

# **Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study**

## **Project Information**

### **1. Proposal Title:**

Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study

### **2. Proposal applicants:**

David Pavetti, HDR Engineering, Inc.

### **3. Corresponding Contact Person:**

Mike Garello  
HDR Engineering, Inc.  
271 Turn Pike Drive Folsom, CA 95630  
916 351-3800  
mgarello@hdrinc.com

### **4. Project Keywords:**

**Anadromous salmonids**  
**Civil Engineering**  
**Habitat Restoration, Instream**

### **5. Type of project:**

Implementation\_Pilot

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

No

### **7. Topic Area:**

Channel Dynamics and Sediment Transport

### **8. Type of applicant:**

Private for profit

### **9. Location - GIS coordinates:**

Latitude: 38.707

Longitude: -121.157

Datum:

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

The project is located at Nimbus Basin in Folsom, California, at the upstream end of the LAR below Nimbus Dam. The Basin is the upstream end of the passable portion of the American River at river mile (RM) 23.

**10. Location - Ecozone:**

9.2 Lower American River

**11. Location - County:**

Sacramento

**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:**

California, 4th

**15. Location:**

**California State Senate District Number: 6**

**California Assembly District Number: 5**

**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: 184785

b) Do you have cost share partners already identified?

No

c) Do you have potential cost share partners?

No

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)**

**John Icanberry    USFWS**

**Mike Healey    DFG**

**Bruce Oppenheim    NMFS**

**John Hannon    USBR**

**21. Comments:**

# Environmental Compliance Checklist

## Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study

### 1. CEQA or NEPA Compliance

- a) Will this project require compliance with CEQA?

Yes

- b) Will this project require compliance with NEPA?

Yes

- c) If neither CEQA or NEPA compliance is required, please explain why compliance is not required for the actions in this proposal.

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

CEQA Lead Agency: CDFG

NEPA Lead Agency (or co-lead:) USBR

NEPA Co-Lead Agency (if applicable):

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

#### CEQA

-Categorical Exemption

☒ Negative Declaration or Mitigated Negative Declaration

-EIR

-none

#### NEPA

-Categorical Exclusion

☒ Environmental Assessment/FONSI

-EIS

-none

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?

No

If the CEQA/NEPA process is not complete, please describe the dates for completing draft and/or final CEQA/NEPA documents.

Can be completed in 12 months as a project task.

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      Required

CWA 401 certification      Required

Coastal Development Permit

Reclamation Board Approval      Required

Notification of DPC or BCDC

Other

**FEDERAL PERMITS AND APPROVALS**

ESA Compliance Section 7 Consultation      Required

ESA Compliance Section 10 Permit

Rivers and Harbors Act      Required

CWA 404      Required

Other

## **PERMISSION TO ACCESS PROPERTY**

Permission to access city, county or other local agency land. Required  
Agency Name: Sacramento County

Permission to access state land. Required  
Agency Name: State Parks

Permission to access federal land. Required  
Agency Name: USBR

Permission to access private land.  
Landowner Name:

### **6. Comments.**

# **Land Use Checklist**

## **Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study**

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?**

No

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**

## **Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study**

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):**

David Pavetti, HDR Engineering, Inc.

### **Subcontractor(s):**

Are specific subcontractors identified in this proposal? No

### **Helped with proposal development:**

Are there persons who helped with proposal development?

No

### **Comments:**



# Budget Summary

## Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study

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.

### Independent of Fund Source

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	Baseline Surveys	442	13,337	5,868	141	438	13,650	0	4,992	38426.0	14,804	53230.00
2	design of pilot experiment	886	24,353	10,715	71	219	0	0	10,006	45364.0	27,032	72396.00
3	environmental documentation	444	13,609	5,988	71	219	0	0	5,014	24901.0	15,106	40007.00
4	coordination and management	192	6,661	2,931	0	0	0	0	2,168	11760.0	7,394	19154.00
		1964	57960.00	25502.00	283.00	876.00	13650.00	0.00	22180.00	120451.00	64336.00	184787.00

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=184787.00**

**Comments.**

# Budget Justification

## Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study

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

HDR Engineering Inc. Ken Meyers - 12 Dave Peterson - 80 Thomas Cannon -134 Mike Garello -460  
Joe Domenchelli-88 Trevor Kennedy -120 Damien Texiera -40 Intern -140 Shelly Hatleberg -228  
Environmental scientist -120 Financial admin -24 Drafter -204 Admin sr. -124

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

Ken Meyers-52.50 Dave Peterson-60.90 Thomas Cannon-47.95 Mike Garrello-25.57 Joe  
Domenichelli-47.66 Trevor Kennedy-42.00 Damien Texiera-15.75 Intern-15.75 Shelley  
Hatleberg-36.75 Environmental Scientist-27.30 Financial Administrator-27.80 Drafter-24.15 Admin  
sr.-19.00

**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.

Traveling for stakeholder meetings and field surveys totals are estimated to total 282.88

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

Task 1-438.00 for misc. field supplies Task 2-219.00 for misc. field supplies Task 3-219.00 for misc. field supplies

**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-Baseline surveys-13,650

**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.

\$19,154

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

Computer recovery, photocopies, documentation, misc.

**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.

The overhead rate encompasses all office costs associated with the project including document reproduction, rent, computers, misc.

## **Executive Summary**

### **Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study**

The proposed study is the initial design phase for a project to restore steelhead and salmon spawning and rearing habitat in Nimbus Basin below Nimbus Dam on the lower American River. The project involves developing a design for a pilot experimental side channel on Nimbus Bar. Hydrology, hydraulic, and biological data will be collected to support the engineering design of a hydraulic channel that will hold large woody material, spawning gravels, and boulders, and adjacent riparian habitat to provide SRA cover and other ecosystem functions. Hypotheses include gravel spawning and rearing habitat for salmon and steelhead is limited in the Nimbus Basin and salmon and steelhead will use created spawning and rearing habitat. The bar location also offers a unique location with excellent access on land owned by USBR and managed by State Parks. Though there are issues related to management of the channels, the project offers excellent potential as an educational and recreational resource that would be a local and regional community asset. The project will be an adaptive management experiment that will have applicability to other Central Valley rivers. HDRs Riparian and River Restoration teams have the biological and engineering capabilities to accomplish the study, as they presently are involved in lower American and Tuolumne River restoration projects. The project design will be developed during the proposed initial phase of the project. Engineering options will be developed and discussed with agencies and local technical and stakeholder groups. The project fits in well with management objectives for the lower American River, and although not the highest priority, it is an important component of long-term restoration programs for the lower American River (e.g., CALFED ERP, SAFCA-Water Forum, and AFRP).

# **Proposal**

**HDR Engineering, Inc.**

## **Nimbus Basin Side Channel Salmon and Steelhead Spawning and Rearing Habitat Restoration - Preliminary Feasibility Study**

David Pavetti, HDR Engineering, Inc.

