

A Landowner's Guide to Best Management Practices

Restoration as a Means to
Treat Agricultural Runoff
Draft



Prepared for: Coalition for Urban/Rural Environmental Stewardship

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**A LANDOWNER’S GUIDE TO BEST MANAGEMENT PRACTICES
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1.0 Background

A variety of factors, including upstream water projects and decades of agricultural runoff laden with silts and environmentally harmful pesticides and herbicides, have significantly degraded the water quality in the Lower San Joaquin River and local tributaries. The San Joaquin River is an impaired water body with high levels of salt, boron, Organophosphorus Pesticide (OP) and low levels of dissolved oxygen (DO). There are many interest groups and governmental and local agencies dealing with this challenging issue, including the Central Valley Regional Water Quality Control Board who continues its efforts to meet the goals of the Clean Water Act and reduce discharges of harmful constituents into the San Joaquin River.

Farming and other agricultural activities are the core of the economy in the Lower San Joaquin Watershed. It is important that local agencies, landowners, farmers and regulators work together in a collaborative and proactive manner to find feasible and effective solutions. Recently, the Regional Water Quality Control Board has begun to enforce new state regulations, requiring landowners to meet standards pertaining to the quality of agricultural discharges and storm water runoff. Landowners are receiving increasing pressure to reduce and/or improve the quality of the drainage leaving their land.

Best Management Practices (BMPs) using wetlands (treatment BMPs) have shown to be an effective means to improve the water quality of agricultural runoff and provide wildlife habitat as a secondary benefit. Local agencies and landowners are setting aside land to serve as a treatment basin for drainage water. Agricultural tailwater is intercepted, treated in these basins, and released at a much improved quality. The basins are designed to slow the flow rate to the extent that silt and other harmful constituents settle out of the water. Often water is then directed through a restored wetland. The wetland not only continues to physically filter out sediment with its dense vegetation, but also removes constituents through biogeochemical interactions with the vegetation and underlying soil.

2.0 Participants

This report is a small component of a larger scale effort funded by a \$269,000 CALFED Drinking Water Program grant for the Orestimba Creek Watershed. The effort is designed to assist growers and the local watershed coalition in meeting the new state water quality standards. The scope of work includes the study of economics, farm practices, and existing BMPs in the watershed in addition to establishing a grower outreach to promote treatment BMPs.

The project is administered by the Coalition for Urban/Rural Environmental Stewardship (CURES) in cooperation with the Westside San Joaquin River Watershed Coalition, the California Water Institute at California State University, Fresno, Ducks Unlimited, Inc., Natural Resources Conservation Service (NRCS), Central California Irrigation District, and Del Puerto Water District. Ducks Unlimited, Inc. was the lead in the development of this specific document.

3.0 Purpose and Format

The purpose of this document is to provide an informative resource to landowners that are interested in pursuing a treatment BMP. Specifically, the following information is provided:

- Section 4.0 – Guidelines to developing a treatment BMP
- Section 5.0 - Funding options. Further details are provided in Appendix A.
- Section 6.0 – Three case studies of existing treatment BMP projects.

The case studies in Section 6.0 include a general description of the existing project and restoration, operations and maintenance, advice from the landowner/lead agency, and site specific challenges associated with each project.

4.0 Guidelines to Developing a Treatment BMP

Although project sites are often different, there are elements common to the development of treatment BMPs. Following a framework of guidelines that contain a series of developmental steps and essential questions landowners should be aware of that will help ensure the success of a project. These guidelines are listed below.

Have a vision of what the project will look like when completed. Although there may be site constraints or other limitations that do not make the ideal plan possible, it is important to establish the main objectives of the project before the project begins. It is recommended that the landowner revisit these objectives during the planning and design phase to ensure these objectives are being met.

Explore funding options. There are a large number of financial assistance programs tailored to assist private landowners who desire to implement a restoration project. Section 5.0 lists many of these programs and further details are provided in Appendix A. Questions the landowner should think about during this phase are: What programs am I eligible for? How involved do I want to be with the planning, design, and construction? Do I want to design the project or let someone else design it for me? How much of my own money can I invest not only for the restoration, but for management following construction? What are the requirements of the funding source? How long of a period do I want to enter into an agreement?

Enter agreement. If seeking funding and/or technical assistance, it will be necessary to enter an agreement with the Program administrator. It is recommended that the landowner thoroughly review the agreement, ask any questions that need clarification, and understand the terms and conditions before signing the agreement.

Planning and Design. Landowners have the option of independently completing the design and restoration on their own or having an external entity do the design and/or construction. If an external firm is completing the design and/or construction, it is recommended that the landowner work closely with the firm to ensure that the original objectives are met. If site

constraints limit these objectives (ie: the soils are too sandy to retain permanent ponds that the landowner would like), landowners should work with the firm in exploring other feasible alternatives that are within the terms and conditions of any signed agreements.

There are key items that the final design should take into account. If the landowner has hired a firm, it is recommended that the landowner discuss these items with the firm's designer to ensure a common understanding of objectives and any site constraints. These items are listed below.

- *Water Source.* Generally tailwater is the main water source for BMPs, however, it is important to assess whether this will supply enough water. Is there enough tailwater to keep an area flooded at desired times? If not, is there an alternative source such as groundwater source? Can the landowner afford pumping groundwater?
- *Topographic survey.* It is recommended that the property be surveyed prior to final design to locate the high and low areas. This will be of great assistance to the designer in determining the layout of the water conveyance system and the magnitude of excavation/fill needed to construct a system that will properly flood and drain. The amount of excavation and fill is also important in estimating construction costs.
- *Drainage.* Due to the onset of the West Nile Virus, it is important to ensure that the property will fill and drain effectively, minimizing mosquito breeding habitat.
- *Flooding history.* Flooding from the San Joaquin River and other tributaries is relatively common in many areas throughout Stanislaus County. If the project area often experiences flooding, additional erosion protection and stabilization efforts may be necessary. This will reduce the potential of the project's infrastructure from being damaged in a future flood.

- *Soil.* Soil characteristics can significantly impact the design and construction of a project. For instance, sandy soils often do not provide an adequate seal to maintain ponded water. This may influence the location of ponds or require the transport of soils with a higher silt/clay content to provide a seal. Another common problem is the lack of suitable on-site material needed for levee construction. The designer should consult with the landowner to discuss the type of soils on the property and determine whether design/construction changes need to be made. A collection of soil samples may also be necessary to further characterize the soils.
- *Management.* Generally it is most beneficial to design a project that will require a minimum amount of maintenance. The landowner and designer should discuss the level of management necessary to effectively maintain the property. If the landowner is to be responsible for management, it is recommended that the landowner understands the level of effort needed for effective management and has the financial resources before committing to the final design.

Environmental Review: The National Environmental Protection Act (NEPA) and the California Environmental Quality Act (CEQA) require an environmental review for projects receiving federal and/or state funding. The purpose of this review is to identify any adverse social, economic, or environmental affects of a project, and whether these affects are significant. If there are significant adverse impacts, mitigation options must be explored and enforced to provide compensation. Permits may also be required to meet state and federal environmental compliance.

The amount of detail necessary in an environmental review depends on the level of expected impact. Environmental reviews should be done in conjunction with the design to ensure that the project is environmentally feasible. Design adjustments may be necessary to ensure compliance (ie: relocation of a pond to avoid impacting cultural resources). Mitigation or avoidance measures may also need to be enforced to compensate/avoid adverse impacts. One common avoidance measure in the Central Valley is timing construction periods to avoid the

potential of harming the endangered Giant Garter Snake. Measures such as this may influence the timing/methods of construction.

