Support for Fish Passage Program in the Sacramento River Region

Project Information

1. **Proposal Title:**

   Support for Fish Passage Program in the Sacramento River Region

2. **Proposal applicants:**

   Dave Pavetti, HDR Engineering, Inc.

3. **Corresponding Contact Person:**

   Tom Cannon
   HDR Engineering, Inc.
   271 Turn Pike Drive Folsom, CA 95630
   916 351-3823
   tcannon@hdrinc.com

4. **Project Keywords:**

   Anadromous salmonids
   Fish Passage/Fish Screens
   Flood Plain and Bypass Management

5. **Type of project:**

   Research

6. **Does the project involve land acquisition, either in fee or through a conservation easement?**

   No

7. **Topic Area**:

   Fish Passage

8. **Type of applicant:**

   Private for profit

9. **Location - GIS coordinates:**

   Latitude: 38.55

   Longitude: 121.5

   Datum:

Describe project location using information such as water bodies, river miles, road intersections, landmarks, and size in acres.

The goal of the proposed project is to provide information that will lead to a full-scale program to reduce fish passage problems in the Sacramento Region rivers and floodplains, including the Yolo Bypass, Sutter Bypass, Butte Bain, and Colusa Basin.

10. **Location - Ecozone:**

    9.2 Lower American River, Code 15: Landscape

11. **Location - County:**

    Butte, Colusa, Sacramento, Sutter, Yolo

12. **Location - City:**

    Does your project fall within a city jurisdiction?

    No

13. **Location - Tribal Lands:**

    Does your project fall on or adjacent to tribal lands?

    No

14. **Location - Congressional District:**

    2,3,5

15. **Location:**

    California State Senate District Number: 4,1

    California Assembly District Number: 2,3,5,8,9

16. **How many years of funding are you requesting?**

    1

17. **Requested Funds:**
    a) Are your overhead rates different depending on whether funds are state or federal?

       No

       If no, list single overhead rate and total requested funds:

       Single Overhead Rate: 110

       Total Requested Funds: 340,173

b) Do you have cost share partners already identified?

No

c) Do you have potential cost share partners?

Yes

If yes, list partners and amount contributed by each:

DWR-FPP 50,000

d) Are you specifically seeking non-federal cost share funds through this solicitation?

No

If the total non-federal cost share funds requested above does not match the total state funds requested in 17a, please explain the difference:

18. **Is this proposal for next-phase funding of an ongoing project funded by CALFED?**

No

Have you previously received funding from CALFED for other projects not listed above?

No

19. **Is this proposal for next-phase funding of an ongoing project funded by CVPIA?**

No

Have you previously received funding from CVPIA for other projects not listed above?

No

20. **Is this proposal for next-phase funding of an ongoing project funded by an entity other than CALFED or CVPIA?**

No

Please list suggested reviewers for your proposal. (optional)

Erwin Van Nieuwenhuyse US Bureau of Reclamation

Paul Ward CDFG-Region 2

John Icanberry USFWS-AFRP

Beth Campbell NMFS-Sacramento

21. **Comments:**

Environmental Compliance Checklist

Support for Fish Passage Program in the Sacramento River Region

1. **CEQA or NEPA Compliance**
   a) Will this project require compliance with CEQA?

      No
   b) Will this project require compliance with NEPA?

      No
   c) If neither CEQA or NEPA compliance is required, please explain why compliance is not required for the actions in this proposal.

      Because Phase 1 of the proposed project for which we are requesting funding is a study and therefore not defined as a "project" by CEQA/NEPA guidelines, no CEQA or NEPA compliance is required.

2. **If the project will require CEQA and/or NEPA compliance, identify the lead agency(ies).** *If not applicable, put "None".*

   CEQA Lead Agency: None
   NEPA Lead Agency (or co-lead:) None
   NEPA Co-Lead Agency (if applicable): None

3. **Please check which type of CEQA/NEPA documentation is anticipated.**

   CEQA
   -Categorical Exemption
   -Negative Declaration or Mitigated Negative Declaration
   -EIR
   Xnone

   NEPA
   -Categorical Exclusion
   -Environmental Assessment/FONSI
   -EIS
   Xnone

   If you anticipate relying on either the Categorical Exemption or Categorical Exclusion for this project, please specifically identify the exemption and/or exclusion that you believe covers this project.

4. **CEQA/NEPA Process**
   a) Is the CEQA/NEPA process complete?

      Not Applicable

   b) If the CEQA/NEPA document has been completed, please list document name(s):

5. **Environmental Permitting and Approvals** (*If a permit is not required, leave both Required? and Obtained? check boxes blank.*)

LOCAL PERMITS AND APPROVALS

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

Scientific Collecting Permit	Required
CESA Compliance: 2081	Required
CESA Compliance: NCCP	
1601/03	
CWA 401 certification	
Coastal Development Permit	
Reclamation Board Approval	
Notification of DPC or BCDC	
Other	

FEDERAL PERMITS AND APPROVALS

ESA Compliance Section 7 Consultation	
ESA Compliance Section 10 Permit	Required
Rivers and Harbors Act	
CWA 404	
Other	

PERMISSION TO ACCESS PROPERTY

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:

6. **Comments.**

Land Use Checklist

Support for Fish Passage Program in the Sacramento River Region

1. **Does the project involve land acquisition, either in fee or through a conservation easement?**

   No

2. **Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?**

   Yes

3. **Do the actions in the proposal involve physical changes in the land use?**

   No

   If you answered no to #3, explain what type of actions are involved in the proposal (i.e., research only, planning only).

   Research only.

4. **Comments.**

Conflict of Interest Checklist

Support for Fish Passage Program in the Sacramento River Region

Please list below the full names and organizations of all individuals in the following categories:

- Applicants listed in the proposal who wrote the proposal, will be performing the tasks listed in the proposal or who will benefit financially if the proposal is funded.
- Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.
- Individuals not listed in the proposal who helped with proposal development, for example by reviewing drafts, or by providing critical suggestions or ideas contained within the proposal.

The information provided on this form will be used to select appropriate and unbiased reviewers for your proposal.

Applicant(s):

Dave Pavetti, HDR Engineering, Inc.

Subcontractor(s):

Are specific subcontractors identified in this proposal? Yes

If yes, please list the name(s) and organization(s):

James Grummon Condor Earth Technologies

Helped with proposal development:

Are there persons who helped with proposal development?

Yes

If yes, please list the name(s) and organization(s):

Ted Frink DWR-FPP

Comments:

Budget Summary

Support for Fish Passage Program in the Sacramento River Region

Please provide a detailed budget for each year of requested funds, indicating on the form whether the indirect costs are based on the Federal overhead rate, State overhead rate, or are independent of fund source.

Federal Funds

Year 1												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
1	program plan	74	4604	2025.94	0	0	0	0	1065	7694.94	5111	12805.94
2	GIS	144	4534	1995	0	0	0	0	2073	8602.0	5033	13635.00
3	maps	172	5507	2423	0	400	0	0	2476	10806.0	6112	16918.00
4	interviews	176	6595	2902	95	0	0	0	2534	12126.0	7320	19446.00
5	hist data	122	3874	1704	0	0	0	0	1756	7334.0	4300	11634.00
6	prel assess	206	7396	3254	143	0	0	0	2966	13759.0	8209	21968.00
7	recon	416	15660	6890	238	0	36,750	0	5989	65527.0	17382	82909.00
8	review/assess	308	11744	5167	0	400	0	0	4434	21745.0	13036	34781.00
9	report	492	16678	7338	0	0	0	0	7083	31099.0	18512	49611.00
10	research plan	206	7365	3241	0	0	0	0	2966	13572.0	8175	21747.00
11	env doc	324	12166	5353	0	0	0	0	4665	22184.0	13504	35688.00
12	PM	80	7011	3085	0	0	0	0	1151	11247.0	7783	19030.00
		2720	103134.00	45377.94	476.00	800.00	36750.00	0.00	39158.00	225695.94	114477.00	340172.94

Year 2												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Year 3												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Grand Total=340172.94

Comments.

Budget Justification

Support for Fish Passage Program in the Sacramento River Region

Direct Labor Hours. Provide estimated hours proposed for each individual.

Ken Myers 48 Tom Cannon 376 Joe Dominecilli 322 Shelley Hatleberg 312 Mike Garello 212 Trevor Kennedy 156 Field Tech 300 Clerical 136 Admin 146 Drafter 284 financial 32 GIS tech 400 data entry 528

Salary. Provide estimated rate of compensation proposed for each individual.

Ken Myers $55.00 Tom Cannon $50.00 Joe Dominecilli $50.00 Shelley Hatleberg $36.75 Mike Garello $30.00 Trevor Kennedy $43 Field Tech 300 $22 Clerical $16.80 Admin $23.10 Drafter $25.00 financial $30.00 GIS tech $30.00 data entry $30.00

Benefits. Provide the overall benefit rate applicable to each category of employee proposed in the project.

44%

Travel. Provide purpose and estimate costs for all non-local travel.

$476 for 1400 miles of Sacramento River Valley travel

Supplies & Expendables. Indicate separately the amounts proposed for office, laboratory, computing, and field supplies.

