The Lower Yuba River Accord

From Controversy to Consensus

Presentation at
RMT Symposium
July, 2009

www.yubaaccordrmt.com
Overview of the Proposed Yuba Accord

• Relationship of the Yuba Accord Elements
  - Three distinct, but inseparable agreements

  - Fisheries Agreement
    Lower Yuba River fisheries protection and enhancement

  - Water Purchase Agreement
    Supplemental water supply for EWA, DWR, and Reclamation

  - Conjunctive Use Agreements
    Enhanced integration of New Bullards Bar Reservoir and local water district operations

  - Term of agreements: through at least 2016 (FERC relicensing)
Lower Yuba Accord

- Englebright to Feather River Confluence
Yuba River Development Project

New Bullards Bar Dam and Reservoir
Our House and Log Cabin Dam
New Colgate Powerhouse (315 MW)
Narrows II Powerhouse (47 MW)
NB Min Flow Powerhouse (150 kW)

Photo by Gary Rose
Control point for the Lower Yuba

Englebright Dam & Narrows 2 Powerhouse

Lower Yuba River Accord
July 2009
Lower Yuba River Fish Resources

• One of the Central Valley’s last wild, native Chinook salmon and steelhead runs

• Primary species of concern for management agencies
  – Fall-run Chinook salmon: federal species of concern
  – Spring-run Chinook salmon: state and federally threatened
  – Steelhead: federally threatened

• Lower Yuba River is considered a significant source of naturally spawned Chinook salmon and steelhead (CDFG 1991)
Lower Yuba Flows Problems?

- Hearings & disagreements, 1991-2002
- SWRCB Process & Decision 1644
  - Litigation by multiple parties
  - Remanded to SWRCB
- Revised Decision 1644
  - Headed back to Court

• There must be a better way
Yuba Accord Process

• Keep it simple
• Start with a small team (Technical Team)
• Start over, with basic science
• Find the common interests (85%),
• Then work through the differences

• Process:
  - Identify Stressors
  - Develop ideal flow schedules
  - Develop dry year flow schedule
  - Fill in the gaps
Flow Schedule Development

Biological Objectives

- Maximize occurrence of appropriate spawning, rearing, and emigration flows
- Appropriate month-to-month flow sequencing
- Provide appropriate water temperatures
  - Adult salmonid immigration, holding, and spawning
  - Juvenile salmonid rearing and emigration
- Promote a dynamic, resilient, and diverse fish assemblage
- Minimize potential stressors to fish species and life stages
Stressor Matrix Development

- **Stressor Derivation**
  - Existing hydrological and biological conditions
  - Variability in existing conditions (i.e., water year type)

- **Stressor Application**
  - Prioritize potential stressors
  - Provide guidance for management/ restoration
  - Provide input and rationale for seasonal flow regime development

Lower Yuba River Accord
July 2009
Stressor Matrix Development
Prioritization Context

- Limiting factor analysis

- **Existing** hydrologic and biologic conditions
  - Particular emphasis on the last 10 to 15 years

- Recognize variation in existing conditions
  - Hydrologic variability:
    - Max Unimpaired Yuba runoff 200% of 50 yr avg., **BUT**
    - Min Unimpaired Yuba runoff only 15% of 50 yr avg.
  - Dry and critical water availability

- Maximize salmonid production and survival
### Stressor Matrix Development

<table>
<thead>
<tr>
<th>Species/Run</th>
<th>Stressors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall-run Chinook salmon</td>
<td>Water Temperature</td>
</tr>
<tr>
<td>Spring-run Chinook salmon</td>
<td>Flow Fluctuation</td>
</tr>
<tr>
<td>Steelhead</td>
<td>Flow Dependent Habitat Availability</td>
</tr>
<tr>
<td></td>
<td>Habitat Complexity and Diversity</td>
</tr>
<tr>
<td></td>
<td>Predation</td>
</tr>
<tr>
<td></td>
<td>Entrainment/Diversion Impacts</td>
</tr>
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<td></td>
<td>Physical Passage Impediment</td>
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<tr>
<td></td>
<td>Transport/Pulse Flow</td>
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<tr>
<td></td>
<td>Poaching</td>
</tr>
<tr>
<td></td>
<td>Spawning Substrate</td>
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<tr>
<td></td>
<td>Angler Impacts</td>
</tr>
<tr>
<td></td>
<td>Attraction of Non-native Chinook Salmon</td>
</tr>
<tr>
<td></td>
<td>Overlapping Habitat</td>
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<tr>
<td></td>
<td>Physical Passage Impact</td>
</tr>
<tr>
<td></td>
<td>LWW Operations</td>
</tr>
<tr>
<td></td>
<td>Motor-powered Watercraft</td>
</tr>
</tbody>
</table>

