

TECHNICAL MANAGEMENT TEAM

COE:	<i>Doug Baus / Karl Kanbergs</i>	BPA:	<i>Tony Norris / Scott Bettin / Robyn MacKay</i>
BOR:	<i>John Roache / Mary Mellema</i>		
NOAA:	<i>Paul Wagner / Richard Domingue</i>	USFWS:	<i>David Wills / Steve Haeseker</i>
OR:	<i>Erick Van Dyke</i>	ID:	<i>Russ Kiefer / Pete Hassemer</i>
WA:	<i>Charles Morrill</i>	MT:	<i>Jim Litchfield / Brian Marotz</i>
Kootenai:	<i>Sue Ireland / Billy Barquin</i>	Spokane:	<i>Andy Miller</i>
Colville:	<i>Sheri Sears / Keith Wolf</i>	Nez Perce:	<i>Dave Statler</i>
Umatilla:	<i>Tom Lorz (CRITFC)</i>	Salish-Kootenai:	<i>Stu Levit</i>

COLUMBIA RIVER REGIONAL FORUM

Technical Management Team Annual Review of Lessons Learned: 2013

Thursday, December 12, 2013
9:00 am - 3:30 pm (PST)
Ambridge Event Center
1333 N.E. Martin Luther King, Jr. Blvd (cross-street Clackamas)
Sellwood Room
Portland, Oregon
Map Quest [\[Directions\]](#)

AGENDA

Questions about the meeting may be referred to Robin Gumpert at (503) 248-4703.

Purpose: To provide an opportunity for TMT members and other interested parties to step out of the regular meeting format and review the management decisions and operations of the 2013 season in order to learn lessons that can enhance choices and decision-making for 2014.

The timing of agenda items are offered as a guide for the day. Depending on information presented and group dynamics it may compress or expand. Presenters are reminded that their presentations are meant to provide visual cues that spark reflection and discussion, as opposed to a full blown analysis of the issue.

9:00 - 9:15 Welcome & Introductions - DS Consulting Facilitation Team

9:15 - 9:45 2013 Conditions Review: What were the water, weather and fish conditions that occurred in 2013? How did this year compare to others? Is there something we can learn from this? Is there anything unique that bears sharing?

1. [2013 Weather Review, 2013-14 Climate Forecast](#) - Kyle Dittmer, Columbia River Inter-Tribal Fish Commission
2. [2013 Water Management Review](#) - Kasi Rodgers, US Army Corps of Engineers, Northwestern Division
3. 2013 Fish Passage -
 - a. [2013 Adult Salmon & Lamprey Passage](#) - Charles Morrill, Washington Dept. of Fish & Wildlife
 - b. [Juvenile Summary](#) - Brandon Chockley, Fish Passage Center
4. Lessons Learned from the 2013 Conditions Review

10:00 - 11:00 2013 Reservoir Operations Review: How effective were proposed actions (SORs) at achieving desired results? What changes might be necessary to enhance results in the future? How did this year compare to others?

1. [Libby Operations](#) / [Libby Sturgeon Operations](#) / [KTOI Sturgeon Habitat Program](#) (*Panel Discussion*)
- Joel Fenolio, US Army Corps of Engineers, Seattle District / Dave Wills, US Fish & Wildlife Service / Paul Wagner, NOAA Fisheries
 - a. Winter Operations - Elevation Targets, Forecast & Foreseeable Modifications
 - b. Spring Operations - Impacts on Sturgeon and Salmon
 - c. Summer Operations - Flow & Elevation Targets; Sturgeon Habitat Project
2. [Hungry Horse Operations](#) - John Roache, Bureau of Reclamation
3. [Grand Coulee Operations](#) - John Roache, Bureau of Reclamation
4. [Dworshak Spring/Summer Operations](#) - Steve Hall, US Army Corps of Engineers, Walla Walla District
5. [Upper Snake Flow Augmentation](#) - Ted Day, Bureau of Reclamation
6. Lessons Learned from the 2013 Reservoir Operations Review: Is there more flexibility that TMT could utilize to improve in-season operations?

11:00 - 11:15 BREAK

11:15 - 12:00 Review of Specific Operations: What was learned about specific operations that were requested by TMT members or other regional entities? How effective were these operations in achieving the intended goal? Should they be continued or modified in future years? Why or why not?

1. [2013 Juvenile Survival / Transport Adult Returns](#) - Steve Smith, NOAA Northwest Fisheries Science Center
2. [2013 Bonneville Turbine Operations / SOR 2013-3 Summary](#) - Tom Lorz, Columbia River Inter-Tribal Fish Commission

12:00 - 12:45 LUNCH

12:45 - 2:00 Continue Review of Specific Operations

1. [2013 Performance Standard Testing Results \(LGS, LMN\)](#) - Eric Hockersmith, US Army Corps of Engineers, Walla Walla District
2. [Lower Granite Dam Adult Passage Delay](#) (*Panel Discussion*)
- Steve Hall, US Army Corps of Engineers, Walla Walla District / Doug Baus, US Army Corps of Engineers, Northwestern Division / Russ Kiefer, Idaho Dept. of Fish & Game
 - a. Water Temperature Differentials
 - b. Review of Operations in July-October 2013
 - c. Adult Salmon Delays & Impacts
3. Lessons Learned from Review of 2013 Special Operations

2:00 - 2:45 Looking Ahead (Small Group Exercise): What have we learned in 2013 that can inform future problem-solving and decision-making?

2:45 - 3:00 BREAK

3:00 - 3:30 Wrap-Up: Given these reviews and discussions of 2013 conditions, decisions and actions, what are the overarching lessons that could impact future work of the TMT? Are there themes that might need further discussion at a future TMT meeting or other regional work group?

3:30 ADJOURN

NOTE: Lunch will be provided for all meeting participants and attendees. A \$10 contribution is required. Please RSVP as soon as possible and no later than Friday, December 6. Your RSVP is required to guarantee enough food for everyone! RSVP & special food requests (e.g., vegetarian) to Jan Kelly at Jan@DSConsult.co (.co not .com) or call (503) 248-4703.

Thank you in advance for your thoughtful participation.

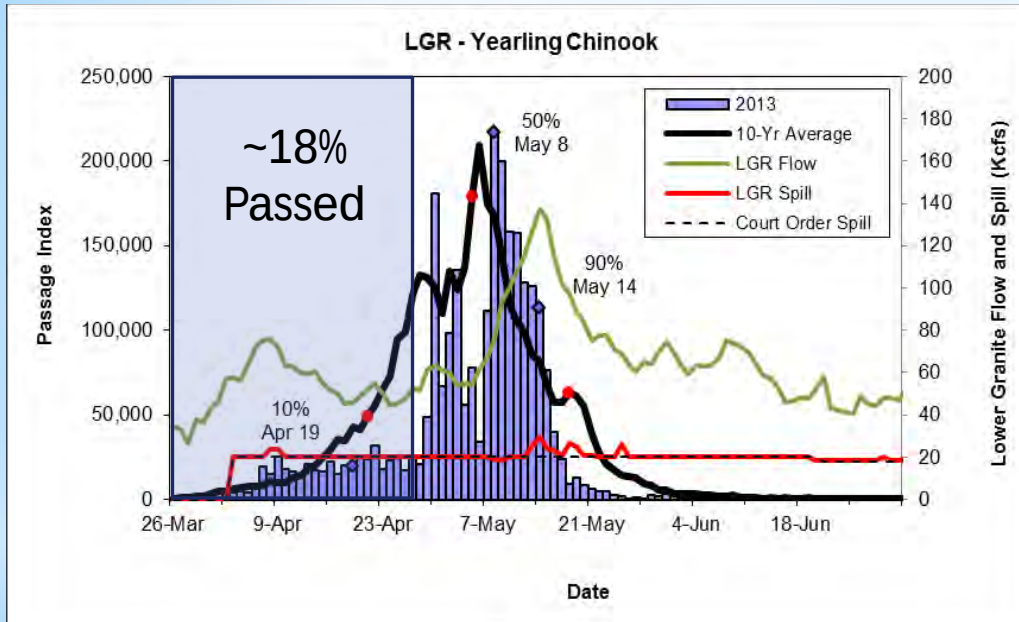
2013 Smolt Monitoring Program

Juvenile Passage Data and Noteworthy Events

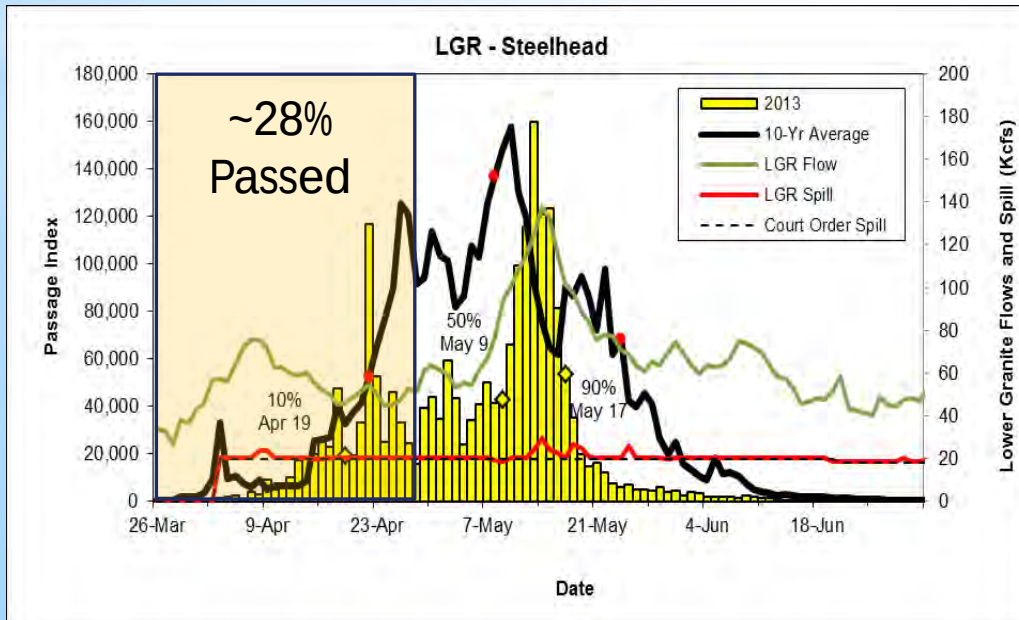
2013 TMT Year-end Review
December 12, 2013

Brandon R. Chockley
Fish Passage Center

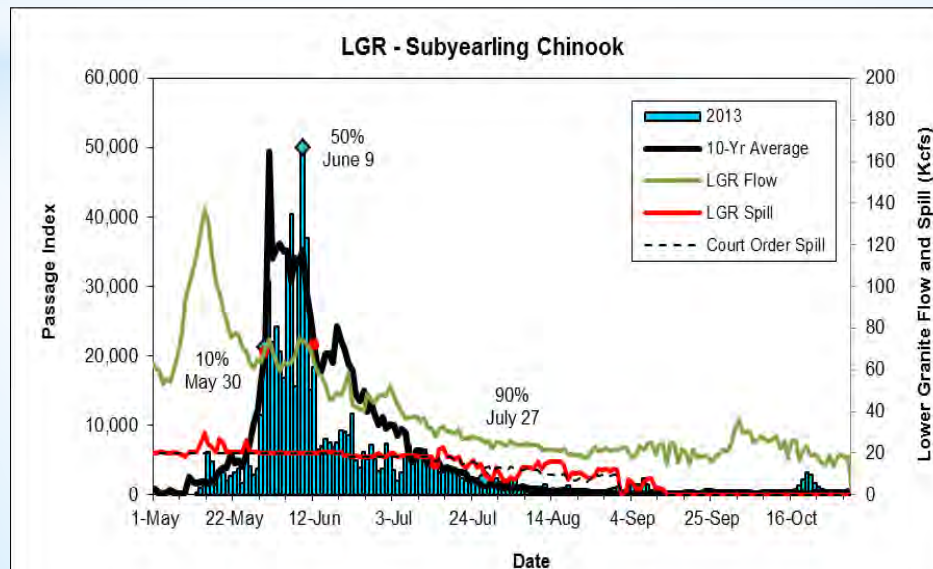
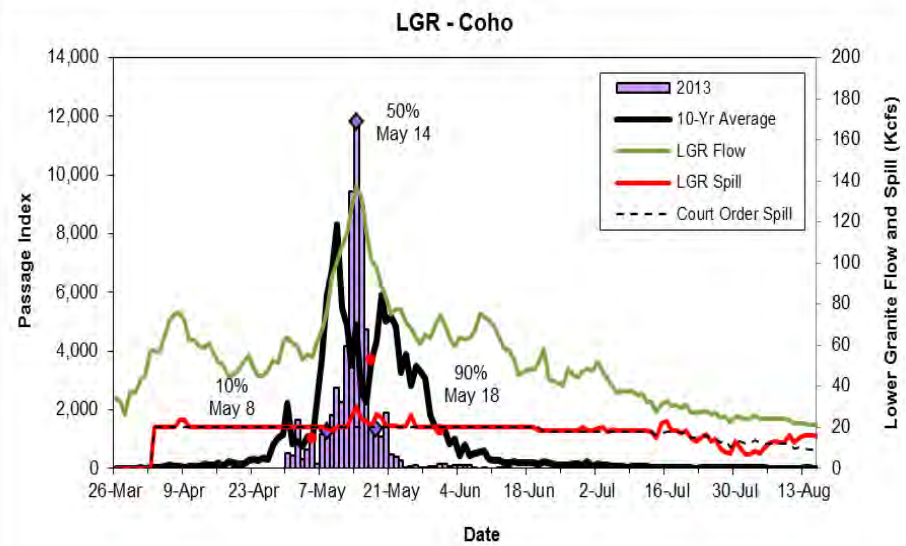
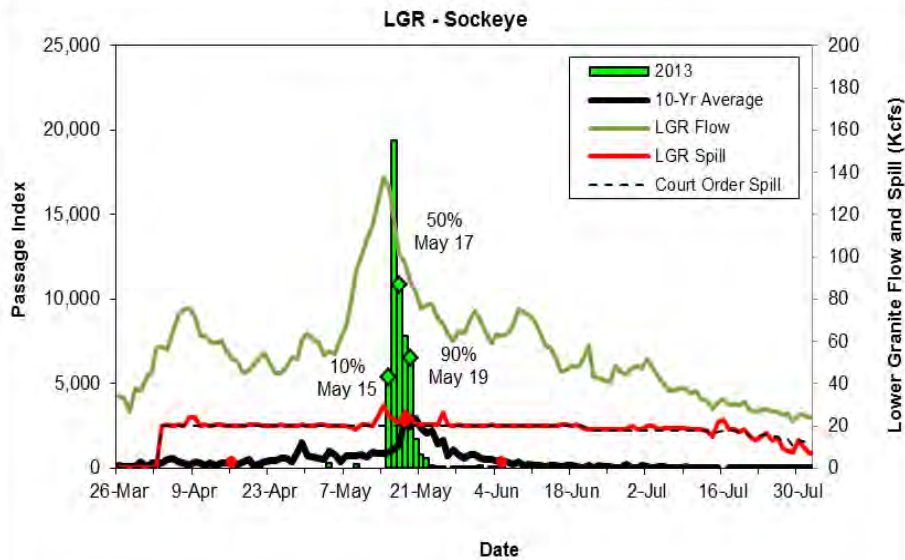
Lower Granite Dam



- Short period of uncontrolled spill in mid- to late May
- Collections for transportation began on Apr. 27, first barge Apr. 28

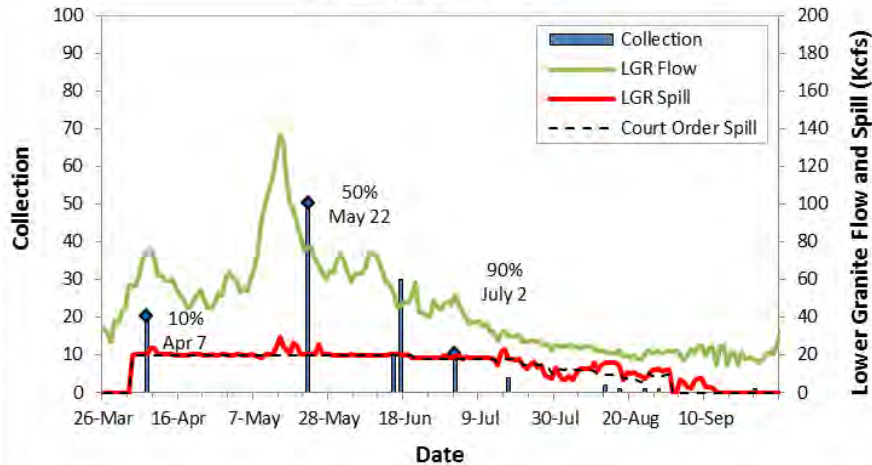


Lower Granite Dam

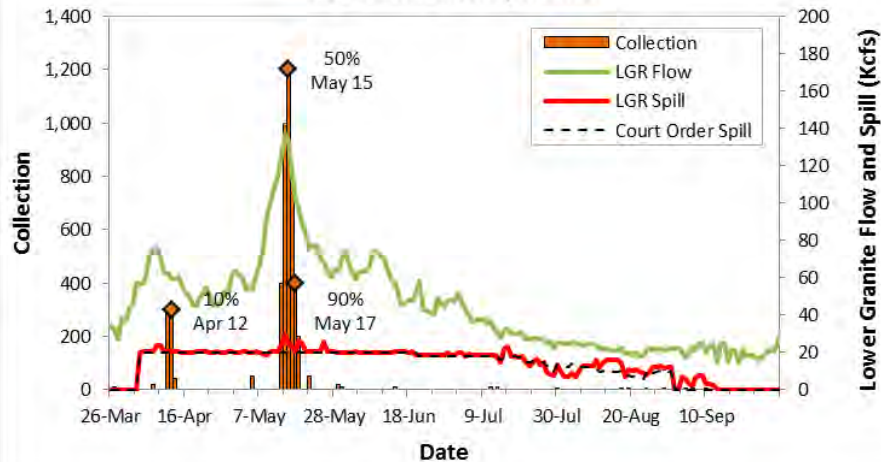


Lower Granite Dam

LGR - Pacific Ammocoetes



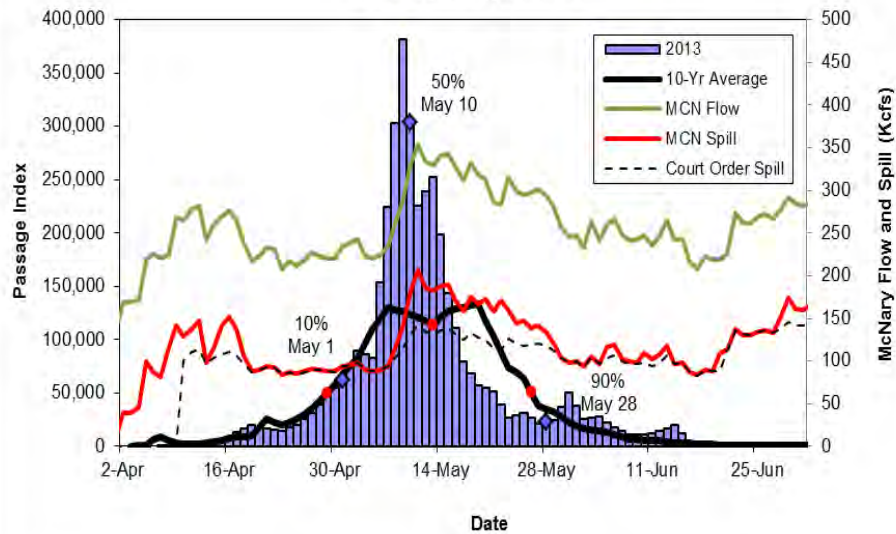
LGR - Pacific Macrophthalmia



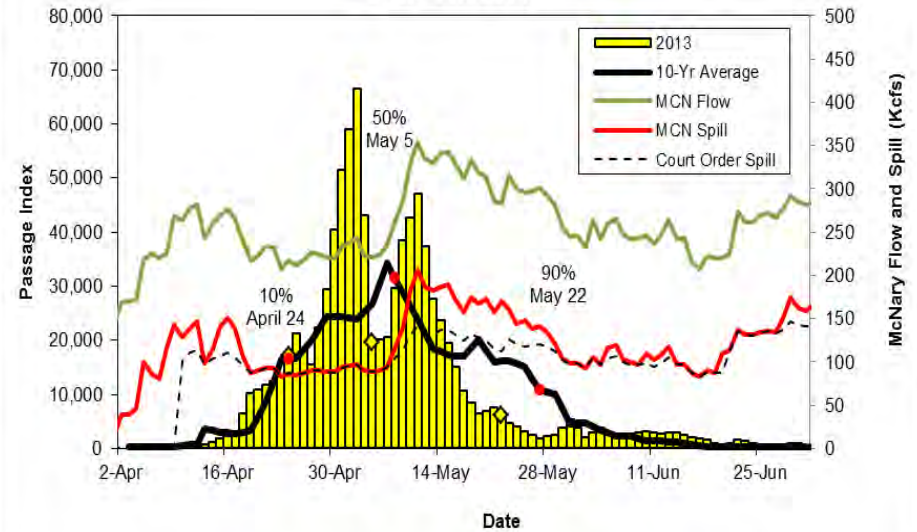
- 2013 study of PIT-tagged macrophthalmia confirmed lamprey juveniles escaping LGR sample tank
- **Under current configuration, estimates of collection at LGR for lamprey juveniles unreliable**
 - Likely underestimates
 - Also true for 2011 & 2012

McNary Dam

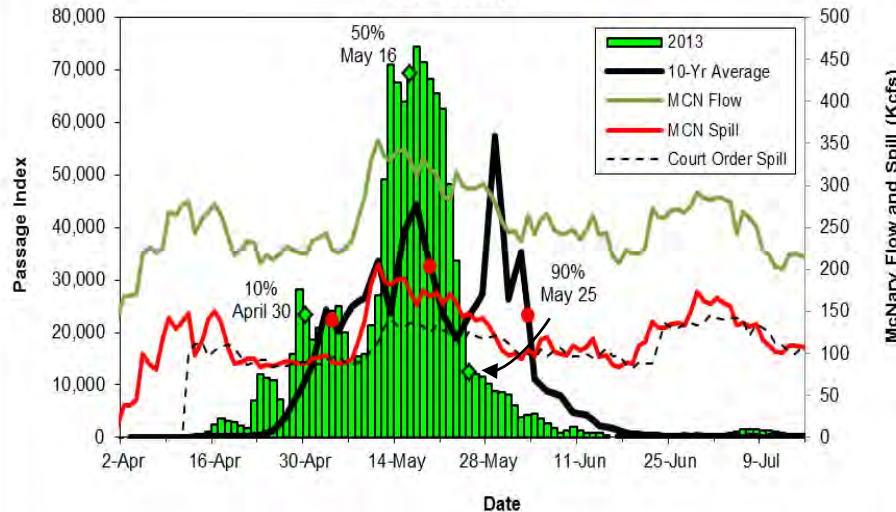
MCN - Yearling Chinook



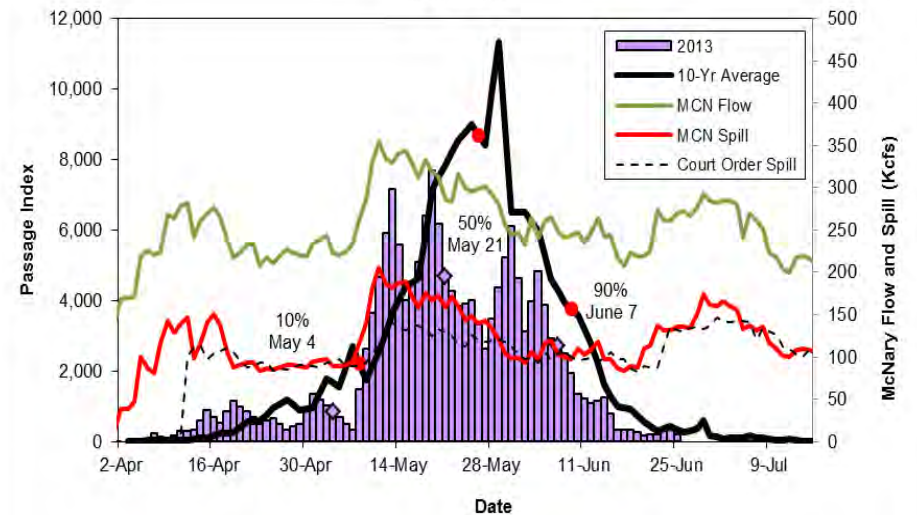
MCN - Steelhead



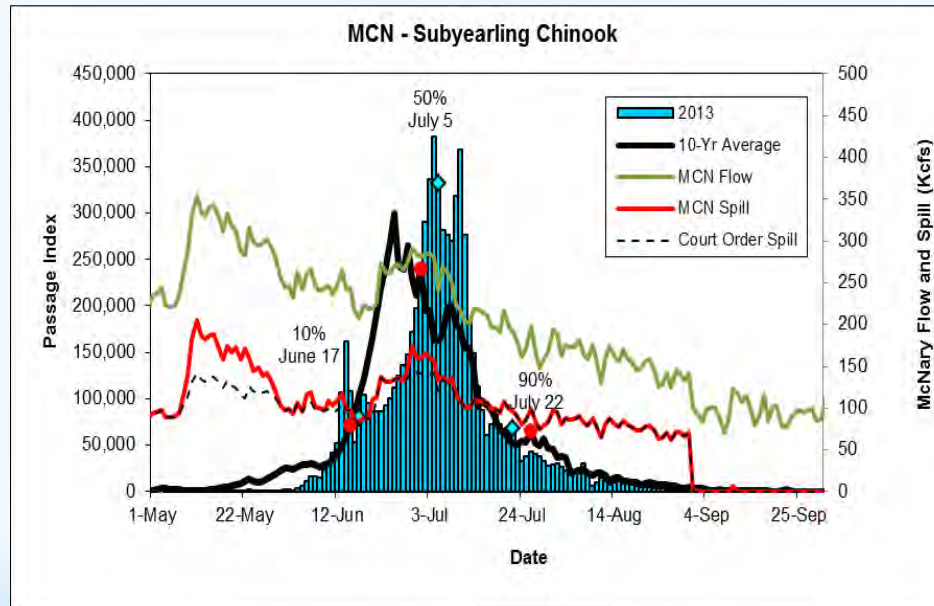
MCN - Sockeye



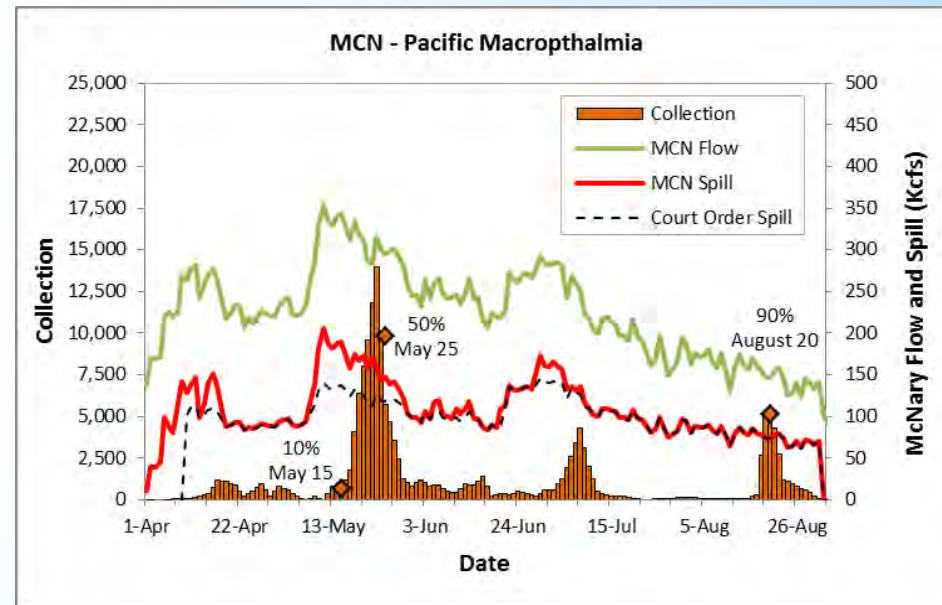
MCN - Coho



McNary Dam

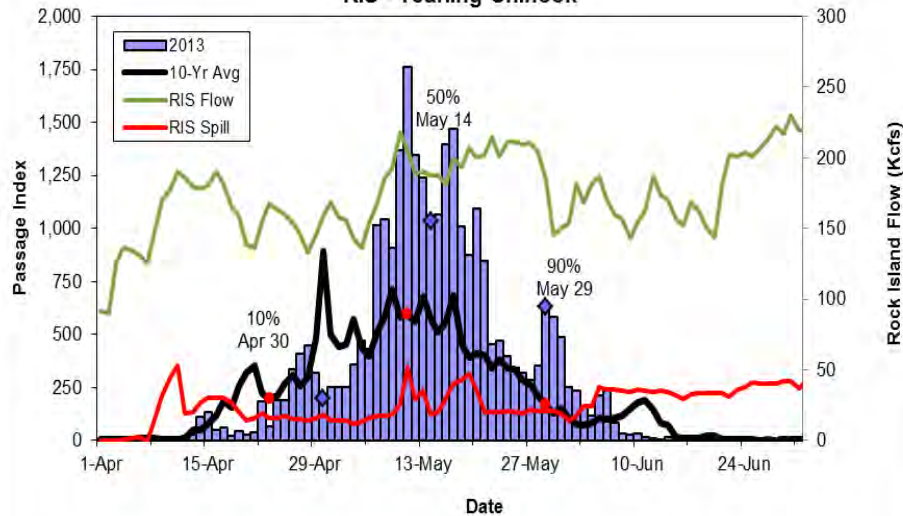


- No Pacific ammocoetes sampled at MCN in 2013
 - Similar to 2012

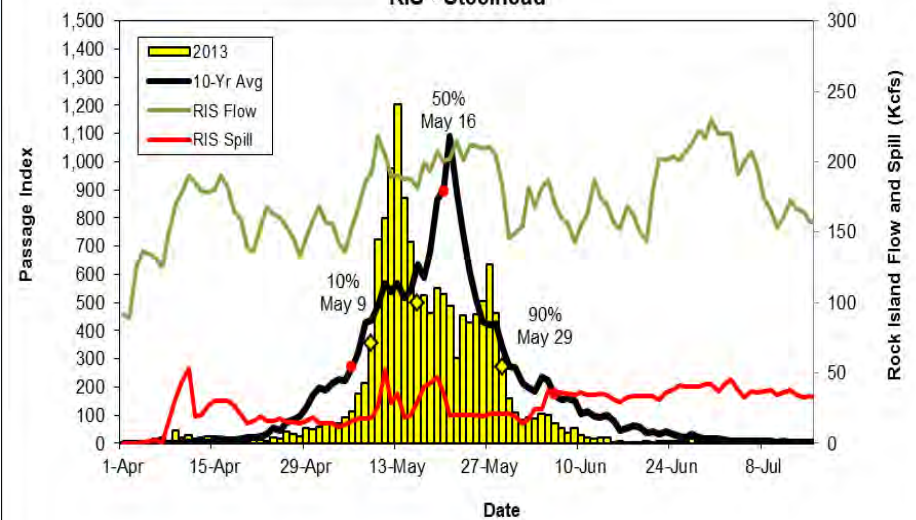


Rock Island Dam

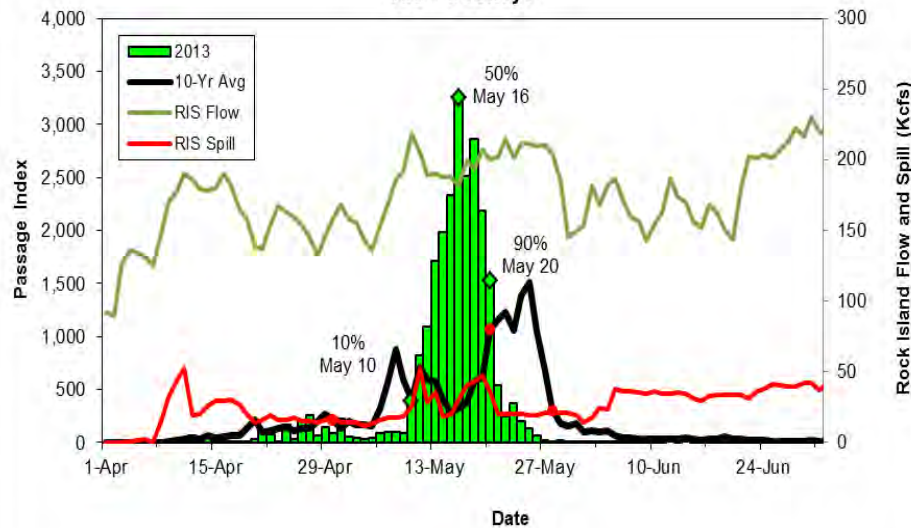
RIS - Yearling Chinook



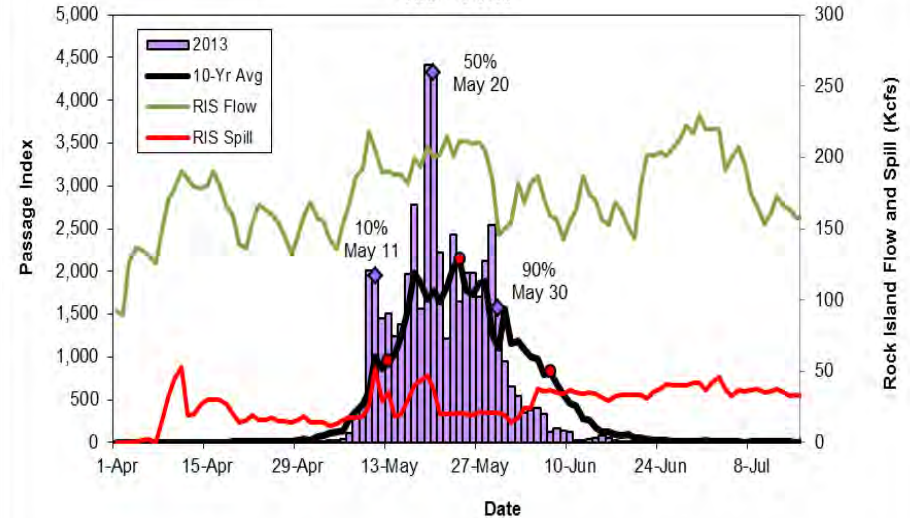
RIS - Steelhead



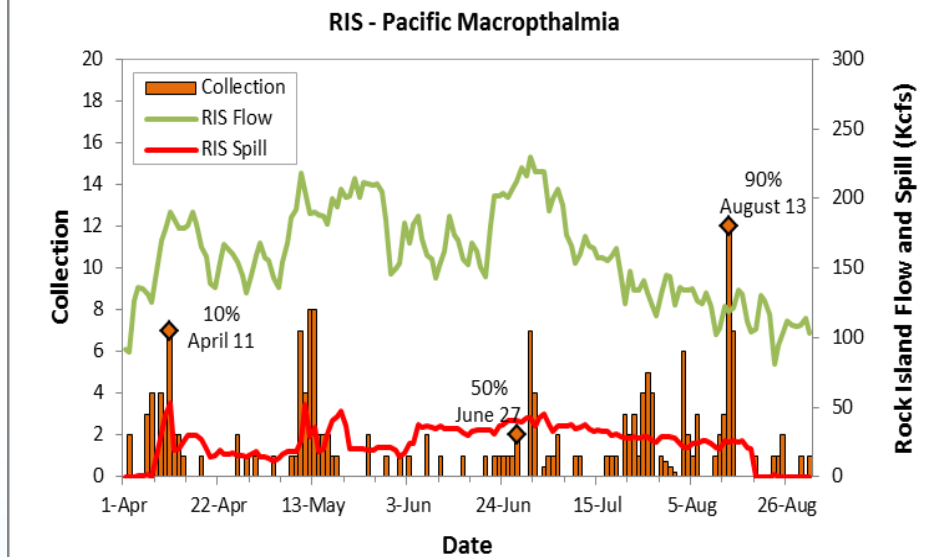
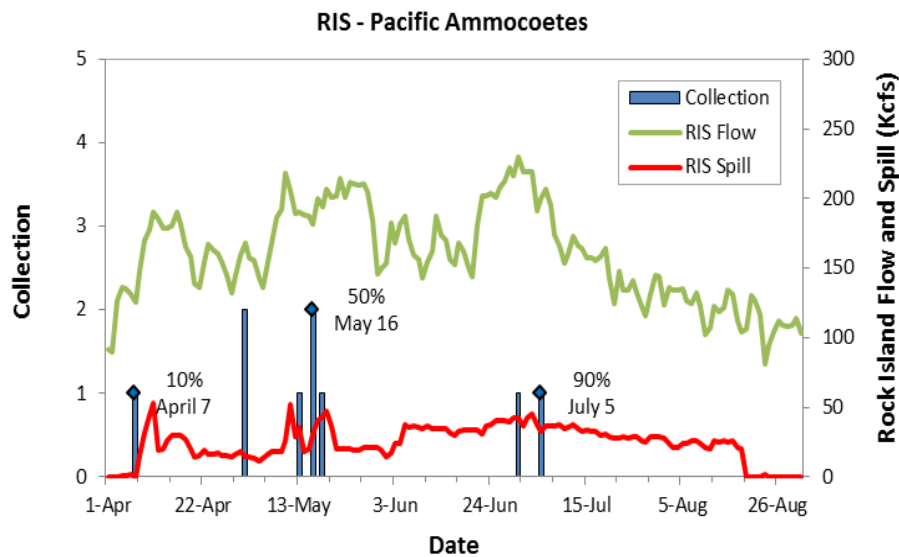
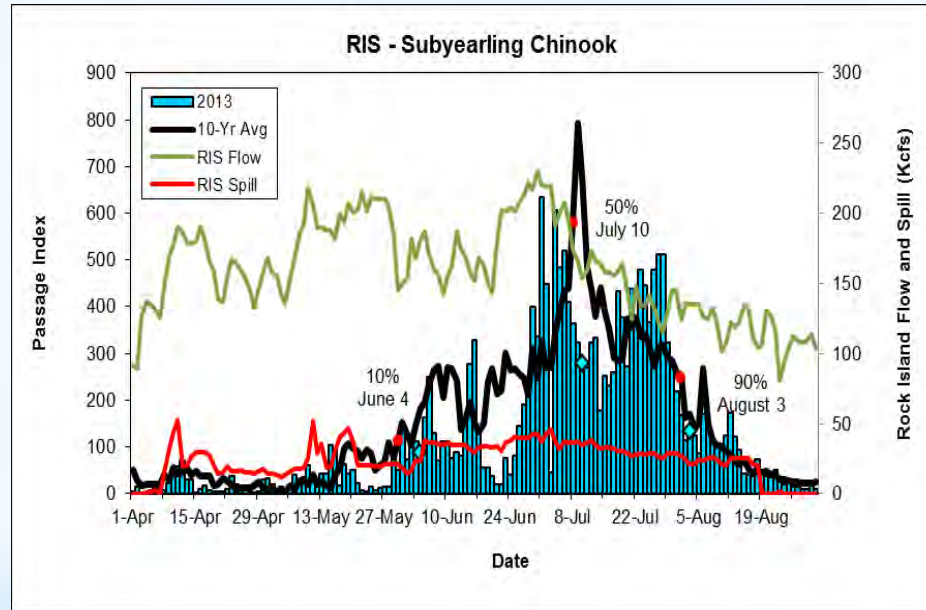
RIS - Sockeye