It is recommended that a landowner consult with a NEPA/CEQA expert in conducting an environmental review. The expert will assess the proposed project, determine the level of review necessary to meet compliance, and identify what specific steps need to be taken. If the landowner is receiving funding from a Federal or State assistance program, generally the lead agency of the Program will complete the environmental review. This may entail inventories of special status species and cultural resources in addition to consultation with the U.S. Fish and Wildlife Service, California Department of Fish and Game (CDF&G), and National Oceanic Atmospheric Administration (NOAA) Fisheries.

Construction: A project that is correctly constructed in accordance to design plans and specifications can greatly reduce the potential of problems in the future. It is recommended that the designer provide the contractor with a set of design plans giving the layout and key elevations of the water systems (water control structure elevations, grade of swales and ditches, levee tops, etc) and a set of specifications. The specifications should include criteria the contractor must meet to ensure sound construction (ie: levee compaction, compaction around water control structures, stripping of vegetation on the footprint of new levees to ensure an adequate foundation, etc). It is recommended that routine construction inspections be conducted to ensure that the contractor is constructing the project to specifications and design plans.

Operations and Maintenance: All projects require a certain level of management. This often includes water management, vegetation control, removal of silt, and infrastructure maintenance (ie: levees and roads). As discussed earlier, if the landowner is responsible for the operations and maintenance, they should have a good understanding of the effort and financial investment involved prior to committing to the restoration.

Enjoy the Restored Property: Developing a treatment BMP can personally be a rewarding experience. The landowner is not only helping to address a regional water quality problem, but also receives the benefit of enjoying the habitat and wildlife on his/her property. As discussed in the following section, financial and technical assistance programs available to the private landowner can allot for undeveloped recreational use.

5.0 Programs and Technical Assistance

There are a variety of programs that offer financial and technical assistance for habitat restoration. These programs award state or federal funding to selected projects that meet the objectives of the program. Projects are selected from a competitive pool of qualified applications. Selection is often based on the level of environmental benefit the project will provide and other program specific criteria.

In addition to programs, there are a variety of non-profit organizations (i.e.: Ducks Unlimited, Inc.) and government agencies that can serve as an intermediary between the landowner(s) and funding programs. These organizations can be of particular help when applying for programs that have a complex application process and generally seek projects with a large pool of participants (i.e.: multiple landowners in ecologically significant areas). Also some programs do not work directly with the landowner, but rather operate through an intermediary, that is responsible for the logistics and final compensation to the landowner. The Wildlife Conservation Board (WCB) Programs, North American Wetland Conservation Act (NAWCA), and the Central Valley Project Improvement Act's (CVPIA) Habitat Restoration Program are examples of these types of programs.

Nevertheless, there are a variety of programs designed for the direct participation of landowners. These programs are more conducive for the individual landowner that would like to directly apply for assistance without an intermediary entity. Table 1 summarizes these programs and provides general contact information. Appendix A provides a more detailed description of the programs.

Additional information may also be sought through the posted websites or contacts given in Table 1. Applications for the Farm Bill Programs are accepted on a continuous basis and may be downloaded online. The local administrative office for these programs, the NRCS, can be located at http://offices.usda.gov/scripts/ndCGI.exe/oip_public/USA_map. The local NRCS service station in Stanislaus County is in Modesto at 209-491-9320.

Table 1: Recommended Restoration Programs for the Landowner

Program and Administrator	Objective	Eligibility	Assistance	Duration of Agreement	Contacts	Websites
Emergency Water Program (EWP) Farm Bill Program - NRCS	Reduce hazards associated with flooding and to secondarily improve water quality and provide wildlife habitat, groundwater recharge, and open space.	Floodplain lands impaired within the past year or historically experience flooding.	Landowner sells NRCS a permanent conservation easement.	Permanent	Local NRCS Service Center Local Conservation District	www.nrcs.usda.gov/programs/ewp/floodplain_ewp.html Applications: http://forms.sc.egov.usda.gov/eforms/mainservlet
Environmental Quality Incentives Program (EQIP) Farm Bill Program - NRCS	Provide assistance to farmers and ranchers who incorporate best management practices that provide significant environmental benefits.	Cropland, rangeland, grassland, pastureland, private non-industrial forest land.	Up to 75% cost share and incentive payments.	1-10 years	Local NRCS Service Center Local Conservation District	www.ca.nrcs.usda.gov/programs/eqip/2004/statepriorities2004.html ftp://ftp-fc.sc.egov.usda.gov/CA/programs/EQIP/2004/CA_EQIP_GSWC_ProgDesc_Fy04.pdf Applications: http://forms.sc.egov.usda.gov/eforms/mainservlet
Wildlife Habitat Incentives Program (WHIP) Farm Bill Program - NRCS	Develop and improve wildlife habitat on eligible lands.	Private lands Tribal land Government land on a limited basis.	Technical assistance and up to 75% cost-share assistance.	1 to 15 years Average agreement is for 5 – 10 years	Local NRCS Service Center Local Conservation District	www.nrcs.usda.gov/programs/whip/ Applications: http://forms.sc.egov.usda.gov/eforms/mainservlet

Table 1 cont... Recommended Restoration Programs for the Landowner

Program and Administrator	Objective	Eligibility	Assistance	Duration of Agreement	Contacts	Websites
Wetlands Reserve Program (WRP) Farm Bill Program - NRCS	Provide incentives to retire marginal agricultural lands to restore, protect, and enhance wildlife habitat.	Private land must be restorable and suitable for wetland habitat or enhances nearby wetland habitat.	Up to 100% for permanent easements and up to 75% for 30-year easements and Cost-Share Agreements.	Options range from permanent to 30 year easements or minimum of a 10 year Restoration Cost-Share Agreement	Local NRCS Service Center Local Conservation District	www.nrcs.usda.gov/programs/wrp/ Applications: http://forms.sc.egov.usda.gov/eforms/mainervlet
Landowner Incentive Program (LIP) CDF&G program U.S. Fish and wildlife – funding program Ducks Unlimited – coordinator	Reverse the decline of special status species in the Central Valley through the enhancement and management of riparian, wetland, and native grassland habitats.	Private lands.	Payments ranging from \$25/acre to \$50/acre to landowners that implement habitat management plans that benefit special status species.	Ranges from 3 to 10 years pending on the type of habitat	Luke Naylor Landowner Incentive Program Coordinator Ducks Unlimited, Inc 916-852-2000	http://www.dfg.ca.gov/lands/lip/ Applications: http://www.dfg.ca.gov/lands/lip/lipinfo.pdf
Partners for Fish and Wildlife Program U.S. Fish and Wildlife	Provide assistance to restore fish and wildlife habitat. Restored habitats include native upland, wetland, riparian, in-stream habitat pending on the site conditions and original natural state of the land.	Private or tribal lands Government agencies interested in restoration on private lands, tribes, private firms, etc.	Average of 50% cost share, but percentage is flexible.	Average of 10 years	Local U.S. Fish and Wildlife Field Office	http://partners.fws.gov/