# NIMBUS BASIN SIDE CHANNEL SALMON AND STEELHEAD SPAWNING AND REARING HABITAT RESTORATION - PRELIMINARY FEASIBILITY STUDY

## A. PROJECT DESCRIPTION

The proposed study is the initial design phase for a project to restore steelhead and salmon spawning habitat at Nimbus Basin (Basin) at the upstream end of the LAR below Nimbus Dam (Figure 1). The

The primary goal of this project is to restore spawning and rearing habitat for salmon and steelhead in the LAR. This project's contribution toward that goal will be a demonstration that restoration of a "natural" side channel on Nimbus Bar can contribute measurably to spawning and rearing habitat of salmon and steelhead.

Basin is the upstream end of the passable portion of the American River at river mile (RM) 23. Nimbus Dam, built in the 1950s, blocks salmon and steelhead from further ascending the American River. Nimbus Dam is an element of the CVP. Nimbus hatchery, built as mitigation for the Folsom-Nimbus Dam complex of the CVP, is located just downstream of the Basin at RM 22.5.

The proposed study entails the initial planning and design phase for restoring salmon and steelhead spawning and rearing habitat in historic side channels of the point bar (bar) in Nimbus Basin. After construction of Nimbus Dam, the American River in the Basin has become incised from flood scouring and blockage of gravel transport. The side channels on the bar are now above the elevation of the river, except during floods, and thus no longer contribute significantly to salmon and steelhead spawning and rearing. Spawning and rearing habitat can be restored on the bar by (1) excavating the side channels down to the present river level at the

most frequent river flows, (2) restoring riparian and SRA habitat along and within the side channels, and (3) introducing spawning gravels into the side channels.

The project is planned in three phases. Phase 1 is to develop a preliminary design concept and a plan for the Phase 2 pilot experiment. Phase 2 involves the actual conduct of the pilot experiment on the bar. Phase 3, if feasible, would involve full-scale restoration on the bar. This proposal covers Phase 1. A future proposal will cover Phase 2 of the project.

Phase 1 involves the following tasks:

1. Conduct a baseline survey of the geomorphology, biology, and habitat conditions of Nimbus Bar in Nimbus Basin to support the design and permitting process for the pilot experiment.
2. Develop an engineering design and plan for restoring spawning habitat on the bar.
3. Prepare environmental and permitting documentation for a pilot restoration experiment on the bar.

### Goals and Objectives

The primary goal of this project is to restore spawning and rearing habitat for salmon and steelhead in the LAR. This project's contribution toward that goal will be a demonstration that restoration of a "natural" side channel on Nimbus Bar can contribute measurably to spawning and rearing habitat of salmon and steelhead. Ancillary objectives of this project include:

- Develop an engineering design that provides a cost-effective means of restoring a side channel in Nimbus Basin and ensuring that the design could be applied to other locations on bar, elsewhere in the American River, and on other rivers in the Central Valley.
- Demonstrate that restoration of side channel spawning and rearing habitat in an urban environment can be accomplished consistent with other uses of Nimbus Basin.
- Demonstrate that a restored side channel would provide recreational, education, and cultural attraction of local and regional significance.

## Problem

The proposed project specifically addresses the lack of spawning and rearing habitat for salmon and steelhead in the upper end of the LAR in Nimbus Basin below Nimbus Dam. Another aspect of the problem is how serious the problem is and how valuable habitat restoration would be to the wild populations of salmon and steelhead. A further aspect of the problem is the flood control aspect of gravel introductions given that the LAR floodplain is restricted and gravel introductions on a large

scale could reduce the flood bearing capacity of the river channel and floodplain. With respect to this problem, the proposed project involves excavation of the floodplain, thus providing more capacity for the placement of gravels. The proposed study and pilot restoration project would address all of these concerns.

*Geological studies conducted between 1994 and 1997 indicated the gravel composition along the stretch of American River make spawning almost impossible...Rehabilitation of spawning gravels can improve spawning conditions and in-river production of fall-run chinook salmon and steelhead as well as the many other aquatic organisms dependent upon healthy, diverse gravel environs...Geological studies showed that significant damage had reduced spawning success because of:*

- *Low substrate permeabilities due to the local occurrence of substrate compaction, the presence of sediment in the size range that impedes the subsurface movement of water, and subsurface clay layers.*
- *Clusters of coarse gravel in the subsurface that exceed the threshold size movable by spawning American River chinook salmon.*
- *Gravel size distributions coarser than optimal for spawning use. (CDFG 1999 news release)*

## Justification (including conceptual model, hypotheses and selection of project type):

This proposal addresses research on how to restore spawning habitat in the LAR. It involves a pilot experiment that tests applicable engineering designs for spawning and rearing habitat for steelhead and salmon

in the LAR. The project is also an initial stage of a public educational facility that puts on display natural spawning and rearing of salmon and steelhead on the American River.

**Conceptual Models and Hypotheses: Conceptual Model/Hypothesis #1:** Gravel spawning habitat may be lacking in the upper end of the LAR, particularly in Nimbus Basin, and restoration of such habitat could contribute to salmon and steelhead smolt production. Steelhead, in particular, lack

spawning and rearing habitat associated with a small stream environment provided by side channels in a large river such as the LAR. The proposed project will monitor spawning habitat in the Basin pre- and post-project to measure habitat changes and determine if spawning and rearing increase.

**Conceptual Model/Hypothesis #2:** Restoration of more diverse stream rearing habitat on the bar in the Basin will improve steelhead production in the LAR. Altered flows, channel incision, channel scour, and lack of gravel recruitment have greatly reduced spawning habitat in the upper end of the LAR near Nimbus Dam. Monitoring post-project will determine if spawning and rearing habitat are improved.

**Conceptual Model/Hypothesis #3:** Nimbus Bar is an ideal location for restoring spawning habitat in the LAR because Nimbus Basin presently attracts many salmon and steelhead; it has cooler water temperatures than downstream locations; it has limited fine sediment input; and it has excellent access to conduct a pilot experiment. It also has some protection from flood velocities (bridge approach abutment) that presently occur in the upper LAR from channel

incising and leveed streambanks (e.g., at hatchery and in Nimbus Basin). River flows have improved in recent years under CVPIA and thus would be more conducive to improved spawning habitat. Monitoring pre- and post-project will determine whether the site has the qualities indicated.

*There are several potential stressors associated with spawning that include (1) altered flows; (2) channel incision and reduced channel complexity that affect water depth and velocity at the spawning area; (3) high water temperatures; (4) loss of gravel recruitment; (5) harvest or harassment of spawners at the spawning riffles; and (6) interbreeding of hatchery fish with "wild" fish that may adversely affect the gene pool of the "wild" fish. (CALFED 2000)*

**Conceptual Model/Hypothesis #4:** Remnant gravel areas in the upper end of the LAR may have a high percentage of finer sediment because of the lack of gravel recruitment. Higher amounts of fine sediments in the gravel reduce egg viability (Kondolf 1988 and Bjornn and Reiser 1991).

Introduction of gravel into Nimbus Basin will increase the recruitment of spawning gravel to the LAR and thus reduce the amount of fines in spawning gravels. Such improvements will reduce channel incision; increase channel complexity; reduce scour of redds; improve egg survival; and increase spawner distribution. Pre- and post-project monitoring will provide information to test these hypotheses and refine the conceptual model. The proposed project will monitor spawning gravels not only on the bar but downstream to determine if the project increases gravel recruitment in the river below the bar.

