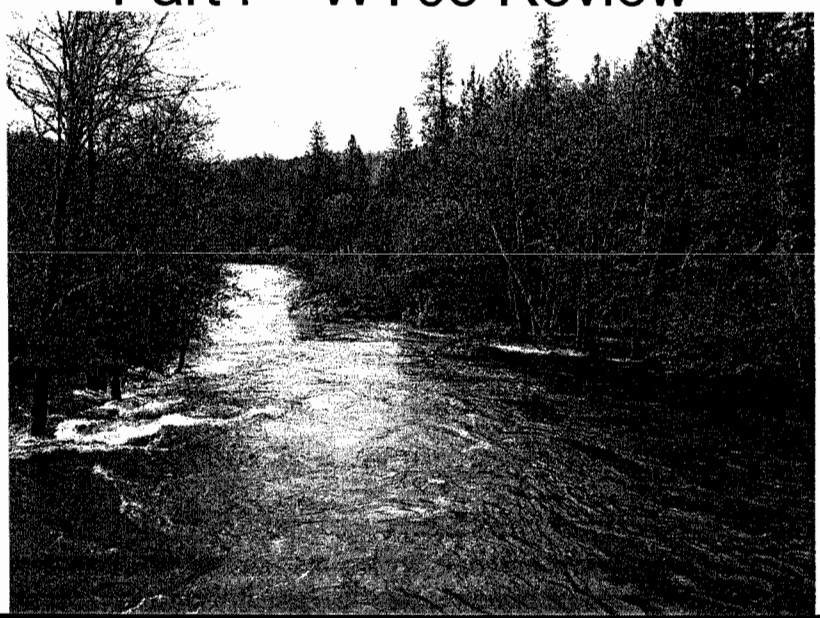
WY 2006
Flow Schedule

Trinity River Restoration Program
Restore • Adapt • Improve

Trinity Adaptive Management Work Group

March 23, 2006

Part I – WY05 Review



WY05 Final Water Year Type

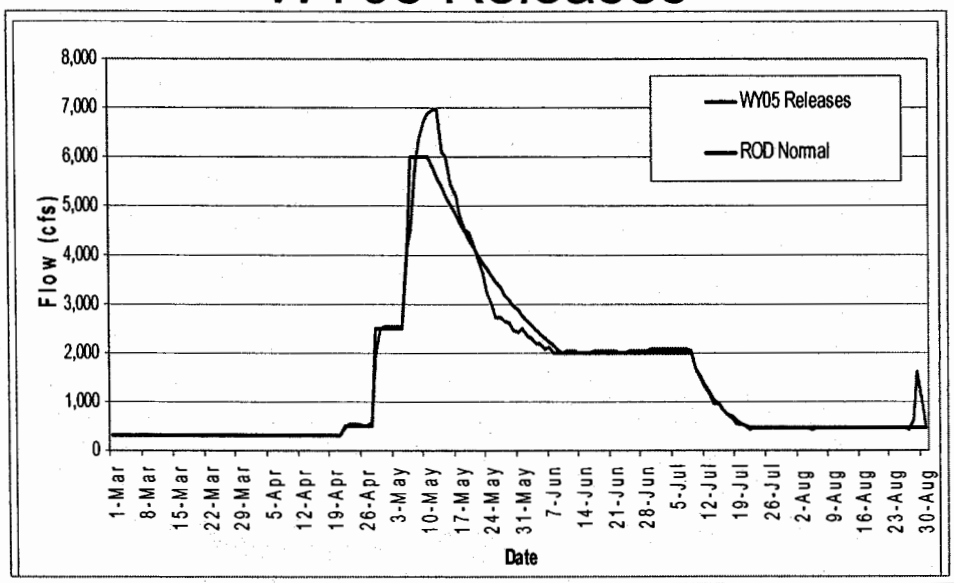
90% Forecast (1,084 TAF) **50% Forecast (1,244 TAF)**

Type	Crit. Dry	Dry	**Normal**	Wet	Ext. Wet
Water Yield (TAF)	< 650	650 to 1,025	**1,025 to 1,350**	1,350 to 2,000	> 2,000
Probability	12%	28%	**20%**	28%	12%
Water Volume (TAF)	369	453	**647**	701	815

WY05 Considerations

- Infrastructure
  - Bridge deck and pier removal
- Sediment Monitoring Contract
- Data for model calibration
- Recreation
  - Opening day fly-fishing season
- Hocker Flat construction
- Late summer release (Fall Pulse Flow)

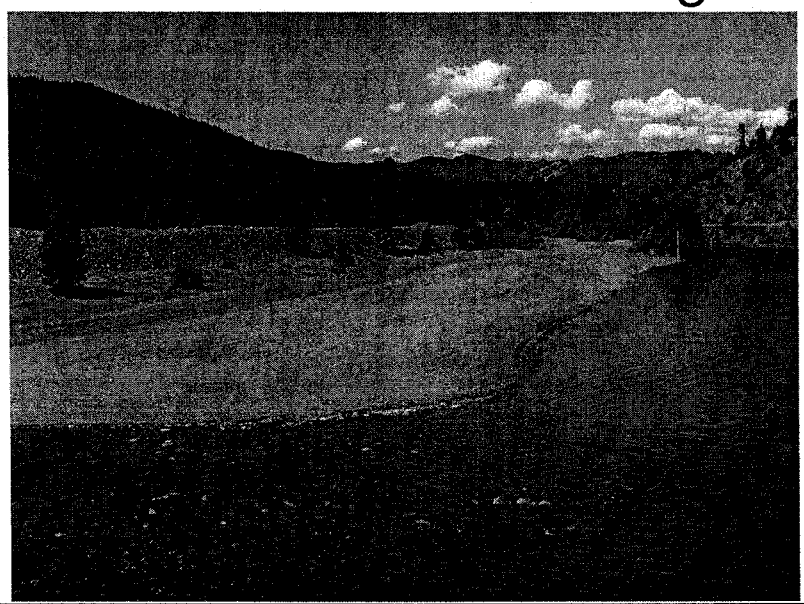
WY05 Releases



WY06 Flow Schedule Process

- Meetings
  - January 24, 2006 (Flow Schedule Work Group)
  - February 15, 2006 (Flow Schedule Work Group)
  - March 17, 2006 (Flow Schedule Work Group)
  - March 23, 2006 (TAMWG)
  - March 29, 2006 (TMC)
  - April 18, 2006 (Backup)