6.0 Case Studies of Treatment BMPs

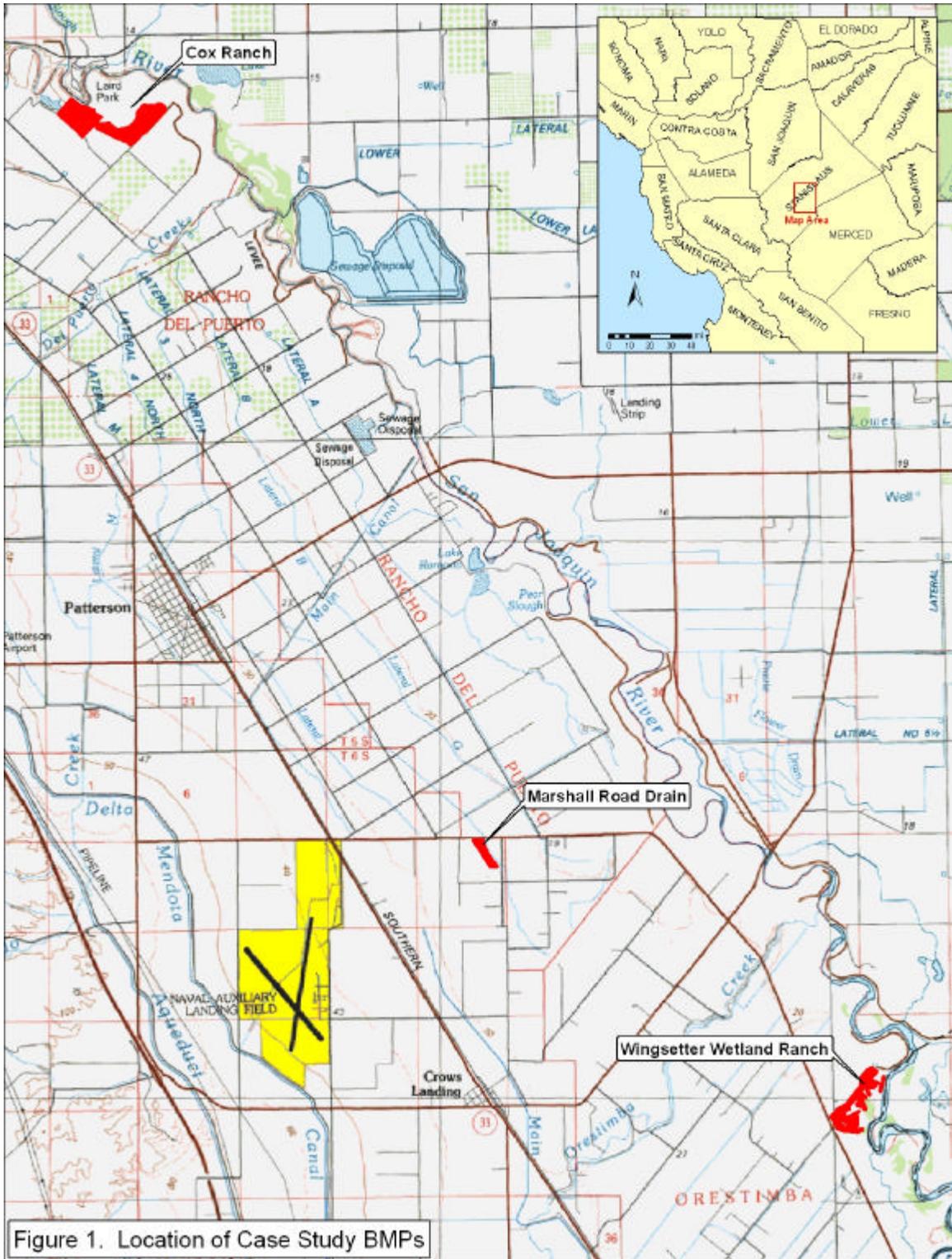
This section provides information on three existing treatment BMP sites in west Stanislaus County. Figure 1 shows the location of these sites in the Orestimba Creek Watershed. Each case study gives a general description of the existing project and restoration that took place, operations and maintenance, advice from the landowner/lead agency, and site specific challenges.

These three sites were selected because they have proven to be effective in treating agricultural runoff yet their basic features are uniquely different from each other. The case studies provide insight into different development approaches and identify a variety of site conditions that may be encountered. Basic characteristics for each case study are summarized below.

- *Wingsetter Wetland Ranch* (Section 6.1) has been in operation for 10 years. The landowner, Mickey Saso, has received financial assistance, but has done the majority of the design, construction management, and maintenance on his own.
- *Cox Ranch* (Section 6.2) has been in operation for the last half of an irrigation season. The landowner, John Cox, received both technical and financial assistance. He hired a firm to design and manage the construction. An agricultural consultant manages the property.
- *Marshall Road Drain* (Section 6.3) has been in operation for nearly two irrigation seasons. A variety of water agencies were involved in developing and funding the project. Patterson Irrigation District (PID) is responsible for the operations and maintenance.

6.1 Wingsetter Wetland Ranch

The Wingsetter Wetland Ranch used to be part of a 2,000 acre row crop farm operation adjacent to the San Joaquin River. A portion of the Ranch was farmed and the remaining acreage left fallow for occasional grazing, supporting a riparian habitat of



Valley Oak, willow trees, and scrub brush. Mickey Saso purchased the Ranch from Manual Gonsalves as a place for recreation with the condition that Saso build a wetland system to treat the silt laden agricultural runoff discharging into the San Joaquin River.

After ten years of restoration and management, Mickey Saso has created a collection of ponds, meandering swales, and sedimentation basins that effectively treats agricultural drainage and supports an abundance of wildlife. The Ranch is immediately west of the San Joaquin River (just north of the Merced County line), intercepting and treating the tailwater of 3,000 to 4,000 acres of upstream farmland.

Funding

Although Mickey has done the majority of work himself, he has received financial and technical assistance from a variety of sources. This includes a EWP easement, assistance from Ducks Unlimited and the Wetland Conservation Board (WCB) to install a well, and assistance from WHIP. The administrator of these programs, the NRCS, has managed the environmental assessment and necessary permits. Mickey has personally enjoyed the operational freedom he has maintained under his partnership with the NRCS. He has been able to manage his land to his liking, under the stipulation that the NRCS agrees his activities are beneficial to the habitat and wildlife.

Restoration and Management Activities

A series of restoration projects have been implemented over the past ten years to transform the 150 acre Wingsetter Wetland Ranch into a treatment system and productive habitat. Mickey Saso did not have any formal training. He used aerial photos taken prior and after major flooding events to assess the water flow direction and used this information to determine the placement of water control structures and major water bodies.

Today there are over nine ponds on the Ranch connected by a series of swales and pipelines. Agricultural tailwater is directed to the Ranch via pipelines and ditches. The tailwater enters the Ranch in three locations. At two of these inlets, sedimentation

basins facilitate the settling/removal of sediment from the silt-laden runoff. These basins are cleaned annually. Mickey has the capability to direct the water to a variety of selected ponds by using over twenty-four water control structures. The treated tailwater is then discharged into the San Joaquin River via four outlets. Figure 2 shows the approximate location of the ponds and inlets/outlets.

In addition to tailwater, a well and pump provides groundwater on an as-needed basis. Groundwater is periodically pumped throughout the winter season, to provide wetland habitat, until the onset of irrigation season in February/March when tailwater is once again received. In January, Mickey generally dries out portions of his Ranch for maintenance purposes and to provide some seasonal fluctuation.

In addition to the management of water, Mickey engages in a variety of management activities to optimize habitat value and ensuring treatment efficiency. He removes over 2,000 - 3,000 cubic yards of sediment from the two sedimentation basin annually. The material is excavated using a long arm excavator and used to refurbish and build levees on the property. The silt makes an excellent foundation for native grasses and shrubs. He engages in a variety of plantings including native grasses and a blending of safflower, barley, and other grains for waterfowl and infrequently mows and sprays for vegetation control and upland game. He has also installed wood duck nesting boxes and built islands for nesting waterfowl habitat.

Mickey has dealt with a variety of site specific challenges. The majority of the site consists of porous sand that does not retain water. Mickey has sealed these ponds with a 4" to 6" layer of bentonite clay. Although this has generally been effective, there is still evidence of seepage. In one specific pond, gophers managed to dig holes through the clay layer. Mickey has staked the holes and is currently in the process of plugging the holes with clay. Other rodents including beavers have been a persistent management problem.