Total 39,960 Computer 34,280 office 5,680

Services or Consultants. Identify the specific tasks for which these services would be used. Estimate amount of time required and the hourly or daily rate.

Task 1-7: 36,750 for GIS

Equipment. Identify non-expendable personal property having a useful life of more than one (1) year and an acquisition cost of more than $5,000 per unit. If fabrication of equipment is proposed, list parts and materials required for each, and show costs separately from the other items.

none

Project Management. Describe the specific costs associated with insuring accomplishment of a specific project, such as inspection of work in progress, validation of costs, report preparation, giving presentatons, reponse to project specific questions and necessary costs directly associated with specific project oversight.

Project Management $19,030

Other Direct Costs. Provide any other direct costs not already covered.

none

Indirect Costs. Explain what is encompassed in the overhead rate (indirect costs). Overhead should include costs associated with general office requirements such as rent, phones, furniture, general office staff, etc., generally distributed by a predetermined percentage (or surcharge) of specific costs.

discounted standard federal overhead rates

Executive Summary

Support for Fish Passage Program in the Sacramento River Region

The California Department of Water Resources Fish Passage Program and Flood Management Division seek CALFED Program support in developing a long-term plan for improving fish passage in the Sacramento River Region. Grant support is sought for HDR Engineering to support DWR in (1)identifying fish passage problems related to flood control and water supply infrastructure; (2)identifying potential solutions; and (3) prioritizing potential actions. HDR would provide support in project management, environmental documentation preparation, engineering, recon surveys, risk assessment, and priority determination. This research project will provide information to reduce fish passage problems with emphasis on stranding in Sacramento Region rivers and floodplains, including the Yolo Bypass, Sutter Bypass, Butte Basin, and Colusa Basin. The first phase of this project involves assessing passage and stranding problems, determining possible engineering solutions, and developing preliminary actions and priorities for restoration. The second phase involves focused research, monitoring, and pilot studies. Seven hypotheses topics addressed: (1) straying-stranding problems; (2) structures that impede floodplain drainage; (3) geomorphologic configuration in the floodplain; (4) bypass flows ; (5) healthy functioning floodplains; (6) role of flood control and bank stabilization; and (7) potential to improve survival and production. Uncertainties include the extent of passage-stranding problems and the related population impacts, and potential engineering solutions and cost. The project team will directly support the Fish Passage Program and work closely with the CVPIA-AFRP in addressing identified fish passage problems along the Sacramento River and its tributaries. CALFED/CVPIA goals addressed include: · Develop and implement habitat management and restoration actions in collaboration with local groups · Restore fish habitat and fish passage particularly for spring-run chinook salmon and steelhead trout and conduct fish passage studies. · Reduce fish stranding in floodplains as a source of mortality to fish populations in the Central Valley.

Proposal

HDR Engineering, Inc.

Support for Fish Passage Program in the Sacramento River Region

Dave Pavetti, HDR Engineering, Inc.

1 SUPPORT FOR FISH PASSAGE PROGRAM IN THE SACRAMENTO RIVER REGION

A. PROJECT DESCRIPTION: PROJECT GOALS AND SCOPE OF WORK

The California Department of Water Resources Fish Passage Program (DWR-FPP) and Flood Management Division (DWR-FMD) seek CALFED Program support in developing a long-term plan for improving fish passage in the Sacramento River Region. Grant support is sought for HDR Engineering Inc. (HDR), and its partner Condor Earth Technologies (Condor) to support DWR-FPP in identifying fish passage problems related to flood control and water supply infrastructure and potential solutions. Specifically, grant funds are sought to support development of an ArcView GIS database of fish passage problem sites; to conduct reconnaissance surveys at representative sites; to assess passage problems; to develop arrays of engineering tools to fix problems; to prioritize problems using a cost-benefit approach; to develop a plan to address the problems; and to prepare environmental documentation for pilot studies and a programmatic approach to the problem. HDR would provide project management, environmental documentation preparation, engineering support, and reconnaissance survey capabilities. The DWR-FPP and DWR-FMD would provide in-kind biological, engineering, and GIS services, as well as in-kind overall program management. The full project team would work together with regional stakeholder groups in developing a comprehensive plan that identifies passage problems, potential engineering solutions, and priorities for implementing solutions.

Project Objective: To support the entire stakeholder team in developing a comprehensive plan that identifies passage problems, potential engineering solutions, and priorities for implementing solutions.

Specifically, the project objectives for Phase 1 are to:

- Develop an ArcView GIS database of fish passage problem sites
- Conduct reconnaissance surveys at representative sites
- Assess passage problems
- Develop engineering tools to fix problems
- Prioritize problems using a cost-benefit approach
- Develop an implementation plan to address problems
- Prepare environmental documentation for pilot studies and a programmatic approach

The second phase will involve focused research, monitoring, and pilot studies. The third phase will be implementation of full-scale fish passage improvement projects. Funding sought in this proposal is for Phase 1.

The project would be part of a program being conducted by the DWR-FPP to improve fish passage on portions of the Sacramento River and its tributaries as indicated in **Figure X.** The first phase is to assess passage problems, determine possible engineering solutions, and develop preliminary actions and priorities for restoration. The second phase will involve focused research, monitoring, and pilot studies. The third phase will be implementation of full-scale fish passage improvement projects. Funding is sought in this proposal for the one-year Phase 1 of the program. We recognize that essential details on Phase 2 cannot be developed until Phase 1 is undertaken.

Goals and Objectives

The goal of the proposed project is to provide information to the DWR-FPP that will lead to a full-scale program to reduce fish passage problems in the Sacramento Region rivers and floodplains. The information obtained and developed in this project will help focus restoration effort on a priority basis.

The project addresses the following specific objectives of the CALFED Ecosystem Restoration Program:

- **Develop and implement habitat management and restoration actions in collaboration with local groups such as the Sacramento River Conservation Area Non-Profit Organization.**

The project team proposes to work closely with local stakeholder groups, the Sacramento River Conservation Area, and the Sacramento River Flood Control Project in developing solutions to fish passage problems and stakeholder issues related to potential solutions. Other groups that will be included are the

Sacramento National Wildlife Refuge, California Department of Fish and Game Wildlife Area managers, California Audubon, the California Waterfowl Association, and private wildlife area and land managers. In addition, the project team will work closely with technical advisory teams that have been formed to address ecosystem restoration on the Sacramento River and its tributaries.

- **Restore fish habitat and fish passage particularly for spring-run chinook salmon and steelhead trout and conduct fish passage studies.**

  Our objective is to study adult and juvenile fish passage problems in the Sacramento River Region especially those related to at-risk species such as winter-run and spring-run chinook salmon, steelhead trout, and splittail. Fish passage problems exist for upstream adult migrations and downstream juveniles of each of these at-risk species.

- **Reduce fish stranding in floodplains as a source of mortality to fish populations in the Central Valley.**

  Our objective is to identify stranding areas, determine causes, develop an array of solutions, and recommend specific solutions on a priority basis. Floodplain stranding is also a concern in the bypasses in wet years, but also in river floodplains in many drier years.

Facilities improvements and fish passage programs. Projects should improve fish passage by improving existing facilities or constructing new fish passage and protection facilities, exclusion barriers, repairing weirs, eliminating ponds and removing physical barriers to upstream and downstream migration (Strategic Goal 1, At Risk Species Assessments).

Sutter Bypass. Projects are needed to establish a network of channels within the Sutter Bypass that effectively drains the flooded lands and provides connections with the Feather and Sacramento Rivers to allow juvenile anadromous and resident fish to move from rearing and migratory areas. (Strategic Goal 4, Floodplains and Bypasses)

Fish stranding studies. Studies need to focus on developing programs to reduce or eliminate fish stranding in the active stream channels, floodplains, and shallow ponds and borrow areas. Field surveys are needed to assess fish stranding under a range of flow conditions. (PSP)

Chinook salmon, including at-risk winter-run and spring-run, as well as fall and late-fall runs, steelhead trout, white and green sturgeon, and Sacramento splittail are all presently limited to varying extents by fish passage problems in the Sacramento Valley. Adult salmon and steelhead moving up the rivers may be blocked or become stranded in the Yolo Bypass, Sutter Bypass, Butte Basin, or Colusa Basin. Even in dry years, adults move upstream into drains and sloughs where they become disoriented, and sometimes trapped and lost. For example: salmon are attracted to flows from Yolo Bypass sloughs in dry years when there are no passage ways to the Sacramento River. Salmon are attracted to these sloughs because much of the flow is from irrigation returns whose original source was the Sacramento River. The DWR-FPP staff has recently verified that large numbers of adult salmon migrate upstream into the Colusa Basin Drain only to become stranded in that Basin. Though records are sketchy and there is only limited anecdotal information, CDFG biologists have long known of the problem (Paul Ward, CDFG Region 2, personal communication). Drains in the Butte Basin (Drumheller Slough), Sutter Bypass (Wadsworth Canal), and Yolo Bypass (Cache Creek exit through PG&E's Conaway Ranch) have been identified as locations where salmon and steelhead may move upstream into dead-end irrigation drainage systems. Adult spring-run salmon heading for Butte Creek via culverts at the mouth of Butte Creek on the Sacramento River (near Colusa) are sometimes blocked from entering the Creek by higher water levels in the Sacramento River than the Creek, which force closure of culverts.

rtion of the Sacramento River flow passing through bypasses many adult and splittail migrate upstream via the bypasses and may be blocked by hen water recedes. On the Butte Basin/Sutter Bypass, on the east side of

the Sacramento River, there are three major weir-bypass complexes: Moulton, Colusa, and Tisdale. On the Yolo Bypass, on the west side of the Sacramento River, there are two weirs: Fremont and Sacramento weirs. Adult salmon, splittail, sturgeon, steelhead, and other fish are hindered in places during overflow and may become trapped behind these weirs when Sacramento River overflow subsides. Trapping is a real risk because flow cessation can happen quickly as flows and water levels in the Sacramento River can change quickly.