**Conceptual Model/Hypothesis #5:** Improvements in the side channel will not only lower the grade at the bar head to allow watering at lower flows, but will improve degraded channel complexity, gravel permeability, large woody debris, cover, and SRA habitat on the bar. The addition of gravel and large woody materials will also improve channel complexity. Channel improvements will reduce streambed armoring and improve suitability for spawning salmon and steelhead based on studies by Vaux (1962 and 1968). Channel complexity will help to retain spawning gravel and improve juvenile rearing habitat. Excavating portions of the impermeable clay lens in the restored channel will provide for greater gravel permeability. Increasing the width, height, and density of the riparian forest reduces and stabilizes water temperature. The production of benthic invertebrates that provide food for juveniles will increase with reduced concentrations of fine sediments, enhanced riparian vegetation, and greater streambed complexity. All aspects of this model will be tested through pre- and post-project monitoring.

**Conceptual Model/Hypothesis #6:** A side-channel within a controlled area, such as on Nimbus Bar, will have less disturbance from anglers, rafters, and boat traffic, and thus improved egg survival. Anglers and other users will abide by warnings and rules that limit access and disturbances to spawning fish. Anglers and other users will appreciate the spawning area and visit its viewing facilities in large numbers to observe naturally spawning salmon and steelhead. The model will be tested with pre- and post-project interviews with wardens and public, angler surveys, and public workshops.

#### *Glossary of Terms*

**CDFG:** California Department of Fish and Game

**CVPIA:** Central Valley Project Improvement Act

**Conceptual Model/Hypothesis #7:** Restoring gravel recruitment on the bar will improve incubation habitat by reducing the concentration of fine sediments in gravel spawning beds, increasing the depth of uncompacted gravel, and by increasing the area of spawning habitat. Spawning habitat and its characteristics will be monitored pre- and post-project.

**Conceptual Model/Hypothesis #8:** The project site and restoration elements will become an important local and regional recreational, cultural, and educational resource. The attraction will serve to publicize CALFED and CVPIA restoration on the American River and in the Central Valley. The educational value alone will be substantial. Most of the facilities necessary for such an attraction, such as access and parking, are presently available. The

proximity to the CDFG Region 2 office and Nimbus Hatchery add to the value of the attraction. With county and state park jurisdiction over the USBR public property, there is substantial opportunity to upgrade recreational and educational facilities on and adjacent to the bar and Basin.

**Conceptual Model/Hypothesis #9:** Excavation of side channels and placement of supplemental gravel supplies to the river via these side channels will maximize the value of gravel introduction, minimize the amount of gravel needed to maintain spawning areas, and limit potential effects on the



flood bearing capacity of the LAR. Direct gravel placement into the river provides only temporary spawning habitat, because the main channel gravel supply has been greatly reduced by dams and channel restrictions (e.g., natural banks, levees, and placer tailings) and associated channel incising. Gravel introduced directly to the river under these conditions tends to be scoured away and has limited (though valuable for at least a short time) usefulness. Excavating side channels increases the complexity of the river channel and provides off-channel areas for spawning and rearing, that if designed effectively, can retain much of the introduced gravel supply. Gravel introductions and habitat restoration in side channels may prove more cost-effective, therefore allowing more restoration with greater long-term benefits in the form of higher numbers of wild salmon and steelhead.

**Uncertainties:** The monitoring, research, and pilot experiment along with the associated planning and environmental documentation elements of the proposed project will specifically address the following uncertainties about the project:

- Because natural gravel recruitment and river channel configuration do not occur at the site, will it be a natural site that is sustained by natural processes? Given the presence of dams, natural gravel recruitment cannot be maintained at the site, thus an artificial means that emulates the natural function seems appropriate to support natural production of salmon and steelhead.
- Will long-term maintenance of the project area be a problem? How much gravel will be necessary each year to maintain gravel recruitment? Will gravel spawning areas require any maintenance to maintain high quality spawning and rearing habitat? Will the channel and its large woody debris, riparian vegetation, and other SRA components be sustained and enhanced, or will they require maintenance to sustain their values?
- Will salmon and steelhead adults use the spawning areas created?
- Will young salmon and steelhead use the rearing habitat created?
- Will the public, and specifically anglers, accept a restoration project in a popular recreation area? (Some management agency staff have expressed skepticism as to whether spawning salmon and steelhead can be adequately protected from harassment or poaching in a location such as the Bar that has considerable public access and use.

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*Regulated rivers must be managed by mimicking natural geomorphic processes, within contemporary sediment and flow constraints, to the greatest extent possible as the most realistic umbrella strategy for preserving and/or restoring river ecosystem health. For anadromous fisheries in regulated rivers, restoring morphological integrity to the mainstems and tributaries may be the only strategy for reviving instream habitat and fully realizing their potential productivity. (McBain and Trush 1997)*

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*Sven-Olbertson Side Channel is located downstream from the (Lewiston) Hatchery. It is a project designed to enhance overwintering habitat for anadromous fish on this section of the Trinity River. It also provides for riparian habitat improvements that benefit other animals the area. This is a great place to view steelhead and salmon spawning and to watch for wildlife. (Shasta-Trinity National Forest)*

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## Approach

The proposed project is Phase 1 of a two-phased program to restore salmon and steelhead spawning and rearing habitat in Nimbus Basin at the upper end of the LAR. Phase 1 includes the following tasks: (1) baseline monitoring; (2) pilot design; and (3) pilot environmental documentation. Phase 2 will entail pilot project implementation and evaluation.

## Task 1 - Baseline Surveys:

Topographic Survey—A topographic survey of the bar will be made using standard survey techniques.

Plant and Animal Survey—A survey of riparian and SRA plants and plant communities will be made on the bar and recorded in a GIS database and maps. The survey will include the following elements:

- Plants, including trees, shrubs, and grasses; canopy type; presence of non-native invasive species (NIS) and at-risk species (e.g., elderberry); presence of snags; and recruitment/regeneration of cottonwoods, sycamores, and willows.
- Animals, including bank swallows, neotropical songbirds, raptors, herons, egrets, shorebirds, reptiles, and amphibians.

### Glossary of Terms

**GIS:** Geographic Information System

**NIS:** Non-native invasive species

**SRA:** Shaded riverine aquatic

Fisheries Survey—A fish baseline survey will be conducted, and will include the following elements:

- Enumeration of and location of adult salmon and steelhead holding and spawning on the bar in the event high flow occur during the monitoring year, including the distribution of redds on the bar to determine existing use. A record will be made of redd distributions among and between riffles and other spawning habitat, particularly in reference to the location and size of hydraulic controls. Tables of results and GIS database and maps will be products. Observations will be made of potential success of any redds based on location and potential for stranding. Attempts will be made to identify redds during high water and upon receding flows. Any redd stranding will be noted.
- Fish habitat on the bar during high flows will be characterized using standard classification schemes (e.g., riffle, run, pool, and backwater).
- If conditions allow, fry salmon and steelhead production on the bar will be monitored by sampling with fyke nets at the lower end of active side channels.
- Juvenile salmon and steelhead rearing on the bar will be documented with snorkel, fyke and seine netting, and visual survey techniques.
- Stranding of salmon and steelhead on the bar after high flows will be assessed. Fish species composition and abundance in permanent stranded ponds on the bar will be documented with or without winter flooding.
- Information collected in other monitoring programs conducted by CDFG will be incorporated into assessments, and the results of this study will be shared with other studies.

