

Stanislaus River Habitat Use Investigation

U.S. Bureau of Reclamation
Fishery Foundation of California
Wildlands Inc.

Institute for Natural Resource Engineering

Goals and Objectives

Goal:

- *To develop a valid methodology to determine fish and fish habitat response to different operational flows in the lower Stanislaus River (LSR).*

Objectives:

- *To conduct a preliminary investigation (Pilot Study) to test survey methods, validate the statistical approach, and define how best to expand the effort to the entire LSR.*

Study Plan

- Select 5-8 half-mile representative reaches.
- Map habitat units at two flows.
- Generate GIS maps of sampling units.
- Survey fish within units at two flows.
- Develop layered GIS database with fish and habitat data.
- Develop 2-D model for one reach.

Lower Stanislaus River

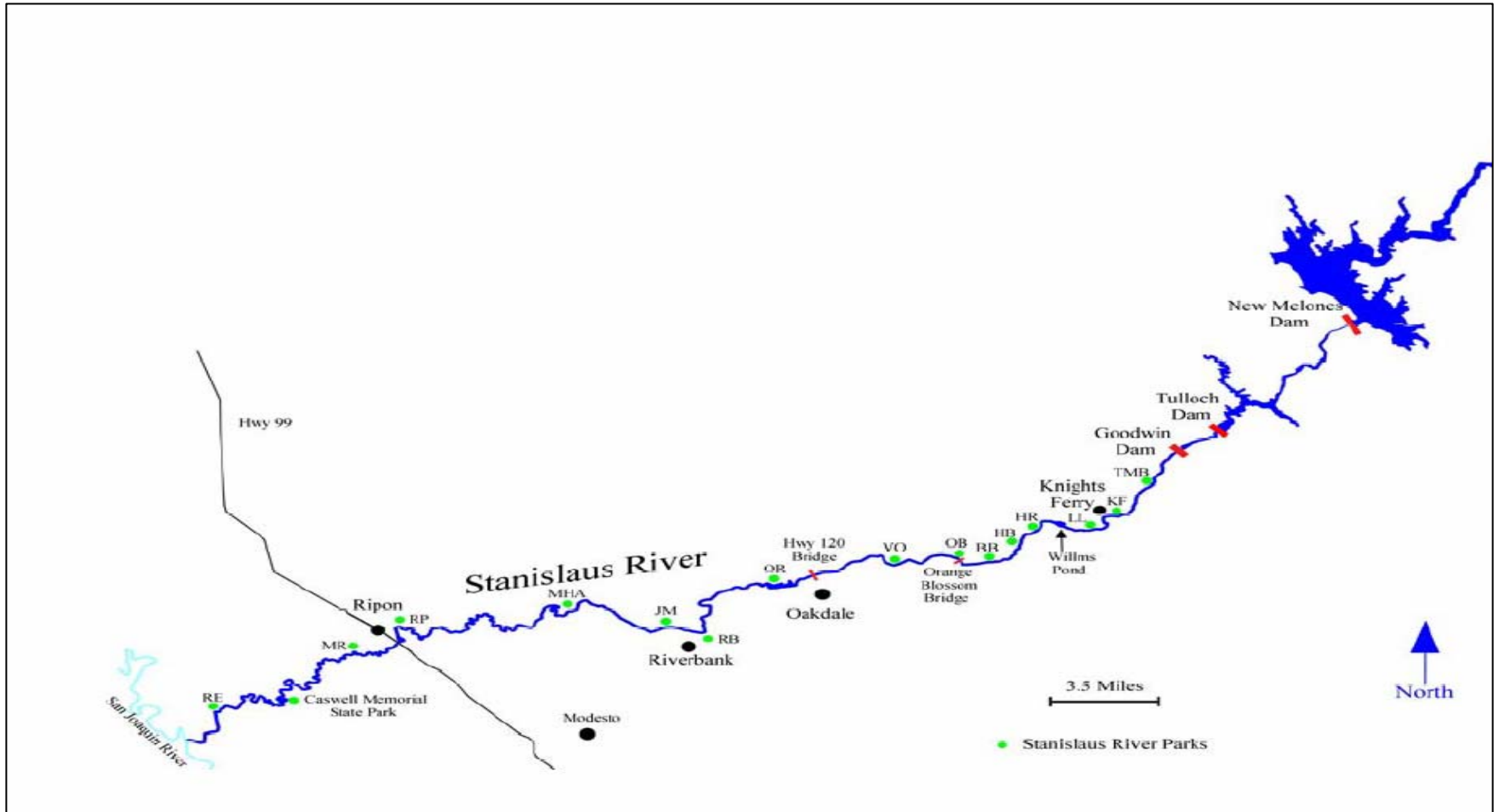


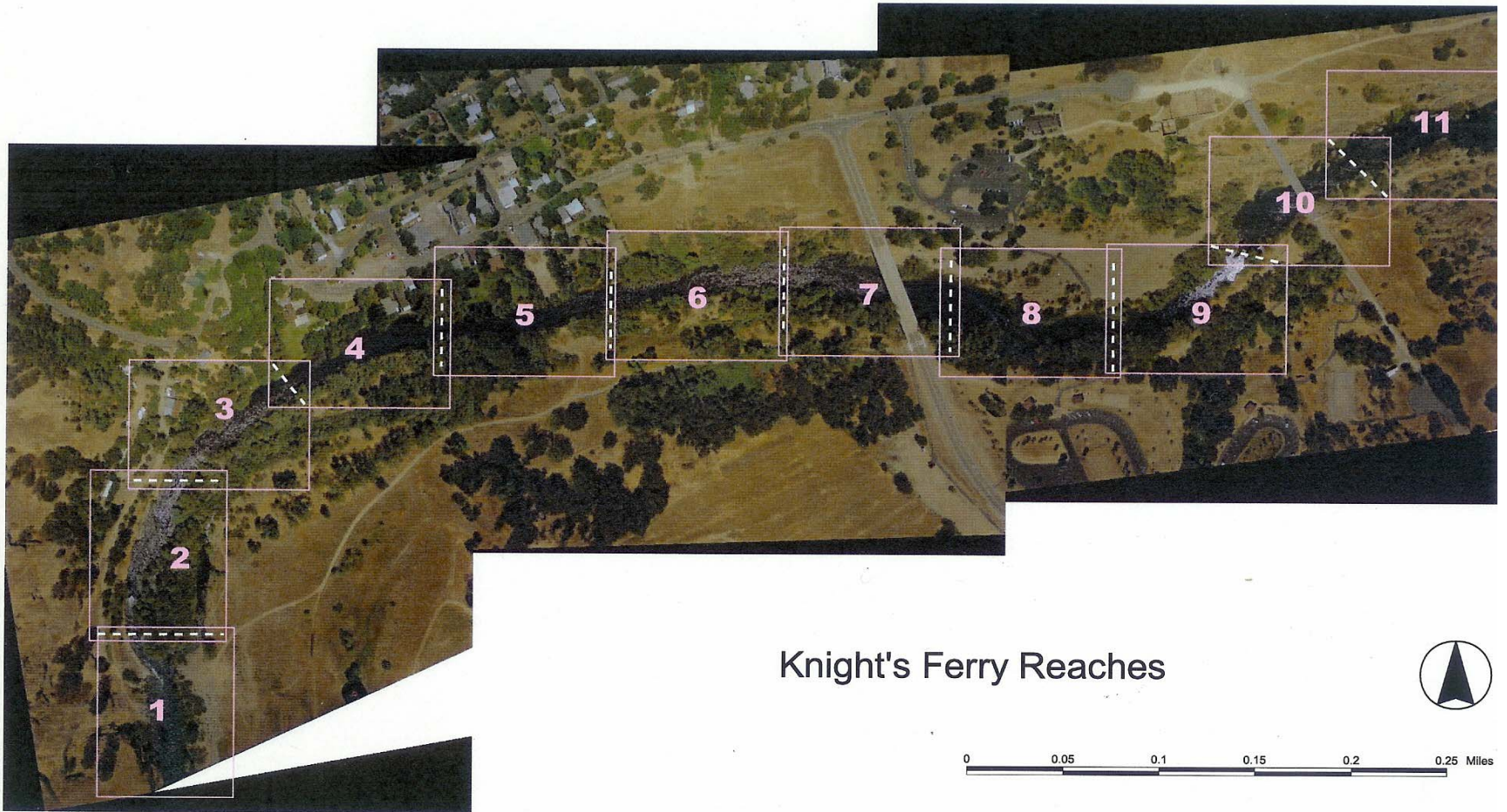
Figure 1. Map of LSR sampling locations. (Source: SRFG 2003).