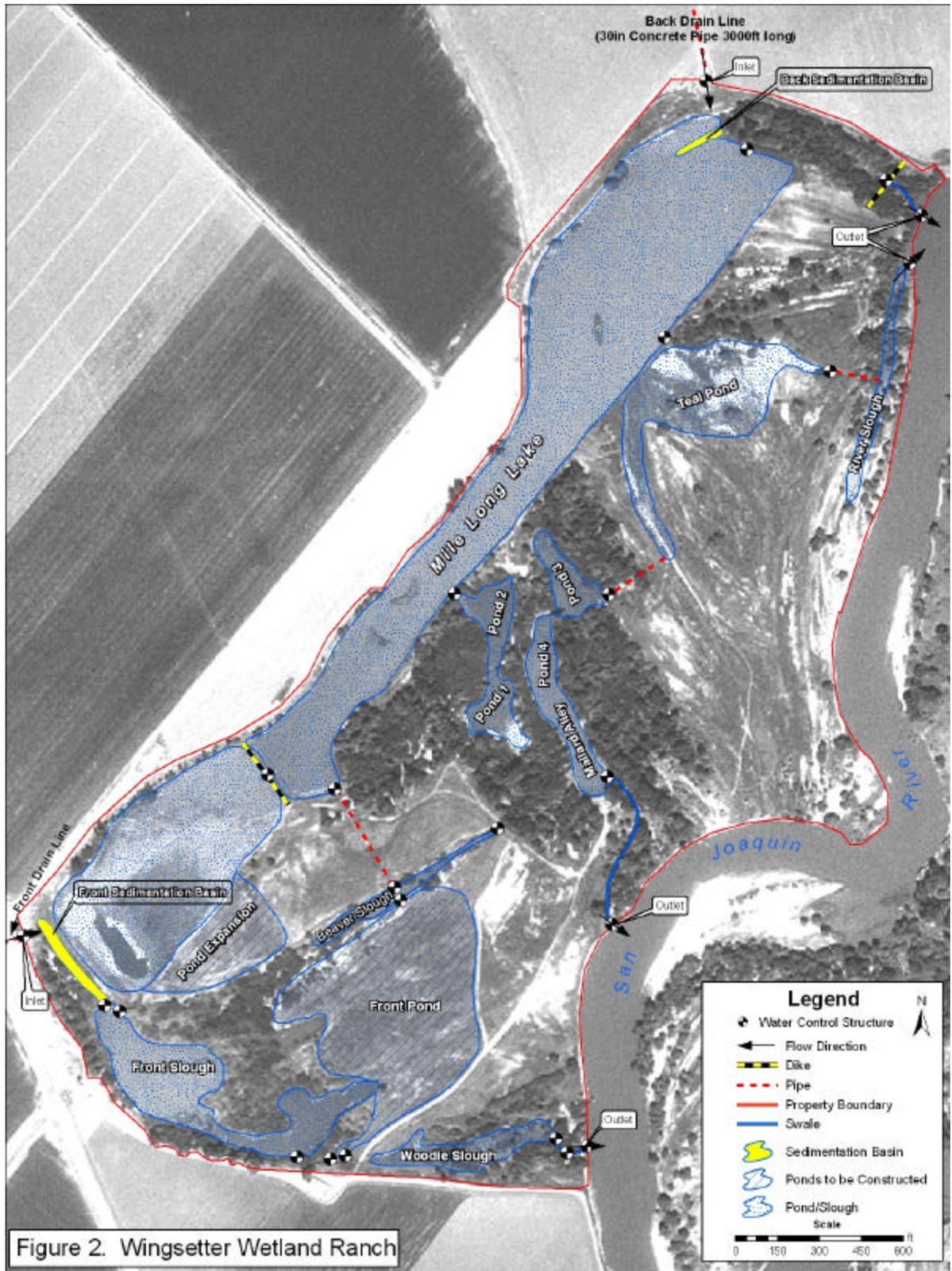


Figure 2. Wingsetter Wetland Ranch

The potential of flooding has also been a challenge. The San Joaquin River has flooded the property four times within the past ten years. As a result Mickey has used heavy concrete pipe for his culverts and pipelines, preventing the possibility of them floating and moving. He has also coated the slopes of his levees with rip rap (broken concrete) to minimize erosion during floods. A layer of sediment overtops the rip rap to provide a foundation for vegetation and enhance aesthetic and habitat value. Mickey hopes that through these efforts, “the Ranch will stay in tact after I am (he is) gone.”

The abundant amount of sediment loading and deposition has also influenced Mickey’s design and management approach. As stated previously, he is required to annually clean out the sedimentation basins. Recently a dense growth of tules has occurred in a sedimentation area and has inhibited access to cleaning out the sediment. Mickey had to spray the tules in order to gain access. The deposition of sediment in pipes has also been a challenge. If unchecked the sediment would plug the system. Many of his concrete pipes are of a large enough diameter (36” to 60”) to facilitate the manual removal of silt.

Mickey has been resourceful in finding inexpensive materials and services. All of his ponds have been excavated by a large contractor based in Los Banos. The contractor excavates the ponds to Mickey’s specifications and hauls the material offsite. In turn, the contractor receives the excavated sand for free. Materials Mickey has received for very little to no money include the following:

- Rip Rap – Approximately 100 - 150 truck loads of relatively clean (rebar free) broken concrete from the City of Newman who tore out a large number of sidewalks.
- Concrete Pipe – Old concrete sewer pipe that the City of Modesto took out
- Supports for nesting boxes – Old telephone poles from PG&E
- Sealant for ponds – Clay that a winery had used for filtration of wine
- Native grass seeds – Donated by the NRCS

Mickey's ingenuity and persistence has paid off. There is an abundant amount of wildlife. Waterfowl and birds, including egrets, herons, pelicans, bald eagles, kite hawks, king fishers, red-tailed hawks, geese, diver ducks, mud hens, cacklers, mallards, wood ducks, shore birds, quail, dove, pheasants, great horned owls, and white-face ibises take refuge on his Ranch. Other wildlife including river otters, cottontails, and coyotes frequent his property. Although not open to the public, Mickey's family and friends are often invited to go fishing and hunting.

Mickey has found a great sense of personal satisfaction in using his "creativity, knowledge, and ideas to create something for wildlife". His Ranch is one of the first local private properties to be restored in this fashion and he has been deemed as "California's first silt farmer" by the State Water Resources Control Board. He advises other landowners that their projects do not need to be as large as his. Projects of any scale can provide an environmental benefit.

Studies

Wingsetter Wetland Ranch has proven to be effective in removing large quantities of sediment based on the amount of sediment annually collected in the sedimentation basins and the increased clarity of the water leaving the site. However, until recently, the water quality entering and leaving the site has not formally been tested.

Dr. A.T. O'Geen, a Soil Resource Specialist at the University of California, Davis is leading a comprehensive study on the treatment efficiency of both Wingsetter Wetland Ranch and Cox Ranch. This study is funded by a grant provided by Kearney Foundation Soil Science, U.S. Bureau of Reclamation and the University of California Center for Water Resources.

The main objective of this three year study is to monitor the capacity of constructed wetlands to enhance water quality of agricultural return flows through their ability to filter contaminants such as sediment, nutrients, and organic carbon in irrigation return flows. Contaminant removal efficiencies will be calculated for Wingsetter Wetland

Ranch (an older more established wetland) and Cox Ranch (restoration just recently completed). The project will identify the conditions that optimize performance, such as age, size, shape, volume, vegetation, hydrology, and quality and quantity of input waters. Other wetlands may be added to provide more data on how wetland design may influence treatment efficiency.

Specific procedures include the collection of flow measurements and water quality samples at the inlets and outlets of the wetlands. The water samples are tested for total suspended solids, dissolved organic carbon, phosphorus, ammonium, chlorophyll-a (a bio-indicator of algae), nitrate, and a variety of other constituents. From these data, the removal efficiency for each wetland is calculated. Sedimentation plates (flat plates) have been placed on the wetland floor to measure annual sedimentation rates. Following removal, a variety of lab tests are conducted to determine the amount of carbon and nutrients in the settled material.

