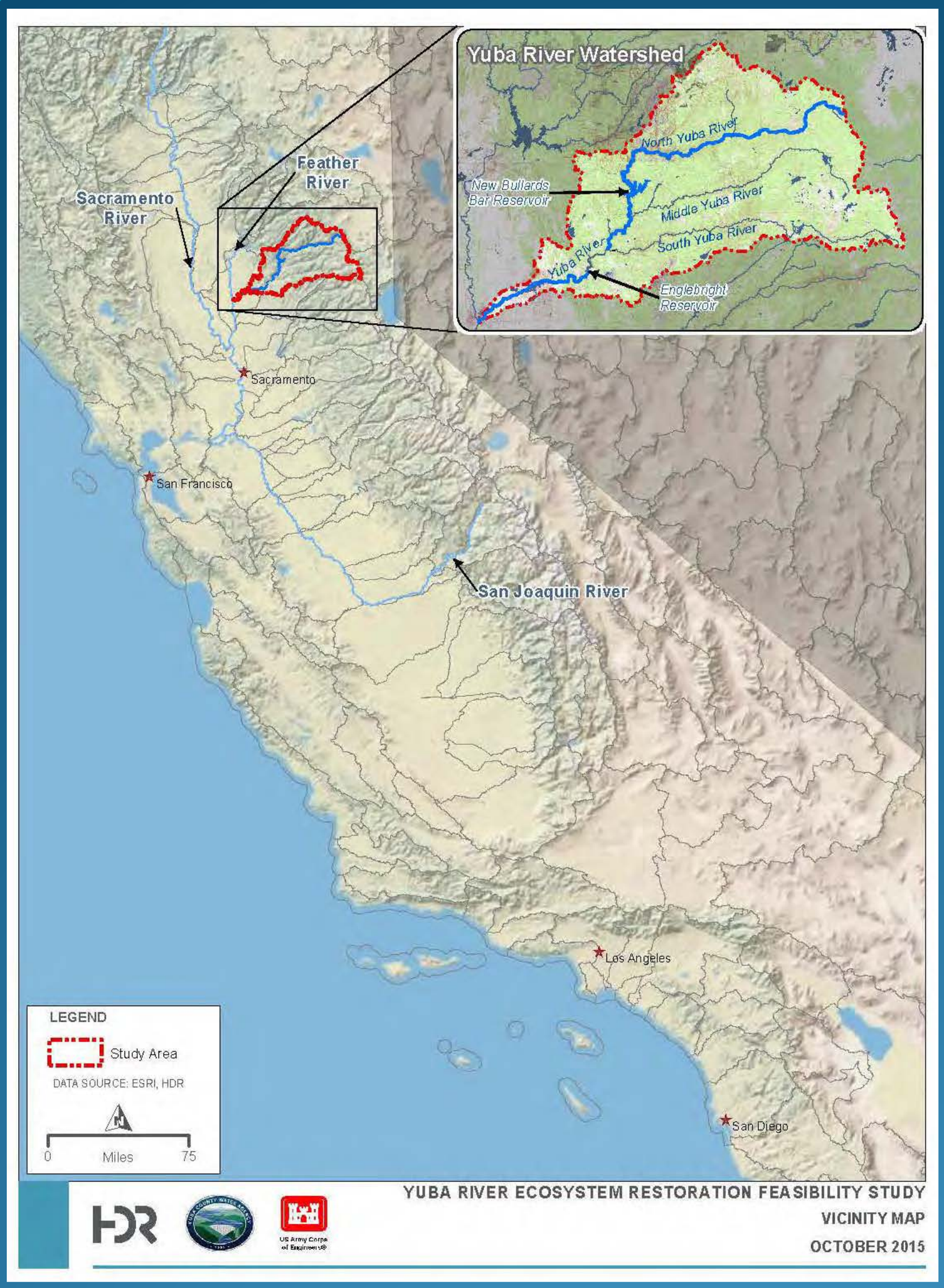
Yuba River Ecosystem Restoration Feasibility Study



Lead Agencies

- US Army Corps of Engineers, Sacramento District (Corps)
- Yuba County Water Agency (YCWA)

Authority

- Rivers and Harbors Act of 1962, Public Law 87-874, Section 209.

Environmental Compliance

- The Corps will be the lead agency for compliance with the National Environmental Policy Act (NEPA).
- YCWA will be the lead agency for compliance with the California Environmental Quality Act (CEQA).

Project Area

- The Yuba River watershed includes 1,340 square miles in portions of Sierra, Placer, Yuba, and Nevada counties.
- The Yuba River is a tributary of the Feather River which, in turn, flows into the Sacramento River near the town of Verona, California.

Tentatively Selected Plan

- Restoration of approximately 178 acres of aquatic and riparian habitat along the lower Yuba River, between Englebright Dam and the confluence of the Yuba and Feather rivers, downstream of the City of Marysville.
- The project is estimated to cost $96.8 million, $33.9 million of which would be YCWA's share as the local sponsor.

The Yuba River Watershed

The Yuba River Watershed begins at the confluence of the Yuba and Feather rivers near the city of Marysville and extends upstream approximately 90 miles to the east past Sierra City. The watershed encompasses 1,340 square miles in portions of Sierra, Placer, Yuba, and Nevada counties. There are numerous dams throughout the Yuba River Watershed, including the Corps-owned Daguerre Point and Englebright Dams and the YCWA-owned New Bullards Bar Dam.

