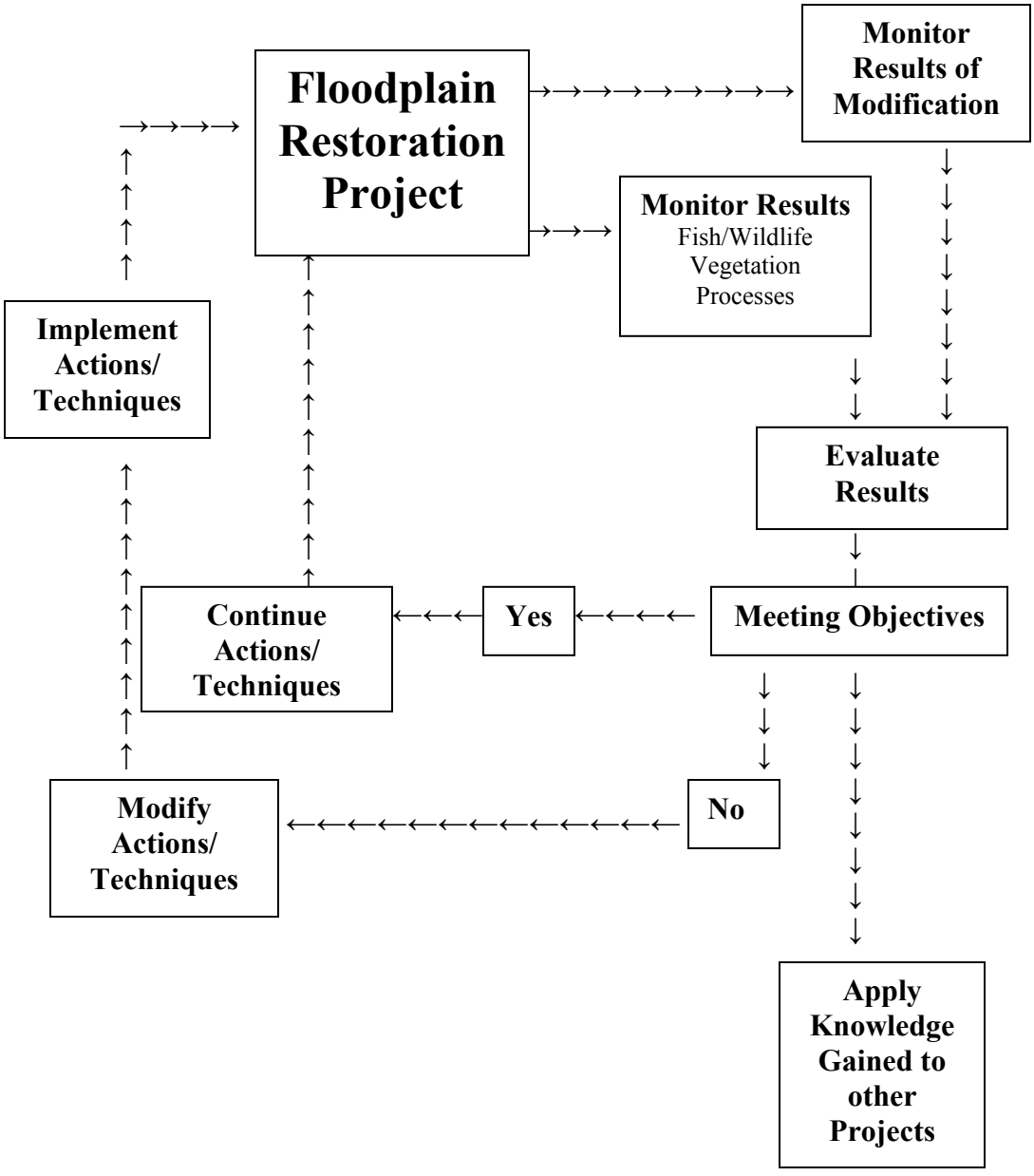
Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. General Technical Report PSW-GTR-144. Pacific Northwest Research Station. U.S. Forest Service, U.S. Department of Agriculture. Albany, OR. 41 pp.

U.S. Fish and Wildlife Service. 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. Portland, OR.

U.S. Fish and Wildlife Service. 1991. Distribution, Habitat, and Status of the Valley Elderberry Longhorn Beetle *(Desmocerus californicus dimorphus).* Sacramento, CA.

H. Nonprofit Verification **-** FWS is a federal agency within the U.S. Department of the Interior.

Figure 1. Conceptual Model of Monitoring and Evaluation of Riparian Habitat Floodplain Restoration Projects at San Joaquin River NWR.



APPENDIX 1. Study Plan for Task B.1

Valley Elderberry Longhorn Beetle Use of Restored and Mature Riparian Habitat at San Joaquin River National Wildlife Refuge

Prepared by
Kenneth M. Griggs, Wildlife Biologist
USFWS, San Luis NWR Complex

Background and Justification

Riparian habitats are complex and diverse ecosystems that have significantly declined in California and throughout North America (Naiman et al. 1993). It is estimated that only 10% of riparian woodlands present in the Central Valley 200 years ago remain intact (Katibah 1984). This is largely due to levee construction for flood control, stream channelization, residential and commercial development, and agricultural activities. Some of the rarest plant and animal species in California are riparian habitat specialists (Sands 1980, Eng 1984).

One of these rare, riparian forest habitat specialists is the valley elderberry longhorn beetle (VELB), *Desmocerus californicus dimorphus*. The VELB has only been found in association with its host plant, elderberry (*Sambucus* spp.). During the VELB life cycle adults feed on the foliage, females lay eggs in the bark, larvae hatch and burrow into the bark where they may remain for up to 2 years. The mature larva pupates in an enlarged pupal chamber, transforms into an adult, chews an exit hole, and emerges. The VELB ranges in the Central Valley from Tehama County in the north to Tulare County in the south (USFWS 1991). Adults have been collected on the valley floor to 2200 feet in the Sierra Nevada (USFWS 1991).

The VELB was designated as a threatened species by the USFWS under the Endangered Species Act in 1980 (USFWS 1980). Extensive losses of habitat and fragmentation contributed to population declines, and continue to threaten the species. To mitigate the effects of habitat loss and fragmentation to the VELB and numerous other riparian dependent species, a large scale, CALFED funded (contract # 01-N08), riparian restoration project was initiated in 2002 on lands within the San Joaquin River National Wildlife Refuge (SJRNWR). This project includes the restoration of over 500 acres of riparian habitat. This coupled with a CALFED funded purchase of over 200 acres of mature riparian habitat along the Stanislaus River, is a positive step toward increasing habitat for the VELB and other riparian dependent species.

To date there has not been a rigorous survey for the VELB on the SJRNWR. Barr (USFWS 1991) conducted a wide ranging survey in the Central Valley covering numerous drainages, however no surveys were conducted at SJRNWR. Due to the lack of information available regarding VELB population size and distribution, habitat requirements, and persistence/colonization of sites, surveys of restored and mature riparian habitats on SJRNWR would significantly increase our knowledge of the species. Information generated from these

efforts will provide valuable information to restoration planners seeking to establish suitable VELB habitat, and ultimately contribute to the recovery of the species.

Objectives

Through surveys of recently restored and mature riparian habitats, the objectives of this monitoring plan were to:

1) Document and map the presence and local abundance of VELB on restored and recently obtained mature riparian habitats within the SJRNWR.

2) Describe the structural and stand level characteristics of elderberry selected by the VELB.

3) Describe population persistence at established sites and colonization of previously unoccupied sites over the duration of the monitoring period.

Overview of Monitoring Effort

Surveys for adult VELB and emergence holes will be conducted in early May and in early September, 2006-2008. Their presence/absence, elderberry structural and stand characteristics, persistence and colonization of sites will be recorded. A GIS and statistical analyses will be employed to answer questions regarding the status of the population, habitat use, and future restoration planning on SJRNWR.

Participants

All planning, field work, data analysis, and report writing will be conducted by Refuge biologists.

Methods

Surveys for VELB will focus exclusively on elderberry bushes, as the species is completely dependent on the plant throughout its entire life cycle (USFWS 1991). Surveys will be conducted over a 2 week period, during early May and again in early September, in each year of the monitoring program (2006-2008), following established protocols outlined by Barr (USFWS 1991). Areas within restoration plots and mature, newly acquired riparian parcels will be systematically surveyed for elderberry bushes. In restoration sites, planting maps will be used to locate elderberry clusters, while transects placed 50-100 meters apart (depending on terrain and vegetation density) will be surveyed in mature riparian sites. When an elderberry bush is detected, the foliage, flowers, branches, and trunks will be thoroughly scanned for adult VELB. Adults can be seen with the unaided eye up to 5 meters away, binoculars will be used to scan for adults in the upper reaches of the plant. Because adults are rarely seen in the field (Lang et al. 1989 and USFWS 1991), the branches and trunk of the plant will be surveyed for emergence holes to indicate the presence of the VELB. The VELB is the only insect in the Central Valley to

form holes of this type and diameter (7-10 mm) (Lang et al. 1989). Emergence holes will be classified as "recent" (made in the current year) or "old" (made in a previous season) based on the condition of the wood inside the hole (light and fresh or discolored and aged), condition of hole opening (clean-cut or eroded), and growth of wood surrounding the hole (USFWS 1991). For each exit hole the branch diameter at the opening, vertical height of the hole from the ground, and maximum diameter of the trunk will be recorded (Collinge et al. 2001). Within mature sites, all clusters (2 or more plants within 30 feet of each other) and individual elderberry regardless of VELB presence/absence, will be mapped using a gps unit. These plants will be re-checked during future surveys to determine if individuals persist on plants or if colonization of new plants is occurring.

The density and spatial arrangement of elderberry stands has been shown to influence the use of individual plants (Collinge et al. 2001). Therefore, the density of elderberry within a 50 meter radius of a plant with VELB present will be determined. In addition, the distance of a plant with VELB present to the next nearest elderberry will be classified as 0-10, 10-20, 20-30, 30-40, 40-50, 50-100, and greater than 100 meters. For comparison with plants used by the VELB, the above density and distance measurements will also be collected on randomly chosen unused elderberry.

Analysis

Descriptive statistics will be used to describe the presence/absence of adult VELB and emergence holes in restored and mature riparian habitats. To map VELB occurrence, a GIS will be created using ARC GIS (Environmental Systems Research Institute, Redlands, California, USA) containing layers with known elderberry locations, VELB occupation status, and structural and stand characteristics, as they change over the duration of the monitoring period. Analysis of variance (ANOVA) will be employed to compare the structural characteristics of elderberry (branch diameter at emergence hole, height of hole, and trunk diameter) with the VELB present between years of the monitoring program (2006-2008) (Zar 1998). Comparisons of density and distance measures between elderberry occupied by the VELB and random unoccupied plants will be made using a two sample t-test (Zar 1998). Finally, to describe colonization of previously unoccupied sites, spatial statistics will be used to assess the degree to which sites close to one another are more similar in occupancy status than those further apart (Collinge et al. 2001).

Quality Control-Quality Assurance Protocols

Survey protocols described above are derived from commonly used and tested methodologies. Government agencies, conservation organizations, and university researchers have employed these techniques. Data collection will be standardized through the use of forms and codes developed by the USFWS. All personnel conducting surveys will be properly trained in the identification of elderberry, adult VELB, and emergence holes that will be encountered on SJRNWR. The Refuge Supervisory Biologist will oversee monitoring on this project.

Products and Archiving

The data and results will be summarized in progress reports and presented in a final report at the end of the project. GIS coverages of elderberry locations, structural and stand characteristics, and VELB occupied sites will be created for use in long term monitoring of this species and future restoration planning. Data from this project will be stored at San Luis NWR complex and incorporated into the permanent Refuge files.

Roles and Responsibilities

All data collection, analysis, and report preparation will be conducted by Refuge personnel.

Literature Cited

Collinge, S. K., M. Holyoak, C. B. Barr, and J. T. Marty. 2001. Riparian habitat fragmentation and population persistence of the threatened valley elderberry longhorn beetle in central California. Biological Conservation. 100:103-113.

Eng, L. L. 1984. Rare, threatened and endangered invertebrates in California riparian systems. Pages 915-919 *in* California Riparian Systems: Ecology, Conservation, and Productive Management. Edited by R. E. Warner and K. M. Hendrix. Univ. of Cal. Press, California.

Katibah, E. F. 1984. A brief history of riparian forests in the Central Valley of California. Pages 23-29 *in* California Riparian Systems: Ecology, Conservation, and Productive Management. Edited by R. E. Warner and K. M. Hendrix. Univ. of Cal. Press, California.

Lang, F. J., J. D. Jokerst, and G. E. Sutter. 1989. Habitat and populations of the valley elderberry longhorn beetle along the Sacramento River. U. S. Forest Service Gen. Tech. Rep. PSW-110. Pages 242-247.

Naiman, R. J., H. Decamps, and M. Pollock. 1993. The role of riparian corridors in maintaining regional biodiversity. Ecological Applications. 3:209-212.

Sands, A. 1980. Riparian forests in California: their ecology and conservation. University of California Regents, Berkeley, California.

U. S. Fish and Wildlife Service. 1980. Listing the valley elderberry longhorn beetle as a threatened species with critical habitat. Office of the Federal Register, National Archives and Records Administration. 45(155):52803-52807.

U. S. Fish and Wildlife Service. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle Desmocerus californicus dimorphus Fisher (Insecta: Coleoptera: Cerambycidae). U. S. Fish and Wildlife Service, Sacramento, CA. 134 pp.

Zar, J. H. 1998. Biostatistical analysis. 4th edition. Prentice Hall publishers. 929 pp.

Budget - Valley elderberry longhorn beetle monitoring in restored and mature riparian habitats at SJRNWR.

Year 1 (2006)					
Salaries					
	GS-5 Biological Technician	112 hrs x 13.83/hr =	$1,548.96	salary	$1,665.44
		112 hrs x 1.04/hr =	$116.48	benefits (7.5%)	
	GS-11 Wildlife Biologist	96 hrs x 25.36/hr =	$2,434.56	salary	$3,165.12
		96 hrs x 7.61/hr =	$730.56	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x 1 months =			$500.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
	Regional Office/CNO overhead of 18% project costs				$995.50
				Total Year 1	$6,526.06
Year 2 (2007)					
Salaries					
	GS-5 Biological Technician	112 hrs x 14.39/hr =	$1,611.68	salary	$1,732.64
		112 hrs x 1.08/hr =	$120.96	benefits (7.5%)	
	GS-11 Wildlife Biologist	96 hrs x 26.38/hr =	$2,532.48	salary	$3,291.84
		96 hrs x 7.91/hr =	$759.36	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x 1 months =			$500.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
	Regional Office/CNO overhead of 18% project costs				$1,030.41
				Total Year 2	$6,754.89

Budget - Valley elderberry longhorn beetle monitoring in restored and mature riparian habitats at SJRNWR (Continued).

Year 3 (2008)					
Salaries					
	GS-5 Biological Technician	112 hrs x 14.96/hr =	$1,675.52	salary	$1,800.96
		112 hrs x 1.12/hr =	$125.44	benefits (7.5%)	
	GS-11 Wildlife Biologist	116 hrs x 27.43/hr =	$3,181.88	salary	$4,136.56
		166 hrs x 8.23/hr =	$954.68	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x 1 months =			$500.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
	Regional Office/CNO overhead of 18% project costs				$1,194.75
				Total Year 3	$7,832.27
				Total Project Cost	**$21,113.22**

Approvals

A. Submitted by: _____ date

B. Reviewed by: _____ date
(Regional Wildlife Biologist)

C. Reviewed by: _____ date
(Appropriate species or scientific expert)

D. Approved by: _____ date
(Refuge Manager)

APPENDIX 2. Study Plan for Task B.2

RESEARCH PROPOSAL

USE OF RESTORED RIPARIAN COMMUNITIES AT THE SAN JOAQUIN RIVER NATIONAL WILDLIFE REFUGE BY RIPARIAN BRUSH RABBITS

Patrick A. Kelly, Laurissa P. Hamilton, Matt R. Lloyd, and Elizabeth A. Williams
California State University, Stanislaus—Endangered Species Recovery Program
1900 N. Gateway Blvd., Suite 101, Fresno, CA 93727
559-453-1103, patrickk@esrp.csustan.edu

8 November 2004

INTRODUCTION

The riparian brush rabbit (*Sylvilagus bachmani riparius*) is California- and federally-listed as an endangered species (U.S. Fish and Wildlife Service 2000). It occupies riparian communities dominated by thickets of willows (*Salix* spp.), wild roses (*Rosa* spp.), blackberries (*Rubus* spp.) and other successional trees and shrubs, and when available seasonally, dense, tall stands of herbaceous plants adjacent to patches of riparian shrubs in the northern San Joaquin Valley. Such communities in the San Joaquin Valley have been reduced to less than 1% of their historical extent, primarily by clearing natural vegetation, irrigated cultivation, impoundment of rivers, and stream channelization.

Today, the only known populations of riparian brush rabbits are confined to Caswell Memorial State Park (Caswell) on the Stanislaus River, and the South Delta area of the San Joaquin River, including Paradise Cut and Tom Paine Slough (Williams and Basey 1986, Williams and Hamilton 2001, ESRP unpubl. data). Both populations of riparian brush rabbits are under significant, proximate threats of extinction. The population in Caswell faces threats from random demographic events in small populations, inbreeding and loss of genetic diversity, wildfire, flooding, disease, and predation exacerbated by high numbers of feral cats (Williams and Basey 1986; Williams 1988, 1993; U.S. Fish and Wildlife Service 1998). The South Delta population faces threats from stochastic demographic and genetic events, flooding, disease, predation, competition, and habitat conversion on private land.

The Recovery Plan for the riparian brush rabbit lists the establishment of three additional self-sustaining, wild populations outside of Caswell and within the historical range of the species as being necessary for recovery (U.S. Fish and Wildlife Service, 1998). Because the extant populations at Caswell and the South Delta are isolated from other suitable sites that currently are uninhabited, reintroductions of individuals derived from existing populations are required to achieve this goal (U.S. Fish and Wildlife Service, 1998). The Caswell population is too small

and nonproductive to serve as a source of wild-born rabbits for translocation. For these reasons, breeding in confinement to provide a source of animals for reintroductions is called for in the Recovery Plan. To that end, efforts to initiate a controlled propagation program were undertaken in 1999. Subsequently, the U.S. Fish and Wildlife Service, California Department of Fish and Game, and U.S. Bureau of Reclamation decided not to pursue studies of controlled propagation on a surrogate subspecies of brush rabbits, but rather to take advantage of a newly discovered population of riparian brush rabbits in the South Delta.

To avoid problems that could arise from confining a rare species in small cages when little is known about its husbandry and mating behaviors, the necessity for offspring to learn about habitat, food, and predator avoidance, and to become acclimated to weather at the translocation site, the Riparian Brush Rabbit Recovery Working Group, decided not to confine and breed rabbits in small cages. Instead, animals were placed in fenced enclosures larger than their typical home ranges (0.33 ha; Dixon et al. 1981) and populated with natural vegetation that provided suitable habitat (Williams and Basey 1986, Williams et al. 2002).

Reintroduction of endangered riparian brush rabbits, bred in captivity, to historical habitat on the San Joaquin River National Wildlife Refuge (Refuge) began in August 2002 (Williams et al. 2002). By 27 October 2004, 305 rabbits had been translocated to the Refuge and an estimated 20 individuals remain to be moved as of early November 2004 (ESRP unpubl. data). Once captive-bred rabbits reached adult size and passed health-screening checks, they were removed from the controlled propagation pens and translocated to soft-release enclosures (fenced to provide some protection from predation) at the Refuge. The rabbits were held in these enclosures for 2-7 day intervals so that they might acclimate to the new surroundings. Upon release, the rabbits are monitored weekly using radiotelemetry and direct observation to track survival and movement.

Concurrent with the reintroduction of riparian brush rabbits to the Refuge, the U.S. Fish and Wildlife Service initiated large-scale restoration of riparian communities with major grant support from the CALFED Bay-Delta Program. The restoration program started in the spring and fall of 2002 when Sacramento River Partners installed 10 *plant associations* on 314 hectares across the Refuge. *Double-density clusters* (31 x 49 m) of mixed willow and elderberry plantings were interspersed in the major plant associations; plants in these clusters are spaced at 5 m intervals rather than at 10 m used elsewhere in the restoration plant associations. The restoration locations are adjacent to two riparian brush rabbit release sites and, beginning in July 2004, use of one of the restoration fields by riparian brush rabbits was documented.

This proposal seeks funding to thoroughly evaluate the use of the restored riparian habitat on the Refuge by riparian brush rabbits and, to a lesser extent, by riparian woodrats (*Neotoma fuscipes riparia*). The primary study objectives of this research are to quantify the use of the newly restored riparian habitat by riparian brush rabbits and to compare the usage levels for the different plant associations in the restored areas. Additional objectives related to riparian brush rabbit use of newly restored riparian habitat on the Refuge include assessing reproductive condition, identification of refuge-born individuals, and monitoring survivorship.

METHODS

Live-trapping

Biannual live-trapping surveys will be conducted for five consecutive nights in November and May along standard rectilinear transects (10 traps with 20 m spacing) in each of the major plant associations (Table 1). To the extent possible, each transect will intersect one double density cluster (Figure 1). T-posts painted fluorescent pink or orange will mark transect ends. Each trap station will be marked with a numbered pin flag and a large nail (hammered into the ground). UTM coordinates will be noted for all markers and posts. Traps will be located where they are most likely to capture rabbits—in runways, along logs, in dense brush, and areas where fresh sign of rabbits is evident—but always within 5 m of the trap station marker.

Community	Spring 2002 Planting	Fall 2002 / Spring 2003 Planting
Fremont Cottonwood – Valley Oak	2	N/A
Valley Oak	2	2
Fremont Cottonwood	2	2
Fremont Cottonwood – Mixed Willow	2	N/A
Mixed-Willow	1	1
Button Bush	2	2
Total	**11**	**7**

Table 1. *Placement of live-trapping transects in relation to major plant association.*

Trapping sessions will occur over two-week periods in November and May: the northern transects in week 1 and the southern transects in week 2. The traps will be operated for 5 consecutive days and will be baited with a combination of rolled oats, molasses, and diced apple (or apple sauce). Fresh bait will be prepared every day and baiting of the traps will be completed one hour prior to sunset. On the first day of each session, all traps will be tested to ensure that they are functioning properly and that the doors will not be caught on vegetation or other debris. If necessary, vegetation will be trimmed from runways to prevent trap doors from becoming obstructed. Traps will be inspected for captures within one hour after sunrise. Traps will be locked open during the non-trapping period with cable-ties and during the day of trapping sessions with bungee cords. Thus, rabbits will be able to pass through the double-door traps without springing them during non-trapping periods. This procedure generally increases trapping success and it significantly reduces the amount of time spent on set up and take down of traps.

Figure 1. *Approximate locations of live-trapping transects (short lines) on the San Joaquin River National Wildlife Refuge.*

Upon first capture in the restoration area and on the first capture of subsequent trapping sessions, founder rabbits[1] will be weighed and measured (length of right ear and right foot in mm), and their reproductive condition (non-reproductive, scrotal, estrus, pregnant, lactating) will be noted. Woodrats and newly captured rabbits will receive additional processing: they will be permanently marked with ear tags[2] and passive integrated transponder (PIT) tags and tissue sampled[3] for genetic analyses.

Recaptured rabbits and woodrats will be weighed, sexed, and measured (rabbits only; length of right ear and length of right foot in mm) on their first capture for the session. If captured again during the same trapping session, those individuals will be identified (using a PIT scanner) and released to avoid further handling.