Part II – WY06 Planning



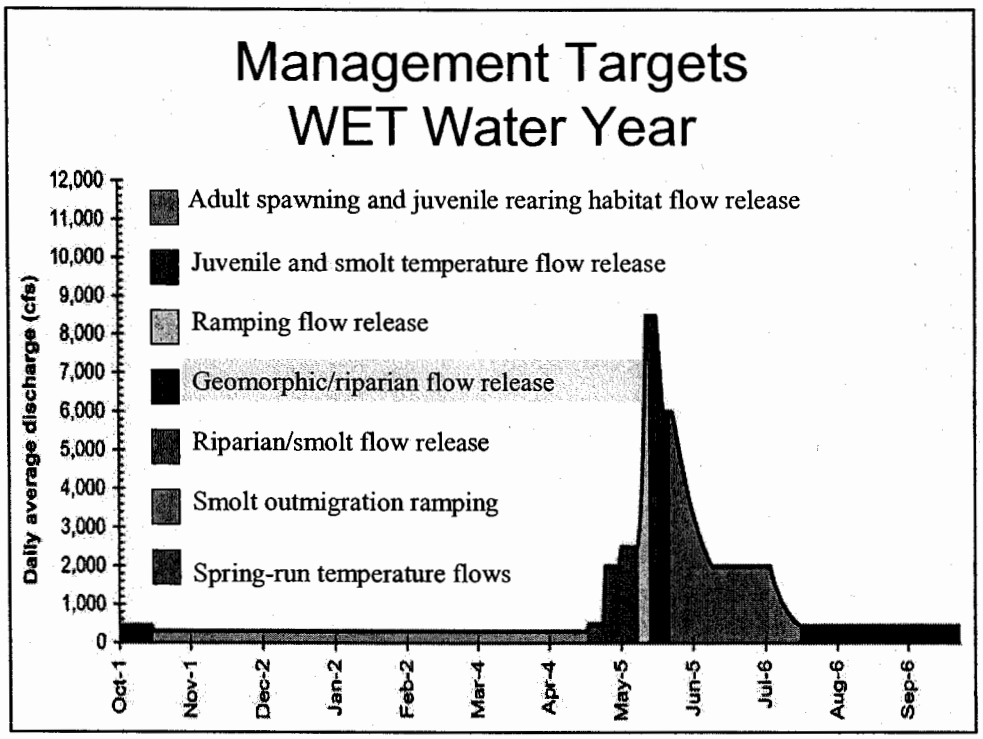
March 2006 WY Forecast

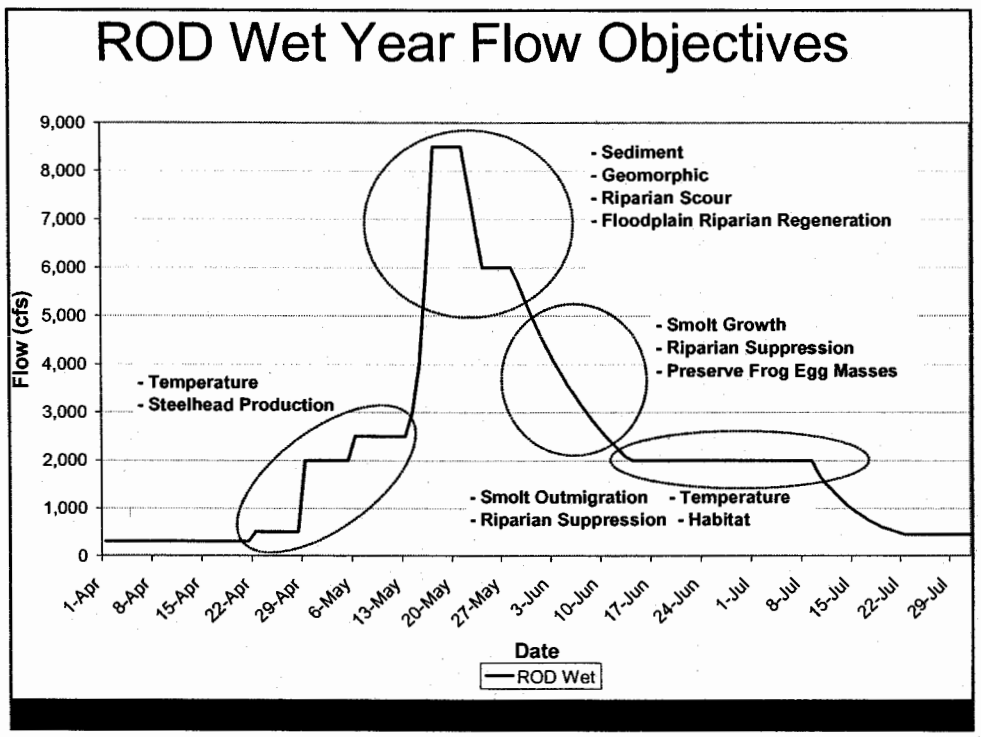
50% Forecast (1,836 TAF)

10% Forecast (2,216 TAF)

90% Forecast (1,531 TAF)

Type	Crit. Dry	Dry	Normal	**Wet**	Ext. Wet
Water Yield (TAF)	< 650	650 to 1,025	1,025 to 1,350	1,350 to 2,000	> 2,000
Probability	12%	28%	20%	28%	12%
Water Volume (TAF)	369	453	647	701	815


Management Targets
WET Water Year
Adult spawning and juvenile rearing habitat flow release
Juvenile and smolt temperature flow release
Ramping flow release
Geomorphic/riparian flow release
Riparian/smolt flow release
Smolt outmigration ramping
Spring-run temperature flows
Daily average discharge (cfs)
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Oct-1
Nov-1
Dec-2
Jan-2
Feb-2
Mar-4
Apr-4
May-5
Jun-5
Jul-6
Aug-6
Sep-6

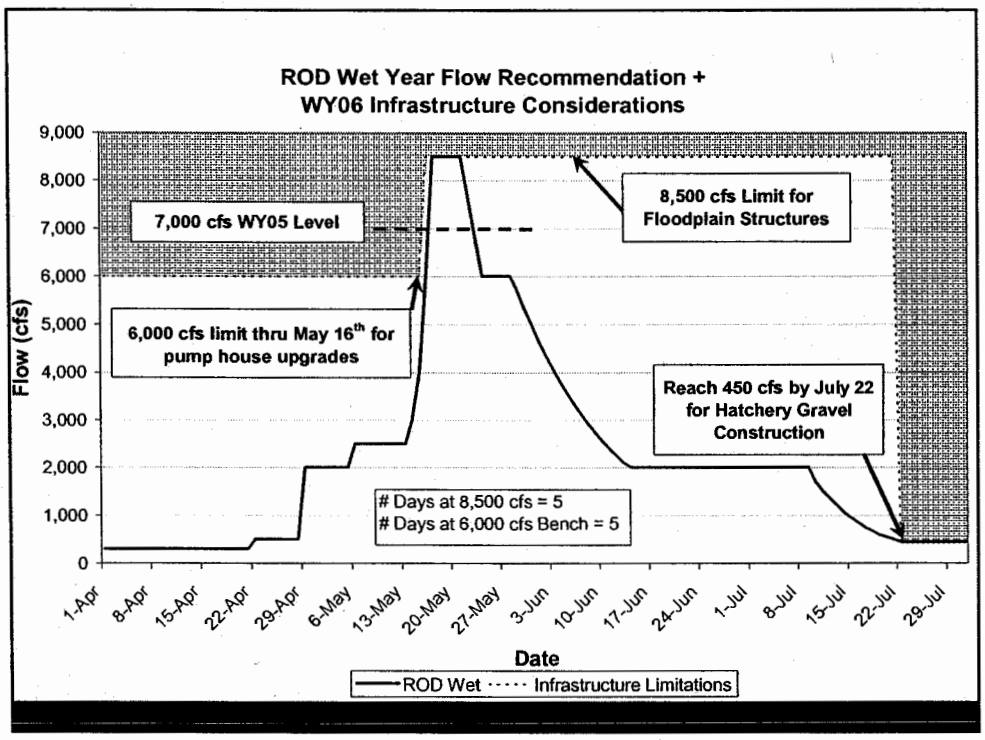

ROD Wet Year Flow Objectives
- Sediment
- Geomorphic
- Riparian Scour
- Floodplain Riparian Regeneration
- Smolt Growth
- Riparian Suppression
- Preserve Frog Egg Masses
- Temperature
- Steelhead Production
- Smolt Outmigration
- Riparian Suppression
- Temperature
- Habitat
Flow (cfs)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
Date
ROD Wet

Reasons for Changing ROD Recommended Hydrographs

- Hypothesis Testing
  - Invalidated hypothesis
  - New/updated analyses
  - Alternative hypotheses
- Response to current conditions
- Infrastructure limitations
- Risk management
- Data requirements

WY06 Considerations

- Infrastructure
- Late summer release criteria
- Fine sediment influx to mainstem
- Migration/Temperature
  - Adult returns
  - Outmigration timing
  - Klamath interaction
  - Wildlife (Frogs & Turtles)
- Floodplain riparian vegetation recruitment
- Data collection
- Diurnal fluctuations