RIS - Coho

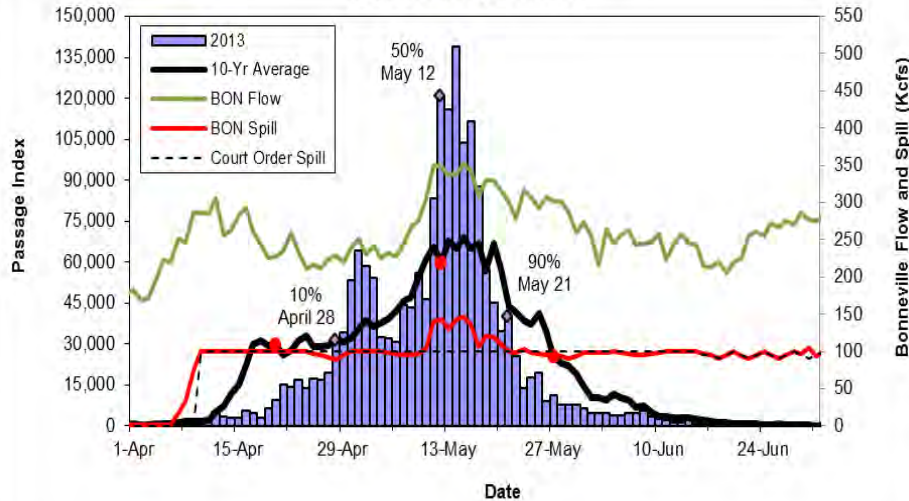


Rock Island Dam

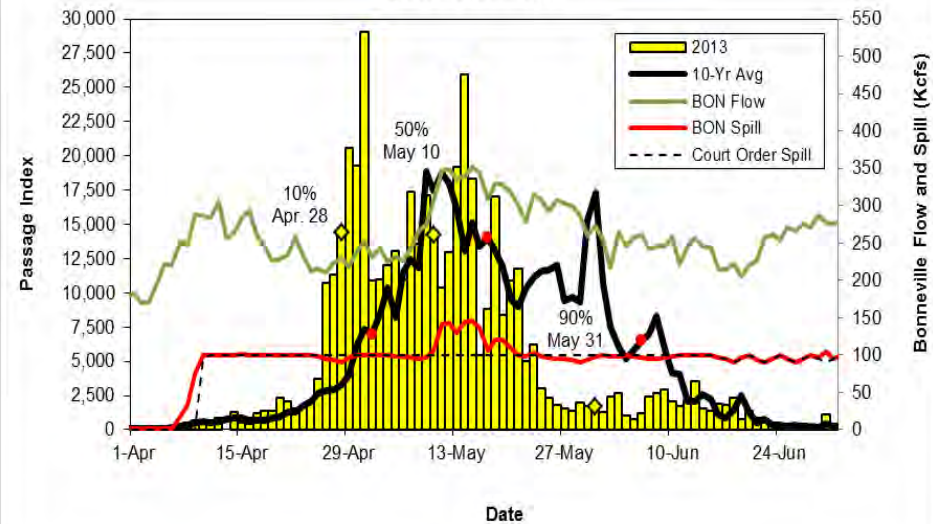


Bonneville Dam

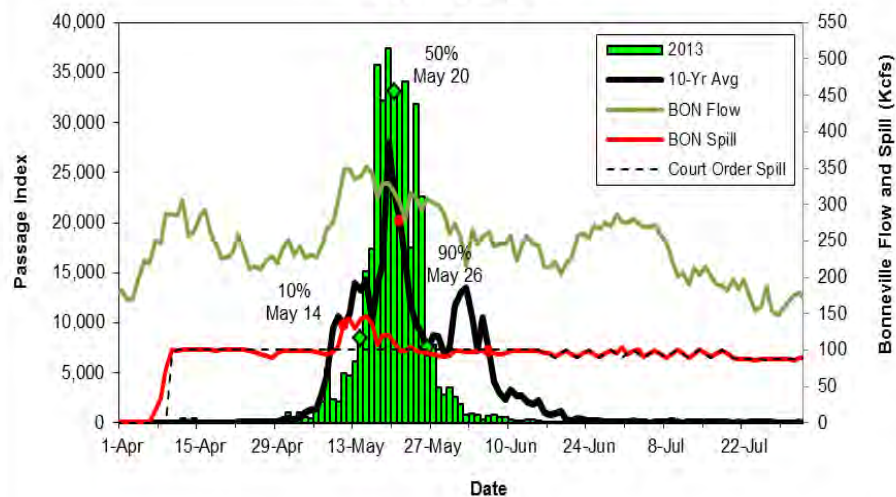
BON - Yearling Chinook



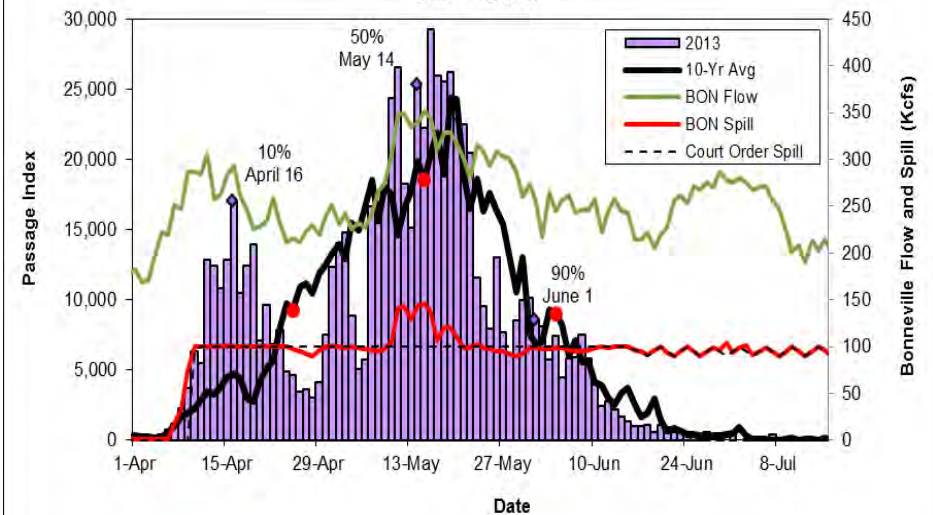
BON - Steelhead



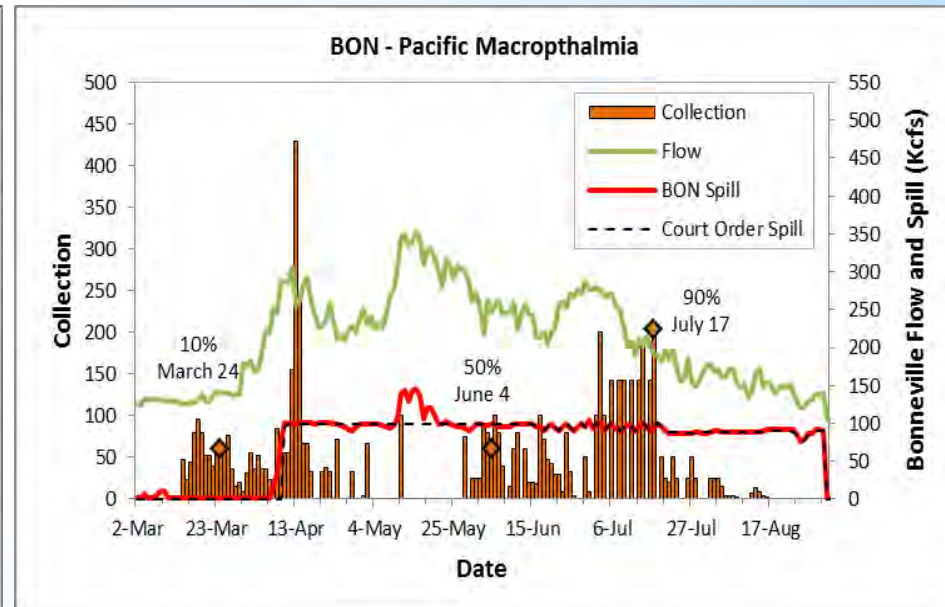
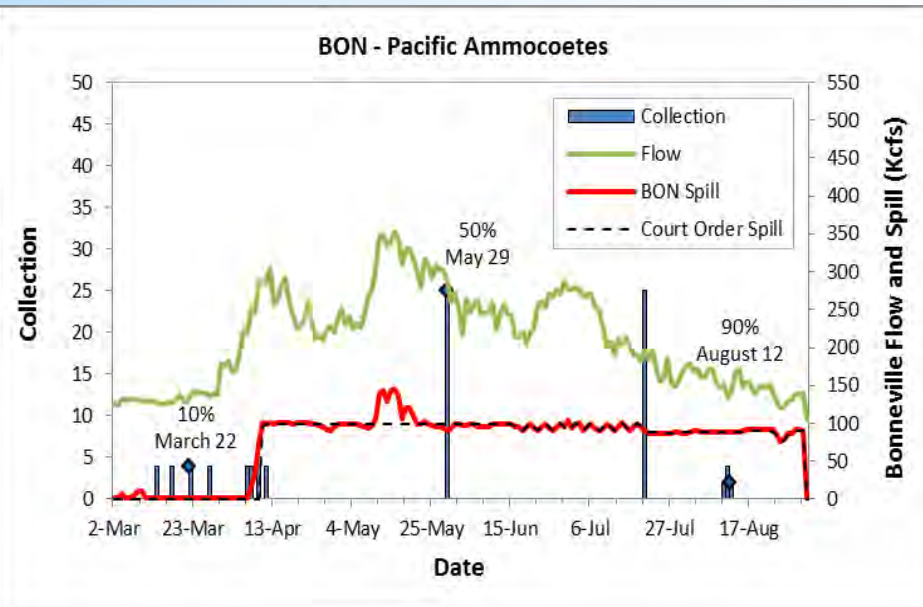
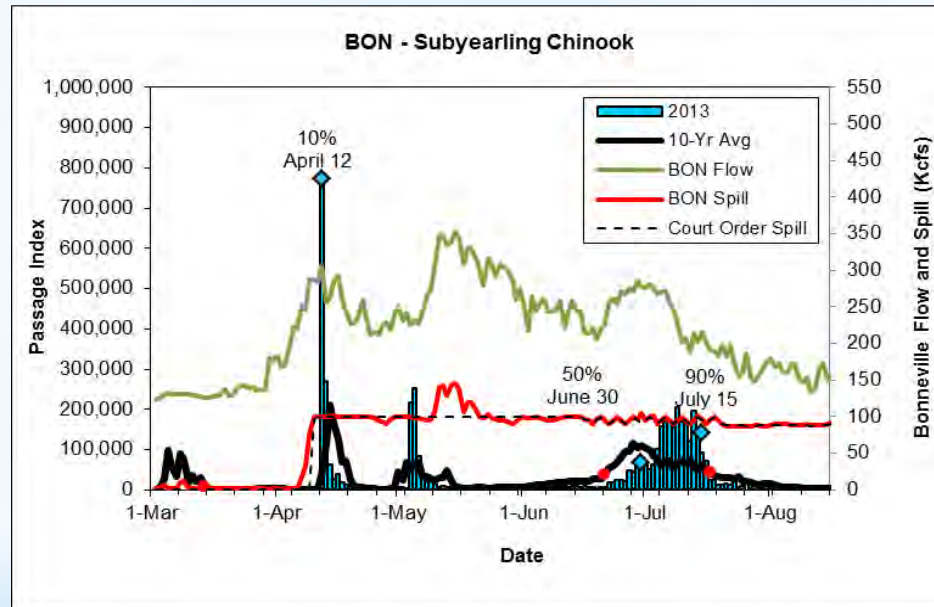
BON - Sockeye



BON - Coho



Bonneville Dam



Noteworthy Events - Mortalities

- Compared to 2012, decreased mortality of CH0 & SO at BON in 2013
- Weighted average mortality for Pacific macropthalmia at BON still high, although lower than 2012
- Weighted average mortality for CH0 at LMN highest over last 12 years

Site	CH0	CH1	CO	SO	ST	MP [†]
LGR*	0.8	0.8	0.0	0.0	0.3	N/A
LGS	0.3	0.1	0.0	0.0	0.1	1.9
LMN	1.4	0.2	0.0	0.0	0.2	1.7
MCN	1.4	0.7	0.0	1.4	0.1	1.5
JDA	0.4	0.3	0.3	0.4	0.2	0.0
BON	0.8	0.5	0.2	1.1	0.3	4.7
RIS	0.2	0.0	0.0	0.0	0.0	N/A

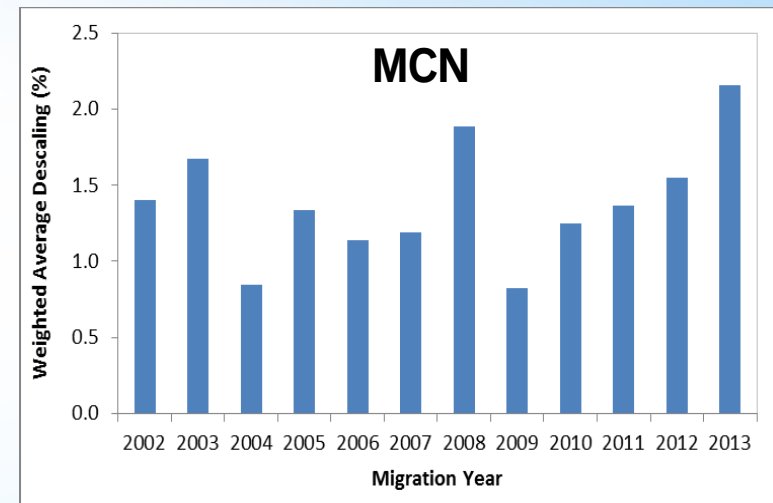
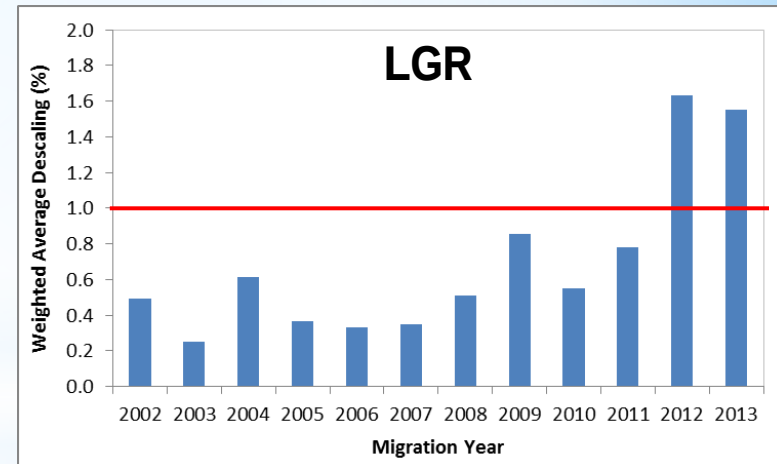
* Mortality recorded for 6/3/2013 sample removed from estimation of weighted average

[†] Weighted by estimated collection, instead of passage index

Noteworthy Events - Descaling

- Weighted average descaling for CH0 at LGR >1.0%
 - Second time in last 11 years (other was 2012)
- Highest weighted average descaling for CH0 at MCN over last 12 years

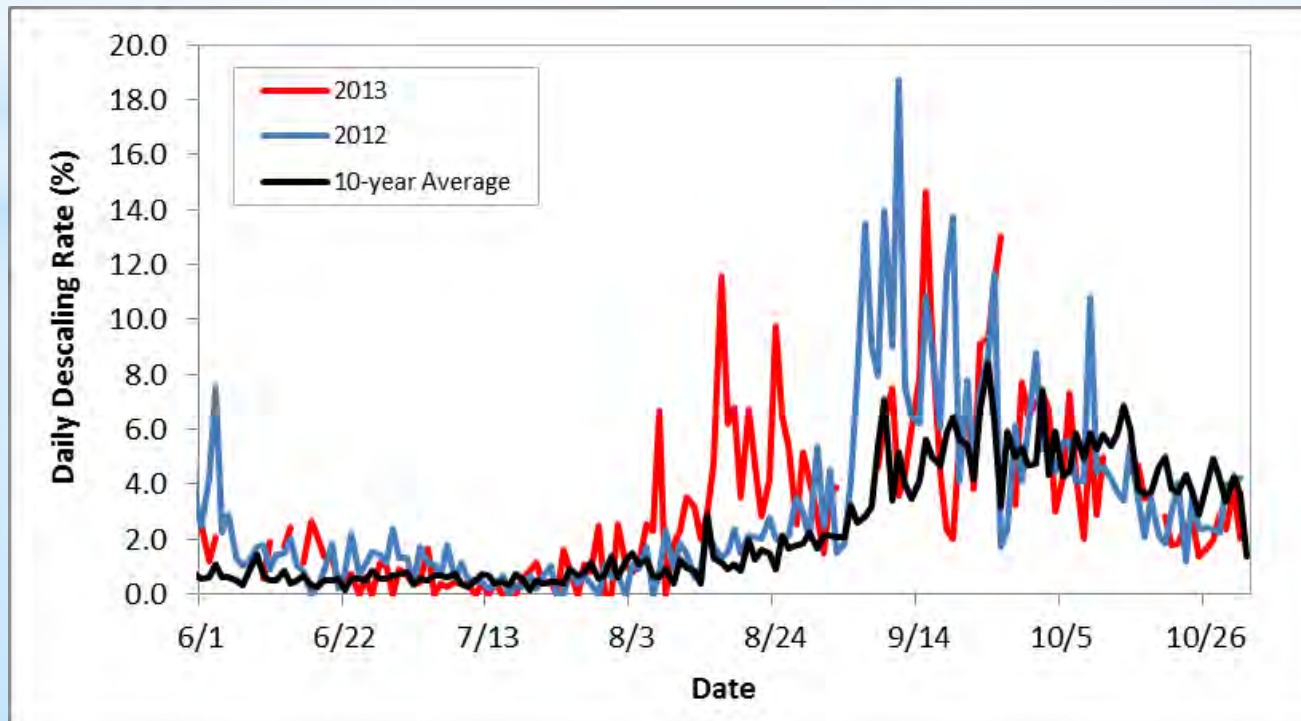
Site	CH0	CH1	CO	SO	ST
LGR	1.6	2.9	0.2	2.2	3.7
LGS	0.6	0.7	0.0	0.0	0.5
LMN	1.7	2.9	4.2	0.0	4.6
MCN	2.2	4.7	2.8	8.0	4.6
JDA	1.2	2.0	2.2	5.0	3.7
BON	0.3	3.2	1.2	10.3	3.0
RIS	1.0	0.3	0.3	1.1	0.4



Noteworthy Events

Descaling

- High descaling in August through October for CH0 at LGR
- Observed similar pattern in 2012
- Cause of descaling still unclear



RECLAMATION

Managing Water in the West

Upper Snake Flow Augmentation 2013



U.S. Department of the Interior
Bureau of Reclamation

KEY CONCEPTS

- **Provide up to 487 kaf of extra water above Brownlee**
- **Provided during the April to August period**
- **Attempt to shift water from August to earlier periods**
- **Must work within State water law and the Nez Perce Agreement**
- **Comes from a combination of Reclamation uncontracted storage, rentals from irrigators, and natural flow water rights**

RECLAMATION

2013 Highlights

- Poor runoff conditions in all Snake Basins:
 - ❖ Boise River: 50%
 - ❖ Payette River: 62%
 - ❖ Snake R. abv Milner: 70%
- Significant refill shortage in Boise and Upper Snake systems
- Very challenging to meet the 427 KAF goal (487 kaf was not possible)

RECLAMATION

2013 Highlights (cont.)

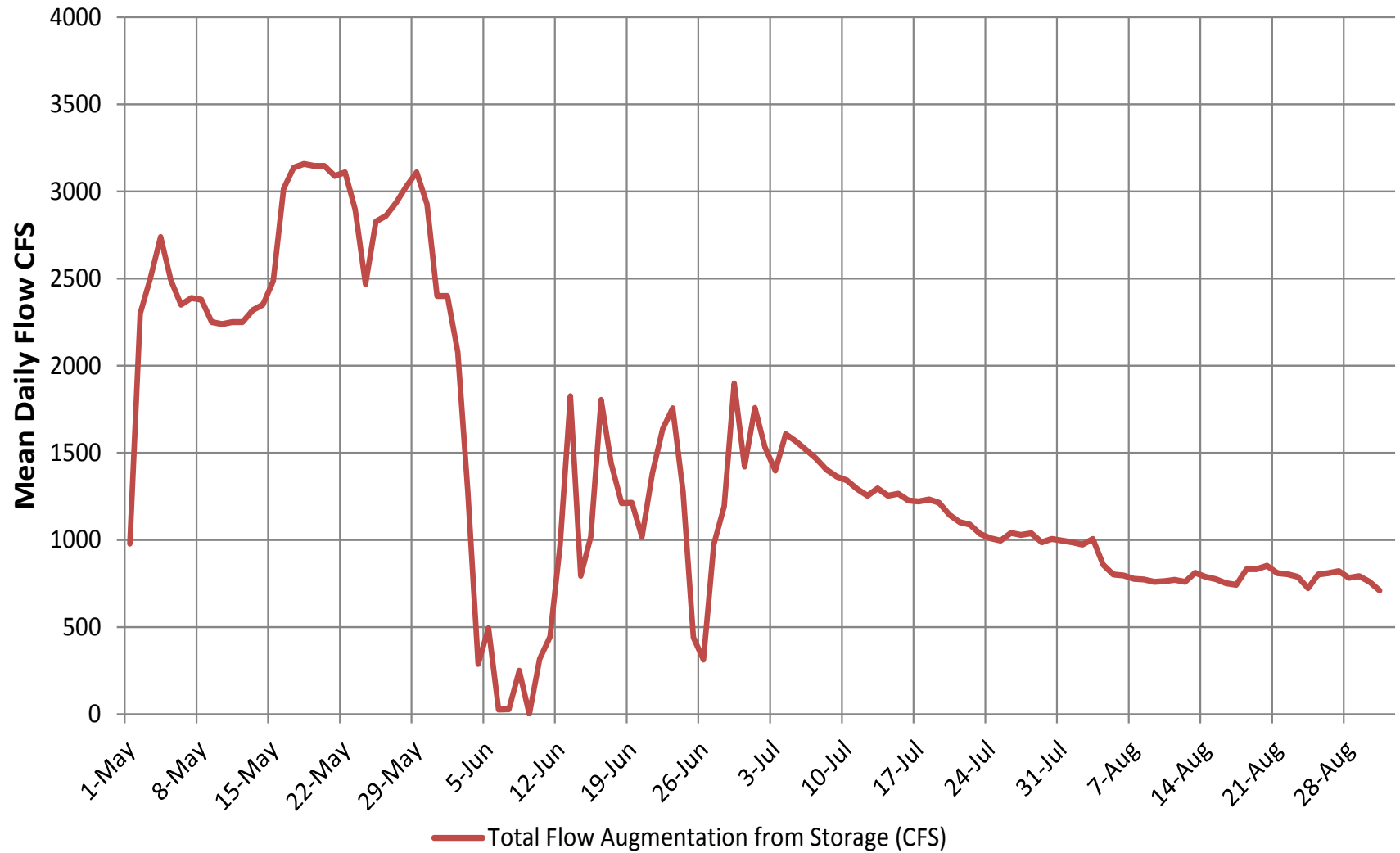
- Limited rental water available, especially from above Milner
- Forced to use large amount (83 kaf) of Palisades powerhead space
- Extraordinary action to use 33 kaf from Payette dedicated to minimum flows/pools

System and Source

<i>Upper Snake</i>		Released May 1 – June 4
WD01 rentals	60000	
Reclamation Space	94885	
<i>Natural Flows</i>		
Idaho	60000	
Skyline	17649	
<i>Payette</i>		Released Jun. 5 – Aug. 31
Reclamation Space	128554	
WD65 rentals	47067	
<i>Boise</i>		Released May 15 – May 30
Reclamation Space	18845	
WD63 rentals	0	
Total	427000	

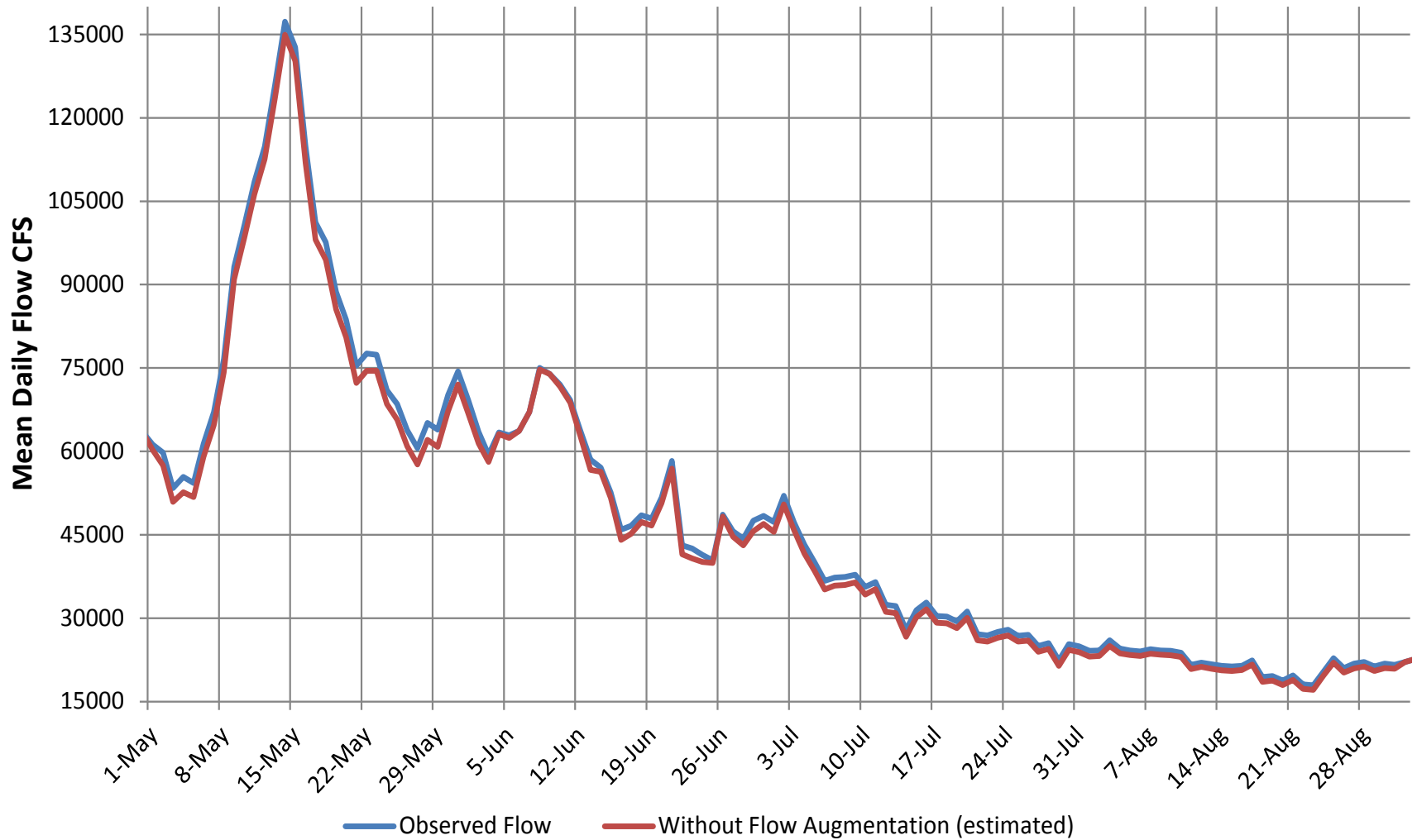
RECLAMATION

Upper Snake Flow Augmentation 2013



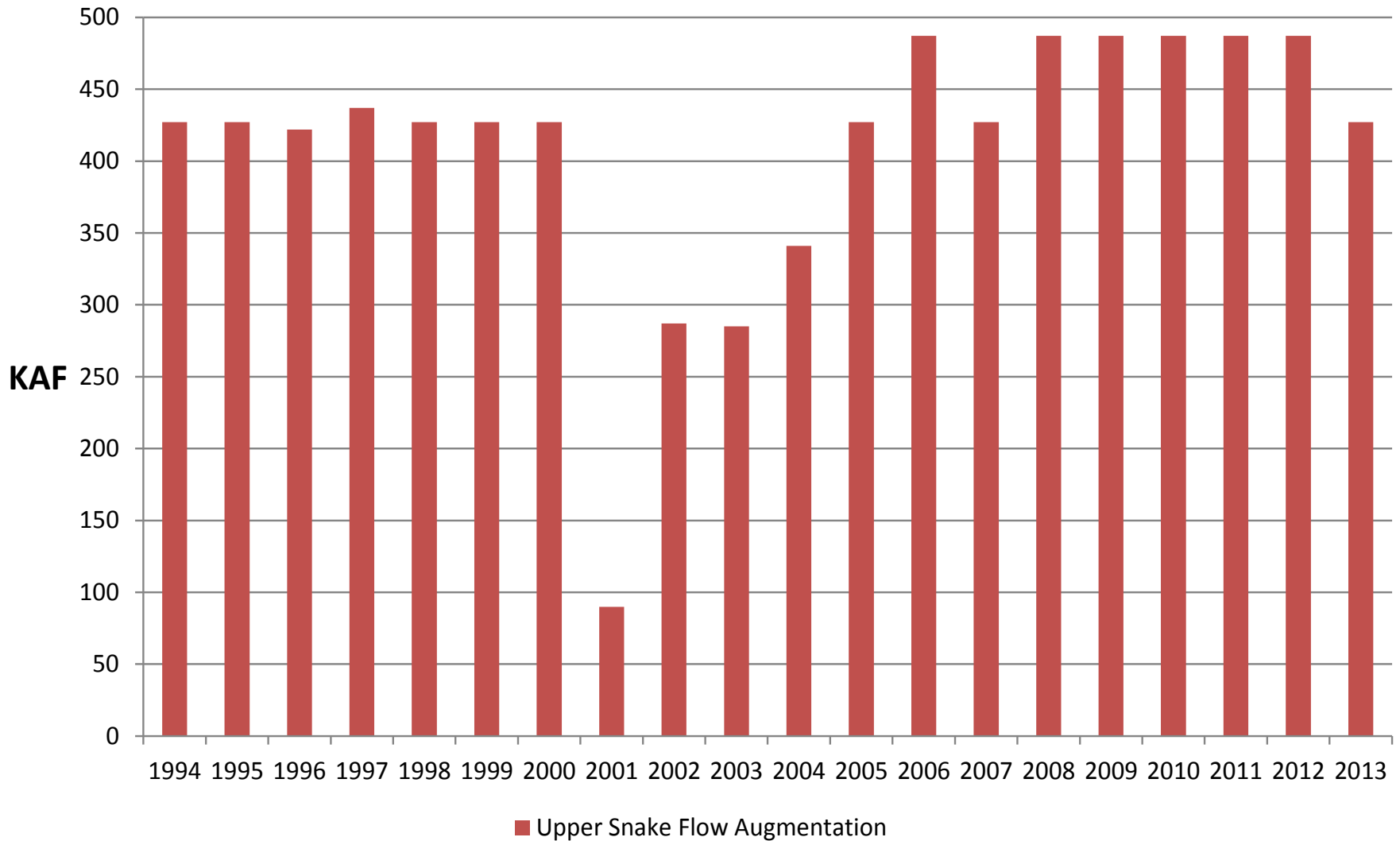
RECLAMATION

Snake River at Lower Granite 2012



RECLAMATION

Upper Snake Flow Augmentation



RECLAMATION

Winter 2013-2014 Climate Forecast



Kyle Dittmer

Hydrologist-Meteorologist

December 12th, 2013

TMT Annual Year-End-Review Meeting

Columbia River Inter-Tribal Fish Commission
Portland, Oregon

Columbia River Inter-Tribal Fish Commission - CRITFC



The screenshot shows the CRITFC website with a top navigation bar containing links for Jobs, Calendar, Donate, Contact, and Press Room. The main header features the CRITFC logo, the organization's name, the tagline "putting fish back in the rivers", and a search bar. Below the header is a secondary navigation bar with links for About CRITFC, Salmon Culture, Member Tribes, Blog, Buy Salmon, and social media icons for Twitter and Facebook. The main content area is divided into four columns: "FISH AND WATERSHEDS" (featuring an article on "Sharing Salmon Culture" with a photo of a person in traditional regalia), "TRIBAL TREATY FISHING RIGHTS" (featuring a photo of a waterfall), "EDUCATION" (featuring a "2013 Bonneville Fish Count" article), and "FISHER SERVICES". Below these are two more columns: "Currents" (featuring an article on "Tribal Restoration Efforts Paying Off" with a photo of fish in a ladder) and "Advocacy Issues" (featuring a "Resident Fish Consumption Advisory" article with a "CONSUMPTION ADVISORY" graphic). The footer contains five sections: CRITFC Home, CRITFC RESOURCES (Jobs, Calendar), RESEARCH (Scientific Reports, Data Resources), ACTIVITIES (Fisheries Management, Fish Restoration Projects), and CONNECT (Facebook, Twitter).



CRITFC website, <http://www.critfc.org>

2012-2013 Climate Forecast Performance



Month:	Temperature (mean monthly):	Avg. (20-yr)	Observed	Precipitation (% normal):	Avg. (20-yr)	Observed
November	Near Normal (-1.8 to + 1.8 degF)	1	3.4	Near Normal (90 - 110%)	92%	149%
December	Near Normal (-1.8 to + 1.8 degF)	1	2.1	Below Normal (70 - 90%)	86%	137%
January	Near Normal (-1.8 to + 1.8 degF)	1	-3.3	Near Normal (90 - 110%)	99%	75%
February	Near Normal (-1.8 to + 1.8 degF)	1	0.3	Below Normal (70 - 90%)	88%	32%
March	Near Normal (-1.8 to + 1.8 degF)	1	0.5	Near Normal (90 - 110%)	101%	41%
	average:	1	0.6	average:	93%	87%

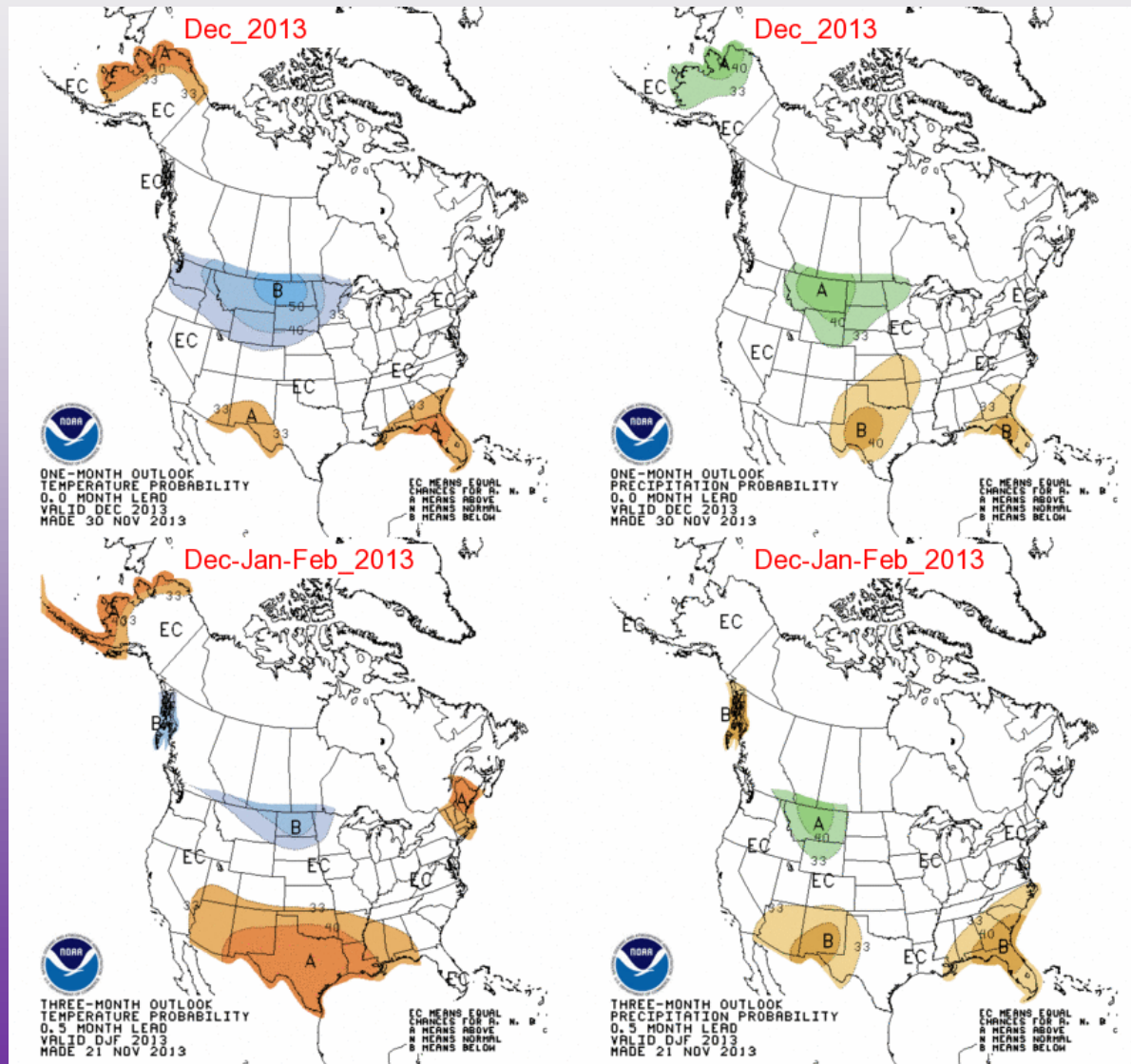
...but what about Snow events?!

Forecasted four events...1 to 2 inches each, December to early March.

Observed THREE snow events...1 inch seasonal total.

Water Supply Forecast (MEI method): Columbia R. at The Dalles, Jan.-July:
 102 MAF (issued Nov 2012), 95%. Observed: 97.7 MAF. Error $\pm 4\%$.
 102 MAF (issued April 2013), 95%. Observed: 97.7 MAF. Error $\pm 4\%$.