Downstream passage problems facing wild salmon and steelhead, as well as splittail, are delays, abnormally high predation, and even stranding loss of juveniles within the Sacramento River Region floodplains. At many of the above-mentioned weirs are scour ponds and even concrete energy-dissipating spillway basins that strand young fish when floodwaters recede. The spillway at the Sacramento Weir is approximately one-quarter mile long, 30 feet wide, and 3 feet deep, and has retained hundreds of thousands of salmon fry, fingerlings, and smolts after spill events (Warren Shaul, Jones and Stokes Associates, personal communication). In the Butte Basin there are approximately 50 square miles of managed wetlands with control structures that potentially strand young salmon, steelhead, and splittail directly from the Sacramento River and Butte Creek (Butte Creek flows directly into the basin and the Sacramento River spills into the basin via the Moulton and Colusa weirs). In the Yolo and Sutter Bypasses, there are approximately 100 square miles of fields, wetlands, borrow pits, ditches, and scoured depressions that may strand fish when overflows recede. And overflow events are not confined to just wet years; they may occur during short-term rainfall events in dry and average years. Within the levee system of the Sacramento River Flood Control Project, which includes the Sacramento River, the lower portions of its tributaries, and the bypasses, are hundreds of miles of borrow pits, sloughs, and dysfunctional oxbows that attract young salmon. On the Sacramento River within the Sacramento River Conservation Area from Red Bluff to the mouth of the Feather River there are 100 miles of river with potentially dysfunction oxbows that have resulted from altered flow and sediment regimes or levee and gravel mining disturbances that may trap young salmon and steelhead.

Chinook salmon have a life history tendency for off-channel and non-natal stream rearing (Maslin et al, 1997), which makes them susceptible to stranding in river-valley floodplains. Endangered winter-run and threatened spring-run chinook salmon, as well as fall and late-fall run, emigrating downstream on the Sacramento River or its bypass system move off-stream sometimes many miles into the floodplain. In doing so they are in jeopardy of becoming stranded. Off of the Sacramento River, young salmon move upstream into lower tributaries but also into flood basins such as those associated with the Cross Canal and East Main Drain Canal (both in the American Basin) where they may become stranded when water levels fall. In the past the Cross Canal has been blocked from draining after spring high water to retain water for rice field irrigation – and in the process many off-stream rearing salmon as well as salmon young originating from upstream spawning in Coon Creek and Auburn Ravine have potentially become stranded and lost.

Justification (including conceptual model, hypotheses and selection of project type): This proposal is for research on how to reduce fish passage problems including stranding in the Sacramento River Region. The research involves identification of problem areas and developing engineering concepts that could be applied to reduce or eliminate general categories of problems.

Conceptual Model/Hypothesis #1: Adult salmon and steelhead seek out their natal stream to spawn based on learned recognition of basic elemental components (or "smell") of the source water of the natal streams (Cooper et al. 1976 and Bodznick 1977). Salmon and steelhead from large and small tributaries must detect waters of their natal streams upon returning as adults. With much water diverted from streams for water supply and considerable water returned via basin drains such as the Colusa Drain there is greater potential in drier years for salmon to be attracted to basin drains or

possibly not find their natal streams. Such drains would include slough outfalls from the lower Sutter and Yolo Bypasses, the Colusa Basin Drain (including its connection to the Yolo Bypass - the Knights Landing Ridge Cut), as well as smaller system drains within these basins and others with direct outlets into the Sacramento River (e.g., Cross Canal in the American Basin). Winter-run and spring-run salmon migrating upstream in the Sacramento River seeking upper tributaries of the river may become attracted to the lower Yolo Bypass or Sutter Bypass sloughs and begin migrations through these systems with no chance of succeeding in reaching their natal spawning streams. In years with wet winters and springs with most of the Sacramento River flow in the bypasses, large numbers of adult winter-run and spring-run salmon may choose the bypasses as their route home, only to find their route potentially blocked at weirs at the upper end of bypasses or even somewhere in the bypasses far below the weirs. They may even become stranded if bypass flows cease (as documented below the Moulton, Colusa, and Fremont weirs – Paul Ward CDFG Region 2, personal communication).

We propose to identify potential adult salmon and steelhead (and other anadromous fish) "straying-stranding" problems as possible through interviews, map and air photo analysis, and field reconnaissance. Each site and associated causal attributes will be documented, and potential engineering solutions identified.

Conceptual Model/Hypothesis #2: Juvenile salmon, steelhead, and splittail become stranded in such numbers in Sacramento Valley floodplains that populations and escapement suffer sufficiently to impede recovery of at-risk populations or limit production of other populations. Mortality from stranding may occur from excessive predation, delays in migration, or outright death from desiccation or high water temperature. During flooding when the bypasses and flood basins are full and tributary river floodplains are flooded, juvenile salmon permeate the margins of the flooded areas and are susceptible to stranding when waters recede and flood control and water supply structures block or impede draining. Dauble et al. (1989) found that subyearling chinook preferred shallow near-shore locations in slower river velocities, and yearling chinook smolts preferred deeper mid-channel locations where river velocities are greater.

We propose to survey in such areas to document fish attraction to such habitat and to determine if stranding occurs to a significant degree in areas where structures impede draining.

Conceptual Model/Hypothesis #3: Floodplain construction (e.g., aggregate and dredger mining, levees, bridges, borrow pits, ditches, agricultural fields, managed wetlands, and urban encroachment into floodplains) causes dysfunctional river and bypass floodplain configurations, that lead to stranding of juvenile and even adult fish. There are many areas where development has encroached on Central Valley floodplains and caused fish passage problems.

We propose to show how development causes direct or indirect geomorphologic configuration in the floodplain that leads to fish passage problems through elevation of before and after floodplains where data is available. We plan to identify engineering solutions or prescriptions that could be implemented to minimize fish passage problems.

Conceptual Model/Hypothesis #4: Modified hydrology in rivers and floodplains leads to sharply ascending and descending hydrographs and flood stages that further contribute to the stranding potential. In bypasses flows can drop abruptly, quickly stranding adults and juvenile fish in open dewatered bypasses and in flooded basins. In river floodplains, levees allow young fish access to high terraces and borrow pits on or behind high terraces that are remnant from levee construction. High stage on the Sacramento River at relatively low flows leads to rapid flooding and draining of lower river floodplains adjacent to the levee-reach of the Sacramento River.

We propose to show how floodplain structures may cause fish passage problems, including stranding under the existing hydrology regime of the Sacramento River Region. For example, we will show how Sacramento River flow relates to river stage on lower tributaries, which in turn relates to non-natal rearing and floodplain borrow pit access to fish and the potential for stranding. We will show how bypass flows can abruptly fall and strand adults and juvenile fish in bypass floodplains areas where draining is hindered or blocked by structures. Such problems will require specialized engineering solutions.

Conceptual Model/Hypothesis #5: Healthy river ecosystems with natural hydrographs, normal sediment supply, and natural floodplains have configurations that do not lead to stranding. Floodplain features such as side channels and oxbows often (but not always) retain connections that provide access and escape routes for rearing salmon. Floodplain terraces also are relatively well drained and have few structures or borrow pits that cause stranding of young salmon.

We plan to find and show up to 20examples of healthy functioning floodplains and relate what physical and biological characteristics allow them to function effectively. With this knowledge we will determine which floodplain structures limit natural function and develop potential engineering solutions that will provide more optimal habitat and minimize passage problems.

Conceptual Model/Hypothesis #6: River channel constrictions, such as levees, can lead to atypical erosion, scour, and deposition in floodplain and river terraces that increase stranding of juvenile fish. Terrace and floodplain deposition may also be remnant from historic placer mining that coupled with floodplain development has led to configurations that cause fish passage/stranding problems. High amounts of placer mining sediments contained in river floodplains of the American, Feather, and Yuba Rivers continue to limit natural physical and biological processes. Flood control structures and bank stabilization may cause unusual scour or deposition that hinder or block fish passage.

We propose to study and show how flood control and bank stabilization may lead to fish passage problems and provide engineering and biological solutions that provide better habitat and passage, and reduce the risk of stranding.

Conceptual Model/Hypothesis #7: Natural or well-configured floodplain habitats such as sloughs, flooded riparian forests, oxbows, and side channels offer rearing habitat that results in good potential growth and survival to juvenile salmon, steelhead, splittail, and other native fishes. Improvements in fish passage could potentially increase salmon, steelhead, and splittail production in the Sacramento Valley.