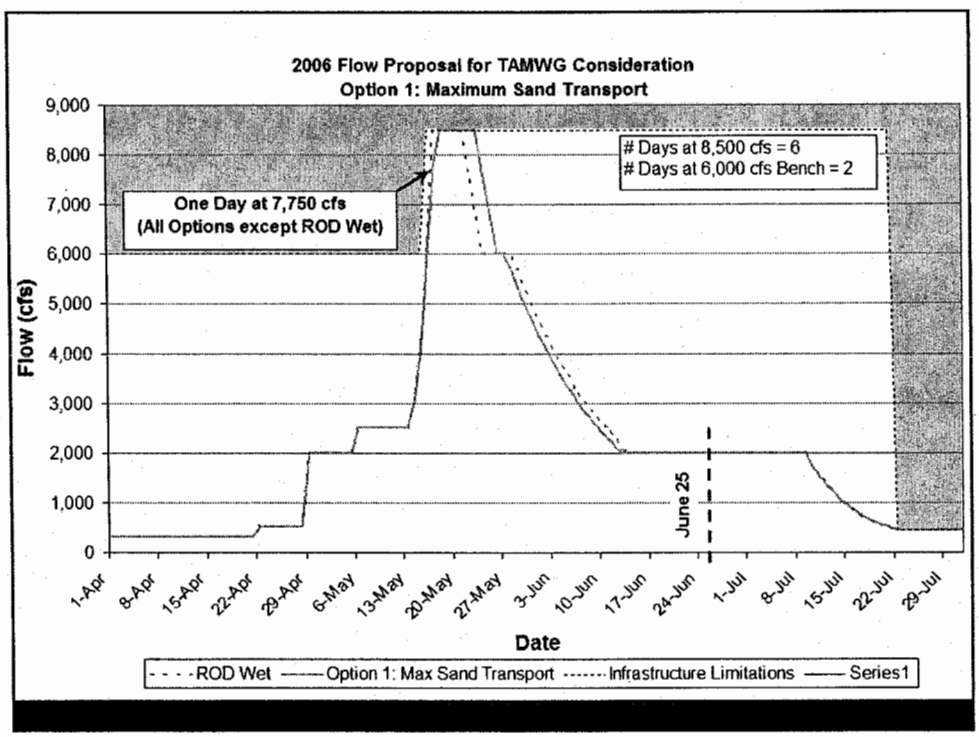


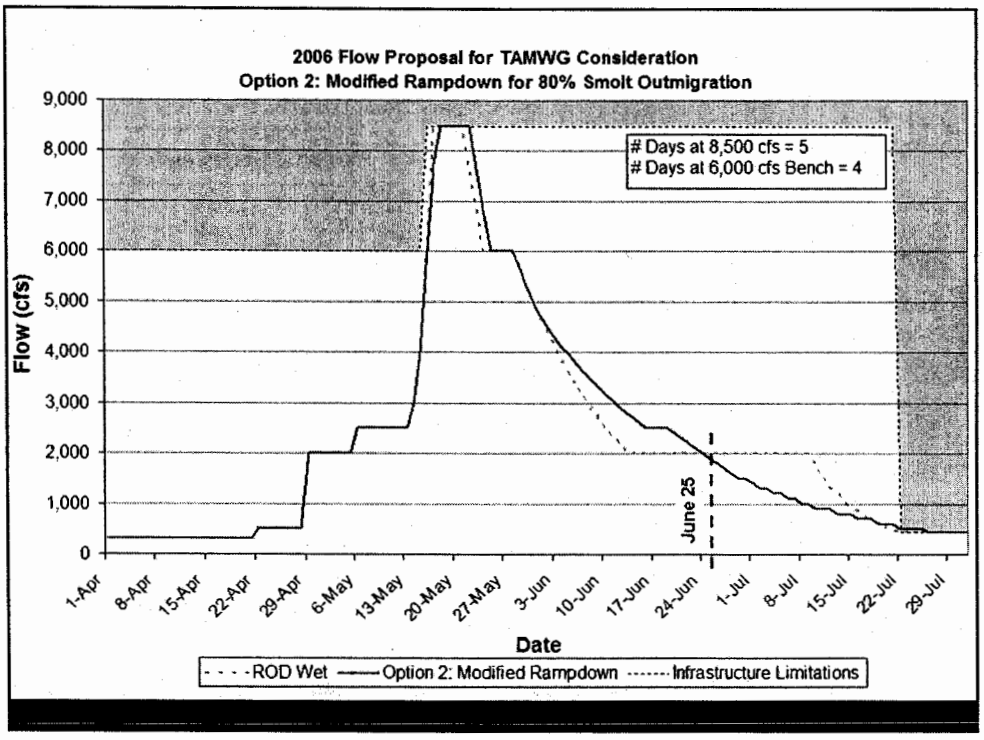
Late Summer Release Criteria

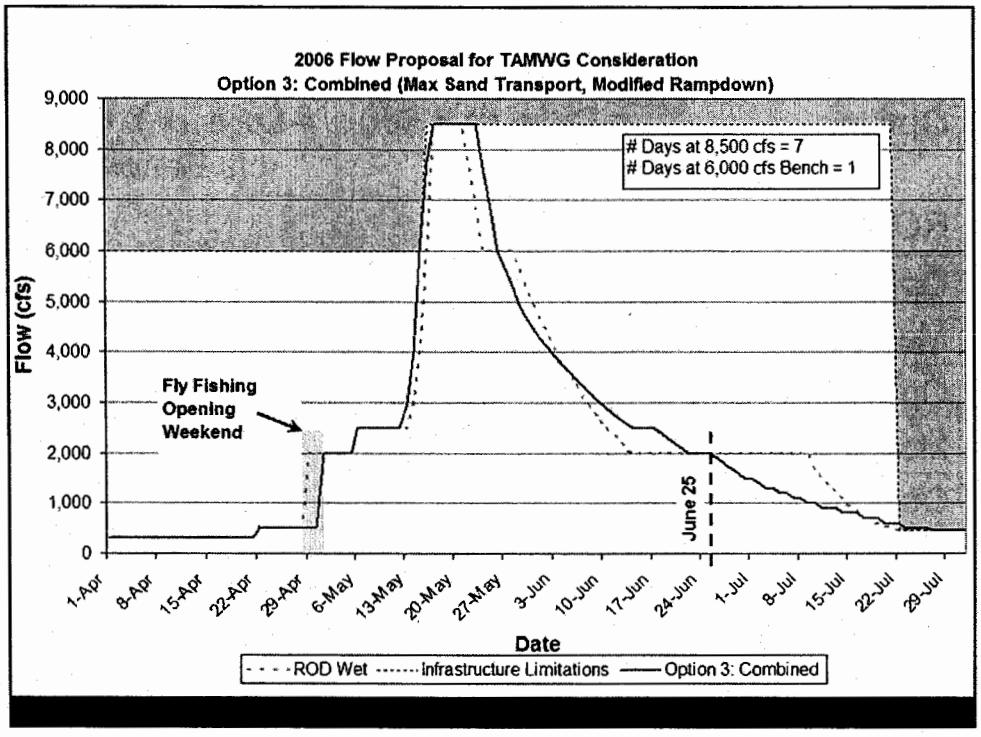
- Predicted run-size
  - 2nd lowest predicted run-size on record
  - Prediction is that criteria will NOT be met
- Predicted flows @ Terwer
  - Greater than 2,400 ft^3/s late summer
  - Prediction is that criteria will NOT be met
- No recommendation for a late summer release at this time

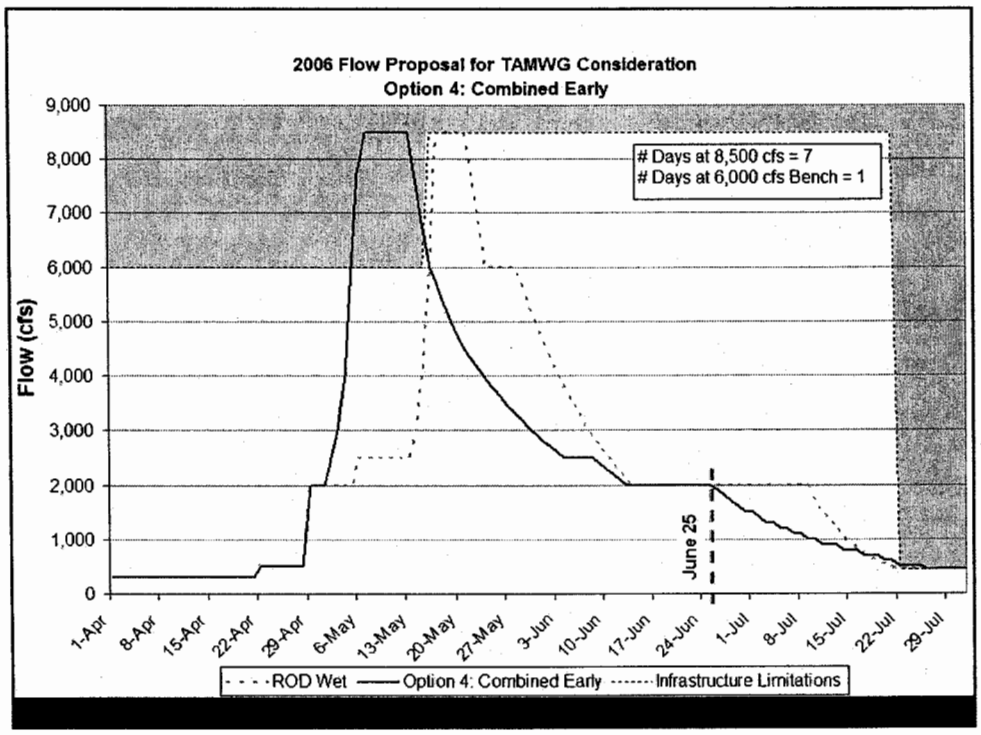
Hydrographs Under Consideration

- ROD – Wet
- Option 1 – Maximum Sand Transport
- Option 2 – Modified Rampdown for 80% Smolt Outmigration
- Option 3 – Combined (Max Sand Transport, Modified Rampdown)
- Option 4 – Combined Early