NOAA – CPC Forecast

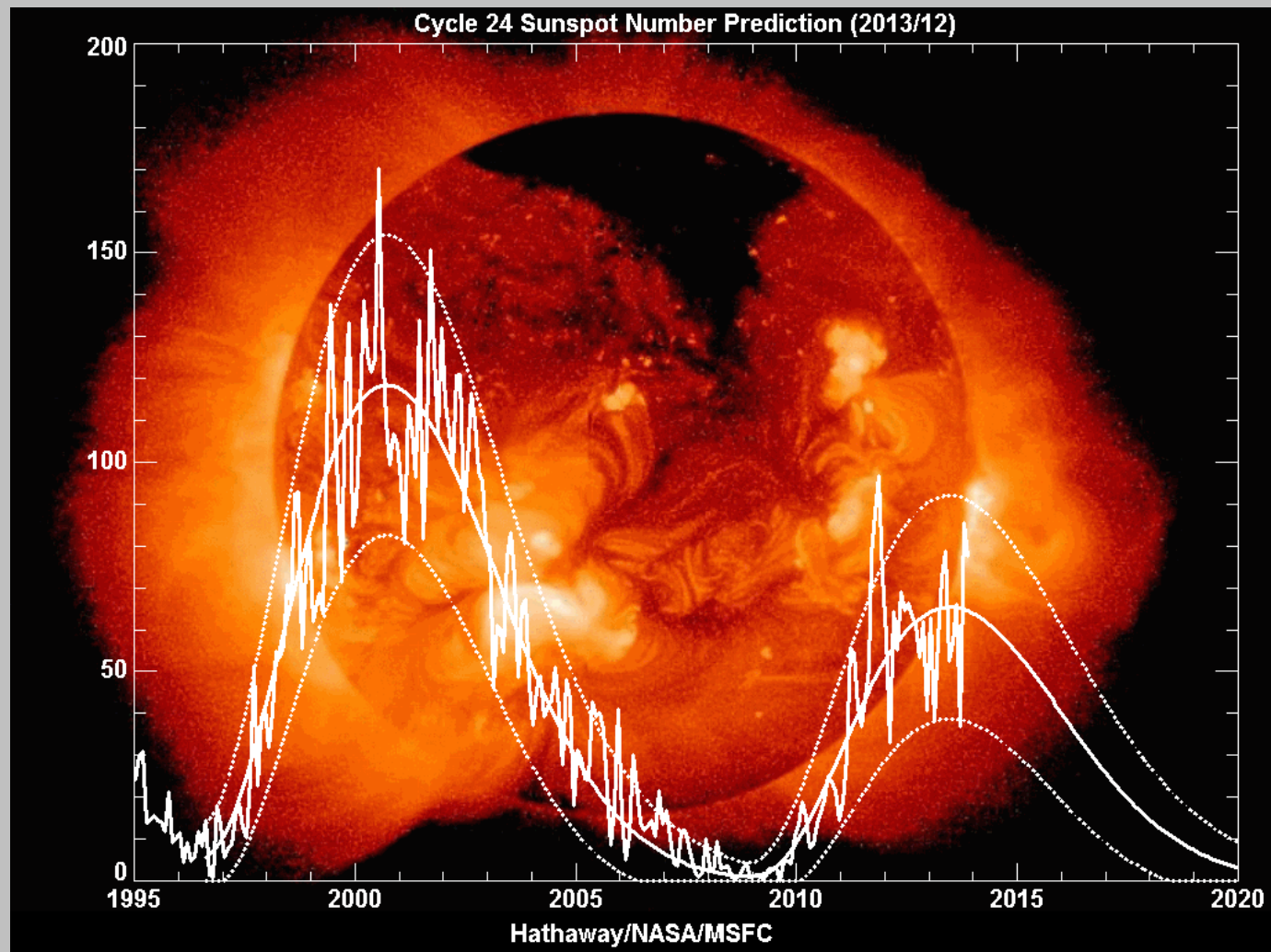




Introduction – Methods

- CRITFC forecast uses a holistic, integrated big picture view.
- Big-picture: **Solar Forcing** (e.g., sunspot cycles) does influence our global weather patterns. *In memoriam:* Dr. Landscheidt, 1922 – 2004, of Germany.
- Track ENSO with the Multi-variable ENSO Index: **MEI**.
- NOAA Sea-Surface Temperature Departure Forecasts.
- Hydro-Climate approach: Water year 2014 volume forecast uses regressed Multi-variable ENSO Index vs. historic runoff for the Columbia R. at The Dalles. Use a suite of 20 past water years.
- Select the “right” mixture of past years: 1949, 1952, 1953, 1957, 1958, 1960, 1961, 1962, **1964**, 1967, 1975, 1981, 1982, 1984, 1990, 1991, **1996**, 2002, 2006, and **2012**.
- Pattern recognition is key: ***ENSO-neutral*** and ***La Niña***.

SUNSPOT COUNTS – TREND TO “???”?

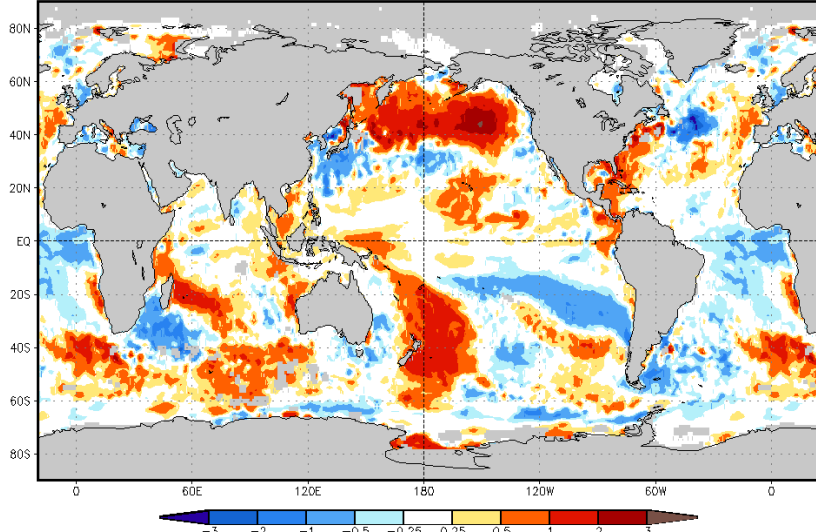


http://solarscience.msfc.nasa.gov/images/ssn_predict_l.gif

NOAA SEA SURFACE TEMPERATURES SUGGEST "????"

Dec 2013

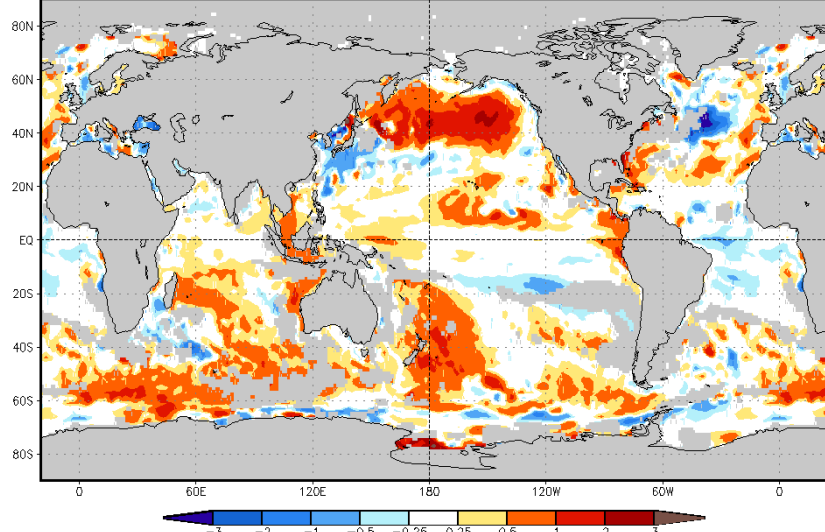
Initial conditions: 1Dec2013–10Dec2013



(Areas of expected skill less than 0.3 are shaded in grey.)

Jan 2014

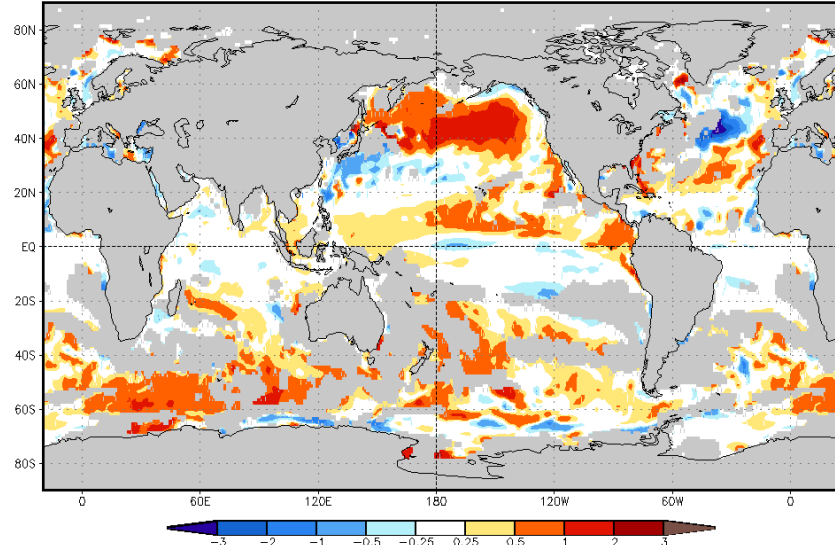
Initial conditions: 1Dec2013–10Dec2013



(Areas of expected skill less than 0.3 are shaded in grey.)

Feb 2014

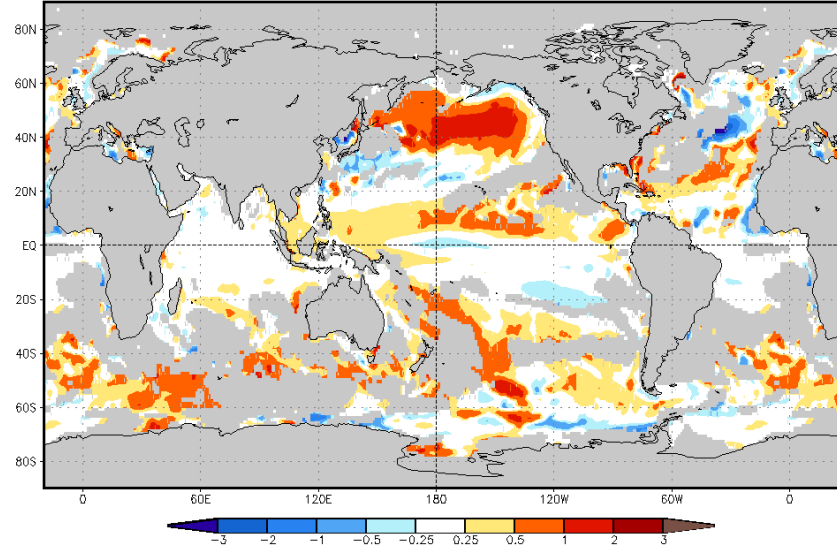
Initial conditions: 1Dec2013–10Dec2013



(Areas of expected skill less than 0.3 are shaded in grey.)

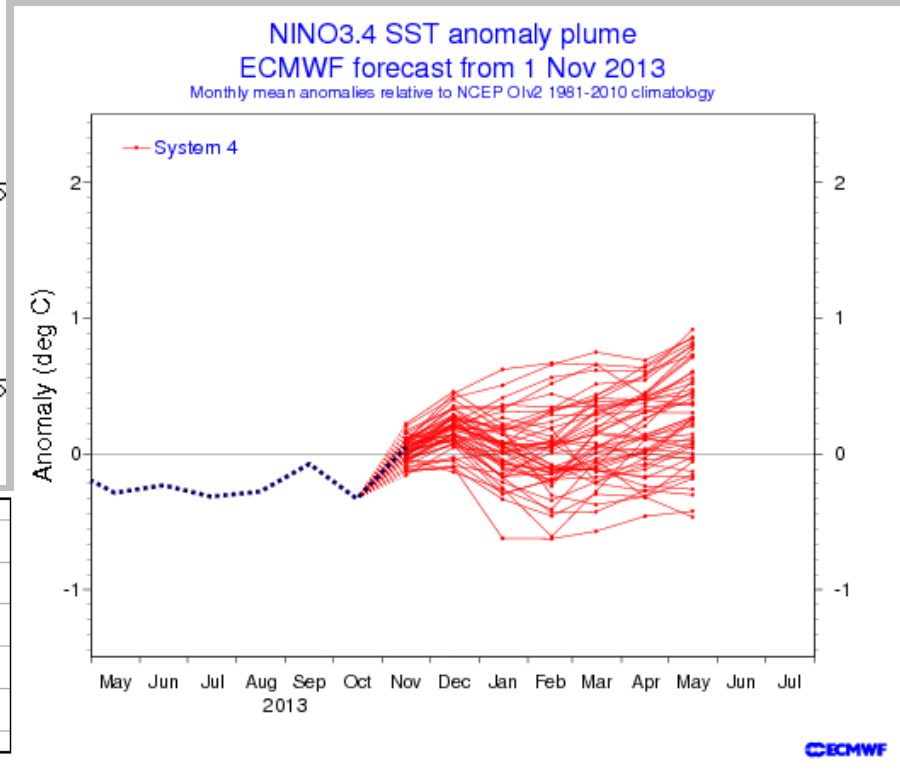
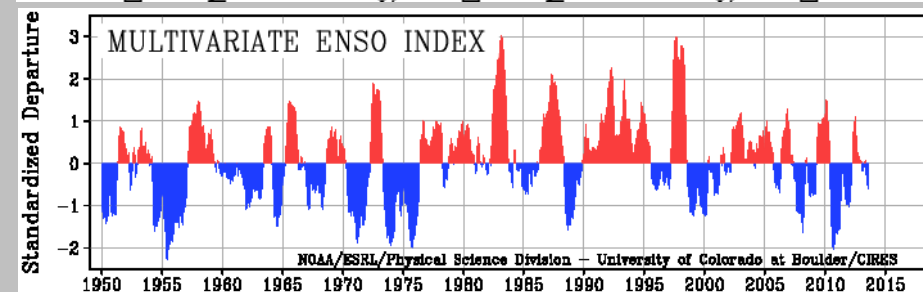
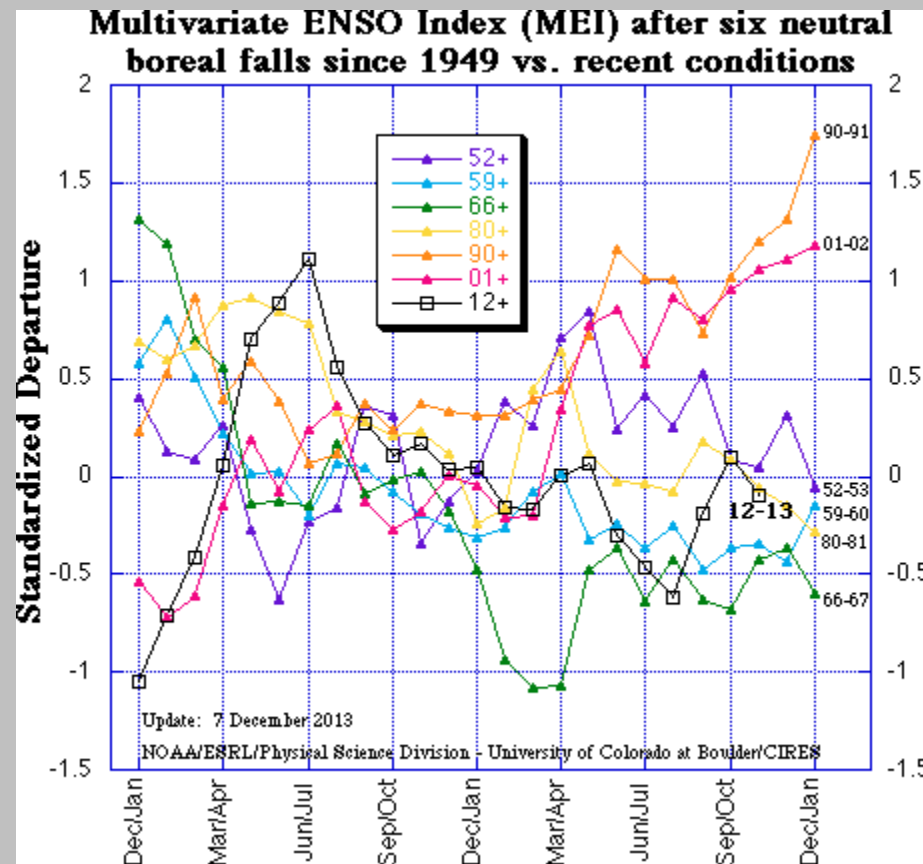
Mar 2014

Initial conditions: 1Dec2013–10Dec2013



(Areas of expected skill less than 0.3 are shaded in grey.)

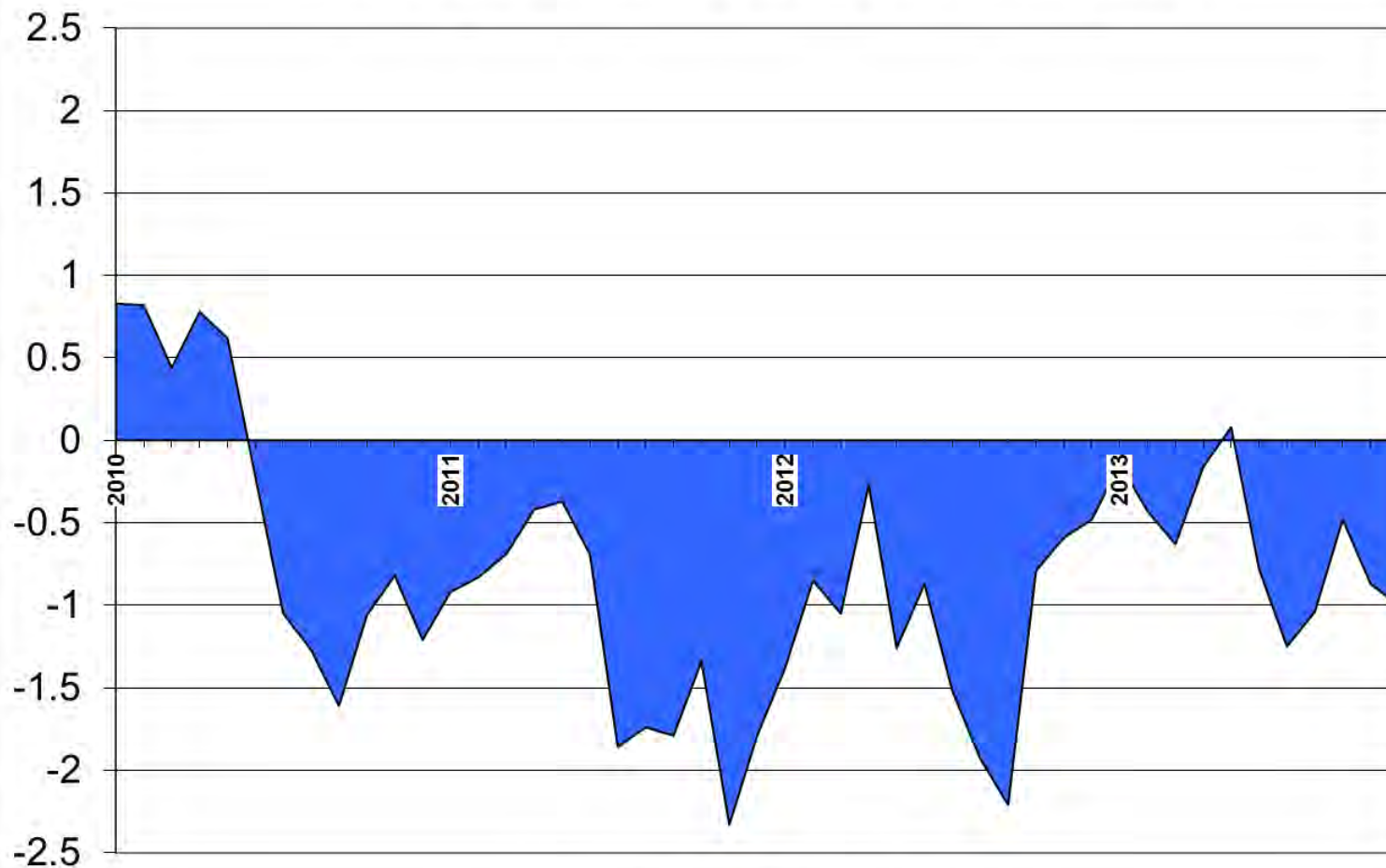
MEI SIGNAL SUGGESTS "ENSO-NEUTRAL" WINTER WEATHER



MEI tracks the Sea-Level Pressure, surface winds (2D), Sea-surface Temperature, Air Temperature, and fraction of Cloud cover.

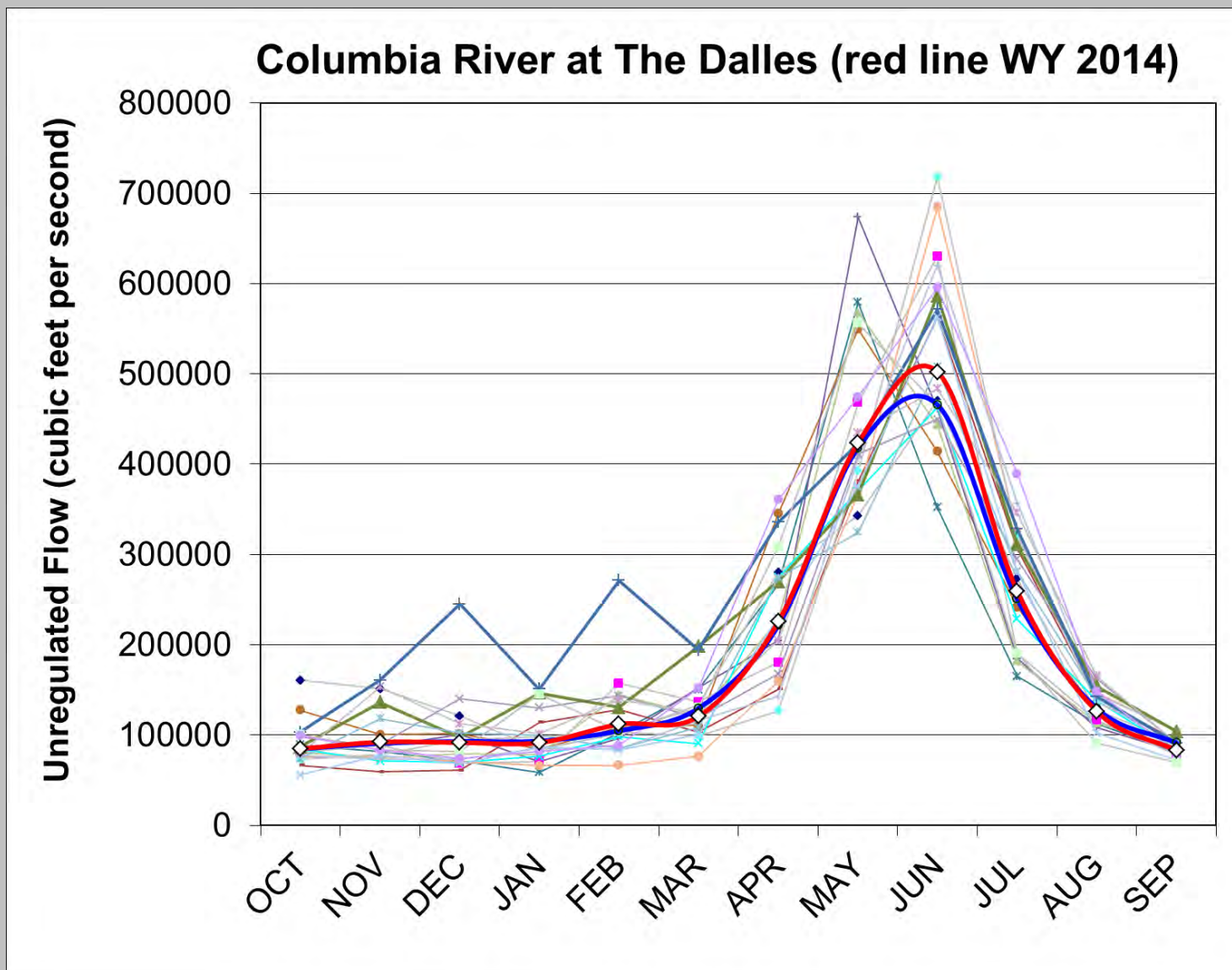
PDO SIGNAL...THE COLD PHASE CONTINUES

PACIFIC DECADAL OSCILLATION (PDO)



Source: UW-Climate Impacts Group

ENSEMBLE STREAMFLOW FORECAST



Blue line = long-term average (WY 1929-2013)



Summary: The Forecast

Month:	Temperature (mean monthly):	Avg. (20-yr)	Precipitation (% normal):	Avg. (20-yr)
November	Near Normal (-1.8 to + 1.8 degF)	1	Near Normal (90 - 110%)	102%
December	Near Normal (-1.8 to + 1.8 degF)	1	Below Normal (70 - 90%)	82%
January	Near Normal (-1.8 to + 1.8 degF)	1	Near Normal (90 - 110%)	100%
February	Near Normal (-1.8 to + 1.8 degF)	1	Near Normal (90 - 110%)	95%
March	Near Normal (-1.8 to + 1.8 degF)	1	Near Normal (90 - 110%)	103%

EXPECT HIGH VARIABILITY PLUS EXTREMES -- HEAVY RAIN EVENTS, DRY-SPELLS, FLOODS, etc. WATCH OUT FOR SPRING!

WATER SUPPLY FORECAST: **102 MAF** or 101%, COLUMBIA RIVER AT THE DALLES, JANUARY - JULY.

...but what about Snow events?!

Expect Four events...1 moderate (2-4 inch), 3 minor (1 inch)
(70% - 90% likely), December through mid-March.



Kootenai Basin Operations for 2013

Joel Fenolio, P.E.

Upper Columbia Senior Water Manager

Paul Wagner

NOAA Fisheries

Dave Wills

USFWS

Seattle District

12 Dec 13



US Army Corps of Engineers
BUILDING STRONG®



2012 Summary

- June highlighted by atypical conditions as unprecedented rains drove inflows, and seasonal water supply, sharply upwards.
 - ▶ Precipitation ranged from 200 to 400 percent of average throughout the Kootenai Basin.
 - ▶ Total Apr-Aug Inflow volume was 9.2 MAF (156% of average)
 - The May forecast was off by 28%
 - ▶ The Libby Dam forebay elevation reached a record peak of 2459.95 feet
 - ▶ The peak stage of Kootenay Lake at Queens Bay was 1753.8 feet—the highest since Libby Dam was completed.



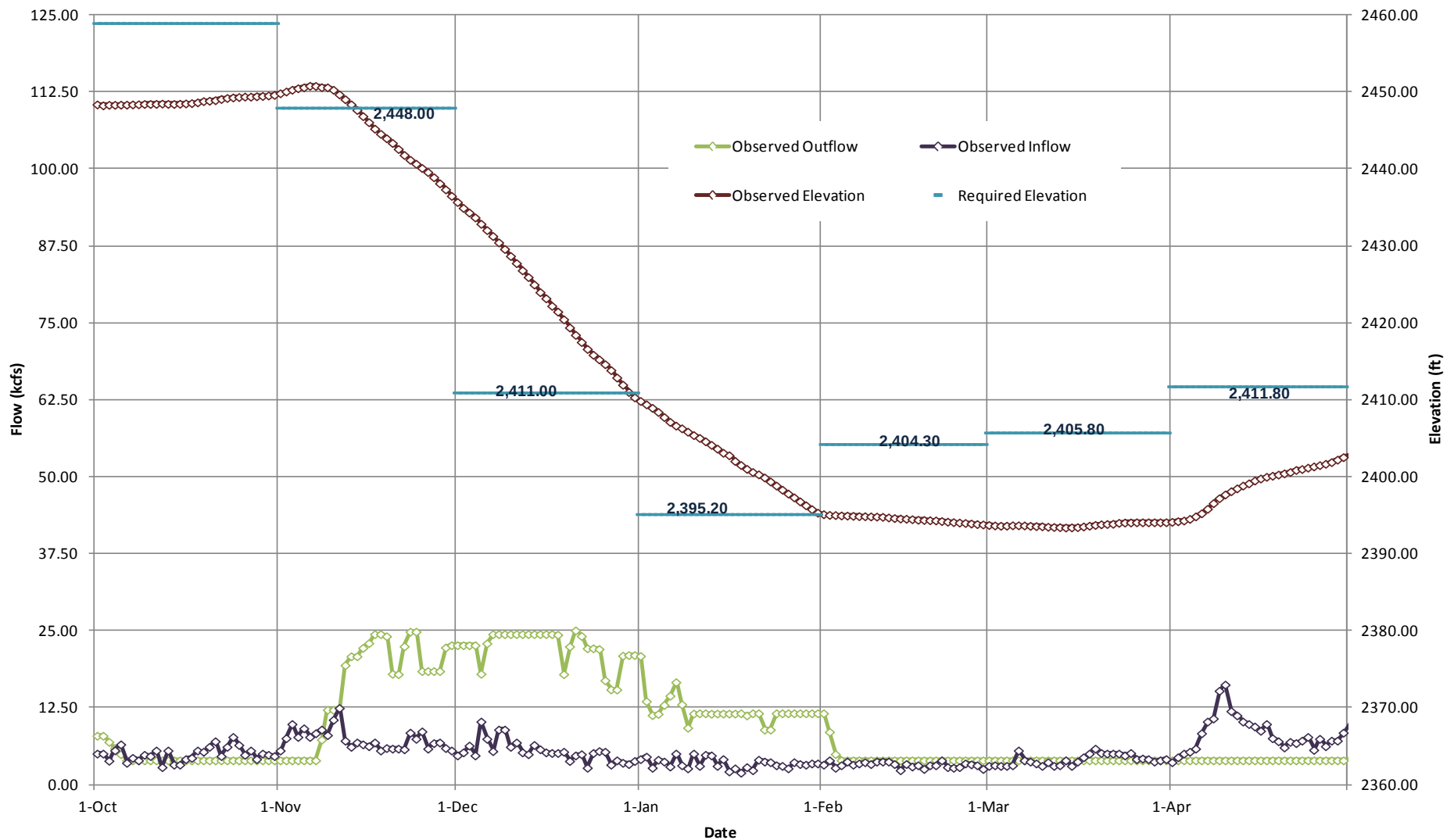
BiOp Operations

- The two main operational goals for this year, outside of flood control were
 - ▶ Sturgeon Flows double peak per May USFWS SOR
 - ▶ Coordination for reduced outflows in Sept – Nov to support KTOI habitat project



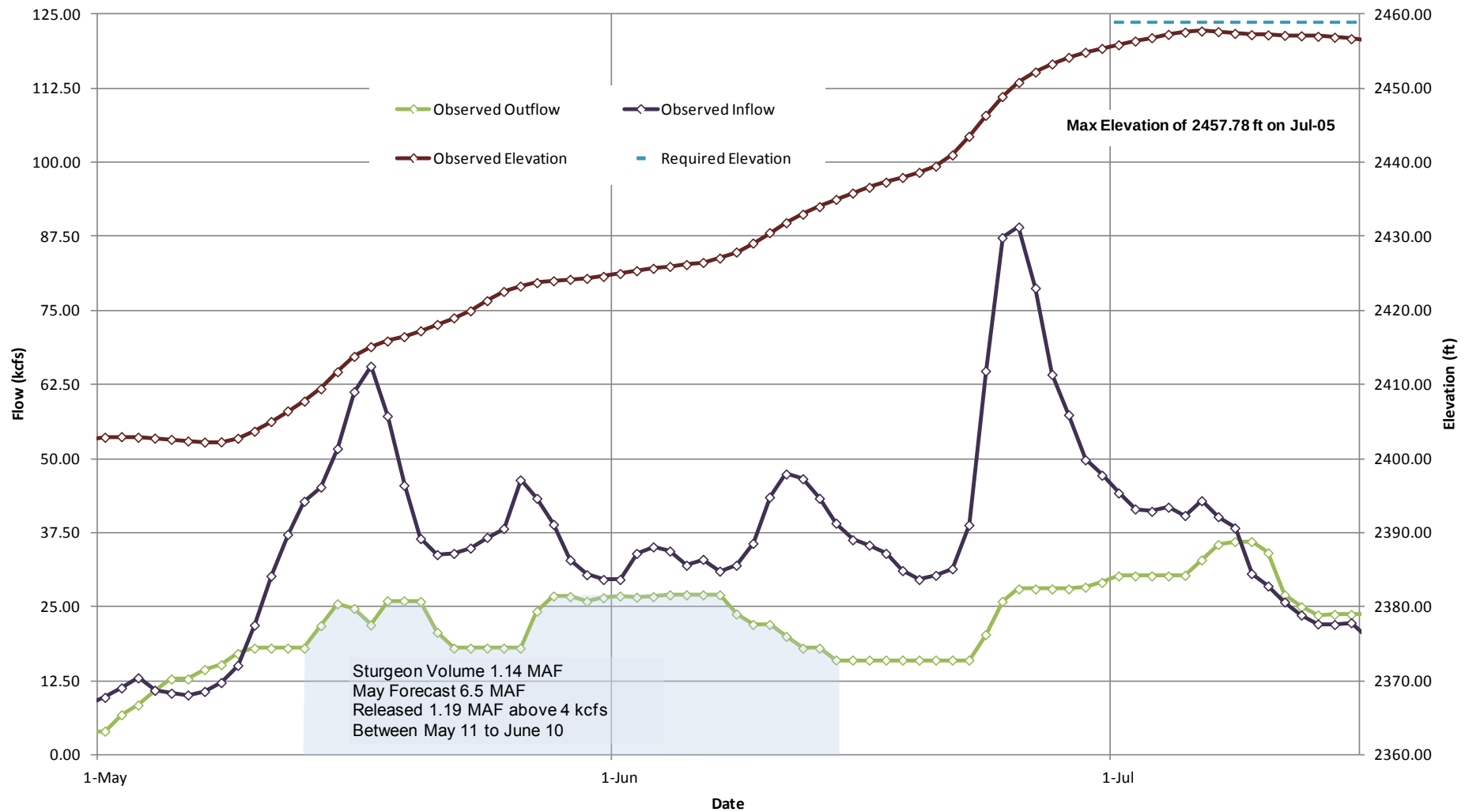
Lake Koocanusa Operations Oct 1 - Apr 30

Water Year 2013



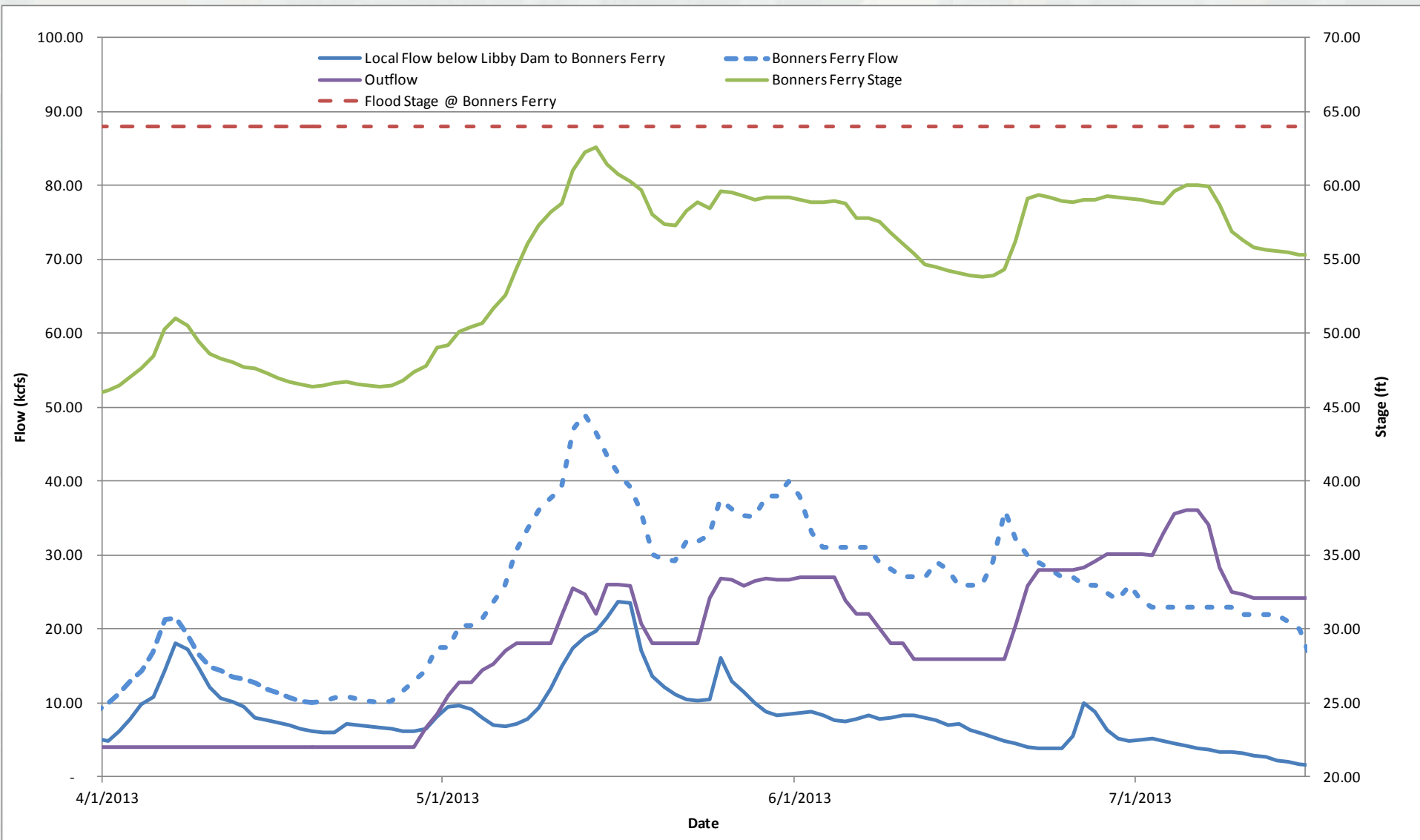
Lake Koocanusa Operations Apr 1 - Jul 15