The Yuba River watershed includes a diverse array of environments and conditions, from the snow-covered Sierra Crest to the Sacramento Valley below. The upper watershed contains such wildlife as the American Dipper, North America's only aquatic songbird, while the lower watershed is along the Pacific Flyway. The lower Yuba River is designated critical habitat for Chinook salmon, steelhead, and green sturgeon. The watershed has been degraded by mining, dredging, and logging.

The Yuba River Watershed encompasses a wide variety of stakeholders, activities, interests, and resources. Some of the major considerations in the watershed are identified below:

Features

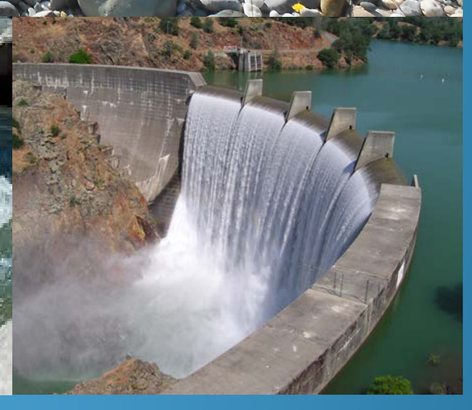
- Dams
  - Daguerre Point
  - Englebright
  - Log Cabin
  - Lake Spaulding
  - New Bullards Bar
  - Our House
- Gold Fields
- National Forests
  - Plumas National Forest
  - Tahoe National Forest
- Pacific Flyway
- Rivers and Creeks
  - North Yuba River
  - Middle Yuba River
  - South Yuba River (CA Wild & Scenic)
- State Parks
  - South Yuba River SP
  - Malakoff Diggins SHP

Biological Resources

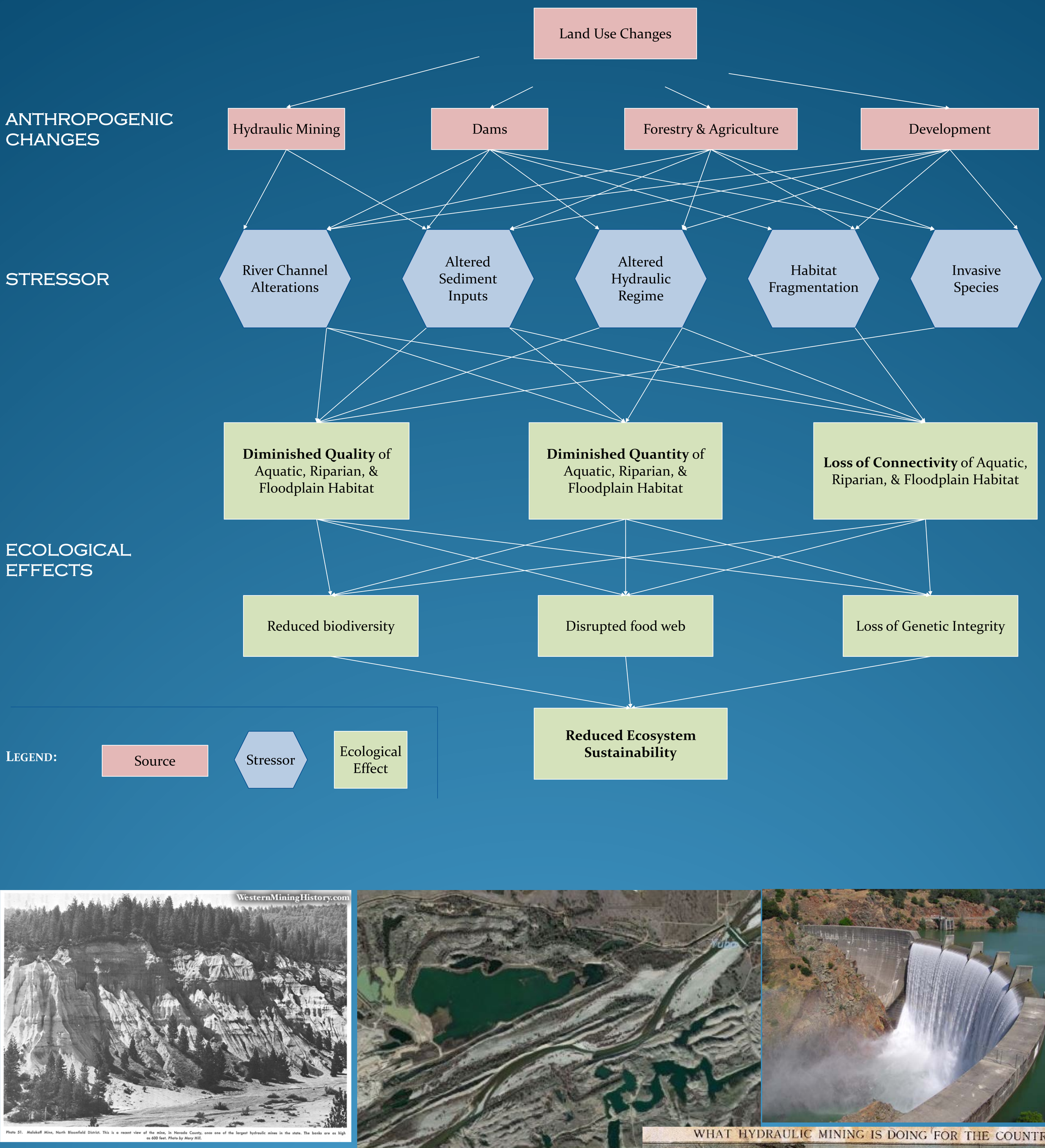
- Central Valley Steelhead
- Chinook Salmon
- Forest, Chaparral, Grasslands, Oak Woodland
- Green Sturgeon
- Migratory and Resident Birds

Activities & Interests

- Aggregate/ Gold Mining
- Agriculture
- Cities and Towns
- Flood Control
- Hydroelectric Generation
- Recreation
- Water Supply



What are the Ecological Problems in the Watershed?



