American River Flow Standard

A Site-Specific Example

Tom Gohring
3/19/14

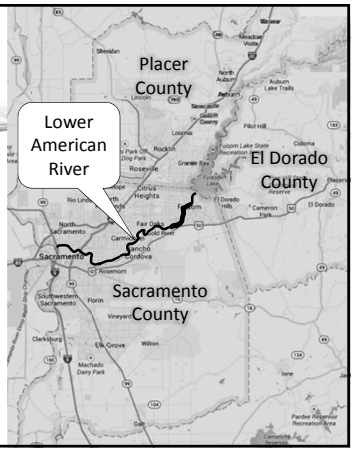
Overview

1. Background
2. Compare / Contrast
   - DSP Hybrid Approach
   - American River Flow Standard
3. Next Steps
4. Ideal Ecological Flow

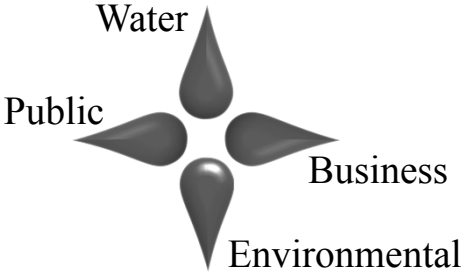
Sacramento Region

Cities:
- Sacramento
- Roseville
- Folsom
- Rancho Cordova

Communities:
- Carmichael
- Granite Bay
- Citrus Heights
- Fair Oaks
- Rio Linda



The Water Forum Agreement
Truce Among 4 Caucuses



The Water Forum Agreement
2 Objectives & 7 Elements

Reliable Water Supply to 2030

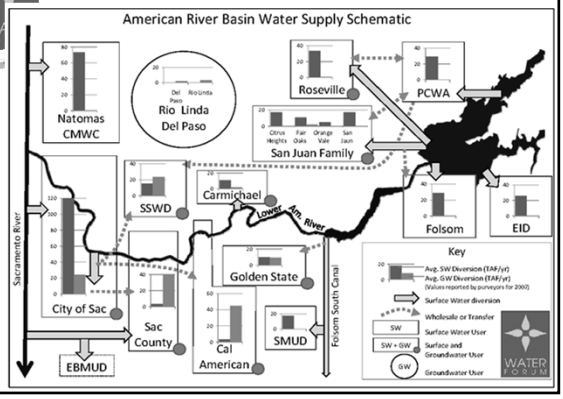
- **Increased Diversions**
- **Dry Year Actions**
- **Groundwater Management**