Water Year 2013

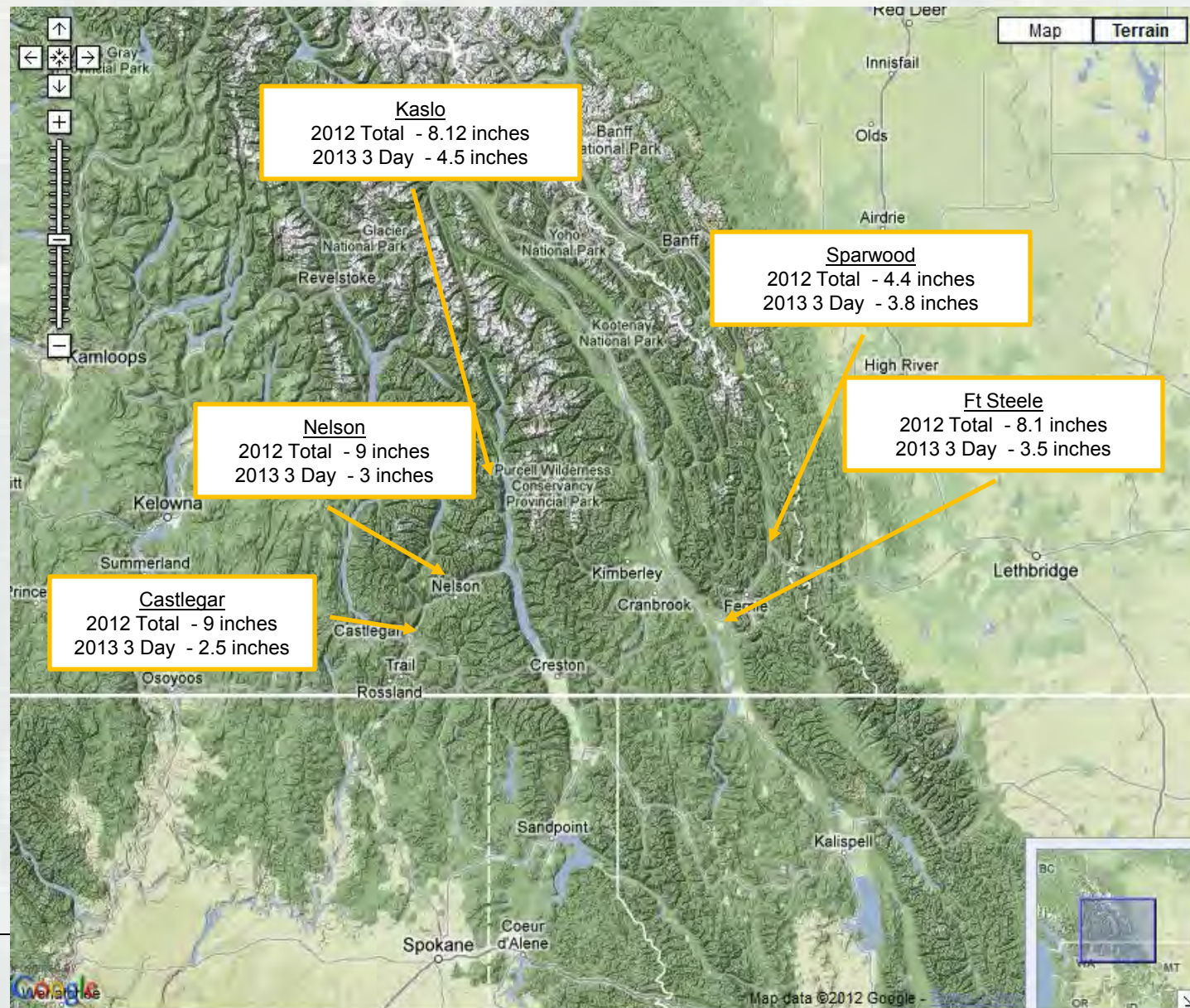


Bonnerr's Ferry Flows and Stage

Apr 1 – Jul 15

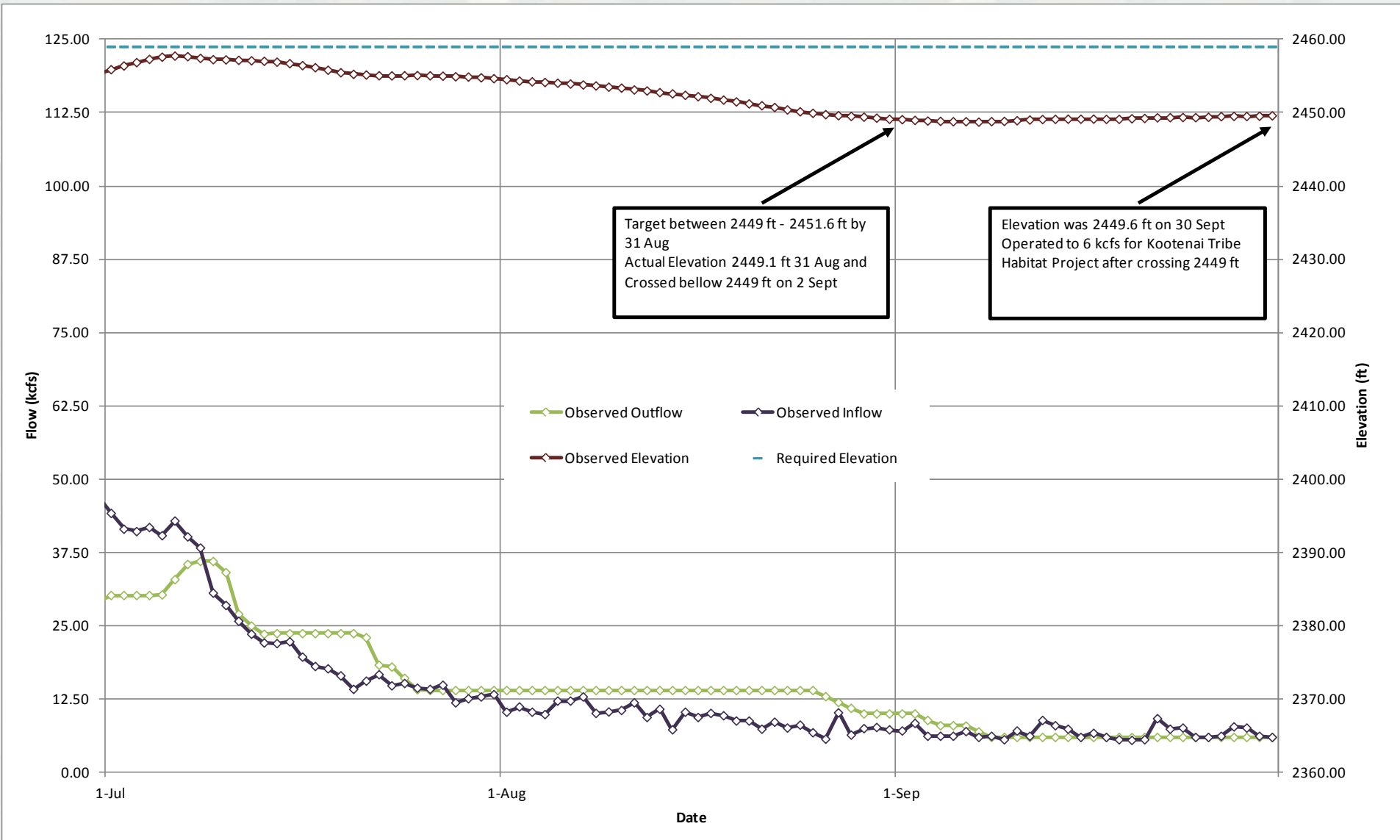


June 2013 Precipitation June 18 to 20

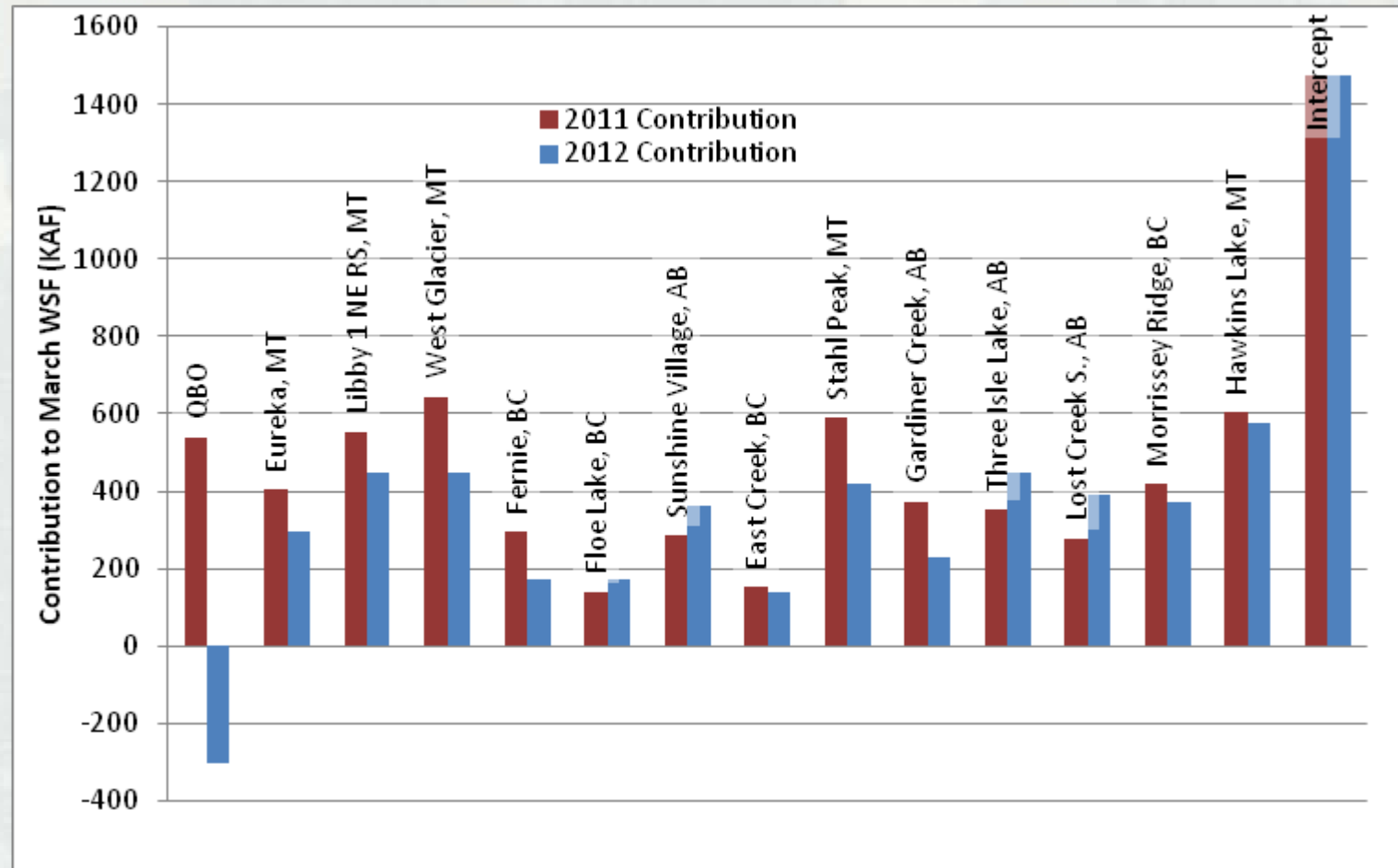


Lake Koocanusa Operations Jul 01 - Sept 30

Water Year 2013



Libby Dam Forecast Update – Why?



Snake River Temperature Augmentation FY13 Operations Review

Reservoir Regulation, CENWW



US Army Corps of Engineers
BUILDING STRONG[®]



LOWER GRANITE LOCK & DAM



LGNW
TDG STATION



LADDER TEMP #1

LADDER TEMP #5



THERMISTER
STRING



DATA COLLECTION STATIONS USED IN MODELING

SNAKE RIVER BELOW LOWER
GRANITE (LNGW)

LOWER GRANITE
LOCK & DAM

SILCOTT ISLAND
WEATHER

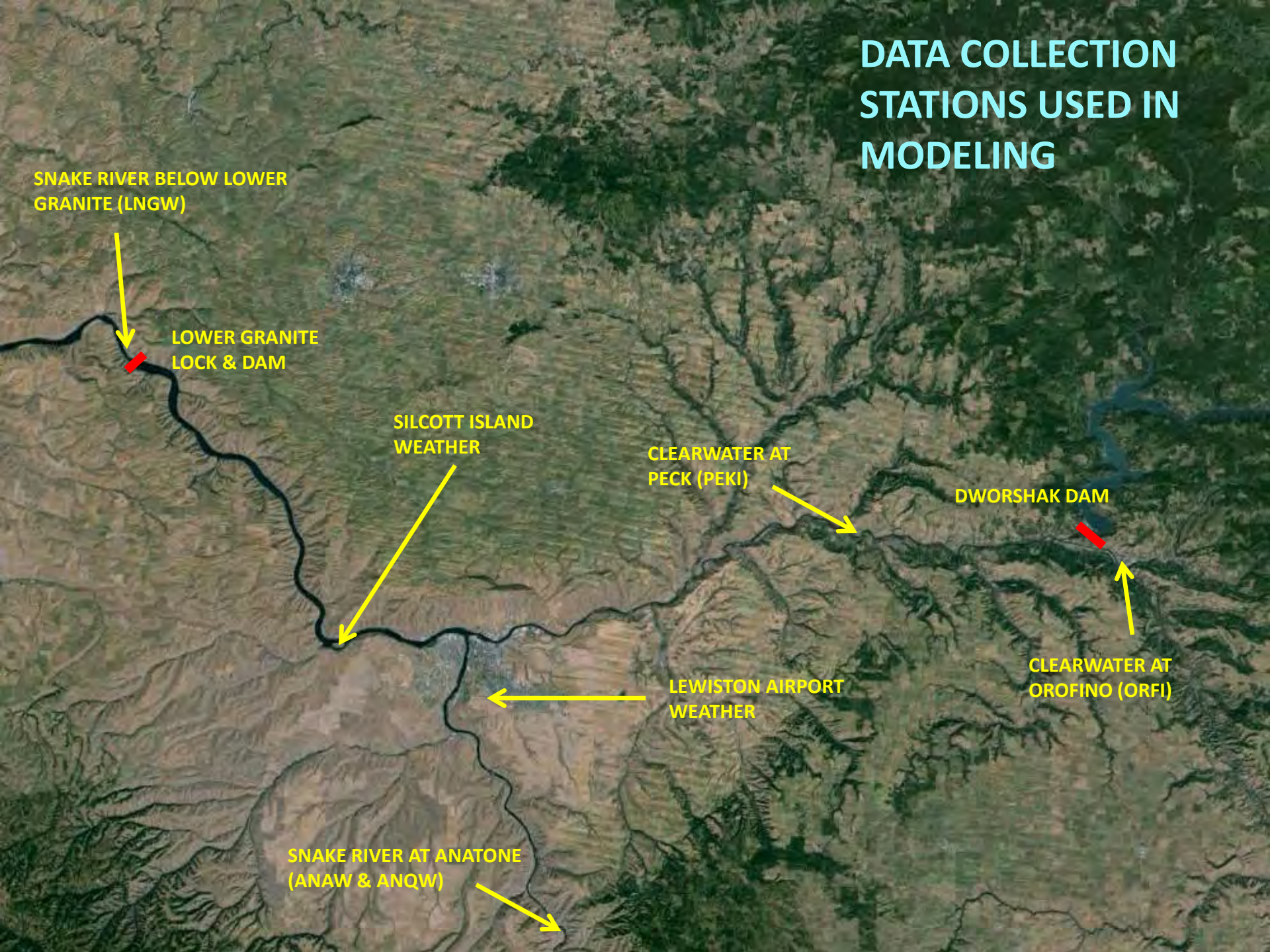
CLEARWATER AT
PECK (PEKI)

DWORSHAK DAM

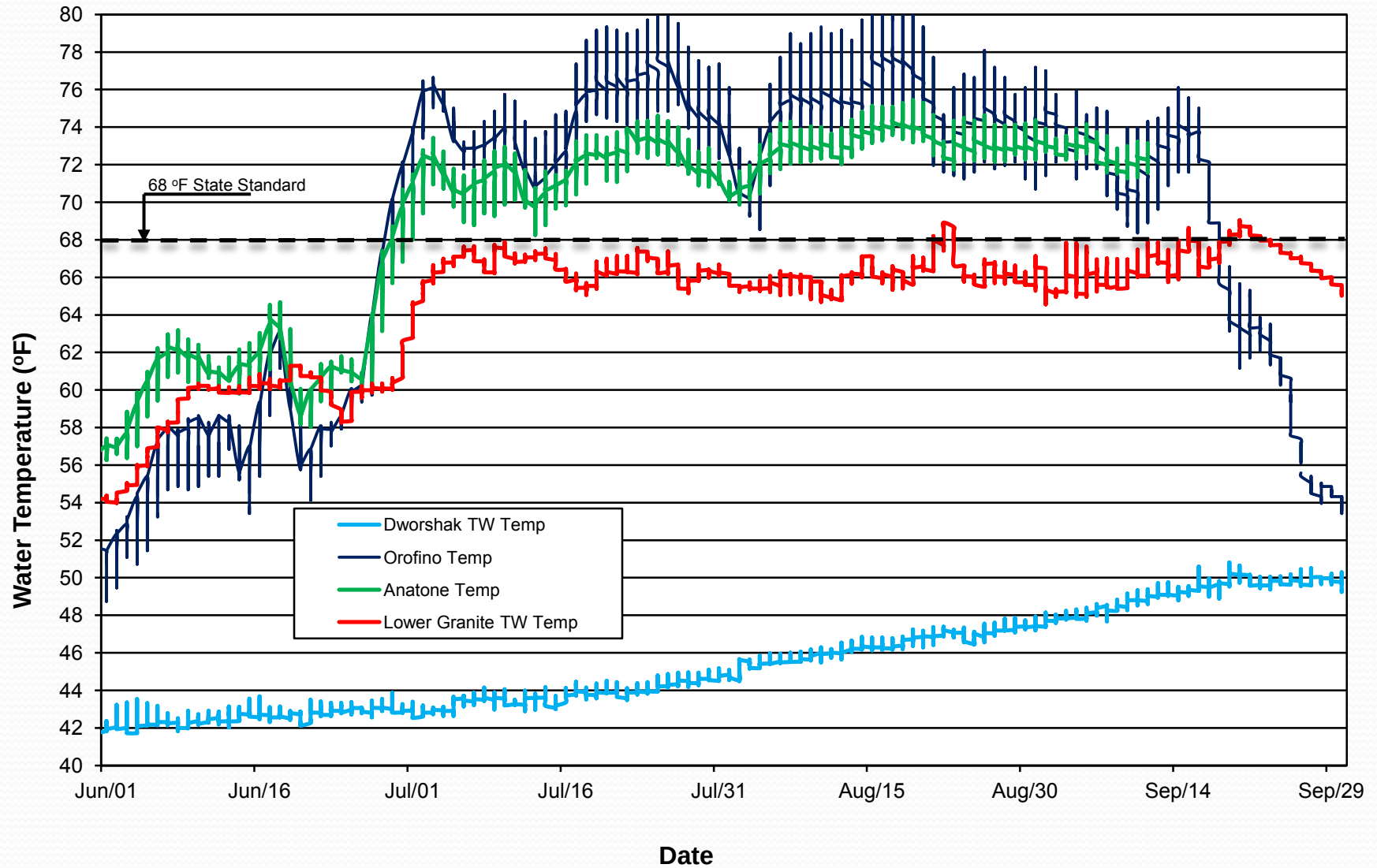
CLEARWATER AT
OROFINO (ORFI)

LEWISTON AIRPORT
WEATHER

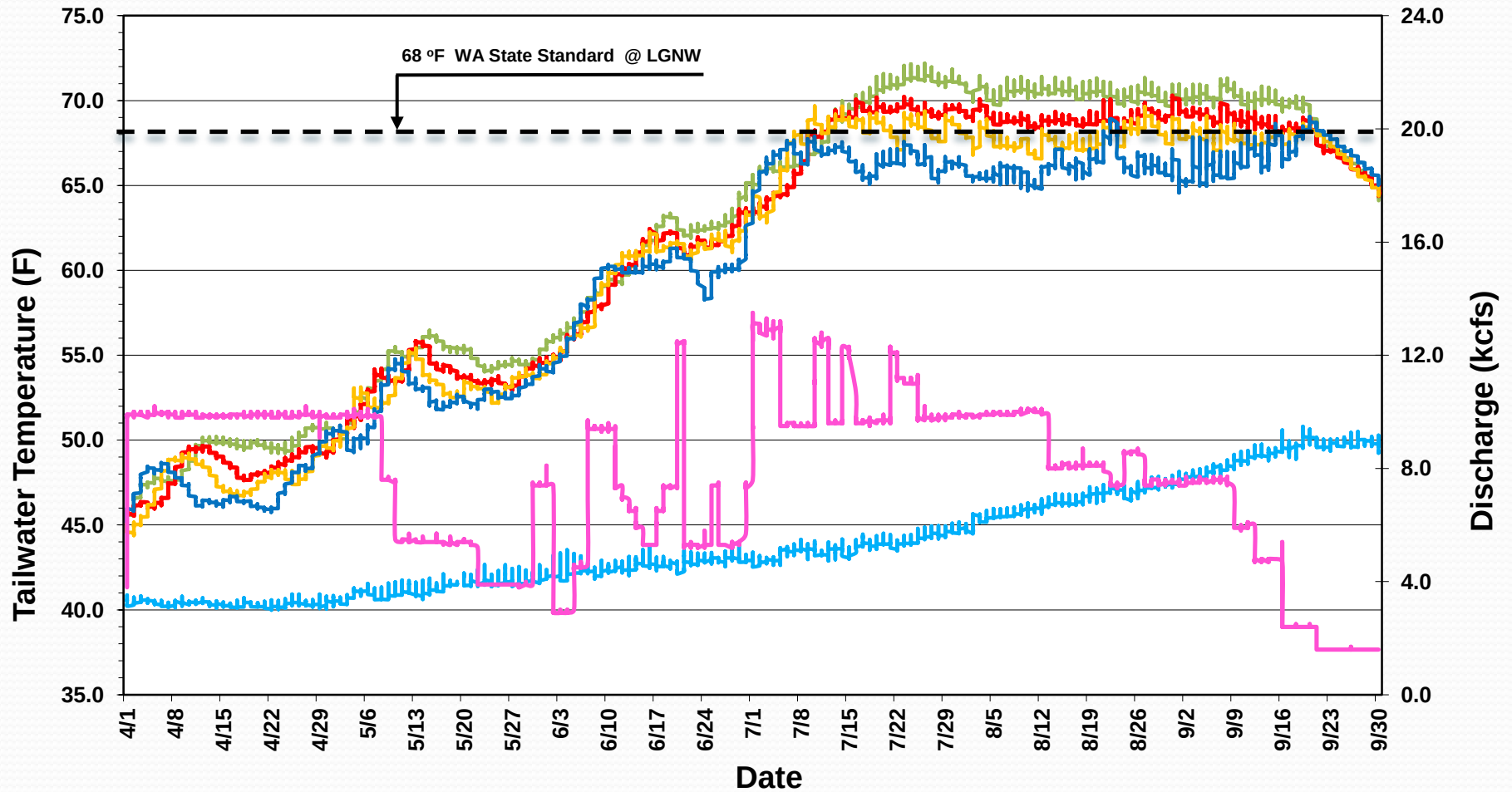
SNAKE RIVER AT ANATONE
(ANAW & ANQW)



Snake River Temperature Augmentation



Snake River Temperature Operations



Ice Harbor

Lower Monumental

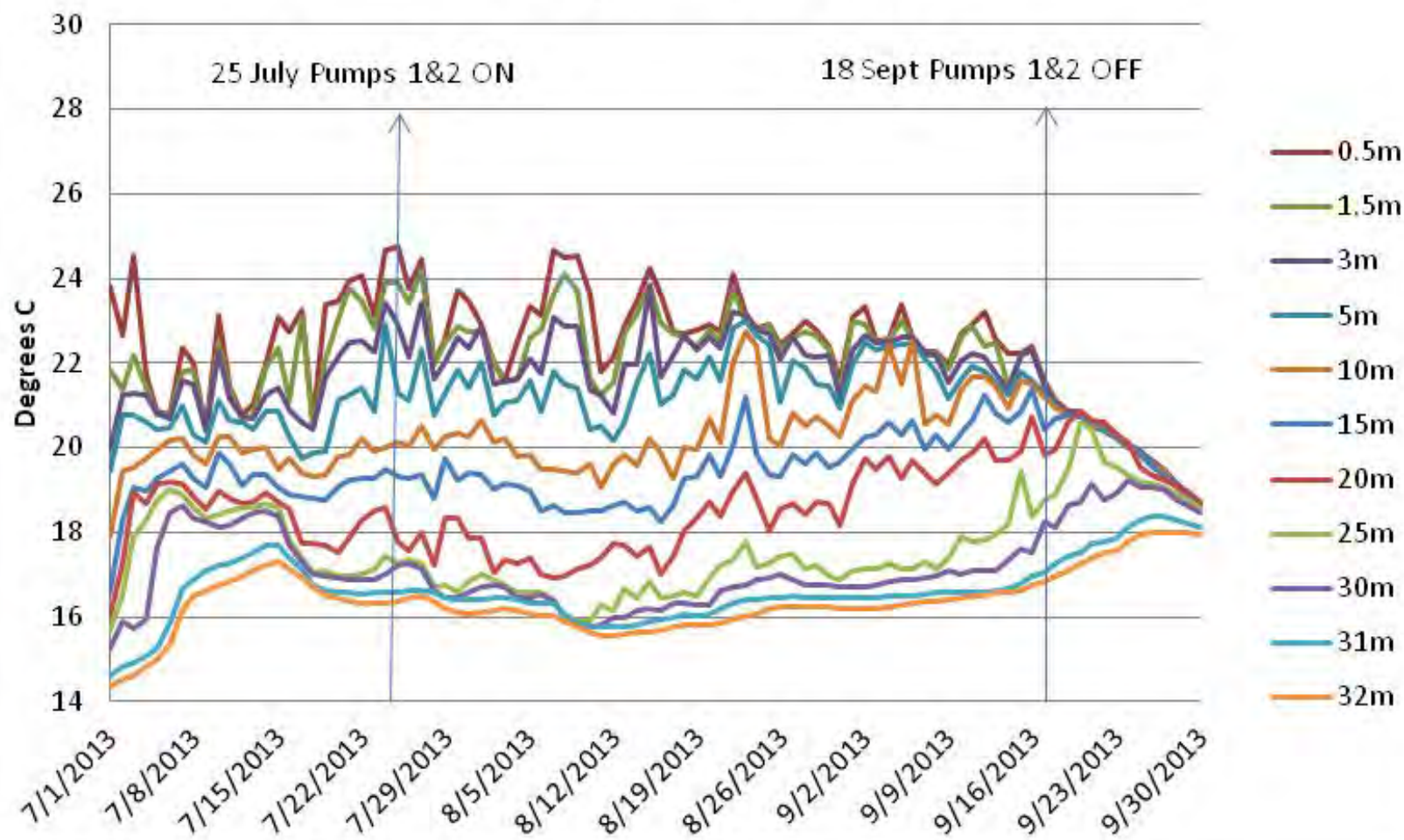
Little Goose

Lower Granite Tail Water Temp in F

Dworshak Temperature in F

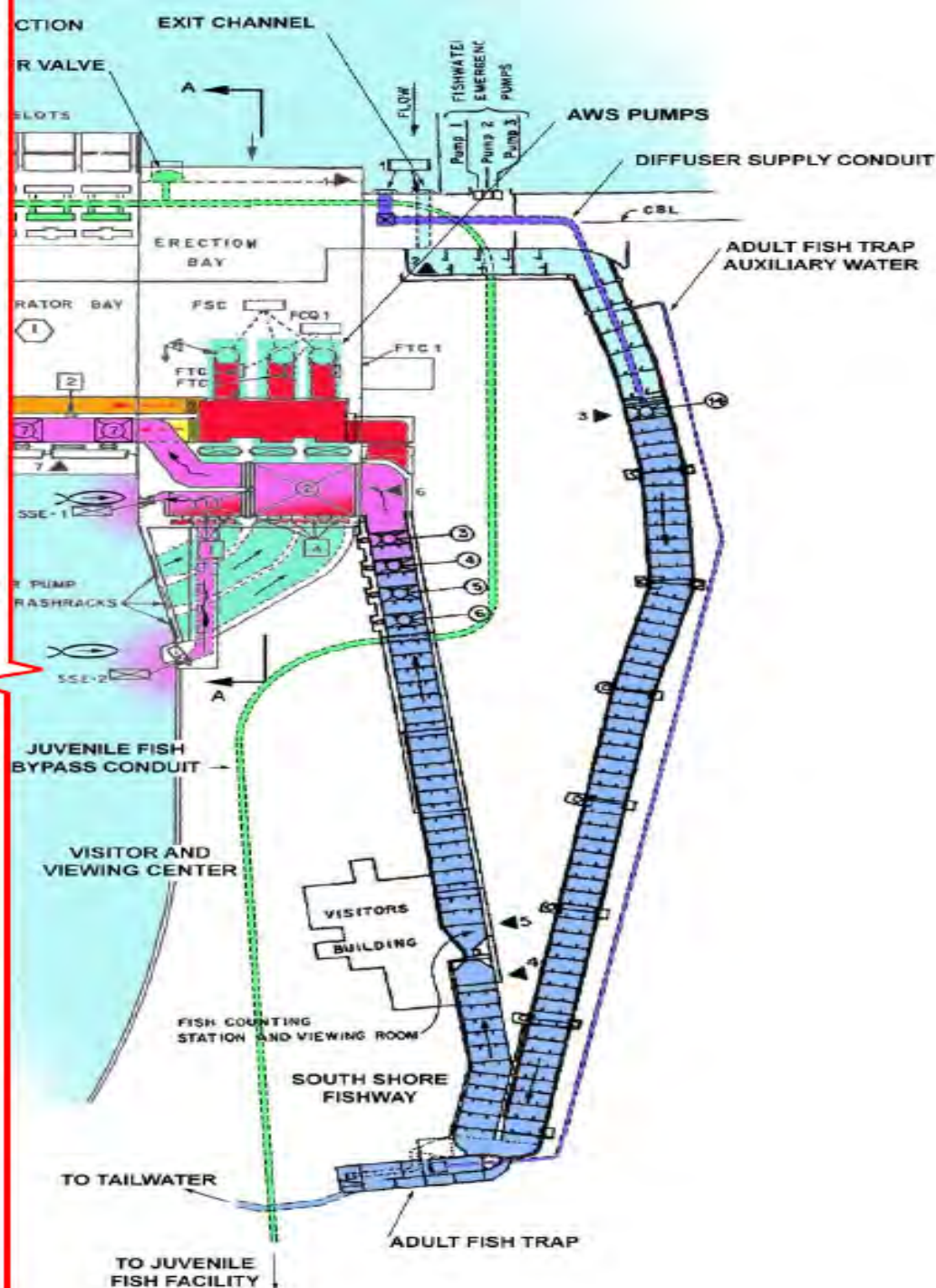
Dworshak Discharge in Kcfs

Lower Granite Forebay Temperature String 1 July-30 September 2013



Lower Granite Fish Ladder Temp





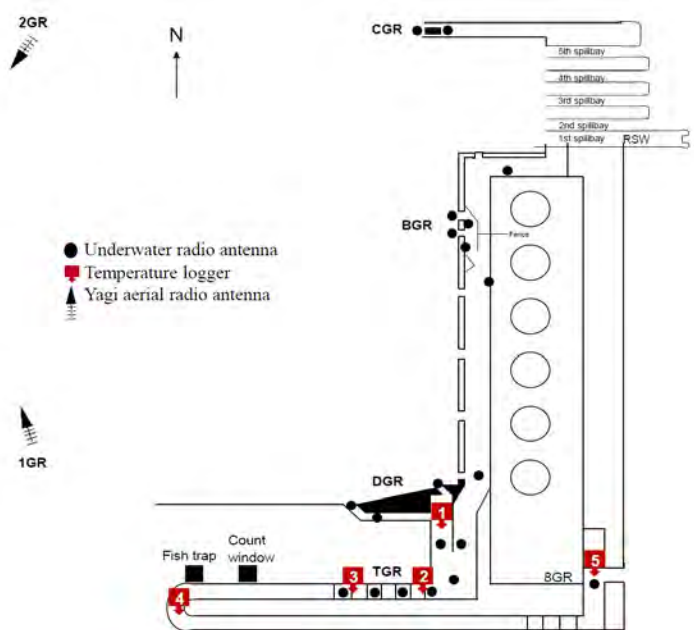


Figure 1. Location of water temperature loggers and radiotelemetry antennas deployed inside the Lower Granite Dam fishway in 2013. (Not to scale.)

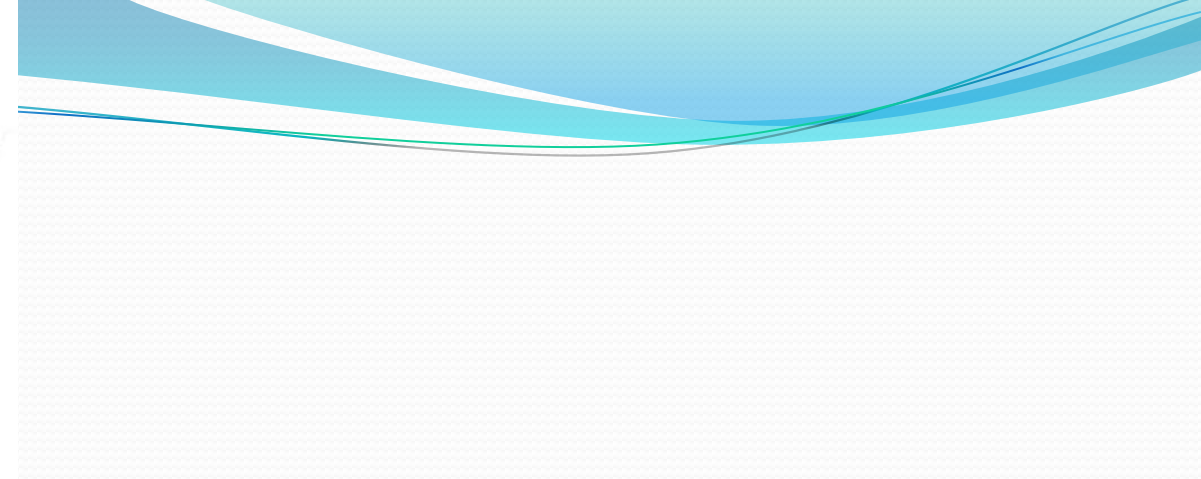
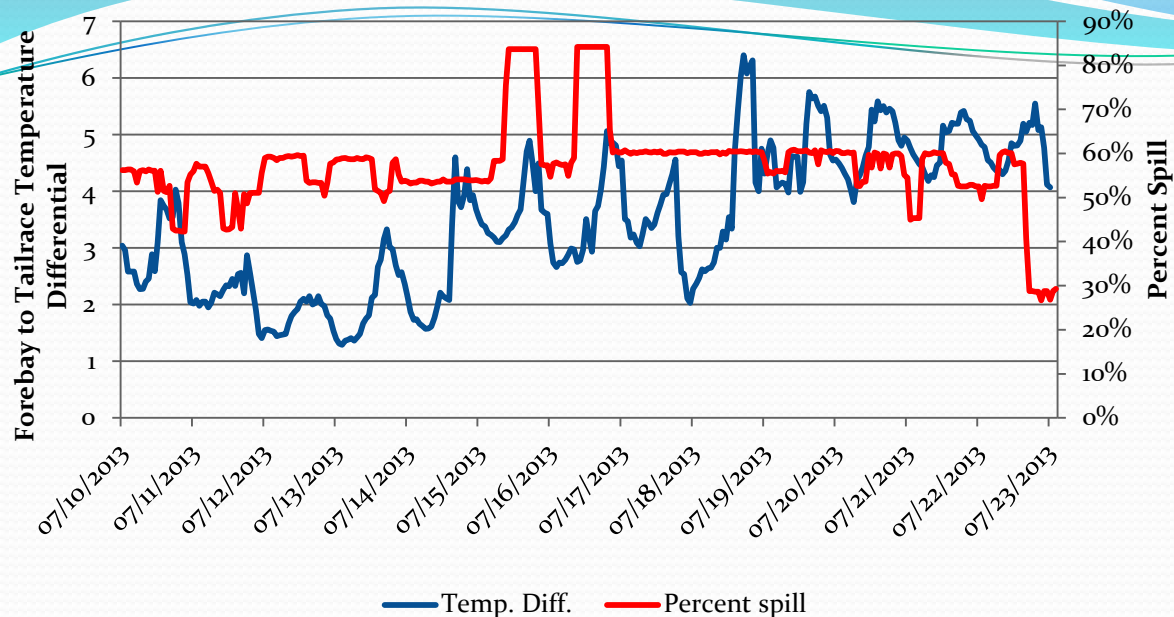
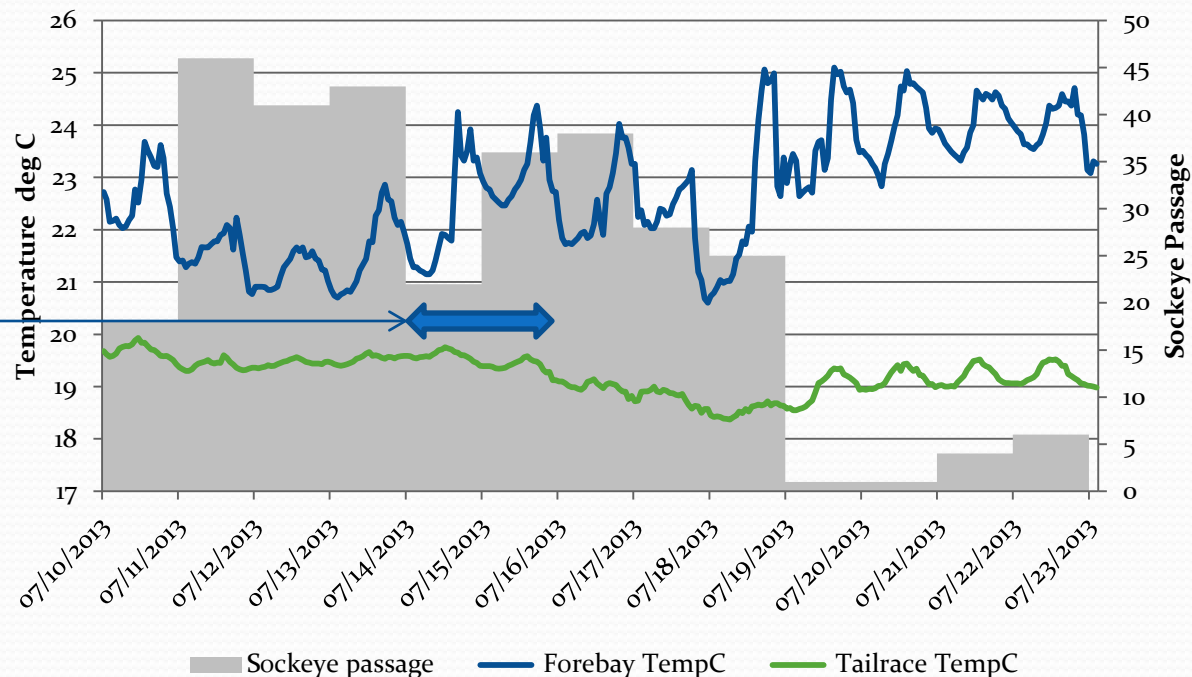


Figure 3. Daily average water temperatures at the five monitored locations in the Lower Granite Dam fish ladder in 2013 (black lines) and at the water quality monitoring site (red line).