[1] Rabbits that have been translocated from the controlled propagation facility to the Refuge.
[2] Ear tags cannot be applied to young rabbits until their weight exceeds 400 g.
[3] Two 3-mm diameter plugs (2-mm for woodrats) of ear tissue will be taken with a biopsy punch and preserved in 95% ethanol (reagent grade, not denatured); two samples of 10-20 hairs, including the follicles, will be plucked from each newly captured rabbit and placed in coin envelopes.

All captured rabbits will be processed and released within 5 m of the site of capture. Individuals of other species (e.g. voles, mice, birds, etc.) that are captured during these sessions will be identified, recorded on the data sheets, and released in adjacent habitat.

Radiotelemetry

To monitor rabbit activity in the restored areas, 20 radio-collared rabbits will be hand tracked using 2-Element "H" style directional antennas (Telonics; Mesa, AZ) and directional five-element antennas with portable receivers (Communications Specialists; model R1000). Five-element antennas will either be mounted on vehicles or placed at permanent telemetry stations.

Each animal will be located twice monthly and its status (dead/alive) determined. Signals will be followed to determine which plant association or vegetation patch a rabbit is using. The rabbit will be located in the patch (typically dense thickets of wild rose or large clumps of blackberry) by quietly walking around it with the antenna disconnected from the receiver, but with a coaxial cable attached to the transmitter antenna jack and fixed to a 2-3 m pole. The animal's position will be estimated to within a few metersand recorded using a global positioning system (GPS). The time, weather conditions, signal quality, and habitat patch in which the rabbit is located will be recorded.

When the previous method of location proves too difficult or disruptive to the rabbits, triangulation will be used. To acquire location information, bearings will be taken simultaneously by two researchers. Synchronous collection of bearings will be achieved using cellular phones or handheld radios. Each researcher will carry an active radio-collar or beacon for orientation and calibration purposes. For each telemetry location, a total of four bearings will be collected, one from each researcher to the rabbit and one from each researcher to the other. Locate II (Pacer software, 1990) or an ArcView® (Environmental Systems Research Institute, Redlands, CA) program extension will be used to estimate rabbit locations. The time, weather conditions, and signal quality will be recorded by each researcher for every location fix.

Telemetry stations will be established along the levees that traverse the Refuge and along the perimeter of the release pen. A survey grade GPS Pathfinder Pro XR/XRS unit (Trimble Navigation Limited, Sunnyvale, CA) will be used to mark the locations of the telemetry stations and to identify landmarks and access roads not shown on United States Geological Survey (USGS) maps. To minimize the extent of the telemetry error polygon, we will hide radios from researchers and test the accuracy of the telemetry system regularly. The telemetry system also will be calibrated prior to each session. To further evaluate telemetry error

polygons, location fixes will be taken on carcasses[4] prior to their collection. Once the carcass is found a GPS reading will be taken at the site and the calculated position will be compared with the known location (Bond 2001).

Habitat patches will be floristically described and measured, and mapped using GPS. Spatial data will be transferred to ArcView®. Data from GPS units, USGS maps, floristic characteristics, and location fixes will be compiled in a geographic information system (GIS) for analyses of community type.

Spatial, trapping, and habitat data and necropsy results will be entered into electronic databases for storage, summary, and analyses. Results of monitoring and censuses will be reported quarterly to the permit-issuing agencies and the Riparian Brush Rabbit Working Group. Data will be summarized in an annual report and in shorter, focused reports for use in habitat restoration and management. Draft final and final reports will be submitted at the conclusion of the study.

BUDGET NARRATIVE

This research will require a crew of two biologists on most occasions (Appendix A); for safety as well as logistic reasons, field crews nearly always consist of two biologists. When possible, project implementation will be merged with our own ongoing research activities and the small mammal monitoring program operated by Dr. Ann Kohlhaas (California State University, Stanislaus) for more effective use of personnel and other resources. Appendix A lists main tasks covered by the proposal and the estimated time required for each. Estimated times include time to assemble equipment, drive to the study site, and store equipment after returning. Some tasks are subdivided by duties performed by personnel with different classifications.

The resource requirements outlined above are summarized below for Years 1-3 (Table 3). The Year-2 and Year-3 budgets assume a 5% combined performance increase and cost of-living increase for salaries but no increase in some negotiated rental rates (office, vehicle).

Budget Category	FY 2005	FY 2006	FY 2007	Project Totals
Personnel	$ 14,320.00	$ 14,431.20	$ 19,827.44	$ 48,578.64

[4] Dead rabbits will be collected following the procedures outlined by Dr. Kirsten Gilardi (Williams et al. 2002) for necropsy by the Pathology Department of the University of California, Davis, Veterinary Medical Teaching Hospital: salvageable specimens will be deposited with the Museum of Vertebrate Zoology at the University of California, Berkeley.

Benefits	$ 6,444.00	$ 6,494.04	$ 8,922.35	$ 21,860.39
Operating Expenses / Equipment	$ 5,002.00	$ 2,720.00	$ 2,720.00	$ 10,442.00
Travel	$ 1,906.13	$ 1,906.13	$ 1,906.13	$ 5,718.38
Subtotal	$ 27,672.13	$ 25,551.37	$ 33,375.91	$ 86,599.40
ESRP administrative fee (10%)	$ 2,767.21	$ 2,555.14	$ 3,337.59	$ 8,659.94
Subtotal of Direct Costs	$ 30,439.34	$ 28,106.50	$ 36,713.50	$ 95,259.34
CSUS Foundation Indirect Costs (18%)	$ 5,479.08	$ 5,059.17	$ 6,608.43	$ 17,146.68
Estimated Totals	**$ 35,918.42**	**$ 33,165.67**	**$ 43,321.94**	**$ 112,406.03**

Table 3. *Summary budget for this proposal over three fiscal years.*

LITERATURE CITED

Bond, B.T., B.D. Leopold, L.W. Burger, and D.L. Godwin. 2001. Movements and home range dynamics of cottontail rabbits in Mississippi. Journal of Wildlife Management 65:1004-1013.

Dixon, K.R., J.A. Chapman, O.J. Rongstad, and K.M. Orhelein. 1981. A comparison of home range size in *Sylvilagus floridanus* and *S. bachmani*. Pp. 541-548, *in* Proceedings of the World Lagomorph Conference (K. Myers and C.D. MacInnes, eds.). Univ. Guelph, 983 pp.

U.S. Fish and Wildlife Service. 1998. Recovery plan for upland species of the San Joaquin Valley, California. Region 1, Portland, OR. 319 pp.

U.S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants; final rule to list the riparian brush rabbit and the riparian, or San Joaquin Valley, woodrat as endangered. Federal Register 65:8881-8890.

Williams, D.F., and G.E. Basey. 1986. Population status of the riparian brush rabbit, *Sylvilagus bachmani riparius*. California Dep. Fish and Game, Sacramento, Wildl. Manage. Div., Nongame Bird and Mammal Section, Contract Final Report, 21 pp.

Williams, D.F. 1988. Ecology and management of the riparian brush rabbit in Caswell Memorial State Park. California Dept. Parks and Recreation, Final Report, Interagency Agreement, 4-305-6108, Lodi, CA 38 pp.

Williams, D. F. 1993. Population censuses of riparian brush rabbits and riparian woodrats at Caswell Memorial State Park during January 1993. Final Report, California Dept. Parks and Recreation, Lodi, CA 15 pp.

Williams, D.F., and L.P. Hamilton. 2001. Riparian Brush Rabbit Survey: Paradise Cut along Stewart Tract, San Joaquin County, California, August 2001. Report to Califia LLC, Lathrop, CA, and California Department of Fish and Game, Sacramento, 10 pp.

Williams, D. F., P. A. Kelly, L. P. Hamilton. 2002. Controlled Propagation and Reintroduction Plan for the Riparian Brush Rabbit. Endangered Species Recovery Program, California State University, Turlock 75 pp.

BIOGRAPHIES

The ESRP riparian brush rabbit recovery team consists of one senior scientist, three wildlife biologists, three field assistants and one maintenance technician. Collectively, ESRP staff has over 30 years of experience with riparian brush rabbits and woodrats

Patrick A. Kelly
Patrick A. Kelly, Coordinator and Director of ESRP, is an Associate Professor of Biological Sciences at California State University, Stanislaus and an Adjunct Associate Professor of Biology at California State University, Fresno. His main research interests are in mammalian ecology and conservation, and his current research focuses on the conservation and recovery of endangered mammals in California. He joined ESRP as Assistant Director in July 1993 and became Director in January 1996. Pat received a B.Sc. from University College Galway, Ireland, in 1981, and a Ph.D. from the University of California, Berkeley, in 1990.

Laurissa P. Hamilton
Laurissa Hamilton, Biologist, has been with ESRP since its inception in August 1992. She has worked with a variety of San Joaquin Valley species including San Joaquin kit fox, blunt-nosed leopard lizards, several types of kangaroo rats, riparian woodrats, and riparian brush rabbits. Her main research interests are in small mammal ecology and conservation. In particular, she is interested in evaluating population viability analysis as a conservation tool. Laurissa received a B.S. degree from California State University, Stanislaus in 1992. She is a Ph.D. candidate at UC Davis in the Graduate Group in Ecology and is pursuing a degree in conservation ecology.

Mathew Lloyd
Matthew Lloyd, Wildlife Biologist, has been with ESRP since 2001. He is most actively involved in the recovery of the riparian brush rabbit. His responsibilities include an array of field activities, data management and analysis, and computer/equipment maintenance. Matt received an M.S. degree from the University of Wisconsin - Eau Claire in 2001 for his work in evaluating wildlife habitat on Conservation Reserve Program parcels.

Elizabeth (Vincent) Williams
Elizabeth Williams is the Riparian Projects Coordinator based out of Turlock CA. She joined ESRP in November 2001. She is primarily involved with the breeding and reintroduction project for the riparian brush rabbit. She also has been involved with projects studying the riparian woodrat, blunt-nosed leopard lizard, and giant kangaroo rat. Prior to her move to California, she worked on telemetry and trapping studies, which included working with black bear, ruffed grouse, big horn sheep, Mexican spotted owl, a variety of bats species and other small mammals. Beth received her B.S. in zoology and Biology at Colorado State University in 1993 and an M.S. in Ecology/Life Sciences at Indiana State University in 1998. Her thesis investigated hibernation activity in *Pipistrellus subflavus*, the Eastern Pipistrellus bat.

APPENDIX 3. Study Plan for Task B.3

Waterbird Use of Restored Wetlands at San Joaquin River National Wildlife Refuge

Prepared by
Kenneth M. Griggs, Wildlife Biologist
USFWS, San Luis NWR Complex

Background and Justification

In 2002, a CALFED funded (contract # 01-N08), large scale restoration project was initiated on lands within the San Joaquin River National Wildlife Refuge (SJRNWR). The purpose of this project was to restore, preserve, and protect over 11,000 acres of fish and wildlife habitat. This acreage includes much needed wetland, riparian, and floodplain habitats that have been lost in the Central Valley (Katibah 1984). In addition to providing high quality fish and wildlife habitats, the widening of floodplains will provide storage for flood waters and facilitate groundwater recharge, thus accomplishing a measure of non-structural flood control (USFWS 2000).

As part of this restoration project, approximately 500 acres of fallow farmland were restored to seasonal and permanent wetland habitat. This project was initiated to help reverse the large losses of wetland habitat (93%; U.S. Dept. of Interior 1987) that have occurred in California due to draining, filling, and leveling to support agriculture and development. As restoration sites develop and mature they will become important foraging, roosting, and breeding habitats for resident and migratory species. One goal of this project is to provide habitat for numerous species of wetland dependent waterfowl, wading birds, and shorebirds (hereafter these groups will be called "waterbirds", see Appendix A for inclusive species). These species have been shown to significantly increase their use of sites following wetland restoration (Muir-Hotaling et al. 2002, Fletcher and Koford 2003, Stevens et al. 2003). Indices of avian use (e.g. abundance, species richness, species diversity, etc.) of an area can be used to assess wetland habitat quality and function (Cable et al. 1989, Mitsch and Gosselink 2000). With large losses and human-modifications to wetlands in California, quantifying the habitat quality of restored wetlands is critical to documenting restoration as a productive conservation technique. To assess the quality of the habitat created, comparisons between avian use of restored wetlands and the habitat they replaced should be made (Muir-Hotaling 2002).

Objectives

To document the benefit of restored wetlands to waterbirds, the objectives of this monitoring plan are:

1) To determine the abundance, species richness, and species diversity of waterbirds using recently restored wetland units.

2) Compare biotic indices of avian use between units pre-restoration to the same units post restoration. Significant increase in species abundance, richness, and diversity will illustrate the beneficial effects of restoration efforts.

3) Describe waterbird productivity in newly restored wetland units and adjacent uplands.

Overview of Monitoring Effort

Data on waterbird abundance, species richness, and diversity was collected on permanent and seasonal wetland units during the winter of 2002-2003, before restoration efforts occurred. Weekly censuses of all waterbirds present were conducted along an established survey route. Data collection will continue after restoration is complete and units are flooded. Nest searches and monitoring to describe productivity will occur on the White Lake unit post-restoration. Comparisons of biotic indices between units pre-restoration and post-restoration will be made.

Participants

All planning, field work, data analysis, and report writing will be conducted by Refuge biologists.

Methods

Data from previous USFWS monitoring efforts on abundance, species richness, and species diversity of waterbirds within pre-restoration sites will be used for comparisons with post restoration data. Data collection will continue on the same sites post-restoration using the same methodologies.

Ground Surveys

Using binoculars (10x42) and/or a spotting scope (20-60x), wetland units within project boundaries on SJRNWR will be surveyed bi-weekly for waterbirds during morning hours (sunrise – 10:00). Scans will be conducted from set points along an established route within the project area. Observation points will be established in locations that maximize visual coverage of the wetland, reduce disturbance to focal species, and minimize the chance of double counting individuals. During surveys, the number of birds of each species and wetland type (permanent or seasonal) will be recorded. Only individuals within the wetland boundaries or seen flying from wetlands will be counted (i.e. birds flying over will not be counted). Data will be used to calculate relative abundance (number of individuals), species richness (number of species), and species diversity (number of species detected weighted by the number of individuals of each species) for each wetland site.

Nest Monitoring

To date there has been no comprehensive inventory or monitoring of nesting waterbirds in the restoration unit. By identify nesting species and developing estimates of nest success, baseline

parameters will be established which can be compared with future productivity data. Nest searching and monitoring will be focused in the White Lake unit. This is the only permanent wetland unit in the restoration project, and therefore the only suitable habitat for over-water nesting birds (e.g. Podicipediformes, Gruiformes, some Ciconiiformes, etc.). To further describe the benefits of restored wetlands to breeding waterbirds, uplands adjacent to wetlands used by nesting waterbirds (e.g. Anseriformes, Charadriiformes, etc.) will also be searched. Because many upland nesting waterbird species rely on permanent water to provide food and escape cover to developing young (Afton and Paulus 1992), birds may be choosing to nest in these areas based on the presence of the wetland unit. Focal areas will be systematically searched to ensure that all nests present are detected. Active nests will be mapped using a GPS unit, compass bearings, and natural landmarks and revisited every seven days until an outcome is determined. For each nest, the species, number of eggs and/or young, final outcome (hatch or fail), and cause of failure (if applicable) will be recorded. Nest searchers will utilize techniques to minimize disturbance to nest sites and reduce the probability of observer influenced predation.

Analysis

Descriptive statistics will be used to describe waterbird distribution, species abundance, richness, and diversity on permanent and seasonal wetlands within the restoration project. Analysis of Variance (ANOVA) will be conducted on within season data to examine differences in biotic indices among restored wetland units. Paired t-tests will be used to examine differences in waterbird use of sites pre-restoration and post restoration (Zar 1998). If sample sizes are large enough, Mayfield estimates of nest success will be calculated (Mayfield 1975).

Schedule and Personnel

Bi-weekly ground surveys will be conducted from 1 October through 31 March in years 1 and 2. Nest searching and monitoring of the White Lake Unit will be conducted from 1April through 15 July in years 1 and 2. All surveys, data compilation and analysis, and report preparation will conducted by a Refuge Wildlife Biologist and Biological Technician.

Quality Control-Quality Assurance Protocols

Survey protocols described above are derived from commonly used and tested methodologies. Numerous agencies, conservation organizations, and university researchers have employed these techniques. Data collection will be standardized through the use of forms and codes developed by the USFWS and previously used on SJRNWR during annual surveys of waterbird species. All personnel conducting surveys are properly trained in the identification of species that may potentially be encountered on SJRNWR. The Refuge Supervisory Biologist will oversee monitoring on this project.

Products and Archiving

The data and results will be summarized in progress reports and presented in a final report at the end of the project. GIS coverages of survey routes, wetland types, and areas searched for nests

will be created for use in long term monitoring of the restoration project. Data from this project will be stored at San Luis NWR and incorporated into the permanent Refuge files.

Roles and Responsibilities

All data collection, analysis, and report preparation will be conducted by Refuge personnel.

Literature Cited

Afton, A. D. and S. L. Paulus. 1992. Incubation and brood care. Pages 62-108 i*n* B. D. Batt, A. D. Afton, M. G. Anderson, C. D. Ankney, D. H. Johnson, J. A. Kadlec, and G. L. Krapu, editors. Ecology and Management of Breeding Waterfowl. University of Minnesota Press, Mineapolis, Minnesota.

Cable, T. T., V. Brack, and V. R. Holmes. 1989. Simplified method for wetland habitat assessment. Environmental Management. 13:207-213.

Fletcher, R. J. and R. R. Koford. 2003. Changes in breeding bird populations with habitat restoration in northern Iowa. American Midland Naturalist. 150:83-94.

Katibah, E. F. 1984. A brief history of riparian forests in the Central Valley of California *in* California Riparian Systems: Ecology, Conservation, and Productive Management. Edited by R. E. Warner and K. M. Hendrix. Univ. of Cal. Press, California. Pages 23-29.

Mayfield, H. F. 1975. Suggestions for calculating nest success. Wilson Bulletin. 87:456-466.

Mitsch, W. J. and J. G. Gosselink. 2000. Wetlands. 3rd edition. Ed. John Wiley and Sons, New York, NY. 920 pp.

Muir-Hotaling, N. E., W. J. Kuenzel, and L. W. Douglass. 2002. Breeding season bird use of restored wetlands in eastern Maryland. Southeastern Naturalist. 1:233-252.

Stevens, C. E., T. S. Gabor, and A. W. Diamond. 2003. Use of restored small wetlands by breeding waterfowl in Prince Edward Island, Canada. Restoration Ecology. 11:3-12.

U.S. Department of Interior. 1987. Report on refuge water supply investigations. Volume 1. U.S. Department of Interior, Bureau of Reclamation, Mid-Pacific Region report. 457 pp.

USFWS. 2000. San Joaquin River National Wildlife Refuge riparian habitat protection and floodplain restoration project-phase II proposal. USFWS unpublished document. 19 pp.

Zar, J. H. 1998. Biostatistical analysis. 4th edition. Prentice Hall publishers. 929 pp.

Budget - Waterbird monitoring SJRNWR restored wetlands

Year 1 (2006)					
Salaries					
	GS-5 Biological Technician	562 hrs x 13.83/hr =	$7,772.46	salary	$8,356.94
		562 hrs x 1.04/hr =	$584.48	benefits (7.5%)	
	GS-11 Wildlife Biologist	289 hrs x 25.36/hr =	$7,329.04	salary	$9,528.33
		289 hrs x 7.61/hr =	$2,199.29	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x 3 months =			$1,500.00
	Binocular Purchase	$500 x 2 =			$1,000.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
		Regional Office/CNO overhead of 18% project costs			$3,705.35
				Total Year 1	$24,290.62
Year 2 (2007)					
Salaries					
	GS-5 Biological Technician	562 hrs x 14.39/hr =	$8,087.18	salary	$8,694.14
		562 hrs x 1.08/hr =	$606.96	benefits (7.5%)	
	GS-11 Wildlife Biologist	289 hrs x 26.38/hr =	$7,623.82	salary	$9,909.81
		289 hrs x 7.91/hr =	$2,285.99	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x 3 months =			$1,500.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
		Regional Office/CNO overhead of 18% project costs			$3,654.71
				Total Year 2	$23,958.66
				Total Project Cost	**$48,249.28**

Approvals

C. Submitted by: _____date
D. Reviewed by: _____date
(Regional Wildlife Biologist)
D. Reviewed by: _____date
(Appropriate species or scientific expert)
E. Approved by: _____date
(Refuge Manager)

APPENDIX 4. Study Plan for Task B.4

Monitoring Bird Populations to Evaluate CALFED-funded Riparian Restoration On San Joaquin River National Wildlife Refuge

Proposal for the 2006-2007 Field Season

Prepared by
Julian K. Wood and Geoffrey R. Geupel

November 2004

Point Reyes Bird Observatory
4990 Shoreline Hwy
Stinson Beach, CA 94970
jwood@prbo.org
gguepel@prbo.org

Executive Summary

In any restoration program it is essential to evaluate restoration efforts for two main reasons: 1) to ensure that the targets or goals of a restoration program are met and are the result of specific management actions and, 2) to learn from such management actions and inform future efforts with continuous feedback and revision using targeted research and monitoring. With approximately $28,720,000 in CALFED funds spent on restoring or protecting over 11,000 acres, the intensive and extensive nature of the restoration program at the San Joaquin River National Wildlife Refuge (SJRNWR), represents a significant investment for CALFED's ERP and should thus be a high priority for monitoring and evaluation. Because the SJRNWR contains a mosaic of existing and restored (process-based and cultivated) riparian habitat and because PRBO has collected and is continuing to collect site-specific baseline data on avian populations, there is an excellent opportunity for the ERP to better understand riparian system function and how specific management actions affect environmental systems. It also allows comparisons between different types of restoration techniques (e.g., cultivated vs. process-based) and their effectiveness at reaching desired targets. PRBO is in a unique position to prescribe a predictive monitoring program whose goal will be to identify factors that cause responses (desirable or undesirable) in certain parameters of the avian community (e.g., how can planting design ultimately affect avian diversity or abundance). Documenting avian use of process-based and cultivated restoration areas over time will not only allow evaluation but can also provide information on the viability of different restoration and management techniques.

PRBO collected three years (2000 to 2002) of baseline pre-restoration data on avian species richness, diversity, abundance, distribution, and productivity as well as vegetation characteristics on the SJRNWR prior to a large scale cultivated restoration project that began in the spring of 2002. We have already witnessed an increase in species diversity in the two years following restoration (Julian Wood personal observation) but have not yet measured productivity at these sites which is critical in evaluating restoration success. In addition to continuing avian monitoring at established restoration and reference sites, we propose to expand our scope of monitoring activities to include other restoration sites that, by 2006, should provide structurally complex habitat and harbor

a diverse breeding community. We will increase the intensity of monitoring by including nest monitoring to directly measure productivity on CALFED-funded restoration sites. We propose to continue limited monitoring in remnant riparian habitat by measuring nest success and other demographic parameters at key reference sites. This is important for comparison with restoration sites given the high annual variability within the system. Recommendations on future monitoring and riparian restoration design and implementation will build from the results of PRBO's previous efforts on the Refuge and provide continuous feedback to the Refuge and its partners involved in restoration.