Hydrologic Survey—Surveys will include the following elements:

- Stage – discharge relationship will be evaluated relative to site geometry. The effect of the hatchery weir on the stage on the bar will be determined.
- Hydrology frequency under historical and future conditions will be evaluated using historical gage data and USBR forecasts.

Geomorphic-Geotech-Hydraulic Survey—Surveys will include the following elements:

- Substrate composition on the bar including the distribution of the underlying impermeable clay layer will be determined along with grain size composition of bar substrate materials.
- Streambed mobilization studies will be conducted at the restoration sites to determine expected duration of gravel introduced in the future and evaluate the impacts of riparian encroachment and channel incision.

- Predictions will be made of depths and velocities at different flows.

*Recreation Survey*—The recreation survey will include the following elements:

- Interviews of recreationists on the bar and within and adjacent to Nimbus Basin (including CDFG hatchery).
- An evaluation the potential effectiveness of the special angling regulations at the proposed restoration site by interviewing sportsmen, state and county park personnel, and CDFG biologists and wardens, and evaluating experiences at other local and regional locations.
- A public meeting with fishermen at hatchery, in cooperation with CDFG.
- Review of CDFG creel census data for the Basin.
- Evaluation of the current level of enforcement and Basin angling regulations to determine whether they are sufficient to protect salmon and steelhead spawners and developing eggs and rearing young. Assess the potential for poaching problems, pre-spawning harassment, redd disturbance, and juvenile harvest/mortality.

**Task 2 - Design of Pilot Experiment:** Hydraulic modeling.

*Hydraulic modeling* - Side channel design configurations will be hydraulically modeled using HEC-RAS and possibly RMA-2D to arrive at a design that will provide the optimum spawning habitat,

while maintaining riverbed stability during higher flood flow releases from Nimbus dam. It will be important that flow velocities will not remove the introduced gravel beds each season. Some re-introduced gravel materials may be necessary after extreme events; however, bed scour should be controlled with the proper hydraulic design.

*Glossary of Terms*

**AFRP:** Anadromous Fish Restoration Program

**ESA:** Environmental site assessment

**NMFS:** National Marine Fisheries Service

**SAFCA:** Sacramento Area Flood Control Agency

**USACE:** United States Army Corps of Engineers

**USBR:** United States Bureau of Reclamation

**USFWS:** United States Fish and Wildlife Service

*Conceptual Design* - The conceptual design will include; a plan view laid over a topographical map of the area; a design profile showing channel invert, top of bank and design water surface for optimum habitat conditions, and for extreme (100-year) flood flows; channel cross sections including the proposed and entire existing channel conditions; and details for SRA planting and in channel enhancements for the proposed design. This concept will be the basis for environmental documentation, permit processing, budget cost opinions, and presentation of the proposed project to other stakeholders .

*Final Design of Pilot Project* - HDR will complete the final design plans and specification for the channel, channel elements, and riparian vegetation. Boulder and gravel bed types and gradation will be specified and locations shown on the plan. The introduction of woody debris within the channel will compliment the riparian habitat planting along the banks. Details for access over the channel to the existing bar will also be a component to allow

access for fisherman and provide a viewing location for the project. A layout of the design alignment can be found at the end of this proposal.

**Task 3 - Environmental Documentation:** Environmental documentation will be completed for the pilot experiment. This will include a combined Environmental Assessment (NEPA) and Initial Study (CEQA), and basic elements of Biological Assessments for state and federal ESA. We anticipate that such documentation would involve a Mitigated Negative Declaration with CDFG being the lead agency for the Streambed Alteration Permit. Consultation would occur with the NMFS on steelhead

and Essential Fish Habitat and with the USFWS on special status plants and animals. Other permits processes through which coordination would occur include the USACE (404 permit process) and State Reclamation Board (floodplain encroachment permit). The NEPA-CEQA process would be tiered to the CALFED and CVPIA environmental documentation.

**Task 4 - Project Coordination and Management:** The project would be coordinated with the Lower American River Fisheries and Instream Habitat Group, and the Lower American River Task Force, the Lower American River Operations Group, as well as CDFG Region 2, the USACE, the USBR, SAFCA, the Water Forum, the AFRP, and other public stakeholder groups. Coordination with the management agencies responsible for the property—CDFG, State Parks, and USBR—will also occur to develop an access and management plan for the Phase 1 studies and Phase 2 pilot experiment.

### Feasibility

The Nimbus Basin site is uniquely suited for a proposed pilot experiment to restore side channel spawning and rearing habitat in the LAR. The proposed one-year preliminary design and documentation of the pilot experiment is necessary to develop an appropriate project design and to gain the appropriate permits for the pilot experiment in Phase 2. It is also necessary to gain the necessary input from the public and government agencies managing the Basin and Bar. Weather should not be a factor except for fish studies that could be performed at higher flows. Without higher flows such studies would not be undertaken, and the conceptual design would have to be developed without that information. Some elements of the monitoring will require ESA permits (e.g., seining and fyke netting). Land ownership or management is not an issue as the bar is public property owned by the USBR and managed jointly by county and state parks departments. These agencies have all expressed support for the pilot restoration project and are active members in the LAR Task Force.

### Performance Measures

Performance measures for the design phase of the project include the following:

- Complete and adequate designs and specifications for Phase 2 pilot experiment.
- Completeness of monitoring and survey data reports.
- Completed and accepted environmental documentation and supporting stakeholder involvement.
- Baseline information on the project site for comparison of post-project conditions.
- Subsequent success of the experiment in providing information on fish response to new habitat, the effectiveness of the engineering design, and public acceptance and response to the project.

#### *Glossary of Terms*

**GPS:** Global positioning satellite

**EA:** Environmental assessment

**IS:** Initial study

**BA:** Biological assessment

### Data Handling and Storage

Given the limited nature of data that will be collected, most data will be stored in spreadsheet format and original hardcopy data sheets and forms. Some survey data, such as that for riparian vegetation, will also be presented and stored in map inventory form showing locations of individual elements (e.g., existing cottonwood trees) identified by GPS and recorded in a GIS database.

### Expected Products/Outcomes

- **Survey Data Reports** - Each survey described above will provide survey data reports within one month of completing the surveys.
- **GIS Database** - Survey and habitat data will be stored in a GIS database that is Microsoft® Access-compatible.



- **Conceptual Design Report and Plans and Specifications** - The Conceptual Design and 30-percent Design and Specifications will be provided to document the project engineering tasks.
- **Meeting Notes** – Notes and summaries will be prepared for all meetings and workshops.
- **Monthly Progress Reports** – Progress reports will be prepared monthly documenting performance, accomplishments, and schedule and budget status.
- **Survey Report** - A survey report will be prepared that presents the results of the surveys and data analyses.
- **Environmental Assessment and Initial Study (with Biological Assessments)** – Environmental documentation will be presented in the form of an EA/IS with associated BAs.

