

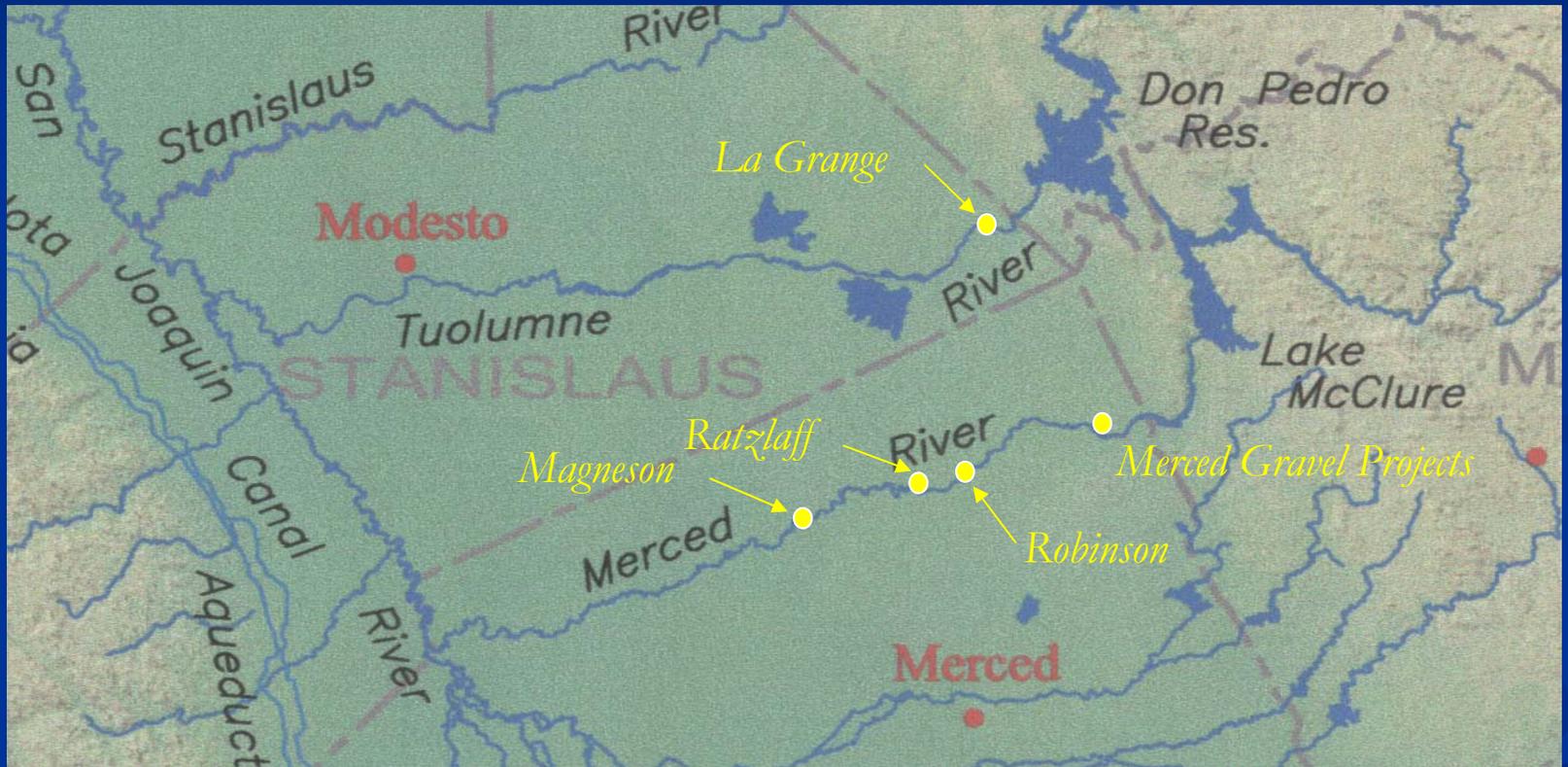
GRAVEL AUGMENTATION

San Joaquin Tributaries



CALIFORNIA DEPARTMENT OF WATER RESOURCES





Assumptions

- ❖ Gravel will be mobile every 1 – 5 years
 - Removes fines
 - Increases flow through the gravel
 - Adds to river's coarse sediment supply
- ❖ Dump and go – Diversity will develop over time