Objectives of avian monitoring

1) To assess bird species richness, diversity, abundance and distribution at restoration sites of different ages and remnant reference sites.
2) To assess primary demographic parameters for select species, specifically adult survival and productivity.
3) To assess recolonization of young restoration sites.
4) To evaluate and inform restoration design, implementation and management using current knowledge of the requirements of birds in riparian habitats by:
    a) Defining habitat associations using avian diversity and abundance
    b) Identifying habitat types and preferred plant species of nesting birds
    c) Identifying landscape variables that affect distribution, abundance and productivity

Proposed Study sites

<u>Nest monitoring plots</u>

1) Hagemann's Field 8-9* (early restoration site)
2) Hagemann's Field 20* (early restoration site)
3) Hospital Creek (process-based restoration)
4) reference site TBA

*new nest monitoring plots

<u>Point count transects</u>

Cultivated restoration sites

Mixed cottonwood willow series

1) Hagemann's Field 8, 9
2) Hagemann's Field 20
3) Hagemann's Field 21 *

Upland series cultivated restoration

4) Upland Restoration site (TBA)*
5) Upland Restoration site (TBA)*

Process-based (post-burn) restoration sites

6) Hospital Creek
7) Gardner's Cove

8) Hagemann's Peninsula
9) Christman Island

Reference sites
10) Caswell Memorial State Park
11) Faith Ranch

Early or pre-restoration sites
12) Vierra Field
13) Seasonal Basin A
14) TBA 1*

*new sites and sites to be selected in 2006

Methods

Nest monitoring
Nest monitoring will be conducted on four nest plots according to Breeding Biology Research and Monitoring Database (BBIRD) protocol (Martin and Conway 1997) and following guidelines outlined in Martin and Geupel (1993). Vegetation data will be collected at each nest site, following BBIRD protocol, which will include 5 m radius plots for shrub density, shrub and ground cover and 11 m radius plots for tree density. Nest monitoring on two sites in Hagemann's Field will provide information on productivity and other demographic parameters in early-successional cultivated riparian habitat. PRBO will select a mature riparian reference site either on the Refuge or nearby (Caswell Memorial State Park). If no suitable reference site is located PRBO will use monitoring data from sites along the Merced and Cosumnes Rivers as reference sites for mature remnant riparian habitat.

Target species were selected based on several criteria. The first set of criteria were developed by CalPIF for the Riparian Bird Conservation Plan and include species who use riparian as their primary breeding habitat, whose populations have experienced a reduction from their historical breeding range, who commonly breed throughout California's riparian areas and have breeding requirements that represent the full range of successional stages of riparian ecosystems (RHJV 2004). In addition, we selected several open-cup nesting species that are common breeders on the Refuge to ensure an adequate sample size for statistical comparisons.

Yellow Warbler (*Dendroica petechia*)
Common Yellowthroat (*Geothlypis trichas*)
Song Sparrow (*Melospiza melodia*)
Spotted Towhee (*Pipilo maculatus*)
Black-headed Grosbeak (*Pheucticus melanocephalus*)
Blue Grosbeak (*Guiraca caerulea*)
Lesser Goldfinch (*Carduelis psaltria*)
American Goldfinch (*Carduelis tristis*)

Territory Mapping
The four selected nest plots will be spot mapped a minimum of 8 times during the breeding season from Mid April to Mid June following standardized protocol (Ralph et al. 1993). All territorial individuals will be mapped and the number of territories for each site will be compiled to determine breeding bird density.

Point Count Surveys
Fourteen point count transects ranging from 4 to 16 points each will be surveyed throughout the refuge as well as a reference site in Caswell Memorial State Park and Faith Ranch. Most of these surveys will be focused on CALFED-funded restoration sites. Point counts will be conducted according to standardized protocol (Ralph et al. 1993). All stations will be surveyed twice during the breeding season (April though June). Data will be taken, beginning at local sunrise and completed within three hours, on all birds seen and/or heard at each point for five minutes. Points will be located a minimum distance of 200 m apart. The point count method will be used to monitor changes in breeding landbird populations over time. Point counts will also be used to determine species richness and avian diversity on the refuge. Vegetation assessment at each point, using the Releve method, will relate changes in species composition and abundance to vegetation differences. Changes in vegetation can be looked at over time, or as differences between habitats or study sites.

Optional Monitoring Tasks

Mist netting- Optional
PRBO will conduct mist netting at two stations on the Refuge. One of these stations will be a cultivated restoration site and the other station will be in a mature riparian reference site. Restoration sites under consideration include Hagemann's Field 8, 9 and 20. Both sites will be operated according to methodology outlined in Ralph et al. (1993) and "MAPS" program protocol. Nets will be opened at each site 15 minutes after local sunrise, checked every 30 to 45 minutes (more often during hot hours of the day) and operated for five hours. Birds captured in the nets will receive USFWS aluminum bands and data will be collected on sex and age as well as morphometric measurements. Productivity and estimates of adult survivorship will be determined using the capture/recapture data.

Yellow Warbler (*Dendroica petechia*) Monitoring- Optional
Once a summer resident and common breeder, the Neotropical migrant Yellow Warbler has been largely extirpated from the valley floor. In 2002, PRBO biologists detected several singing male Yellow Warblers and located one nest along Hospital Creek. In 2003 and 2004, Yellow Warbler territories increased in number and more nests were found. The increasing number of breeding Yellow Warbler pairs may indicate a return of this species to a portion of its former breeding range possibly as the result of recent restoration activities at the refuge. PRBO will monitor the return of this species to Hospital Creek by intensively nest searching and territory mapping the areas used by Yellow Warblers.

Products

PRBO will provide annual progress reports no later than January 1 of the year following breeding season field work. Progress reports will describe methods and provide preliminary results on avian species composition, distribution and status. A final report with recommendations for future restoration activities and monitoring efforts will be provided January 1 of the year following the completion of all field work. Copies of all data (hard copies as well as computer files) will be provided to USFWS.

PRBO proposed budget Year, 2006-2008
Total budget without mist netting

Salaries & Benefits	**Year 1**	**Year 2**	**Year 3**
Principal Investigator	$652	$685	$1,435
Program coordinator	$7,456	$8,184	$7,456
Field crew supervisor	$8,750	$9,000	
Seasonal biologist	$5,850	$6,075	
PRBO senior biologist			$4,830
Subtotal Salaries	**$22,708**	**$23,944**	**$13,721**
Benefits (37%)	$8,402	$8,859	$5,077
Total Salaries & Benefits	**$31,110**	**$32,803**	**$18,798**
Other Direct Costs:			
Housing/Food/Utilities	USFWS	USFWS	
Project supplies and equipment	$1,000	$1,000	
Travel (mileage, gas, etc.)	$3,000	$3,000	$1,000
Total Other Direct Costs	**$4,000**	**$4,000**	
Total Direct Costs	**$35,110**	**$36,803**	**$19,798**
Indirect Costs (29%)	$10,182	$10,673	$5,741
Annual Total Costs	**$45,292**	**$47,476**	**$25,539**
Total Project Costs			**$118,307**

PRBO proposed budget years 2006-2008
Total budget with mist netting

Salaries & Benefits	**Year 1**	**Year 2**	**Year 3**
Principal Investigator	$652	$685	$1,435
Program coordinator	$8,473	$8,896	$9,320
Field crew supervisor	$9,625	$9,360	
Seasonal biologist 1	$5,850	$6,075	
Seasonal biologist 2	$7,200	$7,650	
PRBO senior biologist			$3,019
Subtotal Salaries	**$31,800**	**$32,666**	**$13,774**
Benefits (37%)	$11,766	$12,086	$5,096
Total Salaries & Benefits	**$43,566**	**$44,752**	**$18,870**
Other Direct Costs:			
Housing/Food/Utilities	USFWS	USFWS	
Project supplies and equipment	$2,000	$1,000	
Travel (mileage, gas, etc.)	$3,000	$3,000	$1,000
Total Other Direct Costs	**$5,000**	**$4,000**	
Total Direct Costs	**$48,566**	**$48,752**	**$19,870**
Indirect Costs (29%)	$14,084	$14,138	$5,762
Annual Total Costs	**$62,650**	**$62,890**	**$25,632**
Total Project Costs			**$151,172**

PRBO in kind salaries

	In kind salaries		
Salaries & Benefits	Year 1	Year 2	Year 3
Principal Investigator	$2,609	$2,740	$5,740
PRBO senior biologist			$1,208
Subtotal Salaries	$2,609	$2,740	$6,948
Benefits (37%)	$965	$1,014	$2,571
Total Salaries & Benefits	$3,574	$3,754	$9,519
Total Direct Costs	$3,574	$3,754	$9,519
Indirect Costs (29%)	$1,036	$1,089	$2,761
Annual in kind	$4,610	$4,843	$12,280
Total in kind costs			**($21,733)**

Literature Cited

Martin, T.E. and C. Conway. 1997. The Breeding Biology Research and Monitoring Database (BBIRD) Field Protocol. Univ. of Montana Coop. Unit, Unpublished manual.

Martin, T.E. and G.R. Geupel. 1993. Nest Monitoring Plots: methods for locating nests and monitoring success. J. Field Ornith. 64:507-519.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Field methods for monitoring landbirds. USDA Forest Service Publication, PSW-GTR 144, Albany, CA.

RHJV (Riparian Habitat Joint Venture). 2004. The Riparian Bird Conservation Plan: a strategy for arresting the decline of birds and associated riparian species in California. Calif. Partners in Flight. http://www.prbo.org/CPIF/Riparian/Riparian.html.

APPENDIX 5. Study Plan for Task B.5

Mammal Abundance and Use of Restored Habitats at the San Joaquin River National Wildlife Refuge

By
Ann K. Kohlhaas, Ph.D.
Department of Biological Sciences
California State University, Stanislaus
Turlock, CA 95382

Introduction

The Central Valley of California has suffered some of the greatest habitat losses on Earth. Habitat losses result in consequent loss of habitat functionality, loss of organisms, and sometimes even loss of species. The relatively new field of restoration ecology attempts to restore lost or damaged habitats or to at least rectify some of the functionality of those habitats. This proposed research is a monitoring study designed to investigate how mammals move into and use a habitat as it changes from early restoration to later stages. Often people think of restoration primarily in terms of habitat or vegetative cover. However, a comprehensive view of restoration includes habitat functionality which obviously includes animal use of the habitat. Mammals are an important component of the riparian ecosystem. As such, mammal use and composition in an area contributes to habitat functionality and is an indicator of habitat development.

The Great Central Valley of California is a combination of the Sacramento River Valley and the San Joaquin River Valley. Collectively, the Central Valley is approximately 690 km long and 120 km wide. Its natural habitats include valley grasslands, freshwater marsh, and riparian woodland. Unfortunately, very large portions of these habitats have been lost, altered, or degraded. The estimated losses of these habitats are 99 percent of the grasslands, 94 percent of the wetlands, and 89 percent of the riparian woodlands. (Schoenherr 1992)

The riparian woodlands of the Central Valley are naturally most extensive along the larger rivers, especially the Sacramento River and the San Joaquin River. Originally, there were approximately 400,000 ha of riparian habitat, but only about 41,600 ha (11 percent) remains. The tree species typical of this habitat include: box elder (*Acer negundo*), Fremont cottonwood (*Populus fremontii*), western sycamore (*Platanus racemosa*), three species of willows (*Salix* spp.), and valley oak (*Quercus lobatus*). These riparian woodlands are naturally very productive and are important sources of food, water, and shelter for species from adjacent drier habitats, as well as riparian species. (Schoenherr 1992)

In 2000, Sacramento River Partners (a restoration research group) proposed a restoration plan to convert 3166 acres of former farmland into riparian forest on the San Joaquin River National Wildlife Refuge (SJRNWR) (Griggs 2000). This is now a funded multimillion dollar in-progress project. Their work has included extensive surveys of the soil types, topography, hydrology, and vegetation in the area. They have carefully planned out how and when each portion of the area will be revegetated and how their vegetation plots will be monitored and maintained until they are suitably established to be left alone. Plantings were started in spring of 2002. Their subcategories of riparian habitats that are being established include valley oak (*Quercus lobatus*), Fremont

cottonwood (*Populus fremontii*), mixed willow (*Salix* spp.), and button bush (*Cephalanthus occidentalis*) associations.

This proposed project offers are nearly unique opportunity to study how a particular segment of the faunal community (mammals) reestablish themselves and use a habitat as it is being restored and as it develops. The mammal literature has many mammal studies making various habitat comparisons. However, there is very little published that tracks mammal use in a newly restored habitat from its inception and through its development as proposed here.

The major questions to be answered in this study are:
1) what mammal species are using the restored habitats?
2) what macrohabitat and microhabitat features are correlated with mammal use?
Related questions include:
1) are there seasonal changes in habitat use and what habitat features are those correlated with?
2) is there an affect on movement or longevity within a site?
It is also important to have concurrent data within natural sites for comparison and to know when population fluctuations are occurring throughout the area or are specific to a location.

Study Site

The San Joaquin River National Wildlife Refuge is located in Stanislaus County west of Modesto. The portion under restoration is between Highway 132 and Grayson. The San Joaquin River runs through it. This refuge was first established in 1987 and was composed of a 10,295 acre acquisition. After major flooding in the winter of 1997, another 5,268 acres were obtained from nearby landowners. The refuge now consists of a mix of natural riparian habitats and former farmland that is being reworked and planted with riparian species.

For this study, at least two different restoration areas including multiple habitat associations will be monitored. One of these areas will be H20 in which I have already been collecting small mammal data since August 2003. The other area will selected from the sites planted later than H20, probably H21 or a combination of the Lara restoration sites. The selected restoration areas will effectively be replicates of each other that were planted in different years. There will also be two natural areas, including one which recently burned but for which I already have data prior to the burn.

Preliminary data collection with small mammals live-trapping started in 2003 at H20 and at Christman Island. H20 was, of course, selected as a relatively new restoration site. Christman Island was selected as the natural "control" because it is necessary to collect parallel data on what is happening with the populations in natural areas. In other words, even in established areas, populations fluctuate and change, thus this also affects and may be reflected in the restoration areas. Thus, one needs to be able to discern whether population changes are due to the restoration or are natural fluctuations.

Christman Island was totally burned in July 2004 and is now no longer an "established" natural area. At this time, the most available established natural area is near the Lara sites. Retaining Christman Island as a study site will provide valuable data on how quickly the site and its mammals return as it recovers.

Methods

Data Collection - Mammals

At each specific study site, I propose to collect data on mammal use every three months, in February, May, August, and November. This gives information on seasonal use and also on longevity within sites as many marked animals can be recaptured in the succeeding trapping period. Data will be collected by a combination of trapping, track plates, and camera traps.

Traps will be baited and checked for five consecutive nights when possible, with three consecutive nights considered as minimal. Each study area will have 100 Sherman traps and 40 Tomahawk traps arranged in overlapping grids. The Sherman traps will primarily catch small rodents. The Tomahawk traps are likely to catch larger rodents, and rabbits. Traps will be opened before dusk, provisioned with appropriate bait (rolled oats with a light molasses coating) and nesting materials, and checked at dawn the following morning. Traps will be closed during the daytime. Trapping within the month is timed so as to avoid the full or near full moon period as full moonlit nights may affect rodent activity. Trapping is not done on nights when significant rain is expected. Data collected on trapped mammals will include: species, age, sex, weight, and reproductive condition. All captured animals will be marked with ear tags and released at their trapping location.

Track plates (at least 10 in each site) and camera traps (five in each site) will also be used at each site for five consecutive nights. These will be used as indices of use by other mammal species that will not or are very unlikely to be trapped. This would primarily be the carnivores such as coyotes (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), long-tailed weasel (*Mustela frenata*), raccoon (*Procyon lotor*), striped skunk (Mephitis mephitis), etc. and any other larger mammal species.

Data Collection – Habitat Surveys

It is necessary to also collect data on those aspects of the vegetation that are of most importance to the mammals. Small mammals, such as rodents, will need ground cover. Larger and predatory mammals will be concerned with amount of cover at many levels, as well as, in the rodents and other small mammals. Thus, data will be collected on vegetation structure, composition, amount, and on seeds/fruits. While most of the data needs to be taken every three months, at the same time as the trapping, some features can be recorded at six months intervals.

Initially, for each grid point, the species, main stem diameter, maximum height, and maximum crown diameter will be recorded within 2m of each grid point. These will be reevaluated during the May and November trapping periods.

Every three months, within one week of the trapping period, records of herbaceous structure, species composition, and amount of fruits or seeds.
- estimate of percent ground cover
- species and estimate of percent composition of the herbaceous vegetation within 2 m radius circle of grid point:
- species and estimated number of visible fruits within 2 m radius circle of grid point:
- species and estimated number of surface seeds collected from four randomly selected locations within the 2m radius circle.

While the preceding methods will record microhabitat data, there also has to be some record of macrohabitat. Thus, cover board data will be recorded at 20 permanent but randomly selected location within each study site.

All methodologies will be subjected to prior testing and adjusted as needed. All personnel will have proper training.

When possible, this project and its participants will work in cooperation with the Endangered Species Recovery Program and other participants of the SJRNWR monitoring program.

Analyses and Expected Outcomes

The mammal data that will be directly derived from these efforts include:
1) mammal species present,
2) trapping success per trapping effort,
3) estimated density of each trapped species,
4) number of occurrences of each species on track plates (per effort),
5) number of occurrences of each species on camera recordings (per camera nights).

Additionally, comparisons of the mammal data over time will yield information on:
1) seasonal changes in mammals use of habitat
2) longevity of the trapped species in the different areas,
3) ranging patterns of trapped species in the different areas.

Comparison between the natural, burned natural and restored sites will yield:
1) comparative data on similarity/dissimilarity between their mammal populations,
2) if their seasonal and yearly changes are in synchrony or asynchrony,
3) mammal invasion of planted restored sites as compared to their reinvasion of burned naturally restoring sites.

Comparison of the mammal data with the habitat data will reveal:
1) if there are patterns of density or mammal species use with general habitat changes, plant species composition, cover, or food availability
2) any microhabitat preferences of some species.

I believe the much value of this type of monitoring comes from the long-term changes and trends that are seen. Thus, eventually the data will reveal if and when the mammal populations become similar between the sites and if compositional similarity happens before or after the sites becomes similar in habitat structure and composition.

Timetable and Expected Outcomes

Since the time frame for this grant is three years, the first two years are planned for data collection and the third year for analyses and report writing. In truth, I hope to collect data on these locations for several years until the site is well-developed. Even so, I do believe that many changes will be seen in two years time and the data will be quite interesting. I've already collected Sherman trap data in H20 for a year and have seen major change in the rodent community with the addition of ground cover in recent months.

This project could potentially result in several papers. At a minimum, there will be a paper and presentation on mammal changes over time and between sites. Other potential paper topics would be microhabitat use and any related seasonal changes, and site longevity and movements.

Relation of CalFed Goals

Mammals are an important component of the riparian ecosystem. Thus, monitoring their use of the restored habitats is important both because of their ecological role and their role as an indicator of habitat development. Morrison (2002) stated "the success of a restoration project should be judged by how wildlife species respond to it."

References

Chouinard, T., V. Lyon, B. Barbour, and D. Woolington. 1999. San Joaquin River NWR riparian habitat protection and flood plain restoration project biological inventory and monitoring. 1998. Report prepared for CALFED Bay-Delta Program. Prepared by U.S.Fish and Wildlife Service, Los Banos, California. 49 pages.

Griggs, F. T. 2000. Pre-restoration plan for west units of the San Joaquin River National Wildlife Refuge. 50 pages.

Morrison, M. L. 2002. Wildlife restoration: techniques for habitat analysis and animal monitoring. Island Press, Washington. xix + 209 pages.

Schoenherr, A. A. 1992. A natural history of California. University of California Press. Berkeley, California. 772 pages.

Budget Details	**Year 1**	**Year 2**	**Year3**
Personnel:			
Primary Investigator: (equiv. 2 months per year, or 6 WTUs)	13,490	13,825	14,860
PI benefits (34 %)	4,587	4,701	5,052
Student Assistants – trapping portion: (2 students x $9/hour x 10 hours/day x 10 days/session x 4 sessions/year = $7200/year)	7,200	7,200	0
Student Assistants – vegetation portion: (2 students x $9/hour x 40 hours/session x 4 sessions/year = $2880/year)	2,880	2,880	0
Student benefits (11%)	1,109	1,109	0
Equipment:			
Sherman Traps (200 more x $17/each)	3,400	0	0
Tomahawk Traps (65 more x $50 each)	3,250	0	0
Cameras with infrared monitors (10 X $500 each initially; 2 replacements	5,000	1,000	0
Track Plates, Ear tags & related	400	50	0
Mileage:			
57 miles/trip x 2 trips/day x 15 days/session x 4 sessions/year x $0.345/mile	2,360	2,360	0
Assorted Supplies: Film & Processing (@400/year) Bleach, flagging, gloves (@ $100/year) Machetes, Shovel, assorted tools ($100 once) Insect repellant, garbage, bags, etc. (@50/year) Bait for traps ($40/session x 4/year = $160/year) Data Sheets, pens, etc. (@100/year) Trap repair and track plate materials ($50/year)	960	860	0

Budget Summary	**Year 1**	**Year 2**	**Year3**
Personnel:			
Primary Investigator:	$13,490	$13,825	$14,860
plus benefits (34 %)	$4,587	$4,701	$5,052
Student Assistants	$10,080	$10,080	0
plus benefits (11 %)	$1,109	$1,109	0
Equipment:			
Traps	$6,650	0	0
Cameras with infrared monitors	$5,000	$1,000	0
Track Plates, Ear Tags, etc.	$ 400	$50	0
Mileage:	$2,360	$2,360	0
Assorted Supplies:	$960	$860	0
Subtotal:	$44,636	$33,985	$19,912
Federal Negotiated Rate: (Indirect costs: 18 % for off-campus research)	$8,035	$6,117	$3,584
Total (=$116,269)	**$52,671**	**$40,102**	**$23,496**
CSU-Stanislaus "cost match"(=$14,340) (PI benefits)	**$4,587**	**$4,701**	**$5,052**
TOTAL REQUEST ($101,929)	**$48,084**	**$35,401**	**$18,444**

APPENDIX 6 Study Plan for Task B.6

Proposal to USFWS-CALFED

"Monitoring Pollinating Bees in Restored Habitat of the San Joaquin River National Wildlife Refuge"

by: Gordon W. Frankie
Division of Insect Biology
University of California
Berkeley, CA 94702
Tel. 510/642-0973
email: frankie@nature.berkeley.edu

Table of Contents

I. Introduction:

Restoring habitat in National Wildlife Refuge and especially wetlands and riparian areas, has a productive and successful history in the Central Valley of California. In addition to focal species, such as migratory birds and endangered species there are numerous nontarget vertebrates and invertebrates that benefit greatly from restoration projects.

As restoration of a site proceeds through time, many ecosystem functions are gradually restored. The obvious ones are relatively easy to document, for example, a functional wetland system with its new hydrology, associated vegetation and characteristic megafauna. Other functions are much more subtle and require more careful study to document. Examples of these include reestablishment of soil microorganisms, herbivore-predator/parasite relationships, and pollinator-plant interactions.

This proposal is about determining the subtle, but important, restoration of bee pollination relationships of the San Joaquin River National Wildlife Refuge (NWR) near Modesto. The site is currently undergoing a CALFED-funded restoration of riparian and wetland habitat on the west side of the San Joaquin River in fallowed agricultural land. With this restoration, bee-plant interactions are expected to reestablish in the newly vegetated sites. How this process occurs, at what rates, the species involved, and how restored pollinator numbers affect restoration of riparian plant communities are the main issues of this proposal. The proposed research is important in itself for the San Joaquin, but also because very little is known about restoring bees or other pollinators to a site.

II. Rationale for research

Bees are well known to be the most important pollinators world wide (Proctor et al. 1996; Frankie and Thorp 2003). The role that they and other pollinators play in pollinating plants is well recognized (Proctor et al. 1996 and references therein), but only recently has there been an awakening to the possible consequences of losing the services they provide to the functioning of wildlands and agroecosystems (Daily 1997). More specifically, they play a critical pollination role in the reproductive biology of many plant species, and especially those that are obligate outcrossers. That is, the obligates must be cross pollinated in order to set viable seed. This new awareness has come about with the ongoing and dramatic decline in honey bees owing to increased mortality from introduced parasitic mites, disease pathogens, and, careless application of pesticides. Awareness has also been greatly influenced by a popular book, "Forgotten Pollinators," by Buchmann and Nabhan (1996). Numerous other publications since this time have provided evidence that global pollinator decline is a reality (Matheson et al. 1996; Allen-Wardell 1998; Frankie et al. 1997; Stubbs and Drummond 2001; Freitas and Pereira 2004).