### Work Schedule

Task Number	Task Name	Duration
Task 1	Baseline Surveys	Months 1 through 6
Task 2	Pilot Design.	Months 3 through 9
Task 3	Environmental Documentation	Months 6 through 12
Task 4	Project Management	Months 1 through 12

Tasks 1 through 3 can be performed incrementally, however the schedule would be extended considerably, and there would be less opportunity for economy of scale. If Phase 1 can be completed successfully, grant applications can be made in a timely manner for Phase 2 implementation (within 24 to 36 months).

The payment schedule for each task would be invoiced monthly for each task minus 10-percent that is invoiced after completion of the task. For example, project management would be invoiced for 1/12<sup>th</sup> of the contract amount each month minus 10-percent 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

### 1. ERP, Science Program and CVPIA Priorities.

#### CALFED Restoration Priorities for the Sacramento Region

***Develop and implement habitat management and restoration actions in collaboration with local groups.*** The proposed project would work closely with the AFRP, the CVPIA (b13) program, SAFCA, Water Forum, LAR Task Force, and the LAR Technical Advisory Committees including the FISH Group.

*For the past several years, spring-run chinook salmon have been a species that influenced restoration priorities. More recently, steelhead trout have become a priority at-risk species as well. These species and others will benefit from actions to augment in-stream gravel supplies and gravel quality, actions to improve up and downstream fish passage. (Draft Stage 1 Implementation Plan)*

***Restore fish habitat and fish passage, particularly for spring-run chinook salmon and steelhead trout and conduct passage studies.*** The proposed project focuses on restoring spawning and rearing habitat of steelhead in the LAR.

***Projects are needed to replenish spawning gravel and maintain gravel recruitment, especially in the Sacramento and American Rivers, monitor the movement of replenished gravels, and develop and implement techniques to assess fish use of replenished gravel (Strategic Goal 2, channel dynamics and***

**sediment transport**). The proposed project will lead to replenishment of spawning gravel and habitat in the Nimbus Basin and maintain continuous natural gravel recruitment to the Nimbus Basin and the upper portion of the LAR. The project will also directly assess fish use of the replenished gravel by providing a controlled experimental condition in the side channel on the bar where monitoring and assessment will occur.

***Restore geomorphic processes in stream and riparian corridors.***

- *Fluvial geomorphic assessments of coarse sediment supply needs and sources are needed to maintain, improve, or supplement gravel recruitment and natural sediment transport processes linked to stream channel maintenance, erosion and deposition, maintenance of fish spawning areas, and the regeneration of riparian vegetation (Strategic Goal 2, channel dynamics and sediment transport).* The proposed project, though not designed to restore natural sediment transport, will emulate the natural process by introducing gravel directly into habitat that can be used for spawning and rearing. The project will also study the maintenance of spawning habitat in the LAR, as well as restoration of riparian vegetation on the bar.
- *Understand and compare salmon/steelhead life histories, needs and responses to restoration. (Strategic Goal 1, At-Risk Species Assessments).* The proposed project will provide valuable information on salmon and steelhead spawning and rearing in a controlled study environment and specific responses to a particular restoration type.

**Ecosystem Restoration Program Strategic Goals**

**Goal 1: At-Risk Species** – The proposed project will help restore a self-sustaining population of steelhead and fall-run chinook salmon in the LAR.

**Goal 2: Ecosystem Processes and Biotic Communities** – The proposed project will seek to rehabilitate (though artificially) natural channel habitat and gravel recruitment processes that are now deficient on the LAR because of dams and urban flood control developments.

*The CALFED Program recognizes that current commercial and recreational harvest of some of these species is greatly supported by production from mitigation hatcheries. However, a great deal of scientific uncertainty exists relative to contemporary hatchery management practices and their compatibility with watershed restoration programs (e.g., Battle Creek).*

**Goal 3: Harvestable Species** – The proposed project and other similar projects will help to enhance natural production of fall-run chinook salmon and steelhead populations on the LAR. At present, both species contribute to commercial and recreational harvest. With uncertainties as to the future role of hatcheries in sustaining populations of these species, means for enhancing populations naturally, such as proposed in this project, will be essential if future harvest is to be allowed.

**Goal 4: Habitats** – The proposed project will restore functional spawning and rearing habitat in the LAR by sustaining gravel recruitment, providing functional channel configuration, restoring riparian and SRA habitat, promoting recreational fisheries, improving aesthetics of the Nimbus Basin, and providing a uniquely valuable ecological, educational, recreational, and cultural exhibit in an urban setting where high use and public involvement is expected.

**CALFED Science Program Goals in Relation to the Ecosystem Restoration Program**

*The goal of ecological restoration is to return this altered ecosystem to a more natural condition. The proposed project will return an important location of the LAR to a more natural and functional condition. The proposed side channel will not only provide fish spawning and rearing habitat, but will also restore a stream channel network and associated riparian corridor that exists today in a degraded state.*

*A sustainable restoration program must include an on-going investment in science.* The proposed project is a pilot experiment to determine if the proposed restoration will meet its ecosystem objectives. Collection of scientific information is included in each phase of the program. This phase of the proposed project will collect baseline information about the bar, its geology and geometry, its ecological characteristics, and the potential to modify it in ways to make it more productive to fish and wildlife.

### **CALFED Science Program Objectives**

*Develop performance measures.* The proposed project will develop and monitor performance measures. Such measures will include (1) salmon and steelhead use of the proposed spawning and rearing areas; (2) viability and survival of eggs spawned and juveniles reared in the habitat; (3) sustainability of the gravel and riparian and SRA habitat, and (4) contribution to wild populations of salmon and steelhead.

*Conduct adaptive management experiments.* The proposed project is an adaptive management experiment. Construction and testing of side channel spawning and rearing habitat will provide valuable information on this tool for restoring additional habitat in the future on the bar and elsewhere in the LAR, as well as other rivers of the Central Valley (especially where dams affect anadromous fish runs and their spawning and rearing habitat). The proposed experiment will help in development of improved restoration approaches including appropriate geomorphologic design of side channel, riparian vegetation, and gravel placement, size, and composition. Information obtained from the study will help in defining future priorities and options for restoration based on cost-effectiveness.

*Advance process understanding.* The project will also contribute to our scientific understanding of relevant physical, biogeochemical, ecological, and social processes. The project will provide unique information on how the public may respond to such restoration efforts. With a location in a heavily used urban area the project will test the public's willingness to support and accept restoration projects.

*Build population models for at-risk species.* The proposed project will provide valuable information on how spawning and rearing habitat limits populations of salmon and steelhead in the LAR. If studies indicate that natural production of juvenile steelhead can be measurably improved in the project area, then such knowledge would become a fundamental element of steelhead population models in the Central Valley. If steelhead habitat restoration increases production of steelhead, then such restoration would become an important element in other stream recovery programs.

*Establish integrated science programs in complicated field settings.* The proposed project in Nimbus Basin is within a complicated field setting. Many features of Central Valley river ecosystems come into play at the site, especially those involving rivers greatly modified by dams and reservoirs. The bar itself offers considerable habitat diversity wherein there are several possible side channel restoration sites with different attributes and engineering problems and solutions.