Protect the lower American River

- **Water Conservation**
- **Habitat Management**
- **Improved Flow Standard**

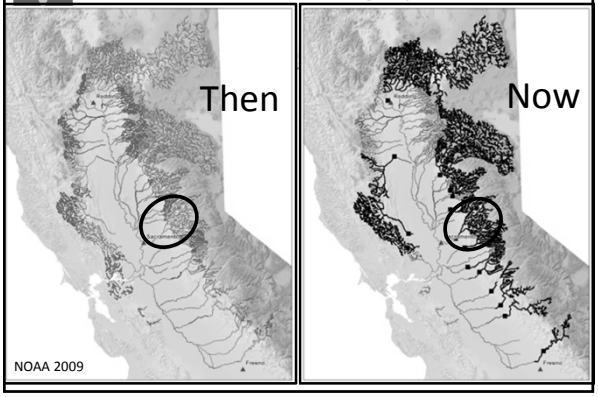
- **Water Forum Successor Effort**

As Viewed by Purveyors

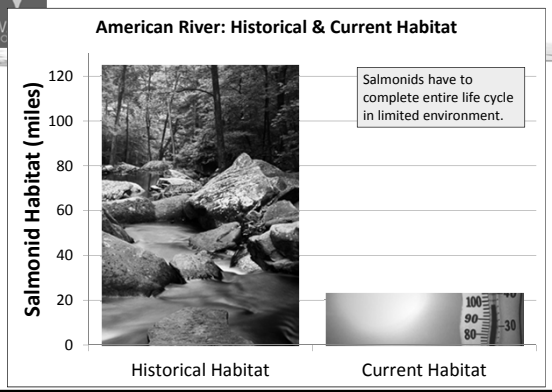


As Viewed by Enviros

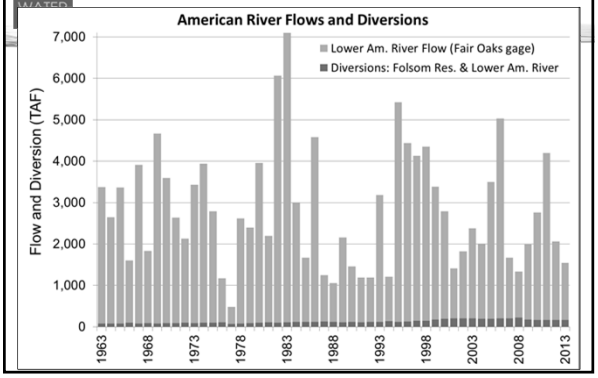
American River: Highly Altered



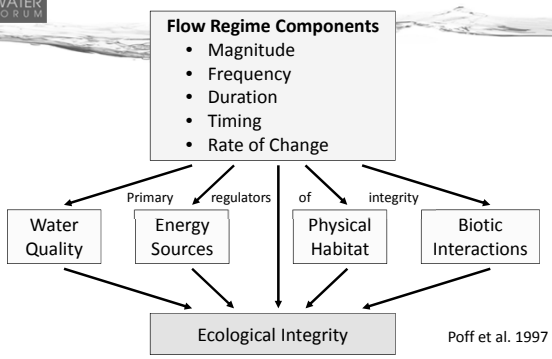
American River: Highly Altered



Flows & Demands



General: Flow Regime



Management Actions for Highly Altered System

- Flow manipulation
- Selective cold water releases

Lower American River Flow Standard

- Gravel/wood replacement
- Reduced diversions
- Re-vegetation
- Drought response
- River-friendly landscaping
- New temperature shutters
- … and more …

Other Water Forum Actions

Habitat Management

THE SACR

Riverbed
Strengths

By Matt Weiser

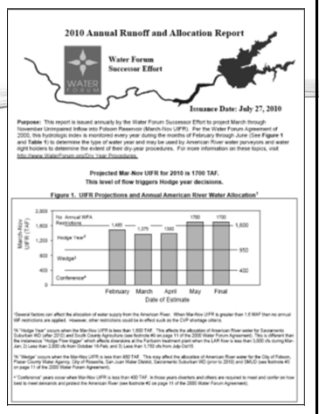
More spawning gravel will be restor
long-running effort to bolster the ri

On Tuesday, crews will begin workin
clean and sort gravel removed from
The gravel will then be put back in
destroyed by that mining.

The work involves taking gravel pile
prefer, washing it to remove 100 ye
in the riverbed. About 12,000 tons

Dry Year Cutbacks

- Protects the River
- Varies by purveyor



Water Conservation

THE SACRAMENTO BEE

November 03, 2012

Region Reduces Its Water Use

By Matt Weiser

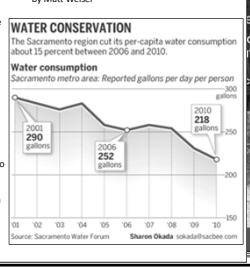
Sacramento region has made significant strides in water conservation in recent years, according to a new report.

What remains unclear, however, is whether the improvement is real or an artifact of the recession, which left thousands of area homes vacant.

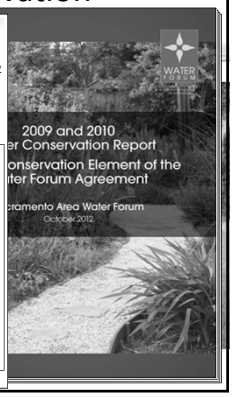
The report by the Sacramento Water Forum provides data from 15 water utilities across the capital metro area for 2009 and 2010. It is the first such report since the group required . member

WATER CONSERVATION
The Sacramento region cut its per-capita water consumption about 15 percent between 2006 and 2010.