Several U.S. and international initiatives have been established to address the many issues associated with decline and how to respond to this challenge (Freitas and Pereira 2004). The most prominent one in the U.S. is the North American Pollination Protection Campaign (NAPPC), which is coordinated through the Coevolution Institute in San Francisco, CA. (www.nappc.org). One of the issues is pollinator restoration and monitoring, which is the subject of this proposal. At this time there are no documented cases on how to restore pollinators, as well as how to evaluate a restoration effort.

Much native bee habitat has been destroyed throughout the Central Valley of California. Despite the destruction, many pockets of pollinators remain such as those found in the San Luis NWR (Los Banos), Cosumnes River Preserve (S. Sacramento Co.), and even the small reserve at Creighton Ranch near Corcoran, Kern Co. (Thorp et al. 1992; Frankie et al. 1998). Other smaller ones exist as well (Frankie pers. obser.). Our research group at UC Berkeley and UC Davis has surveyed these areas and has found viable populations of bees and the plants they need despite the disturbed habitats in which they are found (see section IV).

Many questions remain as to how bees, especially native species, will respond to new habitat made available to them. The logical way to approach these questions is through comparative ecological studies. We

propose to monitor bees at the San Joaquin River NWR to determine how bees colonize newly vegetated areas adjacent to residual natural habitat. We will use two comparative bases for making this evaluation. First, we will use extensive bee collections and bee-flower visitation counts that we have gathered since 1987 in other stable S. Central Valley locations (Thorp et al. 1992; Frankie et al. 1998). Second, we will develop baseline information on the bees in the existing riparian habitat at San Joaquin River NWR for comparison with the bees in the newly restored areas.

We expect this 3-year project to provide much new scientific information on how bees colonize and establish restored habitat.

III. Previous work

The UC Berkeley and UC Davis labs began intensive surveys of bees and their host plants in the S. Central Valley of California in 1987. This work continued until the late 1990s with a focus on the San Luis NWR, Cosumnes Preserve, and Creighton Ranch. Most of the bees and plants have been identified to the species level, however, taxonomic work still remains on some bee and plant groups owing to sparse collections in some months, especially the spring period, from specific host plants and/or taxonomic problems with certain groups (Thorp et al. 1992; Frankie et al. 1998 and in prep).

In the late 1990s a simple method for recording visitation frequencies of bees on most bee host plants was developed by our group at San Luis NWR and Creighton. It involves recording numbers of bees visiting flowers for 2 minute periods on a specific 2x2m area of flowering vegetation. Counts were replicated on same plant species and on many different individuals over a 3-year period, 1998-2000 (see section V. and Frankie et al. 2002). Counts were made when plants were in full flower and when weather conditions were optimal (i.e. with high atmospheric pressure, warm temperatures, and little wind). These counts provide a useful quantitative measure of bee diversity and abundance on most of the host plants at San Luis NWR and Creighton (Frankie and Thorp in prep.).

Putah Creek Restoration Project. We are currently involved in a restoration project supported by CALFED, UC Davis and the Putah Creek Restoration Project. Several riparian sites along Putah Creek, near Winters and Davis, are undergoing restoration or scheduled for restoration in Fall 2004. The objectives of this project are to document the diversity and abundance of native bee and ant populations along Putah Creek. Monitoring is conducted along 500m transects using the techniques described in section V, with the addition of pitfall traps used to sample ant communities. The sites fall into three categories: highly disturbed, natural, and first year restoration. Our research questions focus on whether the diversity and abundance of native bee and ant populations differ between the sites and what effects restoration has on the populations. This project provides an ideal opportunity for a comparative analysis between data collected in the Putah Creek region and in the San Joaquin River NWR.

San Joaquin River NWR. We have made several visits and pilot collections of bees at the Refuge. We have also done preliminary testing there of fluorescent pan traps and light aerial netting, which are two bee monitoring methods we plan to use in our study (see section V. methods). We have also made site visits for the purpose of designing the bee monitoring protocol over a 3-year period (see sect. IV and V).

IV. Objectives of proposed study

1. Collect baseline bee information in existing riparian vegetation at SJRNWR and compare with previous bee collections from other S. Central Valley sites.
2. Determine all bee host plants, their phenology, and their associated relative attraction to bees and use "target plant species"-for more intensive bee monitoring.

3. Determine bee diversity and/or relative abundance on different age restoration plots: (One versus 3, 4, and 5 years) and differences with extant riparian site.
4. Determine bee taxa colonizing preexisting cavities for nests in each plot and the riparian site and extent of ground nesting by selected bee taxa in each plot/riparian site.
5. Describe the role of restored pollinator populations in the restoration of riparian plant communities, and to a limited extent in adjacent agricultural fields of almonds, alfalfa, and tomatoes.

V. Methods

Several standardized monitoring methods will be used to record bees and their host plants.

Flourescent pan traps. Simple plastic pans (6oz Solo brand from Safeway) will be used to passively collect bees at a study site. Three pan colors will be used: white, blue, and yellow. White is the original color of the Solo pan. The blue and yellow pans result from fluorescent spray paints applied to the standard white. The pans will be half filled with a soapy water solution (1 Tbls blue Dawn per gal.) that kills the attracted bees almost immediately upon contact. Bees are modestly attracted to the pans, which are alternated by color (white, blue, yellow, etc.) along 200m transects at specific locations. They are left to attract bees for four-hour sampling periods at each location.

We plan to use the pans in four sites each year of the study. These are: existing riparian, fallowed grassland, one-year restoration site, and variable-year restoration sites (see Section VI.) Each of these four vegetation sites will be divided into two subsites, and each will have 18 pan traps (6 of each color). There will be a total of 144 pans placed in the field on a given monitoring day (36 for each vegetation site).

The fluorescent pant trap method, which is relatively new, is now being used extensively by bee researchers through North America to monitor bees. Our group used it recently with considerable success at Mt. Wanda in the John Muir National Monument near Martinez (Griswold and Frankie in prep.) and in the tropical dry forest of Costa Rica (Frankie and Vinson 2004). There are several benefits to the pan traps: they are easy to employ; passive pan collections remove collector bias; results can be quantified and compared with other sites in North America; they tend to collect mostly small bees and at modest levels (this avoids over sampling).

Light aerial netting. While the pan traps are slowly collecting bees, field collections of bees with aerial nets are made from all attractive flowering species in the vicinity of the pan-trap transect. The collections are designed to take only voucher bees from host flowers. Usually this amounts to one to three replications per bee. These small, but important, collections allow us to sample a great diversity of bees during a given flowering period. Voucher bees and their associated host plants are then curated at UC Berkeley. Aerial netting and pan traps will form the core of the bee monitoring program (see also other methods below).

Target plant species. As mentioned earlier, this is a new monitoring method that our research group developed in California at the San Luis NWR and Creighton Ranch. It involves recording diversity and abundance of bees visiting certain flowering plant species for which predictable visitation frequencies are known. For example, Helianthus annuus is a target species in the S. Central Valley well known to have certain bee species visiting the flowers at certain frequencies during summer. On target plant species, types and numbers of bees that visit flowers in a 2x2 m patch of flowering vegetation are recorded for 2 minutes. Once an individual bee touches the reproductive parts of the flower, it is counted as one visit by that species. Subsequent flower visits in the patch by that bee are not counted unless the bee leaves the patch and returns to forage within the 2 minute period. This allows the recorder time to prepare for the next bee to enter the 2x2m area and make floral contact. Numerous replicated counts on different conspecific plants in several sites within a study area provide quantitative data for assessing bee [5]*population estimates (Frankie et al 2002). Observing

[5] *Will need to plant small patches in strategic spots in restoration plots

and counting the bees is intense, but lasts for only 2 minutes. It is a simple but effective way to record diversity and abundance, and assistants with good focusing and recognition skills can be easily trained to gather data.

In addition to *H.* annuus, other candidate target species include *Rosa californica, Amsinckia menziesii*, *Glycyrrhiza lepiodota*,* *Lotus corniculatus*, *Marrubium vulgare*,* *Malvella leprosa*, *Grindelia camporum*,* and *Eremocarpus setigerus*. These are the plants for which we have already gathered considerable bee data, especially at the San Luis NWR. Because the flowering phenologies of each of these species are respectively spread over spring and summer, and each plant attracts a certain guild of bees, we expect the target plants as a group to attract a wide diversity of bee species. These data will be used to complement and supplement the other monitoring methods.

Trap nest blocks. These are wooden blocks with predrilled holes of various sizes that provide attraction for those bee species using preexisting cavities for nest sites. They are useful for monitoring selected species of bees, and data collected from the blocks can be quantified. See relevant papers in Appendices. The trap nests can easily employed, however, they will be only selectively used because they require intensive care, monitoring, rearing of bees, and accurate identification of bee species (see Thorp et al. 1992; Frankie et al. 1998).

Plant monitoring. All flowering plants attractive to bees at San Joaquin River NWR will be monitored for flowering twice each month, as well as the bees they specifically attract. When **target species** come into flower (we expect to identify 8-10 species), they will be given special attention because of the expected high bee diversity and abundance levels they attract. Voucher bees will be taken to insure accurate diversity and abundance counts (Frankie et al. 2002). Our research group has extensive experience in documenting flowering activity of Angiosperms (Frankie et al. 2004 and references therein).

Some plants will need to be identified, and Dr. Ertter at the UC Jepson Herbarium at Berkeley has agreed to assume this work. She is an expert in the taxonomy of the California flora.

VI. Work plan and timetable

During year one we will use all methods at four sites (section V.) to monitor bees. After year one, we will make any adjustments in the methods to meet the main project goals. We will use the planting schedule of River Partners, Chico to determine the age of sites being revegetated for each of the three years of study. River Partners is the contractor conducting the native plant restoration for the US Fish and Wildlife Service at San Joaquin River NWR. Although many of their plants are attractive to bees, many other bee-attractive plants are expected to colonize the restoration sites.

Year One. Four sites will be monitored simultaneously:

1. Fallowed grassland, which is scheduled for eventual restoration
2. **One**-year old planting
3. **3**-year old planting
4. Existing riparian (control plot)

Year Two.

1. Grassland
2. New **One**-year old planting
3. **4**-year old planting (same site as year one)
4. Existing riparian (control plot)

Year Three

1. Grassland
2. New **One**-year old planting
3. **5**-year old planting (same site as year one)

4. Existing riparian (control plot)

We will monitor bees and bee plants twice monthly from February through October or November, weather permitting. Warm, high pressure days will be selected for monitoring. We will make additional visits each month to record bee diversity and abundance on the 8-10 target plant species. All collections of bees (and some plants) will be processed and curated at UC Berkeley for identification, which Robbin Thorp will do at UC Davis. Plant IDs will be done at UC Berkeley by Barbara Ertter. Identified bee vouchers will be made that will allow for progressive data compilation and initial analysis, by the Berkeley lab.

At the end of each year we will compile all data gathered and examine the main emerging patterns. In the case of years 2 and 3, comparisons will be made with previous years. Three years of planned intensive monitoring will also provide an opportunity to examine seasonal (esp. spring) and year-to-year variations in bee diversity and abundance (Frankie et al. 1998). We assume at the onset that there is greater diversity and abundance of native bees in existing riparian habitat than in adjacent fallowed farm land (grass) and in developing-restored habitats, but this needs to be documented.

Statistical analysis will involve the use of Poisson regression (McCullagh and Nelder 1989) as well as descriptive graphics (see Frankie et al. 1993). There will also be progress reports (annual) and final reports prepared. A collection of identified voucher bees will also be made for future use by Fish and Wildlife personnel.

VII. Expected results

At the end of the three-year project we will have a complete survey of the bee taxa and their associated host plants from the San Joaquin River NWR. This information will complement and supplement the collections we have already from the San Luis NWR, Cosumnes Preserve, Putah Creek, and Creighton Ranch. Overall, we expect to have high quality baseline information on most bee species and their hosts from the S. Central Valley of California.

We will also have one or more measures of relative abundance of each bee species. Regarding bee diversity, we estimate that there will be between 65-80 native California bee species with an additional 3-4 exotic species (includes the honey bee).

We will know which bee taxa are the best colonizers and why based on floral plant needs, comparisons of different aged vegetation plots, and nesting patterns. Comparisons through time will also provide information on rates of colonization by bee taxa. Overall, we expect to produce the first predictive information on patterns of bee colonization in a restored area.

It follows that once the bees begin colonizing (establishing) in the restored areas, their floral visitations will provide pollination services that will result in viable fruit and seed set of both the newly planted species (e.g. *Rosa californica*, *Sambucus mexicana*, *Baccharis* species) as well as naturally colonizing native plants that will move in from the existing riparian area.

Finally, absolute numbers of bees are expected to rise throughout the restoration area and most likely the existing riparian habitat. They will also likely be sufficient to visit adjacent croplands that have well-known bee attractive flowers such as almonds, alfalfa, and tomatoes. Although quantitative monitoring in these fields is beyond the scope of this project, we will do casual surveys in each of these crops to estimate the diversity and abundance of bees entering the agricultural areas. It is likely that the restoration project as a whole could provide substantial free pollination services to the agricultural neighbors (see Kremen et al. 2002).

Reports of our findings will be prepared at the end of each year. Several publications in scientific journals will also be prepared as the ecological patterns of bee colonization and establishment become apparent.

VIII. Cooperators

Dr. Robbin Thorp, Dept. of Entomology, UC Davis. will work on identification of the bees to species level wherever possible Dr. Thorp has done extensive work on Central Valley bees and their host flowers with G. Frankie in the past.

Dr. Mark Rizzardi, Dept. of Mathematics at Humboldt Sate University, Arcata will work on monitoring design and analysis of data. Dr. Rizzardi has worked in the past with G. Frankie on statistical analysis of field data on bees and their plants.

Dr. Barbara Ertter, Jepson Herbarium, University of California, Berkeley. Dr. Ertter has worked with G. Frankie since 1987 identifying plants from the Central Valley and coastal northern California on several other bee projects. She will identify all of the unknown plants collected at the San Joaquin study site.

IX. Literature

Allen-Wardell, G., et al. 1998. The potential consequences of pollinator declines on the conservation of biodiversity and stability of food crop yields. *Conserv. Biol.* **12,** 8-17.

Buchmann, S. L., and G. P. Nabhan. 1996. "The Forgotten Pollinators." Island Press, Covelo, CA.

Daily, G. C. (ed.). 1997. "Nature's Services: Societal Dependence on Natural Ecosystems." Island Press, Covelo, CA.

Frankie et al. 1993. Nesting-habitat preferences of selected *Centris* bee species in Costa Rican dry forest. Biotropica 25: 322-333.

Frankie, G. W., S. B. Vinson, M. A. Rizzardi, T. L. Griswold, S. O'Keefe, and R. R. Snelling. 1997. Diversity and abundance of bees visiting a mass flowering tree in disturbed seasonal dry forest, Costa Rica. *Journal of the Kansas Entomological Society* 70:281-96.

Frankie, G. W., S. B. Vinson, R. W. Thorp, M. A. Rizzardi, N. Zamora, and P. S. Ronchi. Coexistence of Africanized honey bees and native bees in the Costa Rican seasonal dry forest. In *Proceedings of the Second International conference on Africanized Honey Bees and Bee Mites,* ed. E. H. Erickson, R. E. Page, and A. A. Hanna, 327-39. Medina, Ohio: A.I. Root Co.

Frankie, G. W. and R. W. Thorp. 2003. Pollination and Pollinators. (pp.919-926). Chpt in *Encyclopedia of Insects*. eds. V. Resh and R. Carde. Academic Press, San Diego.

Frankie, G.W., et al. 2004. Flowering phenology and pollination systems diversity in the seasonal dry forest. *In* "Biodiversity Conservation in Costa Rica: Learning the Lessons in a Seasonal Dry Forest" (G.W. Frankie, A. Mata, and S.B. Vinson, eds.). University of California Press, Berkeley.

Frankie, G. W. and S. B. Vinson. 2004. Restoring native bee pollinators: A case history in Costa Rica. Chpt in Freitas and Pereira (2004). See reference below.

Freitas, B. M. and J. O. P. Pereira (eds.). 2004. Solitary Bees, Conservation, Rearing and Management for Pollination. Proc. of International Workshop on Solitary Bees, held in Beberibe, Ceará, Brazil, April 2004. Brazilian Ministry of the Environment. Fortaleza: Imprensa Universitá, 285pp.

Kremen, C., N. M. Williams and R. W. Thorp. 2002. Crop pollination from native bees

At risk from agricultural intensification. Proceedings of the National Academy of Sciences. 99(26): 16812-16818.
Matheson, A., S. L. Buchmann, C. O'Toole, P. Westrich, and I. H. Williams. (eds.) 1996. "The Conservation of Bees." Academic Press, San Diego. [Linnean Soc. Symp. Ser. No. 18].
McCullagh, P. and J. E. Nelder. 1989. Generalized Linear Models. 2nd edition, Chapman and Hall. New York, NY.
Proctor, M., P. Yeo, and A. Lack. 1996. "The Natural History of Pollination." Timber Press, Portland, OR.
Stubbs, C. S. and F. A. Drummond (eds.) 2001. Bees and Crop Pollination-Crisis, Crossroads, Conservation. Proc. Thomas Say Publ. in Entomology. Publisher: Entomological Society of America. 156pp.

Thorp, R. W., G. W. Frankie et al. 1992. Long-term studies to gauge effects of invading bees. *California Agriculture* 46:20-23.

X. Budget Justification

Personnel. This is a labor intensive project. We have done pilot work at the SJRNWR and other sites as well and recognize that going to the field twice monthly with follow up field trips and lab processing of collected material will require one graduate student, one part-time undergrad, and ongoing field/lab involvement of the P.I. (see sect. XII). The field work is relatively easy, but the lab work will take considerable time and will be tedious. In addition to routine processing of bees and plants, the unknown bee fauna and flora must be regularly sent or delivered to Robbin Thorp and Barbara Ertter, respectively. We expect to have frequent contact with both of these experts. Robbin Thorp will need to make occasional trips to UC Berkeley and perhaps the California Academy of Sciences to check on native bee identifications, which are known to be difficult for some bee genera and families. In this regard, the native flora will be relatively easy to identify, but the weedy exotics, which are now a major part of the bee pollen and nectar resources, will require special attention by Dr. Ertter. G. Frankie will serve as P.I. for the project. No support is requested for the P.I. who will devote 35-40% of his research time to the project.

- One graduate student will need support to conduct field and lab work.
- One part-time undergraduate will be required to assist the P.I. and the graduate student. This support should amount to ca 8hrs per week, for eight months of the year (see sect. XII)..

Identification services: Robbin Thorp and Barbara Ertter will each require support to identify bees and plants respectively. (est. $4,000. total per year).
Transportation: From Berkeley to SJRNWR-rental car or personal vehicle.
Supplies: Schmidt collection boxes for insects, pins, film/develop, nets, etc.
Transportation: We expect to rent vehicles or to use personal vehicles to conduct the field research at SJNWR.
Supplies: These are standard necessary items for field work.
Indirect costs: 25% of Modified Total Direct Costs (MTDC), which consists of salaries and wages, fringe benefits, materials, supplies, services, travel, subgrants and subcontracts up to the first $25,000 of each subgrant or subcontract. MTDC shall exclude equipment, capital expenditures, charges for patient care, tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant or subcontract in excess of $25,000 of overhead charges.

XI. <u>Partnership contribution</u>: Because of the newness of restoring bees to a habitat, the P.I. will devote 35-40% of his research time to the project (ca $40,000 ann.) to insure that it starts properly, that all activities are conducted in a timely manner, and that results are appropriately compiled and analyzed for publication. UC Berkeley will also support one undergraduate for ca 8 hrs per week for eight months each year (ca $8,000. ann.).65

The existing curated collections of plants and bees from both UC Berkeley and UC Davis will be used for references in the identification work planned for this study. Fortunately, these extensive collections have previously identified material, as well as long historical records from the Central Valley.

XII. Budget

PRINCIPAL INVESTIGATOR: *Gordon Frankie* *USFW (Calfed)*

BUDGET PROPOSAL
For a 3-Year Period

	Year 1	Year 2	Year 3	Total	Matching
SALARIES *(pls. see note #1)*					(pls. see note #4)
1 Grad.Stdnt.Res. @ 50% of $2913 for 9 mos. *(academic)*	13109	13371	13639	40119	
@ 100% of $2913 for 3 mos. *(summer)*	8914	9092	9274	27280	
1 PI @ 35% of $9708/mo for 12 mos.				0	122319
1 Undergrad Asst. @ 30% for $10/hr for 9 mos. Each year (academic)				0	14772
@ 100% for $10/hr for 3 mos. Each year (summer)				0	16131
Total Salaries	**22,023**	**22,463**	**22,913**	**67,399**	**153,222**
FRINGE BENEFITS *(pls. see note #2)*					
1 Grad. Stdnt . Res. @ 50%					
In-State Full Fees @ $3728.45/sem x 2 semesters	0	9023	9925	18948	
In-State Fees for year 1 @ $3850.95/sem x 2 semesters	8472	0	0	8472	
Non-Resident Fees @ $7347.00/sem x 2 semesters	16163	0.00	0.00	16163	
1.3% of 9 mos. salaries *(academic)*	170	174	177	522	
3.0% of 3 mos. salaries *(summer)*	267	273	278	818	
1 PI @ 35% with 30% Benefits				0	36698
1 Undergrad Asst. 1.3% of 9 mos. Salaries (academic)				0	189
3.0% of 3 mos. salaries (summer)				0	171
Total Fringe Benefits	**25073**	**9469**	**10381**	**44923**	**37,058**
Total Salaries and Fringe Benefits	**47,096**	**31,933**	**33,293**	**112,322**	**190,280**
TRAVEL COSTS pls. see note #3					
Vehicle rental for research trips	**3000**	**3000**	**3500**	**9500**	
OTHER DIRECT COSTS					
Contract Services for bee/plant taxonomic identification	4000	4000	4000	12000	
Field supplies, collection boxes, nets, etc.	1500	1500	1500	4500	
Total Other Direct Costs	**5500**	**5500**	**5500**	**16500**	
TOTAL DIRECT COSTS	**55,596**	**40,433**	**42,293**	**138,322**	**190,280**
INDIRECT COSTS (25% of MTDC)	**7,740**	**7,852**	**8,092**	**23,685**	
TOTAL DIRECT AND INDIRECT COSTS	**63,336**	**48,285**	**50,385**	**162,007**	**190,280**

Notes to Budget Proposal:

1. Salaries quoted at current rates and to be increased by 2% annually, starting Year 1.

2. Annual increase in In-State Fees will be 10.0%. In-State fees for non-residents in year 1 are slightly higher than for resident students and non-resident fees are covered only for students working more than 25%.