What are the Key Benefits of the TSP?

Secondary Channels, Backwaters, Bank Scalloping, and Floodplain Lowering

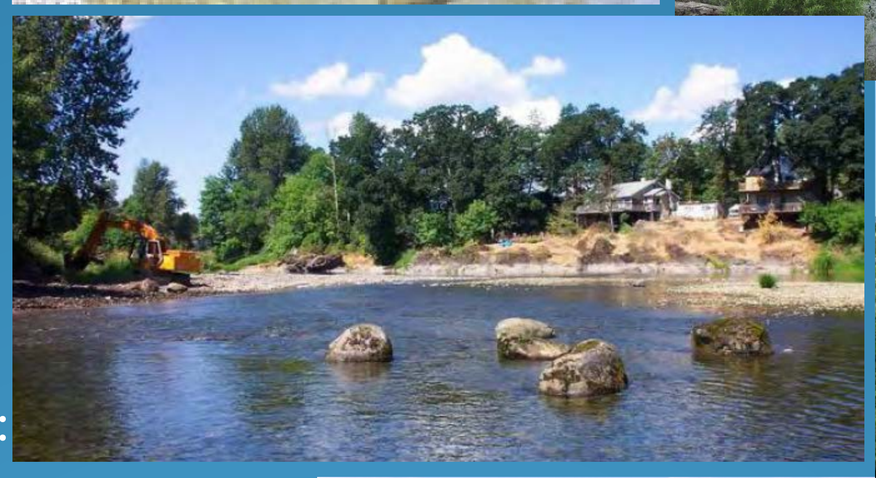
These aquatic habitat features would:

- Increase structural habitat complexity (greater aquatic habitat complexity supports a greater diversity of species)
- Increase edge habitat (dynamic habitat where the water meets the land)
- Improve connectivity between the river and its floodplain (increase the frequency and duration of inundation)
- Facilitate natural recruitment of riparian vegetation, through improved depth to water table and the recruitment of fine sediments.

Large Woody Material and Boulders

These habitat features would:

- Improve structural complexity of aquatic habitat including creating velocity refuges, areas for benthic macroinvertebrates to colonize, and refuge from predators.
- Create scour and deposition that support a diversity of aquatic microhabitats
- Trap woody and other organic material adding to local availability of food resources and habitat structure.
- Promote desirable hydraulic conditions to improve the resilience of key aquatic habitats (secondary channels, backwaters, and lowered floodplain).



Riparian Planting

These Riparian habitat features would:

- Increase the extent of riparian vegetation and provide foraging, nesting, cover, for terrestrial plants and wildlife.
- Improve the food supply for benthic macro-invertebrates.
- Enhance fish habitat by providing shade and cover
- Provide a long-term source for locally recruited large woody material.
- Provide structural complexity for aquatic habitat when inundated at high flows.

What Does Habitat Restoration Look Like?

Side Channel - Sunrise Side Channel on the American River

Backwater Area- Example of a backwater area on the American River

Floodplain Lowering - Lower Dosewallips Floodplain Restoration
http://wildfishconservancy.org/projects/lower-dosewallips-floodplain-estuary-restoration/

Riparian Planting - Example of stinger planting (could be following floodplain lowering) on LYR as part of Hallwood Restoration (http://www.hallwoodproject.org/)

Large Woody Material -
Example of ELJs on the Klamath River (USFWS 2016)

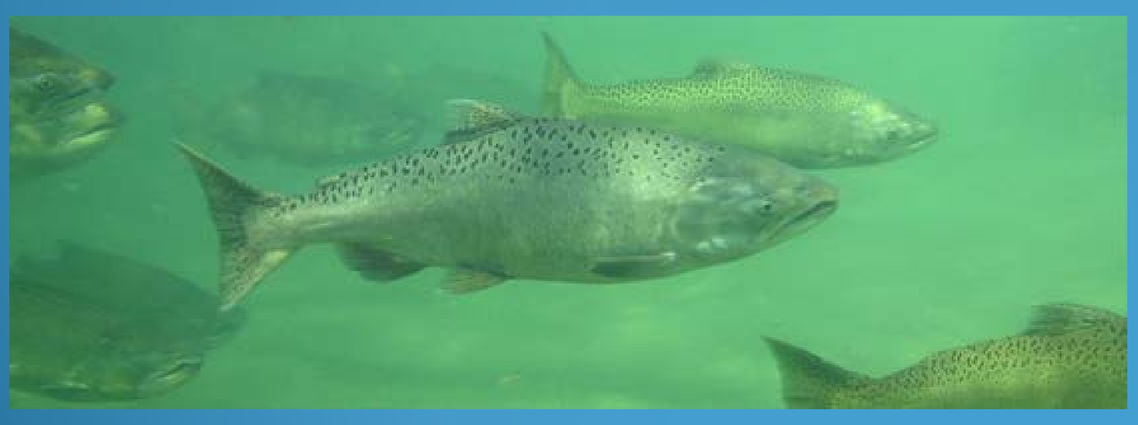
Boulder Placement
(https://www.wou.edu/.../restoration/WA_Dept_Forestory_2004_Boulder_Clusters.pdf)

What are the Key Benefits of the TSP?