7/14-15/2013 hydraulic survey for new outfall placement:
 7/14 TU2, 50% spill split
 7/15 SS5kcfs TU5, 27 kcfs spill



01 JUL 2013



FLOW
09.5
KCFS

DWK TOTAL FLOW

1599.6
DWK ELEVATION

76 F
75 F
74 F
73 F
72 F
71 F
70 F
69 F
68 F
67 F
66 F

ANQW

FLOW
36.4
KCFS

FLOW ANQW



61 F
60 F
59 F
58 F
57 F
56 F
55 F
54 F
53 F
52 F
51 F

PEKI

MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

THERMOCLINE

PUMP 1 & 2 OFF

72.1
67.8
64.6
62.2
62.2
60.9
60.4
59.4

730.0
720.0
710.0
700.0
690.0
680.0
670.0
660.0
650.0
640.0

#5 LADDER TEMP

66.6

#1 LADDER TEMP

64.6

FOREBAY
THERMISTERS
STRING

LOWER GRANITE

FLOW
18.4
KCFS

LWG SPILL

FLOW
29.4
KCFS

LWG
POWER HOUSE

71 F
70 F
69 F
68 F
67 F
66 F
65 F
64 F
63 F
62 F
61 F



08 JUL 2013



FLOW
09.6
KCFS

DWK TOTAL FLOW

1593.0
DWK ELEVATION

76 F
75 F
74 F
73 F
72 F
71 F
70 F
69 F
68 F
67 F
66 F

ANQW

FLOW
21.4
KCFS

FLOW ANQW



6
60 F
59 F
58 F
57 F
56 F
55 F
54 F
53 F
52 F
51 F

PEKI

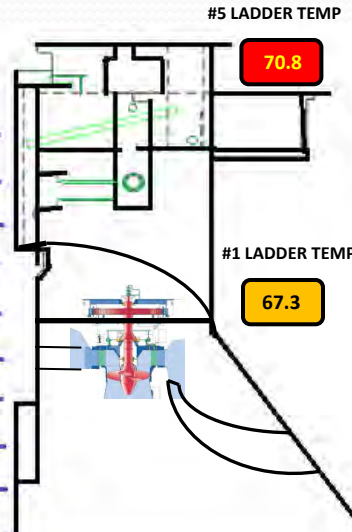
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

THERMOCLINE

PUMP 1 & 2 OFF

72.6	730.0
70.8	720.0
68.6	710.0
68.1	700.0
	690.0
66.5	680.0
	670.0
65.9	660.0
64.5	650.0
61.6	640.0

FOREBAY
THERMISTER
STRING



LOWER GRANITE

FLOW
18.7
KCFS

LWG SPILL

FLOW
18.3
KCFS

LWG
POWER HOUSE

71 F
70 F
69 F
68 F
67 F
66 F
65 F
64 F
63 F
62 F
61 F



15 JUL 2013



FLOW
12.1
KCFS

DWK TOTAL FLOW

1586.2
DWK ELEVATION

76 F
75 F
74 F
73 F
72 F
71 F
70 F
69 F
68 F
67 F
66 F



FLOW
17.4
KCFS

FLOW ANQW

61 F
60 F
59 F
58 F
57 F
56 F
55 F
54 F
53 F
52 F
51 F

PEKI

MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 OFF

#5 LADDER TEMP

71.9

#1 LADDER TEMP

64.6

THERMOCLINE

73.2
71.7
70.3
69.5
67.8
65.6
65.4
64.9

730.0
720.0
710.0
700.0
690.0
680.0
670.0
660.0
650.0
640.0

FOREBAY
THERMISTER
STRING

LOWER GRANITE

FLOW
18.7
KCFS

LWG SPILL

FLOW
18.3
KCFS

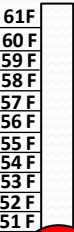
LWG
POWER HOUSE

71 F
70 F
69 F
68 F
67 F
66 F
65 F
64 F
63 F
62 F
61 F

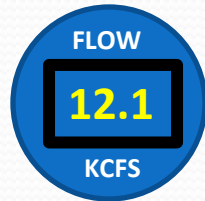


LGNW

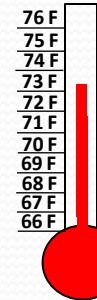
22 JUL 2013



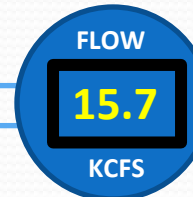
PEKI



DWK TOTAL FLOW



ANQW

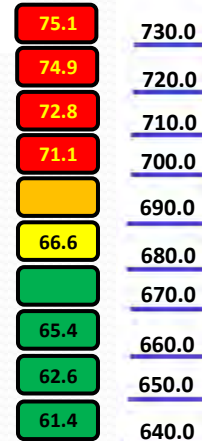


FLOW ANQW



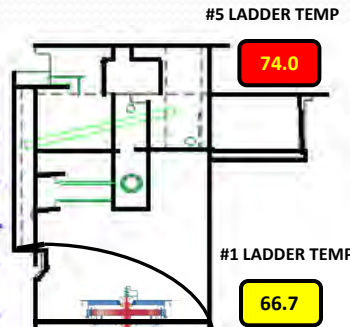
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

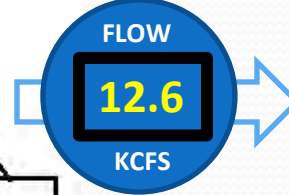
FOREBAY
THERMISTER
STRING



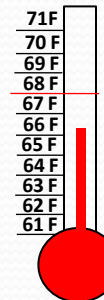
LOWER GRANITE



LWG SPILL

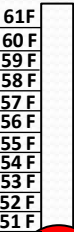


LWG
POWER HOUSE



LGNW

29 JUL 2013



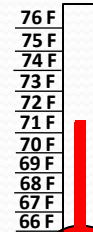
PEKI



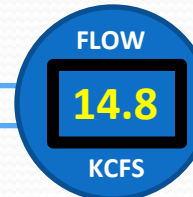
DWK TOTAL FLOW



DWK ELEVATION



ANQW

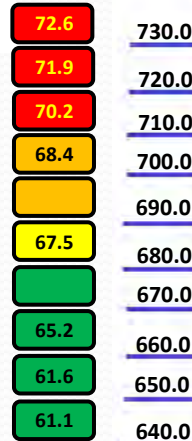


FLOW ANQW

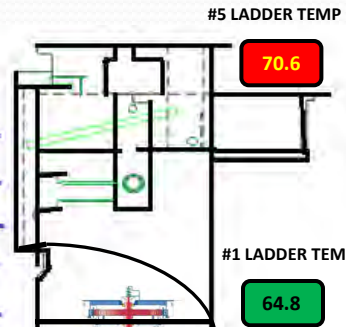


MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

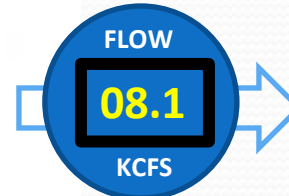
PUMP 1 & 2 ON



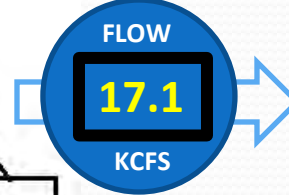
FOREBAY
THERMISTERS
STRING



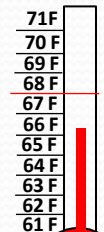
LOWER GRANITE



LWG SPILL



LWG
POWER HOUSE



LGNW

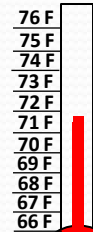
05 AUG 2013



FLOW
09.9
KCFS

DWK TOTAL FLOW

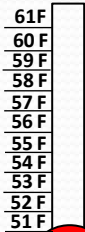
1563.2
DWK ELEVATION



ANQW

FLOW
13.9
KCFS

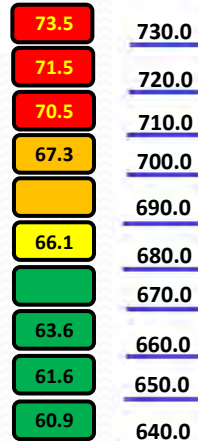
FLOW ANQW



PEKI

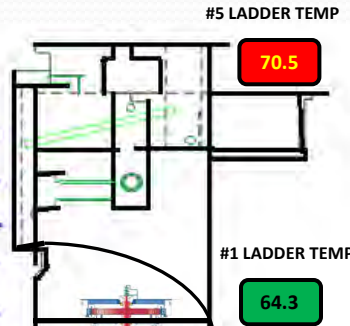
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



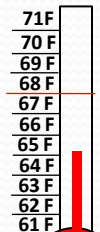
LOWER GRANITE

FLOW
07.1
KCFS

LWG SPILL

FLOW
17.0
KCFS

LWG
POWER HOUSE



LGNW

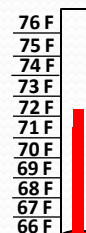
12 AUG 2013



FLOW
10.1
KCFS

DWK TOTAL FLOW

1554.7
DWK ELEVATION



ANQW

FLOW
13.0
KCFS

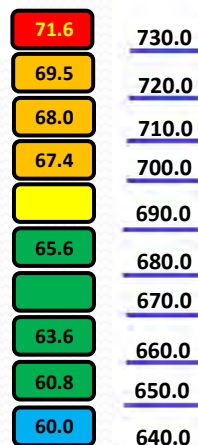
FLOW ANQW



PEKI

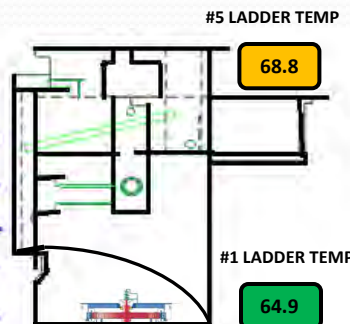
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



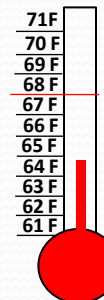
LOWER GRANITE

FLOW
12.4
KCFS

LWG SPILL

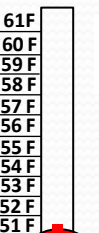
FLOW
08.7
KCFS

LWG
POWER HOUSE



LGNW

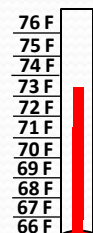
19 AUG 2013



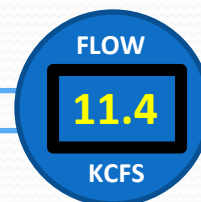
PEKI



DWK TOTAL FLOW



ANQW



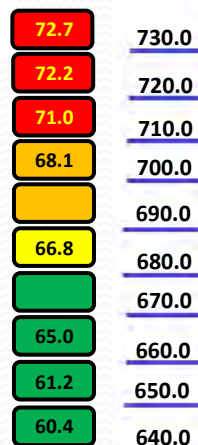
FLOW ANQW



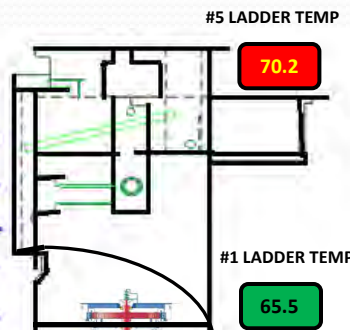
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON

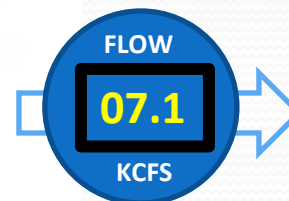
THERMOCLINE



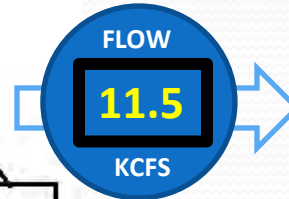
FOREBAY
THERMISTER
STRING



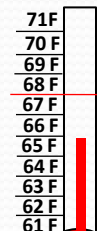
LOWER GRANITE



LWG SPILL

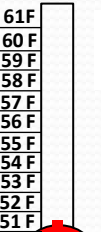


LWG
POWER HOUSE



LGNW

23 AUG 2013



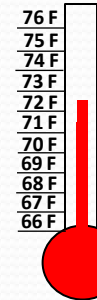
PEKI



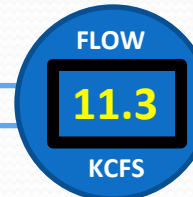
DWK TOTAL FLOW



DWK ELEVATION



ANQW

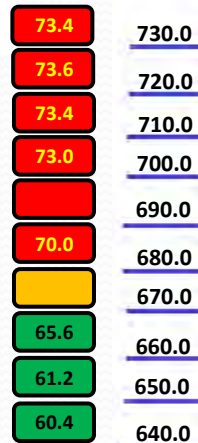


FLOW ANQW

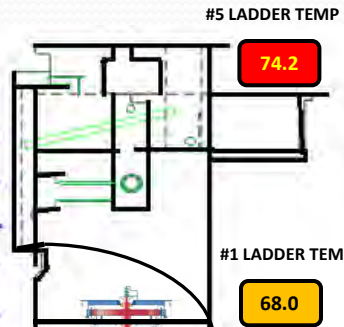


MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



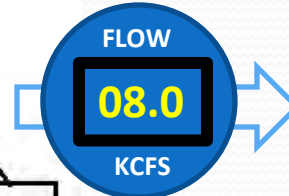
FOREBAY
THERMISTERS
STRING



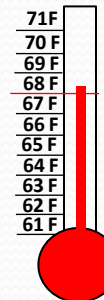
LOWER GRANITE



LWG SPILL



LWG
POWER HOUSE



LGNW

THERMOCLINE

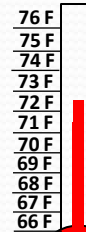
23 AUG 2013



FLOW
07.4
KCFS

DWK TOTAL FLOW

1543.5
DWK ELEVATION



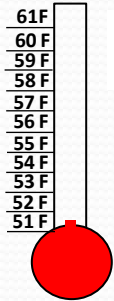
ANQW

FLOW
11.3
KCFS

FLOW ANQW



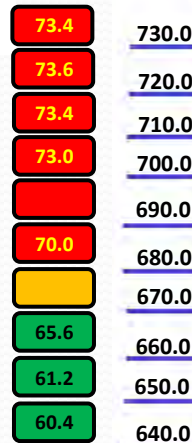
TEMPERATURE
ALERT



PEKI

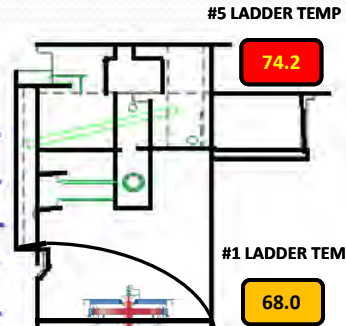
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



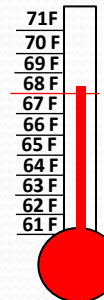
LOWER GRANITE

FLOW
09.8
KCFS

LWG SPILL

FLOW
08.0
KCFS

LWG
POWER HOUSE



LGNW

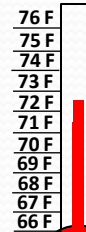
23 AUG 2013



FLOW
07.4
KCFS

DWK TOTAL FLOW

1543.5
DWK ELEVATION



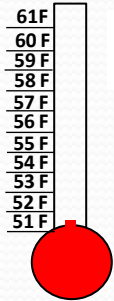
ANQW

FLOW
11.3
KCFS

FLOW ANQW



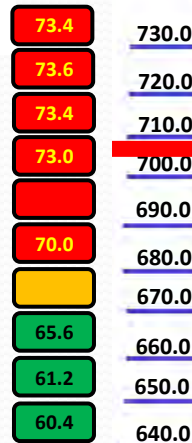
TEMPERATURE
ALERT



PEKI

MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING

LOWER GRANITE

#5 LADDER TEMP

74.2

#1 LADDER TEMP

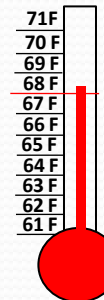
68.0

FLOW
09.8
KCFS

LWG SPILL

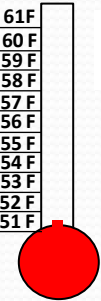
FLOW
08.0
KCFS

LWG
POWER HOUSE



LGNW

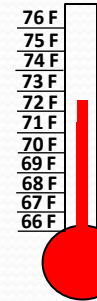
23 AUG 2013



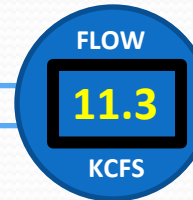
PEKI



DWK TOTAL FLOW



ANQW



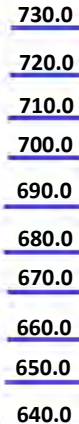
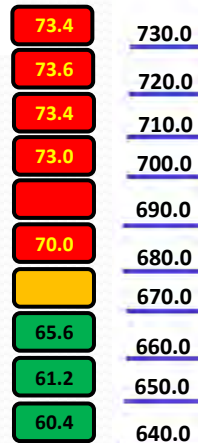
FLOW ANQW



TEMPERATURE
ALERT

MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



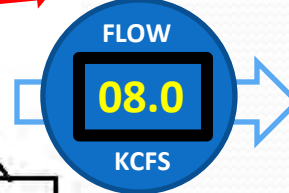
#5 LADDER TEMP



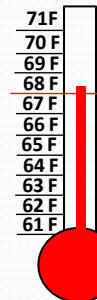
#1 LADDER TEMP



LWG SPILL



LWG
POWER HOUSE



LGNW

FOREBAY
THERMISTER
STRING

LOWER GRANITE

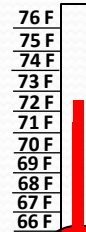
23 AUG 2013



FLOW
07.4
KCFS

DWK TOTAL FLOW

1543.5
DWK ELEVATION



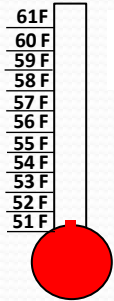
ANQW

FLOW
11.3
KCFS

FLOW ANQW



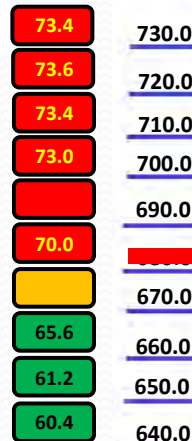
TEMPERATURE
ALERT



PEKI

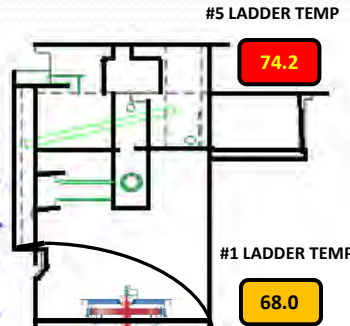
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



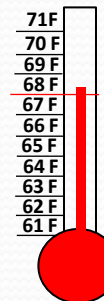
LOWER GRANITE

FLOW
09.8
KCFS

LWG SPILL

FLOW
08.0
KCFS

LWG
POWER HOUSE



LGNW

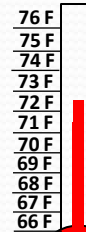
23 AUG 2013



FLOW
07.4
KCFS

DWK TOTAL FLOW

1543.5
DWK ELEVATION



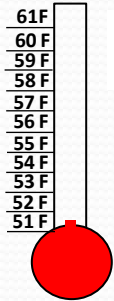
ANQW

FLOW
11.3
KCFS

FLOW ANQW



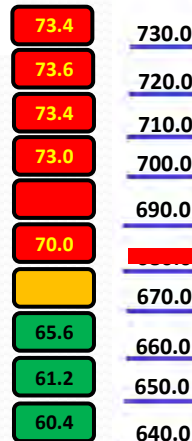
TEMPERATURE
ALERT



PEKI

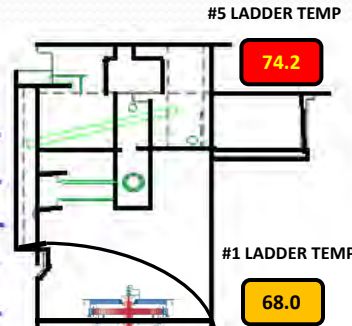
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



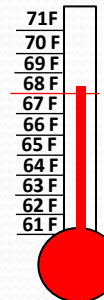
LOWER GRANITE

FLOW
09.8
KCFS

LWG SPILL

FLOW
08.0
KCFS

LWG
POWER HOUSE



LGNW

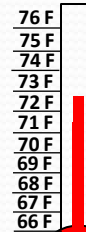
26 AUG 2013



FLOW
08.6
KCFS

DWK TOTAL FLOW

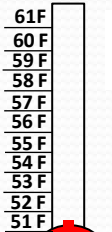
1540.4
DWK ELEVATION



ANQW

FLOW
11.5
KCFS

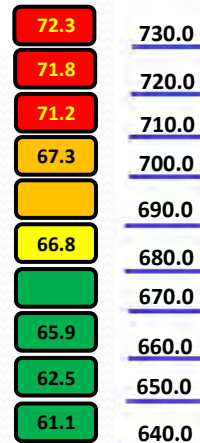
FLOW ANQW



PEKI

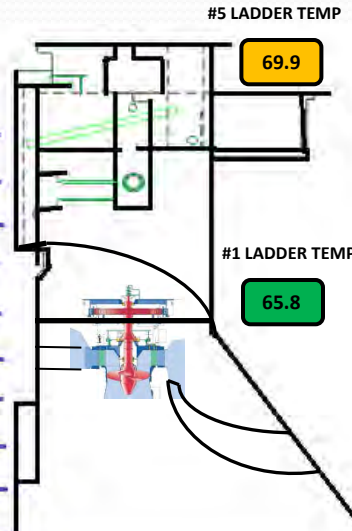
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



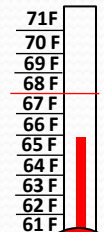
LOWER GRANITE

FLOW
09.9
KCFS

LWG SPILL

FLOW
12.3
KCFS

LWG
POWER HOUSE



LGNW

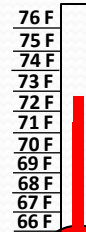
02 SEP 2013



FLOW
07.5
KCFS

DWK TOTAL FLOW

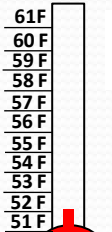
1533.2
DWK ELEVATION



ANQW

FLOW
12.5
KCFS

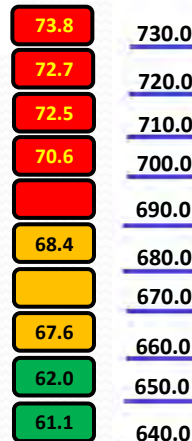
FLOW ANQW



PEKI

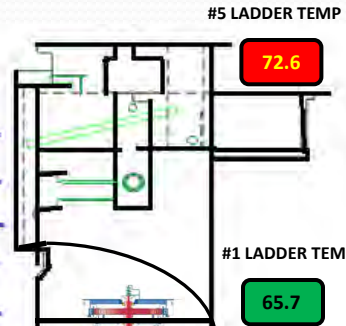
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

FOREBAY
THERMISTER
STRING



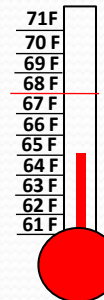
LOWER GRANITE

FLOW
00.0
KCFS

LWG SPILL

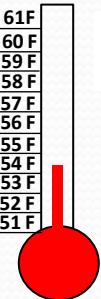
FLOW
21.4
KCFS

LWG
POWER HOUSE



LGNW

16 SEP 2013

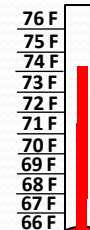


PEKI

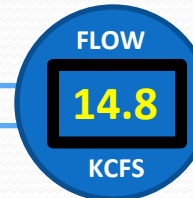


DWK TOTAL FLOW

LOW POOL WARNING



ANQW

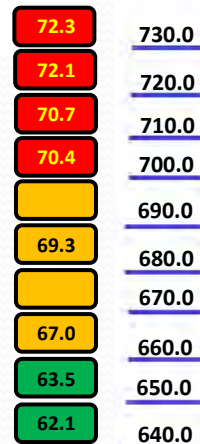


FLOW ANQW



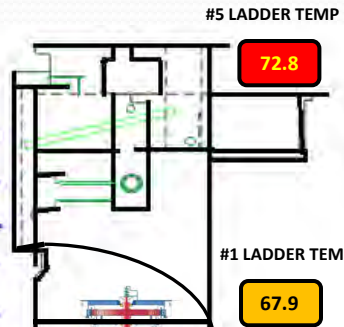
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 ON



THERMOCLINE

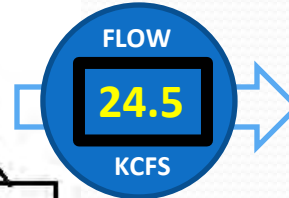
FOREBAY
THERMISTER
STRING



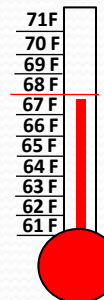
LOWER GRANITE



LWG SPILL



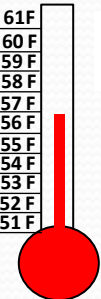
LWG
POWER HOUSE



LGNW

20 SEP 2013

1700 HOURS

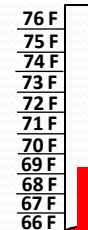


PEKI

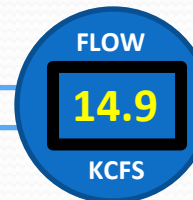


DWK TOTAL FLOW

LOW POOL WARNING



ANQW



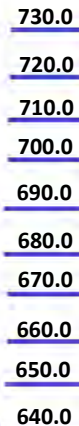
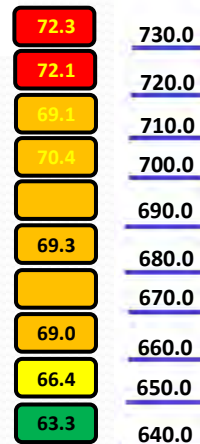
FLOW ANQW



TEMPERATURE
ALERT

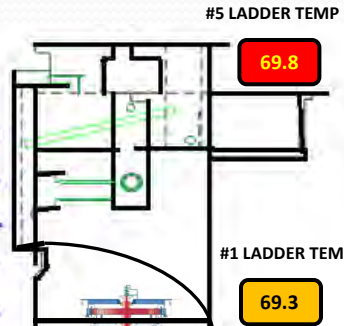
MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

PUMP 1 & 2 OFF



THERMOCLINE

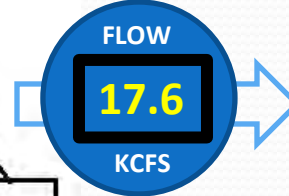
FOREBAY
THERMISTER
STRING



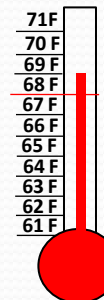
LOWER GRANITE



LWG SPILL



LWG
POWER HOUSE



LGNW

21 SEP 2013
1800 HOURS



FLOW
02.4
KCFS

DWK TOTAL FLOW

WATER EXPENDED

1519.9
DWK ELEVATION

76 F
75 F
74 F
73 F
72 F
71 F
70 F
69 F
68 F
67 F
66 F

ANQW

FLOW
14.7
KCFS

FLOW ANQW



TEMPERATURE
ALERT

61 F
60 F
59 F
58 F
57 F
56 F
55 F
54 F
53 F
52 F
51 F

PEKI

MAX POOL EL 746.5
NORM POOL EL 738.0
MOP EL 733.0

68.4
69.2
68.9
69.0
68.9
68.8
66.4
63.3

PUMP 1 & 2 OFF

#5 LADDER TEMP

69.0

#1 LADDER TEMP

68.3

FLOW
00.0
KCFS

LWG SPILL

FLOW
17.6
KCFS

LWG
POWER HOUSE

71 F
70 F
69 F
68 F
67 F
66 F
65 F
64 F
63 F
62 F
61 F



LGNW

THERMOCLINE

FOREBAY
THERMISTER
STRING

LOWER GRANITE



Coordinated Operations to Increase Adult Passage

1. July 22: Modified unit priority (1,2,3,4-6).
2. July 23-25: SOR 2013-4, A) daytime unit 1 priority and b) nighttime unit 5 at speed-no-load (5 kcfs) and spilled to the gas cap.
3. July 26: Modified priority (1,2,3,4-6).
4. July 29: FPP priority (2,3,4-6,1).
5. July 31: Modified unit priority (1,2,3,4-6).
6. August 2: Cont. modified priority (1,2,3,4-6).

Operations Continued

7. August 5: A) daytime unit 1, RSW spill, as inflows allow and B) nighttime unit 4 priority and gas cap spill.
8. August 10: Roof repair began. A) daytime unit 5 at speed-no-load (5 kcfs), spilled remainder of inflow, and B) nighttime unit 2.
9. September 4: Unit 2 and 3 morning operation. Unit 1 was OOS.
10. September 18: Unit 1 RTS and modified priority (1,2,3,4-6).

Next Steps

1. Continued coordination with Regional Partners (FPOM, TMT, FFDRWG, SCT, etc).
2. Exploring operational adjustments in the short term (e.g. change in FPP operations - spill pattern/unit priority).
3. Exploring structural modification in the long term (e.g. JFF upgrade and cool water, aux pump intake extensions, fish ladder/adult trap modifications, etc.).

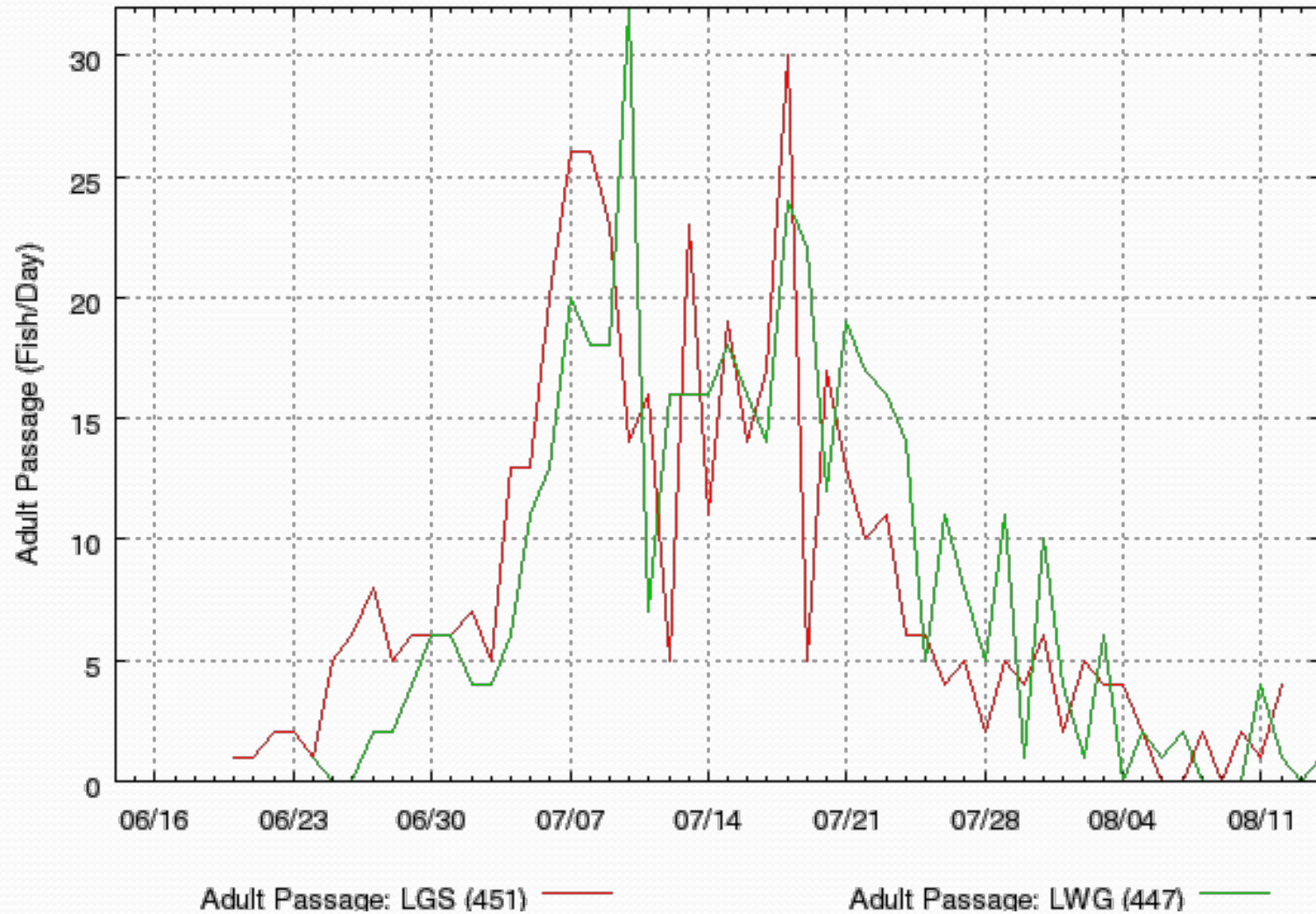


An underwater photograph showing a large group of adult salmon swimming in clear, greenish water. The fish are silvery with a pinkish-red hue, characteristic of salmon during their spawning run. They are swimming in various directions, creating a sense of movement. The background shows the water surface with some ripples and light reflecting off it.