3. Research will be conducted at off-campus site in SJRNWR, San Joaquin County, CA. Applicable Indirect Cost rate will be 25% to be based on the following:

4. Matching costs will come from G. Frankie's state fund allocation (fund 19900).

	Year 1	*Year 2*	*Year 3*	*Total*
Total Direct Costs	*55596*	*40433*	*42293*	*138322*
Less:				
In-State Fees	*8472*	*9023*	*9925*	*27420*
Non-resident fees	*16163*	*0*	*0*	*16163*
Sub-Total	*24635*	*9023*	*9925*	*43583*
Indirect Cost Base/Modified Total Direct Costs	*30,961*	*31,410*	*32,368*	*94,738*

Modified Total Direct Costs (MTDC) *consists of all salaries and wages, fringe benefits, materials, supplies, travel and subgrant and subcontracts up to the first $25,000 of each subgrant or subcontract. Equipment capital expenditures, charges for the patient care, tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of $25,000 is excluded of overhead charges.*

APPENDIX 7. Study Plan for Task C.1

Fish Community Monitoring and Evaluation for the San Joaquin River National Wildlife Refuge

Objectives:

1. Assess the species composition and relative abundance of fish communities within the Refuge. Identifying the native and non-native species, habitat usage, and life history.

2. Compare the fish communities within the Refuge with those in reference sites on the San Joaquin River.

3. Determine predation by non-native fish on native fish, and feeding of juvenile Chinook salmon and splittail in channel and floodplain habitats.

Background:

The U.S. Fish and Wildlife Service, Stockton Fish and Wildlife Office conducted initial fish sampling on the Refuge, May 30, 2001. With the assistance of Refuge personnel, and using a 15 meter beach seine, fish species present on the Refuge were identified . A total of five sites were sampled. Fish composition included 12 species, mostly centrarchids, cyprinids, ictalurids. There were only three native fish in the samples, one splittail, and two Sacramento suckers. Most fish were juveniles, with the largest fish being a 122 mm redear sunfish, and the most frequently sampled fish was the common carp.

Seasonal sampling started on May 21, 2002, and was conducted once per month during the months of February, March, May, October, and December, and has continued yearly. Other winter and spring months were not sampled due to NOAA concerns about the capture of juvenile steelhead. Summer months were not sampled as juvenile Chinook and splittail would most probably not be present.

While other methods of sampling were considered for the baseline sampling period, only the beach seine was used. Such gears as fyke traps, electro fishing, and hook-and-line sampling were also considered, but not used since the beach seine provided the most flexibility for collecting a variety of species and life stages.

The general composition of fish species in the refuge remained unchanged over the baseline period, mostly non-native species, and inland silverside numbers were the highest of any species. Native species remained rare in the samples, with only Sacramento blackfish, splittail, and Sacramento suckers sampled.

As restoration work on the Refuge continued, sample sites were lost until there were only two sites. Spring 2004 sampling was not conducted due to restoration activity, and as scheduling personnel became difficult with increased sampling in other areas.

Contingent upon the occurrence, extent, duration and timing of potential flooding events, the following hypotheses will provide performance criteria to evaluate the conditions under which the restored habitats are most likely to benefit native fishes and least likely to benefit non-native fishes:

1. Relative abundance by native fish is higher in the restored floodplain when compared to adjacent, non-restored flooded sites and channel areas during high flow events.

2. Condition factor and feeding of native fish are higher in the restored floodplain than in the non-restored degraded flooded sites or channel areas
3. Predation on native fishes is lower in the restored floodplain areas than in the non-restored areas.

Approach:

Conceptual Model - fish utilize the areas within the Refuge and the period of sampling and sampling methods will capture all species present. This will provide the information required to test the stated hypotheses to assess project performance. Methods will include:

1. Identify sites where consistent sampling can be maintained during periods when the Refuge is not flooded.
2. Use sampling gear that will target all life history stages, larval through adult including:
    a. Beach seining - for juvenile and smaller adult fish.
    b. Fyke traps - for juvenile and adult fish. Fishable for 24 hour cycles to determine diurnal and nocturnal patterns. Traps will be set in the morning, checked in the afternoon, and checked and pulled the following morning.
    c. Minnow traps - for smaller benthic fish, and invertebrates. Fishable for 24 hour cycles. Traps will be set in the morning, checked in the afternoon, and checked and pulled the following morning.
    d. Light traps - for larval fish. Set before dark and checked and pulled the following morning.
    e. Electro fishing (backpack) - for juvenile and adult fish.
    f. Hook-and-line fishing - for juvenile and adult fish.
3. Identify native and non-native fish species.
4. Identify habitats used by fish species, native and non-native.
5. Identify species and life history stages of fish.
6. Conduct flood event monitoring of fish in the Refuge.
7. Analyze fish stomachs to evaluate fish predation by non-native fishes and the feeding patterns of native fishes in different habitats.

Statistical analyses:

The sampling effort for each gear type will depend on the extent of flooding and habitat types. Comparison of catch per unit effort (CPUE) among habitats will be based on the gear types with low coefficient of variation of the mean CPUE (e.g. CV = 20%, Cyr et al. 1992). Existing baseline samples for two non-restored areas and five sites in the restored areas will be statistically evaluated to assess number of samples required to compare the abundance of targeted fish species.

Both parametric and non-parametric statistical methods (e.g. ANOVA, t-test, Kruskal-Wallis tests) will be considered to compare the relative abundance, size composition, and fish feeding between restored and non-restored habitats.

Sampling Uncertainties:

During those periods when the Refuge is flooded, sampling intensity will be increased accordingly, with adjustments made to the monitoring frequency. It is noted that sampling effort during a flood event cannot be accurately estimated, as the Refuge has not flooded since baseline sampling began in 2001. However, sampling flexibility for substantial increases in monitoring effort is accounted for in the requested budget. December,

February, and March would be the most probable months when flooding could occur during the allowed sampling period.

Budget: (attached file)

References

Cyr, H. J.A. Downing, S. Lalonde, S.B. Baines and M.L. Pace. 1992. Sampling larval fish populations: choice of sample number and size. Transactions of the American Fisheries Society. 121:356-368.

Williams, P. and Associates. May 2001. San Joaquin River National Wildlife Refuge Phase 1: Analysis of Proposed Levee Breaches.

Field Activities

Gear Type	Habitat Type	Species Targeted: life stage	Months Sampled												Field Sampling Staffing							Fuel and Maintenance for Vehicles and Vessels			
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Labor	Rate	Hours per Day	Days/Year	Yearly	Benefits (30%)	Labor + Benefits	Fuel/day	Maintenance per day	Vessel Days/Year	Cost
15m Beach seine	near shore, beach	**CHN**: juv., **SPLT**: juv., **DSM**: adults, resident natives		4	4		4					4		4	GS-5, step 5	$15.98	10	40	$6,392.00	$1,917.60	$8,309.60	$75.00	$100.00	20	$3,500.00
															GS-7, step 5	$19.81	10	10	$1,981.00	$594.30	$2,575.30				
Hook & Line	near shore, tules, channels	resident natives, nonnative predators		x	x		x					x		x											
Fyke traps	near shore, beach, channels	**CHN**: juv., **DSM**: adults, nonnative predators,resident natives													GS-5, step 5	$15.98	10	40	$6,392.00	$1,917.60	$8,309.60	$75.00	$100.00	20	$3,500.00
															GS-7, step 5	19.81	10	10	$1,981.00	$594.30	$2,575.30				
															GS-9, step 5	24.22	10	10	$2,422.00	$726.60	$3,148.60				
Minnow Traps	channels, open water, ponds, mud flats	**SPLT**: juv., , **CHN**: Juv, resident natives		4	4		4					4		4											
				x	x		x																		
Electrofishing	**south**-open water	adults, nonnative predators													GS-5, step 5	$15.98	10	20	$3,196.00	$958.80	$4,154.80	$75.00	$100.00	5	$875.00
	middle-channels														GS-7, step 5	$19.81	10	2.5	$495.25	$148.58	$643.83				
	north-channels														GS-9, step 5	$24.22	10	2.5	$605.50	$181.65	$787.15				
	north-open water, ponds			1	1		1					1		1											
Light Traps	**south**-open water	**SPLT**: larvae, **DSM**: larvae, resident natives													GS-5, step 5	$15.98	10	36	$5,752.80	$1,725.84	$7,478.64	$75.00	$100.00	12	$2,100.00
	middle-open water, mud flats														GS-7, step 5	$19.81	10	6	$1,188.60	$356.58	$1,545.18				
	middle-channels														GS-9, step 5	$24.22	10	6	$1,453.20	$435.96	$1,889.16				
	north-channels																								
	north-open water, ponds			4	4		4																		
		Total days			57													183	$31,859.35	$9,557.81	$41,417.16			57	$9,975.00

Field Staff Summary

	Rate	Hours/Day	Days/Year	Yearly	Benefits	Total
Bio Tech GS-5	$15.98	10	136	$21,732.80	$6,519.84	$28,252.64
Bio Tech GS-7	$19.81	10	28.5	$5,645.85	$1,693.76	$7,339.61
Biologist GS-9	$24.22	10	18.5	$4,480.70	$1,344.21	$5,824.91
Admin support	$24.22	8	20	$3,875.20	$1,162.56	$5,037.76
			203			$46,454.92

Vehicle/Vessel Support Summary

	Rate		Days/Year	Yearly		Total
Fuel/day	75		57	4275		$4,275.00
Maintenance/da	100		57	5700		$5,700.00
						$9,975.00

Laboratory Staff Summary

Bio Tech GS-5	$15.98	8	26	$3,323.84	$997.15	$4,320.99
Bio Tech GS-5	$15.98	8	40	$5,113.60	$1,534.08	$6,647.68
Bio Tech GS-5	$15.98	8	36	$4,602.24	$1,380.67	$5,982.91
Biologist GS-9	$24.22	8	30	$5,812.80	$1,743.84	$7,556.64
Biologist GS-11	$29.31	8	35	$8,206.80	$2,462.04	$10,668.84
			167			$35,177.06

Larval fish processing and identification
Food habits analyses
Data input
Data analyses and report preparation

In-kind Staff Contributions

Senior Biologist	$34.39	8	40	$11,004.80	$3,301.44	$14,306.24
Senior Biologist	$48.33	8	10	$3,866.40	$1,159.92	$5,026.32
			50			$19,332.56

Data analyses and report preparation

Three-year Staff and Vehicle/Vessel Support Summary

Item	Year 1	Year 2	Year 3	Total	In-kind
Field staff (includes 18% OH)	$54,816.80	$56,461.30	$58,155.14	$169,433.25	
Laboratory staff (includes 18% OH)	$41,508.94	$42,754.20	$44,036.83	$128,299.97	$70,510.91
Vehicle/vessel support	$9,975.00	$10,274.25	$10,582.48	$30,831.73	
Facility support	$0.00	$0.00	$0.00	$0.00	$320,924.15
	$106,300.74	$109,489.76	$112,774.45	$328,564.94	$391,435.06

bio days *600 *3
400 240000 720000
minus $399,075.85
$320,924.15

Three-year Equipment Summary

Description	Quantity	Unit Price	Total Price
Fyke traps with wings and fence posts	12	$400	$4,800
6 ft. block nets: 1/16" mesh delta 4 ft. deep	18	$75	$1,350
Long-handled dip nets	9	$50	$450
Beach seines	6	$500	$3,000
Backpack electrofisher	1	$6,200	$6,200
electrofishing gloves	12	$90	$1,080
Dip nets handles	2	$172	$344
Dip nets	2	$131	$262
Replacement nets	4	$24	$96
Additional HD Battery	1	$305	$305
Total			$17,887

APPENDIX 8. Study Plan for Tasks D.1 and E.3

San Joaquin River National Wildlife Refuge

Riparian Habitat Restoration Monitoring Plan

San Joaquin River National Wildlife Refuge
San Joaquin River Mile 77L—87L
Stanislaus County, California

November 2004

Prepared for:

U. S. Fish and Wildlife Service
San Luis National Wildlife Refuge Complex

Table of Contents

List of Appendices

List of Tables

List of Figures

INTRODUCTION

Project Overview

This document describes River Partners' monitoring plan for 777 acres of restored riparian vegetation on the West Unit of the San Joaquin River National Wildlife Refuge. River Partners will determine if the restored vegetation has met project and CALFED's Ecosystem Restoration Program goals including restoring riparian habitat and preventing the establishment of and reducing impacts from non-native invasive species. Monitoring results will lead to recommendations for designing and implementing future riparian habitat restoration projects.

Riparian Restoration Project Background

In 2001, through CALFED's Ecosystem Restoration Program (No. ERP-01-N08), the US Fish and Wildlife Service (USFWS) was awarded a grant to restore 777 acres of the West Unit of the San Joaquin River National Wildlife Refuge to riparian vegetation. With this funding, the USFWS entered into a Cooperative Agreement (No. 11650-2-J116) with River Partners (RP) to implement the riparian restoration.

The San Joaquin River National Wildlife Refuge (Refuge), located approximately 13 miles west of Modesto, California, in Stanislaus County, was created in 1987 to provide foraging and roosting habitat for the threatened Aleutian Canada goose as well as other endangered species and migratory birds. In 1999, the USFWS with the NRCS purchased 3,166 acres of flood-prone farmland located on the west bank of the San Joaquin River near its confluence with the Tuolumne River. This area is referred to as the "West Unit" and consists of three properties: Hagemann, Vierra, and Lara. River Partners restored over 777 acres in fields located on the former Hagemann and Lara properties (Figure 1).

Riparian Restoration Goals and Objectives

Goals and objectives of this riparian restoration project included: 1) provide habitat for several at-risk species including chinook salmon and steelhead, Sacramento splittail, riparian brush rabbit, valley elderberry longhorn beetle, yellow-billed cuckoo, and Swainson's hawk by planting diverse native riparian vegetation, and 2) limit establishment and effects of non-native invasive plants by planting a dense, herbaceous understory.

Riparian Restoration Planning and Implementation

The restoration project was planted in two phases (Project A and Project B). Prior to implementation, River Partners conducted detailed site assessments including soil texture and stratification, depth to water table, past land use, and current conditions. A restoration plan describing site conditions, a conceptual site model, planting design, project implementation, and monitoring was developed for each phase of the project (Sacramento River Partners 2002a, 2002b).

Figure 1. Regional map and location of restored fields on the San Joaquin River National Wildlife Refuge.

River Partners used site physical characteristics (soils and depth to water table), recommendations from PRBO Conservation Science and the Endangered Species Recovery Program, wildlife objectives, and management considerations to develop plant designs for both projects (Figure 2). Thirteen native tree and shrub species were included in the plant design (Table 1). Ten native herbaceous species were included in the understory planting (Figure 3; River Partners 2003).

Restoration planting began in March 2002 for Project A on 235 acres of abandoned agricultural land on the Hagemann property (fields H8, H9, and H20). Planting began in December 2002 for Project B (550 acres) on the Hagemann and Lara properties (fields H5, H6, H21, H25, and L1-L9). Over 196,000 native trees and shrubs have been planted on the Refuge since 2002. Approximately 60 acres each of creeping wildrye (*Leymus triticoides*), mugwort (*Artemisia douglasiana*), and gumplant (*Grindelia camporum var. camporum*) were planted in December 2003 throughout Project A. The same herbaceous understory species will be planted throughout Project B in November/December 2004.

Table 1. Summary of native tree and shrub species planted on the San Joaquin River National Wildlife Refuge.

Common name	Scientific name	Total Number
Box elder	*Acer negundo*	12,525
Buttonbush	*Cephalanthus occidentalis*	5,909
California blackberry	*Rubus ursinus*	22,001
Coyote brush	*Baccharis pilularis*	17,146
Elderberry	*Sambucus mexicana*	26,812
Fremont cottonwood	*Populus fremontii* ssp. fremontii	20,444
Mule fat	*Baccharis salicifolia*	578
Oregon ash	*Fraxinus latifolia*	4,751
Valley oak	*Quercus lobata*	31,079
Wild rose	*Rosa californica*	12,517
Arroyo willow	*Salix lasiolepis*	24,166
Gooding's black willow	*Salix goodingii*	6,370
Sandbar willow	*Salix exigua*	12,030
	TOTAL	**196,328**

On-going Monitoring

Monitoring is essential to demonstrate the success of a project and to improve its success during implementation. River Partners uses an adaptive management approach to evaluate all aspects of our restoration projects (Sacramento River Partners 2003). Our restoration plans provide a framework from which to evaluate project progress and state scientific or management hypotheses. For example, the plant design, which matches plant species to specific site conditions, can be viewed as a testable hypothesis. River Partners has developed a computer database system that identifies the plant species at a particular row and planting location within a field (Appendix I). This allows us to develop specific plant designs to create structurally diverse

Figure 2. Location of vegetation associations for the riparian restoration on the San Joaquin River National Wildlife Refuge.

Figure 3. Location of understory associations for the riparian restoration on the San Joaquin River National Wildlife Refuge.

vegetation (i.e., dense thickets, light gaps, groves of tall trees) for target wildlife species, match site conditions (i.e., flood tolerant species in wet areas), and incorporate management objectives (i.e., dense vegetation to serve as a wildlife screen).

River Partners conducted monitoring on an annual basis. At the end of the 2002, 2003, and 2004 growing seasons, River Partners collected census data on all trees planted within the restoration project. Results from 2004 showed an 82% survivorship of restored vegetation. Maps showing the location, species, and status (dead/alive/not planted) of each planted tree and shrub can be produced from these census data.

In addition to the census data, species survival, cover, height, and density data were collected in twenty 20 m x 50 m permanent monitoring plots located randomly throughout the 777 acre planting area in 2004. In 2004, River Partners collected herbaceous understory cover, height, density, and dominant weed species data along eighteen permanent transects located in woody species permanent plots.

CONCEPTUAL MODEL

The model (Figure 4) begins with definitions of the objectives that the restoration planting will accomplish, in this case the vegetation structure of the habitat for several different species of wildlife – riparian obligate songbirds, riparian brush rabbit, and VELB. The restoration planting is composed of thirteen species of trees and shrubs, each with their own unique requirements for growth in different soils with different water tables. Thus, information from excavated soil pits, soil texture and stratification and depth to the water table, is used in combination with known wildlife habitat needs, to develop the planting design. The restoration is installed into abandoned agricultural fields and maintained over 3 years with irrigation and weed control. By the end of the project, the native plants have out-competed the non-native weeds and a riparian forest has been established. The entire process from the installation of the plants, through maintenance, to the end of the project is monitored intensively with an adaptive management perspective, allowing for the adjustment of management actions and their timing. Monitoring throughout the project defines progress toward the wildlife habitat goals of the restoration project.

River Partners will test three hypotheses developed during site assessment and project design phases of the restoration project.

Hypothesis 1a: Planting design appropriately met site conditions.
If the plant design appropriately met site conditions, monitoring results will show the same relative percent composition for each species as the planting design. If the plant design did not meet site conditions, soils analysis and groundwater monitoring may explain species-specific trends. A sub-hypothesis: Can we define the "successional trajectory" of the restoration planting? Recruitment of seedlings and saplings after active management could predict succession.

Hypothesis 1b: Planting design resulted in diverse vegetative structure within the restoration project.

Vegetative structure of the restored vegetation will be characterized by collecting density, height, and cover at one-meter vertical intervals of planted species within permanent plots. Vegetation structure will be examined within and across restoration fields.

Hypothesis 2: Riparian restoration limits the establishment of non-native invasive species. Native and non-native herbaceous understory cover will be examined within and across restoration fields. This monitoring will indicate whether restored woody and herbaceous vegetation are effective at limiting the establishment or extent of non-native invasive weeds.

Hypothesis 3: Planting design resulted in functional wildlife habitat.
This proposal will also monitor the last three boxes in the model – wildlife habitat structure for target wildlife species. Overlaying monitoring plots on avian, riparian brush rabbit, and small mammal transects will estimate how much suitable vegetation structure exists in the entire restoration project.

METHODS

Vegetation Monitoring

The existing 20 permanent plots established in 2004 and approximately 80 additional plots will be used the first year to measure density, height, cover, recruitment, and herbaceous understory cover of restored vegetation. During the second year, additional permanent plots will overlay avian, riparian brush rabbit, and small mammal transects to estimate habitat quality of the entire project area.

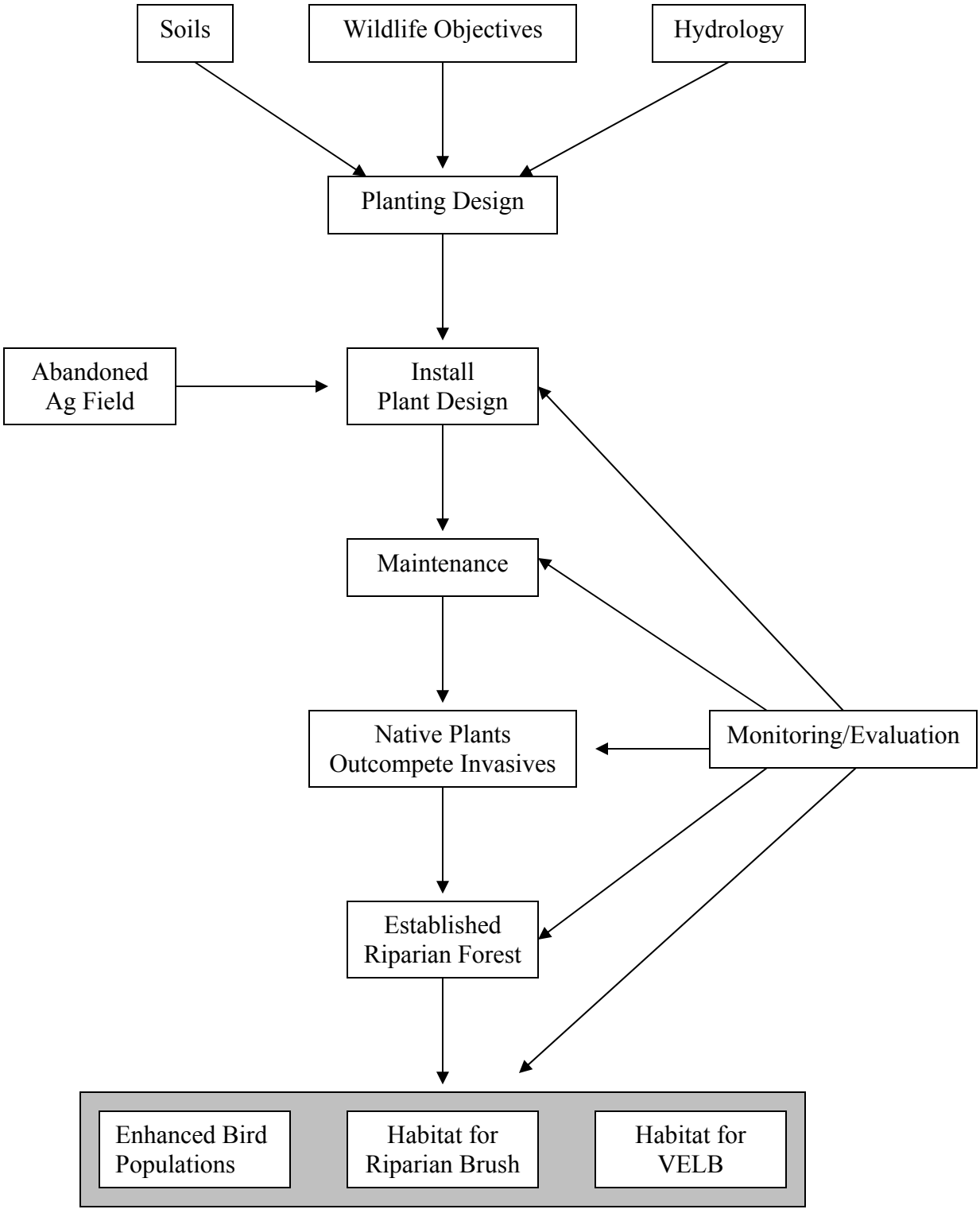
Woody Species

River Partners planted 14 plant associations throughout the restoration project. We will monitor permanent plots to examine how different plant associations performed after maintenance activities (weed control and irrigation) ceased, when physical site conditions will have more effect on vegetation. The following will be collected to characterize species composition and vegetative structure:

- density,
- height,
- cover at 1 m meter vertical intervals, and
- number of native woody recruits.