Types of Channel Augmentation

- ❖ Spawning Riffle Maintenance
- ❖ Channel Maintenance and Construction
- ❖ Wing Dam Diversion Maintenance

Gravel Specifications

- ❖ Regulatory Compliance
 - Mercury issues
 - Suspended sediment
- ❖ Availability of Resources
 - Funds
 - Equipment
 - Materials
- ❖ Gradation
 - Mobility(1 to 5 year event)
 - Current hydrology
 - Source

Vendor Selection

- ❖ Location
 - Preference given to vendors in the same watershed
- ❖ Material Origin
 - Pit-run
 - Tailings
 - On-site
- ❖ Lowest bidder

Triggers For Augmentation

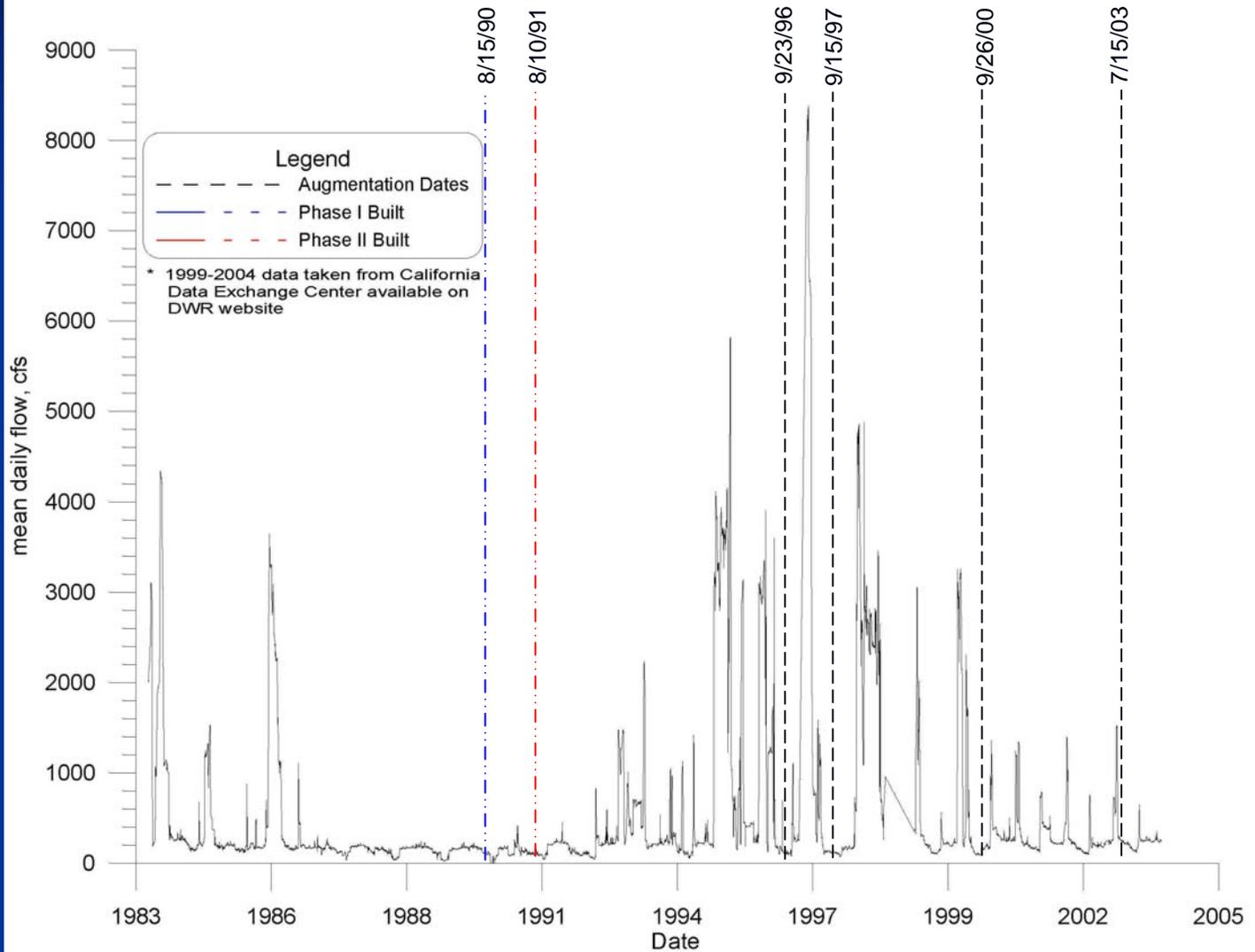
- ❖ High Flows
 - Transports rock
- ❖ Monitoring
 - Tracer gravel moved
 - Sections show change
- ❖ Opportunity
 - Funds
 - Cooperative partners