We propose to evaluate the potential benefits of reducing fish passage problems in the Sacramento River Region in terms of potential survival and production. Potential pilot experiments will be identified for possible implementation in Phase 2. The potential benefits will be determined for the array of stranding problems defined, which will help in prioritizing the order in which problems are addressed.

Uncertainties: Our present understanding of adult and juvenile stranding in the Central Valley is limited to anecdotal observations and selected small-scale studies of the problem (e.g. Jones and Stokes 1999, DWR-IEP Yolo Bypass studies). It is unknown how much habitat in the Sacramento Valley floodplains poses risk to stranding. The extent and effect of adult passage delays and stranding is also unknown. We will also address engineering and cost of solutions. With cost we will have the three essential elements for planning remediation: risk, effect, and cost.

The numerical effect of passage and stranding problems to adult and juvenile fish on populations is also unknown. Knowing the risk and potential for effect are essential ingredients for prioritizing fixes and restoring fully functional habitats. Do fish leave their stranding situation if given an opportunity? What does it take to induce their escape? For example, Jones and Stokes (1999) discovered that opening a culvert to a 17-acre stranding pond in the American River floodplain did not induce tens of thousands of stranded fall-run chinook salmon fingerlings to leave the pond—they appeared to like where they were or were incapable of finding the exit. In contrast, the hundreds of stranded winter-run smolts in the pond left almost immediately, and were obviously able to quickly find the culvert exit so they could continue their journey to the ocean.

The research aspect of the proposed project involves both biological and engineering elements. In the biological elements we hope to learn more about the relationship of fish and their floodplain habitats. What behavior characteristics do they have and what factors do they respond to in migrations and in dispersal into rearing habitat. Within the engineering element we hope to develop a "tool-box" of engineering solutions to the array of problems identified. For example, we would like to consider different designs for excluding adult salmon and steelhead from entering drain outlets or ways to allow escapement from the upper ends of drains. We would develop alternative means of configuring weirs and bypasses so that fish do not become stranded when overflows cease. Even then, risks may not be alleviated and an effective solution may require providing permanent flows to bypasses and drainage systems within bypasses to allow adult and juvenile fish to continue their migrations or rearing elements of the life history. Permanent flows to bypasses would mean pumps and fish passage components (e.g., ladders). Permanent flow may also lead to greater amounts of habitat particularly in years when there is no overflow into bypasses. The proposed studies should provide considerable insight into whether permanent flow may be needed in the bypasses.

Upon completion of this research we will be better able to define the extent of the problem, the potential solutions, and priorities for restoration. With the information we then can design pilot studies to test the effectiveness of various solutions, which should ultimately lead to full-scale restoration with priorities identified and appropriate cost-effective engineering prescriptions. Without the knowledge we would obtain from this project, we would be faced with a vast array of fish passage problems that we would either ignore or "shop" projects on an arbitrary basis based whim or political-social pressures.

Adaptive Management: Given the vast extent of the Sacramento Valley floodplain and the lack of information presently available, our proposed study has many elements that are relatively undefined or lack precise experimental design at this time. Our experimental design is thus necessarily fluid and subject to change based on what we learn in first year tasks (i.e., mapping, reconnaissance surveys, stakeholder involvement, literature review, and knowledge from other river systems). A more detailed and precise design of second and third year pilot studies and focused research (Phase 2) will be a product and deliverable of the first year study (Phase 1). The results of focused second and third year research and pilot studies (Phase 2) will form the basis of a detailed and comprehensive full-scale restoration plan and the supporting environmental documentation that are the products of the third-year year of the project. Even the proposed first year research and reconnaissance surveys will necessarily involve considerable adaptive management based on information being collected and received by the project.

Approach

The proposed project includes the first phase of a three-phased long-term program to reduce fish passage problems in the Central Valley. The first phase represents studies outlined for the proposed one-year grant.

Phase 1 (Year One) - The first phase involves developing information and planning tools for the project, and developing a research and pilot study plan for Phase 2. The basic approach to the proposed study is to identify potential fish passage and stranding problems in the Sacramento Valley, inventory individual sites, conduct site-specific reconnaissance of a representative sample of sites, and store site information in an Arc-View GIS database. Phase I involves developing and populating the database with information readily available, analyses of the information from interviews and stakeholder involvement, and then developing a plan with appropriate environmental documentation for Phase 2 of the program.

Task 1-1: Develop a program plan for Phases 1 through 3 of the program. DWR-FPP and DWR-FMD staff, with support from its consultants including those funded under this grant, will develop a program plan that includes scope, schedule, and budget. The plan will detail performance goals and measures of performance.

Task 1-2: Develop Arc-View GIS database of the Sacramento River Central Valley floodplain and fish passage/stranding problem areas-locations. A new database for fish passage problems will be developed for the program from existing DWR-FPP GIS databases. The elemental database and base maps will be disseminated to program teams with instructions and training for using and populating the database with information.

Task 1-3: Obtain and review maps and aerial photos of Sacramento River Valley rivers and floodplains. Existing topographic information (e.g., quad maps, digital topography) and aerial photographs will be reviewed and information on up to 20 specific sites where passage problems may exist will be transferred to the GIS database.

Task 1-4: Conduct interviews with knowledgeable agency staff and stakeholders who may have information on specific passage problems and place relevant information obtained (e.g., maps, photos, anecdotes, and data) in the GIS database for the specific locations/problem areas.

Task 1-5: Collect and analyze information on historical stage and hydrologic data and biological data for areas where fish passage problems may occur. Input relevant information to GIS database.

Task 1-6: Conduct preliminary assessment of potential fish passage problems using information available for the identified sites from first five tasks. Identify potential problems in GIS database and prepare preliminary Phase 1 assessment report that includes recommended sites for recon surveys. The report will include a listing of potential engineering solutions which are applicable to the different stranding problems identified. Constraints and opportunities relative to the technical feasibility for implementation of engineering solutions will also be discussed, such as hydraulic limitations, water delivery commitments, and general constructability issues. A partial list of potential solutions are provided below

Problem	Potential Solutions
Fish migrating upstream in river bypasses, become stranded in ponds and shallow channels when the flood recedes.	Construct or interconnect collection channels to provide a deeper passageway for fish migrating upstream. Provide a continuous supply of water in the bypass during non-flood periods so fish will not be stranded. This can be achieved with a low flow notch or water pumped from the main river channel. Provide barriers such as side weirs and gated structures on side sloughs and channels where fish should not enter.

Problem	Potential Solutions
Fish migrate upstream in bypass and get stranded behind the bypass weir.	Provide a means for the fish to get past (over the weir), such as a ladder and or a low flow notch in the weir. Provide a continuous supply of water during non-flood periods so fish will not be stranded, and to provide attraction water at the ladder.
Downstream migration is hindered when juvenile salmon and steelhead enter bypass channels during high flood flows.	Provide a continuous supply of water during non-flood periods so fish can continue downstream. This can be achieved with a low flow notch or water pumped from the main river channel.
Borrow pits, mining dredger pits on the water side of levees and along floodplain of non-leveed reaches trap salmon and steelhead as river flow recedes	Fill these pits or interconnect them to the main river channel creating a secondary side channel or a return channel.
Old river oxbows and side channel no longer connected to the main river. High water fills these traps as water recedes, fish are left.	Construct or interconnect collection channels to provide a passage back to the main channel.
Leveed systems along the main rivers where tributaries without adequate levees flood at higher than historic levels due to backwater. Fish get stranded in these floodplains behind levees and in ponding areas.	Construct or interconnect collection channels to provide a passage back to the main channel. Set levees back in the tributaries to provide habitat and an area to restore channelization and terracing within the over-back.
Older leveed systems where breaches create flooding in overbank, but do not provide adequate return flow passage.	Remove larger sections of levee and provide return channels.

Many of the solutions require supply of a continuous flow into bypass reaches during migration when flood flows recede. The analyses in Phase I will address the costs to construct pumping facilities and the maintenance and operational costs to provide enough flow for a sufficient period of time to meet objective numbers of fish passage. Fish ladders and barriers considered will consist of conventional concrete structures, inflatable dams, screw pumps, and gated barriers. Other solutions would require earth movement for pond filling and channel construction.

Task 1-7: Conduct reconnaissance surveys of potential fish passage problem areas. Reconnaissance surveys will include biologists and engineers who will assess potential problems and solutions for problem areas identified in Task 1-6. Additional areas and potential problems may be identified during reconnaissance surveys. Only basic biological, geomorphologic, and social information will be collected at each site/area. Permission will be sought from regulatory agencies to collect basic reconnaissance-data at these sites including the limited use of seines and trap nets to determine species composition and relative abundance of fish in survey areas at the time of reconnaissance surveys. No research or monitoring will be conducted in Phase 1. Relevant information will be placed into GIS database.