Density will be recorded as the number of rooted individuals within the plot and will reflect survival and species composition. The height of each individual will be an indicator of vigor and will be used to characterize vegetative structure. Aerial cover of trees and shrubs at 1 m vertical intervals will be based on the longest diameter through the horizontal plane of the plant's drip line at each interval. Cover at vertical intervals will also be used to characterize vegetative structure. Because restoration activities often create conditions that favor natural recruitment of native plants, we will also record the number of recruited native riparian woody species.

Figure 4. Conceptual model for riparian vegetation restoration on the San Joaquin River National Wildlife Refuge.



These data will be collected for all shrubs and trees inside approximately one hundred 20 m x 50 m plots. Random permanent plots will be located in:

- each plant association within each field,
- double-density planting clusters designed to increase structural heterogeneity and provide habitat for target wildlife species,
- existing remnant riparian vegetation on the Refuge, and
- non-restored abandoned agricultural fields on the Refuge.

The 20 m x 50 m permanent plots will be placed with the long axis oriented in a north-south direction. Each location will be marked with a metal t-post and metal tag in the northwest corner of each plot. GPS coordinates of the northwest corner of each plot will also be recorded.

Herbaceous Understory

By the end of 2004, River Partners will have planted a native herbaceous understory throughout the entire restoration project. We will monitor permanent transects to evaluate impacts of native woody and herbaceous species restoration on the establishment and extent of non-native invasive species.

A 50 m transect inside the woody species permanent plot will run parallel to tree planting rows. Eight ½ m x 1 m quadrats will be randomly placed along each transect. Additional transects will be placed in areas that were not planted with herbaceous understory species to separate competitive effects of woody species and herbaceous understory species on non-native weeds.

Ocular estimates of canopy cover by native herbaceous understory species, general weeds, weeds of concern, and bare ground/litter will be recorded to the nearest 10% above 10% (i.e., 1, 5, 10, 20, 30, 40%, etc.). Weeds of concern include perennial pepperweed (*Lepidium latifolium*), Johnson grass (*Sorghum halepense*), yellow star thistle (*Centaurea solstitialis*), Bermuda grass (*Cynodon dactylon*), and sweet clover (*Melilotus albus*).

Soils and Depth to Water Table Sampling

River Partners' plant design, in large, was based on soil pits excavated during the site assessment. The original soil pits will likely not be within the permanent plots because of plot location criteria. In this proposed study, soil texture and stratification and depth to water table will be recorded at each permanent plot by means of a soil-auger sample. These data will be used to evaluate the success of native riparian vegetation restoration success in relation to soils and depth to water table.

Groundwater Monitoring

River Partners has been monitoring 27 groundwater-monitoring wells on the Refuge on a monthly basis since August 2002. Results from this extended monitoring will be used to evaluate the success of native riparian vegetation restoration and natural recruitment in relation to groundwater levels and to build a long term dataset examining changes in groundwater levels as the project site has changed from intensively cultivated farmland to a functioning floodplain.

Data Analysis

To evaluate if the plant design (based upon an evaluation of site factors and the target wildlife habitat needs) appropriately met site conditions, metric means (density, height) for each species will be presented graphically for each plant association (14 plant associations in the restoration design) for all fields (14 fields). Vegetation structure will be described by a "horizontal histogram" to compare mean cover by vertical strata within each plant association and across fields. Metric means for each species within associations will be correlated (using regression) with soil texture and measured depth to water table across all fields.

Vegetation data collected from wildlife plots in year 2 will be compared to vegetation data from year 1 to estimate area of quality habitat and to determine if there is any correlation between vegetation metrics and wildlife responses (e.g., does height of cottonwoods correlate with the number of song sparrow nests).

CONCLUSIONS

Monitoring results from this study would evaluate the success of the riparian vegetation restoration, describe how each plant association responded to soils and depth to water table, indicate the importance of knowing these physical conditions when developing a plant design, and estimate the acreage of quality habitat throughout the entire restoration project for riparian brush rabbits, avian species, and VELB. Monitoring results will lead to recommendations for developing plant designs for future riparian habitat restoration projects.

TIMELINE

The proposed timeline for monitoring riparian vegetation restoration for two growing seasons followed by data analysis and report writing is shown in Table 2.

Table 2. Proposed monitoring timeline for the San Joaquin River National Wildlife Refuge.

Task	2006			2007				2008	
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer
Vegetation Monitoring									
Well Monitoring									
Data Analysis/Reporting									
Project Management									

REFERENCES

River Partners. 2003. Understory Restoration Plan for the San Joaquin River National Wildlife Refuge, Stanislaus County, California. October 2003. Tom Griggs and Tamara Sperber. Modesto, California.

Sacramento River Partners. 2002a. San Joaquin River National Wildlife Refuge Riparian Restoration Plan for Fall 2002 (Project B: Fields H5, H6, H21, H25, and L1-L9), Stanislaus

County, California. Final Report, December 2002. Tom Griggs and Tamara Sperber. Modesto, California.

Sacramento River Partners. 2002b. San Joaquin River National Wildlife Refuge Riparian Restoration Plan for Spring 2002 (Project A: Fields H8, H9 and H20), Stanislaus County, California. Final Report, December 2002. Tom Griggs. Chico, California.

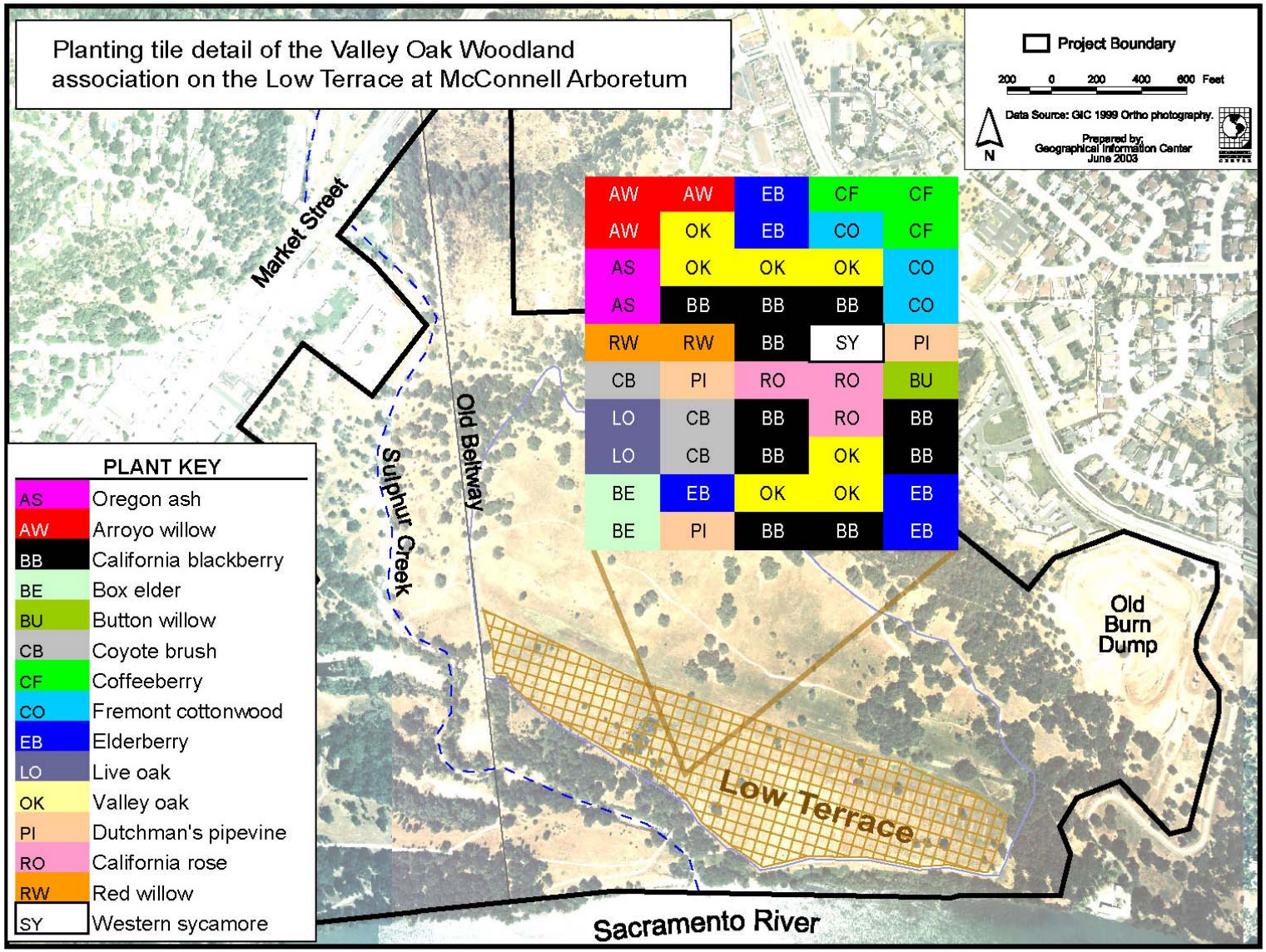
Sacramento River Partners. 2003. 2003 Monitoring program plan for Sacramento River Partners. Dan Efseaff, Tom Griggs, Erin McKinney, Tamara Sperber, and Helen Swagerty. Chico, California.

APPENDIX I

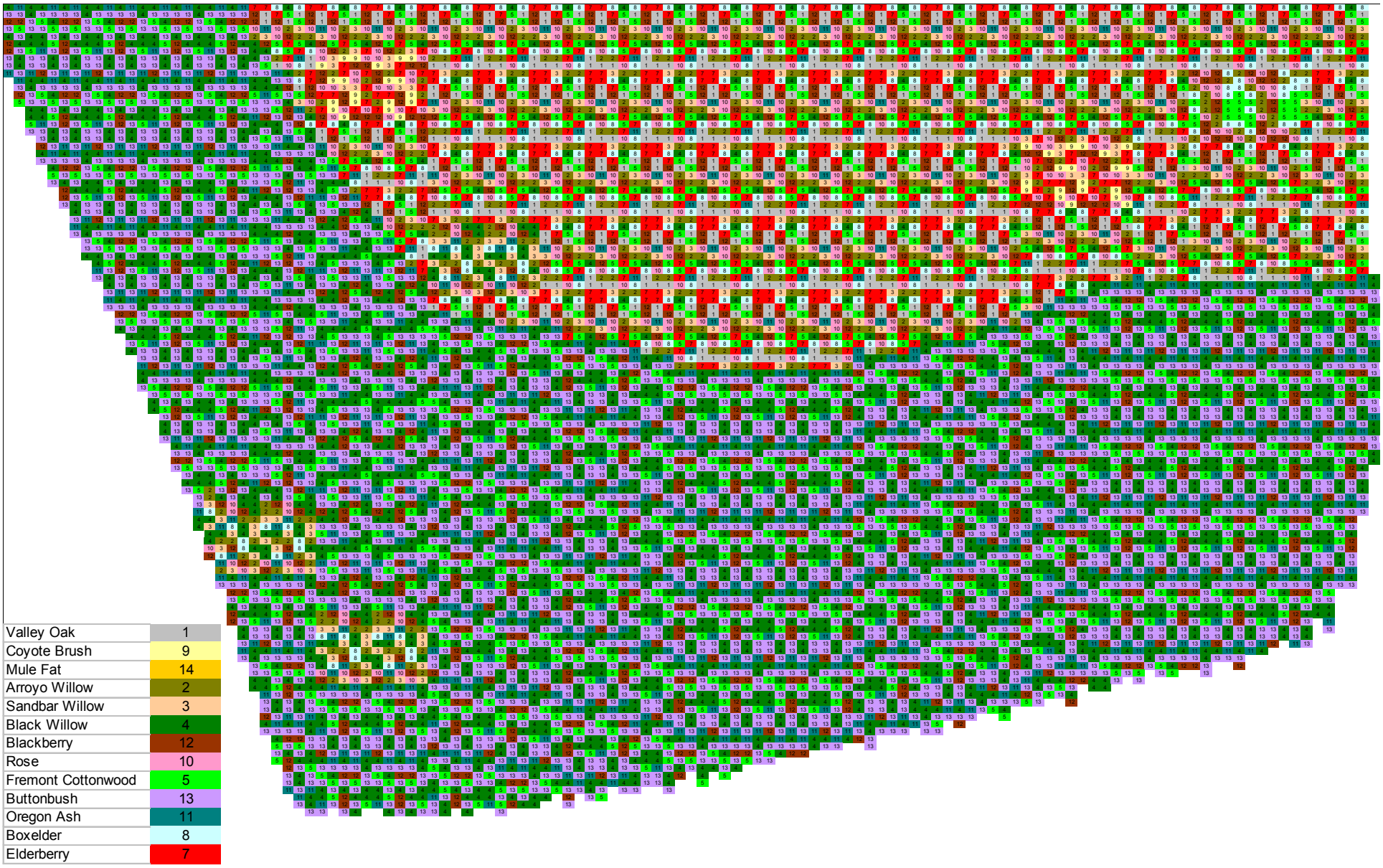
River Partners Planting Design Database System

River Partners has developed a computer database system that identifies the plant species at a particular row and planting location within the field. This planning tool allows us to develop specific planting patterns that will create a vegetation mosaic of structural patterns within the restoration planting (i.e. dense thickets, light gaps, groves of taller trees, etc.) and match plants to specific field conditions (i.e. flood tolerant species in wet areas) or management objectives (i.e. dense vegetation to serve as a wildlife screen). Each planting location receives a computer-generated label that lists its row and plant number, location, plant association, and species name and number code. The labels are installed in the field prior to planting, allowing us to clearly communicate the plan to the planting crew. The database is an important adaptive management tool because it allows us to discern any patterns in a plant species' survival rate or growth patterns across a field.

Within each plant association, the main planting subunits are expressed as "tiles." Each tile covers an area of 5 rows by 10 planting locations within each row and is approximately 1/5 of an acre. Each tile will be replicated as often as needed to fill in the area for a particular association. Within each tile, plants are arranged so that we can create a mosaic of vegetative structure across the field. For example, grouped trees will create dense cover sooner compared to trees that are evenly spaced across a site. Likewise, small shrubs that are grouped together will attract wildlife species faster than if they were grown spaced apart. Mexican elderberry and mixed willow clusters are embedded within the other association types to enhance structural diversity of the vegetation as it matures over time.


Planting tile detail of the Valley Oak Woodland association on the Low Terrace at McConnell Arboretum
Project Boundary
200 0 200 400 600 Feet
Data Source: GIC 1999 Ortho photography.
Prepared by: Geographical Information Center June 2003
N
AW AW EB CF CF
AW OK EB CO CF
AS OK OK OK CO
AS BB BB BB CO
RW RW BB SY PI
CB PI RO RO BU
LO CB BB RO BB
LO CB BB OK BB
BE EB OK OK EB
BE PI BB BB EB
PLANT KEY
AS Oregon ash
AW Arroyo willow
BB California blackberry
BE Box elder
BU Button willow
CB Coyote brush
CF Coffeeberry
CO Fremont cottonwood
EB Elderberry
LO Live oak
OK Valley oak
PI Dutchman's pipevine
RO California rose
RW Red willow
SY Western sycamore
Market Street
Old Beltway
Sulphur Creek
Old Burn Dump
Low Terrace
Sacramento River

Example database map for Field L3 on the San Joaquin River National Wildlife Refuge.



Year 1	Task	Direct Labor Hours	Direct Salary	Material Costs	Misc & Other Direct Costs	Overhead & Indirect Costs	Year 1 Total
	Monitoring Vegetation			$2,750.00	$3,850.00	$1,386.00	$7,986.00
	Biologist Labor	460	$11,500.00			$2,415.00	$13,915.00
	Biology Intern Labor	1400	$18,200.00			$3,822.00	$22,022.00
	Monitoring Wells					$0.00	$0.00
	Biologist Labor	106	$2,650.00	$100.00		$577.50	$3,327.50
	Reporting	99	$2,970.00	$385.00		$704.55	$4,059.55
	Project Management	100	$3,300.00			$693.00	$3,993.00
	Total	2165	$38,620.00	$3,235.00	$3,850.00	$9,598.05	$55,303.05

Year 2	Task	Direct Labor Hours	Direct Salary	Material Costs	Misc & Other Direct Costs	Overhead & Indirect Costs	Year 2 Total
	Monitoring Vegetation			$550.00	$3,850.00	$924.00	$5,324.00
	Biologist Labor	460	$11,500.00			$2,415.00	$13,915.00
	Biology Intern Labor	1400	$18,200.00			$3,822.00	$22,022.00
	Monitoring Wells					$0.00	$0.00
	Biologist Labor	106	$2,650.00	$100.00		$577.50	$3,327.50
	Reporting	99	$2,970.00	$385.00		$704.55	$4,059.55
	Project Management	100	$3,300.00			$693.00	$3,993.00
	Total	2165	$38,620.00	$1,035.00	$3,850.00	$9,136.05	$52,641.05

Year 3	Task	Direct Labor Hours	Direct Salary	Material Costs	Misc & Other Direct Costs	Overhead & Indirect Costs	Year 3 Total
	Monitoring Vegetation					$0.00	$0.00
	Biologist Labor					$0.00	$0.00
	Biology Intern Labor					$0.00	$0.00
	Monitoring Wells					$0.00	$0.00
	Biologist Labor					$0.00	$0.00
	Reporting	132	$3,960.00	$555.00		$948.15	$5,463.15
	Project Management	100	$3,300.00			$693.00	$3,993.00
	Total	232	$7,260.00	$555.00	$0.00	$1,641.15	$9,456.15

Total	Task	Direct Labor Hours	Direct Salary	Material Costs	Misc & Other Direct Costs	Overhead & Indirect Costs	Total
	Monitoring Vegetation	0	$0.00	$3,300.00	$7,700.00	$2,310.00	$13,310.00
	Biologist Labor	920	$23,000.00	$0.00	$0.00	$4,830.00	$27,830.00
	Biology Intern Labor	2800	$36,400.00	$0.00	$0.00	$7,644.00	$44,044.00
	Monitoring Wells	0	$0.00	$0.00	$0.00	$0.00	$0.00
	Biologist Labor	212	$5,300.00	$200.00	$0.00	$1,155.00	$6,655.00
	Reporting	330	$9,900.00	$1,325.00	$0.00	$2,357.25	$13,582.25
	Project Management	300	$9,900.00	$0.00	$0.00	$2,079.00	$11,979.00
	Total	4562	$84,500.00	$4,825.00	$7,700.00	$20,375.25	$117,400.25

APPENDIX 9. Study Plan for Task D.2

Vegetation Monitoring at Levee Breach Sites on San Joaquin River National Wildlife Refuge: Response to Flood Events

Prepared by
Kenneth M. Griggs, Wildlife Biologist
USFWS, San Luis NWR Complex

Background and Justification

In 2002, a CALFED funded (contract # 01-N08), large scale restoration project was initiated on lands within the San Joaquin River National Wildlife Refuge (SJRNWR). The purpose of this project was to restore, preserve, and protect over 11,000 acres of fish and wildlife habitat. This acreage includes much needed wetland, riparian, and floodplain habitats that have been lost in the Central Valley (Katibah 1984).

A major part of this project is to widen the floodplain on SJRNWR and restore its hydrological processes. This restoration will provide high quality fish and wildlife habitat that is lacking in the Central Valley. In addition, a larger floodplain will provide storage for flood waters and facilitate groundwater recharge. Therefore, the restoration effort also accomplishes a measure of cost effective, non-structural flood control, as directed by Executive Order 11988, the Council for Environmental Quality, and the Office of Management and Budget (USFWS 2000).

A major component of the floodplain restoration is the breaching of Army Corp of Engineers' levees along the San Joaquin River. Breaching will restore hydrological processes to the floodplain such as overbank flooding and channel movement, resulting in sediment deposition and scouring. The impacts of these processes will vary over time depending on the magnitude of and frequency of the flood events. The most significant changes to vegetation will be seen immediately adjacent to breach sites, where flood waters will enter and exit the floodplain with varying velocities. Vegetation monitoring will focus on these sites in order to establish baselines before breaching, track changes after breaching, and determine effects to vegetation after flood events occur.

Objectives

To document the effects of levee breaches used in this floodplain restoration on surrounding vegetation, the objectives of this monitoring plan are:

1) To establish a baseline on the composition and structure of vegetation surrounding proposed breach sites. Data on the species frequency, percent cover, and density of vegetation will be collected.

2) Compare composition and structure from baseline data to measures collected after levees have been breached. The breaches in levee will alter micro-climates, light regimes, and could provide openings for invasive plants to establish.
3) Track changes in vegetation composition and structure after flood events to describe the effects of scouring and sediment deposition. Compare changes to previously established baselines.

Participants

All planning, field work, data analysis, and report writing will be conducted by Refuge biologists.

Methods

Schedule and Timing

To establish baselines, vegetation monitoring will be conducted during a one week period in mid-April and again in mid-September in 2006. If levee breaches do not occur between sampling periods, the second period will be rescheduled in order to generate data at sites after breaching operations have occurred. Post flood monitoring of vegetation at levee breach sites will be conducted during mid-April and mid-September following the flood event.

Sampling Design

Systematic sampling using 100 meter transects, placed perpendicular to breaches, 25 meters apart will be the sampling design employed. Depending on the size of breaches, four to five permanent transects per breach will be established. The beginning of each transect will be marked with a lathe stake and a precise compass bearing will be taken to provide consistency when sites are re-sampled. One meter-square quadrats will be spaced 5 meters apart along each transect and will serve as the sampling unit. The same transects and quadrats will be surveyed in each sampling period to allow for comparison between baseline, post breaching, and post flood data.

Within each quadrat, 3 measures of species composition and structure will be determined: frequency, percent cover, and stem density. To describe frequency, the presence/absence of focal native and invasive plant species will be determined for each quadrat. The number of quadrats with an individual species present divided by the total number of quadrats equals the frequency of that species. Percent cover will be visually estimated for each species within each quadrat. Stem density within each quadrat will be determined by counting the number of stems at 12 inches high for each species. Density estimation using a quadrat is impractical for grass and forb species, therefore only shrub species will be counted (Elzinga et al. 1998). Data will be collected by two biologists properly trained in species identification and monitoring methodologies.

Analysis

Descriptive statistics will be used to describe measures of species composition and structure within each sampling period. Paired t-tests will be used to examine differences in measures of species composition and structure between sampling periods, baseline and post breaching surveys, and baseline and post flood surveys (Zar 1998).

Quality Control-Quality Assurance Protocols

Survey protocols described above are derived from commonly used and tested methodologies. Numerous agencies, conservation organizations, and university researchers have employed these techniques. Data collection will be standardized through the use of forms and codes developed by the USFWS and previously used on SJRNWR during other vegetation monitoring programs. All personnel conducting surveys are properly trained in the identification of species that may potentially be encountered around breach sites at SJRNWR. The Refuge Supervisory Biologist will oversee monitoring on this project.

Products and Archiving

The data and results will be summarized in progress reports and presented in a final report at the end of the project. GIS coverages of breach sites, survey transects, and species composition and structure layers will be created for use in long term monitoring of the restoration project. Data from this project will be stored at San Luis NWR and incorporated into the permanent Refuge files.

Roles and Responsibilities

All data collection, analysis, and report preparation will be conducted by Refuge personnel.

Literature Cited

Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and monitoring plant populations. U. S. Bureau of Land Management Technical Reference 1730-1. 477pp.

Katibah, E. F. 1984. A brief history of riparian forests in the Central Valley of California *in* California Riparian Systems: Ecology, Conservation, and Productive Management. Edited by R. E. Warner and K. M. Hendrix. Univ. of Cal. Press, California. Pages 23-29.

USFWS. 2000. San Joaquin River National Wildlife Refuge riparian habitat protection and floodplain restoration project-phase II proposal. USFWS unpublished document. 19 pp.