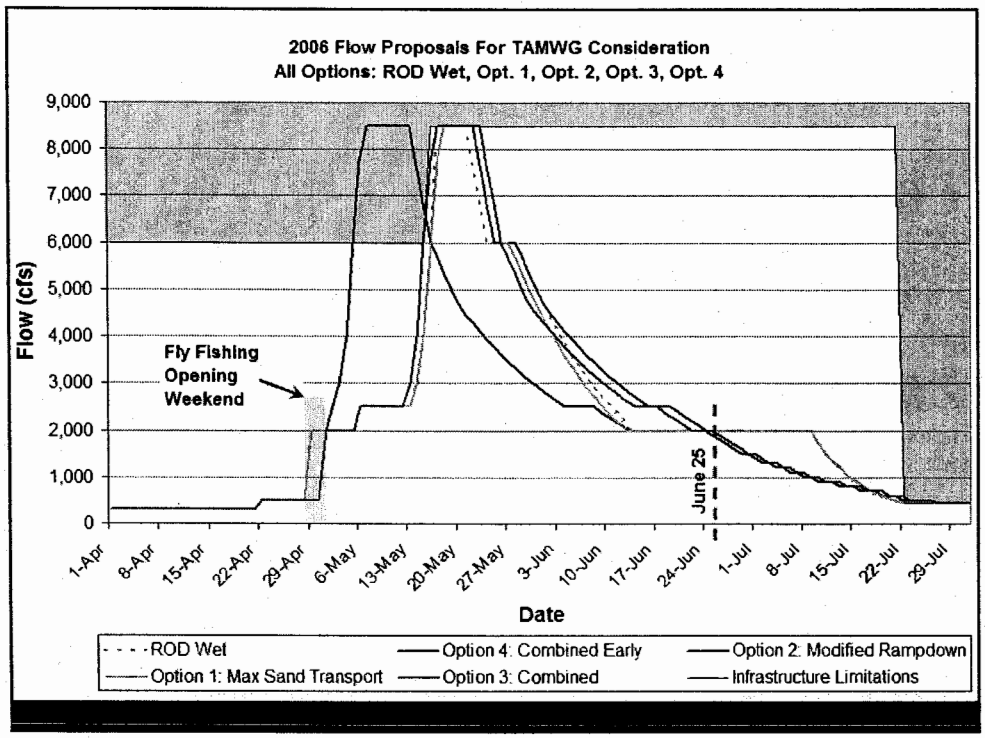

2006 Flow Proposal for TAMWG Consideration
Option 2: Modified Rampdown for 80% Smolt Outmigration
Days at 8,500 cfs = 5
Days at 6,000 cfs Bench = 4
Flow (cfs)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
June 25
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
Date
ROD Wet
Option 2: Modified Rampdown
Infrastructure Limitations

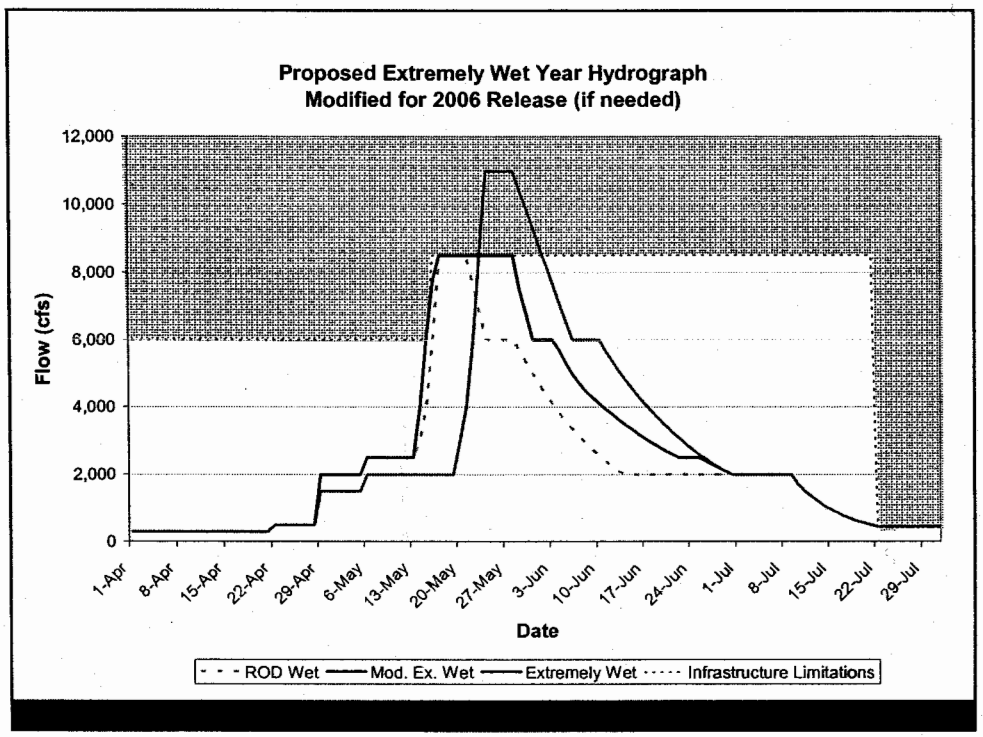

2006 Flow Proposal for TAMWG Consideration
Option 3: Combined (Max Sand Transport, Modified Rampdown)
Days at 8,500 cfs = 7
Days at 6,000 cfs Bench = 1
Fly Fishing
Opening
Weekend
Flow (cfs)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
June 25
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
Date
ROD Wet
Infrastructure Limitations
Option 3: Combined



High Flow Comparison

Option	# Days @ 8,500 cfs	# Days at 6,000 cfs Bench
ROD Wet	5	5
Opt. 1 – Max Sand	6	2
Opt. 2 – Mod Ramp	5	4
Opt. 3 - Combined	7	1
Opt. 4 - Combined Early	7	1


2006 Flow Proposals For TAMWG Consideration
All Options: ROD Wet, Opt. 1, Opt. 2, Opt. 3, Opt. 4
Flow (cfs)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Fly Fishing Opening Weekend
June 25
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
Date
ROD Wet
Option 4: Combined Early
Option 2: Modified Rampdown
Option 1: Max Sand Transport
Option 3: Combined
Infrastructure Limitations


Proposed Extremely Wet Year Hydrograph
Modified for 2006 Release (if needed)
Flow (cfs)
12,000
10,000
8,000
6,000
4,000
2,000
0
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
Date
ROD Wet
Mod. Ex. Wet
Extremely Wet
Infrastructure Limitations

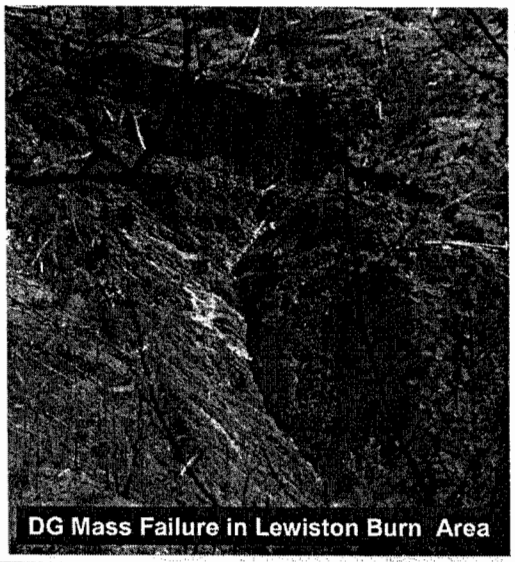
Analyses & Modeling

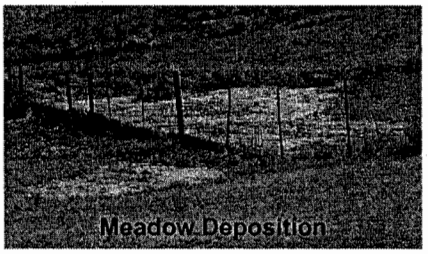
- Sediment Transport
  - Krause, Gaeuman, GMA
  - Analyses of sediment transport data
    - 2004, 2005
- Migration
  - Polos, Strange, Hemphill, Pinnix, Hayden
  - Analysis of RST data (TRRP/USFWS)
    - 1992-2005
  - Analysis of sonic tag migration studies (Strange)

Analyses & Modeling

- Temperature
  - Paul Zedonis, USFWS
  - SNTEMP - river water temperature model
    - 7-day, network, calibrated
- Riparian Vegetation Recruitment
  - HVT (McBain & Trush – John Bair)
  - TARGETS - **T**ool for **A**chieving **R**iparian **G**ermination and **E**stablishment of **T**arget **S**pecies

WY06 Landslides in Lewiston


DG Mass Failure in Lewiston Burn Area


Meadow Deposition

Watershed Sand Delivery

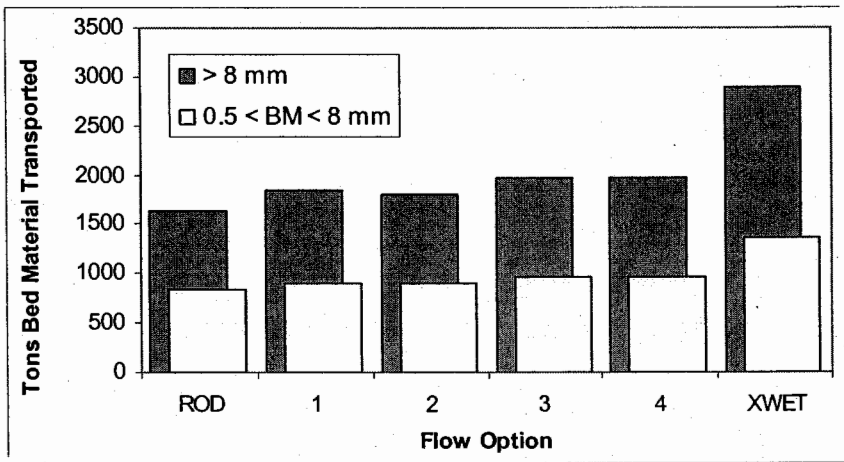
New Delta at Alder Gulch

Sand Filled Channel Bed

Lewiston Sampling Station

Bed-material transport rate is small, especially for fine fraction.