An aerial photograph of a river hatchery. The water is dark and turbulent, with many small white bubbles and ripples. Numerous fish are visible, swimming in the water. The fish are mostly silver and brown, with some showing darker spots. The text "Merced River Hatchery" is overlaid in the center of the image in a white, serif font with a black outline.

Merced River Hatchery

Aerial Photo of the Site





Placement Methods



Semi-end
dumps
(stockpile)

Excavator &
Loader
(place)



Monitoring

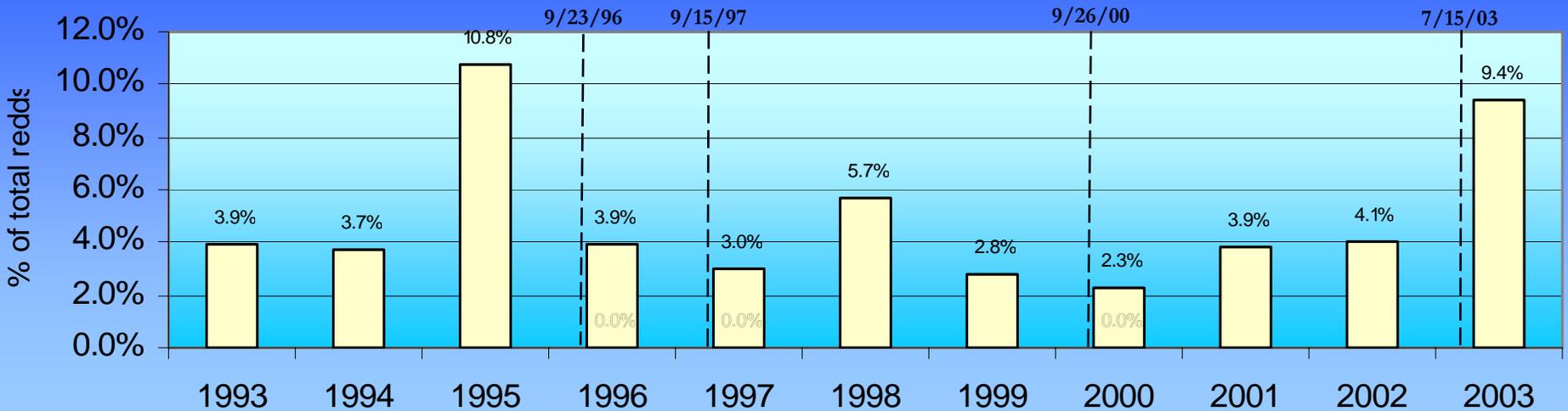
- ❖ Cross Sections
- ❖ Wolman Method Pebble Counts
- ❖ Tracer Gravel
- ❖ Redd Counts and Carcass Surveys