*Compare relative effectiveness of different restoration strategies.* There are many potential restoration strategies and opportunities on the LAR, whether for at-risk or other important species and habitats. The proposed project will provide valuable information for comparing the potential effectiveness of different strategies. Specifically, the proposed project will test whether gravel introductions to physically manipulated habitats is more or less effective than simply introducing gravel directly to the river.

*Understand intertwined implications of all CALFED Program actions.* The proposed project was not a high priority item in past planning for the American River or Central Valley-wide restoration programs despite the long-standing objective of the CVPIA of restoring spawning gravels below CVP dams. A reason for this has been that other concerns particularly CVP effects on flow and water temperature, have been the major focus. It is important that the overall LAR restoration program become more diverse and that information and experience is not all developed in a linear manner as each problem is resolved. With great improvements in flows and water temperatures over the past decade and further improvements expected, it is important that other physical limitations of the habitat be considered to provide the full recovery potential of the salmon and steelhead populations.

*Advance the scientific basis of regulatory activities.* The proposed study will provide valuable scientific information on steelhead spawning and rearing that will help in regulatory activities on the LAR and other rivers in the Central Valley. Present uncertainties have led to the primary focus of steelhead restoration being on flow and water temperature. Greater understanding of the life history and habitat requirements of steelhead will lead to a more informed basis for regulatory actions including fishery regulations, minimum instream flows, etc.

*Coordinate and extend existing monitoring.* Existing monitoring in the LAR and other Central Valley steelhead streams of steelhead spawning is limited. With low present populations little information is available and what exists has been difficult to collect. The proposed project will provide considerable new steelhead life history and habitat information that will be useful for the LAR and other Central Valley rivers.

*Take advantage of existing data.* The proposed project will be integrated into existing monitoring and data collection programs on the LAR. Existing programs will hopefully be expanded to accommodate the project. Existing data on gravel distribution, spawning habitat, wild steelhead adult escapement, and steelhead smolt production will be essential in the evaluation of this project.

*Address environmental justice issues.* Some criticism of this particular project has been that sport fishermen and recreationists will be impacted by the project by imposing on their activities on the bar. Our proposed Phase 1 activities, including surveys and environmental documentation, will address these potential impacts. One of the major objectives of the project is that it will become a major recreational, educational, and cultural attraction and resource of the LAR parkway, city, and county. How these values are achieved will be the subject of studies and environmental documentation.

*Address societal issues related to restoration.* Salmon and steelhead juvenile production in the LAR has until the present been a function of the Nimbus hatchery production. Management of the river and its fisheries has focused on hatchery production and subsequent escapement of hatchery fish to the river. This is particularly true for steelhead. This project will help to deter acceptance on the part of the public and resource managers that hatcheries effectively replace natural populations of salmon and steelhead, and that there are alternatives to, or in addition to, hatcheries especially in the event that ESA programs preclude or restrict hatcheries on the LAR in the future.

*Address landscape scale issues.* The proposed project addresses landscape-level issues including spawning and rearing habitat for the entire LAR. Spawning and rearing habitat restoration below dams and the associated engineering solutions remains a common issue to most Central Valley rivers. This project will address this issue in a comprehensive biological, engineering, and social way.

### **Goals of the Central Valley Project Improvement Act - Anadromous Fish Restoration Program**

General objectives have been identified for projects to achieve the AFRP goals, including the following that are met by the proposed project:



1. *Improve habitat for all life stages of anadromous fish by providing flows of suitable quality, quantity, and timing, and improved physical habitat.* The proposed project directly achieves this goal by leading to improvements in habitat for salmon and steelhead spawning and rearing.
2. *Collect fish population, health, and habitat data to facilitate evaluation of restoration actions.* The project will collect population and habitat data that will be useful in evaluating restoration actions at the site and other locations within and outside the LAR. Specifically, the project will evaluate the feasibility of rehabilitating side channels that were once functional as a means of restoring spawning and rearing habitat for salmon and steelhead.
3. *Integrate habitat restoration efforts with harvest and hatchery management.* The proposed project would be tied directly to harvest and hatchery management of the LAR. With increasing successful restoration efforts, wild steelhead production may increase to such a level to allow continued recreational catch-and-release fishing or some harvest of wild fish as allowed on selected California rivers (e.g., Smith River) with healthy wild populations. Improved wild steelhead production would also lessen the need to supplement the population with hatchery production.
4. *Involve partners in the implementation and evaluation of restoration actions.* Of necessity, the proposed project would involve numerous partners including the LAR Task Force, the LAR FISH Group, SAFCA, the Water Forum and its members, CDFG, and the AFRP.
5. *The CVPIA directs the AFRP to give first priority to measures that protect and restore natural channel and riparian habitat values.* – The proposed project would restore natural habitats within the Nimbus Basin that were disrupted by CVP project facilities. The proposed project would be on USBR property and restoration of that property would be an important contribution to meeting CVPIA objectives.
6. *Action Item #5 – Replenish spawning gravel and restore existing spawning grounds – priority high.* (AFRP 1997, 2000) The proposed project would be one of an array of tasks for the AFRP to further prepare for this action item. To date CDFG has used CVPIA 3406(b)(13) funds to place gravel in three areas of the upper LAR. The proposed project would add gravel and create spawning habitat approximately one mile upstream of the most upriver CDFG gravel introduction site. Gravel replenishment and spawning habitat restoration remain a high priority for the American River (Larry Puckett and John Icanberry, USFWS CVPIA program, personal communications).

### **The CVPIA Habitat Restoration Program Objective**

*Protect and restore native habitats impacted by the CVP that are not specifically addressed in the Fish and Wildlife Restoration Activities section of the CVPIA. Initial focus will be on habitats known to have experienced the greatest percentage decline in habitat quantity and quality since construction of the CVP, where such decline could be attributed to the CVP (based upon direct and indirect loss of habitat from CVP facilities and use of CVP water).* The proposed project focuses on restoring salmon and steelhead habitat below the CVP's American River project reservoirs. Loss of steelhead habitat and access to upstream habitat is directly attributable to the CVP.

### **Gravel Replenishment and Riparian Habitat Protection Program – CVPIA Section 3406(b)(13)**

The goal of the gravel replenishment and riparian habitat protection program under the CVPIA is to develop and implement a continuing program for restoring and replenishing, as needed, spawning gravel lost due to activities associated with the CVP. In 1998, six thousand tons of specially mixed

gravel were placed in three locations along the American River Parkway below Nimbus Dam. CDFG's Stream Evaluation Program carried out the work with funding from the Central Valley Project Improvement Act. The U.S. Fish and Wildlife Service provided the biological lead for the project with the U.S. Bureau of Reclamation assisting with construction and engineering services. While this recent project input a small supply to a starved process, it proved there is a real need for gravel recruitment and additional spawning habitat in the LAR. The proposed project would add another research direction and further option to these direct gravel introduction experiments. The proposed project is consistent with section 3406(b)(13) objectives in that it provides a direct means of restoring spawning gravel and spawning habitat in the LAR. Any introductions of gravels to the side channel to replace that lost to scouring will be a further source of gravel recruitment to the LAR.