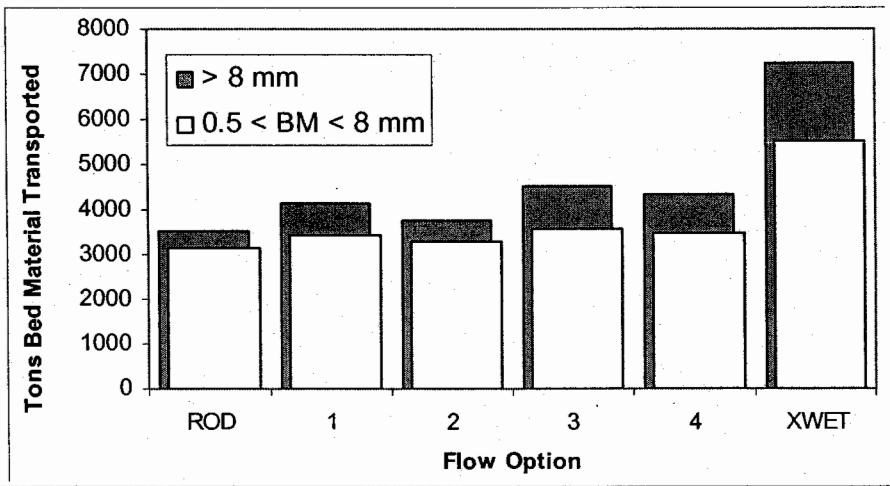
Fine bed material transport rate is similar for all wet-year options



Limekiln Gulch Sampling Station

Fine bed material transport similar for all wet-year options

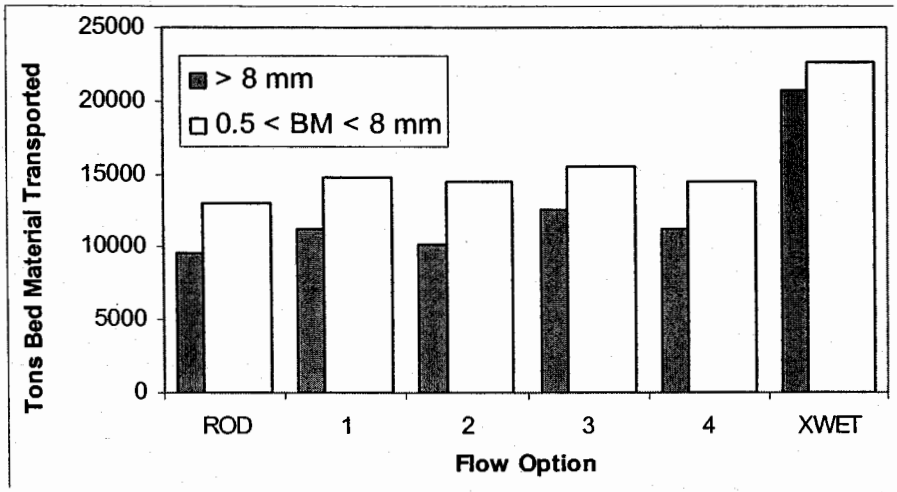
Less gravel transport relative to sand transport with Option 2



Douglas City Sampling Station

Fine bed material transport rates similar for Options 1-4

Less gravel transport relative to sand transport with Option 2



Relative Transport Effectiveness

- The Combined Option (3) transports the most fine bed material
- The ROD Option will transport the least fine bed material
- However, the differences in fine bed material transport between wet-year options are relatively small (generally < ± 10%)
- Overall, the Modified Ramp-down Option (2) provides the largest ratio of sand transport to gravel transport of any option.

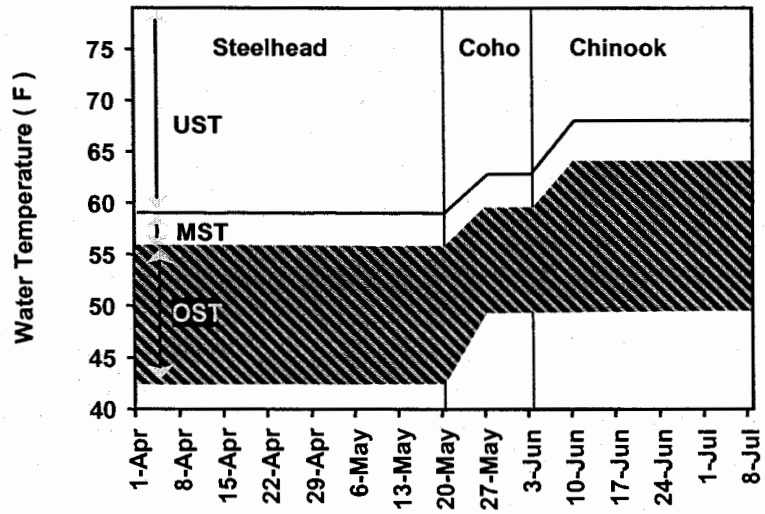
Transport Relative to Winter Inputs

- Estimates of winter fine-sediment input are a lower bound. It is likely that the actual total volumes delivered to the mainstem greatly exceed these estimates
- All flow options will transport a fine-sediment volume exceeding the lower-bound estimates of winter input at Lewiston and at Douglas City
- No flow option, including a modified extremely wet year release, will transport a volume approaching the lower-bound estimates of winter inputs at Limekiln Gulch

Pertinent Sediment Issues

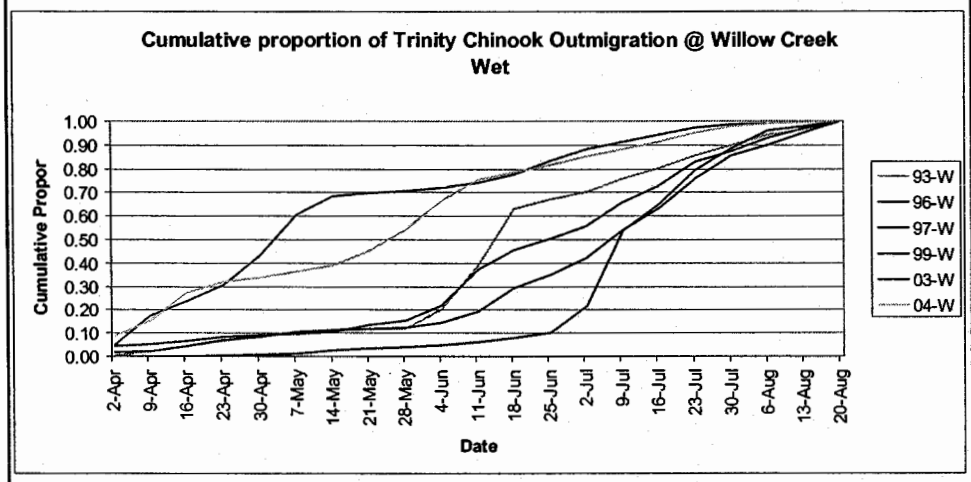
- Total amount of fine sediment transport
  - Days at either 6,000 ft^3/s or 8,000 ft^3/s
- Ratio of fine to coarse sediment transport
- Coarse sediment "TAX"
- Geomorphic/Riparian issues
  - Condition of the berm
  - Riparian scour

Target Temperature Criteria at WPC: E.Wet, Wet, and Normal Hydrologic Years



Cumulative Proportion of Natural Chinook Outmigration at Willow Creek – 1992-2005

Wet Water Years



- 2000 excluded because trapping did not start until May 14 due to high flows
- Water year class is based on upper basin inflow but does not represent ROD flow schedule releases.