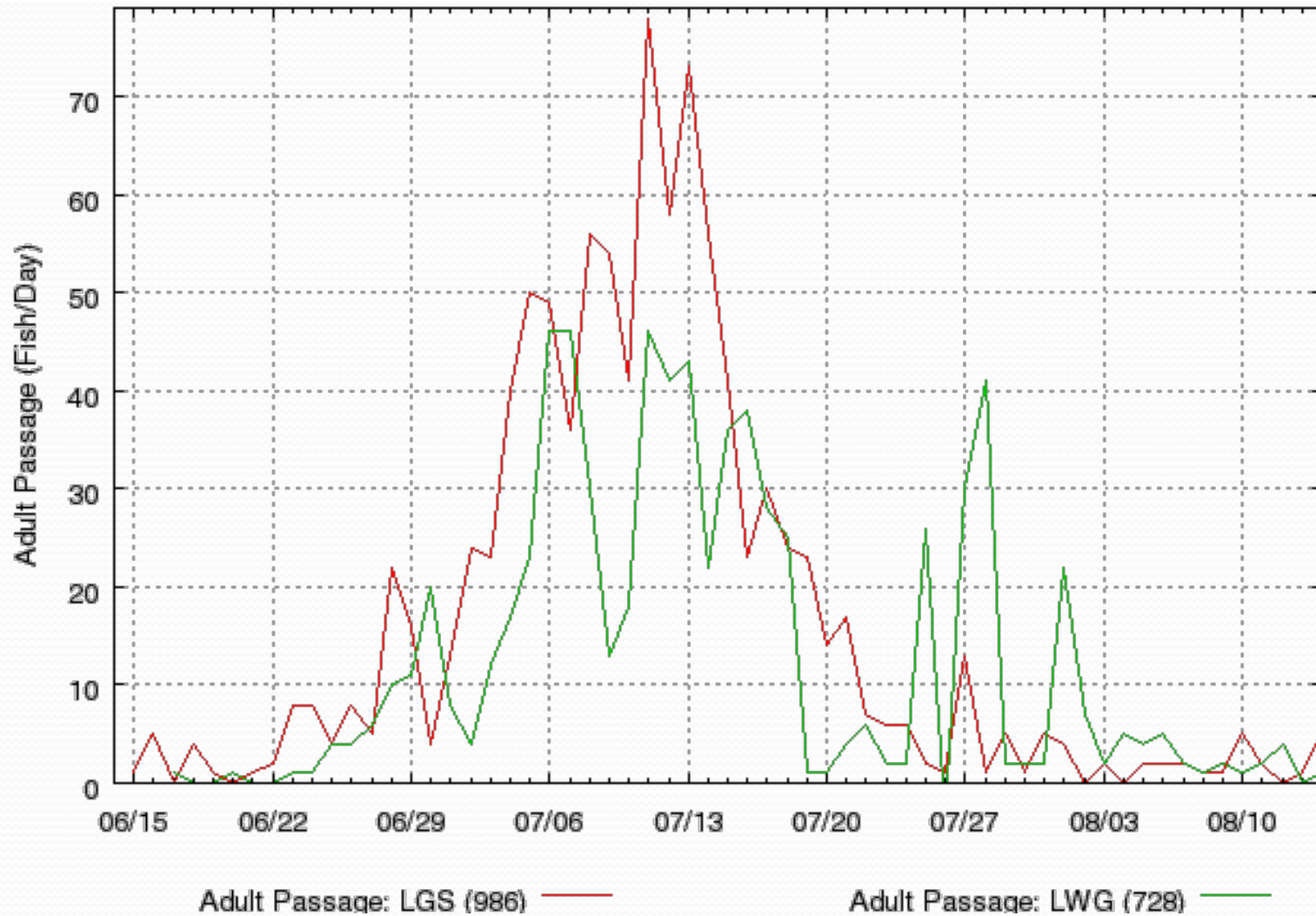
2013 Snake River Adult Delays & Impacts

Russ Kiefer
Idaho Department of Fish & Game

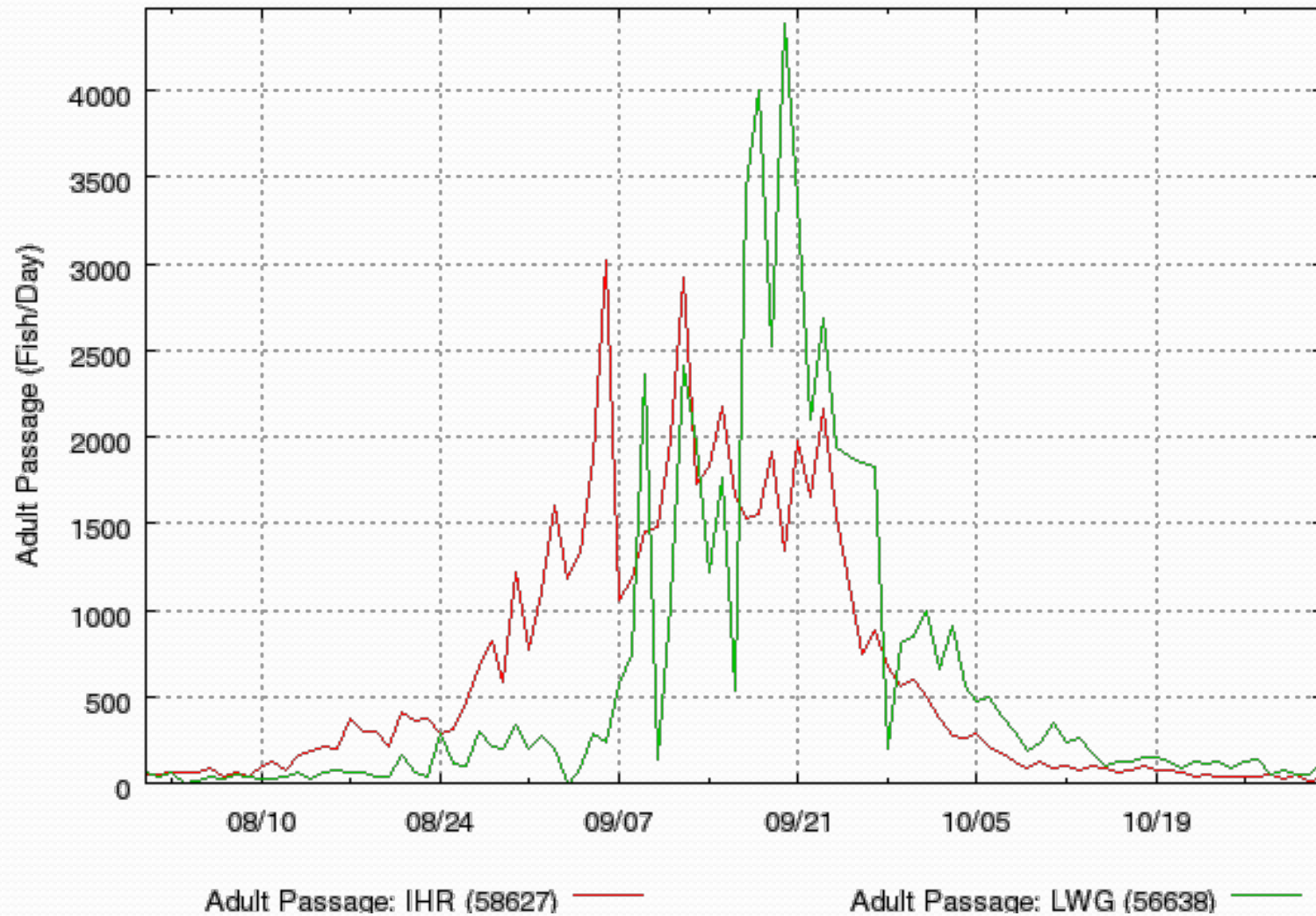
Adult Passage 2012, Sockeye



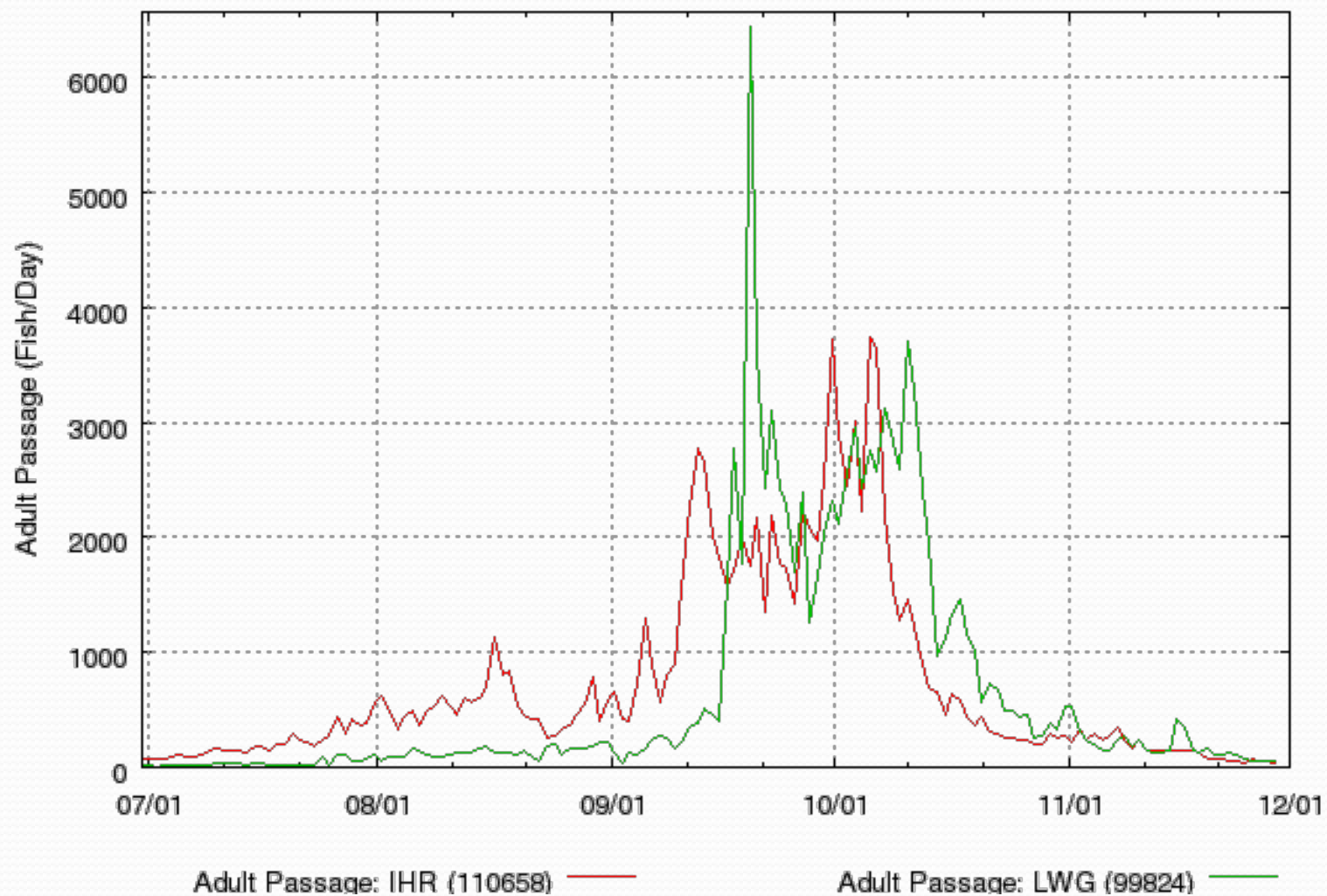
Adult Passage 2013, Sockeye



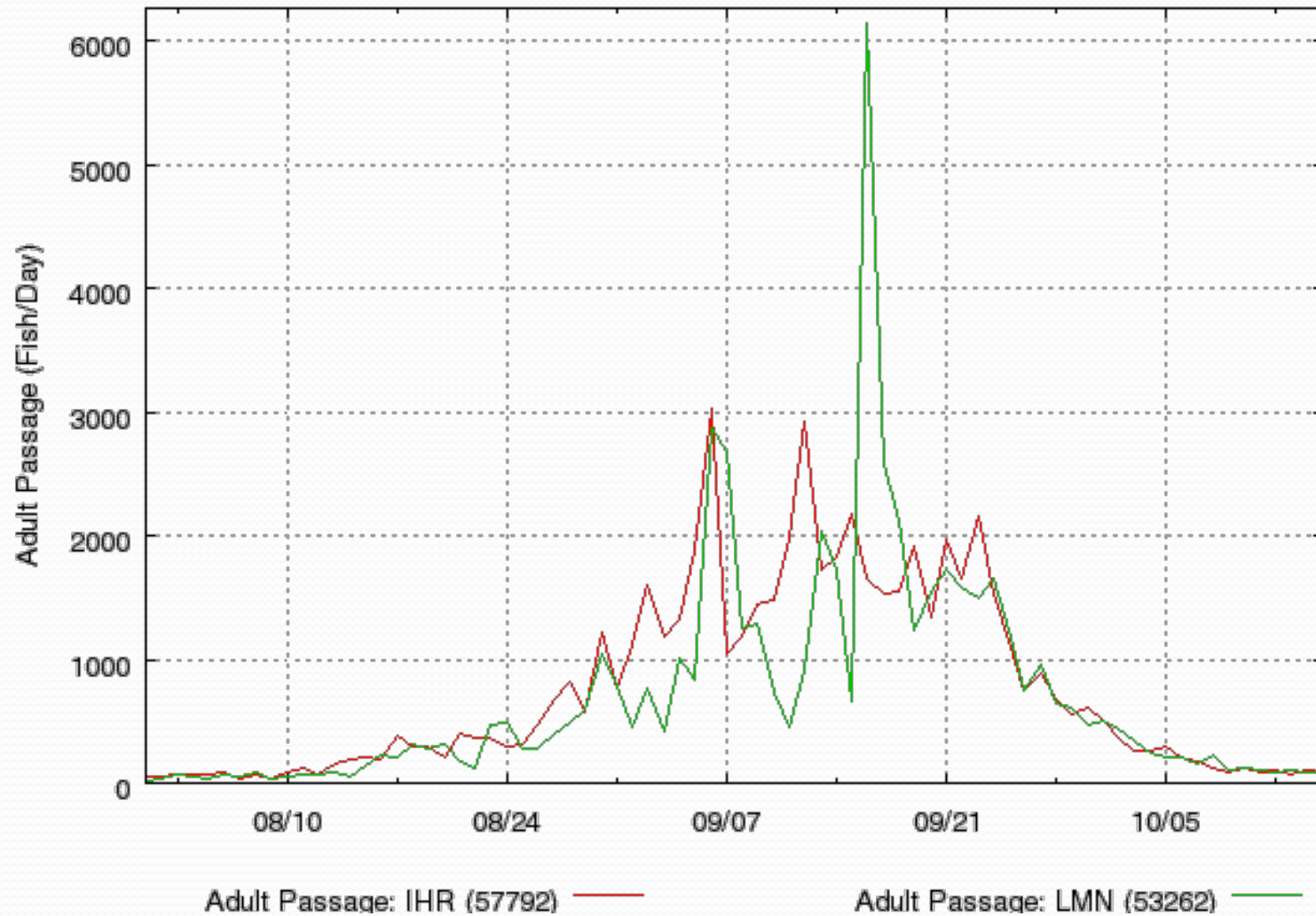
Adult Passage 2013, Chinook



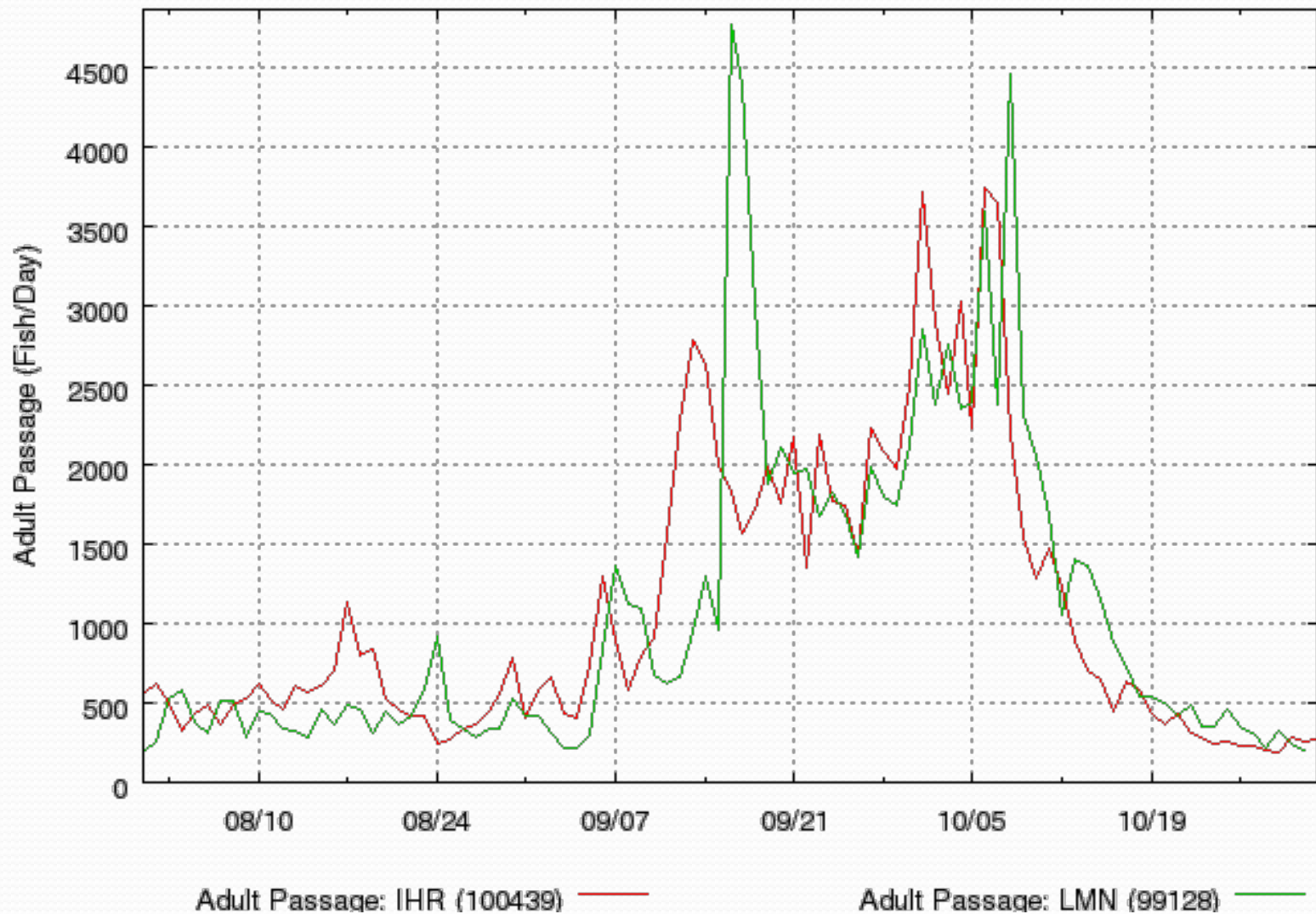
Adult Passage 2013, Steelhead



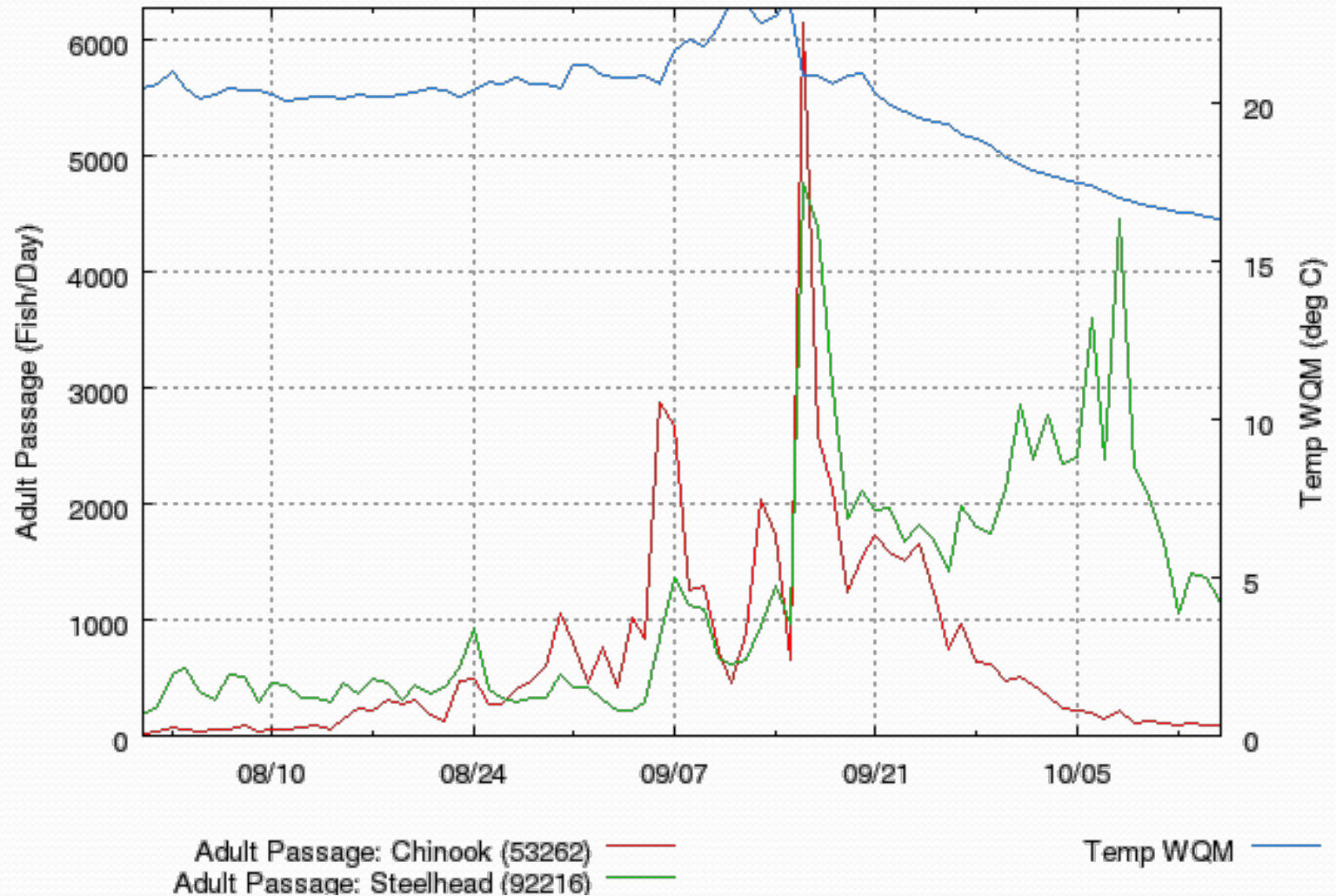
Adult Passage 2013, Chinook



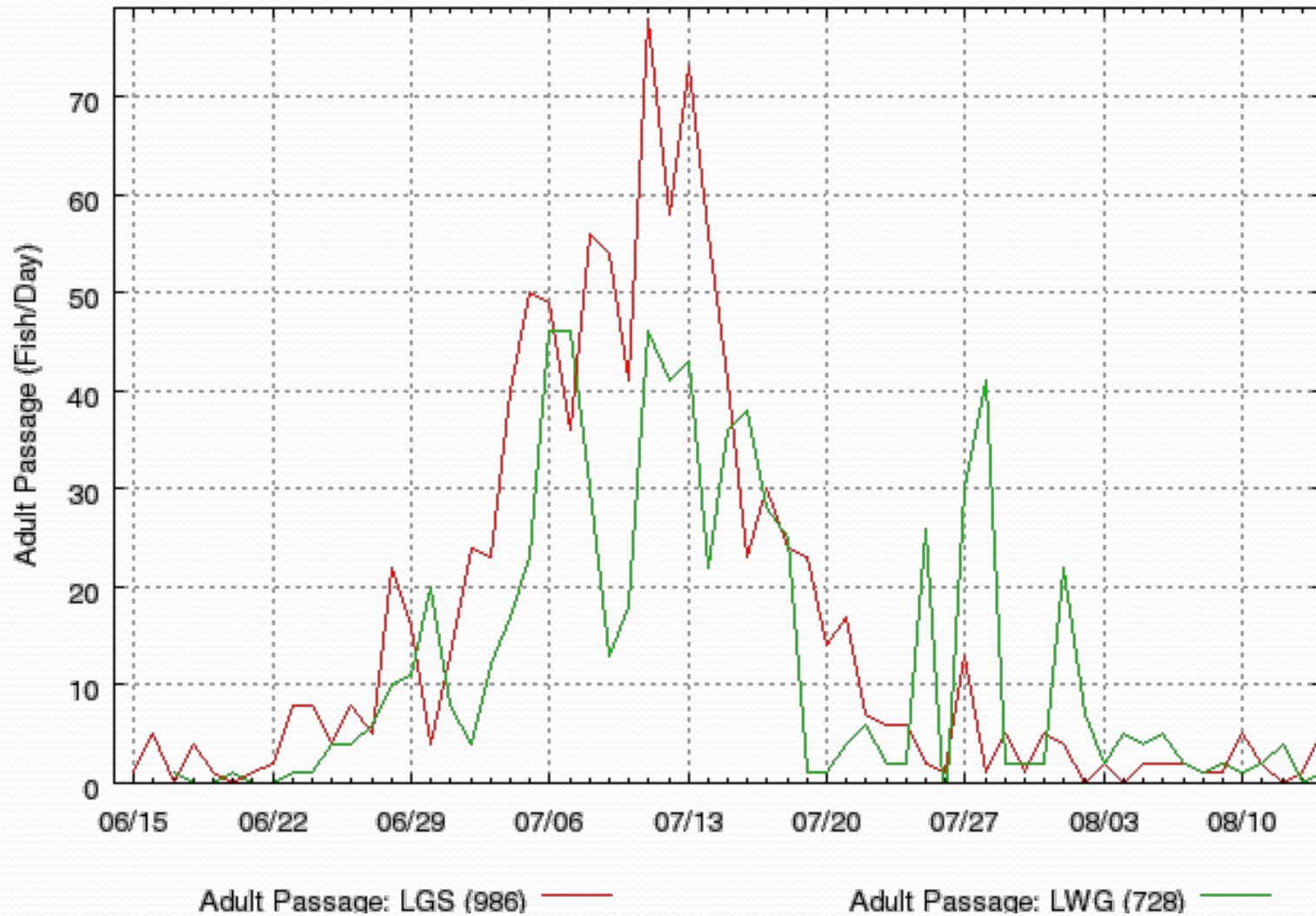
Adult Passage 2013, Steelhead



Adult Passage, Temperature (WQM) 2013, Lower Monumental



Adult Passage 2013, Sockeye



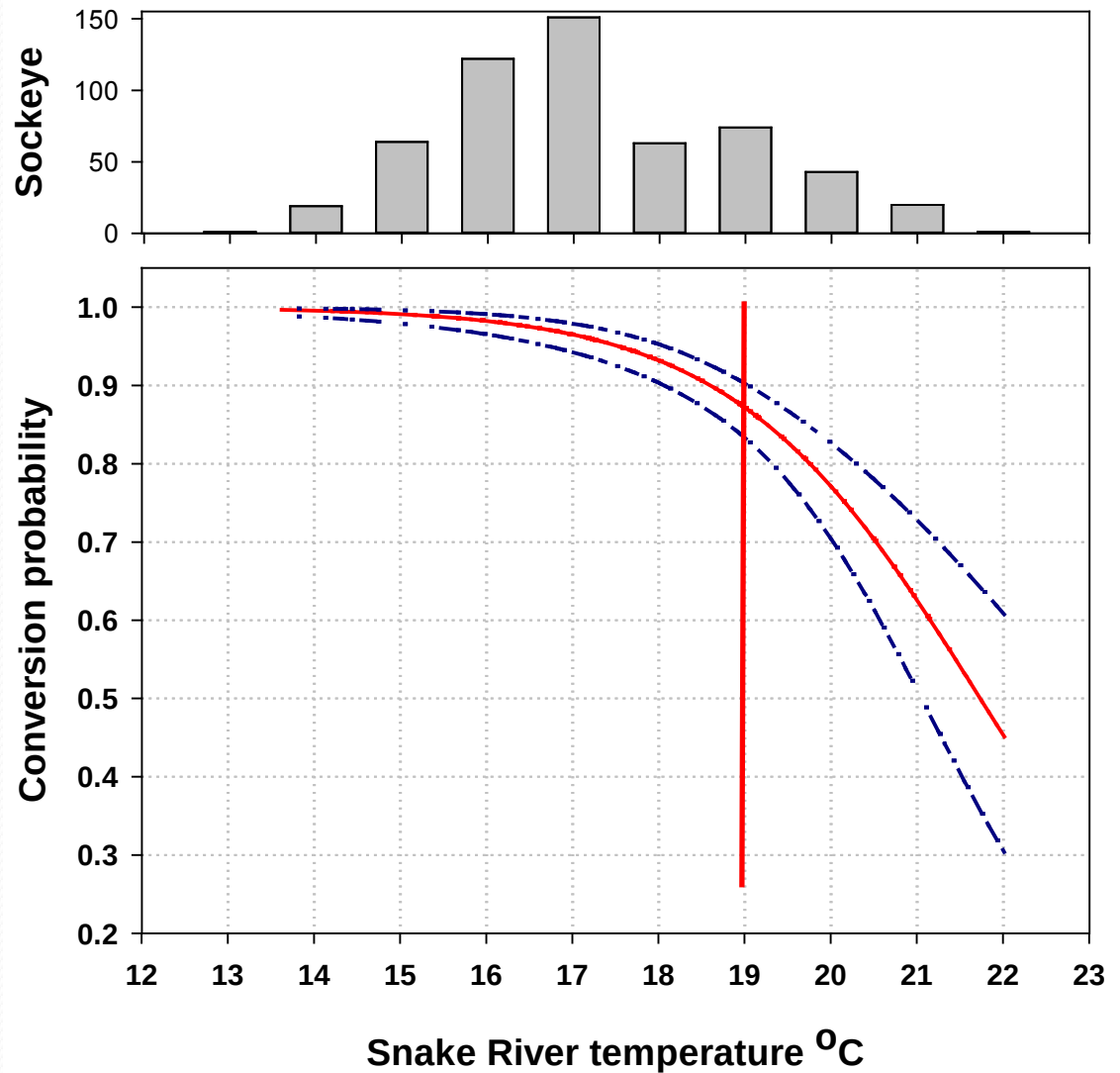
Sockeye

- IH-GR logistic reg. model

- $\text{chisq} = 49.5$

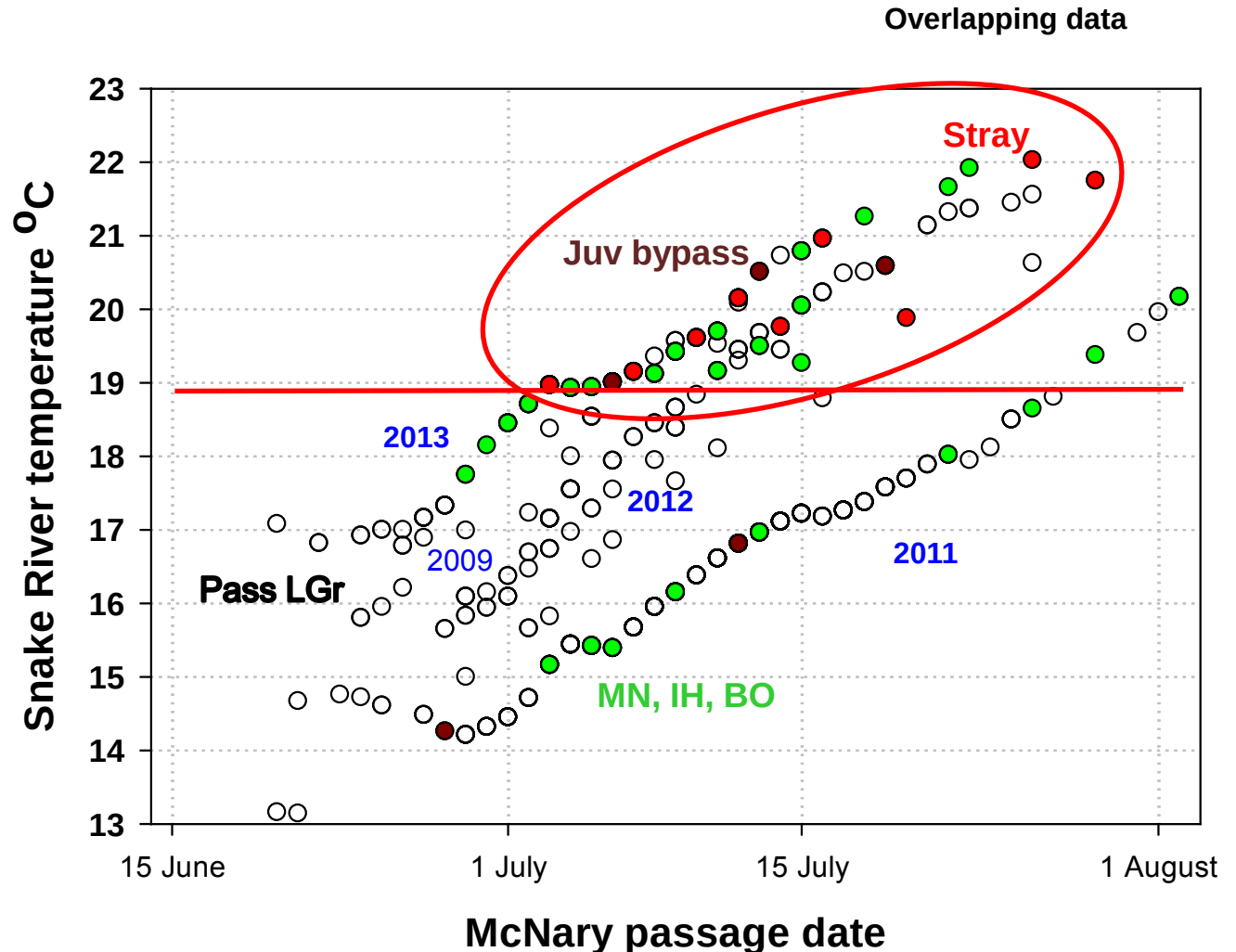
- $P < 0.0001$

- $n = 558$

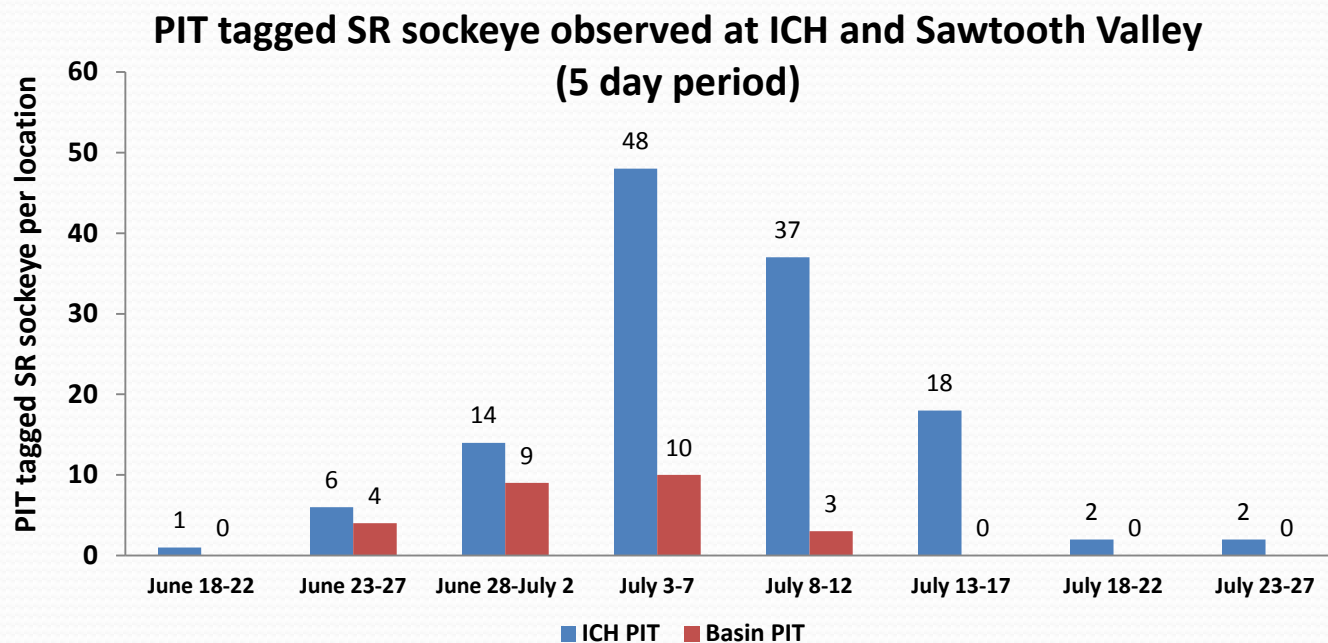


Sockeye fates (MN-LGr)

- $n = 608$
with date
and temp

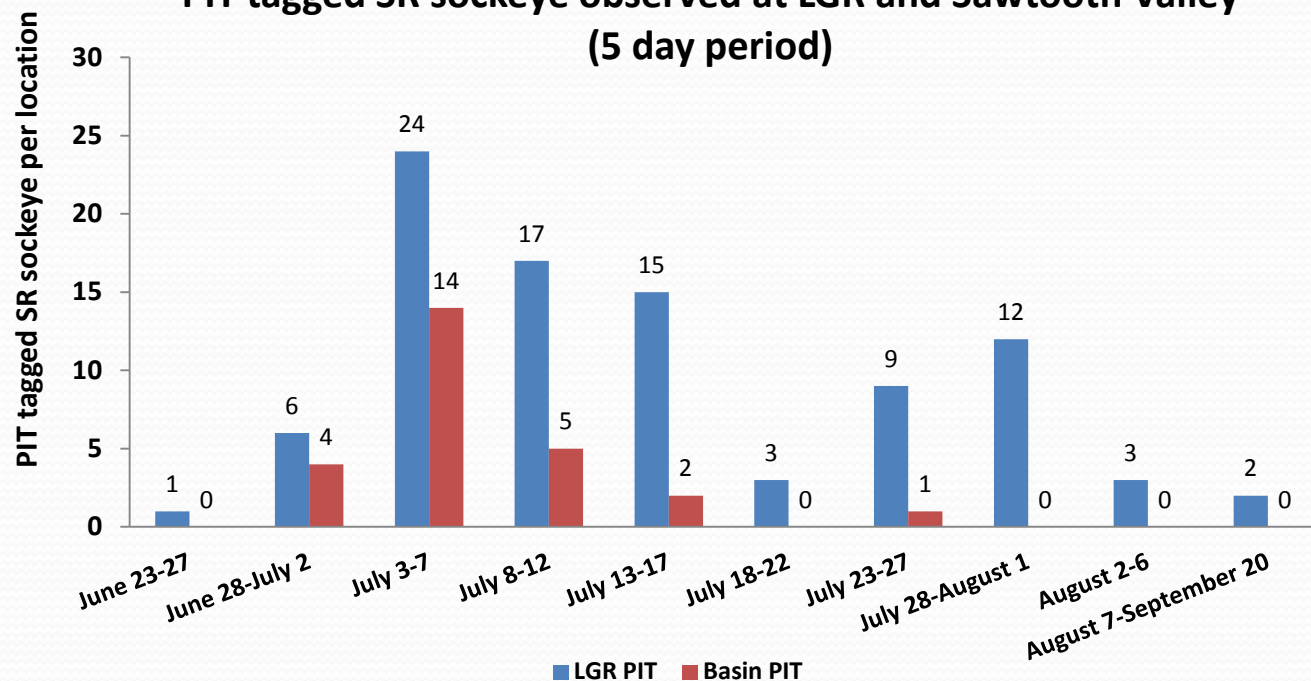


2013

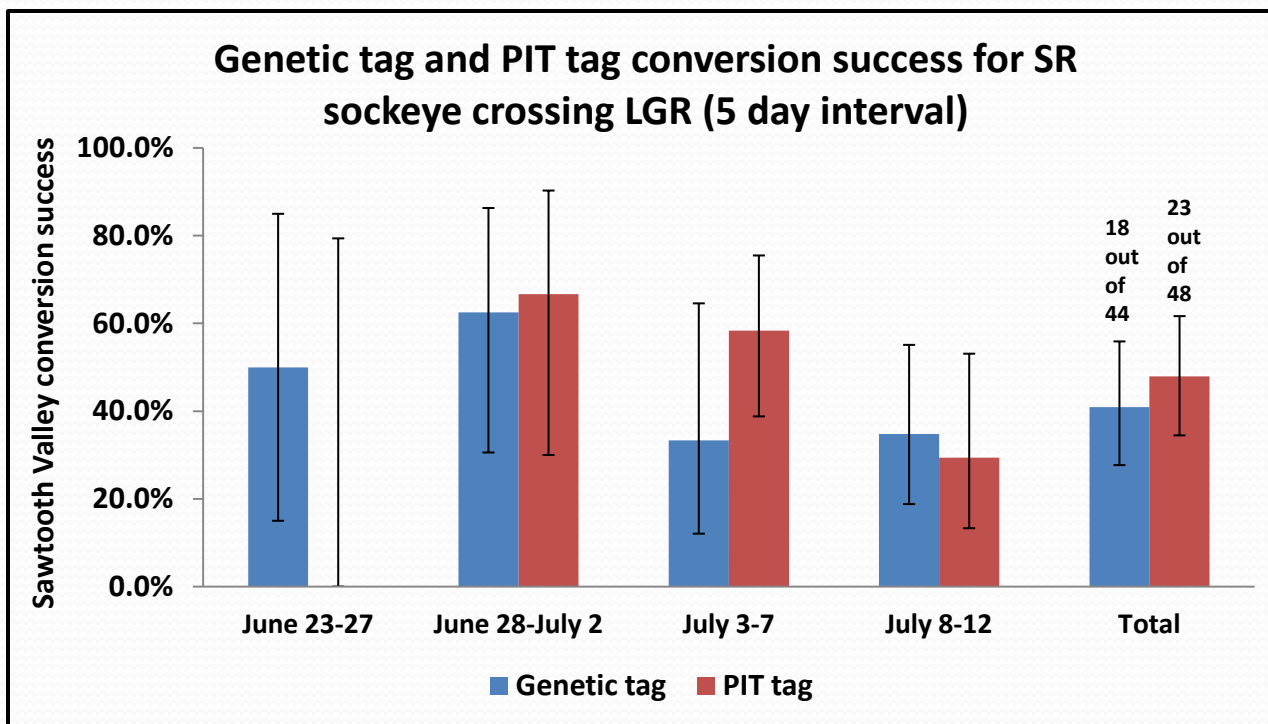


2013

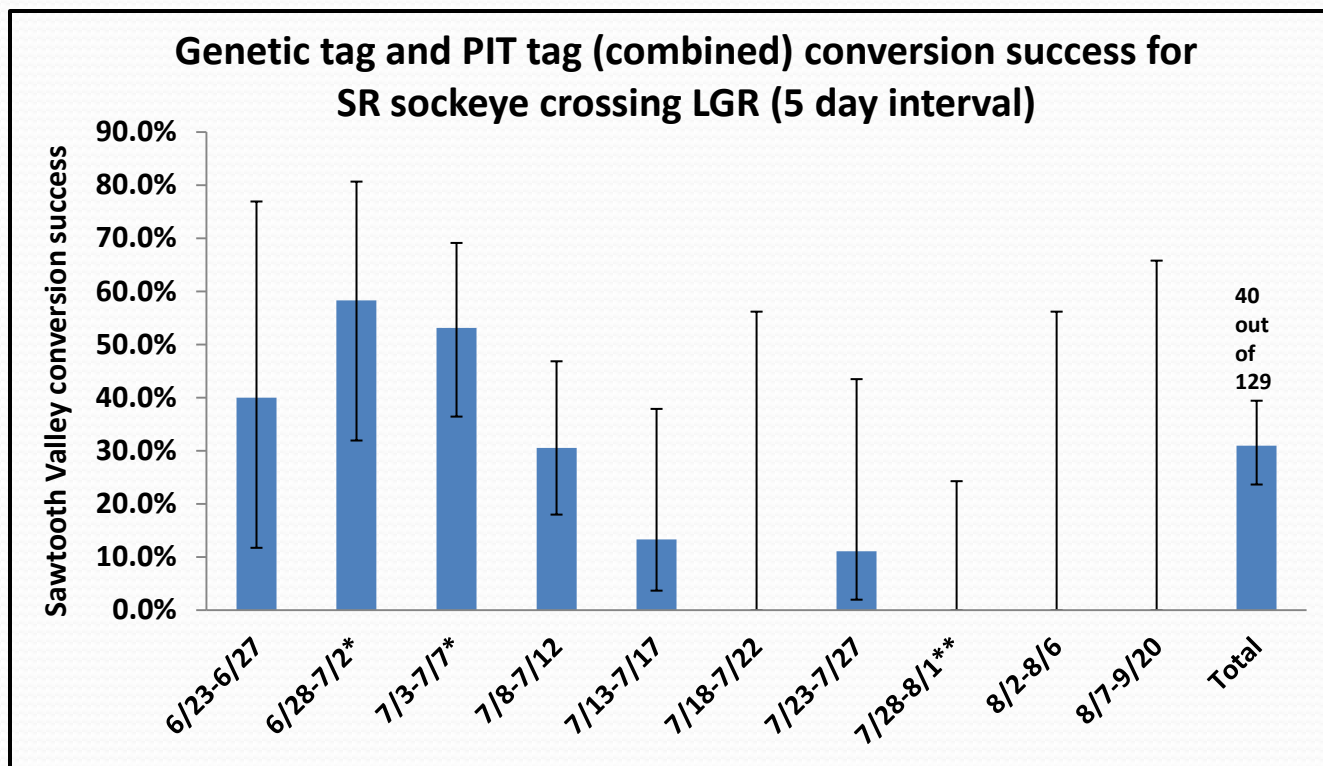
PIT tagged SR sockeye observed at LGR and Sawtooth Valley (5 day period)



