ATTACHMENT #1

Trinity River Restoration Program Concepts/Vision

Clair B Stalnaker
USGS Senior Scientist, Retired
clair_stalnaker@cowisp.net

Foundation Impacts

- Blocked access to 109 miles of primary habitat for salmonids
- Forced downstream portion of river to function as headwater habitats
- Changes in fluvial geomorphic processes initiated detrimental changes to remaining habitat downstream of dam
  - historic flow variability of 100 cfs to 100,000 cfs reduced to 150-450 cfs year round with most "high" flows <6,000 cfs

Interdisciplinary Studies

Fifteen Years +

- Habitat hydraulics (micro-habitat, PHABSIM)
- Habitat Temperature (macro habitat)
- Channel restoration (feather edges, side channels)
- Sediment Transport (fine deficit and gravel augmentation)
- Channel Morphology (rehab sites, mechanical actions, channel unraveling)
- Salmon pre-smolt Production Potential

Integration of Six Studies as TRFES, 1997-99

- Six Independent studies
- Haggling over which was most important
- Interior required FWS with Hoopa Valley Tribe input (and concurrence) to review and recommend fish population restoration strategy
- IFIM concept of combining flow, geomorphology, water quality, habitat and salmonid biology to formulate recommendations adopted by inter agency/tribal group
- Interior accepted TRFES recommendations and incorporated into ROD and Implementation Plan

TRFES Major Conclusions

- Salmon juvenile rearing habitat is severely limiting (areas with suitable temperature and hydraulics). The river channel has degraded to such an extent that simply managing flow releases cannot achieve the restoration goals mandated by Congress.
- A dynamic alluvial channel with complex habitat features and suitable temperatures must be recreated to overcome this limitation
- Must increase rearing habitat 3-4X to detect change in smolt production

Conclusions (cont.)

- A dynamic alluvial channel cannot be accomplished solely by prescribing flow releases.
- Mechanical notching of riparian berms, reshaping of the channel, introduction of coarse bed material and reducing sand input from the tributaries would also be necessary.

Basic Premise

- Therefore a combination of mechanical actions and vegetation removal along with managed high-flow releases in the spring and enhanced water temperatures through the remainder of the year is expected to redirect natural fluvial processes resulting in the evolution of a highly complex channel form that is expected to provide significantly increased spawning and rearing habitat for anadromous salmonids

General Hypothesis No. 1

- Recreating a complex dynamic alluvial river channel will increase salmonid habitat quantity and quality
  - A smaller scale dynamic alluvial river with at least a 3x-4x increase in habitat can be created on this highly regulated river

General Hypothesis No. 2

- Salmonid smolt survival will improve as a result of enhanced habitat and temperature conditions that increase growth, improve health and smoltification and reduce travel time associated with emigration

Major TRFES Recommendations

- An Adaptive Environmental Assessment and Management program
- A combination of channel rehabilitation, temperature control and timed releases will be necessary to reach restoration goals of at least doubling the chinook salmon production
- Different environmental accounts for different water supply conditions

A New Management Structure for the Trinity River

"The recommendation includes implementing a new management structure that incorporates water supply forecasting, biological and physical process modeling, annual evaluation of reservoir operation criteria and procedures, predictions of channel evolution toward a more complex bar and pool configuration, and monitoring to test basic hypotheses."

Interior Call for Science Based Program for the Trinity River

- An adaptive management program to establish scientific validity and distinguish it from reactive management (trial and error).
- A deliberate setting of goals, selection of indicators for assessment design, implementation and evaluation of specific management strategies, peer review and regular revisiting and updating of the strategy based on assessment data.

Record of Decision

- Set the policy for rehabilitating the Trinity River
  - Established initial hypotheses of system behavior
  - Specified total volumes in each of 5 WY types
  - Allowed flexibility in flow scheduling within fixed annual volumes (allocated water volumes for 5 WY's)
  - Called for mechanical rehabilitation of the channel
  - Specified sediment management
- Established a new science based management organization
  - Mandated to establish scientific credibility for this NEW approach of combining flow, physical habitat, water temperature in order to restore salmonid populations

Water allocations

WATER VOLUMES BASED ON MEETING MANAGEMENT OBJECTIVES

- 5 water year classes based on Trinity Lake inflow with variable release volumes and schedules
  - Crit. Dry: **369,000 acre-ft** with peak release of 1,500 cfs; p=0.12.
  - Dry: **453,000 acre-ft** with peak release of 4,500 cfs; p=0.28.
  - Normal: **647,000 acre-ft** with peak release of 6,000 cfs; p=0.20.
  - Wet: **701,000 acre-ft** with peak release of 8,500 cfs; p=0.28.
  - Ext. Wet: **815,000 acre-ft** with peak release of 11,000 cfs; p=0.12.
- Weighted average instream release of **595,000 acre-ft**, an increase of **255,000 acre-ft** over pre-2000 instream releases.