#### Species/Run
- Fall-run Chinook salmon
- Spring-run Chinook salmon
- Steelhead

#### Life stages
- Adult Immigration and Holding
- Spawning and Embryo Incubation
- Young-of-year Downstream Movement/Outmigration
- Fry Rearing
- Juvenile Rearing
- Yearling (+) Outmigration

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Lower Yuba River Accord  
*July 2009*
### Stressor Matrix Development

- Identify species, life stage, potential stressor, geographic and temporal considerations
- Weight the relative “importance” of each species, life stage, and stressor to each life stage
- “Composite Weight” = “species weight” x “life stage weight” x “stressor weight” x 100

Excerpt from Steelhead Stressor Matrix

<table>
<thead>
<tr>
<th>Fish Species/Race</th>
<th>Weight (0-1) Sum to 1</th>
<th>Life stage</th>
<th>Weight (0-1) Species Sum to 1</th>
<th>Potential Stressor/Limiting Factor</th>
<th>Geographic Considerations</th>
<th>Temporal Considerations</th>
<th>Weight (0-1) Life stages Sum to 1</th>
<th>Composite Weight (X100)</th>
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</thead>
<tbody>
<tr>
<td>Steelhead</td>
<td>0.35 (Adult Immigration &amp; Holding (Aug - Mar))</td>
<td>0.15</td>
<td>Water Temperature</td>
<td>Downstream of DPD</td>
<td>Aug - Oct</td>
<td>0.40</td>
<td>2.10</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Flow Fluctuation</td>
<td>Narrows II Powerhouse Pool</td>
<td>Aug - Dec</td>
<td>0.05</td>
<td>0.26</td>
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<td></td>
<td></td>
<td></td>
<td>Physical Passage</td>
<td>At DPD</td>
<td>Dec - Mar</td>
<td>0.35</td>
<td>1.84</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Poaching</td>
<td>At DPD</td>
<td>Aug - Mar</td>
<td>0.10</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Angler Impacts</td>
<td>Entire River</td>
<td>Aug - Mar</td>
<td>0.10</td>
<td>0.53</td>
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</table>
## Stressor Matrix Development

<table>
<thead>
<tr>
<th>Rank</th>
<th>Stressor</th>
<th>Composite Weight</th>
<th>No. of Species-Lifestages</th>
<th>Normalized Weight</th>
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<td>17.68</td>
<td>18</td>
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<td>Flow Dependent Habitat Availability</td>
<td>11.46</td>
<td>10</td>
<td>1.06</td>
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<tr>
<td>4</td>
<td>Habitat Complexity and Diversity</td>
<td>9.94</td>
<td>12</td>
<td>0.84</td>
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<td>5</td>
<td>Predation</td>
<td>7.85</td>
<td>12</td>
<td>0.67</td>
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<td>6</td>
<td>Entrainment / Diversion Impacts</td>
<td>7.23</td>
<td>12</td>
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<td>7</td>
<td>Transport / Pulse Flow</td>
<td>5.04</td>
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<td>1.06</td>
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<td>Angler Impacts</td>
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<td>Attr. Of Non-Nat. Chinook</td>
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<td>2</td>
<td>0.89</td>
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<td>13</td>
<td>Overlapping Habitat</td>
<td>1.75</td>
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<td>1.75</td>
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<td>0.65</td>
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<td>0.33</td>
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<td>16</td>
<td>Motor-powered Watercraft</td>
<td>0.45</td>
<td>1</td>
<td>0.45</td>
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### Monthly Stressor Summary

**Top four stressors**

<table>
<thead>
<tr>
<th>Composite Weight</th>
<th>FR CHS</th>
<th>SR CHS</th>
<th>STE</th>
<th>Normalized Weight</th>
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<tr>
<td>Water Temperature</td>
<td>10.58</td>
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<td>1</td>
<td>2</td>
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<tr>
<td>Flow Fluctuation</td>
<td>7.15</td>
<td>2</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Flow Dependent Habitat Avail.</td>
<td>6.03</td>
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<td>2</td>
<td>1</td>
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<tr>
<td>Habitat Complexity &amp; Diversity</td>
<td>2.70</td>
<td>1</td>
<td>2</td>
<td>0.90</td>
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<tr>
<td><strong>May</strong></td>
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<td>11.06</td>
<td>2</td>
<td>2</td>
<td>5</td>
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<tr>
<td>Flow Fluctuation</td>
<td>10.00</td>
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<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Habitat Complexity &amp; Diversity</td>
<td>6.86</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Predation</td>
<td>6.03</td>
<td>2</td>
<td>2</td>
<td>4</td>
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<tr>
<td><strong>August</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Water Temperature</td>
<td>8.75</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>Flow Fluctuation</td>
<td>4.18</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Flow Dependent Habitat Avail.</td>
<td>3.15</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Habitat Complexity &amp; Diversity</td>
<td>2.89</td>
<td>1</td>
<td>2</td>
<td>0.96</td>
</tr>
</tbody>
</table>