80% Smolt Outmigration Dates

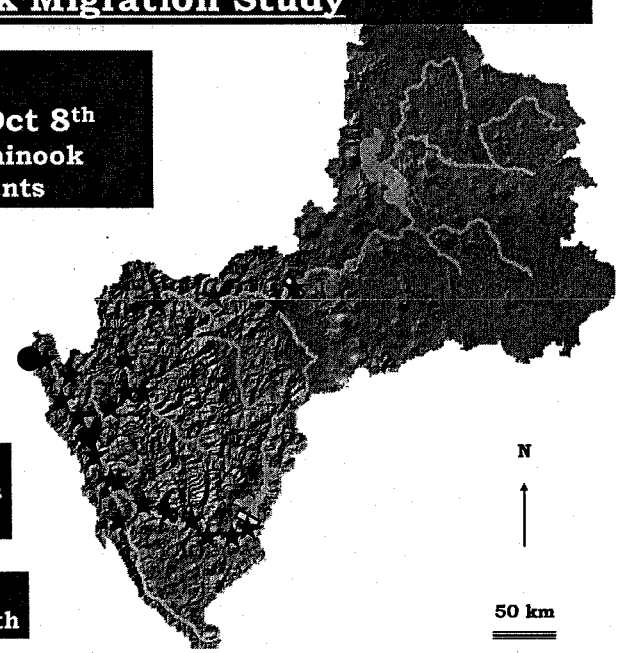
	Pre ROD	Post ROD
Statistic	1992 – 1999	2001 – 2005
Mean	July 16	June 18
Min	June 18	June 4
Max	August 6	**June 25**
Range	7 weeks	3 weeks

Summary

- Earlier Outmigration (1 month)
- Reduced date range for outmigration

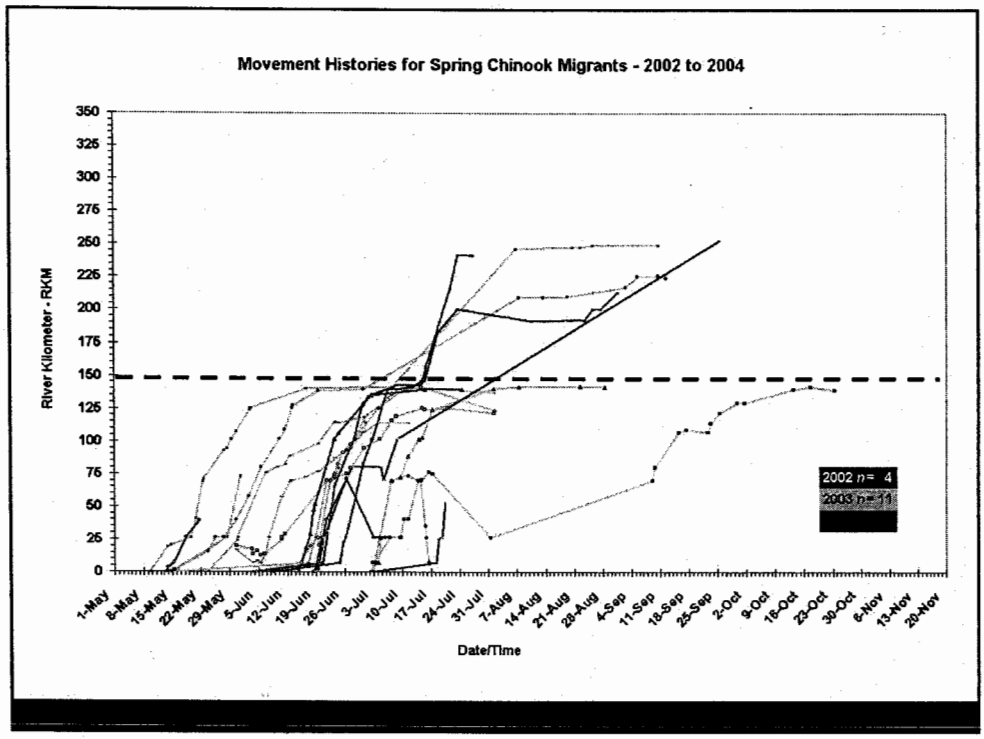
Adult Chinook Migration Study

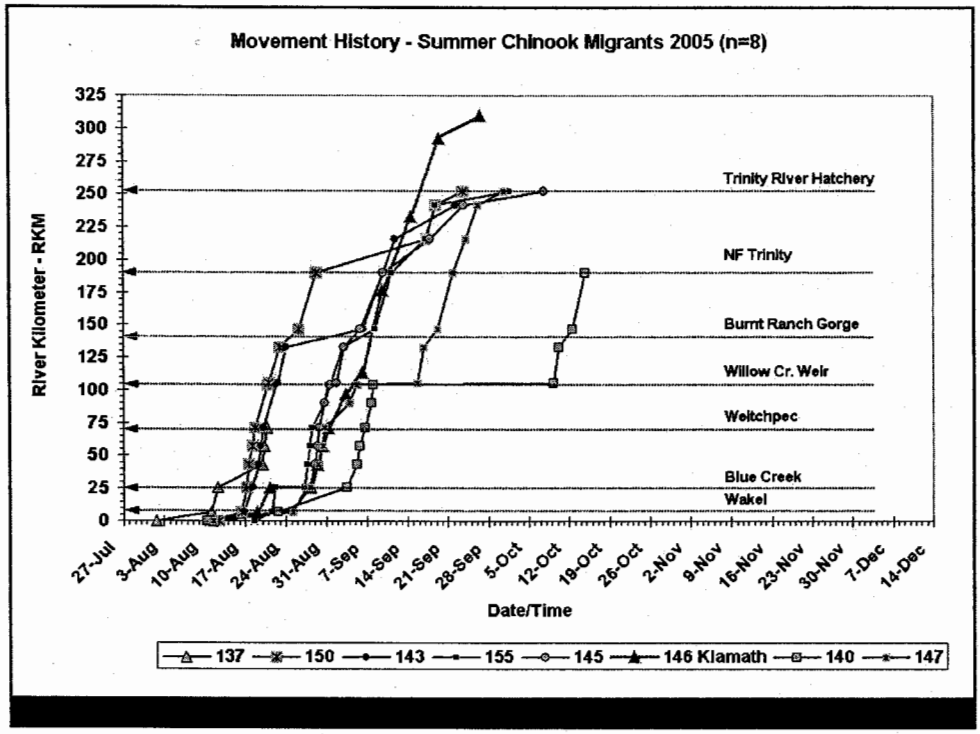
2005
July 28th – Oct 8th
n=88 Adult Chinook
n=23 migrants

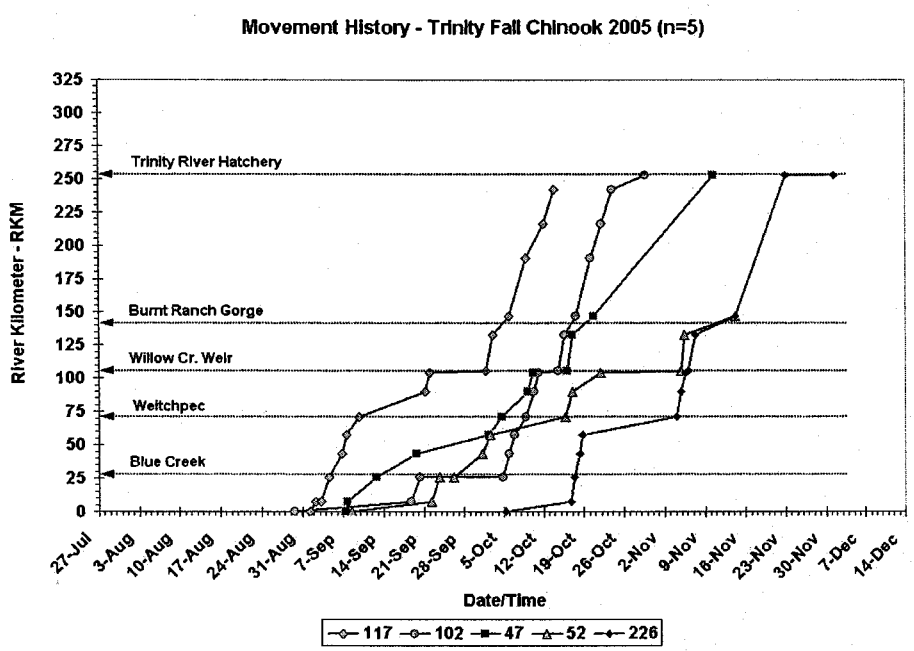


Sonic Listening Stations n=32

All fish tagged at mouth of Klamath


Movement Histories for Spring Chinook Migrants - 2002 to 2004
River Kilometer - RKM
Date/Time
2002 n= 4
2003 n= 11


Movement History - Summer Chinook Migrants 2005 (n=8)
River Kilometer - RKM
Date/Time
Trinity River Hatchery
NF Trinity
Burnt Ranch Gorge
Willow Cr. Weir
Weitchpec
Blue Creek
Wakel
137
150
143
155
145
146 Klamath
140
147