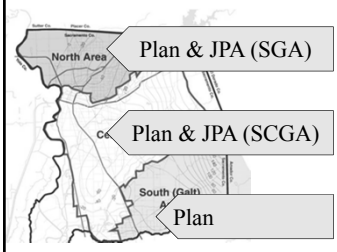
Water consumption
Sacramento metro area: Reported gallons per day per person



Source: Sacramento Water Forum Sharon Okada sokada@sacbee.com



Groundwater Management

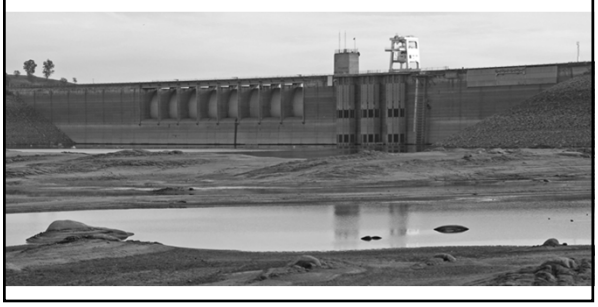


- Sustainable Yields
- North Area
  - 131,000 Acre-feet
- Central Area
  - 273,000 Acre-feet
- South Area
  - 115,000 Acre-feet

The New California Landscape

www.ecolandscape.org

Upgrading Folsom Dam Temperature Control Device



American River Flow-Related Ecological Goals

- Sustain diverse aquatic & riparian ecosystem
- Restore/enhance natural processes
- Reduce Stressors
  - Increase Fall-run Chinook Salmon spawning habitat
  - Reduce of redd superimposition and dewatering
  - Improve Fall-run Chinook spawning temperatures
  - Reduce egg mortality due to water temperature
  - Improve summer juvenile Steelhead rearing temperatures

Compare / Contrast: DSP Hybrid & Am. River Approaches

- ✓ Step 1) Stream segment classification
- ✓ Step 2) Hydrologic analysis
- ✓ Step 3) Site-specific field work
- ✗ Step 4) Extrapolation of findings
- ✓ Step 5) Produce environmental flow regime
- ✓ Step 6) Interaction: scientists & stakeholders
- ✓ Step 7) An adaptive management protocol

✓Step 1) Stream segment classification

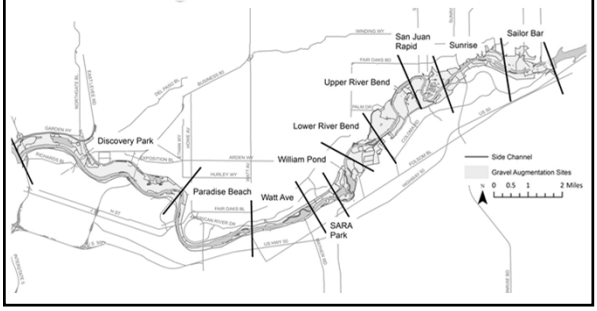
DSP Hybrid Approach

- Physical variables
  - Depth
  - Velocity
- Stream attributes
  - Substrate
  - Cover

American River Approach

- Stream reaches:
  - Ecological zones

✓ Step 1) Stream segment classification



✓ Step 2) Hydrologic analysis

DSP Hybrid Approach

Separate hydrology into key flow regime components (blocking) and an analysis of historical changes.

… more than the consideration of species specific habitats

… consider full range of flows

American River Approach

Flow Standard is blocked into:

- Flood control
- Steelhead spawning & rearing
- Fall-run spawning & rearing
- Other species & life stages
- Pulses
- CVP operations

✓ Step 3) Site-specific field work

DSP Hybrid Approach

… targeted toward representative species assemblages and processes … such as instream habitat requirements of notable fish species …

(e.g. floodplain connectivity, benthic productivity or native assemblages)

American River Approach

- Detailed surveys &habitat modeling
  - Substrate
  - Bathymetry
  - Depth
  - Velocity
  - Redds
  - Temperature
  - DO
  - Stranding
  - Other

✗ Step 4) Extrapolation of findings

DSP Hybrid Approach

… the essence of … setting flow criteria

American River Approach

Not needed. Ours is site-specific approach.

While a more regional approach is desired either due to time or resource constraints, it should be acknowledged that a site-specific approach would be more scientifically defensible simply because uncertainties associated with extrapolation would be avoided.