Potential engineering solutions identified in Task 1-6 will be considered at each identified site during the reconnaissance surveys. Engineers will inventory the site conditions relative to possible solutions and will outline the technical evaluations necessary to establish the feasibility of the potential solutions. Along with gathering pertinent site data through photos, water samples, and rough physical measurements, engineers will determine the need for additional investigations such as topographic surveys and geotechnical explorations for each site to be conducted in Phase II of this program.

Task 1-8: Perform a review, synthesis, and analysis of information available, and develop an assessment of potential fish passage problems and potential engineering solutions. The task includes analysis of available information collected in Task 1-7, including maps, aerial photographs, electronic topography data, and flow and stage gage data, along with a comparison with available information of the potential presence of juvenile salmonids and splittail in time and space in the Central Valley floodplain (from reconnaissance surveys or other available information). Team engineers from DWR-FPP, DWR-FMD, and consultants working with team biologists will develop preliminary design concepts for problems areas. An array of potential engineering solutions and tools will be developed with basic cost estimates to address each problem area. Potential engineering solutions will then be developed for each problem site in the database. At this stage of the process, engineering solutions such as pond back-filling, pump stations, fish ladders, and barriers will be hydraulically analyzed and specific components will be sized based on stream data gathered, the physical site conditions, and desired flow requirements specified by the project biologists. Conceptual design (10-percent) will be completed and preliminary opinions of probable costs cost will be estimated under this task. The database will show complete information for each problem site/area. Sites will be ranked relative the significance of passage problem and cost to alleviate problem.

Task 1-9: Prepare final Phase 1 assessment report. The preliminary Phase 1 assessment report developed in Task 1-6 will be updated with information from Tasks 1-7 and 1-8.

Task 1-10: Develop study design and research plan for focused research and pilot studies (Phase 2). The task will entail the project team working with stakeholder and resource agencies via workshops and other communications to develop a design and plan for Phase 2 studies.

Task 1-11: Prepare environmental documentation for Phase 2 studies. An Environmental Assessment (NEPA) and Initial Study (CEQA) document including Biological Assessments of ESA species will be prepared to cover planned research, monitoring, and pilot studies in Phase 2. This task covers all tasks leading to obtaining the necessary permits for Phase 2.

Task 1-12: Perform project management activities to ensure the project runs smoothly, provides timely and quality deliverables, and completes the assigned tasks as planned on schedule and on budget. Project management will also be responsible for project planning, progress reports, communications, and liaison, as well as preparation and dissemination of deliverables.

Phase 2 (Years Two and Three) – Phase 2 includes conducting research and pilot studies, and developing a plan for full-scale restoration along with environmental documentation. Funding for Phase 2 is not being requested at this time.

Task 2-1: Conduct research and pilot studies prescribed in Phase 2 Plan developed in Phase 1.

Tack 2-3: Develop Plan for Full-Scale Restoration Program (Phase 3).

Task 2-4: Prepare environmental documentation for Phase 3. An Environmental Assessment (NEPA) and Initial Study (CEQA) document including Biological Assessments of ESA species will be prepared to cover planned full-scale restoration in Phase 3. This task covers all tasks leading to obtaining the necessary permits for Phase 3.

Feasibility

The study plan developed for this project will go a long way toward evaluating the risk to Sacramento River Valley salmon and steelhead populations from fish passage problems caused by river and

floodplain development. Phase 1 activities should provide considerable knowledge as to the extent of the problem, the types of solutions that can be employed to alleviate the problems, and where we should focus attention in the coming years. The studies proposed in Phase 1 are not dependent on the weather, although information and knowledge learned would be somewhat different with a wet year versus a dry year.

Technical feasibility of solutions will be partially established in the Phase I efforts through detailed hydraulic analyses and extensive database application. To refine the technical feasibility and establish more precise project costs, implementation of Phase II efforts will be necessary. Once pilot study locations and related project components are identified, additional evaluations such as geotechnical explorations and detailed topographic surveys will be necessary to finalize engineering feasibility of the proposed solutions.

Information gained on fish communities and relative abundance in floodplain habitats and on the extent of stranding would be more extensive and helpful if we gain permission to sample fish in the rivers and floodplain problem areas that we identify. The program upon commencing the project would seek such permission immediately from ESA agencies. In some cases it will be necessary to obtain landowner permission to gain access to specific properties; however, most of the lands in the river floodplains is in public ownership.

Performance Measures

Performance on this project will be based on the following criteria:

- The extent and accuracy of the information collected in the database.
- The quality of engineering design options that are developed for solving the array of identified passage problems.
- The quality and completeness of the environmental documentation for Phase 2 of the program.
- The ability to reach applicable stakeholders and to enlist their ideas, information, and support for the program.
- The quality and thoroughness of the Phase 2 plan delivered at the end of the first year of the program.
- The project can also be judged on the number and quality of presentations it makes to various groups to disseminate and obtain information related to fish passage problems in the Sacramento Valley.

Information on the project will be published in CALFED, AFRP, and IEP newsletters and web sites. The number, timing, and quality of these accounts will be a measure of performance.

Publications are planned of the information collected to the scientific literature locally in California and nationally. A performance measure will be how much information is exchanged with other such programs in western North America where salmonid populations are at risk from river and floodplain development.

Feedback on the preliminary designs will be solicited and ideas exchanged from the various agencies and organizations will be summarized in the program database. The program will develop and implement a project plan (Task 1-1) that specifies the performance measures outlined above and provides for periodic measure of performance.

Data Handling and Storage

The proposed project is fundamentally one of data collection, handling, and storage in the form of an Arc-View database. Information about each identified problem site/area will be maintained in this geographic based database. Photos, videos, facts, reconnaissance reports, monitoring and surveillance data will be stored for easy access. In most cases, most of the information collected on a site can be accessed through a simple click of a site location on an Arc-View database map. Information will also be available in database program formats compatible with Arc-View such as Microsoft® Access. The program will work with the CVPIA CAMP database, CALFED CMARP, or IEP database with web connections to make survey data available. Conceptual design will also be illustrated in the Arc-View database. References to obtain concept details and back up engineering data will also be provided.

Expected Products/Outcomes

The program's Phase 1 will generate the following list of products in general order of development or delivery:

- Program Plan - (9/31/02)
- Arc-View database – (9/31/02-8/31/03)
- Preliminary Assessment Report – (1/31/03)
- Reconnaissance survey reports -- (10/31/02-6/30/03)
- Engineering solutions report -- (6/30/03)
- Final Phase 1 Assessment Report -- (7/31/03)
- Phase 2 Study Design and Research Plan – (8/31/03)
- EA/IS/BA environmental report -- (8/31/03)

In addition to these deliverables, the Phase 1 Program will contribute the following:

- A public seminar/workshop on fish passage problems in the Sacramento River Valley. (Fall 2002)
- A presentation at a CALFED Science or IEP meeting. (Winter 2003)
- A presentation at a stakeholder meeting such as an annual ACWA meeting. (Winter 2003
- Periodically updated information on a DWR, CALFED, or AFRP web site. (Fall 2002-Summer 2003)
- A paper in a regional scientific journal such as the California Fish and Game Journal or other scientific journal that publishes articles on fisheries science or water resources management. (Fall 2003)

Work Schedule

Task	Start Date	Completion Date
Task 1-1: Develop program plan.	9/1/02	9/30/02
Task 1-2: Develop ArcView Data Base	9/1/02	8/31/03
Task 1-3: Obtain geographic information	9/1/02	9/30/02
Task 1-4: Conduct interviews	9/1/02	6/30/03
Task 1-5: Collect and analyze data	9/1/02	12/31/02
Task 1-6: Conduct preliminary assessment	1/1/03	1/31/03
Task 1-7: Conduct reconnaissance surveys	10/1/02	6/30/03
Task 1-8: Perform review, synthesis and analysis	6/1/03	6/30/03
Task 1-9: Prepare Phase 1 Report	7/1/03	7/31/03
Task 1-10: Prepare Phase 2 Plan	6/1/03	8/31/03
Task 1-11: Prepare EA/IS/BA for Phase 2	7/1/03	8/31/03
Task 1-12: Project Management	9/1/02	8/31/03

The payment schedule for each task would be invoiced monthly for each task minus 10% that is invoiced later after completion of the task. For example, project management would be invoiced for 1/36th of the contract amount for that task each month minus 10% of the total to be withheld until completion of the task, which in the case of project management would be the last deliverable.

B. APPLICABILITY TO CALFED ERP AND SCIENCE PROGRAM GOALS AND IMPLEMENTATION PLAN AND CVPIA PRIORITIES

ERP, Science Program and CVPIA Priorities

This proposal addresses Sacramento River priorities for restoration actions. It is a collaborative effort to develop and implement habitat restoration and provide fish passage (SR-1). In collaboration with the DWR-FMD the project involves planning and resources of the Comprehensive Study. The project involves the Sutter Bypass and Sacramento River corridor and fish stranding studies, as well as all the objectives of Strategic Goal 4, Fish Passage. The project is the first of three phases that will lead to full-scale restoration of fish passage/stranding problems in the Sacramento River Valley.