Following the first year of the study, preliminary data indicate that constructed wetlands are efficient at removing nitrogen, sediment and phosphorous. In addition, the ability to remove sediment and environmentally harmful constituents increases as wetlands age and as vegetation becomes established. For more information contact Dr. Toby O'Geen at: atogeen@ucdavis.edu or (530)-752-2155.

6.2 Cox Ranch

The 155 acres Cox Ranch has been owned by the Cox family for over a century. The currently owner, John Cox, would like to have the property stay in the family for future generations and consequently, recently entered an EWP easement. This easement provides him financial compensation for retiring his land out of agricultural production while still allowing him to maintain ownership and use the land for undeveloped recreation.

The property is about 3 to 4 miles southeast of the town of Grayson, directly east of Cox Road. The majority of restoration has been completed with exception of some plantings. The property began to receive tailwater in the middle of the 2004 irrigation season.

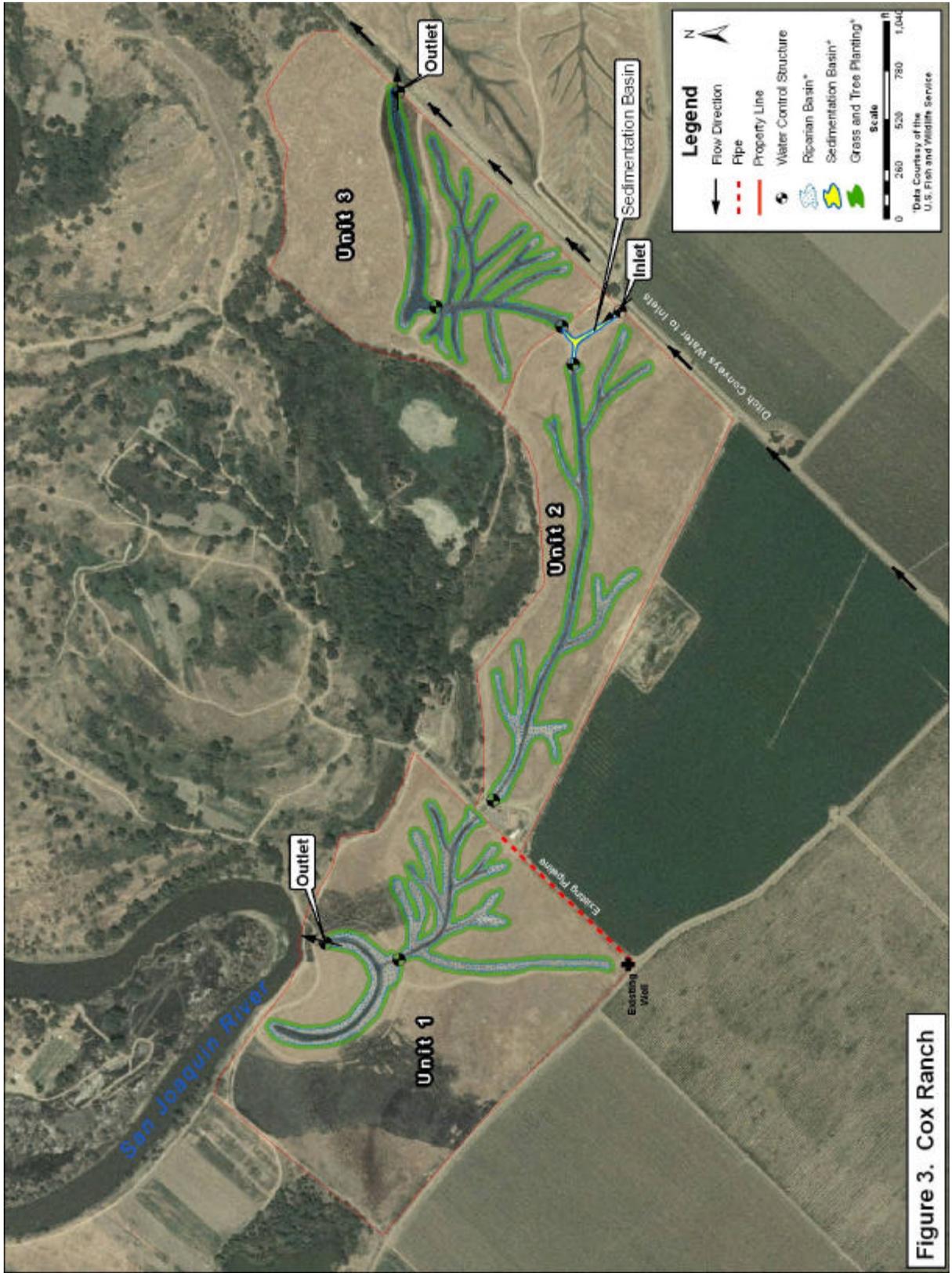
Financial Assistance

The Cox Ranch is one of three adjacent properties (the Houk, Herger, and Cox properties) along the San Joaquin River that was purchased as an EWP Easement and recently restored. In addition to the EWP conservation easement, John Cox received financial assistance from the U.S. Fish and Wildlife Service's Partners for Wildlife Program. This program applied for and received a NAWCA grant for the restoration of Cox Ranch and other targeted areas. John Cox hired and paid a local firm to complete the design and construction. He was reimbursed by both the U.S. Fish and Wildlife Service and the NRCS. The NRCS funded the earthwork, native grass plantings, and a portion of the water control structures while the U.S. Fish and Wildlife Service funded the tree seedlings, native grass plantings, and the remaining portion of the water control structures. The NRCS was responsible for the environmental assessment and approving the final design prior to construction.

Restoration and Management Activities

The property consists of three units including wetland, upland, and riparian habitat. Figure 3 shows the general layout of the conveyance system and habitats. A drainage ditch along the eastern edge of the property delivers tailwater to Unit 2. Silt settles out of the tailwater in the settling basin at the inlet of Unit 2. The water is treated further as it is conveyed through a system of swales and ponds through Unit 1 and Unit 3. The treated water is discharged from two outlets. Water draining from the outlet in Unit 1 is discharged directly into the San Joaquin River. Discharge leaving the Unit 3 outlet is directed into the same drainage ditch delivering the tailwater, downstream of the inlet. The treated water is eventually discharged into the San Joaquin River via this ditch.

During the design phase, the presence of intermittent sand lenses dispersed throughout the property posed as a challenge. John Cox gave the designer a drawing showing the



location of historic natural sloughs that were on the property to assist in characterizing the subsurface. The NRCS also collected soil samples to help locating the sand lenses. Design revisions were made to address this problem. Swales were designed to avoid sand lenses and the wetland ponds were confined to areas that provided an adequate seal. Despite these efforts, however, the variable location and size of the lenses were difficult to characterize and accommodate in the design.

The property is currently being managed by Neil Phillips, an agricultural consultant and personal friend of John Cox. During the first season of operation, Neil focused on experimenting with water levels to “get a feel” for a water management strategy that would be most effective for the water treatment, and minimizing mosquito reproduction. The property was initially flooded when the first case of the West Nile virus was introduced to the local area. Mosquito abatement was concerned with the flooding of the property and immediately stocked the units with mosquito fish.

In addition water management for mosquitoes, spraying for invasive plants, and the removal silt from the settling basin will also be necessary. Neil anticipates spraying twice a year for invasive plants. The U.S. Fish and Wildlife Service also plan on planting willows, cotton woods, and a few other natives in the spring of 2005. They are currently applying for funding from the LIP to irrigate the newly planted trees and shrubs.

It is anticipated that groundwater will be needed to supplement the tailwater supply following the irrigation season. Although there is sufficient tailwater during the irrigation season, there is a dramatic decrease in tailwater following the season. Furthermore, the San Joaquin Wetlands, a neighboring duck club, has first priority rights to the tailwater in the delivery ditch. Cox Ranch only receives water after the San Joaquin Wetlands has diverted their share. During the first year of operation it was a challenge to keep areas flooded and maintain the mosquito fish. The lack of water supply following the irrigation season also reduces the possibility of hunting waterfowl on the property. There is an existing well on the property and the possibility of

extending an existing delivery pipeline from the well to a desired delivery location has been explored. Funding to extend the pipeline and pay for the pumping costs will be needed.