Monitoring Section Locations



Spawning

Percentage of Merced River Redds by Year





MRSHEP
Robinson Reach

Robinson Reach





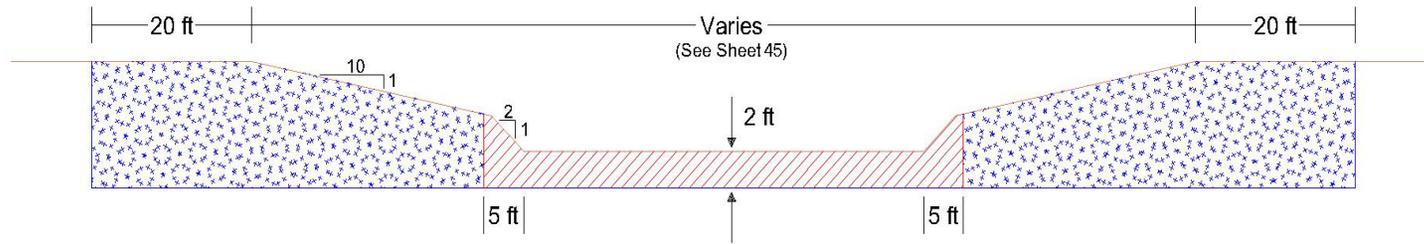
Gravel Production



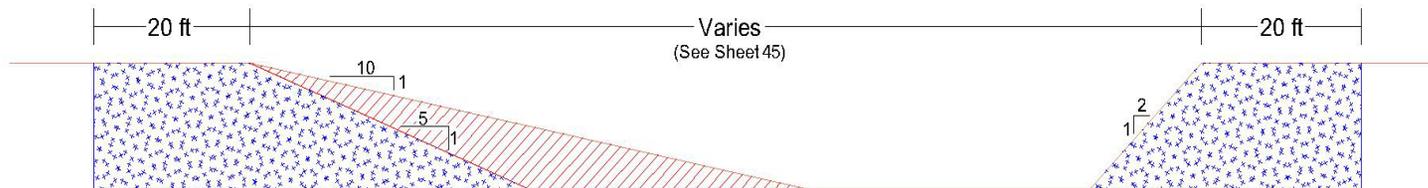
Gravel Placement



Riffle & Pool Design



Typical Riffle Section



Typical Pool Section



Under
construction

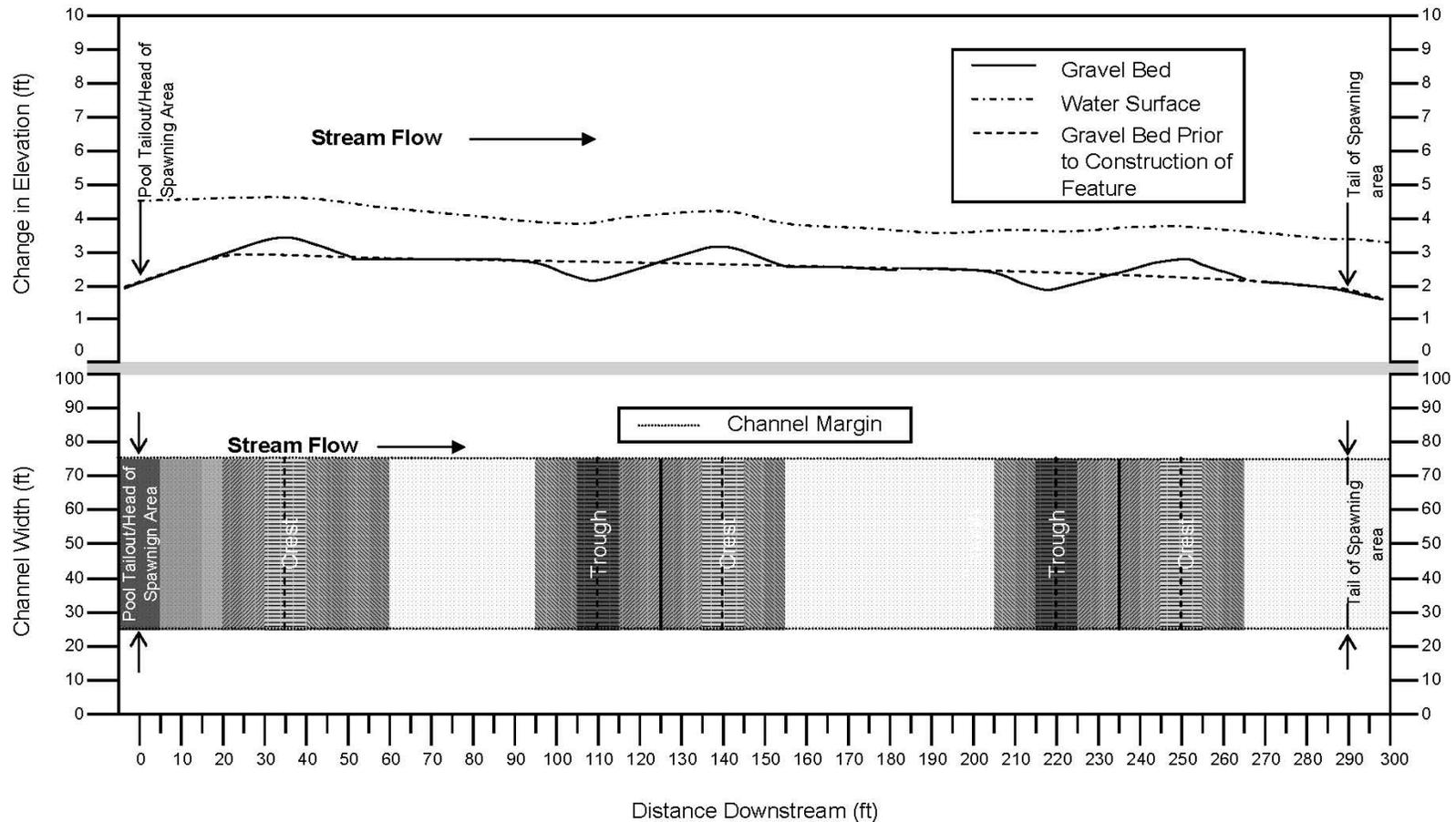
Completed
product



Simulated And Developing Diversity

Riffle "Bump" Design

Longitudinal Profile and Planform of Spawning Area Design "D"