## 2. Relationship to Other Ecosystem Restoration Projects

### **The Draft River Corridor Management Plan for the Lower American River**

(LARTF 2001) includes riverwide fisheries and instream habitat management actions to improve physical habitat for fish within the LAR. The following are the applicable actions:

*Fish 5: Identify and evaluate opportunities to improve LAR habitats* – The proposed project will evaluate the feasibility and cost-effectiveness of restoring spawning and rearing habitat for steelhead and salmon at the upper end of the LAR below Nimbus Dam.

*Fish 6: Identify and evaluate location and benefits of enhancing SRA habitat* – The proposed project includes an evaluation of the potential to restore SRA habitat on the bar and within the proposed side-channel restoration.

*Fish 15: Compile information and identify measures to reduce or eliminate stranding* – Though not a major project objective, there are stranding ponds on the bar that strand adult and juvenile steelhead and juvenile salmon after high flow events that inundate the bar. The proposed project will indicate how side channel restoration can reduce stranding by excavating side channels in the floodplain that have ponds or low areas that strand fish.

*Fish 16: Identify and inventory locations for creating shallow inundated floodplain habitat* - Though not a major project objective, spawning and rearing habitat restoration on the bar includes in addition to excavating a side channel other adjacent areas to allow more frequent inundation of the floodplain.

*Fish 17: Identify opportunities to enhance and construct, and potential benefits and detriments of enhancing or constructing mainstem and side-channel habitats for salmon and steelhead spawning and rearing.* – This is the main purpose of the proposed project. The major objective of the project is to construct a pilot restoration project and study its potential benefits and any detrimental effects that may occur as a direct or indirect consequence. Future phases of the project will include full-scale restoration of spawning and rearing habitat on the bar. The results of this pilot study will contribute significantly to evaluating the benefits of such restoration in the LAR as well as other Central Valley rivers.

*Fish 20: Develop a collaborative program to investigate erosion, bedload movement, sediment transport, and depositional processes and their relationship to the formation and maintenance of fish habitat in the LAR.* – The proposed project will contribute significant information on sediment and erosion processes of the LAR as well as how such processes function in side channel restoration projects.

*Fish 21: Assess the need to develop a spawning gravel monitoring and management program for steelhead and fall run chinook in which intervention would be based on identification of specific sites where intervention would enhance or increase salmonid spawning habitat. The project would directly assess the benefits and drawbacks of spawning gravel management and whether intervention as proposed in this project would be beneficial to salmon and steelhead.*

*Fish 24. Continue to provide ongoing long-term consultation and technical assistance to the LAR Task Force, its component committees, and agencies with responsibilities for LAR management. The proposed project will provide long-term information on LAR restoration and will aide and further educate the public and stakeholders as to the need for and the potential success of such projects.*

**Lower American River Fisheries and Instream Habitat Group (Group) (August 2001)**—*Identify opportunities to, and potential benefits and detriments of, enhancing or constructing mainstem and side channel habitats that provide salmon and steelhead spawning and rearing habitat, and implement measures where suitable opportunities are available.* The proposed project fits within the long-term plan for habitat restoration on the LAR. The project focuses on the feasibility of such restoration projects and in determining potential benefits and detriments. The Lower American River Fisheries and Instream Habitat Group is in the process of preparing a management and restoration plan for the LAR. A draft of this plan was circulated for Group review in August 2001. The proposed project would be accomplished in coordination with the Group in evaluating and designing the side channel restoration.

### **3. Previous Recipients of CALFED Program or CVPIA funding.**

*Not Applicable.*

### **4. System-Wide Ecosystem Benefits.**

The proposed project will yield side-channel restoration designs that would be useable or applicable to many streams in the Central Valley. Furthermore, Phase 2 restoration represents an adaptive management experiment that will be invaluable in applying the restoration design.

#### ***Glossary of Terms***

**EIR:** Environmental Impact Report

**EIS:** Environmental Impact Statement

The proposed Phase 1 of the study involves project design and environmental documentation. It will provide the first opportunity of tiering to the CALFED and CVPIA EIR/EISs for restoration projects.

The proposal compliments other studies on the LAR, including the following:

- Analyses of spawning bed mobilization (Ayers 2001).
- Lower American River Pilot Salmon and Steelhead Spawning Habitat Improvement Project (CDFG 2000)— this study focused on placement of gravel in three areas of the mainstem of the LAR. The proposed study tests gravel placement in a controlled side channel designed specifically for steelhead spawning and rearing.
- LAR Task Force River Corridor Management Plan (Jones and Stokes Associates 2001) – the RCMP recommends research to “*Identify opportunities to, and potential benefits of, enhancing or construction mainstem and side channel habitats that provide salmon and steelhead spawning and rearing habitat.*”
- CDFG Steelhead Restoration and Management Plan for the American River (McEwan and Nelson 1991) – the plan calls for restoring spawning and rearing habitat on the LAR.

## 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:

- **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.
- **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 multidisciplinary 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

### *HDR Engineering, Inc.*

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

**HDR Ranks:**  
**#26 in Top 200 Environmental Firms**

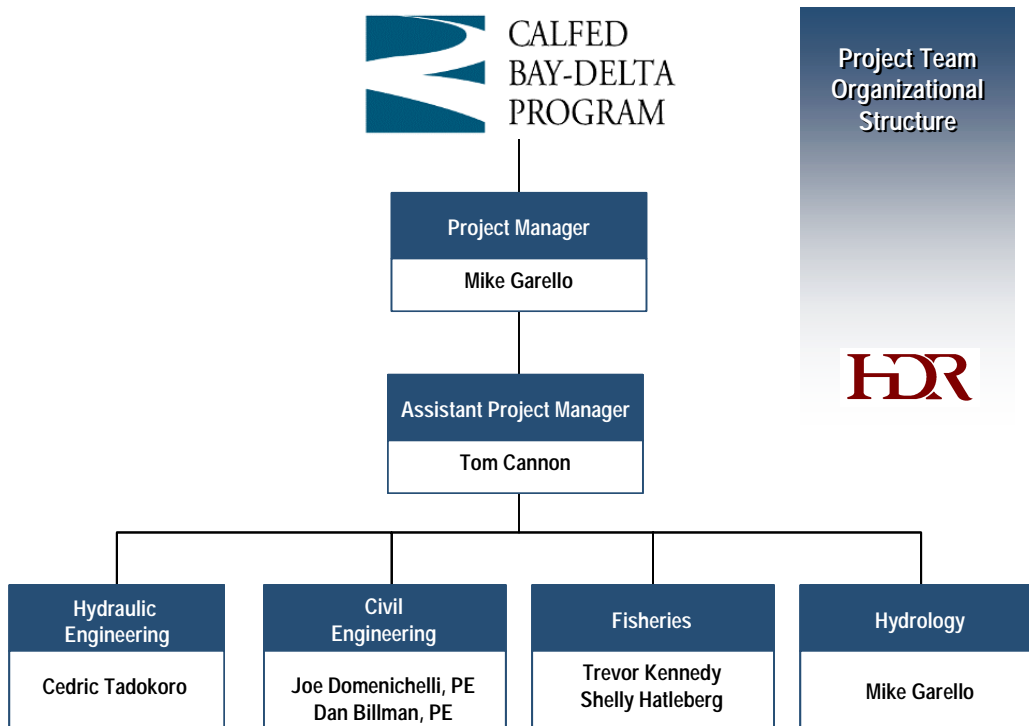
*Source: 2001 ENR Sourcebook*



- **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.