2013



2013





Dworshak Reservoir Regulation Water Year 2013

Stephen Hall P.E., PMP

Water Management Program Manager

Walla Walla District

December 12th, 2013



®

US Army Corps of Engineers
BUILDING STRONG®



Dworshak Operations Review

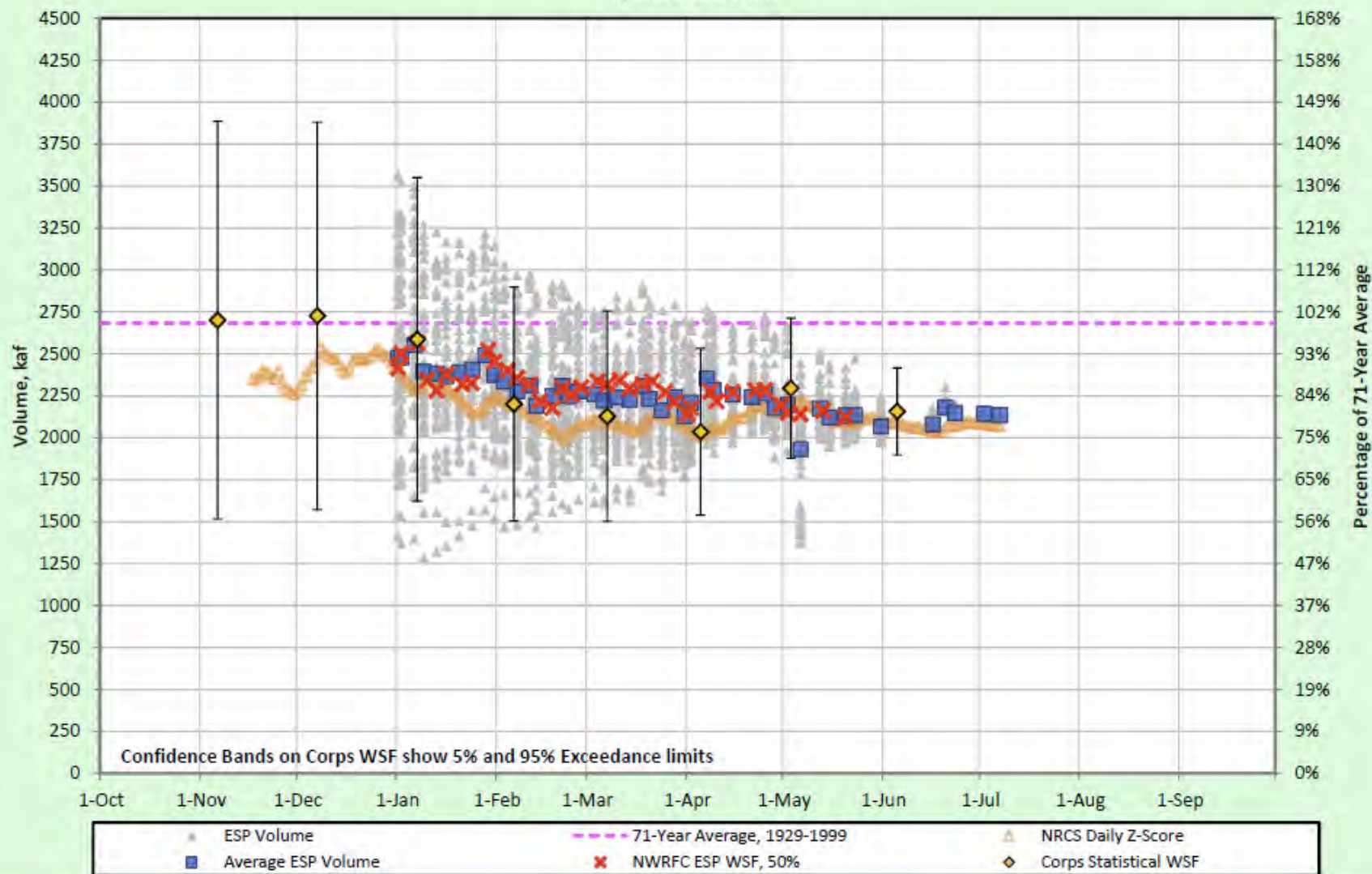
- Water Supply Forecast
- BiOp Operations
- Flood Control Space Shift to Grand Coulee & Spring Flow Augmentation
- Final Refill & Temperature Augmentation
- Summer Temperature Operations
- Total Dissolved Gas Operations



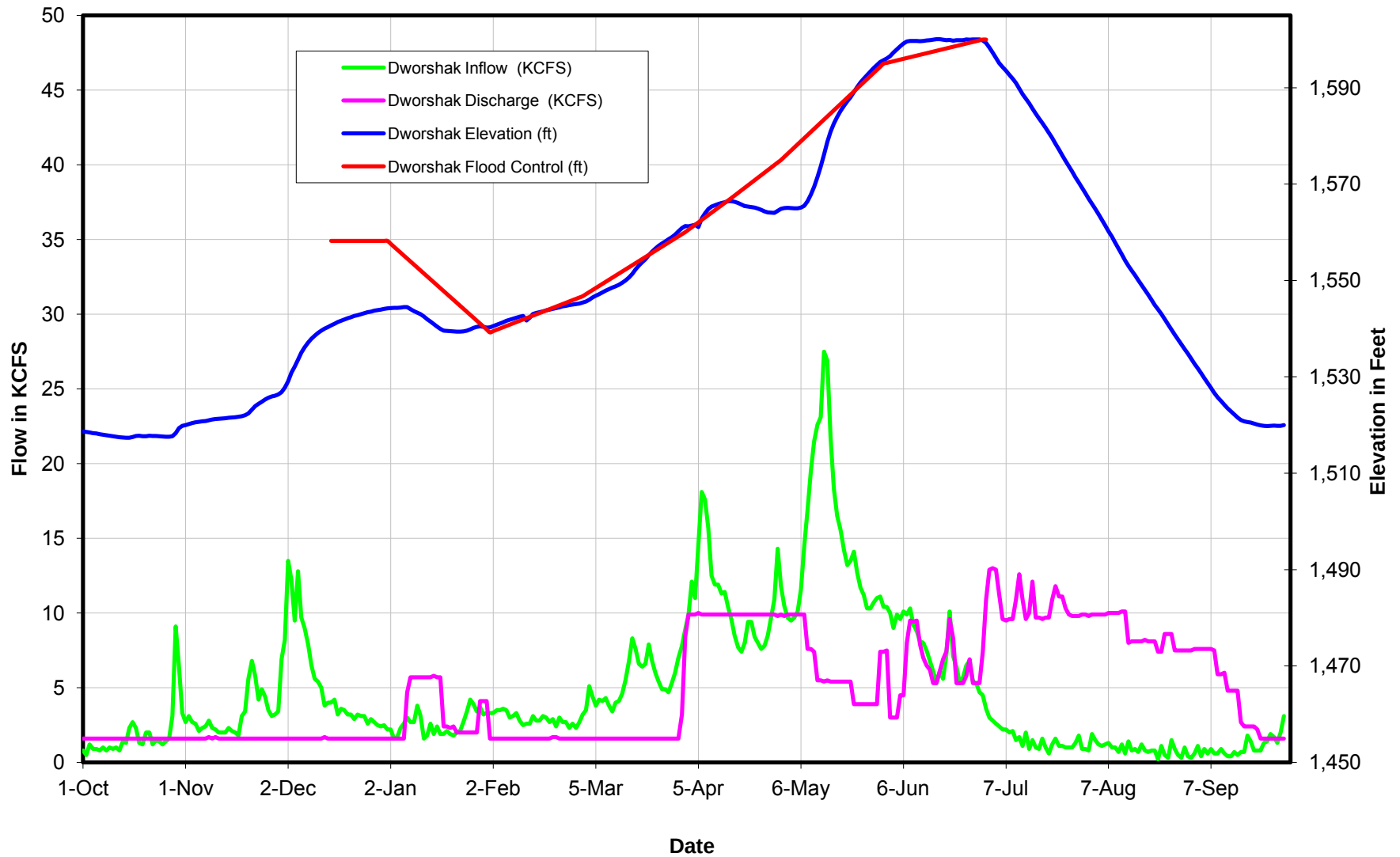
DWORSHAK, IDAHO

April-July Water Supply Forecast Comparison

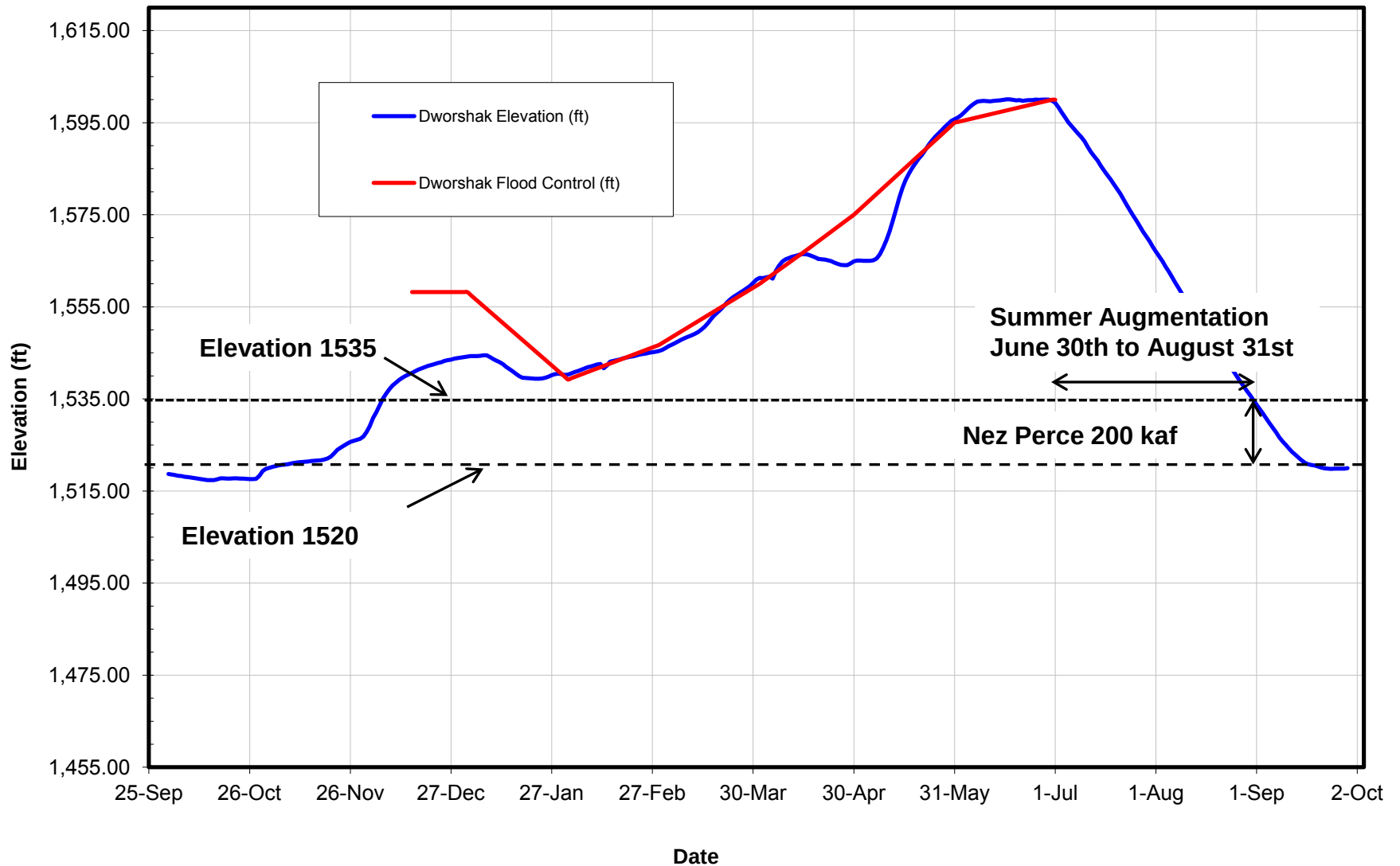
Water Year 2013
Updated on 04-Dec-2013



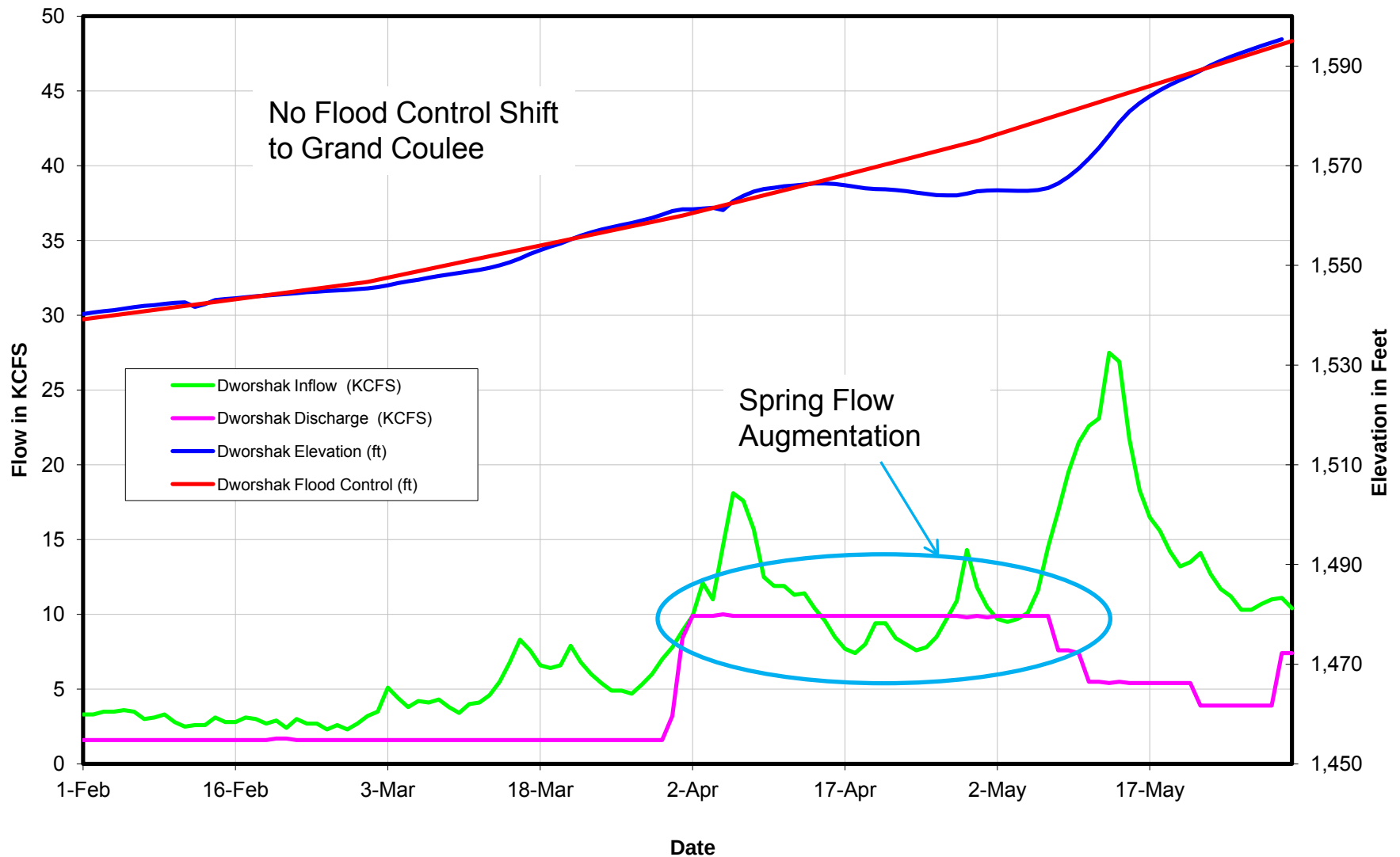
2013 Dworshak Operations



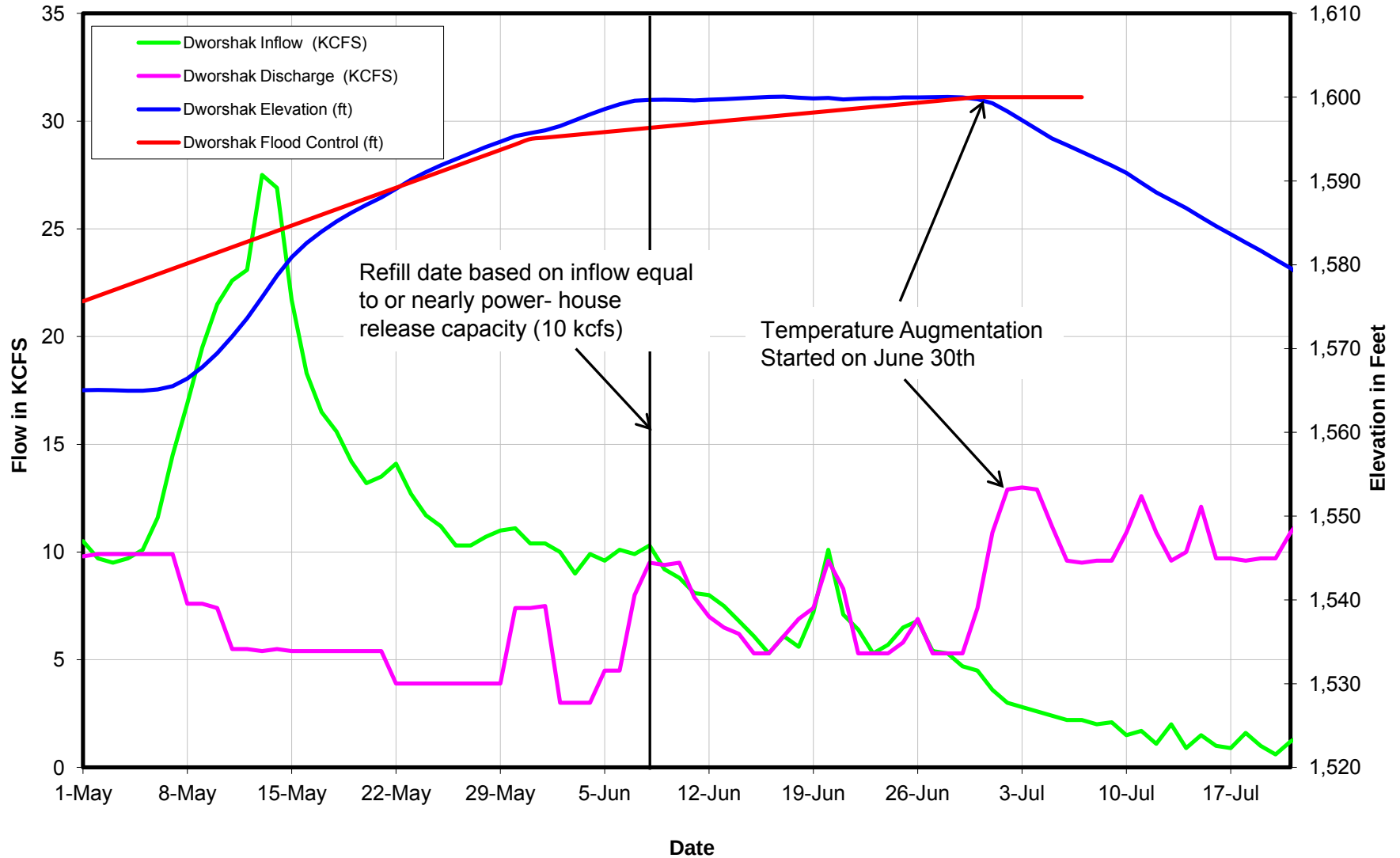
BiOp Operations



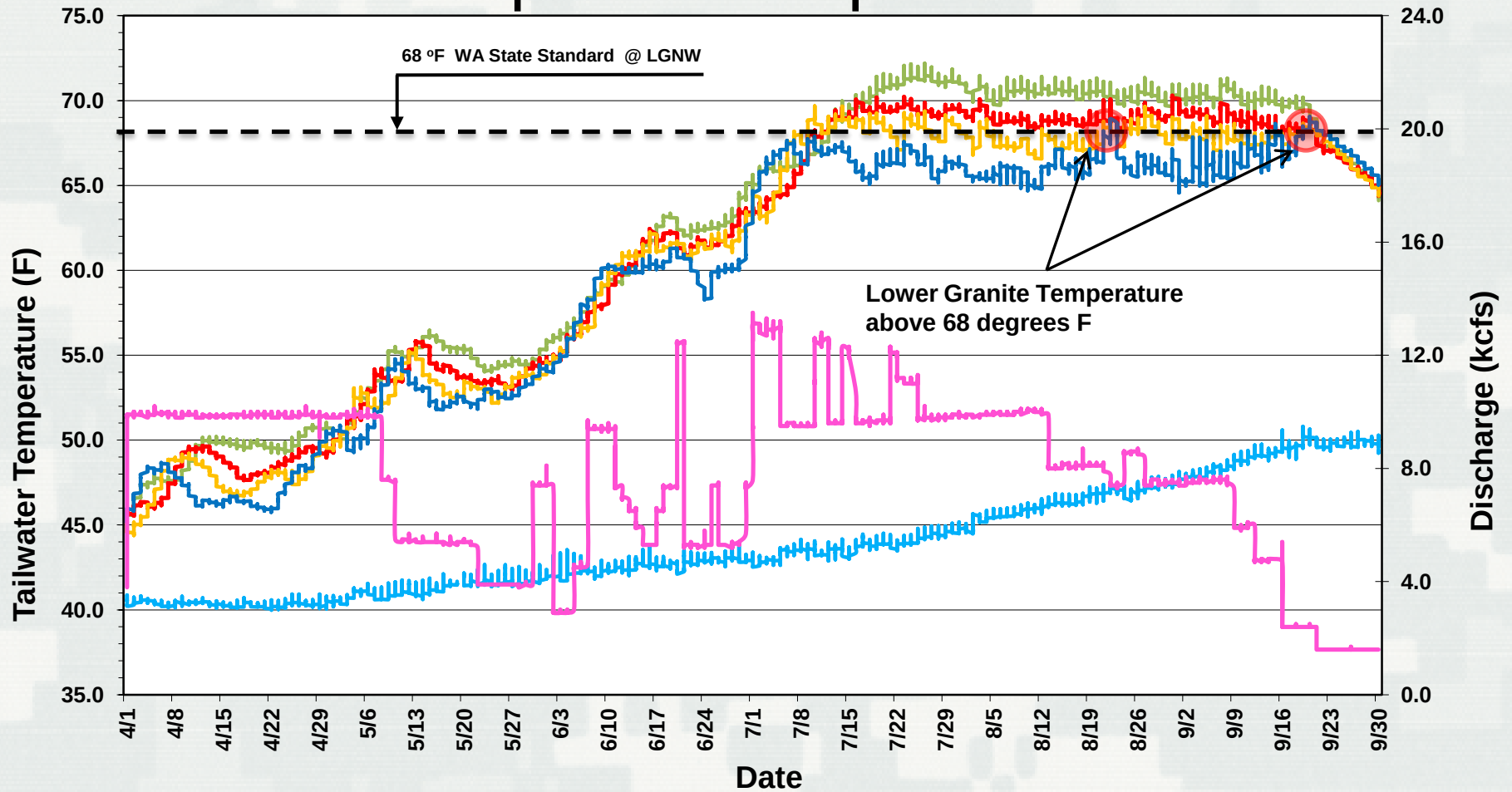
Grand Coulee Shift & Spring Augmentation



Final Refill & Temperature Augmentation



Temperature Operations



Ice Harbor

Lower Monumental

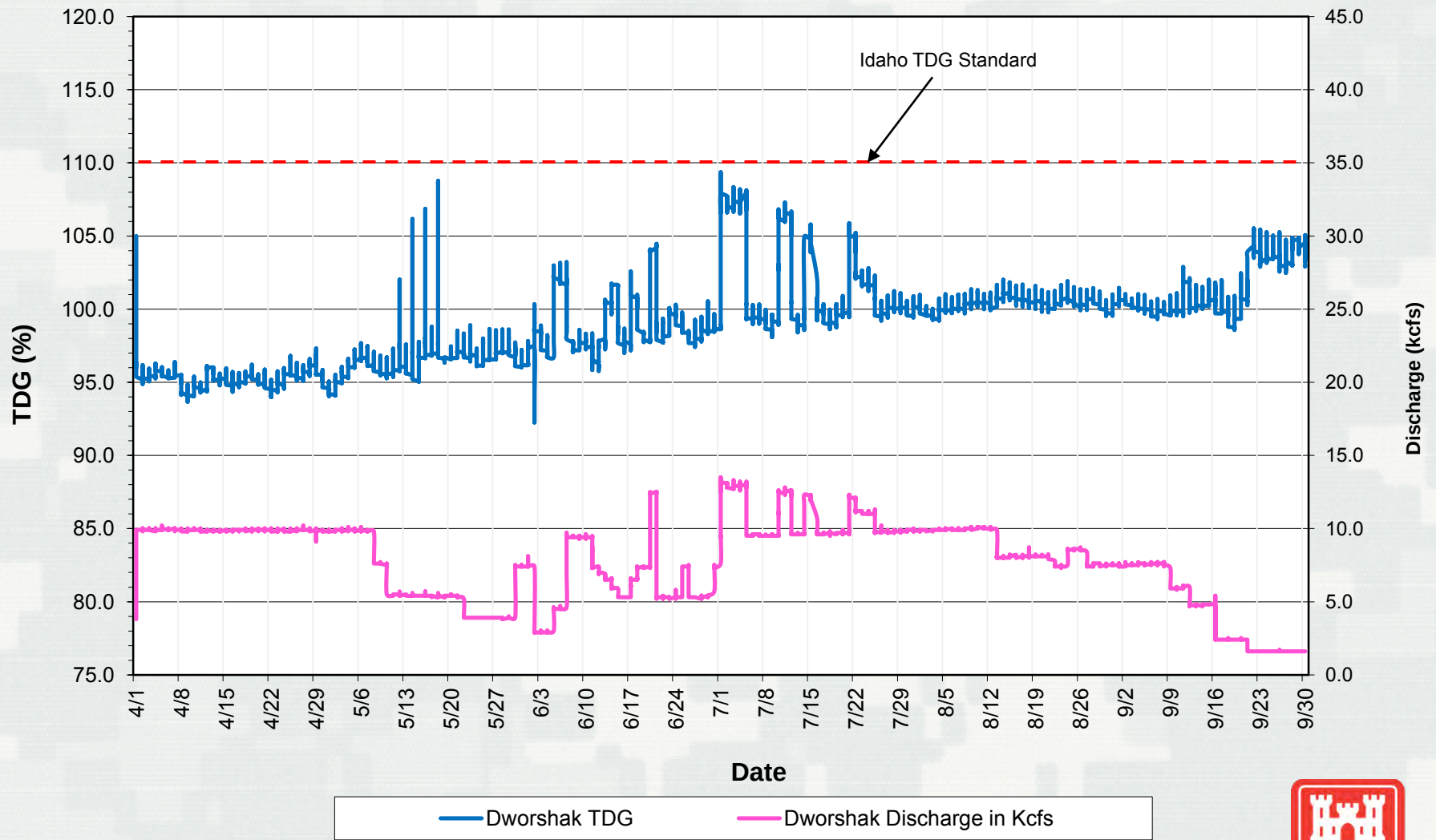
Little Goose

Lower Granite Tail Water Temp in F

Dworshak Temperature in F

Dworshak Discharge in Kcfs

Total Dissolved Gas Operations



Questions?



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2013 Juvenile Dam Passage Performance Evaluations

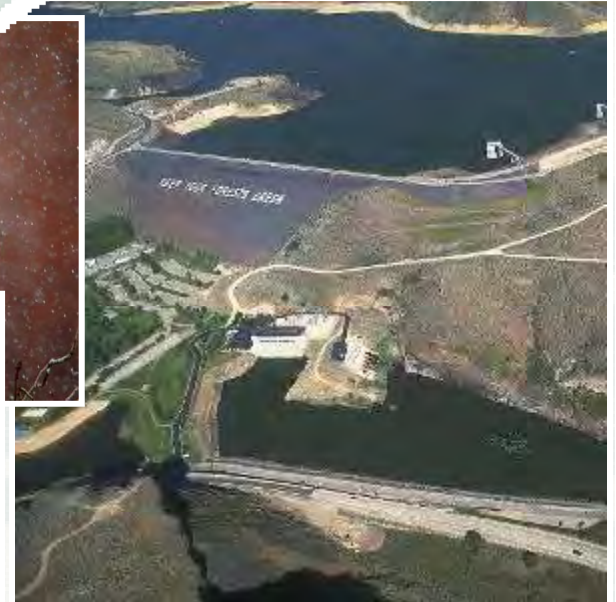
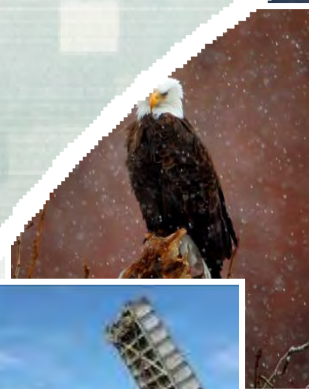
Eric Hockersmith,
USACE NWW

Presentation to Technical Management Team

12 December 2013



US Army Corps of Engineers
BUILDING STRONG®



Juvenile Dam Passage BiOp Performance Standards

RPA Actions - Strategy 2 (Hydrosystem RM&E):

- Action Agencies operate to achieve and maintain average performance standards across all dams of:

- $\hat{S}_{Dam} \geq 96\%$ ($SE \leq 1.5\%$) for Spring Migrants
 - yearling Chinook and steelhead
- $\hat{S}_{Dam} \geq 93\%$ ($SE \leq 1.5\%$) for Summer Migrants
 - subyearling fall Chinook salmon

- $\hat{S}_{dam}$ passage survival- survival from the upstream face of the dam to a standardized reference point in the tailrace



2013 Juvenile Dam Passage Performance Evaluations

- Snake River
 - Little Goose Dam
 - Lower Monumental Dam
 - Summer – Measure Dam and Route-Specific $\hat{S}$
 - Maintain 2008 Columbia Basin Fish Accord Metrics
- Lower Columbia River
 - No test conducted



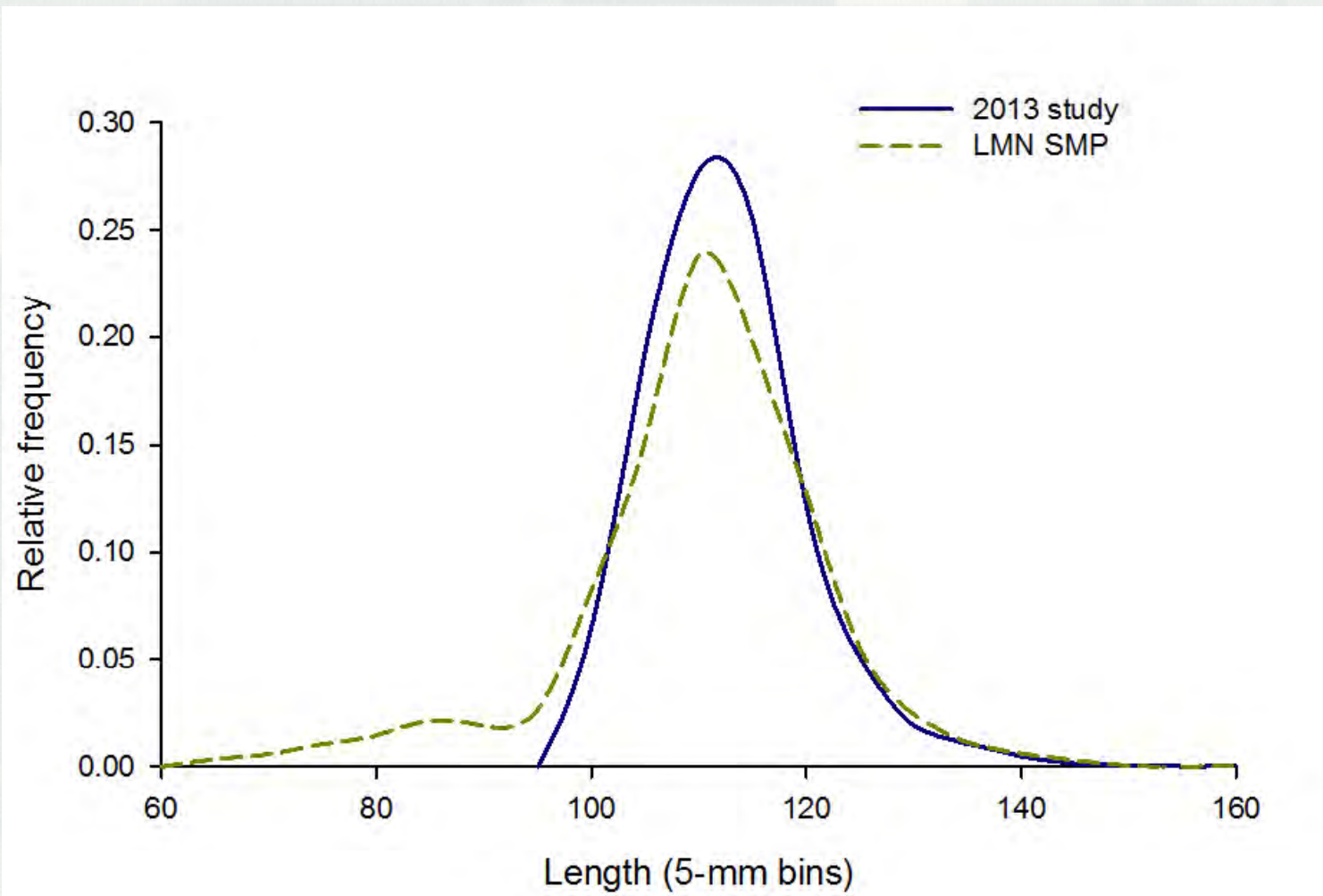
2013 Study Design-Fish Selection Criteria

- Run-of-River fish collected at Juvenile Fish Facilities, selected for tagging based on criteria:
 - Species: subyearling Chinook (CH0)
 - No previous PIT-tag or active tag
 - Alive with no severe or lethal injuries, diseases, etc.
 - Fork length ≥ 95.0 mm
- Rejection rate – 18.5%
 - Previously tagged – 0.4%
 - Undersize – 13.6%
 - Poor condition – 4.5%



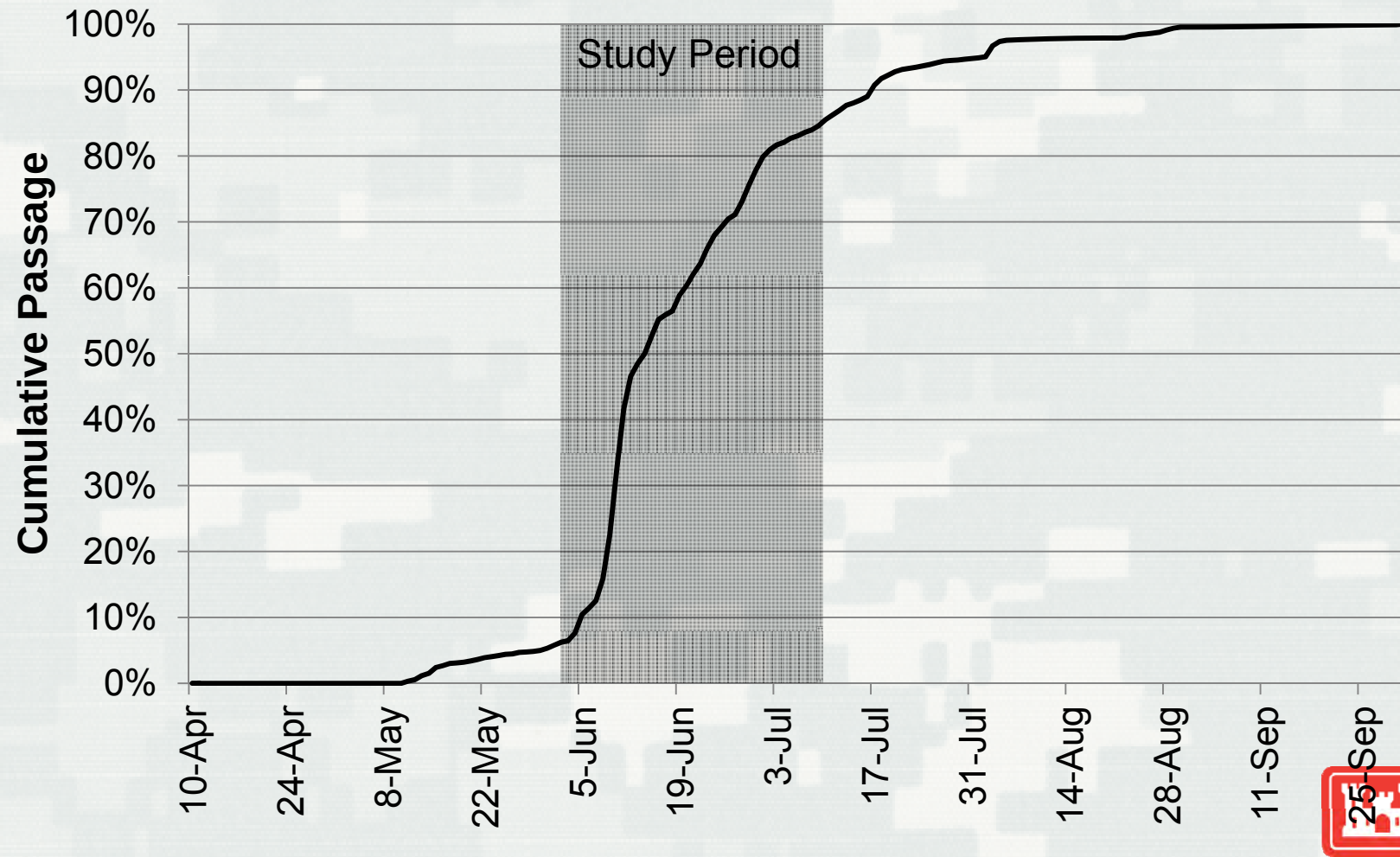
2013 Results – Representative Study fish