✓ Step 5) Production of an environmental flow regime

DSP Hybrid Approach

Species

Processes – such as:
- Temperature
- Sediment transport
- Lateral connectivity

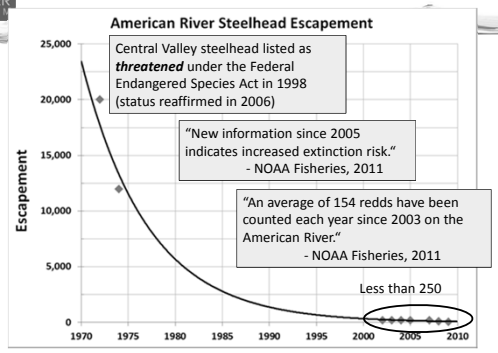
Reliance on flow alteration statistics alone may or may not address these issues.

American River Approach

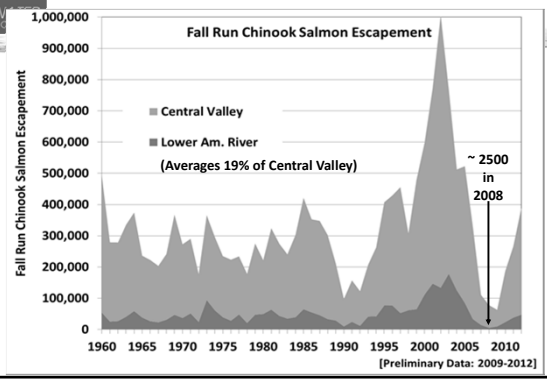
– Steelhead
– Fall-run Chinook

– Temperature management
– Delta water quality
– Sediment transport
– Floodplain connectivity
– Pulse flows

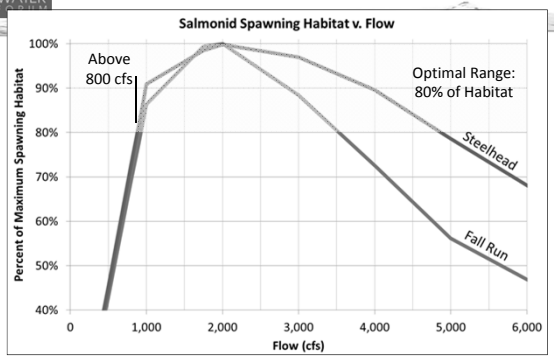
Steelhead



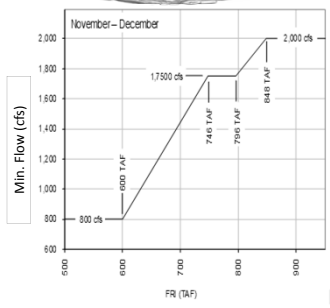
Fall Run Chinook



Flow and Habitat



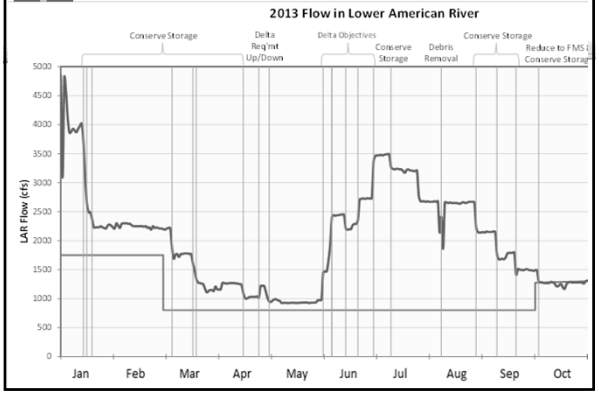
Minimum Flows



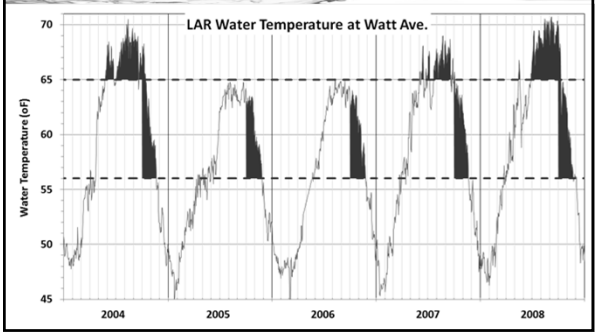
Developed to:
- Optimize habitat
- Support sensitive life stages of salmonids
- Avoid redd superimposition
- Avoid redd dewatering
- Avoid stranding

Note: USBR can operate above the minimum.