Why TRRP was Restructured in ROD

- Establish financially independent scientific leadership
  - Funding of assessment and monitoring needs to have strong linkage to priority information
- Establish independent peer review
- Objective science necessary to demonstrate validity of ROD strategy
  - Objective driven assessments for consistency and quality of monitoring
  - Eliminate continued funding of projects just because of inertia

Adaptive Environmental Assessment And Management

- The AEAM approach to management relies on teams of scientists, managers, and policy makers jointly identifying and bounding management problems in quantifiable terms
- Treats management actions as experiments with assessment of results to guide future decisions

AEAM (cont.)

- An AEAM program would combine assessment and management as consequences of actions. Previous agency and task force structures had focused almost exclusively on monitoring.
- The AEAM program was designed to test the ROD hypotheses and assess the system and population responses.

AEAM (cont.)

- It was not to be a research program, rather a management approach to establish scientific credibility for the unique TRRP flow/physical habitat/temperature strategy for restoration.
- May spin off research projects to fill information gaps

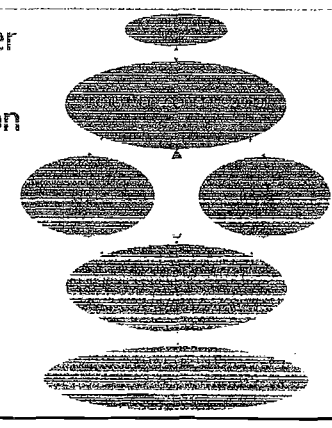
AEAM Program for the Trinity

- TRRP was to manage salmon population restoration by:
  - Gathering scientific evidence for testing hypotheses related to:
    - Rehabilitation of river channel (promoting evolution through natural processes)
    - Managing sediments (coarse and fine)
    - Managing temperature regimes
    - Designing annual flow release schedules within allocated WY volumes
  - Assessing progress toward goal of a more complex and dynamic alluvial channel leading to salmon restoration

Implementation Plan

- Objectives (ROD)
  - Maximizing smolt growth rate and achieving at least a two fold increase in average smolt production in order to reach pre-TRD escapement goals
- Hypotheses Testing (TRFES)
  - E.g. Factors influencing smolt growth rate, habitat limitations, channel evolution via combination of mechanical actions and high flows
- Experimental Design (TRRP)
  - E.g. Escapement, annual flow schedule, assessing evolving habitat and channel shape, annual growth and production estimates, gravel augmentation and sediment routing

Trinity River AEAM Organization



Trinity Management Council (TMC)

- Executive Director
- U S Fish and Wildlife Service
- U S Bureau of Reclamation
- U S Forest Service
- National Marine Fisheries Service
- Hoopa Valley Tribe
- Yurok Tribe
- State of California
- Trinity County

Adaptive Environmental Assessment and Management Team (AEAMT)

- Technical Modeling and Analysis Group (TMAG) permanent
- Rehabilitation Implementation Group (RIG) six -10+ year life
- Serve as scientific staff to the TMC/Executive Director

Technical Modeling and Analysis Group (TMAG)

- Fisheries Biology/Physiology/Population Dynamics
- Fluvial Geomorphology/Hydraulics Engineering
- Riparian Ecology/Wildlife Ecology
- Water Quality/Temperature
- Hill Slope Geomorphology/Watershed Hydrology
- Information Management/Computer Modeling

Rehabilitation Implementation Group (RIG)

- Civil/River Mechanics/Hydraulic Engineering
- Engineering Technician/Surveyor
- Contracting Officer
- Contract Technical Representatives
- Part-time support from:
  - Construction Inspector
  - Construction Contract Specialist
  - Realty Specialist
  - Field Engineer

Trinity Adaptive Management Working Group (TAMWG)

- Stakeholders
  - Recreation
  - Environment
  - Landowners
  - Commercial Fishing
  - Sport Fishing
  - Timber
  - Power
  - Agriculture
  - Water Users
- Members may also serve on Technical Advisory Committees

Independent Review

- Scientific Advisory Board
  - Broad Science Program and Policy reviews
- Peer Review Panels (technical reviews)
  - Agencies
  - Tribes
  - TAMWG
  - Outside experts

TRRP Initial Steps

1st yr.

- Trinity Management Council in place (including FACA working group)
- Staffing of the AEAM team
- Establish baseline conditions for reporting comparisons over time
- Design implementation actions outlined in the Record of Decision

Implementation Plan

- Bridge removal/replacement
- Channel rehabilitation and gravel augmentation
  - Mechanical actions rapidly applied to ½ sites within three yrs.
- TRRP to integrate models and concepts in TRFES in order to develop annual forecasts and the assessment process
- Develop refined river sampling designs for baseline and annual comparisons
- Establish peer review process to assure scientifically sound assessments and management actions

Implementation (cont.)