Relationship to Other Ecosystem Restoration Projects

The project enhances the planning and resource capabilities of the DWR-FPP to address fish passage and stranding in the Sacramento River Valley rivers and floodplains. The DWR-FPP is striving to perform objectives of the CALFED, CVPIA, and Comprehensive Study throughout the Central Valley. The DWR-FPP and DWR Northern District work closely with the SRCA and manage the SB 1086 Program. The DWR-FPP and DWR-FMD are working closely to restore fish habitat and reduce fish passage problems throughout the Sacramento River Region. The project team will also work closely with the CVPIA-AFRP in addressing identified fish passage problems along the Sacramento River and its tributaries. The DWR-FMD has worked closely with such programs as the Butte Creek/Sink Fish Passage Project (Ducks Unlimited, California Waterfowl Association, and local stakeholders), a project that has received considerable funding from CALFED and the CVPIA-AFRP that has been instrumental in improving fish passage and restoring spring-run chinook salmon on Butte Creek. The project team will work with these programs and build upon these and other efforts in the region. Where possible, local support and sponsors for potential restoration projects identified will be sought.

The proposed project compliments studies in the Sacramento River Conservation Area being conducted by the DWR Northern District and others. It also compliments ongoing studies of fish passage in the Butte Sink, Sutter Bypass, and Yolo Bypass already undertaken by stakeholder groups. For example: DWR-FMD is already a partner in Ducks Unlimited's study of fish passage through

the Butte Sink and Sutter Bypass – a study funded by CVPIA-AFRP. The DWR-FMD also participates in Yolo Basin Foundation planning studies under grants from CALFED.

Previous Recipients of CALFED Program or CVPIA funding

HDR has been indirect recipients of program funding to Turlock Irrigation District. As an engineering contractor to Turlock Irrigation District for Tuolumne River fish passage projects, HDR has been responsible for the design and construction of projects to improve fish passage in the Tuolumne River. Initial phases of the project were recently completed and a dedication ceremony held that was attended by CALFED's director Patrick Wright and Mary Nichols head of the California Resources Agency.

System-Wide Ecosystem Benefits

Fish passage restoration directly links to habitat restoration studies, as both go hand in hand. Reducing fish stranding in floodplains generally coincides with improving floodplain habitat for rearing, which involves improvement in riparian and wetland habitats for native Central Valley species including many at-risk species. In rare cases, fixes for stranding or passage problems may involve loss of wetland habitat; however, in most cases alleviating passage and stranding problems will involve expanding riparian and wetland habitats in floodplain to provide more access and escape routes to fish. Improving fish passage often can lead to substantial benefits to specific populations as the remarkable recovery of the Butte Creek spring-run chinook salmon exemplifies. Fish passage restoration in the Sacramento Valley has the potential to provide substantial benefits to other salmon and steelhead populations as well as sustaining the improvements seen in Butte Creek salmon. Benefits may also be seen in expansion of the Bay/Delta splittail and sturgeon populations.

SUMMARY

- Goals and Objectives
- Applicability to CALFED/CVPIA goals and gaps in region)
- Justification (including project type - research, pilot, full-scale
- Approach (study design, information richness and value)
- Technical Feasible and Probability of Success
- Performance Measures
- Linkages to other projects in region
- Local constraints
- Value of Products
- Qualification (capabilities and track record, ability of team to accomplish work)
- Cost benefits (budget adequacy)
- Engineering Approach and Justification
- Engineering Feasibility and Likelihood for Success
- Post Construction Evaluation
- Strategic Benefit
- Implementation Plan Priority
- Next-Phase Funding
- Ecological Benefit
- Information Value
- Public Support and Implementability

C. QUALIFICATIONS

The project team consists of staff from HDR Engineering, Inc.'s, Sacramento office and other office locations. The team includes fisheries biologists, terrestrial biologists, environmental engineers, and civil engineers from the following HDR programs:

HDR Engineering, Inc.

- *Founded in 1917*
- *60 offices*
- *Over 3,000 professionals*

- ***Riparian Engineering*** – multidisciplinary team that evaluates all impacts to a waterway's riparian zone and designs solutions to reduce those impacts. The team specializes in developing innovative approaches to bank stabilization, improving riparian and SRA habitat, increased flood flow conveyance, and aesthetics. Members of this team are presently working on the USACE Site-5 Levee Project on the lower American River near Watt Avenue.

HDR Ranks
#26 in Top 200 Environmental Firms

Source: 2001 ENR Sourcebook

- ***Creek Habitat Restoration*** – a multidisciplinary team that has designed and constructed creek relocation and restoration projects that improve creeks abilities to handle floods, while enhancing aquatic habitat and community aesthetics. By incorporating methods from bioengineering, river engineering, and environmental sciences, the team's restoration techniques represents a holistic approach that focuses on balancing the needs of all users of the creek system. Members of this team are actively involved in the channel restoration projects on the lower Tuolumne River under contract to the Turlock Irrigation District with funding from CALFED and the AFRP. The team has restored several urban creeks for the City of Anchorage, Alaska.

- ***Hydraulic Evaluation*** – Understanding the hydraulics and hydrology of a restoration site is an integral part of designing effective solutions. HDR has developed broad capabilities in understanding hydraulics and hydrology through challenging projects in Alaska flood control projects where salmon habitat was also restored, and projects in California including the Upper Penitencia Creek Project for the Santa Clara Valley Water District. Members of the design team are hydraulic engineers and modelers who determine forces and sediment transport a various design flows and creek configurations. They team uses models including HEC-2 and HEC-RAS to design appropriate channel configuration and hydraulic structures such as boulders and large woody debris to dissipate energy and protect the streambed from excessive scour.

- ***Bank Stabilization*** – HDR specializes in both traditional and state-of-the-art environmentally sensitive bank stabilization projects. HDR engineers experiment with low-tech, low-cost stabilization materials such as fiber logs, vegetated geogrids, and native materials including large wood and cobbles/boulders. Example projects include the levee design for Site-5 on the LAR and the Theodore River in south-central Alaska, where root wad revetments were used to protect a road and bridge.

- ***Environmental Resources Management*** – The ERM program is a multidisclinary team of scientists and planners who focus on monitoring and assessment of biological, chemical, and social impacts of development. Experience includes environmental monitoring, assessment, and documentation for the following recent projects:

  - Bryte Bend Water Intake Screen for the City of West Sacramento on the Sacramento River (NEPA-EA; CEQA-IS; ESA-BA)

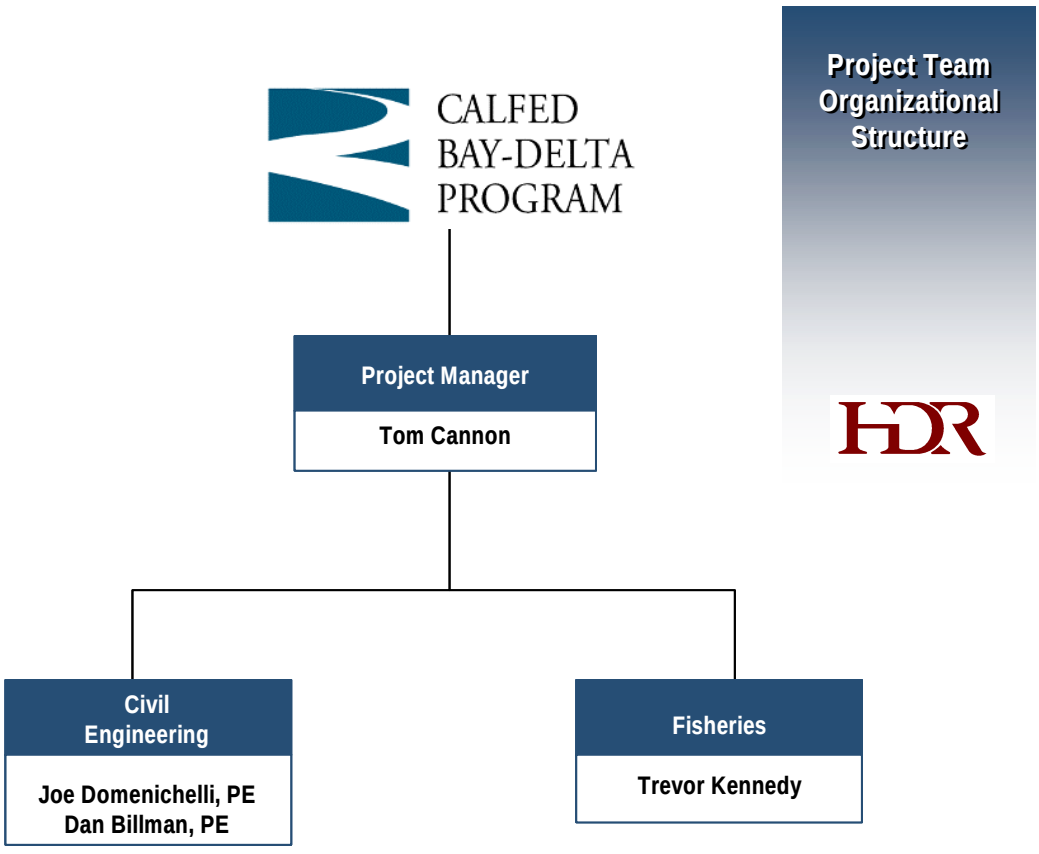
  - M&T Chico Ranch Water Intake System maintenance on the Sacramento River (CEQA-IS)

- Northgate Boulevard Flood Project – City/County of Sacramento

- ***Design and Construction*** – The cornerstone of HDR's team is its design and construction capabilities, most notably our ability to produce clear plans and specifications for restoration and stabilization projects. HDR tailors plans and specifications for each construction venue. Bryte Bend and Site-5 were recent projects with designs and specifications. Design and construction supervision experience includes the Lake Natoma Crossing, recently completed in Folsom.