Zar, J. H. 1998. Biostatistical analysis. 4th edition. Prentice Hall publishers. 929 pp.

Budget - Vegetation monitoring adjacent to levee breaches prior to and following flood events at SJRNWR.

Year 1 (2006)					
Salaries					
	GS-5 Biological Technician	80 hrs x 13.83/hr =	$1,106.40	salary	$1,189.60
		80 hrs x 1.04/hr =	$83.20	benefits (7.5%)	
	GS-11 Wildlife Biologist	42 hrs x 25.36/hr =	$1,065.12	salary	$1,384.74
		42 hrs x 7.61/hr =	$319.62	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x .5 months =			$250.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
	Regional Office/CNO overhead of 18% project costs				$544.38
				Total Year 1	$3,568.72
Year 3 (2008)					
Salaries					
	GS-5 Biological Technician	80 hrs x 14.96/hr =	$1,196.80	salary	$1,286.40
		80 hrs x 1.12/hr =	$89.60	benefits (7.5%)	
	GS-11 Wildlife Biologist	42 hrs x 27.43/hr =	$1,152.06	salary	$1,497.72
		42 hrs x 8.23/hr =	$345.66	benefits (30%)	
Equipment					
	GSA Truck Lease	$500/month x .5 months =			$250.00
	Misc Supplies	(notebooks, waders, markers, etc..)			$200.00
Overhead					
	Regional Office/CNO overhead of 18% project costs				$582.14
				Total Year 3	$3,816.26
				Total Project Costs	**$7,384.98**

APPENDIX 10. Study Plan for Task D.3

Invasive Plant Control Monitoring proposal: San Joaquin River NWR, Calfed Monitoring 2005-07

Prepared by:

Todd Williams, Wildlife Biologist
Dennis Woolington, Supervisory Wildlife Biologist
U.S. Fish & Wildlife Service
San Luis National Wildlife Refuge Complex
Box 2176
Los Banos, CA 93635

Background and Justification

The CALFED funded San Joaquin River NWR Riparian Habitat Protection and Floodplain Restoration Project included restoration of over 1000 acres of riparian and wetland habitat from 2001-2004. Part of this restoration effort included control of non-native invasive plants. This plan details monitoring of ongoing control efforts for Arundo (*Arundo donax*), Himalayan blackberry (*Rubus procerus*), Tree tobacco (*Nicotiana glauca*), saltcedar (*Tamarix ssp*.), Johnson grass (*Sorghum halpense*), and Russian knapweed (*Acroptilon repens*).

San Joaquin River NWR occupies lands that, historically, consisted of broad riparian floodplain with many wetlands areas and grasslands dominated by valley oak. The flood adapted plants that dominated these habitats aided in maintaining this dynamic ecosystem. Activities such as timber cutting, clearing land for agriculture, and channelizing waterways have altered this ecosystem to the point that it can no longer provide many beneficial functions such as flood water retention, soil retention, water purification, and habitat for species of uniquely specialized plants and wildlife.

Many species of non-native plants have been introduced into the central valley. Some of these plants thrive in our riparian areas and compete with native species. Many of these species were present when refuge lands were acquired & have spread during the time that former agricultural land has lain fallow prior to restoration efforts. Mapping the extent of infestations annually, as well as estimating percent cover, and incorporating this data into a geographically referenced database will facilitate adaptive management that will enable refuge staff to control and eradicate invasive species.

Monitoring is a necessary part of ongoing Control activities for invasive plants and will aid in achieving restoration objectives by reducing competition with native vegetation and limiting the spread of weeds into restoration sites, thereby allowing native communities to thrive and expand. All monitoring, data compilation, and analysis for the species in this plan will be conducted by refuge personnel.

Scientific Objectives

Objectives of this monitoring plan are to document the effectiveness of invasive plant control measures to accomplish eradication of the target species, arundo, salt cedar, tree tobacco, Johnson grass, Russian Knapweed, and Himalayan blackberry. The control methods that will be used (mechanical or manual removal, herbicide application) have been widely used and have proven effective (Radosevich 1997).

The species selected for monitoring under this plan were chosen because they exist as relatively small, sharply defined populations within the restoration area. Because of this, treatment will be designed to completely eradicate, rather than simply control, these species. Control activities for yellow star thistle, perennial pepperweed, Russian thistle, and others are ongoing as part of refuge operations, and are outside the scope of this monitoring plan. San Luis NWR Complex staff will conduct monitoring and control activities for these species.

Monitoring efforts will include documentation of the extent of localized infestations of arundo, Himalayan blackberry, tree tobacco, Russian knapweed, Johnson grass, and saltcedar before and after treatment. Continued monitoring efforts are needed as the restoration area is subject to reinfestation through transportation of seeds & plants by wildlife, vehicles, waterways and flood events.

Methods

Two methods will be used to document success of control activities. A geographic database that was created in 2003 will be updated in spring 2005 to monitor reduction of arundo, saltcedar, Himalayan blackberry, tree tobacco, Johnson grass, and Russian knapweed. Mapping was conducted using a Global Positioning System (gps) to collect point feature and/or area perimeter data (depending on species). This same method will be used to update the map created in 2003, using ARCMAP software. Mapping will be conducted using a gps unit and analysis will be direct comparison of reduction of area infested by species by year. A visual estimation of reduction in cover and/or density will also be used to describe success of control efforts. Since the arundo and Himalayan blackberry grow in dense stands, prior to control activities cover was 100% within these areas. Therefore, reduction in cover may be estimated by using an ocular technique to estimate existing cover within the original area of infestation and subtracting that figure from 100 to derive the percent reduction in cover. Tree tobacco grows as individual plants and may be closely packed together or grow far apart. Since the infestations will be mapped as an area, rather than individual plants, a count of stem density (number of stems per unit area) will be used to derive a density of tree tobacco in these areas. Since the total number of saltcedar plants is less than 100, saltcedar will be mapped as individual plants. Russian knapweed and Johnson grass will be mapped by area and each infestation will be treated as a distinct unit. Existing cover of these species will be estimated when they are mapped for inclusion in the geographic database. Success of

treatment of each of the target species will be quantified as % reduction of area infested and/or as reduction of percent cover.

Quality Control/Quality Assurance

Monitoring methods have been used by various agencies and researchers and are derived from commonly used, time-tested techniques. All personnel involved in monitoring efforts have training and experience in identification of these invasive species and will be briefed on monitoring methods.

Products

The data and results will be summarized in progress reports and presented in a final report at the end of the project. A GIS database containing geographic information about areas of invasive plant infestation will be updated annually and maintained by refuge staff. Site-specific information about these infestations will also be contained within the database as text. This database may then be used in long-term weed management activities. Data from this project will be stored at San Luis NWR Complex office and incorporated into the permanent refuge files.

References

Radosevich, Steven, Jodie Holt, and Claudio Ghersa. 1997. Weed Ecology, implications for management, 2nd Edition. John Wiley & Sons, Inc., New York, New York, USA. 589 pp.

Budget for invasive weed monitoring, SJRNWR

Year 1 (2006)			
Salaries	GS-05 Biological Science Technician	68 hrs x $13.83/hr = $940.44 Salary	
		68 hrs x $1.04/hr = $70.72 Benefits	$1,011.16
	GS-11 Wildlife Biologist	80 hrs x $25.36/hr =$2028.80 Salary	
		80 hrs x $7.61/hr = $608.80 Benefits	$2,637.60
Equipment			
	GSA Truck Lease	$500.00/Mth x 0.65 Mths = $325.00	$325.00
	GPS unit (USFWS owned)	No cost	
Overhead	Regional Office/CNO overhead of 18% project costs		$715.28
Year 2 (2007)			
Salaries	GS-05 Biological Science Technician	68 hrs x $14.39/hr = $978.52 Salary	
		68 hrs x $1.08/hr = $73.44 Benefits	$1,051.96
	GS-11 Wildlife Biologist	80 hrs x $26.38/hr =$2110.40 Salary	
		80 hrs x $7.91/hr = $632.80 Benefits	$2,743.20
Equipment			
	GSA Truck Lease	$500.00/Mth x 0.65 Mths = $325.00	$325.00
	GPS unit (USFWS owned)	No cost	
Overhead	Regional Office/CNO overhead of 18% project costs		$741.63
Year 3 (2008)			
Salaries	GS-05 Biological Science Technician	68 hrs x $14.96/hr = $1017.28 Salary	
		68 hrs x $1.12/hr = $76.16 Benefits	$1,093.44
	GS-11 Wildlife Biologist	80 hrs x $27.43/hr =$2194.40 Salary	
		80 hrs x $8.23/hr = $658.40 Benefits	$2,852.80
Equipment			
	GSA Truck Lease	$500.00/Mth x 0.65 Mths = $325.00	$325.00
	GPS unit (USFWS owned)	No cost	
Overhead	Regional Office/CNO overhead of 18% project costs		$768.82
		Grand Total:	$14,590.89

Approvals

Submitted by:_____Date:_____

Reviewed by:_____Date:_____

Reviewed by:_____Date:_____

Approved by:_____Date:_____

APPENDIX 11. Study Plan for Tasks E.1 and E.2

Physical Process Monitoring Plan to Evaluate CBDA-Funded Floodplain Restoration at the San Joaquin River National Wildlife Refuge

Proposal for the 2006 – 2009 Seasons

Prepared by Philip Williams & Associates, Ltd.

November 8, 2004

Background

Philip Williams & Associates, Ltd. (PWA) has undertaken a feasibility study on behalf of the U. S. Fish and Wildlife (USFWS) Anadromous Fish Restoration Program (AFRP) for restoration of up to 4,000 acres of the San Joaquin River National Wildlife Refuge (SJRNWR) through breaching of the project levees that bound a large portion of the refuge. The project was undertaken in two phases:

- Phase 1 of the study, completed in May 2001 was to develop the tools to evaluate habitat effects of proposed levee breaches and modifications to the proposed levee breaches (referred to as "NSA refinements") with particular emphasis on anadromous fish. The primary analysis tool used in this study was a one-dimensional, looped network hydrodynamic model, MIKE 11. Model results generated include depth and time of inundation as well as simulated flow during a sample flood on reactivated floodplain at the SJRNWR.

- Phase 2 of the study, completed in October 2004, was to develop and analyze alternatives to the original USACE non-structural alternative and relate the results of the analysis to the habitat evaluation criteria developed in Phase 1 of the study. The goal of Phase 2 was to identify a preferred alternative for levee breaching at the SJRNWR that integrates improved floodplain habitat to benefit anadromous fish, to complement existing aquatic and terrestrial habitat consistent with local infrastructure goals and requirements. The primary analysis tool used in Phase 2 of the study was a one-dimensional, looped network hydrodynamic model, MIKE 11, which was dynamically coupled to a two-dimensional, depth averaged hydrodynamic model, MIKE 21. The resulting modeling package is referred to as MIKE FLOOD. In this instance, MIKE 11 was used to model the main channel of the San Joaquin River and associated floodplains within the project levees while MIKE 21 was used to model the floodplain units of the SJRNWR. The MIKE FLOOD package provided for the integration of these two modeling tools in a single modeling environment.

The findings of the study recommended alternatives for levee breaching at the SJRNWR. The USACE are presently undertaking further studies to modify the maintenance

program for the levees surrounding a portion of the SJRNWR and it is likely that permission will be given to breach the levees in 2005. At this point final design for levee breaching will occur and it is anticipated that construction of levee breaches will occur in 2007.

Therefore the purpose of this proposal is to recommend and describe physical process monitoring tasks to evaluate pre- and post-project evolution of physical processes on the floodplain, as result of breaching levees.

Objectives

Specifically, to describe the evolution of physical processes at the SJRNWR, the objectives of this monitoring plan are:

1. To characterize physical process characteristics of habitat conditions resulting from the project, for the purpose of gauging the benefits and success of the project.
2. To describe the geomorphic evolution of the site, for the purpose of learning about the evolution of this example of a breached levee floodplain restoration site.

Participants

All planning, field work, data analysis, and report writing relating to the physical process monitoring described in this submittal will be undertaken by PWA hydrologists and geomorphologists.

Monitoring and Monitoring Parameters

This section addresses the physical parameters required to evaluate the success of the project in improving habitat conditions for native anadromous fishes, and the evolution of floodplain and main channel geomorphology as a result of the levee breaches and other modifications to the floodplain. Monitoring of physical parameters associated with habitat may provide essential information to determine the need for and nature of desirable adaptive management project modifications for improved project function. It will also provide useful indicators of project success in providing beneficial floodplain habitat for anadromous fish. Monitoring of site evolution may be of some benefit for adaptive management, but primarily will be of interest in learning more about the nature and rate of change at breached levee floodplain restoration sites, particularly those adjacent to the San Joaquin in the vicinity of the project site.

Habitat Conditions

Physical parameters associated with habitat conditions include the following:

a. Surface water flow: depth, duration, timing, velocity, flow patterns, ponding *(ponding not undertaken by this monitoring proposal as a result of funding limitations)*

b. Surface water quality: temperature
c. Groundwater: depth below ground surface – *to be undertaken by River Partners*

Recommended monitoring approaches for each of these parameters are addresses as follows.

Monitoring of Surface Water Flows (Task E.1)

This subtask will be conducted by Philip Williams & Associates, Ltd., (PWA) of Sacramento, and represents a new component of monitoring for this restoration project. Surface water flows will be monitored with respect to flows in the main channel of the San Joaquin River, depth, area, duration, timing, and flow patterns on the floodplain between the San Joaquin River and the project levee prior to breaching and on the floodplain of the Refuge after breaching. This information is important to assess the suitability of the site for various life stages of native fishes and for riparian succession. A more detailed monitoring study plan and individual budget are present in Appendix A.

1. Main Channel Flow: to characterize the flow in the main channel of the San Joaquin River adjacent to the SJRNWR.
    a. We recommend that a USGS gauging station be established in the vicinity of the SJRNWR in order to establish accurate stage-discharge relationships for the floodplains of the site. We understand that USFWS will contact the USGS for costs relating to this task.
    b. PWA will use the flow data gathered by the USGS to modify the existing frequency relationships at the project site through correlation to upstream and downstream gauging stations.

2. Depth and Area: to characterize the depth and areal extent of floodplain flows across the site relative to known flow-frequency relationships and floodplain topography.
    a. PWA will install two pressure transducers to collect continuous stage data on the floodplain between the main channel of the San Joaquin River and the project levee bounding the SJRNWR. We will download the data and maintain the sensor at three-monthly intervals.
    b. PWA will install two pressure transducers after breaching of the levees surrounding the SJRNWR to collect continuous stage data on the floodplain of the SJRNWR. We will download the data and maintain the sensor at three-monthly intervals. We have assumed one year of monitoring after the levees are breached.

3. Duration: to characterize the duration of flood flows.
    a. PWA will derive this information from the depth and area data collection described in Task 2, in conjunction with previously collected floodplain topography and orthophotography collected by others.

4. Timing: to characterize the timing of flood flows.

a. PWA will derive this information from the depth and area data collection described in Task 2.

5. Flow Patterns: to broadly identify the movement patterns during inundation events on the rising limb of the hydrograph.
    a. PWA will analyze up to three flood events using both aerial and ground observations on the rising limb of the hydrograph, and we will document our findings in photographic and videographic media and written description.

Monitoring of Surface Water Quality

This subtask will be conducted by PWA, and represents a new component of monitoring for this restoration project. Surface water quality will be monitored continuously over the monitoring period with respect to temperature of flows over the floodplain between the main channel of the San Joaquin River and the project levee prior to breaching and on the floodplain of the Refuge after breaching. This information is important to assess the suitability of the site for various life stages of native fishes. A more detailed monitoring study plan and individual budget are present in Appendix A.

6. Temperature: to characterize the temperature of floodplain flows.
    a. PWA will monitor the temperature of floodplain flows continuously using a similar same methodology described in Task 2 – Depth and Area. The pressure transducers used for this task will also be supplied with a temperature sensor. The data collected by the sensors will be downloaded at three-monthly intervals.

Site Evolution

Physical parameters associated with evolution of the site include the following:

a. Floodplain topography
b. Breach geometry

Monitoring of Floodplain Topography and Breach Geometry (Task E.2)

This subtask will be conducted by PWA, and represents a new component of monitoring for this restoration project. Site evolution will be monitored using a combination of aerial photography (collected by others) and ground reconnaissance. Aerial photography should be conducted annually for the monitoring period and is not included in PWA's budget estimate. In addition, up to twenty-five monitoring transects will be established on the SJRNWR and on the floodplain between the San Joaquin River and the project levee. Ground surveys will be undertaken along these transects annually for the monitoring period. The purpose of monitoring the site evolution is to identify areas of scour and deposition of sediments conveyed onto the floodplain during flood events. Varied

topography on the floodplain is important for terrestrial and aquatic habitat diversity. A more detailed monitoring study plan and individual budget are present in Appendix A.

7. Floodplain Topography and Breach Geometry: to characterize evolution of the floodplain.
    a. PWA will establish and survey up to 25 transects adjacent to breach locations, across the SJRNWR and between the SJRNWR and the San Joaquin River. PWA will survey the transects once before breaching occurs and once at the end of the three year monitoring period.

Quality Control-Quality Assurance Protocols

Survey protocols described previously are derived from commonly used and tested methodologies. Data collection will be standardized through the use of forms developed by PWA for previous physical process monitoring projects. All PWA personnel conducting surveys are experienced professionals in topographic and hydrographic surveying. The PWA project manager will oversee the physical process monitoring section of this project.

Products and Archiving

The data and results will be summarized in progress reports on a yearly basis and presented in the final report at the end of the project.

Appendix A – Budget

Task		Year 1	Year 2	Year 3
E.1	Labor	$25,662	$19,680	$22,658
E.2	Labor	$22,000	$2,000	$17,120
	Escalation on labor costs	$0	$3,274	$3,372
	Total Labor	**$47,662**	**$24,954**	**$43,150**
	Other Direct Costs			
	Mileage	$700	$355	$700
	Flights	$600	$600	$600
	Per Diem	$150	$50	$150
	Copying/Reproduction	$50	$50	$50
	Courier/Delivery	$50	$50	$50
	Field Equipment	$500	$225	$500
	Pressure Transducers	$8,841		
	Miscellaneous	$200	$63	$100
	Total Other Direct Costs	**$11,091**	**$1,393**	**$2,150**
	Total Direct Costs	**$58,753**	**$26,347**	**$45,300**
	Indirect Costs	$1,664	$209	$323
	Annual Total Costs	**$60,417**	**$26,556**	**$45,623**
	Total Project Costs			**$132,596**

Tasks And Deliverables

Monitoring and evaluation of riparian habitat and floodplain restoration at San Joaquin River National Wildlife Refuge

Task ID	Task Name	Start Month	End Month	Deliverables
A	Project Management	1	36	Semiannual and final reports Periodic invoices
B.1	Valley Elderberry Longhorn Beetle Surveys	1	36	Input to semiannual reports Final report
B.2	Riparian Brush Rabbit Use of Restored Habitats	1	36	Input to semiannual reports Final report
B.3	Avian Distribution, Diversity, and Abundance in Restored Wetland Habitats	1	24	Input to semiannual reports Final report
B.4	Avian Distribution, Diversity, and Abundance in Restored Riparian Habitats	1	36	Input to semiannual reports Final report
B.5	Small Mammal Abundance and Use of Restored Habitats	1	36	Input to semiannual reports Final report
B.6	Primary Pollinator Diversity and Use of Restored Habitats	1	36	Input to semiannual reports Final report
C.1	Fish Community Assessment	1	36	Input to semiannual reports Final report
D.1	Success of Restored Riparian Plant Communities	1	36	Input to semiannual reports Final report
D.2	Vegetation Communities Around Proposed Levee Breaches	1	36	Input to semiannual reports Final report

D.3	Success of Invasive Weed Control Activities	1	36	Input to semiannual reports Final report
E.1	Surface Water Flows	1	36	Installation of hydrological sensors Input to semiannual reports Final report
E.2	Floodplain Topography Development	1	36	Topographic mapping of floodplain Input to semiannual reports Final report
E.3	Groundwater Levels	1	24	Input to semiannual reports Final report

Comments

If you have comments about budget justification that do not fit elsewhere, enter them here.

Budget Summary

Project Totals

Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
$381,171	$98,626	$0	$15,587	$777,513	$47,506	$0	$0	$1,320,403	$144,379	$1,464,782

Do you have cost share partners already identified?
Yes.

If yes, list partners and amount contributed by each:

U.S. Fish and Wildlife Service (San Luis NWR Complex and Stockton Fisheries Office): $522,071

Point Reyes Bird Observatory Conservation Science: $21,733

California State University – Stanislaus: $14,340

Universiy of California – Berkeley: $190,280

Do you have potential cost share partners?
No.

If yes, list partners and amount contributed by each:

Are you specifically seeking non−federal cost share funds through this solicitation?
No.