FR: fall-run    SR: spring-run    CHS: Chinook salmon
STE: steelhead
Stressor Results Application

• Provide guidance regarding management and restoration activities

• Provide specific input and rationale for a seasonal flow regime
  • Instream flow schedules based on lower Yuba River biology and hydrology
Flow Schedule Development

- **Stepwise Process**

1. **Develop an ‘ideal’ flow schedule, with no limits or constraints**
   - Assume any necessary water is available
   - Use stressor results and all available data
   - Adjust flows by month to meet species/life stage requirements

2. **Develop ‘ideal’ flow schedules (resulted in a ‘high’ and ‘low’ range of ideal flows)**
   - Variety of opinions among Technical Team (TT) biologists
   - Extensive discussion and collaboration
   - General agreement among TT biologists and representatives
Flow Schedule Development

• Stepwise Process

3. Develop a ‘survival’ flow schedule to be used in the most extreme drought years
   • Minimum flows to foster the survival of drought year cohort

4. With bounds of flow ‘schedules’ (i.e., ideal flow range to ‘survival’ flows), populate the flow schedule matrix based on likely hydrologic year classes
   • Not all years will have unlimited water supply
   • Need a series of flow schedule steps to accommodate dryer year classes
   • Several flow Step sizes considered - large enough to make a difference, small enough not to be an excessive jump
Flow Schedule Development
Considerations

- Interrelated Dependencies
  - Flow Schedules & total volumes
  - Implementation Rules
  - Flood control rules, water rights, delivery obligations
  - New Bullards Bar Reservoir Carryover Storage
  - Release Timing – from flow or storage

- Iteration Implications
  - Changes to any of the components affect the other components and resulting flows in the lower Yuba River
  - Intra- and inter-seasonal variability in water availability is the single greatest challenge to meeting competing demands
Accord-Specific Index

North Yuba Index

• Dedicated Index required
• Utilize both carryover storage and predicted inflow
• Balances current year demands, conservation for following year needs

North Yuba Index = SaNBB + INBB

Where:

SaNBB = New Bullards Bar Reservoir Active Storage, Sept 30 previous year

INBB = Forecasted Total Annual Inflow To NBB Reservoir (actual inflow to date to NBB Reservoir plus forecasted inflow for the remainder of the water year based on the DWR 50%-exceedance forecast)
### Accord Flow Schedule Development

**Define an “optimum” flow range: Schedules 1 and 2**

<table>
<thead>
<tr>
<th></th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
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<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
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</tbody>
</table>

**October through March:** Provide maximum spawning habitat

**April through June:** Mimic unimpaired hydrology patterns for rearing and emigration

**July through September:** Provide suitable water temperatures for rearing and holding

<table>
<thead>
<tr>
<th></th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>Annual Vol. (TAF)</th>
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<tr>
<td>1</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>700</td>
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<td>800</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

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Lower Yuba River Accord

*July 2009*
Flow Schedules

During the summer months, flow requirements at the (downstream) Marysville Gage will always control, so no Schedule A or Schedule B flows were developed for May through August. Flows at the Smartville Gage will equal or exceed flows at Marysville.

In Schedule 6 years, an additional 30 TAF available from groundwater substitution could be used to increase flows above the minimum requirements during periods of concern (e.g., June 18th to August 31st).
### Lower Yuba River Accord

**July 2009**

#### Flow Schedule Occurrence (72 yrs hydrology modeled)

**Percent Exceedance New Bullards Bar Available Water Index with Schedules**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>North Yuba Index (TAF)</th>
<th>Percent Occurrence</th>
<th>Cumulative</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt; 1,400</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>2</td>
<td>1,400 to 1,051</td>
<td>22%</td>
<td>78%</td>
</tr>
<tr>
<td>3</td>
<td>1,050 to 931</td>
<td>7%</td>
<td>85%</td>
</tr>
<tr>
<td>4</td>
<td>930 to 826</td>
<td>5%</td>
<td>90%</td>
</tr>
<tr>
<td>5</td>
<td>825 to 691</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>6</td>
<td>500 to 690</td>
<td>4%</td>
<td>99%</td>
</tr>
<tr>
<td>Conference</td>
<td>&lt; 500</td>
<td>1%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Log Normal Distribution With Skew**