Habitat Mapping

Three Stage Sampling

- Reach (e.g. Goodwin, Knights Ferry, etc)
- Sub-reach (e.g. Riffle, Glide, Pool)
- Sampling unit (polygon)
 - Bar, Bank, Backwater, Mid-channel, Side channel, etc.
 - Habitat Parameters (e.g. Depth, Velocity, cover, substrate, etc.)

Knights Ferry Aerial Index



Aerial Photo for Habitat Delineation

Knights Ferry Reach Sheet 7 of 11



GIS Mapping

- Digitize sampling units from aerial photos.
- Populate database by sampling unit with habitat and fish variables collected during field surveys.
- Generate layered data maps.

Fish Sampling

Methods

- Snorkel surveys.
- Alternative (e-fishing, seining)

Variables collected

- Polygon unit number (Lat/Long).
- Fish (numbers, species, and size)
- Water Temp

Statistical Analysis

Objectives:

- Relate fish use and habitat conditions to flow and river location.
- Compare fish densities among unit types.
- Relate densities to habitat parameters.
- Generate standard statistics (e.g. means).

Products:

- Standard statistics
 - Means and variance
 - Mean square error
 - ANOVA
 - Regressions
- The area of each habitat type under two flows.

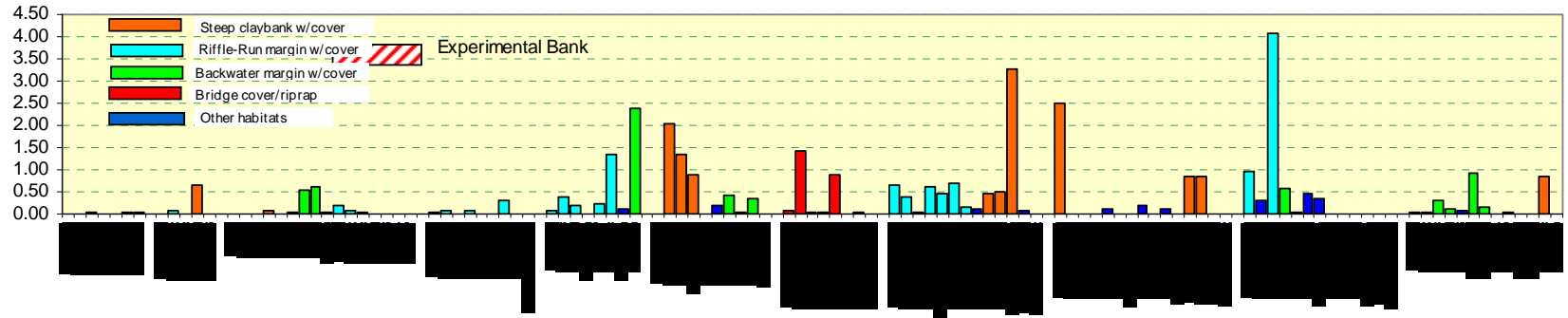
2-D Modeling

- Field measurements (e.g. depth, velocity, substrate, cover)
- Model development.
- Model testing.
- Predictions and Presentations.