Monitoring and evaluation of riparian habitat and floodplain restoration at San Joaquin River National Wildlife Refuge

Year 1 (Months 1 To 12)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
A: project management (12 months)	**41496**	**9278**	**0**	**500**	**0**	**1500**	**0**	**0**	$52,774	**9499**	$62,273
B.1: Valley Elderberry Longhorn Beetle Surveys (12 months)	**3984**	**847**	**0**	**200**	**0**	**500**	**0**	**0**	$5,531	**996**	$6,527
B.2: Riparian Brush Rabbit Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**35918**	**0**	**0**	**0**	$35,918	**2155**	$38,073
B.3: Avian Distribution, Diversity, and Abundance in Restored Wetland Habitats (12 months)	**15102**	**2784**	**0**	**1200**	**0**	**1500**	**0**	**0**	$20,586	**3705**	$24,291
B.4: Avian Distribution, Diversity, and Abundance in Restored Riparian	**0**	**0**	**0**	**0**	**62650**	**0**	**0**	**0**	$62,650	**3759**	$66,409

Habitats (12 months)											
B.5: Small Mammal Abundance and Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**48084**	**0**	**0**	**0**	$48,084	**2885**	$50,969
B.6: Primary Pollinator Diversity and Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**63336**	**0**	**0**	**0**	$63,336	**3800**	$67,136
C.1: Fish Community Assessment (12 months)	**62794**	**18838**	**0**	**11687**	**0**	**16175**	**0**	**0**	$109,494	**19709**	$129,203
D.1: Success of Restored Riparian Plant Communities (12 months)	**0**	**0**	**0**	**0**	**51975**	**0**	**0**	**0**	$51,975	**3119**	$55,094
D.2: Vegetation Communities Around Proposed Levee Breaches (12 months)	**2117**	**403**	**0**	**200**	**0**	**250**	**0**	**0**	$2,970	**544**	$3,514
D.3: Success of Invasive Weed Control Activities (12 months)	**2969**	**680**	**0**	**0**	**0**	**325**	**0**	**0**	$3,974	**715**	$4,689
E.1: Surface Water Flows (12 months)	**0**	**0**	**0**	**0**	**38417**	**0**	**0**	**0**	$38,417	**2305**	$40,722

E.2: Floodplain Topography Development (12 months)	0	0	0	0	22000	0	0	0	$22,000	1320	$23,320
E.3: Groundwater Levels (12 months)	0	0	0	0	3328	0	0	0	$3,328	200	$3,528
Totals	**$128,462**	**$32,830**	**$0**	**$13,787**	**$325,708**	**$20,250**	**$0**	**$0**	**$521,037**	**$54,711**	**$575,748**

Year 2 (Months 13 To 24)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
A: project management (12 months)	43168	9649	0	500	0	1500	0	0	$54,817	9867	$64,684
B.1: Valley Elderberry Longhorn Beetle Surveys (12 months)	4144	880	0	200	0	500	0	0	$5,724	1030	$6,754
B.2: Riparian Brush Rabbit Use of Restored Habitats (12 months)	0	0	0	0	33166	0	0	0	$33,166	1990	$35,156
B.3: Avian Distribution, Diversity, and Abundance in Restored Wetland	15711	2893	0	200	0	1500	0	0	$20,304	3655	$23,959

Habitats (12 months)											
B.4: Avian Distribution, Diversity, and Abundance in Restored Riparian Habitats (12 months)	**0**	**0**	**0**	**0**	**62890**	**0**	**0**	**0**	$62,890	**3773**	$66,663
B.5: Small Mammal Abundance and Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**35401**	**0**	**0**	**0**	$35,401	**2124**	$37,525
B.6: Primary Pollinator Diversity and Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**48289**	**0**	**0**	**0**	$48,289	**2898**	$51,187
C.1: Fish Community Assessment (12 months)	**64678**	**19403**	**0**	**0**	**0**	**10274**	**0**	**0**	$94,355	**16984**	$111,339
D.1: Success of Restored Riparian Plant Communities (12 months)	**0**	**0**	**0**	**0**	**49313**	**0**	**0**	**0**	$49,313	**2959**	$52,272
D.2: Vegetation Communities Around Proposed Levee Breaches (12 months)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	$0	**0**	$0

D.3: Success of Invasive Weed Control Activities (12 months)	**3089**	**706**	**0**	**0**	**0**	**325**	**0**	**0**	$4,120	**741**	$4,861
E.1: Surface Water Flows (12 months)	**0**	**0**	**0**	**0**	**24556**	**0**	**0**	**0**	$24,556	**1473**	$26,029
E.2: Floodplain Topography Development (12 months)	**0**	**0**	**0**	**0**	**2000**	**0**	**0**	**0**	$2,000	**120**	$2,120
E.3: Groundwater Levels (12 months)	**0**	**0**	**0**	**0**	**3328**	**0**	**0**	**0**	$3,328	**200**	$3,528
Totals	**$130,790**	**$33,531**	**$0**	**$900**	**$258,943**	**$14,099**	**$0**	**$0**	**$438,263**	**$47,814**	**$486,077**

Year 3 (Months 25 To 36)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
A: project management (12 months)	**44883**	**10029**	**0**	**500**	**0**	**1500**	**0**	**0**	$56,912	**10244**	$67,156
B.1: Valley Elderberry Longhorn Beetle Surveys (12 months)	**4857**	**1080**	**0**	**200**	**0**	**500**	**0**	**0**	$6,637	**1195**	$7,832
B.2: Riparian Brush Rabbit Use of	**0**	**0**	**0**	**0**	**43322**	**0**	**0**	**0**	$43,322	**2599**	$45,921

Restored Habitats (12 months)											
B.4: Avian Distribution, Diversity, and Abundance in Restored Riparian Habitats (12 months)	**0**	**0**	**0**	**0**	**25632**	**0**	**0**	**0**	$25,632	**1538**	$27,170
B.5: Small Mammal Abundance and Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**18444**	**0**	**0**	**0**	$18,444	**1107**	$19,551
B.6: Primary Pollinator Diversity and Use of Restored Habitats (12 months)	**0**	**0**	**0**	**0**	**50385**	**0**	**0**	**0**	$50,385	**3023**	$53,408
C.1: Fish Community Assessment (12 months)	**66618**	**19985**	**0**	**0**	**0**	**10582**	**0**	**0**	$97,185	**17493**	$114,678
D.1: Success of Restored Riparian Plant Communities (12 months)	**0**	**0**	**0**	**0**	**9456**	**0**	**0**	**0**	$9,456	**567**	$10,023
D.2: Vegetation Communities Around Proposed Levee Breaches (12 months)	**2349**	**436**	**0**	**200**	**0**	**250**	**0**	**0**	$3,235	**582**	$3,817

D.3: Success of Invasive Weed Control Activities (12 months)	**3212**	**735**	**0**	**0**	**0**	**325**	**0**	**0**	$4,272	**768**	$5,040
E.1: Surface Water Flows (12 months)	**0**	**0**	**0**	**0**	**28503**	**0**	**0**	**0**	$28,503	**1711**	$30,214
E.2: Floodplain Topography Development (12 months)	**0**	**0**	**0**	**0**	**17120**	**0**	**0**	**0**	$17,120	**1027**	$18,147
Totals	**$121,919**	**$32,265**	**$0**	**$900**	**$192,862**	**$13,157**	**$0**	**$0**	**$361,103**	**$41,854**	**$402,957**

Budget Justification

Monitoring and evaluation of riparian habitat and floodplain restoration at San Joaquin River National Wildlife Refuge

Labor

FWS labor costs included in this budget are for temporary or term employees specifically hired to implement project management and FWS monitoring tasks for this project. Salary rates for Refuge employees are based on the fiscal year 2005 General Schedule salary table increased annually by a 4 percent cost of living adjustment for years 2006 through 2008. Salary rates for Stockton Fisheries Office employees (C.1) are calculated at the step 5 level for each GS grade, averaged over the three year period, and shown here as a single hourly charge for all three years.

(TASK A). GS−5 Admin. Clerk, Year 1: 400 hrs @ $13.84/hr = $5,532; Year 2: 400 hrs @ $14.39/hr = $5,756; Year 3: 400 hrs @ $14.96/hr = $5,84. GS−11 Wildlife Biologist Year 1: 1080 hrs @ $25.36/hr = $27,389; Year 2: 1080 hrs @ $26.38/hr = $28,490; Year 3: 1080 hrs @ $27.43 = $29,624.

(TASK B.1) GS−5 Biol. Technician, Year 1: 112 hrs @ $13.84/hr = $1,550; Year 2: 112 hrs @ $14.39/hr = $1,612; Year 3: 112 hrs @ $14.96/hr = $1,633. GS−11 Wildlife Biologist, Year 1: 96 hrs @ $25.36/hr = $2,435; Year 2: 96 hrs @ $26.38/hr = $2,532; Year 3: 96 hrs @ $27.43 = $2,633.

(TASK B.3) GS−5 Biol. Technician, Year 1: 562 hrs @ $13.84/hr = $7,772; Year 2: 562 hrs @ $14.39/hr = $8,087. GS−11 Wildlife Biologist, Year 1: 289 hrs @ $25.36/hr = $7,329; Year 2: 289 hrs @ $26.38/hr = $7,624.

(TASK C.1)GS−5 Biol Technician (4) total of 2,253 hours @ $15.98/hr = $36,003/yr for 3 years. GS−7 Biol. Technician (1) 285 hours @ $19.81/hr = $5,646/yr for 3 years. GS−9 /Wildlife Biologist (2) total of 425 hours @ $24.22/hr = $10,294/yr for 3 years. GS−9 /Admin Officer (1) 160 hours @ $24.22/hr =

$3,875/yr for 3 years. GS−11 /Wildlife Biologist (1) 280 hours @ $29.31/hr = $8,207/yr for 3 years.

(TASK D.2) GS−5 Biol. Technician, Year 1: 80 hrs @ $13.84/hr = $1,106; Year 3: 80 hrs @ $14.96/hr = $1,197. GS−11 Wildlife Biologist, Year 1: 42 hrs @ $25.36/hr = $1,065; Year 3: 42 hrs @ $27.43/hr = $1,152.

(TASK D.3) GS−5 Biol. Technician, Year 1: 68 hrs @ $13.83/hr = $904, Year 2: 68 hours @ $14.39/hr = $979, Year 3: 68 hours @ $14.96 = $1017. GS−11 Wildlife Biologist, Year 1: 80 hours @ $25.36 = @$2,029, Year 2: 80 hours @ $26.38 = $2110, Year 3: 80 hours @ $27.43 = $2,194. Salaries for Permanent FWS are shown as cost share contributions (see Other Comments section)

Salaries for partner employees conducting tasks B.2, B.4. B.5, B.6, D.1, E.1, E.2, and E.3 are incorporated into their individual contracts (see Services and Consultants section).

Benefits

Benefits rates for FWS employees are calculated at 7.5 percent of salary for employees on temporary appointments and 30 percent of salary for those on term appointments.

The Refuge will hire a GS−5 budget clerk and a GS−5 biological technician on temporary appointments (7.5 percent rate) and a GS−11 wildlife biologist on a term appointment (30 pecent rate).

All Stockton Fisheries Office employees funded through this proposal are hired through term appointments at the 30 perecent benefits rate. Benefit rates for partner employees conducting tasks B.2, B.4. B.5, B.6, D.1, E.1, E.2, and E.3 are incorporated into their individual contracts (see Services and Consultants section).

Travel

No travel costs are claimed for FWS employees implementing this project. Travel costs associated with vehicle operation

while traveling to and from the project site are incorporated in the GSA (General Services Administration) vehicle lease fees shown in the Equipment section of this form.

Travel costs for project partners are incorporated into the total contract costs listed for implementing tasks B.2, B.4, B.5, B.6, D.1, E.1, E.2) detailed in the individual study plans (Appendices 1–11) in the Proposal Text section. costs

Supplies And Expendables

FWS General Field Supplies and Expendables (Refuge) (notebooks, markers, office supplies, waders binoculars) Task A Year 1 $500, Year 2 $500, Year 3, $500 Task B.1 Year 1 $200, Year 2 $200, Year 3, $200 Task B.3 Year 1 $1200, Year 2 $200, Year 3 –– Task D.2 Year 1 $200, Year 2 –– Year 3 $200

FWS Fish Sampling Supplies and Expendables (Stockton Fisheries Office) (nets, traps, seines, dip nets, gloves,replecement battery) Year 1 Year 2 Year 3 Task C.1 Year 1 $11,687, Year 2 ––, Year 3 ––

Supply and Expendable costs for project partners are incorporated into the total contract costs listed for implementing tasks B.2, B.4, B.5, B.6, D.1, E.1, E.2) detailed in the individual study plans (Appendices 1–11) in the Proposal Text section.

Services And Consultants

TASK B.2 Riparian Brush Rabbit Use of Restored Habitats – This task will be implemented through a contract with the CSU Stanislaus Endangered Species Program with Dr. Patrick Kelly as Principal Investigator. Labor needs will be primarily for fieldwork and surveys, data entry, analysis and report writing. Labor costs for the 3 years will include a senior biologist ($20/hr [with 5% annual increase] for 872 hrs) a project biologist ($15/hr [with 5% annual increase] for 1152 hrs) and student intern ($9/hr [with 5% annual increase] for 1152 hrs) and a GIS analyst ($30/hr [with 5% annual increase] for 32 hrs). Benefits are calculated at 45 percent student

salaries. Travel is calculated at 16,575 miles/yr at $0.345/mi. for vehicle operation costs to/from and at the project site for two years. Supplies and Expendables include radio−collars, telemetry supplies, engineering stakes, flagging, t posts, notebooks, storage bags, and trap bait ($14,442 total) ESRP charges a 10 percent administrative fee for office staff support. Overhead is calculated at a CSU negotiated rate of 18 percent for off campus research (included in contract cost) plus a FWS standard rate of 6 percent for contracts and other pass−through funds.

TASK B.4 Avian Distribution, Diversity, and Abundance in Restored Riparian Habitats − This task will be implemented through a contract with Point Reyes Bird Observatory Conservation Science with Geoff Geupel as Principal Investigator. Labor needs will be primarily for fieldwork and surveys, data entry, analysis and report writing. Labor costs for the 3 years will include a senior biologist (most of salary contributed as cost share), a PRBO senior biologist (part of salary contributed), a program coordinator, field crew supervisor, and seasonal biologist. Total salary costs are calculated at $31,800, $32,666, and $13,774 respectively for years 1–3. Benefits are calculated at 37 percent of salaries. Travel costs, estimated at $3,000 for years 1−2 and $1,000 for year 3, are for vehicle operation costs to/from and at the project site for two years. Supplies and Expendables include engineering stakes, flagging, notebooks, and office supplies ($3,000 total). PRBO charges 29 percent for indirect costs for administrative support. FWS will charge its standard overhead rate of 6 percent for contracts and other pass−through funds.

TASK B.5 Small Mammal Abundance and Use of Restored Habitats − This task will be implemented through a contract with CSU Stanislaus with Dr. Anne Kohlhaas as Principal Investigator. Labor needs will be primarily for fieldwork and surveys, lab analysis, data analysis and report writing. Labor costs will include a pro−rated portion of the Principal Investigators salary (2 months/year for 3 years, or $13,490 – 14,860 annually) and 1120 hours of student assistant labor at $9.00/hr. Benefits are calculated at 11 percent of student

salaries (PI benefits paid by CSU Stanislaus as a cost share contribution). Travel is calculated at 6,840 miles/yr at $0.345/mi. for vehicle operation costs to/from and at the project site for two years. Supplies and Expendables include specialize live−traps, cameras, and track plates ($13,100 total) and field supplies such as film/processing, stakes, flagging, tools, notebooks, storage bags, and trap bait ($1,820 total). Overhead is calculated at a CSU negotiated rate of 18 percent for off campus research (included in contract cost) plus a FWS standard rate of 6 percent for contracts and other pass−through funds.

TASK B.6 Primary Pollinator Diversity and Use of Restored Habitats − This task will be implemented through a contract with UC Berkeley with Dr. Gordon Frankie as Principal Investigator. Labor needs will be primarily for fieldwork and surveys, lab analysis, data analysis and report writing. Labor costs will include a research stipend for a graduate student (50% of $2913/month for 9 months [academic] and 100% of $2913 for 3 months [field season]) for 3 years. Benefits include full tuition fees for 3 years ($43,983 total) and 1.3 percent of stipend during 9 months and 3 percent of stipend for 3 months for all 3 years. (salarys/benefits of PI and student assistants will be paid by UC Berkeley as a cost share contribution). Travel is estimated at $3,000/yr for years 1 and 2 and $3,500 for year 3 for vehicle lease/operation costs for travel to/from and at the project site. Other direct costs will include $4,000/yr for 3 years for subcontracting taxonomic services and $1,500/yr for 3 years for traps, nets, collection boxes, and other field supplies. Overhead is calculated at a UC negotiated rate of 25 percent for off campus research (direct costs minus tuition fees and included in contract cost) plus a FWS standard rate of 6 percent for contracts and other pass−through funds.

TASK D.1 Success of Restored Vegetation on Restored Floodplain Habitats – This task will be implemented through a contract with River Partners with Dr. Thomas Griggs as Principal Investigator. Labor needs will be primarily for field surveys, data compilation, analysis/report writing and project management. Labor and benefits costs are calculated for

different level biologists at 460 hours @ $25/hr, 1400 hours @ $13/hr, 99 hours @ $30/hr, and 100 hours for $33/hr. annually for 2 years. Year 3 labor and benefits cost will be calculated at 132 hours @ $30/hr. and 100 hours @ $33/hr. Materials and supplies will total $4,825 for the 3 years and include purchase of specialized sampling gear such as a soil auger, meter tapes, measuring rods, t posts, flagging and lathe. Cost of operation/maintenance of vehicles and tractors is calculated at $3,850/yr for 2 years. Overhead is calculated at 21 percent of project costs (included in contract cost) plus a FWS standard rate of 6 percent for contracts and other pass−through funds.

TASK E.1 Surface Water Flows and TASK E.2 Floodplain Topography Changes. – These tasks will be implemented through a contract with Philip Williams and Associates, Ltd. with Dr. Chris Bowles as Principal Investigator. Labor needs will be primarily for installation, maintenance, monitoring of hydrologic sensors; field surveys, aerial photo interpretation, data compilation, computer modeling, analysis/report writing and project management. Labor and benefits costs are calculated for different level biologists and technicians and total $109,634. Labor costs are split between tasks E.1 and E.2, but all other costs are shown on the budget lines for task E.1. Materials and supplies will total $1,725 for the 3 years and include field supplies and office supplies. Equipment purchased will consist of 4 hydrologic pressure transducers ($8841 total). Travel expenses consist of vehicle operation costs and are calculated at $1,755 for the 3 years. Other direct costs include installation of pressure transducers and an aerial photography flight ($2,313 total). PWA will charge a $2,195 administrative fee for office support. The FWS will impose its standard 6 percent overhead rate for contracts and other pass−through funds. TASK E.3 Groundwater Levels – This task will be implemented through a contract with River Partners with Dr. Thomas Griggs as Principal Investigator. Labor needs will be primarily for field well monitoring, and biologist labor/benefits costs are calculated 106 hrs @ $25/hr annually for 2 years. Field supplies are estimated at $200. All other project costs are incorporated into Task D.1. The FWS standard

overhead rate of 6 percent for contracts and other pass−through funds is applied to the labor and materials costs for this task.

Equipment

One backpack electrofishing unit costing $6,200 will be purchased by FWS to implement task c.1.

Costs of leasing GSA vehicles (standard p/u truck) by the FWS is calculated as $500/month rent and milage, and is pro−rated by the amount of use estimated necessary to implement tasks A, B.1, B.3, C.1, D.2, and D.3)

Costs of operating FWS owned boats (task C.1) are calculated at the standard rates ($75/day fuel, $100/day maintenance)established by the Stockton Fisheries Office

Equipment operation costs for non−FWS partners (tasks B.2, B.4, B.5, B6, D.1, E.1, and E.2)are incorporated into the costs for contracts listed in the Services and Consulting Section of this form, and detailed in the individual task study plans (Appendices 1−11) in the Proposal Text section

Lands And Rights Of Way

None. All monitoring activities in this proposal will be done on lands currently owned by the U.S. Fish and Wildlife Service

Other Direct Costs

None claimed in this proposal.

Indirect Costs/Overhead

The current standard FWS overhead rate is calculated at 18 percent of FWS salary, benefits, materials and equipment lease/purchase (non pass−through). This overhead is for costs incurred by the FWS Regional Office, FWS Washington Office, and the Denver Finance Office − none to the Refuge or Stockton

Fisheries Office. This overhead rate applies to Tasks A, B.1, B.3, D.2, and D.3

The standard FWS overhead rate is calculated at 6 percent of contract and other pass−through funds. This overhead rate applies to Tasks B.2, B.4, B.5, B.6, D.1, E.1, and E.2.

Overhead costs for non−FWS partners (tasks B.2, B.4, B.5, B6, D.1, E.1, and E.2)are incorporated into the costs for contracts listed in the Services and Consulting Section of this form, and are base on standard university or organization rates. Rates and total costs are detailed in the individual task study plans (Appendices 1−11) in the Proposal Text section

Comments

Environmental Compliance

Monitoring and evaluation of riparian habitat and floodplain restoration at San Joaquin River National Wildlife Refuge

CEQA Compliance

Which type of CEQA documentation do you anticipate?
X none
− negative declaration or mitigated negative declaration
− EIR
− categorical exemption

If you are using a categorical exemption, choose all of the applicable classes below.
− Class 1. Operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. The types of "existing facilities" itemized above are not intended to be all−inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of an existing use.
− Class 2. Replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced.
− Class 3. Construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. The numbers of structures described in this section are the maximum allowable on any legal parcel, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 4. Minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 6. Basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies. These may be strictly for information

gathering purposes, or as part of a study leading to an action which a public agency has not yet approved, adopted, or funded.
– Class 11. Construction, or placement of minor structures accessory to (appurtenant to) existing commercial, industrial, or institutional facilities, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

Identify the lead agency.

Is the CEQA environmental impact assessment complete?

If the CEQA environmental impact assessment process is complete, provide the following information about the resulting document.

Document Name
State Clearinghouse Number

If the CEQA environmental impact assessment process is not complete, describe the plan for completing draft and/or final CEQA documents.

NEPA Compliance

Which type of NEPA documentation do you anticipate?
– none
– environmental assessment/FONSI
– EIS
X categorical exclusion

Identify the lead agency or agencies.

U.S. Fish and Wildlife Service

If the NEPA environmental impact assessment process is complete, provide the name of the resulting document.

If the NEPA environmental impact assessment process is not complete, describe the plan for completing draft and/or final NEPA documents.

Monitoring and research on a National Wildlife Refuge is under a Catagorical Exclusion through FWS Administrative Manual 516 DM 6 Appendix 1.4 B

Successful applicants must tier their project's permitting from the CALFED Record of Decision and attachments providing programmatic guidance on complying with the state and federal endangered species acts, the Coastal Zone Management Act, and sections 404 and 401 of the Clean Water Act.

Please indicate what permits or other approvals may be required for the activities contained in your proposal and also which have already been obtained. Please check all that apply. If a permit is *not* required, leave both Required? and Obtained? check boxes blank.

Local Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
conditional Use Permit	–	–	
variance	–	–	
Subdivision Map Act	–	–	
grading Permit	–	–	
general Plan Amendment	–	–	
specific Plan Approval	–	–	
rezone	–	–	
Williamson Act Contract Cancellation	–	–	
other	–	–	

State Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
scientific Collecting Permit	–	X	
CESA Compliance: 2081	–	–	
CESA Complance: NCCP	–	–	
1602	–	–	
CWA 401 Certification	–	–	

Bay Conservation And Development Commission Permit	**–**	**–**	
reclamation Board Approval	**–**	**–**	
Delta Protection Commission Notification	**–**	**–**	
state Lands Commission Lease Or Permit	**–**	**–**	
action Specific Implementation Plan	**–**	**–**	
other	**–**	**–**	

Federal Permits And Approvals	**Required?**	**Obtained?**	**Permit Number (If Applicable)**
ESA Compliance Section 7 Consultation	**–**	**–**	
ESA Compliance Section 10 Permit	**–**	**–**	
Rivers And Harbors Act	**–**	**–**	
CWA 404	**–**	**–**	
other	**–**	**–**	

Permission To Access Property	**Required?**	**Obtained?**	**Permit Number (If Applicable)**
permission To Access City, County Or Other Local Agency Land Agency Name	**–**	**–**	
permission To Access State Land Agency Name	**–**	**–**	
permission To Access Federal Land Agency Name	**–**	**–**	
permission To Access Private Land Landowner Name	**–**	**–**	

If you have comments about any of these questions, enter them here.

Land Use

Monitoring and evaluation of riparian habitat and floodplain restoration at San Joaquin River National Wildlife Refuge

Does the project involve land acquisition, either in fee or through easements, to secure sites for monitoring?
X No.
– Yes.

How many acres will be acquired by fee?

How many acres will be acquired by easement?

Describe the entity or organization that will manage the property and provide operations and maintenance services.

San Luis National Wildlife Refuge Complex US Fish and Wildlife Service, Department of Interior

Is there an existing plan describing how the land and water will be managed?
– No.
X Yes. **Draft Comprehensive Conservation Plan for San Joaquin River National Wildlife Refuge, USFWS**

Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?
X No.
– Yes.

Describe briefly the provisions made to secure this access.

Do the actions in the proposal involve physical changes in the current land use?
X No.
– Yes.

Describe the current zoning, including the zoning designation and the principal permitted uses permitted in the zone.

Describe the general plan land use element designation, including the purpose and uses allowed in the designation.

Describe relevant provisions in other general plan elements affecting the site, if any.

Is the land mapped as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance under the California Department of Conservation's Farmland Mapping and Monitoring Program?
X No.
– Yes.

Land Designation	Acres	Currently In Production?
Prime Farmland		–
Farmland Of Statewide Importance		–
Unique Farmland		–
Farmland Of Local Importance		–

Is the land affected by the project currently in an agricultural preserve established under the Williamson Act?
X No.
– Yes.

Is the land affected by the project currently under a Williamson Act contract?
– No.
– Yes.

Why is the land use proposed consistent with the contract's terms?

Describe any additional comments you have about the projects land use.

The project site, San Joaquin River National Wildlife Refuge, is part of a nation–wide network of lands administered by the US Fish and Wildlife Service for the purpose of conserving wildlife species and the natural plant communities on which they depend. There are over 540 refuges totaling more than 92 million acres in the National Wildife Refuge System