During its first year of operation, the property has effectively demonstrated its ability to remove silt from the tail water. The quality of habitat and water treatment will most likely continue to increase as the habitats become more established. Additional modifications (ie: placement of islands) and other maintenance activities will be needed to improve habitat quality and management flexibility.

6.3 Marshall Drain

The Marshall Drain Project stems from the Stanislaus County Regional Drainage Water Management Program. This collaborative program was established by local irrigation districts to address water quality and water use efficiency in southwest Stanislaus County. With financial assistance from a CALFED Water Use Efficiency grant, the program has begun to implement projects that improve water quality discharges and water management efficiency.

Located at the intersection of Armstrong and Marshall Road, southeast of Patterson, the Marshall Road Drain was the first project implemented by this program. It was designed to remove silt and all other harmful constituents from the Marshall Drain tailwater and recycle the treated tailwater for irrigation, thereby not allowing said constituents to enter the San Joaquin River. The project has been in operation for a portion of the 2003 irrigation season (late June to early October) and for the 2004 season, capturing and reusing 2,200 acre-feet of tailwater on an annual basis. Approximately 6,800 acres of agricultural drainage within Central California Irrigation District (CCID), Del Puerto Water District (DPWD), and Patterson Irrigation District's (PID) borders in addition to a few small independent farms drain into the Marshall Drain. This project not only provides water quality and supply benefits, but also provides energy conservation, customer service, and habitat benefits.

Financial Assistance

The Marshall Road Drain Project is one component of a two phase approach funded by the CALFED Water Use Efficiency grant. The second phase is the development of a master plan strategy to improve water quality in other water drainages in southwest Stanislaus County. Ninety one percent of the grant funding was used for the Marshall Drain improvement and the remaining portion will be used for the Master Plan.

A local cost share of \$200,000 in addition to in-kind services was divided among the three participants to improve the Marshall Drain. The three participants, DPWD, CCID, and PID are the water agencies upstream of the Drain. From a water supply standpoint, PID is the sole beneficiary, however, all three agencies benefit by improving their drainage water quality discharging to the San Joaquin River. The allocation of the local cost share and in-kind services was agreed by all three participants prior to project implementation. In addition to these services and expenses, PID spent an additional \$250,000 on canal improvements downstream of the drain, enhancing customer service to their downstream users by properly tying the canal system to their reservoir. As the sole water supply recipient, PID incurs complete operational, management and maintenance responsibilities, and costs of the Marshall Drain.

Restoration and Management Activities

The Marshall Drain is a pipe constructed in the early 1970s that parallels Marshall Road. The pipeline collects tailwater from a series of agricultural drainage canals and eventually discharges the tailwater into the San Joaquin River. The Marshall Drain Project diverts a portion of the tailwater from the pipeline and conveys the water through a series of basins. Sediment and a variety of other harmful constituents are contained in the basins. The water is then recycled by reusing it for irrigation, rather than releasing the water directly to the San Joaquin River.

The 20 acre reservoir site was purchased from a local farmer. An environmental review was completed to evaluate potential environmental effects and a local engineering firm and contractor were hired to design and construct the project.

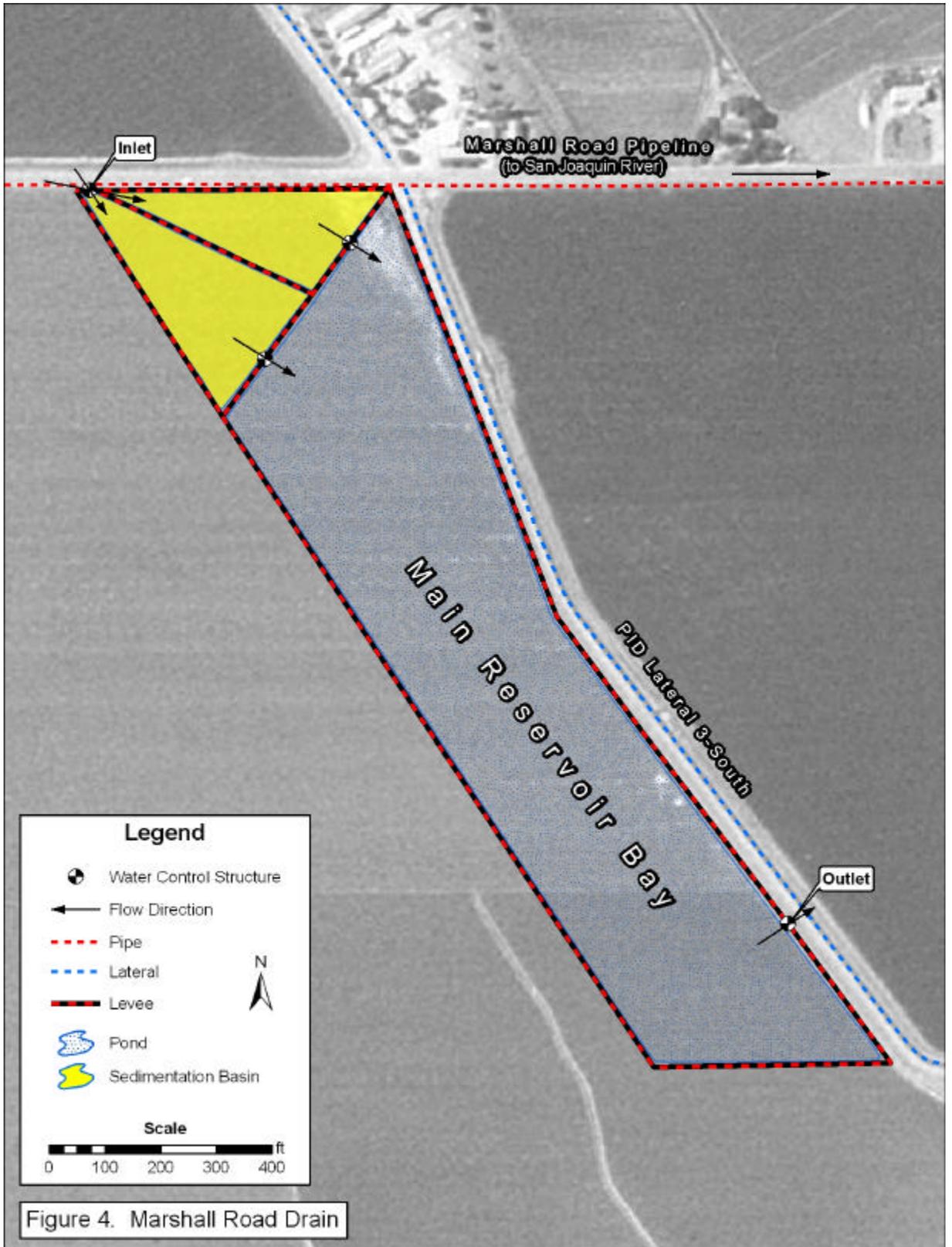
Three basins were constructed with a maximum storage of 42 acre-feet and surface area of 17 acres. (See Figure 4). The two smaller upstream basins were designed to be the primary settling basins. Tailwater from the pipeline is diverted into these basins where the majority of sediment settles out. The treated water then flows into the third basin, the Main Reservoir Bay, where it is stored until released through the outlet structure into the Lateral-3-South Canal. This canal conveys the recycled water downstream to irrigate 850 acres of crops within the PID.

In addition to the earthwork and water control structures, several other elements were necessary to address specific characteristics of the site. The groundwater table is semi high in the local area. A drain system was put around the reservoir recycling seepage back into the basins. Levee erosion from wave action was also a concern. Because the prevailing wind direction was from the north, rip rap was placed on the southern bank to minimize erosion.