The following are biosketches of key HDR staff.

Dan Billman, P.E., is proposed as senior design engineer on the project team. He has a B.A. in Ecology and a B.S. and M.S. in civil engineering. He specializes in designing instream and riparian habitats in river floodplains, and conceptual and final designs, permitting, and flood hazard analysis. He has developed innovative techniques for restoring salmon habitat in flood conveyance channels including replacing habitat-poor riprap revetments with root wads and vegetation. Mr. Billman's capabilities include HEC2 analysis, scour analysis, as well as hydrology and hydraulic studies. In Alaska he has successfully designed and built numerous stream and wetland rehabilitation projects including several involving restoration of salmon habitat in floodwater conveyance channels. As project manager for restoring several Anchorage areas creeks, he conducted anadromous fish habitat surveys of project reaches, developed habitat improvement designs, evaluated culvert sizing, performed HEC-2 modeling, carried out permitting (Section 404, flood hazard, and park use permits), and prepared final design drawings.



Tom Cannon is proposed as the stream habitat specialist on the project team. He will also serve as assistant project manager. Mr. Cannon has a B.S. in fisheries and masters in biology and biostatistics. He is a stream ecologist and habitat assessment specialist with an extensive background in salmonid habitat assessment. He has been a key participant in the CALFED program since its inception in 1995, having contributed to the Ecosystem Restoration Program Plan, the Multi-species Conservation Strategy, EIR/EIS, Upper Yuba River Studies Program, and Stage 1 Implementation Plan. His experience on the American River includes working with SAFCA, the Water Forum, and East Bay Municipal Utilities District (EBMUD) on various projects including the aquatic habitat section of SAFCA's Floodway Management Plan, a precursor to the River Corridor Management Plan. He has considerable experience working with local stakeholder groups including the Lower American River Operations Group, Lower American River Task Force, and the Lower American River Fisheries and Instream Habitat (FISH) Group, and the Lower Yuba River Fisheries Technical Team. Other

experience includes working with the AFRP and CDFG Region 2 fisheries staff. Tom also has extensive CEQA, NEPA, ESA, and permitting process experience (e.g., CDFG Streambed Alteration Permit).

Joe Domenichelli, P.E., is proposed as senior design engineer on the project team. He has over 20 years of experience in water resource engineering. He specializes in designing water conveyance and flood control facilities. He has been the engineer of record on several levee improvement projects, channel and pipeline conveyance systems and most recently a large river restoration project. His capabilities cover a wide range of computer modeling analysis including USACE HEC models, water distribution modeling, scour analysis, as well as hydrology and hydraulic studies. During work experience in hydroelectric generation, he provided analysis and preliminary designs for fish barriers, screens and ladders, as well as preparation of permitting and environmental documentation for these projects. He has worked with landowners and the Department of Fish and Game on restoration work on a stream located in the coastal mountains for the protection of steelhead trout. On the most recent Tuolumne River Restoration Project, Joe has design restoration features to enhance the habitat for migrating chinook salmon, as well as the design of innovative facilities for irrigation diversion using an infiltration gallery below the riverbed. Other related work has included fish passage design for salmon crossing through large highway under-crossings on the Calaveras River, and fish flow design analysis for a bypass weir in the Santa Clara valley.

D. COST

Please see electronic forms.

E. LOCAL INVOLVEMENT

The proposed project will work within DWR's Fish Passage Program and Flood Management Division, which have well established stakeholder involvement and coordination system already implemented. For example, DWR works closely with landowners and stakeholders on existing Yolo Bypass, Sutter Bypass, and Butte Sink projects, as well as the Sacramento River Conservation Area (through the Northern District). Because the proposed project involves the entire Sacramento Valley, there will be many potential stakeholders interested in the findings and plans of the project. The DWR-FPP and DWR-FMD will use well-established processes to involve stakeholders in the project to determine their support or opposition to any element of the program. Resource agencies including the USFWS, NMFS, and CDFG are also involved and supportive of the DWR programs. Local watershed technical groups will also be involved – two examples of working with DWR are the Lower Yuba River Fisheries Technical Team and Lower American River FISH Group.

F. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

HDR Engineering Incorporated agrees to the Terms and Conditions with the exception of the following suggested modification to Item 11 identified with underlining.

11. Indemnification: The Grantee agrees to indemnify, defend, and save harmless the CALFED agencies, the State of California, the Resources Agency, the Department of Water Resources, and the National Fish and Wildlife Foundation and their officers, agents, and employees from any and all claims and losses accruing or resulting to any or all contractors, subcontractors, material persons, laborers, and any other person, firm, or corporation furnishing or supplying work services, materials, or supplies in connection with the performance of this contract, and resulting from the negligence of the Grantee, and from any and all claims and losses accruing or resulting to any person, firm, or corporation who may be injured or damaged by the Grantee in the negligent performance of this Agreement.

G. LITERATURE CITED

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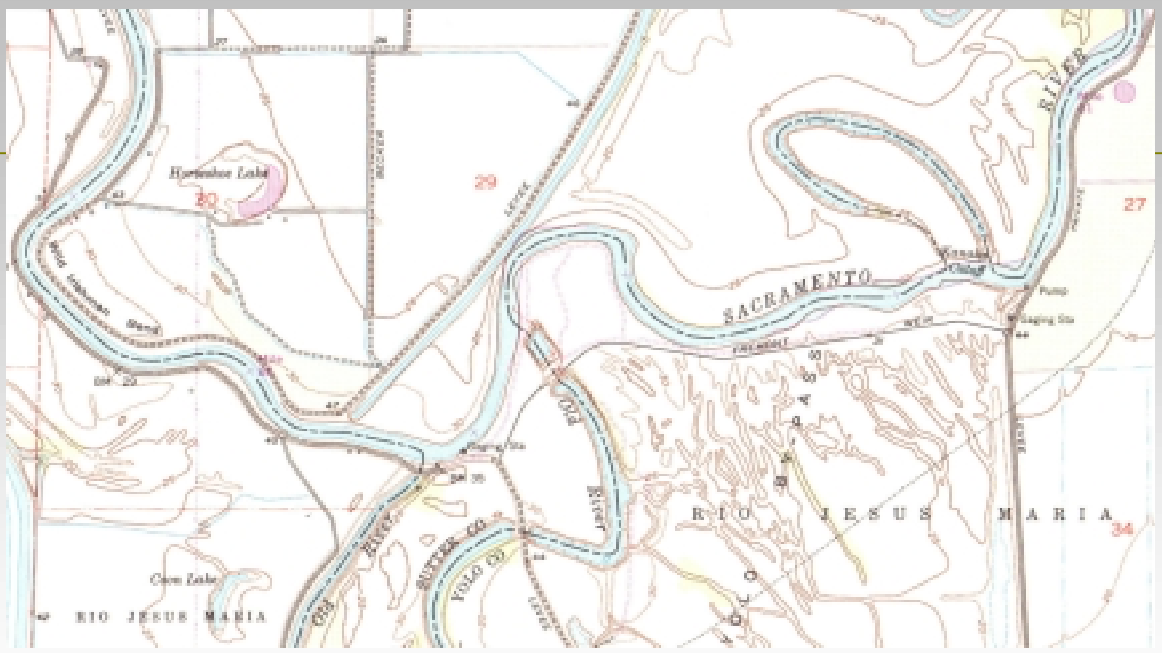
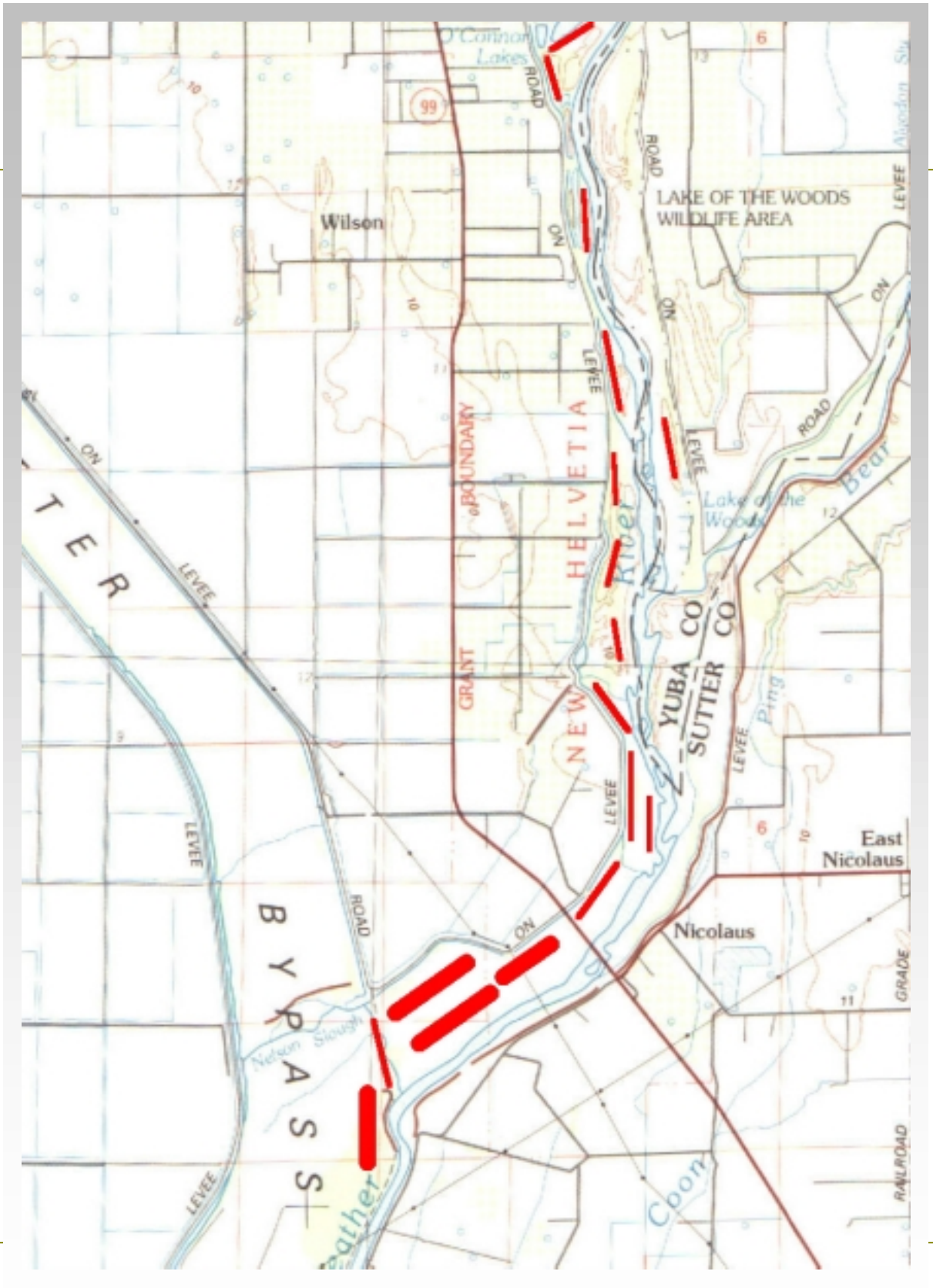
Lower American River Floodplain - The lower 5 miles of the American River has a floodplain on the north side that strands juvenile salmon from the Sacramento and American rivers. Areas outlined in red are known areas of floodplain where young salmon have become stranded after high water. The floodplain is a backwater of the Sacramento River when Sacramento flows are high. Young salmon move into riparian habitats of floodplain when flooded. When water levels drop, which can be quickly on the Sacramento, hundreds of acres of isolated ponds remain with stranded salmon.