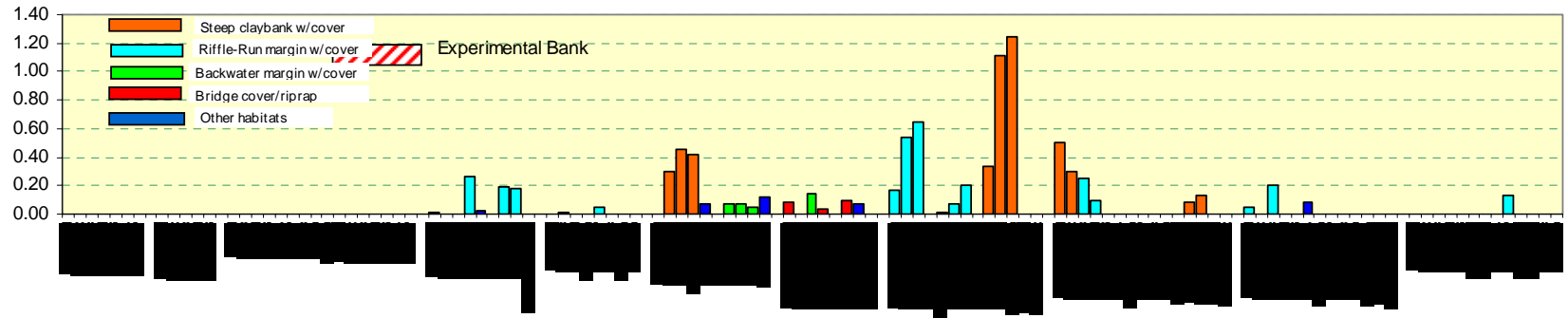
Report

- Present results.
- Compare methodologies.
- Recommendations for future studies.

Chinook Salmon - Lower American River Snorkel Survey - Late April



Steelhead - Lower American River Snorkel Survey - Late April



Survey Alternatives

Study Design Alternatives

Preferred Approach

The habitat and fish surveys (surveys) will be conducted at two flows, a base flow of approximately 250 cfs in February and another during VAMP (750-1250cfs) in April or May.

Advantages:

Flows during these time periods have historically been relatively consistent within and between years.

Hydrologic variability would be reduced during field surveys.

Disadvantages:

Flood releases from New Melones dam are presently greater than 4000cfs and it is not likely that the planned February base flow will occur at a time consistent with the scope.

Direct comparison among flow regimes for fish density may not be possible because different species and life stages are likely to occur during the two survey periods

Alternative 1

The high flow survey will begin as flows decrease to 1250cfs, presumably in late winter or early spring, depending on local precipitation and storage in New Melones Reservoir. The low flow survey would occur during the post VAMP, summer baseflow period (late May).

Advantages:

No significant temporal deviation from scope is likely. The order of the high and low flow surveys would simply be switched.

High and low flow ranges are consistent with the original scope of work.

Disadvantages:

Field surveys will take two to three weeks and it is very likely that flows will vary significantly during the high flow data collection period.

Direct comparison among flow regimes for fish density may not be possible because different species and life stages are likely to occur during the two survey periods

Alternative 2

The high flow survey will occur during VAMP releases which typically fall within the 750 to 1250 cfs range (April or May). Low flow surveys will begin during the summer base flow period (250-500 cfs) immediately following VAMP

Advantages:

High and low flows are consistent with the scope of work

Flows during each survey will likely be stable while fish and habitat data are being collected.

Of the three alternatives, the present offers the best opportunity to make direct comparisons of fish distribution among flow regimes.

Disadvantage

Overall fish densities will be low relative to the time period originally proposed.

Reviewers Comments

Questions from group?

- 5 reaches and two different flow not sufficient
 - sample size too small.
 - Lack of replication
- Data points and reaches are not independent
 - Sampling method is biased
 - Statistical significant

How will they direct the data analysis (i.e., scientifically-based functional relationships between Chinook/steelhead and habitat) or will it simply be exploratory?

It is highly unlikely that the limited data collected will be adequate to conduct such a thorough analysis.

- if the model does not capture large roughness, what assurances are there that the model adequately represents the environment experienced by aquatic fauna?

Linking flow to fish is difficult since flow rarely is the causative agent that drives populations. Rather, flow is correlated in predictable and unpredictable ways to fish abundance and the same flow under different life stage or ecological conditions can produce different impacts to fish populations. How will the contractor's approach address this issue?