**Mike Garelo** is proposed as project manager. He has a B.S. in Environmental Resources Engineering. Mr. Garelo's experience has focused on water resources engineering and environmental studies including hydrologic/hydraulic analysis and modeling, pumping station



designs, and water quality investigations. He was project engineer for preparation of Design Documentation Report for bank stabilization at Site 5 of the Lower American River. He performed hydraulic analysis of existing and project conditions using HEC-RAS. He performed channel stability analysis and geomorphic analysis. The design incorporated biotechnical engineering components to improve existing splittial and salmonid habitat values. He provided engineering design support for the restoration of about six miles of the Tuolumne River, which

included restoring spawning and riparian habitats, and bioengineered bank protection. His experience includes an anadromous fish passage study for second and third order tributaries along the Humboldt and Mendicino Coast.

**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 has been discussed with members of the Lower American River Fisheries and Instream Habitat (FISH) Group including members from CDFG, USFWS, USBR, and NMFS. In addition the concept was discussed with staff of the Water Forum and AFRP. It is the intent of the applicants to work closely with these entities during Phase 1 to design a pilot project that meets the needs of everyone involved.

The property is owned by the USBR, which actively participates in the FISH Group and Lower American River Task Force. The Basin and Bar are managed under a cooperative agreement between California State Parks, USBR, and CDFG. These groups will be included in the planning process for the study and subsequent Phase 2 and would be cooperating agencies in the NEPA/CEQA documentation and the associated stakeholder involvement process.

The proposed project has multiple facets of public outreach. Task 1 includes elements that seek input from the public on its views on recreation on the Bar and whether the proposed project concept would interfere with or enhance the recreational values on the Bar. A meeting is planned with fishermen at

the hatchery to discuss the project. This meeting will be sponsored by CDFG, with participation and participation by game wardens and biologists. The NEPA/CEQA documentation would also include public information meetings and opportunities to comment on the proposed project, and would identify all potential impacts and any necessary mitigation.

## F. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

HDR 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

- AFRP (Anadromous Fish Restoration Program). 1997. Revised Draft Restoration Plan for the AFRP: A plan to increase natural production of anadromous fish in the Central Valley of California. May 30, 1997. US Fish and Wildlife Service, Stockton, CA.
- Bjornn T. and D. Reiser. D . 1991. Habitat requirements of salmonids in streams. Pages 83-138 in W.R. Meehan, editor. *Influences of Forest and Rangeland Management*. American Fisheries Society Special Publication 19. Bethesda, Maryland.
- CALFED. 2000. Comprehensive Monitoring, Assessment, and Research Program for Chinook Salmon and Steelhead in the Central Valley Rivers.
- California Department of Fish and Game. 2000. Lower American River Pilot Salmon and Steelhead Spawning Habitat Improvement Project, Quarterly Status Report July 1999-March 2000. Prepared for the US Fish and Wildlife Service Central Valley Anadromous Fish Restoration Program, Stockton, California.
- Jones and Stokes Associates, Inc. 2001. Draft River Corridor Management Plan for the Lower American River. Submitted to the Lower American River Task Force. Jones and Stokes Associates, Sacramento, CA.
- Kondolf, M.G., 1988. *Salmonid spawning gravels: A geomorphic perspective on their size distribution, modification by spawning fish, and criteria for gravel quality*. PhD thesis, Johns Hopkins University, Baltimore, MD.
- Lower American River Fisheries and Instream Habitat Group. 2001. Initial Fisheries and Aquatic Habitat management and restoration plan for the lower American River.
- McBain, S and B. Trush. 1997. Thresholds for managing regulated river ecosystems. Published in the Proceedings of the Sixth Biennial Watershed Management Conference. S. Sommarstrom, Editor. Water Resources Center Report No. 92. University of California, Davis.

McEwan, D. and J. Nelson. 1991. Steelhead restoration plan for the American River. CDFG, Rancho Cordova, CA.

Vaux, W.G. 1962. Interchange of stream and intragravel water in a salmon spawning riffle. U.S. Fish and Wildlife Service Special Scientific Report -- Fisheries No. 405. Contribution No. 82, College of Fisheries, University of Washington.

Vaux, W.G. 1968. Intragravel flow and interchange of water in a streambed. Fishery Bulletin 66(3): 479-489.

Vyverberg, K., B. Snider, and R. Titus. 1997. Lower American River chinook salmon spawning habitat evaluation, October, 1994: An evaluation of attributes used to define the quality of spawning habitat. 44 pp.





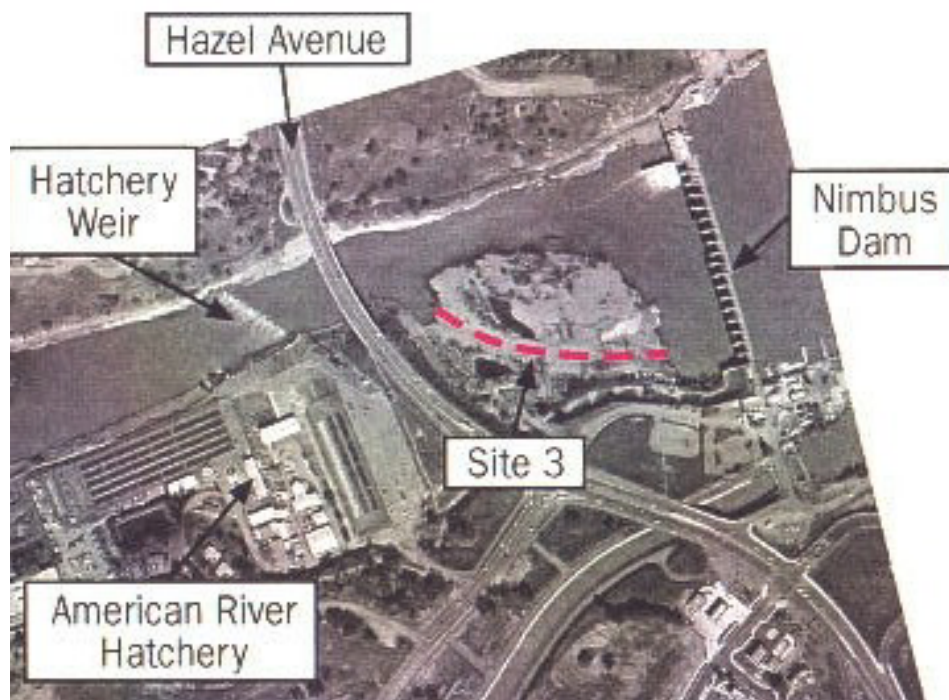


Figure 1. Aerial photo of the proposed Nimbus Bar side channel site.



Figure 2. View of upper side channel site looking

Figure 3. View of lower side channel site looking toward northwest. Standing water is indicative of ground water level on the bar. The water was only a few inches deep and several small largemouth bass were stranded in the pond.