- **Flow Schedule Occurrence (72 yrs hydrology modeled):**
  - Schedule 1: 1% Conference
  - Schedule 2: 3%
  - 4%
  - 5%
  - 6%

**Percent Exceedance New Bullards Bar Available Water Index (AF):**

- NBBAW Index (AF) vs. Percent Exceedance.
Resulting Flows
September

Lower Yuba River Accord
July 2009
Resulting Flows
August

Lower Yuba River Accord
July 2009
Resulting Water Temperatures

August

Lower Yuba River Accord

July 2009
Flow Schedule Allocation

Yuba River Year Type versus Consensus Schedule

Percent of Years

- D-1644 Interim Annual Volume: 400,066 af
- Consensus Flow Annual Volume: 574,017 af

Yuba River Index Schedule

Percent

- Critical: 1%
- Below Normal: 40%
- Above Normal: 20%
- Wet: 10%
- Dry: 10%

Annual Volume

- D-1644 Interim: 400,066 af
- Consensus Flow: 574,017 af

Consensus Flow Schedule

Annual Volume

- Critical: 334,810 af
- Below Normal: 398,479 af
- Above Normal: 362,182 af
- Wet: 264,258 af
- Dry: 212,651 af

D-1644 Interim

Annual Volume

- Critical: 1% Conference
- Below Normal: 2
- Above Normal: 2
- Wet: 2
- Dry: 2

Lower Yuba River Accord

July 2009

27
New Water Use Paradigm

Higher Fishery Flows made available via:

- New index structure closely tied to Yuba hydrology and operations for dispatch of flows
- Conjunctive use and demand limit commitments
- Lower Carryover Storage Target
- Transfer flows ‘embedded’ within fishery flows
  - Old transfer approach used a ‘block’ of water on top of minimum flow requirements
  - Better advance planning ability for both Yuba River and Project flow decisions
- Transfer revenues fund conjunctive use, River Mgmt Team, study program

Lower Yuba River Accord
July 2009
Interrelationships Between Proposed Lower Yuba River Accord Agreements

Fisheries Agreement
Yuba River instream flow requirements
- Chinook salmon
- Steelhead
- American shad
- Other

System-wide flow changes to utilize additional Yuba River water
- Feather River
- Sacramento River
- Bay-Delta

 Conjunctive Use Agreements
- Allows coordinated use of surface water and groundwater
- Provides additional operational flexibility

Conservation, efficiency, and conjunctive use measures provide assurances for meeting irrigation and domestic demand.

Water Purchase Agreement
Transfer revenue to finance:
- Conjunctive Use Program
- Fisheries Monitoring and Studies
- Aquatic Habitat Enhancement
- Flood Control Measures/Other

Water Purchase Agreement provides:
- EWA Supply
- SWP-CVP Water Supply Reliability
Going Forward, 2009 and Beyond

• Long Term Yuba Accord adopted & implemented spring of 2008
• RMT up and running, study plans & Management & Evaluation (M&E) Framework in progress
• Field studies in progress:
  – Rotary screw trapping
  – VAKI automated fish ladder counting system
  – Escapement survey
  – Habitat mapping
  – Redd locations & spawning habitat utilization
  – Dewatering & fry stranding
• Additional field studies 2009
  – Juvenile habitat utilization
  – Acoustic tagging
Finding the Balance

• The Accord recipe for success:
  – Check the positions & politics at the door
  – Identify the common interests and goals first
  – Work through Interests as a group
    • Never underestimate collaborative problem solving
  – Everyone has skin in the game, a deadline, or a potential problem if a solution can’t be found
    • Pressure & deadlines help solve problems
  – Keep the work group small, focused, and committed
Who Made It Happen

• Technical Team:
  – Cesar Blanco, representing USFWS
  – Paul Bratovich, representing YCWA
  – Tom Johnson, representing YCWA
  – Jerry Mensch, representing NGO’s
  – John Nelson, representing CDFG
  – Mike Tucker, representing NMFS

• Agreement Drafting Team
  – Gary Bobker, TBI
  – Chuck Bonham, TU
  – Tom Johnson, YCWA
  – Alan Lilly, YCWA
  – Nancee Murray, CDFG

• Assistance by
  – Brian Ellrott
  – Steve Grinnell
  – Ben Ransom

Lower Yuba River Accord
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Additional Information on the Lower Yuba Accord

Go to www.yubaaccordrmt.com for more information
The Lower Yuba River Accord

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