The Marshall Drain Project has improved PID's water management flexibility, energy efficiency, and quality of service to this 850 acre unit. The 850 acre unit was not a part of the original system built in 1910 and it has always been difficult for PID to meet service needs during peak irrigation periods. In response, PID installed a well near the 20 acre reservoir site. This well provided groundwater to supplement irrigation needs when demand was high. The Marshall Drain Project provides recycled water to meet these needs, reducing if not eliminating the need to use the well and providing energy cost savings. Furthermore, the additional supply of recycled water reduces the amount of water PID needs to pump from its downstream diversion point in the San Joaquin River. Customer service has drastically improved. Improvements PID made on the Lateral-3-South Canal including improvements at road crossings and the installation of a pipeline,

in addition to water storage source closer to the 850 unit has increased flow capacity beyond the 2.8 cfs that was available from the well.

PID's water delivery system, including Marshall Drain, is controlled by an automated system that can be operated and/or monitored from the office. Generally speaking, the Marshall Drain is



operated to capture as much tailwater as possible during the irrigation season. During the off-season, water levels within the basins are lowered to reduce the potential for erosion, but still allot some water for habitat purposes. Releases from the large basin are determined by downstream irrigation needs and real time conveyance data. The water surface elevation in the Lateral-3-South Canal in conjunction with flow measurements in a pipeline further downstream of the canal is monitored to regulate the downstream flow. The amount of water released from the basin depends on the desired flow reaching the downstream users. The surface elevation of the large basin is also monitored to ensure adequate freeboard and regulate the amount of water entering Marshall Drain.

Operations and Maintenance costs for PID are currently about \$20,000 annually. This includes weed control, operational costs associated with water control, and annual silt removal (most expensive). Approximately 1,900 cubic yards of sediment was removed using a long arm reach excavator in both 2003 and 2004 from the small upstream basins. The quantity of soil removed was determined by comparing an as-built survey taken just after the project was completed with surveys conducted just prior to silt removal. The silt has been used by the PID to fortify levees or given to farmers who use it to fill in depression areas and replenish top soil in their fields.

John Sweigard, General Manager of PID, stresses the importance of having a good engineer on the project. He recommends local firms that have hands on experience with agriculture and restoration work. His district plans on pursuing projects similar to Marshall Drain in the future, feeling that it is PID's responsibility to take the "burden off farmers for surface drainage."

The Marshall Drain Project is a successful demonstration of a multi-agency effort to improve water quality and address water supply issues. Water quality measurements taken before and after the construction of the Marshall Drain Project show that the project is effectively removing silt and harmful constituents to the levels projected prior

to construction. The project has received very positive feedback from local landowners and government agencies.

7.0 Conclusion

The need to find feasible and effective solutions to address water quality is rising as the pressure to meet the state water quality regulations increases. Private landowners are encouraged to initiate the development of treatment BMPs to help address this problem. There are a variety programs that provide landowners with both financial and technical assistance.

Whether pursuing the development independently or acquiring technical assistance, there are basic elements common to all treatment BMP projects. It is recommended that the landowner follow a set of guidelines to help ensure the success of the project and the landowner's final approval.

It is also important to learn from the successes and challenges of existing local projects. The three case studies in this report not only serve as a model of what can be accomplished to help improve water quality and provide habitat for wildlife, but also provide additional insight to landowners who are just beginning the BMP development process.

Appendix A

Restoration Assistance Programs

Emergency Water Program

The Emergency Water Program (EWP) was founded to provide relief to victims of natural hazards such as floods, fires, and windstorms. In 1996, this program was amended, allowing floodplain easements to be purchased on flood-prone lands. This is intended to reduce the imminent hazards associated with flooding by enhancing and maintaining floodplain functions and also providing a series of secondary benefits. These include the conservation and restoration of habitat for wildlife, groundwater recharge, open space, and the improvement of water quality.

The program is administered by United States Department of Agriculture's (USDA) National Resource Conservation District (NRCS). The NRCS purchases permanent conservation easements from landowners owning flood-prone land. The owner receives payment either at a geographic rate established by the NRCS state conservationist, at the landowner's offer, or at a market appraisal value. Under the terms of the easement, the landowner gives NRCS "full authority" to restore and improve the function of the floodplain, however the landowner still retains the opportunity to participate with the restoration. The landowner also reserves the rights to control public access, use the land for quiet enjoyment, and for undeveloped recreational use such as hunting and fishing. Additional activities that would further protect/enhance the property such as haying or grazing may also be permitted. These activities are agreed on by the landowner and NRCS on a case-by-case basis.

This program has proven to be successful at a local level. As of April 2004, fourteen perpetual conservation floodplain easement/restoration projects have been established in Stanislaus County.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) was established in the 1996 Farm Bill and reauthorized in the 2002 Farm Bill to provide a conservation program that provides assistance to farmers and ranchers who incorporate best management practices that provide significant environmental benefits. The program was designed to encourage the reduction of non-point source pollution, emissions, and soil erosion and promote habitat conservation. The program is administered by the NRCS and provides cost share assistance and incentive payments to recipients.

Applications for assistance are received on a continuous basis, however, there are cut off dates to determine which applications will be reviewed and qualify for funding each designated year. Local groups comprised of USDA officials, local farmers, ranchers, farm advisors, and other agricultural agencies are responsible for reviewing the applications and determining how the funding is allocated. Applications are awarded based on the level of environmental benefits and water conserved using a ranking criteria established by the local groups and State Technical Advisory Committee.

Cost shares may provide up to 75 percent of the cost for certain conservation practices. Incentive payments may be paid for three years to encourage best management practices normally not practiced. Contracts can last from one to ten years.

As of February 2004, EQIP has given \$1.08 billion and 117,625 contracts since the founding of the program. In Stanislaus County, 104 of 400 projects in 1993 were approved for funding with an average award of \$17,307 a piece. The program has received favorable review from environmental groups and continues to grow in California. Total state funding increased from \$7.4 million in 2002 to \$42 million in 2003.

Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) was reauthorized in the 2002 Farm Bill. This voluntary program was designed to develop and improve wildlife habitat on private lands, tribal lands, and some governmental lands on a limited basis. As the administrator, the NRCS provides cost share assistance of up to 75 percent to participants. In turn, the participant voluntarily limits use of the land for the duration of the agreement while still retaining private ownership. Since its inception in 1998, the program has worked with 14,700 participants on more than 2.3 million acres.

Private landowners may apply for funds at any time through the USDA Service Centers and Conservation district offices. A person leasing land for the term of the agreement may also apply as long as they can show proof of the lease period. Applications are reviewed and ranked in accordance to established State Criteria. These Criteria are developed from local groups that provide input to the State Technical Committee which in turn provides assistance to the State Conservationist in developing the State WHIP Plan and State Criteria. Priority is generally given to habitat and species that have significantly experienced regional or national decline or to practices beneficial to wildlife that normally do not qualify for other funding sources.

Land that is enrolled in programs including the Conservation Reserve Program, Wetlands Reserve Program, Water Bank Program, Grassland Reserve Program, or the Emergency Watershed Protection Program are not eligible for WHIP.

Agreements generally last between 5 to 10 years. However, shorter agreements have been established to provide relief for specific wildlife emergencies. Up to 15 percent of WHIP funding may also be allocated for 15-year agreements that provide benefits to a significant habitat or specie. The NRCS may work with participants to develop a wildfire habitat development and continue to provide engineering and biological assistance for the duration of the agreement. The landowner may still control public access to their land, but must allow NRCS access for biological monitoring.