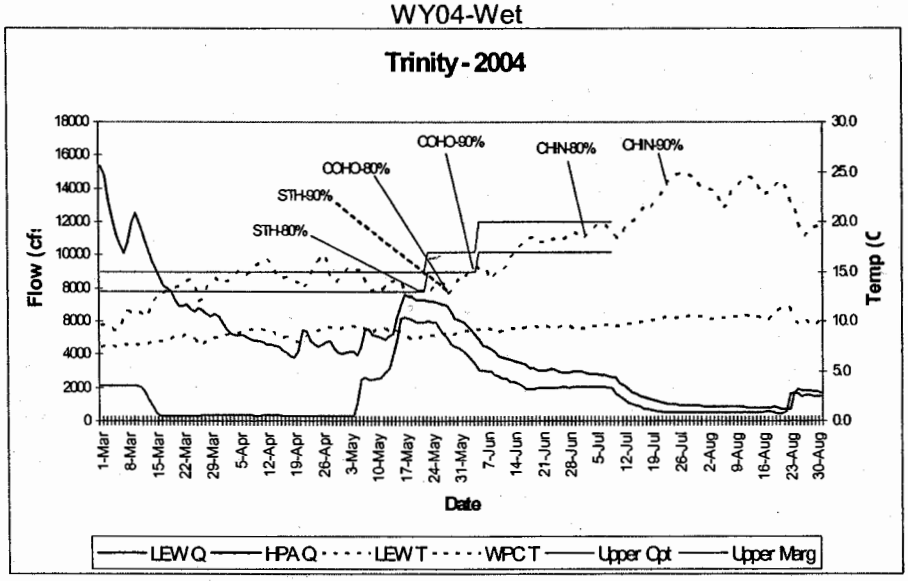


Pertinent Migration Issues

- Outmigration is likely earlier under ROD flows
- Earlier outmigration may avoid some disease issues in the Klamath River
- Adult escapement may be better without the rapid decrease from the 2,000 ft^3/s bench &…
- May be better at lower flows due to effort to transit Burnt Ranch gorge