1. The TSP will improve the availability and quality of aquatic and riparian habitat. In the short term, the TSP would increase aquatic and riparian habitat by creating aquatic features and planting riparian vegetation. The TSP would improve the complexity and diversity of habitat by adding features to the landscape including woody material, boulders, vegetation, and topographic diversity. In the long-term the TSP would improve conditions that support the natural recruitment of riparian vegetation and promote processes that maintain good aquatic and riparian habitat.

2. Improved habitat will provide opportunities for populations of fish, wildlife, and vegetation to thrive. Individuals and populations of species like anadromous salmonids, benthic macroinvertebrates, and migrant songbirds will directly benefit from improvements to the availability and quality of habitat. Direct benefits to key species would result in indirect benefits to the populations of species that interact with there species and share these habitats.

3. Improving the health of communities of fish, wildlife, and vegetation would result in a more productive and resilient ecosystem on the lower Yuba River.



Understanding the Environmental Review Process

Major Environmental Topics Addressed

Air Quality, Noise, Transportation, Water Quality

- Temporary effects during construction
- Best management practices and environmental commitments for construction would reduce localized construction effects.
- Continued coordination with the regional air quality management district and regional water quality control board under the Clean Air Act and the Clean Water Act.

Biological Resources

- Construction and staging could result in vegetation removal which could adversely impact habitat for listed species such as the Valley Elderberry Longhorn Beetle, Chinook salmon, steelhead, and green sturgeon.
- Other construction activities could adversely impact listed species such as the Spring-run Chinook salmon, Steelhead, and green sturgeon.
- Continued coordination with USFWS and NMFS through formal consultation under the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the Fish and Wildlife Coordination Act.

Cultural Resources

- Potential effects on archaeological resources could occur from construction of project features.
- A programmatic agreement between the Corps and the State Historic Preservation Officer would provide a framework for appropriate compliance with Section 106 of the National Historic Preservation Act.
- Ongoing coordination with tribal representatives would continue throughout implementation of the Programmatic Agreement

Notice of Intent	Official notice that an environmental document is being prepared.
Scoping	Lead agency solicits comments from public and agencies on scope and content of environmental report, and seeks input on alternatives to be considered
Preparation of Draft FR/EA	Describes the purpose, need, and objectives of proposed project; alternatives considered or rejected; and a comprehensive evaluation of the environmental impacts that the proposed action and/or alternatives would likely cause
Publication of Draft FR/EA	A 45 day period of review during which the public and agencies review the draft document and submit comments to the lead agency
Preparation of Final FR/EA	Addresses the comments on the draft document and from any public hearing and presents the final evaluation of project-related environmental impacts
Final Decision and Publication of Final FR/EA	Lead agency uses information from final document and the project record to report and issue a decision documenting conditions, commitments, and or mitigation associated with approval. The final document will be posted to the study website.

How Can I Comment?

Comments on the draft Feasibility Report/ Environmental Assessment will be accepted from January 8, 2018 to February 23, 2018. Written comments can be submitted as follows:

1. AT PUBLIC MEETINGS - Fill out a written comment form and return it to the comment box

2. BY MAIL - Written comments and comment cards can be addressed to:

   U.S. Army Corps of Engineers, Sacramento District
   Attn: Planning Division
   1325 J Street, 10th Floor
   Sacramento, CA, 95814-2922

3. BY E-MAIL - E-mailed comments can be addressed to:
   Yuba-River-Eco-Study@usace.army.mil
   Please include "Yuba River Ecosystem Restoration Feasibility Study" in the subject line and include the commenters' U.S. Postal Service mailing address.

You can stay up to date on the progress of the Yuba River Ecosystem Restoration Feasibility Study and download a copy of the FR/EA by visiting ***http://www.spk.usace.army.mil/Missions/Environmental-Projects/Yuba-River-Eco-Study***

We need your feedback. This is your chance to have a say in the refinement of the Tentatively Selected Plan

Habitat Measure Design

In line with SMART planning principles, design criteria and resulting project design for the TSP was developed and applied at a level of detail appropriate to for plan formulation process- to ensure reasonable representative values of ecosystem outputs and cost estimates.

Following the current public comment period and other concurrent reviews, the next step for the proposed plan is design refinements. These refinements will include the beginning of site-specific engineering, and eventually lead to updated (Class III) cost estimates. Class III cost estimates are what are used for construction cost share agreements and Congressional authorization.