Wetland Reserve Program

The Wetland Reserve Program (WRP) provides landowners financial incentives to retire marginal agricultural lands in order to restore, protect, and enhance wetland habitat. At least 70 percent of each project is restored to its original natural conditions, or as much as possible. The program was reauthorized by the 2002 Farm Bill and administered by the NRCS. Local Conservation Districts play an important leadership role in local work groups and also help identify resource objectives and provide recommendations on program priorities and eligible practices. Partnerships with other local conservation groups such as California Waterfowl Association (CWA), Ducks Unlimited, Inc., and The Nature Conservancy (TNC) are encouraged.

The program offers three types of conservation options including a Permanent Easement, 30-Year Easement, and a Restoration Cost-share Agreement. For both easements, the landowner retains ownership yet voluntarily limits use of the land. In exchange, for the Permanent Easement, the landowner receives financial compensation to the lowest of the following three values: the agricultural value of the land, an established payment cap, or the amount offered by the landowner. For the 30-Year Easement, the landowner receives 75 percent of the lowest aforementioned values. The USDA will cover the costs associated with recording the easements in the local land records, survey and appraisal fees, title insurance, charges for abstracts, and up to 75 percent of restoration costs.

Similar to the Easements, the USDA will fund up to 75 percent of restoration costs for lands entering a Restoration Cost-share Agreement. The Agreements are normally in the form of long-term contracts, locally awarded contracts, or cooperative agreements and do not involve easements. Normally an Agreement is for a minimum of 10 years. Partnerships with other conservation organizations that provide additional financial incentives and technical assistance are encouraged.

Eligible lands must be restorable to wetland habitat or will enhance adjacent wetland habitat. Wetlands converted after December 23, 1985, lands with timber stands

developed under the Conservation Reserve Program, Federal land, and lands where restoration is impossible are not eligible. Generally the landowner must own the land for at least one year prior to enrolling in the program, however, there are exceptions (see website in Table 1 for further details).

Applicants are ranked and selected on the State level through a State screening Criteria that is based on national standards. The local NRCS offices have information on these State criteria. Congress allocates funding annually to the WRP based in the amount of acres to be restored. Funding is somewhat flexible. Through the 2002 Farm Bill, up to 250,000 acres may be restored per year. As of September 2004, 7,831 projects on 1,470,998 acres have been enrolled in the program. The average project cost is \$1,400 per acre for restoration and easements with the average project size of 177 acres.

During the term of the agreement or easement, the NRCS and other applicable partners provide technical, biological, and administrative assistance during and following restoration activities. The landowner maintains the right to control access to his/her land and use the land for undeveloped recreation. Additional uses may also be possible if the use(s) are beneficial to the habitat and agreed on by the landowner and NRCS. The landowner is responsible the control of noxious weeds, invasive plants, and pests in accordance to local, state, and federal regulations.

Landowner Incentive Program

The Landowner Incentive Program (LIP) focuses on the enhancement and management of habitat (wetland, native grasses, and riparian) on private lands as a means to reverse the decline of special status species in the Central Valley. Private landowners are given incentive payments for implementing a habitat management plan that benefit special status species.

Projects are selected through a competitive ranking process implemented by the LIP Ranking Team. Members of this Team include the LIP Coordinator and representatives

from the U.S. Fish and Wildlife Service, California Department of Fish and Game (CDF&G), and NRCS.

If selected, the landowner enters into a contract with the CDF&G. The contract includes a site specific habitat management plan which is developed cooperatively between the LIP Coordinator and landowner. This plan establishes the objectives and management strategy for the habitat enhancement. The plan provides flexibility to tailor annual management activities to changing habitat conditions while also providing assurances that the level of required management will not exceed a specified level of intensity.

The LIP Coordinator annually meets with the landowner on the property to discuss habitat conditions and cooperatively develop an "Annual Work Plan," that addresses management activities for the following year. Examples of these activities include wetland flooding and vegetation control. All required activities will be within the framework of the habitat management plan. The Coordinator conducts a follow up visit to assess management. If satisfactory, the landowner receives an incentive payment. The amount of payment (per acre) and length of contract varies pending on the type(s) of habitat.

This is a California Department of Fish and Game Program that is funded by the U.S. Fish and Wildlife Service, with Ducks Unlimited, Inc. serving as the coordinator. The amount of funding available to the Program will vary on an annual basis, dependant on Congressional allotments. The first year of operation was in 2004 and has been a successful program with positive feedback from participating landowners.

Partners for Wildlife Program

The Partners for Wildlife Program provides financial and technical assistance to restore private and tribal lands, providing fish and wildlife habitat. Since the inception in 1987, this program has been managed by the U.S. Fish and Wildlife Service. Unlike other programs that specify certain site conditions (i.e.: lands must be prone to flooding) or the type of habitat to be created, the Partner for Wildlife Program does not focus on a

specific type of habitat. Lands may be restored to wetland, native upland, riparian, or in-stream habitat, pending on site conditions and the original natural state of the land.

Private and tribal lands are eligible for the program. The majority of projects stem from partnerships directly with private landowners; however, almost anyone desiring to invest in restoration can get involved. This includes conservation organizations, government agencies, tribes, private organizations, corporations, schools, and others. Partnerships are encouraged.

Landowners interested in the program should contact their local Fish and Wildlife field office. Phone calls will be directed to the Partner's biologist who will answer questions and meet with the landowner at the site to assess the property and discuss restoration options. The restoration project is then developed with the assistance of the Fish and Wildlife Service and/or with other agencies (i.e.: NRCS) or conservation organizations. Following development, the landowner submits a signed agreement to the local Fish and Wildlife Service field office. If funding is available and the project is approved, the agreement is sent to the U.S. Fish and Wildlife's Regional Office for final approval. Restoration may begin following final approval. The landowner is reimbursed for their cost share portion following the completion of the project.

The agreement includes the project design, cost share, length of agreement, and management plan. The cost-share between the Fish and Wildlife Service and the landowner is normally 50 percent. However, this is flexible and often depends on additional partners involved with the project. The duration of the agreement depends on the technical and financial assistance. The average duration is ten years. During this time, the landowner agrees to not destroy any restoration work or return to original land use until the term of the agreement is over without reimbursing the Fish and Wildlife Service. Projects are generally designed to minimize maintenance. Minor maintenance is normally the responsibility of the landowner. Any major maintenance (i.e.: replacement of water control structure) is assessed on a case-by-case basis.

Upon project review, the U.S. Fish and Wildlife Service gives preferences to projects that have the following features: greatest benefits to Federal trust, endangered, and threatened species, project on permanently protected private land, lands identified as high priority by wildlife agencies, lands near National Wildlife Refuges, habitats considered impaired by the State Natural Heritage Programs or Heritage Data Base, projects that reduce habitat fragmentation, and projects that incorporate self sustaining systems with little maintenance. If projects equally meet the criteria listed above, preference is given to projects with longer agreement durations, partnerships that involve cost share, and projects that are most cost effective.

Over 677,000 acres of wetlands have been restored on a national level since the beginning of the Partners for Fish and Wildlife Program in 1987. Additionally, over 1,253,700 acres of native upland and 5,560 miles of riparian and in-stream habitat have been restored with over 33,103 landowner agreements. In 2003, the national restoration budget of \$28 million was used to restore 37,500 acres of wetlands, 184,000 acres of native upland, and 820 miles of riparian corridor.

The Program has been active in California since 1990, focusing on the restoration of wetlands in the Central Valley and the restoration of riparian and native uplands.

Appendix B – Pictures



Photo 1: Wingsetter Wetland Ranch – Surplus culverts that will be used for future work



Photo 2: Pond on Wingsetter Wetland Ranch



Photo 3: Sediment Basin on Wingsetter Wetland Ranch



Photo 4: Delivery Ditch to Cox Ranch



Photo 5: Water Control Structure on Cox Ranch



Photo 6: Swale on Cox Ranch



Photo 5: Two upstream sedimentation basins at Marshall Road Drain



Photo 6: Sediment excavated from Marshall Road Drain



Photo 7: Lower basin at Marshall Road Drain

Appendix C

Contacts

NRCS

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Conservation District

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