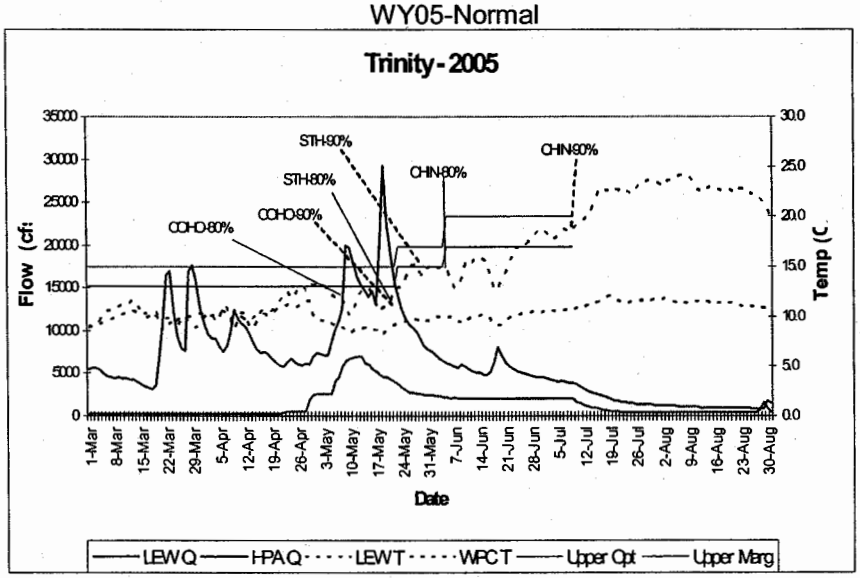
Smolt Temperature Objectives

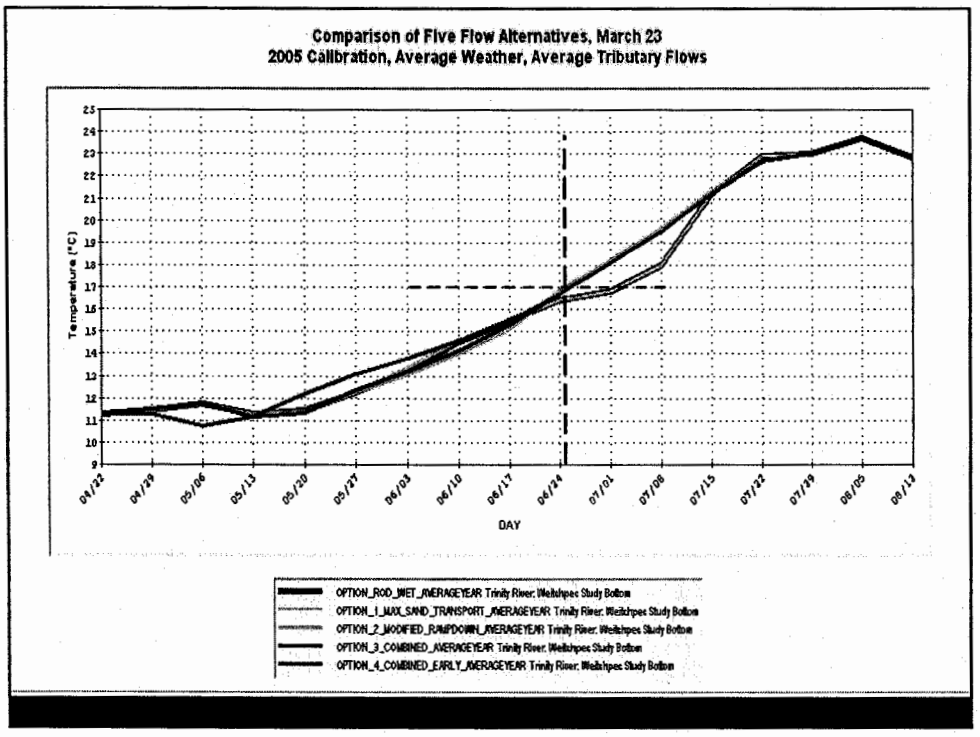
WY04-Wet

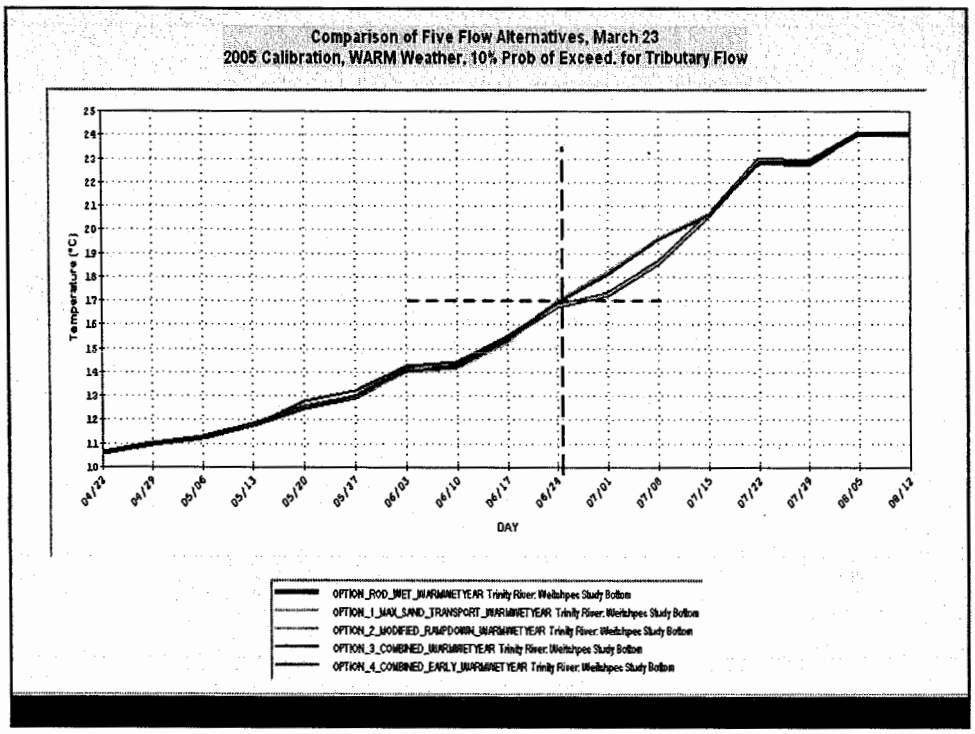


Smolt Temperature Objectives

WY05-Normal

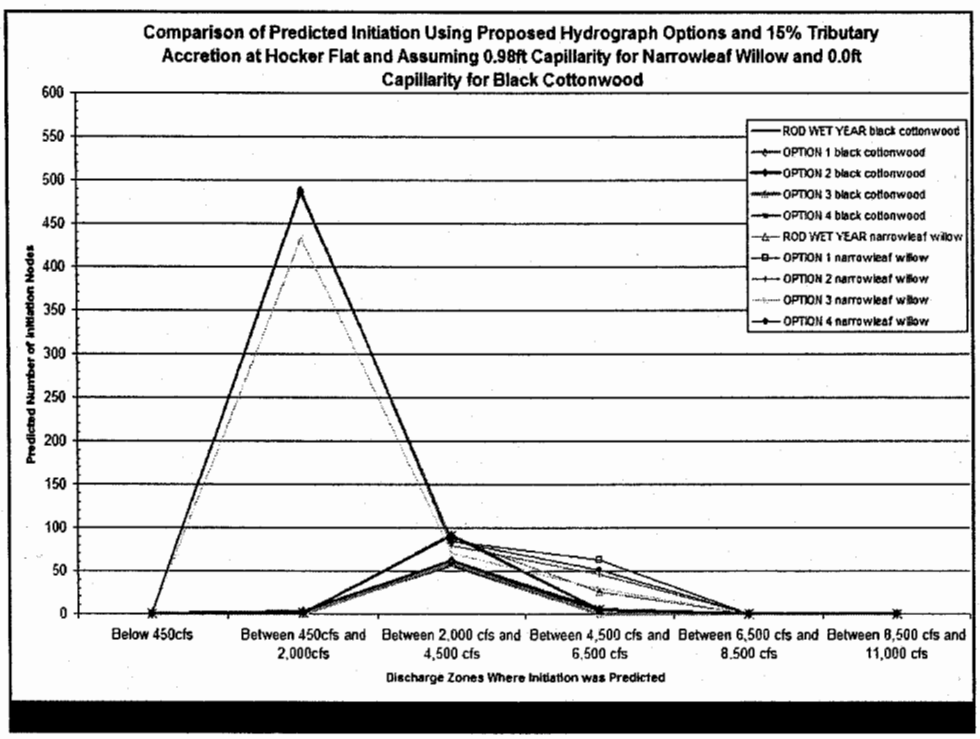



Comparison of Five Flow Alternatives, March 23
2005 Calibration, Average Weather, Average Tributary Flows
Temperature (°C)
DAY
OPTION_ROD_INET_AVERAGEYEAR Trinity River: Weitchpec Study Bottom
OPTION_1_MAX_SAND_TRANSPORT_AVERAGEYEAR Trinity River: Weitchpec Study Bottom
OPTION_2_MODIFIED_RAMPDOWN_AVERAGEYEAR Trinity River: Weitchpec Study Bottom
OPTION_3_COMBINED_AVERAGEYEAR Trinity River: Weitchpec Study Bottom
OPTION_4_COMBINED_EARLY_AVERAGEYEAR Trinity River: Weitchpec Study Bottom


Comparison of Five Flow Alternatives, March 23
2005 Calibration, WARM Weather, 10% Prob of Exceed. for Tributary Flow
Temperature (°C)
DAY
OPTION_ROD_INET_WARMWETYEAR Trinity River: Weitchpec Study Bottom
OPTION_1_MAX_SAND_TRANSPORT_WARMWETYEAR Trinity River: Weitchpec Study Bottom
OPTION_2_MODIFIED_RAMPDOWN_WARMWETYEAR Trinity River: Weitchpec Study Bottom
OPTION_3_COMBINED_WARMWETYEAR Trinity River: Weitchpec Study Bottom
OPTION_4_COMBINED_EARLY_WARMWETYEAR Trinity River: Weitchpec Study Bottom

Pertinent Temperature Issues

- ROD 2,000 ft^3/s bench inadequate to keep temperatures in optimum range
- ROD 2,000 ft^3/s bench covers bar surfaces during only part of the seed bearing period of narrow leaf willow
- A more continuous descending limb may:
  - Reduce desiccation of yellow-legged frog egg masses
  - Send a better signal to juveniles to begin outmigrating



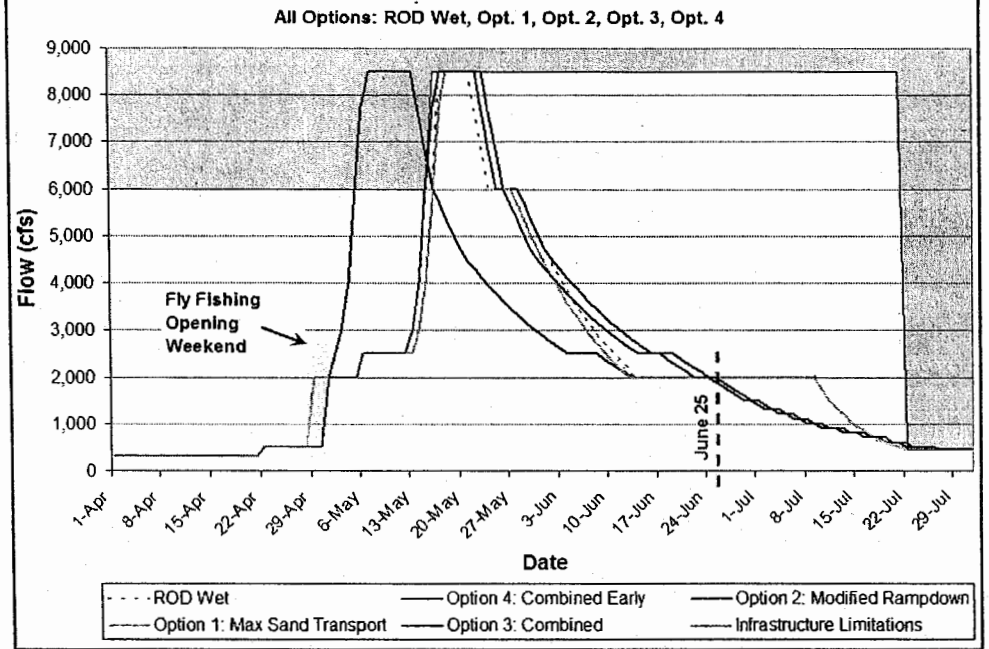
Pertinent Riparian Issues

- 6,000 ft^3/s bench is relatively important for germination
- The rate of decline on the descending limb is important for root growth relative to receding groundwater
- All hydrographs recruit narrowleaf willow
- Challenge is to modify the hydrograph to recruit a wider variety of floodplain vegetation (hardwoods)

Floodplain Vegetation Summary

- TAMWG Option 1 predicts the most cottonwoods, with or without tributary accretion
- TAMWG Option 4 is the runner up, and is not that distant from Option 1
- TAMWG Option 2 and 3 are very similar in performance to the ROD Wet Year flows, with the exception of the WY03 accretion where Option 3 is better than Option 2
- The ROD Wet Year produces the fewest cottonwoods

Discussion



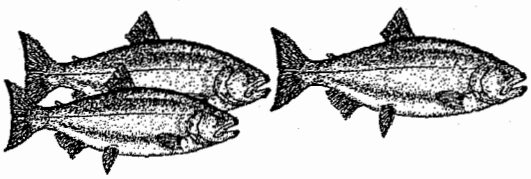
Questions?

Point of Contact

Rod Wittler

Technical Modeling & Analysis Group

Phone: 530-623-1801



UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. BUREAU OF RECLAMATION-CENTRAL VALLEY PROJECT-CALIFORNIA

DAILY CVP WATER SUPPLY REPORT

MARCH 17, 2006 RUN DATE: March 18, 2006

RESERVOIR RELEASES IN CUBIC FEET/SECOND

RESERVOIR	DAM	WY 2005	WY 2006	15 YR MEDIAN
TRINITY	LEWISTON	326	317	300
SACRAMENTO	KESWICK	3,788	25,400	5,831
FEATHER	OROVILLE (SWP)	1,750	10,000	1,900
AMERICAN	NIMBUS	3,779	7,522	3,779
STANISLAUS	GOODWIN	229	3,009	470
SAN JOAQUIN	FRIANT	125	0	141

STORAGE IN MAJOR RESERVOIRS IN THOUSANDS OF ACRE-FEET

RESERVOIR	CAPACITY	15 YR AVG	WY 2005	WY 2006	% OF 15 YR AVG
TRINITY	2,448	1,856	1,760	2,055	111
SHASTA	4,552	3,621	3,411	3,827	106
OROVILLE (SWP)	3,538	2,557	2,165	2,812	110
FOLSOM	977	579	659	637	110
NEW MELONES	2,420	1,498	1,495	2,037	136
FED. SAN LUIS	966	925	966	941	102
MILLERTON	520	370	439	0	0
TOT. N. CVP	11,360	8,479	8,291	9,497	112

ACCUMULATED INFLOW FOR WATER YEAR TO DATE IN THOUSANDS OF ACRE-FEET

RESERVOIR	CURRENT WY 2006	DRIEST WY 1977	WETTEST WY 1983	15 YR AVG	% OF 15 YR AVG
TRINITY	935	67	1,097	652	143
SHASTA	4,709	1,287	6,091	3,614	130
FOLSOM	2,392	182	3,107	1,436	167
NEW MELONES	676	0	1,012	464	146
MILLERTON	621	105	1,411	551	113

ACCUMULATED PRECIPITATION FOR WATER YEAR TO DATE IN INCHES

RESERVOIR	CURRENT WY 2006	DRIEST WY 1977	WETTEST WY 1983	AVG (N YRS)	% OF AVG	LAST 24 HRS
TRINITY AT FISH HATCHERY	40.26	8.67	45.04	26.43 (44)	152	0.36
SACRAMENTO AT SHASTA DAM	67.96	9.78	90.36	50.63 (49)	134	1.17
AMERICAN AT BLUE CANYON	81.11	14.11	85.19	51.85 (31)	156	0.00
STANISLAUS AT NEW MELONES	26.18	0.00	37.49	21.50 (28)	122	0.37
SAN JOAQUIN AT HUNTINGTON LK	38.31	9.50	67.30	34.04 (31)	113	0.00