Riffle “Bump” Implementation



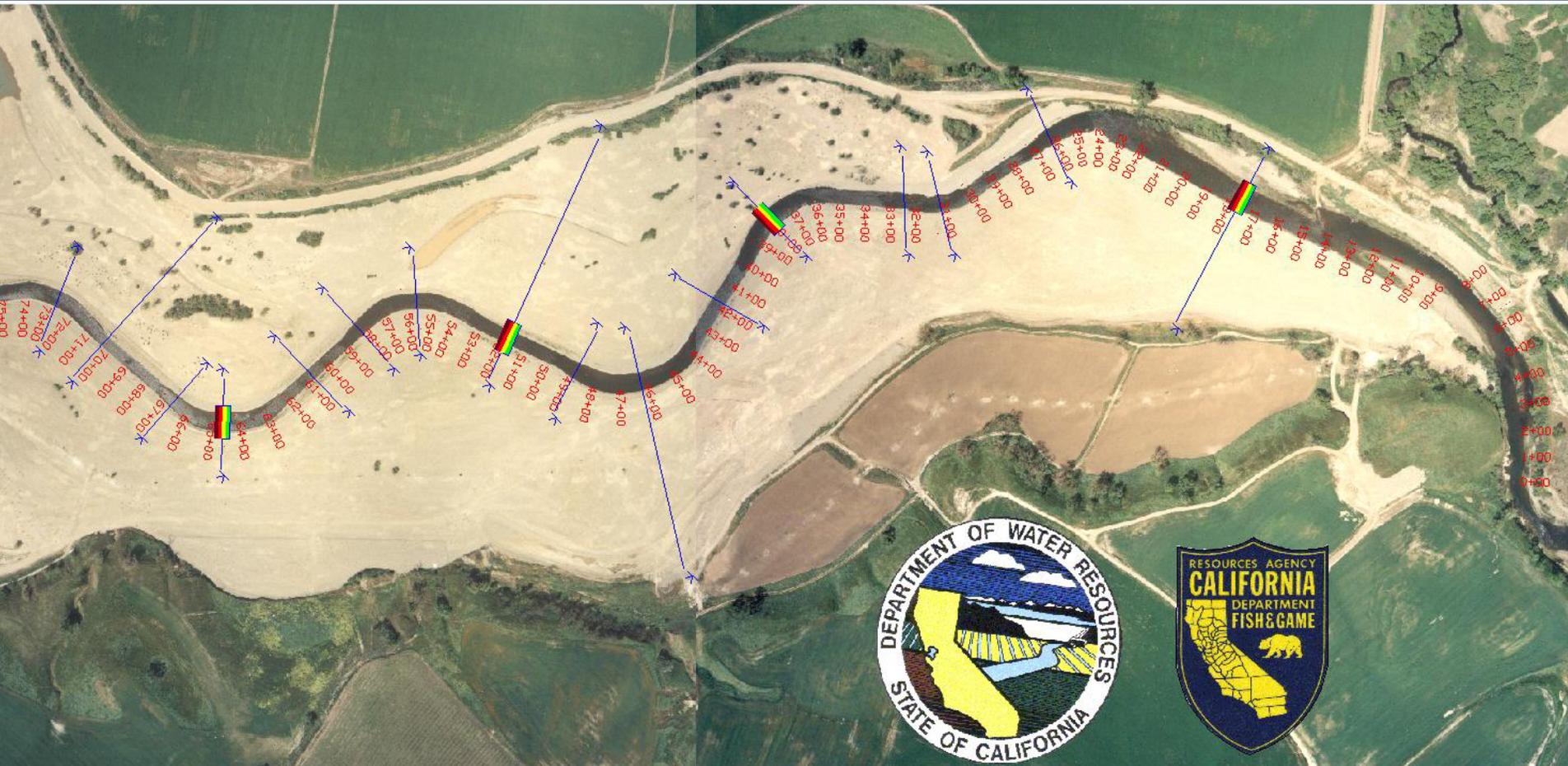
Emerging Diversity



Monitoring

- ❖ Cross-Sections/Profiles
 - Section Surveys
 - Velocity profiles/flow measurements
- ❖ Pebble Counts
- ❖ Sediment Transport
 - Tracer Gravel Studies
 - Sediment Samples (Helly-Smith)
- ❖ Redd Counts and Carcass Surveys (DFG)
 - Also performed by DWR

Upstream Robinson Reach