Seeking Optimal Habitat

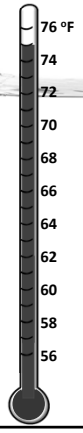


Problem – Water Too Warm

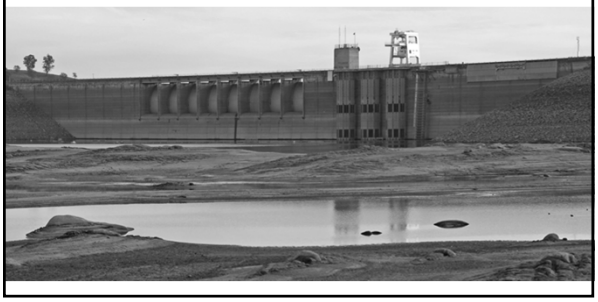


Temperature Management - Annual Plan & Operations -

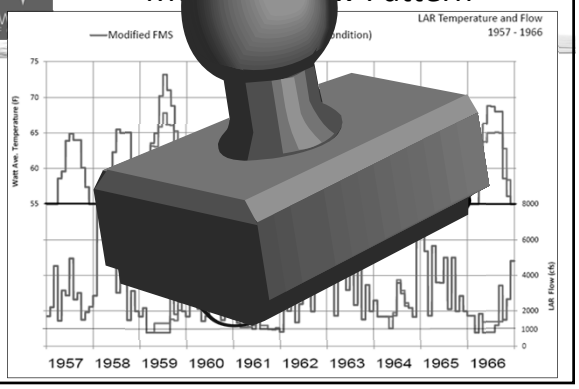
- Obtains BEST POSSIBLE temperature
- Temperature shutter operations
- Temperature targets set by May 1
- Fixed compliance point (Watt Ave)
- Ongoing oversight (NMFS approval)
- Requires Analysis by USBR
  - Good technical tools
  - Good data



Folsom Dam Temperature Control Device (Shutters)



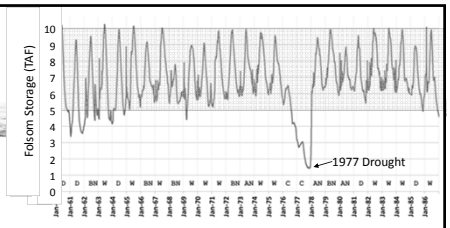
Mo w Pattern

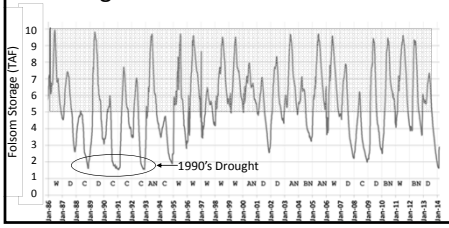


Carryover Storage Alternative

- Balancing ecological benefits
  - Near-term: Am. River habitat; Delta water quality
  - Long-term: Protect against dry year impacts
- Must consider potential unintended consequences: Delta; Sacramento River
- In response to
  - 2014 Drought
  - Recent changes in CVP operations

Historical Folsom Storage





Folsom: drawn down more since 1990's drought

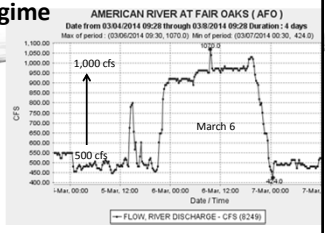
✓ Step 5) Production of an environmental flow regime

- Salmonid habitat
- Water temperature
- Other Processes
  - Sediment Transport
  - Pulse flows
  - Lateral connectivity
  - Flood plain inundations

✓ Step 5) Production of an environmental flow regime

Additional Protections

- Ramping rates
- Avoiding redd superimposition
- Drought response: 2014 Example
  - Water Forum dry year conference
  - Fishery working group
  - March pulse flow



✓ Step 6) Interaction between scientists and stakeholders

DSP Hybrid Approach

Successful implementation of flow standards commonly rests more heavily on these societal challenges than any challenges that are of a more scientific nature.