TSP Side Channel, Backwater, and Bank Scalloping Design Criteria

- Baseflow Assumptions
  - 730 cfs upstream of Daguerre Point Dam
  - 530 cfs upstream of Daguerre Point Dam
- Entrance and Exit
  - Non-depositional area
  - Capable of transporting out coarse sed.
  - Not convey more than 15% baseflow (to maintain main stem sed. transport)
  - Entrance (first 1/3 of channel) not too rough so that sed. transport maintained
- Footprint - Based on numerous previous reports
- Shore Slope - 3:1 (H:V) from the base flow condition to a design depth (0.5 ft)
- Depth – balancing act between species suitability vs. flow frequency. 0.5 ft design flow chosen
  - Steelhead Fry – rearing (Apr to Jul) habitat 70 - 100% of optimal depth about ½ of the time
  - Steelhead Juveniles – rearing (Jun to Sep) habitat 50 - 80% optimal upstream, 50 - 60% optimal downstream of Daguerre Point Dam about ½ of the time
  - Spring-run Chinook Salmon Fry – rearing (Nov to mid-Feb) habitat 100% suitable about ½ of the time
  - Spring-run Chinook Salmon Juveniles – rearing (Jun to Sep) habitat 50 - 90% optimal upstream, 50 - 60% optimal downstream of Daguerre Point Dam about ½ of the time

TSP Structural Complexity Feature Design Criteria

Woody Material - Bankline application

- 25 feet in length
- 2 ft in diameter.
- anchored in the bankline at a 45 degree angle downstream
- protrude 1/3 of its total length beyond the bankline into the channel.

Woody Material - Floodplain or seasonally inundated area application

- placed parallel with the flow
- anchored with cables, boulders, and pins

Boulders

- 5 tons in weight
- Average 1 m in diameter

Habitat Measure Design

If the proposed plan proceeds through a Final Report, Congressional Authorization, execution of a cost sharing agreement, and funds are then appropriated by Congress, Preconstruction Engineering and Design (PED) would begin. This would include final engineering, including site explorations, environmental permitting, and further review.

TSP Floodplain Lowering, Floodplain Grading Design Criteria

- Flow Related Target Elevations
  - 2000 cfs upstream of Daguerre Point Dam
  - 2000 cfs upstream of Daguerre Point Dam
- Duration of Inundation – 21 day minimum duration
  - floodplain invertebrate densities approach main channel densities after 2 to 4 weeks of inundation on American River
  - studies have shown increased juvenile salmonid growth rates as a result of at least 21 days on Central Valley floodplains
  - 21 days adequate for phytoplankton and zooplankton to produce food resources in shallow water with temperatures warmer than main river channel
  - 21 days likely provide the opportunity for macroinvertebrates to colonize off-channel areas
- Frequency of Inundation – 67% (2 in 3 years)
  - highly supportive of juv. anadromous salmonids in spring rearing and growth period
    - Increased functionality of shallow off-channel rearing habitat
    - Increased growth associated with refugia habitat and food availability
  - potentially increasing benthic macroinvertebrate producing habitat
  - provide increased riparian vegetation and subsequent woody material recruitment to riverine habitats
  - promoting riparian vegetation recruitment, instream object and over-hanging cover, and allochthonous food sources

TSP Vegetative Planting Design Criteria

- Native Species Planting Composition
  - Gooddings black willow (*Salix gooddingii*)
  - red willow (*S.laevigata*)
  - arroyo willow (*S lasiolepis*).
- Planting Density
  - 1,500 cuttings per acre
  - Target 75% survivorship
- Planting Design
  - Cover no more than 50% of constructed surfaces to promote natural plant recruitment
  - Pod planting method (20’ diameter planting units)
  - Cuttings combination: 6 cottonwood, 2 of each willow species
  - 7’ length, 2” in max diam.
  - Willows 2” into groundwater
  - Cottonwoods 2” above groundwater

The Screening Process

Efficiency Evaluation Criteria

- Quantity of ecosystem restoration
- Quality and significance of ecosystem restoration
- Relative cost of measures

Efficiency of measure = (Quality Factor X Quantity Factor) / Cost Factor

In other words, efficiency is the amount of restoration compared to cost, and the higher the efficiency score the better the buy.

Evaluating Quality of Restoration Achieved by Measures

How would each measure affect the characteristics of the river system:

- **Habitat Scarcity**
- **Connectivity**
- **Special Status Species**
- **Hydrologic Character**
- **Geomorphic Character**
- **Self-Sustaining**

Scoring Quality of Measures

Measures were scored on a scale of 1 – 5 for each characteristic using defined criteria (see handout).

Evaluating Quantity of Restoration Achieved by Measures

Comparing the quantity of restoration between fish passage measures, dam removal measures, and conventional restoration measures is a difficult problem

USACE guidance established methods to compare fish passage measures to habitat restoration measures in terms of weighted acres. The guidance provides the following fish passage weighting factors:

- Fish passage measures do not create new habitat for other species (weighting factor = 0.25)
- Not all fish passage measures are equally effective. For example, a technically complex ladder versus a natural bypass. (weighting factor = 0.2 to 1.0)

Scoring Quantity of Measures

- **1 = Low = 0 – 100 weighted acres**
- **2 = Low-Medium = 101 – 200 acres**
- **3 = Medium = 201 – 300 weighted acres**
- **4 = Medium-High = 301 – 400 weighted acres**
- **5 = High = 401 – 500 weighted acres**

The Screening Process

Comparing Cost of Measures

In order to compare the relative cost of measures, cost categories were established to rank measures using rough order of magnitude cost estimates. The ranking categories are as follows:

- 1 = Low = $0 to $200 million
- 2 = Low-Medium = $200 to $400 million
- 3 = Medium = $400 to $600 million
- 4 = Medium-High = $600 to $800 million
- 5 = High = $800 to $1,000 million
- 6 = Very High = $1,100 to $1,200 million
- 7 = Very High = $1,200 to $1,400 million
- 8 = Very High = $1,400 to $1,600 million
- 9 = Very High = $1,600 to $1,800 million
- 10 = Very High = over $1,800 million