Survey Cross Section



Velocity Profiles

Pebble Counts



Tracer Gravel Studies

Sediment Samples (Helly-Smith)

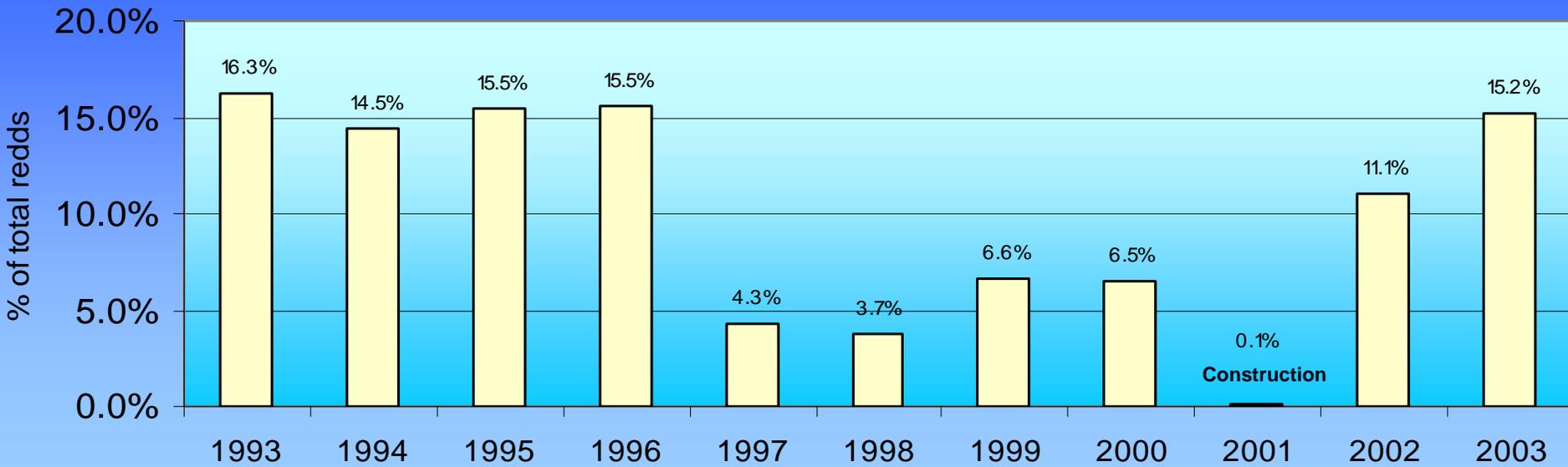
Downstream Robinson Reach



- Survey Cross Section
- Velocity Profiles
- Tracer Gravel Studies
- Pebble Counts
- Sediment Samples (Helly-Smith)

Robinson Reach

Percentage of Merced River Redds by Year



THE END