Ideally, stakeholder involvement is ongoing from the earliest stages … essential that all stakeholders are involved … so that there is support and consensus

American River Approach

Have ongoing science & stakeholder interaction and buy-in.

- Science Team
- Management and Resource Agencies
- Water Forum Stakeholders

✓Step 6) Interaction between scientists and stakeholders: Am. River

Science Team

- Fisheries Biologists
  - Paul Bratovich, Mike Bryan, et al
- Hydrologist & Geomorphologists
  - Chris Bowles, Chris Hammersmark, et al
- Water and Power Systems
  - Buzz Link, Jeff Weaver, et al
- Food Service
  - Tom Gohring

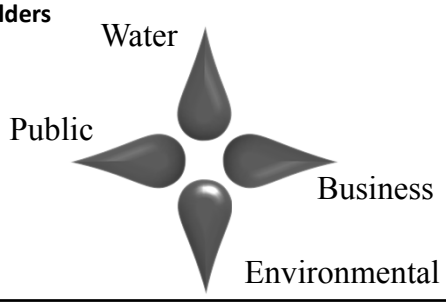
✓Step 6) Interaction between scientists and stakeholders: Am. River

Management and Resource Agencies

- US Bureau of Reclamation
  - Implementing since 2006
  - Flow approach in 2008 BA
- US Fish and Wildlife Service
- National Marine Fisheries Service
  - Flow approach in 2009 BiOp
- California Department of Fish and Wildlife

✓Step 6) Interaction between scientists and stakeholders: Am. River

Stakeholders



Stakeholders

BUSINESS

AKT Development
Associated General Contractors
North State Building Industry Association
Sacramento Association of Realtors
Sacramento Metropolitan Chamber of Commerce
Sacramento Sierra Building & Construction Trades Council

PUBLIC

City of Sacramento

✓Step 6) Interaction between scientists and stakeholders: Am. River

All Together - American River Group

- Reclamation
- US FWS
- NMFS
- Cal DFW
- State Water Board
- Scientists
- Water Forum stakeholders

✓ Step 7) An adaptive management protocol

DSP Hybrid Approach

Provides flexibility and feedback to the management of natural resources in the face of considerable uncertainty.

American River Approach

- Minimum flow – changes based on hydrology and storage
- Temperature management – changes with available coldwater pool and balances Steelhead and Fall-run needs
- Ongoing monitoring program: leads to changes as necessary

✓ Step 7) An adaptive management protocol

DSP Hybrid Approach

American River Approach

- Ongoing monitoring program
  - Biological
  - Physical
  - Chemical
  - Operations
- "What have we learned" approach
- Equating physical & operational changes to biological response.
- American River Group – ongoing oversight and adaptive decision-making

Compare / Contrast: DSP Hybrid & Am. River Approaches

- ✓ Step 1) Stream segment classification
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American River: Next Steps

- Continue working with State Board staff
- Update models – 2013 DRR, etc.
- Complete investigation into Carryover Storage option
- Complete EIR
- Long-term implementation

Ideal Ecological Flow: Am. River

- Magnitude
  - Maximum spawning habitat availability for fall-run Chinook and steelhead spawning
  - Allow channel forming, floodplain inundation, and riparian vegetation establishment
- Frequency
  - High probability of occurrence of flows providing maximum spawning habitat
- Duration
  - Seasonally-encompassing flows (lifestage periodicity oriented)
- Timing
  - A range of flows, within and among years
  - Maintain channel and riparian dynamics and, consequently, aquatic habitat
  - Allow behavioral responses – adult immigration and juvenile emigration
- Rate of Change
  - Ramping rate and flow fluctuation limits for spawning, incubation and juvenile rearing
- Suitable water temperature regime
  - Fall-run Chinook spawning and incubation, and over-summer rearing juvenile steelhead
  - Shape flow pattern for best water temperatures