Efficiency Results

Measure	Quantity Factor	X	Quality Factor	÷	Cost Factor	=	Efficiency Ranking Factor = (Quantity × Quality) ÷ Cost	Efficiency Ranking
Lower Yuba Habitat Restoration	3	×	4	÷	1	=	12	Very High
Daguerre Point Dam Removal	3	×	4	÷	3	=	4	Low-Med
Daguerre Point Dam Step Pools	1	×	3	÷	1	=	3	Low-Med
Englebright Dam Removal	4	×	5	÷	10	=	2	Low
Daguerre Point Dam 10% Bypass	1	×	2	÷	1	=	2	Low
Collect & Transport above Englebright Dam and Reservoir	2	×	3	÷	3	=	2	Low
Collect & Transport above New Bullards Bar Dam and Reservoir	1	×	3	÷	2	=	2	Low
Englebright Dam Fish Ladder	2	×	3	÷	5	=	1	Low
Englebright Dam Fish Tram	2	×	3	÷	6	=	1	Low
Englebright Dam Bypass	2	×	3	÷	6	=	1	Low

Considering Risk and Uncertainty in Addition to Efficiency

Six risk factors that could affect efficiency ratings were identified and analyzed.

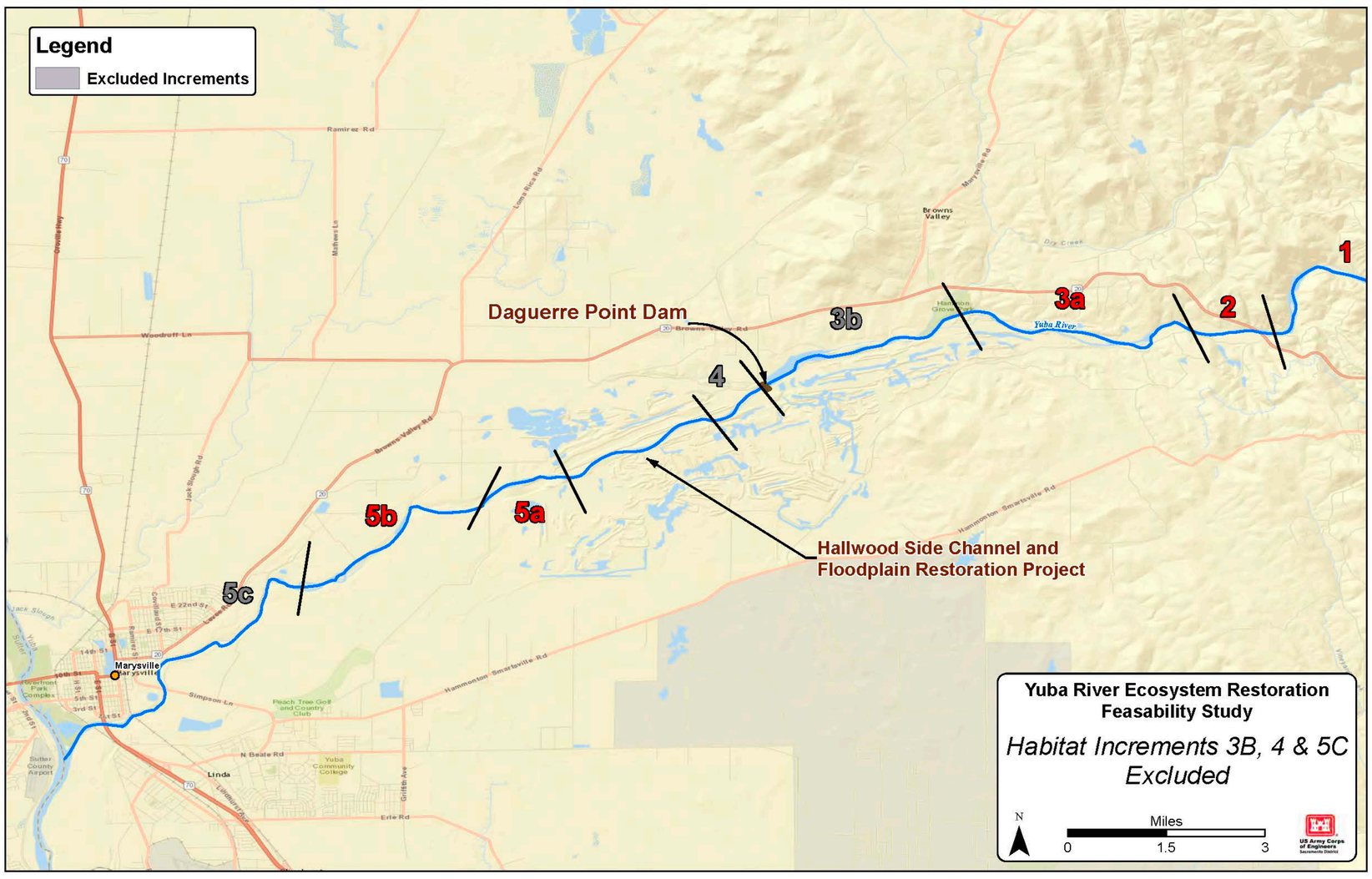
Risk and Efficiency Results

Measure	Efficiency		Cost Risks of Mercury Contamination		Cost Risk of Distance to Sediment Disposal		Potential Effects to Water Rights		Risk of Design Complexity		Risk of Construction Complexity	
Lower Yuba Habitat Restoration	Very High	12	Low	1	Low	1	Low	1	Low	1	Low	1
<----------*Screening Break*---------->												