- RFP Based-Contracts and data collection agreements
  - Peer review necessary for unbiased scientific evaluations
- Objective Specific and Long Term Monitoring
  - Designs for Baseline, Trends, Processes- RFP driven
- Annual Assessments, Testing Hypotheses, Comparing Predictions with Monitoring Results
- Adapt by revisiting hypotheses if TRFES assumptions are not supported, giving supporting evidence

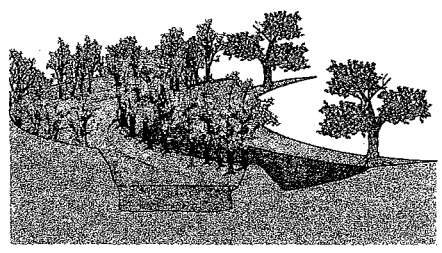
My Thoughts 10 Years Later

- Organization continues to evolve, appears moving toward the old Task Force way of doing business
  - (2004 TMC subcommittee attempted to refocus vision)
- Bridges completed and structures removed
- Fourteen rehabilitation sites completed
- Gravel augmentation at approx. 10,000 tons/yr
- Enhanced temperature regimes have improved growth and health of salmon pre-smolts
- Disagreements re-emerging over role of mechanical actions
  - (engineered and re-sculpted sites vs. simply opening up berms to promote flow induced unraveling)

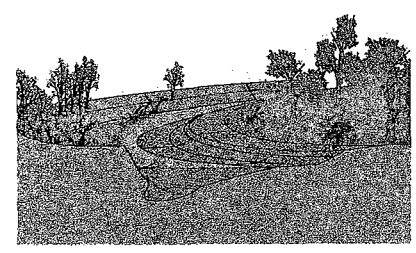
Thoughts (cont.)

- AEAM Team scientists underutilized
- Status of alluvial vs. bed rock controlled proportions in upper 40 miles unresolved
- Slow to design and conduct habitat creation experiments
- Apparent fear by TMC of RFP process
  - Evidenced by no formal response to SAB emphasis on peer review
- Continual delay and revision of Integrated Assessment Plan (original intent was to conduct annual assessments and reports on system response)

Diagram of Bermed Site



Engineered Site



Channel Rehab Sites:

Hocker Flat R4: Before & After

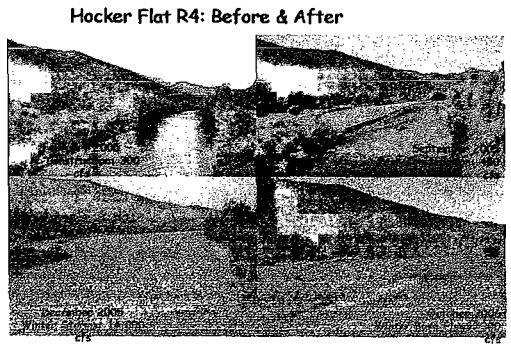
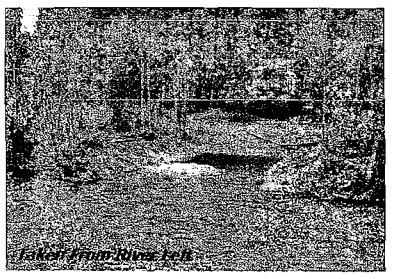


Figure 10 - Results of Photo Monitoring: Notch 6

Nov. 2007



Status Report: Vitzhum Gulch December 2008

- "Vitzhum Gulch, as designed and constructed, is an adaptive management experiment to see if the river, using stream power, not horse power, would exploit the berm notches, unravel the berm, and maintain a new, complex geomorphology and associated habitat. If...activities provide long term fish and wildlife habitat, or reduce stranding of fry/juvenile fish, then it will help meet the overall goal of the program..."

ROD Developed

Status Report: Vitzhum Gulch

- Design Rationale

  "A prevalent concept for channel rehabilitation during the flow study (completed in June 1999) was commonly expressed as 'notching the berm', 'unraveling the berm', and 'unzipping' the channel. This concept assumed that some level of channel evolution would be caused by the increased flow regime associated with the TRFES strategy.... coined the term 'notching the berm' .... The concept was widely endorsed at the time by the flow study authors as key to the overall restoration strategy. Because the draft budget associated with the ROD projected that all projects would be completed within 7 years at roughly $2.4M/year (EIS, Appendix C, pg. C-30), it was initially assumed that most projects would be relatively small, inexpensive, and quickly constructed."