Borrow pits along North East Main Drain Canal near new Arden-Garden Bridge in lower American River floodplain. Large numbers of juvenile salmon were stranded in the spring of 1999. Some of these young salmon may have come upstream from the Sacramento River.

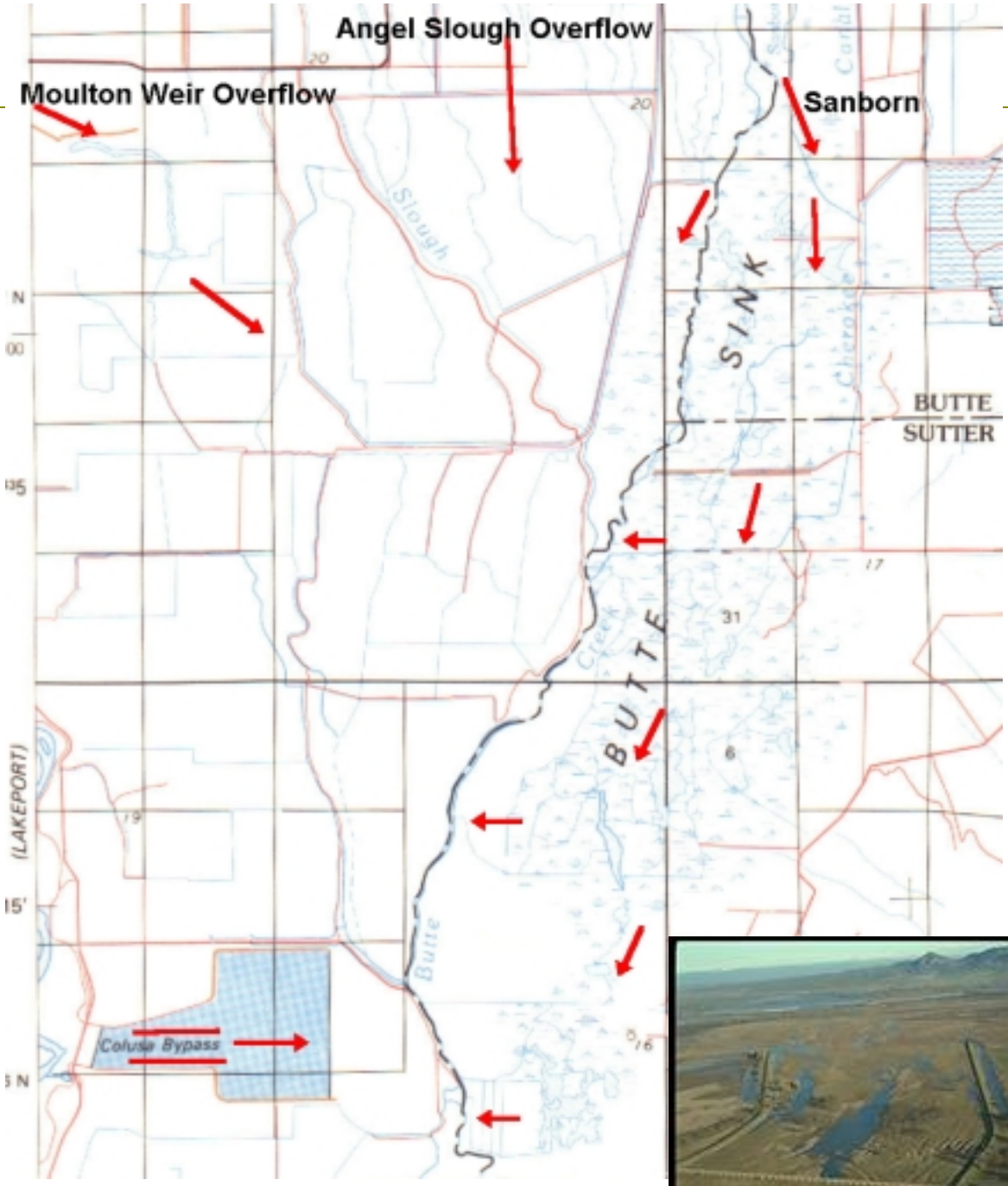


Fremont Weir – Yolo Bypass: At the upper end of the Yolo Bypass the Fremont weir spills water from the Sacramento River when the river reaches 31-ft elevation. The Sutter Bypass enters the Sacramento River opposite from the weir from the North. At flood flows Sacramento River salmon move up and down the Sutter Bypass, over the weir and down the Yolo Bypass, or down the river. Just in the area of the weir there are many areas where fish may become stranded when the water recedes. There also many less permanent ponds and sloughs on both the Sutter and Yolo sides that strand young salmon as well as adult salmon and sturgeon.

Lower Yuba River at Gold Fields - During very high flows the lower Yuba River overflows its restraining walls near Daguerre Dam and spills into the Gold Fields upstream of Marysville. Winter events such as these take young salmon and steelhead into the Gold Fields where they are eventually lost to stranding. Adult salmon and steelhead also migrate into the Gold Fields at various outlets.



Lower Feather River floodplain borrow pits where young salmon are known to become stranded after periods of high water.



Butte Sink System Fish Passage - In wet years overflows from the Sacramento River enter Butte Sink via the Angel Slough system, Moulton Weir and Bypass, and Colusa Weir and Bypass (inset photo). In addition, flows from Butte Creek enter directly into the Sink. Migrating adult and juvenile Sacramento and Butte Creek salmon and steelhead may be hindered, blocked, or stranded in the bypasses and the Sink as flood waters recede. Adults salmon and steelhead bound for the upper Sacramento River and its tributaries including Butte Creek may move upstream via the Butte Creek system as it receives Sacramento River water in wet and dry years. In wet years flood flows enter directly via overflows and bypass weirs. In dry years irrigation returns to Butte Creek of water originally diverted from the Sacramento River attract salmon and steelhead to the Sink where they are unable to reach their natal streams. Young salmon and steelhead migrating downstream on the Sacramento River may enter the sink in wet years when the river overflows into the sink. In dry years young salmon from Butte Creek may enter the Sink when creek flows are diverted into the Sink. Once in the Sink young fish may be delayed, stranded, or subject to a high rate of predation.