Daguerre Point Dam Removal	Low-Med	4	High	5	High	5	High	5	Med	3	Med-High	4
Daguerre Point Dam Step Pools	Low-Med	3	Med	3	Low	1	Low	1	Med	3	Low-Med	2
Englebright Dam Removal	Low	2	High	5	High	5	High	5	High	5	High	5
Daguerre Point Dam 10% Bypass	Low	2	Low	1	Med	3	Low	1	Med	3	Med	3
Collect & Transport above Englebright Dam and Reservoir	Low	2	Low	1	Low	1	Low	1	High	5	High	5
Collect & Transport above New Bullards Bar Dam and Reservoir	Low	2	Low	1	Low	1	Low	1	High	5	High	5
Englebright Dam Fish Ladder	Low	1	Low	1	Low	1	Low	1	High	5	High	5
Englebright Dam Fish Tram	Low	1	Low	1	Low	1	Low	1	High	5	High	5
Englebright Dam Bypass	Low	1	Low	1	Low	1	Low	1	High	5	High	5

The Lower Yuba River Habitat Restoration measure was the only measure retained for further evaluation.

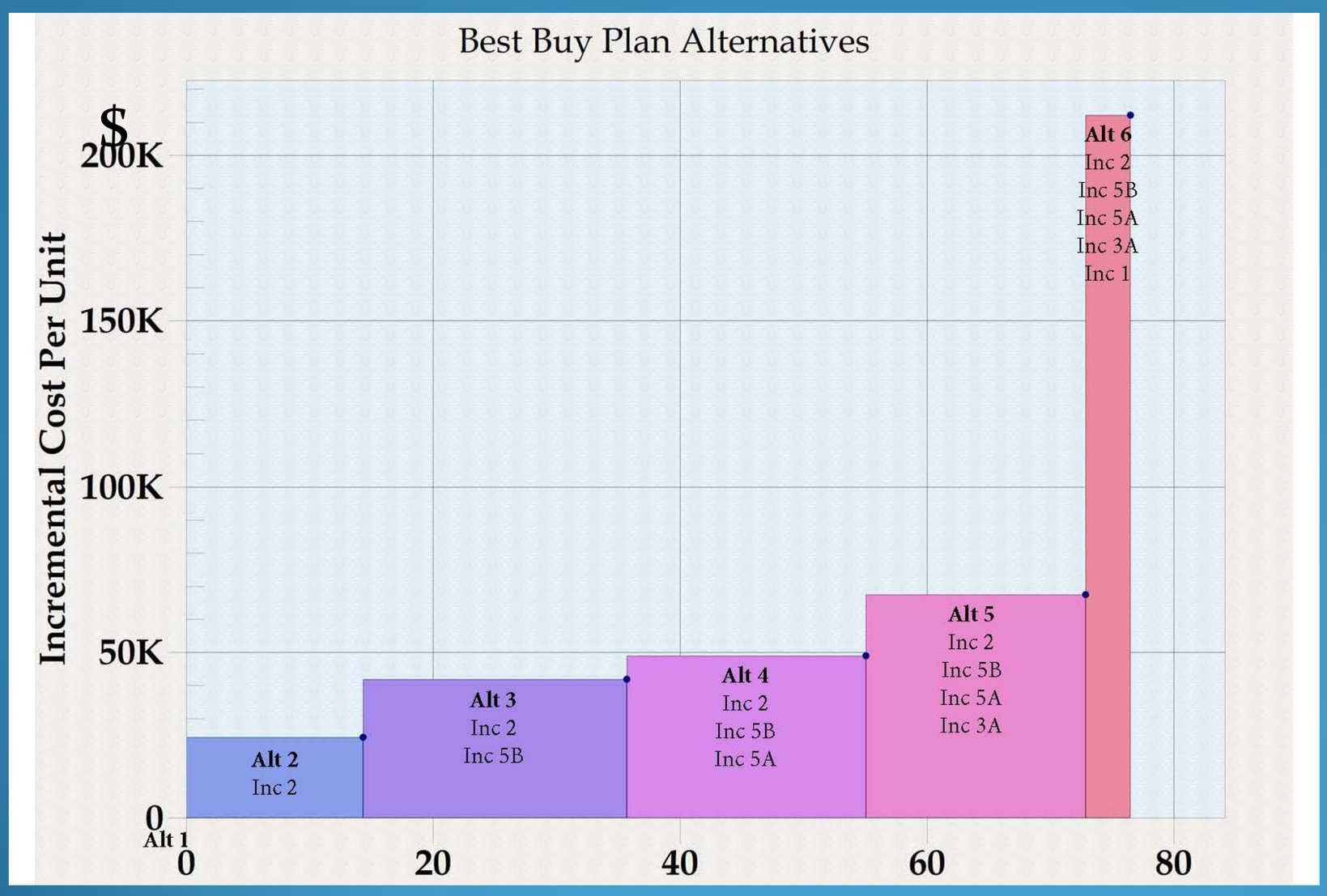
The Final Array of Alternatives

- For more detailed evaluation, the Lower Yuba River Habitat Restoration measure was divided into eight Habitat Increments based on geographic locations that take advantage of cost-efficiencies of scale, including shared access routes for construction.
- Increments 3b and 4 were screened in order to NOT preclude further actions at Daguerre Point Dam.
- Increment 5c was screened due to changed conditions during winter floods of 2016.



Cost Effectiveness/Incremental Cost Analysis

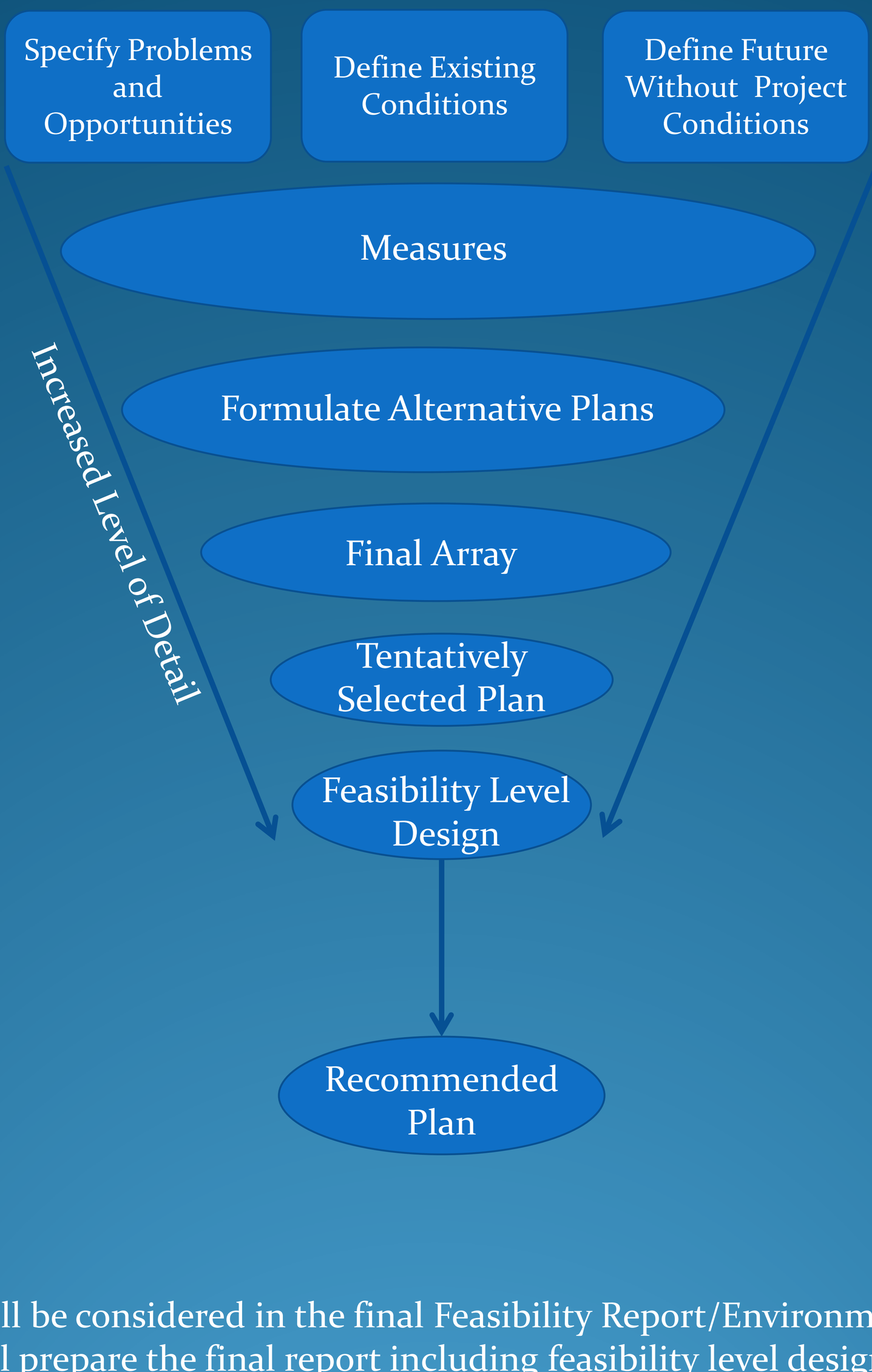
- A Habitat Evaluation Procedure was used to quantify ecosystem outputs for each Habitat Increment. Visit the Environmental Considerations station for more detail on ecosystem outputs.
- Preliminary cost estimates were prepared for each Habitat Increment.
- Ecosystem outputs and costs were input into Cost Effectiveness/Incremental Cost Analysis software to generate all possible combinations of Habitat Increments and identify Best Buy Plan Alternatives.



Alternative 5 maximizes benefits relative to costs and is therefore the Tentatively Selected Plan

Next Steps

Plan Formulation Process



- Comments will be considered in the final Feasibility Report/Environmental Assessment.
- The Corps will prepare the final report including feasibility level design.
- The Corps will notify all interested parties when the final report is available for review.
- The Assistant Secretary of the Army for Civil Works will submit the report to Congress.
- Congress may:
  - Authorize the project
  - Fund the project
- If the project is authorized and funded, the next steps are:
  - Cost sharing agreement with YCWA
  - Preconstruction Engineering and Design
  - Construction
  - Monitoring and Adaptive Management