- Fish size – 13.6% rejection rate < 95 mm

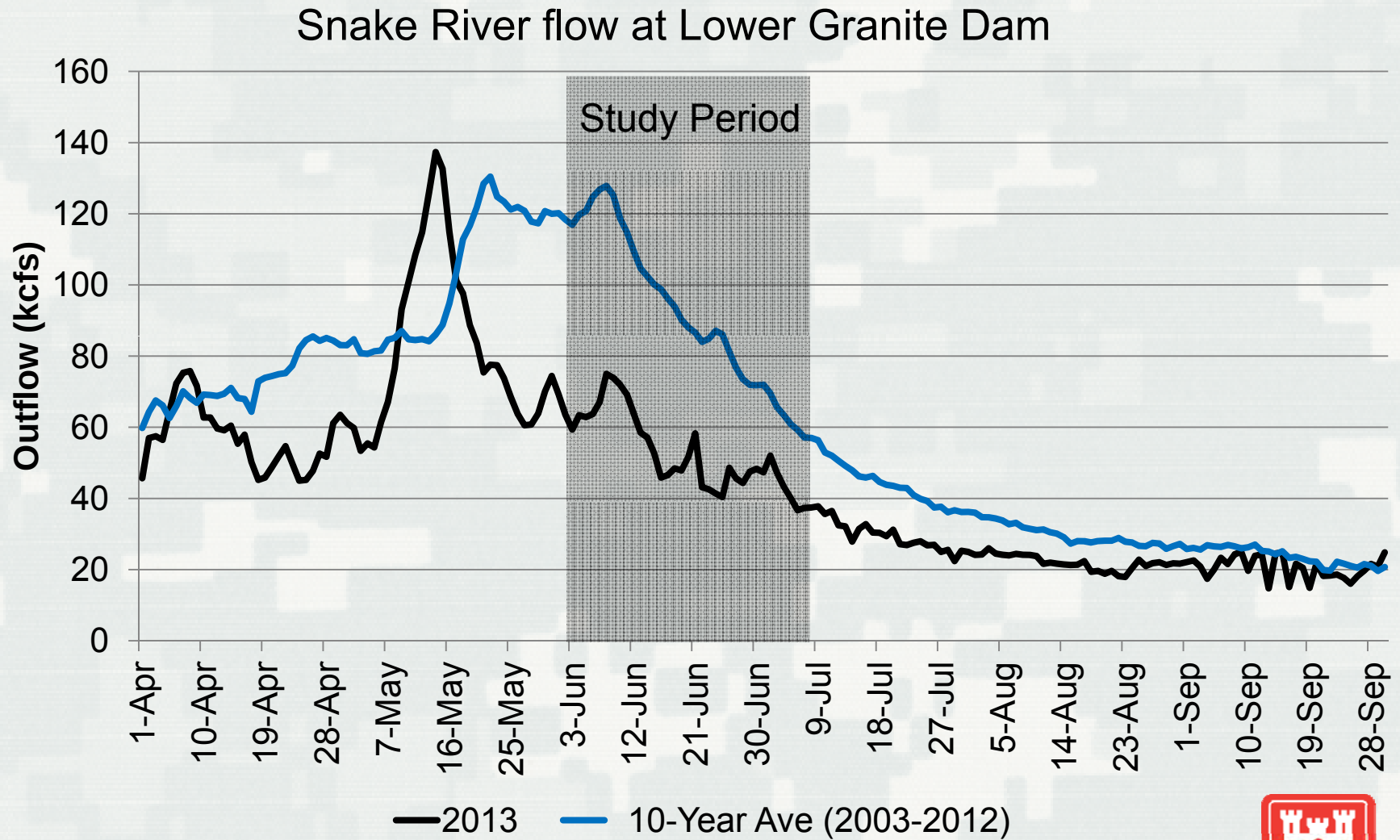


2013 Results – Representative Study fish

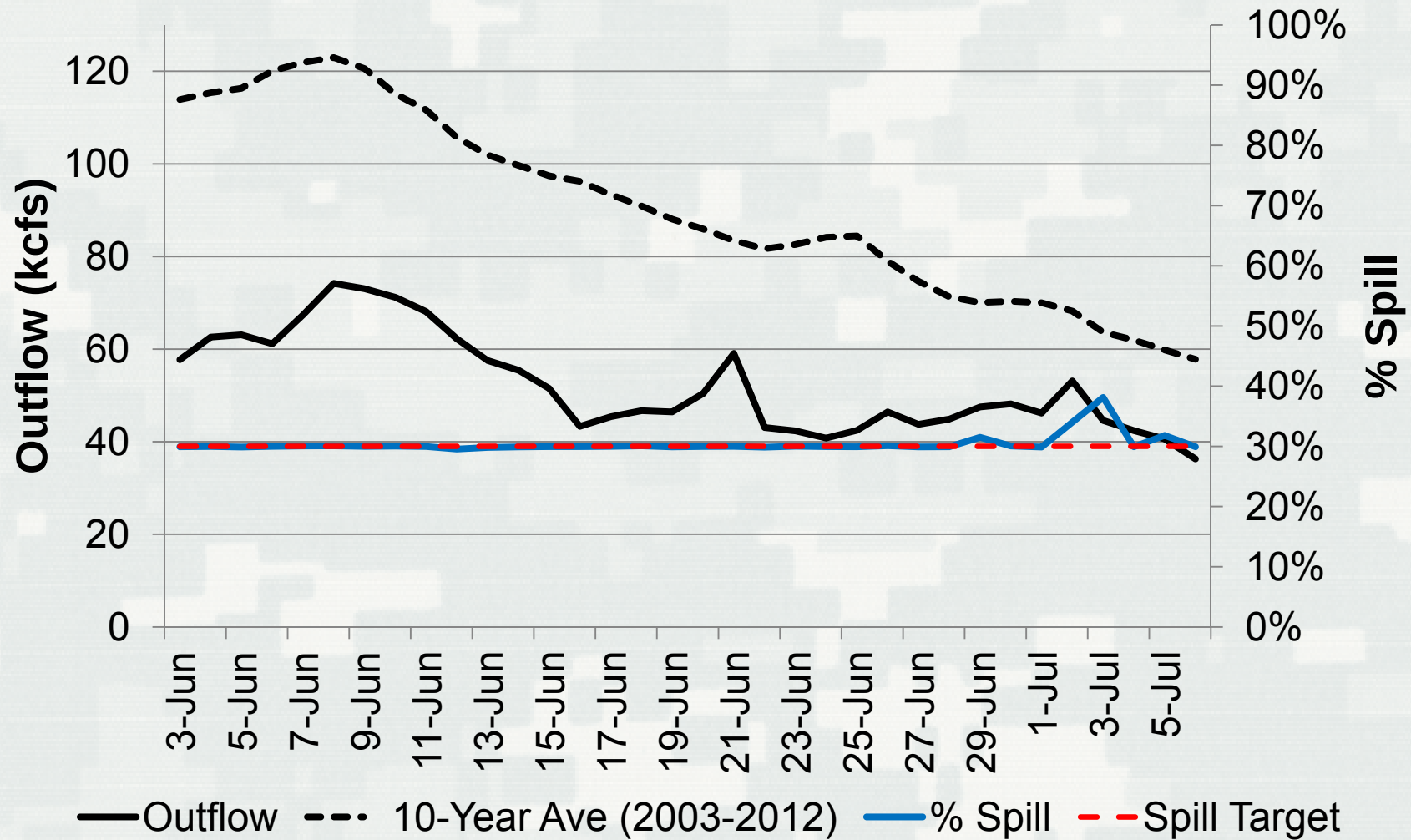
- Run timing – 77.5% of the Passage Index (6.5% to 84.0%)



2013 Results - Water Year – Lower Granite Dam Outflow



2013 Results – Little Goose Dam Conditions



2013 Results – Little Goose Dam

Metric	Target	2013
Dam Passage Survival	$\geq 93\%$ (SE $\leq 1.5\%$)	90.76% (SE 1.39%)
BRZ-BRZ Survival		90.07% (SE 1.39%)
SPE (%)*	58% to 84%	76.8%
FPE (%)		95.0%
FB Residence median (h)	≤ 6.8 to 16.3	3.7
TR Egress median (h)		1.2

*SPE = % Passage spillway, including spillway weirs



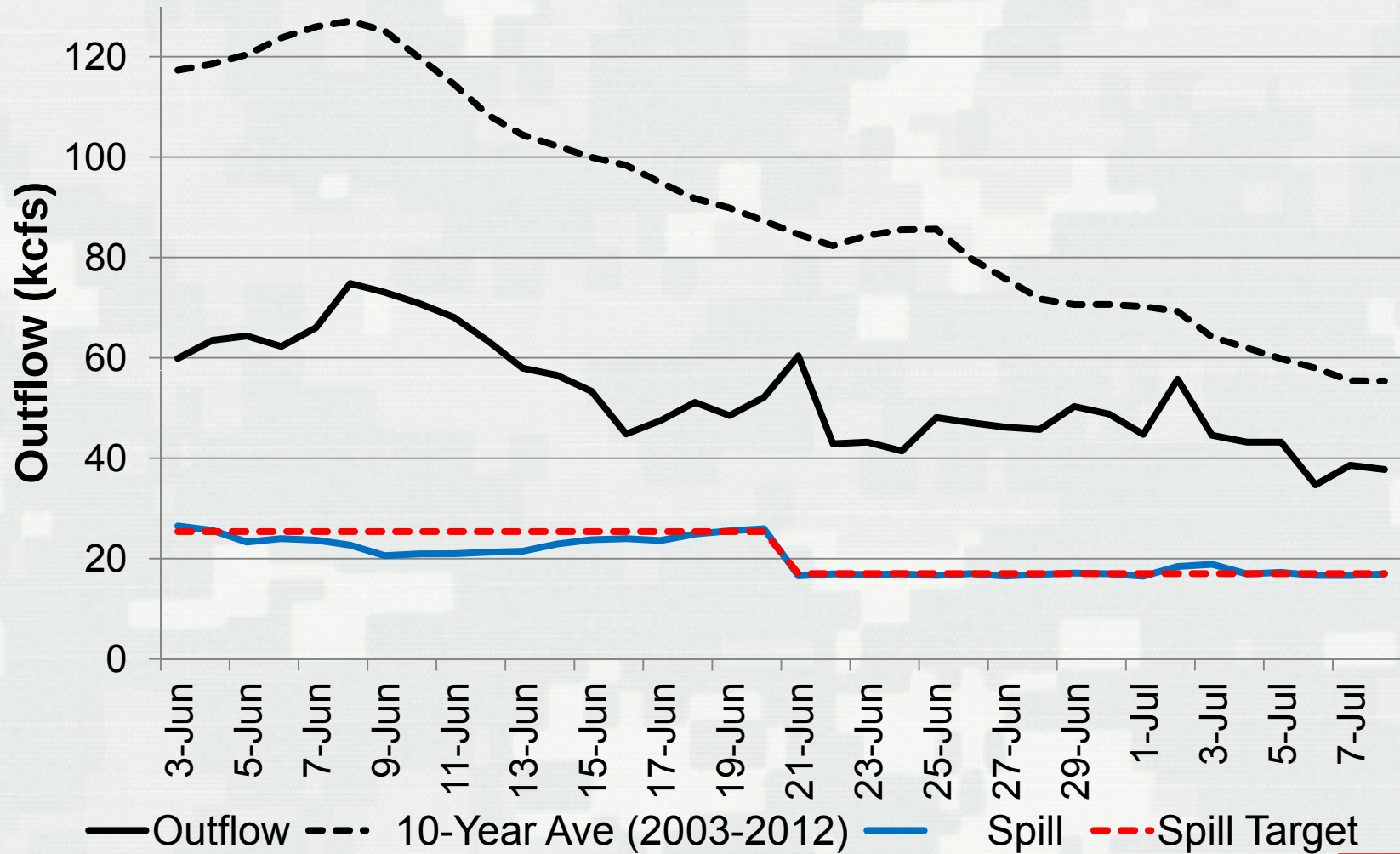
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2013 Results – Little Goose Dam Route Specific

Metric	Subyearling Chinook Salmon
Spillway Weir (surface spill)	% Passage = 65% % Survival = 91.4%
Spillway (deep spill)	% Passage = 12% % Survival = 91.1%
JBS	% Passage = 18% % Survival = 89.8%
Turbine	% Passage = 5% % Survival = 84.0%



2013 Results – Lower Monumental Dam Conditions



2013 Results – Lower Monumental Dam

Metric	Target	2013
Dam Passage Survival	$\geq 93\%$ (SE $\leq 1.5\%$)	92.97% (SE 1.05%)
BRZ-BRZ Survival		91.61% (SE 1.05%)
SPE (%)*	81% to 90%	89.1%
FPE (%)		95.1%
FB Residence median (h)	≤ 2.7 to 3.0	2.99
TR Egress median (h)		0.67

*SPE = % Passage spillway, including spillway weirs



2013 Results – Lower Monumental Dam Route Specific

Metric	Subyearling Chinook Salmon
Spillway Weir (surface spill)	% Passage = 68% % Survival = 94.1%
Spillway (deep spill)	% Passage = 21% % Survival = 91.8%
JBS	% Passage = 6% % Survival = 95.7%
Turbine	% Passage = 5% % Survival = 83.5%



2013 Dam Passage Performance Tests Summary

- 2 Survival Tests representing 1 stock at 2 dams (Little Goose and Lower Monumental Dams)
- Both met Precision Level Standard in the BiOp
- Spill Targets were maintained
- Columbia Basin Fish Accord Metrics were met
- Little Goose Dam test < BiOp Survival Standard
- Regional Discussions to determine if Lower Monumental Dam test met the BiOp Survival Standard



Future Plans

- 2013 Further analysis
 - Data mining of 2013 results
 - ERDC Modeling of 2013 Little Goose Dam conditions to develop a better spill pattern during low flows
- 2014 Performance Standard Testing
 - MCN – Spring (CH1 and STH); Summer (CH0)
 - JDD – Summer (CH0)





Kootenai Tribe of Idaho



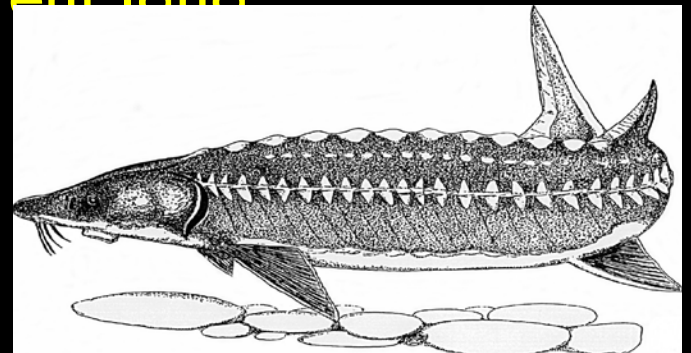
Kootenai River Habitat Restoration Program



Presentation for Columbia River Regional Forum
Technical Management Team
December 2013

What is the Kootenai River Habitat Restoration Program?

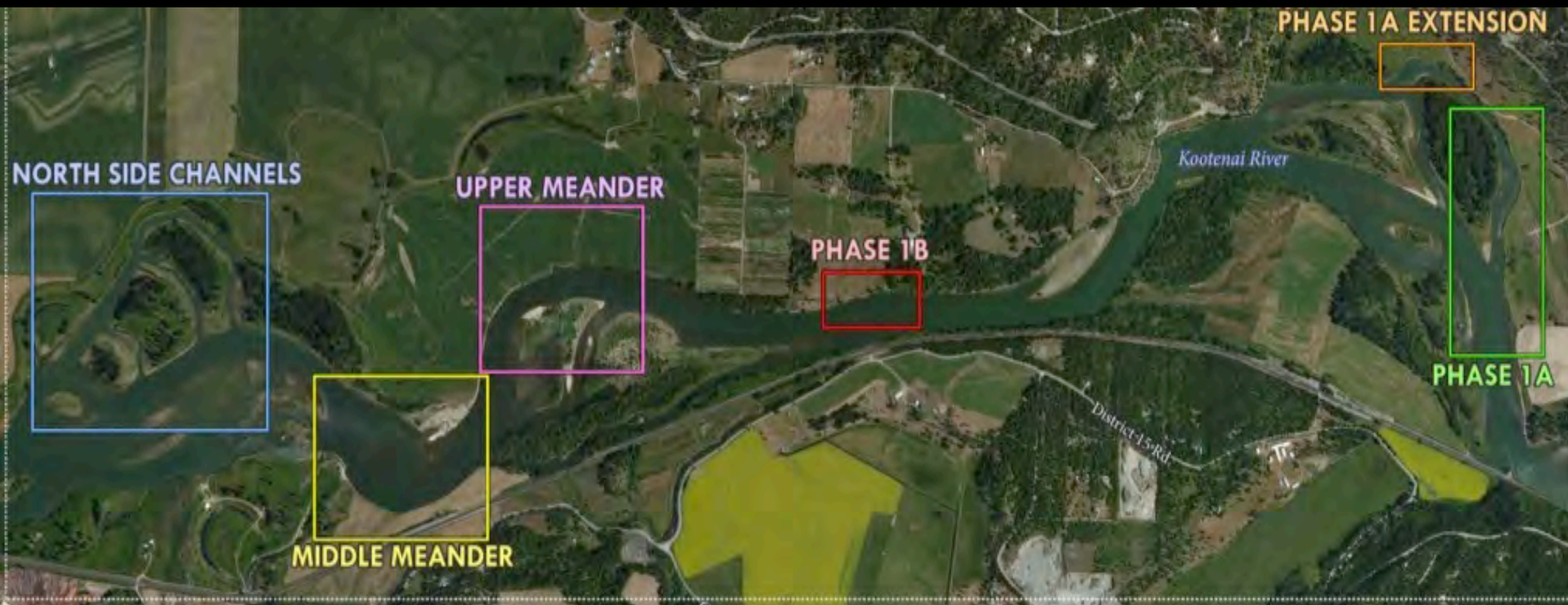
- Program consisting of multiple Kootenai River habitat restoration projects
- Projects are designed to restore and enhance aquatic habitat conditions for Kootenai River white sturgeon (and other native fish too)
- Projects are designed to restore habitat in ways that are consistent with current land uses and river operations



Kootenai River Habitat Restoration Program

2011 through 2013 projects

- 2011 – Phase 1A & Phase 1B
- 2012 – Upper Meander & North Side Channels
- 2013 – Middle Meander & 1A Extension



Major Types of Project Actions to Date

1. Pool forming structures & pool enhancement to encourage Kootenai sturgeon to migrate to upstream habitat & to provide holding habitat for sturgeon & other native fish
2. In river & bank structures (LWD) to create more diverse & complex habitats for sturgeon & other native fish
3. Side channel reconnection & floodplain creation or enhancement to enhance the food web & provide habitat for juvenile Kootenai sturgeon & other native fish
4. Riparian enhancement to enhance the food web & provide cover for native fish

2011

Phase 1A project during construction



2011 Phase 1A project site after construction



2012 Project

Upper Meander project construction



10/24/2012

2012 Project

Upper Meander project pile structure

Flow



2012 Project North Side Channels during construction



10/24/2012

2012 Project North Side Channels

Lower Side Channel





2013 Middle Meander project
Construction of mega pool



2013 Middle Meander project construction





Physical & biological monitoring

- The Kootenai River Habitat Restoration Program includes physical monitoring of all projects to determine if the project treatments are meeting identified physical objectives
- The Tribe is coordinating with Idaho Department of Fish and Game, University of Idaho, and other co-managers to collect data to determine the biological response to the habitat restoration projects

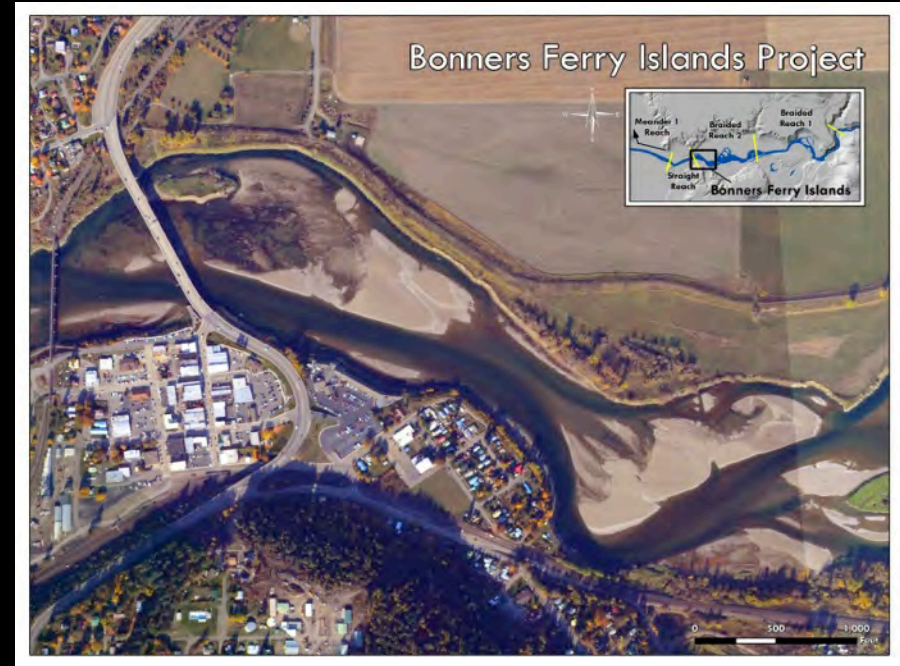
Upcoming projects – 2014

- Substrate Enhancement Pilot Project in existing sturgeon spawning areas
- Rock will be placed by barge (no SOR request)
- Includes two sites - Shorty's Island and Myrtle Creek with 1 acre patch at each site



Upcoming projects – 2015 & 2016

- Straight Reach & Bonners Ferry Islands Projects
- Construction sequence TBD. EA for projects in development. Will make SORs for both.



The Kootenai Tribe wishes to thank the Corps and members of the TMT!



The approved lower flows during construction:

- **Allowed for pool excavation**
- **Allowed for construction of spur dikes**
- **Facilitated placement of large wood structures**
- **Allowed for construction to be completed in one season**

Bonneville Powerhouse Two Turbine Operations Summary



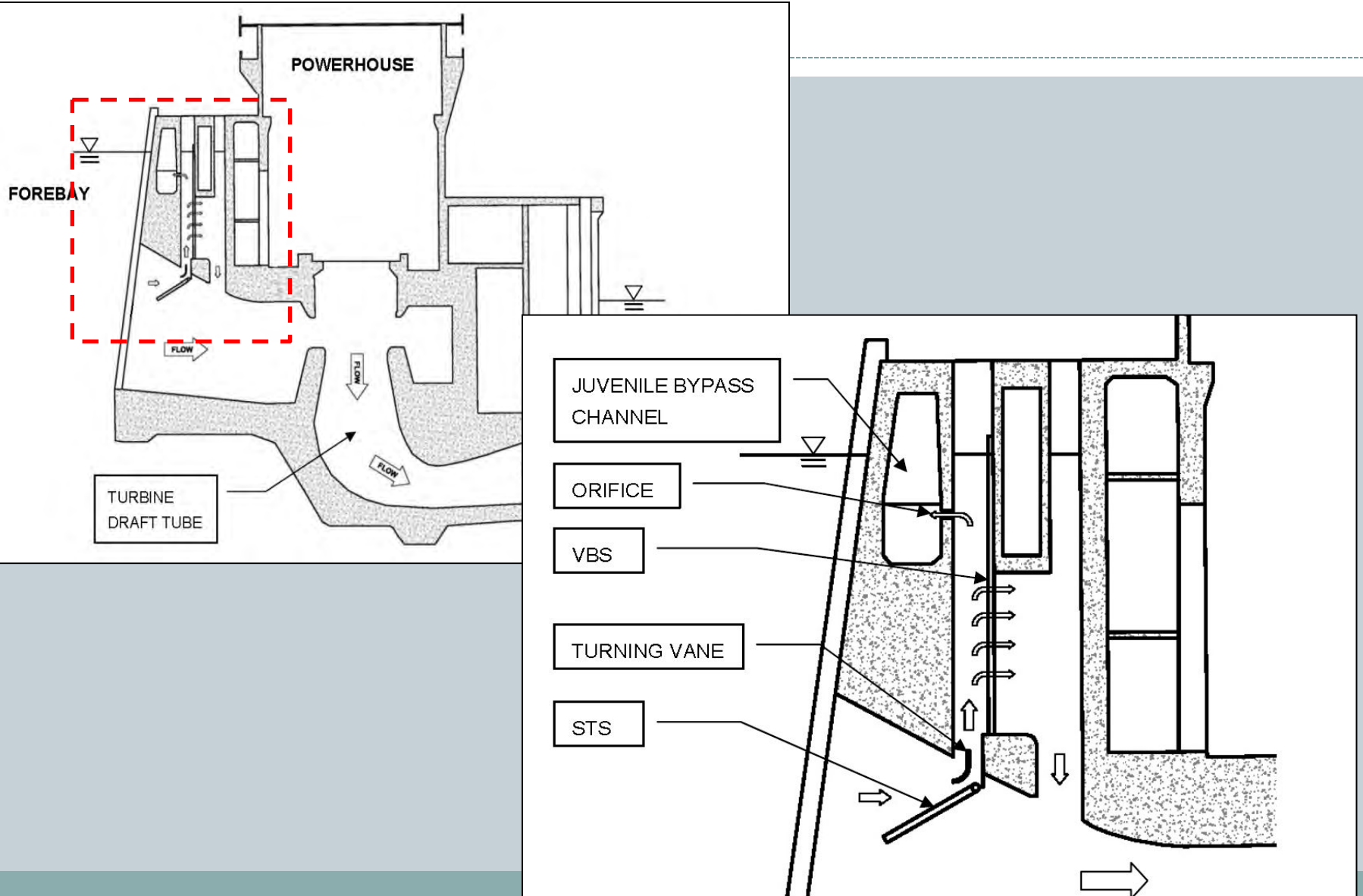
*PRESENTED BY THOMAS LORZ,
HYDRAULIC ENGINEER/FISH PASSAGE
COLUMBIA RIVER INTER-TRIBAL FISH
COMMISSION*

How We Got Here



- 1999 Bonneville Powerhouse 2 Bypass Relocation
- 2002 COE starts on FGE Improvements at Powerhouse 2 (Fully Implemented in 2007)
- 2008 – 2009 Second Powerhouse Fish Condition Testing Conducted (Debris limited testing in 2008)
- 2012 FPOM Forms Task Group to create a *change form* outlining possible operations at Bonneville until modifications at powerhouse 2 are complete
- 2013 COE Installs and tests TRD's (Turbine Reduction Devices)

Cross Section Of Powerhouse Two



Difference Between Unit Discharge and Flow Up the Gatewell



Unit Flow (ft ³ /s)	VBS Flow (ft ³ /s) no TRDs	VBS Flow (ft ³ /s) TRDs modeled
12,000	219	
15,000	272	
18,000	328	366

Review of 2013 Operations & Actions



- TRD's testing complete
- Change form for Bonneville Turbine Operations Submitted to the COE (Waiting for Response)
- System Operation Request (SOR) submitted on May 28, 2013 due to high descaling and mortality associated with sockeye (Partially Implemented)
- COE had Researchers Review Past Survival data for different turbine operations

Future Steps



- TRD testing – COE reviewing model and data. Will likely pursue other means to alter flows into the gatewell given mediocre TRD results
- Fish Passage Plan (FPP) change forms being reviewed and new ones due for the 2014 FPP
- Regional parties will review new data and continue to monitor fish condition in season
- Outcome of submitted change form will determine if TMT is still the primary forum where this issue will be dealt with.....

**COLUMBIA RIVER REGIONAL FORUM
TECHNICAL MANAGEMENT TEAM**

Year End Review

December 12, 2012

FACILITATORS' SUMMARY NOTES

Facilitator: Robin Gumpert

Notes: Emily Plummer

The following notes are a summary of the year-end review meeting and are intended to point out future actions or issues that may need further discussion at upcoming meetings. These notes are not intended to be the “record” of the meeting, only a reminder for TMT members.

Welcome and Introductions - DS Consulting Facilitation Team

The Facilitator, Robin Gumpert, welcomed the group to the Columbia River Technical Management Team Year End Review. She encouraged participants to use the YER as an opportunity to reflect and think critically and creatively about how the 2013 TMT experience can inform process and operations for 2014. The DS Consulting Facilitation Team provided comment sheets to be filled out during the presentations. The comment sheets will be used to capture lessons learned for future management and will be collected and compiled by the Facilitation Team for later TMT discussion.

2013 Conditions Review: What were the water, weather and fish conditions that existed throughout the year? How did this year compare to others? Is there something we can learn from this? Is there anything unique that bears sharing?

2013 Water Management Review - Kasi Rodgers, COE Division

Kasi reviewed the water and temperature profile for the year, describing 2013 as a relatively dry year despite what started out looking like a good water year with a wet spell from October through December 2012. Warm and dry weather started in January and continued through March; February, which is usually the wettest month, was dry in 2013. April brought cooler temperatures and peak runoff was in May with some rain on snow events. Flows dipped below average as temperatures rose with the first heat wave in June. July and August were warm and dry with only 25% of the average rainfall, lightening and resulting fires.

Parts of Idaho and some areas in Oregon saw severe drought in 2013. From April through August, the water supply forecast was average and steady. Mica operated below the flood control space, and Arrow came close to operating in the flood control space in April. Grand Coulee inflows would have exceeded the flood control space if they were not able to regulate inflows with upstream projects. Daily average flows at The Dalles peaked at 338kcfs, with peak unregulated flows at 503kcfs and average peak unregulated flows of 507kcfs. Overall, 2013 had the 49th highest flows recorded between 1929 and 2013, with 87Maf. It was noted that the shape of the forecast is vital in planning operations and that, through comparison of past water years and ESP forecasting, forecasters can help show shape.

2013 Weather Review and 2014 Forecast- *Kyle Dittmer, CRITFC*

Kyle reported on the annual weather forecast: his 2013 forecast was the 2nd best forecast that he has generated. Summer was dry and not too hot, with few air temperature records. Winter was below average as well, with a poor snow season. September brought a major rain event across the Northwest.

Moving into 2014, the Climate Prediction Center Forecast is showing near average precipitation with colder temperatures throughout the winter season. ENSO signals are suggesting a neutral year with El Nino conditions potentially shifting towards La Nina conditions. Kyle forecasts slightly warm, but near normal temperatures, high variability and extremes, with heavy rain events, dry spells and floods. Spring is expected to be wet, with an estimated 102Maf (101% of average) of water at The Dalles between January and July. Four snow events are likely between December and mid-March.

Fish Passage - *Charles (Charlie) Morrill, WDFW, & Brandon Chockley, FPC*

Adult summary

Charlie reported on adult fish counts for 2013-

- 2013 was a good year for some fish and a bad year for others.
 - **Fall Chinook** counts at Bonneville set a new record high for recent years
 - Coho counts at Bonneville although slightly better than 2012 were still only slightly more than half the 10 year average
- High water temperatures at Lower Granite had an effect on sockeye numbers
 - There was an abnormally large difference (~25%) in sockeye counts between Lower Granite and Little Goose.
- Steelhead counts at Bonneville were about the same as last year but only about 60 % of the 10 year average. Wild steelhead counts at Bonneville were up from 2012 and about 11 % below the 10 year average. At Lower Granite, Hatchery steelhead counts were only about 60 % of the 10 year average. Wild steelhead counts were about 77 % of the 10 year average.
- Lamprey numbers were also low in 2013; however, the Mid-Columbia counts seem to be improving, one potential cause could be pheromone emittance from juveniles
 - Lamprey had a difficult time passing The Dalles and the counts decreased between Bonneville and The Dalles
 - 19 lamprey passed Lower Granite
 - It was noted that lamprey counts that are taken during the day do not reflect the entirety of the runs. Day and night counts at Bonneville show around 85,000 passed; day and night counts at Lower Granite hit 180 versus 19 recorded during day only counts.
 - Only 1% of lamprey that passed Bonneville made it past Lower Granite.

	10 Year	2012	2013
<u>Spring Chin:</u> BON	A:141,700 / J:20,300	A:158,100 / J:7,600	A:83,300 / J:33,800

Priest Rapids	A: 13,200 / J:1,400	A: 19,500 / J:1,000	A:13,700 / J:1,300
Lower Granite	A:53,400 / J:9,900	A:66,400 / J:3,500	A:35,000 / J:2,000
Summer Chin: BON	A:87,500 / J:17,600	A:81,700 / J:12,200	A:93,100 / J:26,200
Priest Rapids	A:53,900 / J:2,600	A:50,700 / J:2,000	A:71,100 / J:3,200
Lower Granite	A:16,000 / J:5,600	A:13,200 / J:1,700	A:8,400 / J:7,600
Sockeye: BON	A:177,600	A:515,700	A:185,500
Priest Rapids	A:154,800	A:408,300	A:163,100
Lower Granite	A:613	A:470	A:757
Ice Harbor	A:425	A:453	A:895
Lo Mo	A:530	A:486	A:1,014
Little Goose	A:508	A:453	A:996
Steelhead: BON	A:363,800/W:111,300	A:234,900 / W:85,300	A:233,900/W:99,100
Lower Granite	A:179,000/W:43,900	A:110,100/W:31,200	A:107,700/W:33,600
Fall Chinook: BON	A:389,00 / J:61,200	A:350,200 / J:124,200	A:953,200 / J:11,100
Priest Rapids	A:36,900 / J:5,600	A:54,800 / J:10,500	A:263,980 / J:18,500
Lower Granite	A:18,900 / J:14,100	A:34,700 / J:22,000	A:56,600 / J:22,300
Ice Harbor	A:24,300	A:38,500	A:57,850
LoMo	A:22,000	A:33,500	A:53,400
Little Goose	A:19,200	A:34,800	A:55,200
Coho: BON	A:120,300	A:55,000	A:59,600
McNary	A:21,300	A:16,800	A:12,100
Lower Granite	A:2,700	A:2,400	A:2,100
Lamprey: BON	A:34,000	A:29,200	A:29,000
The Dalles	A:8,400	A:6,200	A:8,700
McNary	A:3,300	A:970	A:1,570
Lower Granite	A:32	A:48	A:19
Shad: BON	A:2.8M	A:2.4M	A:3.7M
McNary	A:923,000	A:675,000	A:1.2M
Hungry Horse	A:179,000	A:176,000	A:194,000

Juvenile Summary

Brandon reviewed passage timing of juveniles compared to ten-year averages:

Lower Granite:

- There was a short spill period over FOP between mid-late May
- Fish were collected and transported beginning in April
- Yearling Chinook timing was similar to the last 10 years
- Sockeye had a tight period, which is not uncommon; the 10% end date was in the end of April
- No Kokanee in 2013
- Coho timing coincided with peak flows; the majority of the Coho were hatchery fish
- Chinook timing was fairly normal with a spike in late October
- 2013 was the 3rd year that juvenile lamprey were recorded as a target species and were part of the PIT tag study

- Lamprey are escaping the sample tank and thus collection estimates are not accurate for Lower Granite; escapement was confirmed in 2013, however, also affected 2011 and 2012 estimates

McNary:

- Spill slightly exceeded FOP in May and June
- Yearly Chinook had an average year
- Steelhead had a double peak, with 50% by May 10th
- Sockeye timing was similar to the previous 10 years, however, the end of the run was a bit early, with 50% by May 16th
- Coho and Chinook had average years
- No Lamprey ammocoetes were sampled this year (only 1 sampled in 2012), it is uncertain why, however, may potentially be due to impact from screens

Rock Island:

- Yearling Chinook were pretty much on average, with a late beginning and 50% date on par with past years
- Steelhead peaked earlier than average, with 10% by May 16th
- Sockeye were average
- Coho were average, however, the run ended a bit early towards the end of May
- Chinook were average
- Not many Lamprey ammocoetes were collected, however, some macrophthalmia were collected

Bonneville:

- Chinook had a good and relatively average year, however, both the 10% and 90% dates were earlier than normal
 - The 10 year averages still reflect the 2009 Spring Creek Hatchery releases
- Steelhead were slightly earlier with a double peak
- Sockeye and Coho were the same as previous years
- Fewer Lamprey ammocoetes were collected than the last 2 years; not many macrophthalmia were collected past August

Brandon reported on noteworthy events of 2013: There was a decrease in Chinook and Sockeye mortality at Bonneville compared to 2012. The weighted average macrophthalmia mortality at Bonneville is lower than 2012, however, still high. And the weighted average sub-yearling Chinook mortality at Lower Monumental is higher than it has been in the last 12 years. Sub-yearling descaling at Lower Granite and McNary is high, in fact higher than the last 12 years at McNary. Descaling at Lower Granite was particularly high from August through October, it is unclear why.

Reservoir Operations Review: How effective were the proposed actions (SORs) at achieving desired results? What changes might be necessary to enhance results in the future? How did this year compare to others?

Libby Operations - Joel Fenolio, Corps Seattle District, Dave Wills, USFWS, & Paul Wagner, NOAA

Joel Fenolio reported that Libby Dam reached its peak pool for 2013 on July 6th, with an elevation of 2,457.74ft. June brought unprecedented rains, increasing reservoir elevations. Inflows between April and August were 111% of average.

The forecast will be updated prior to water year 2015 to tie in physical conditions and will no longer include climatic variables due to a lack of tele-connection between climatic conditions and the forecast. The new forecast will incorporate precipitation and snow-water-equivalent.

In addition to flood control, the two main 2013 BiOp operation goals were a double peak flow for sturgeon and lower outflows in September for the Kootenai habitat restoration project:

As a result of 2006 and 2008 BiOp revisions, it was agreed that the project aim to raise flows during the peak of the sturgeon pulse to spill up to 10 kcfs above powerhouse capacity to try and simulate the historical, pre-dam peaks. The first attempt was in 2010; 2011 had enough in river water that spilling up to 10 kcfs was not needed. Heavy flows in 2012 resulted in an even higher than seen in the previous two years on the 3 year experiment. With the three years of testing, there was no discernible change in sturgeon migration. In 2013, a double pulse operation was implemented: the first pulse was intended to assist migration and staging; elevations were held up to the second pulse which was intended to encourage spawning. In 2013 there was no spill test and a double pulse was implemented in May and June to see how sturgeon responded. The Corps was expecting to avoid double peaking after the sturgeon flows were extinguished, however, due to a large rainstorm in the upper basin they had to spill 10-11 kcfs because refill was reached sooner than expected. The rainstorm hit Canada hard, with 1/3 to 1/2 of the precipitation seen for the entire month on June 2012 (June 2012 was the record June for precipitation on record) of the total average rainfall delivered within 3 days.

Dave Wills reported that the double pulse operation was implemented well and more spawning occurred in a shorter amount of time towards the end of the 2nd pulse. Generally, they did not see a large effect in migration or spawning behaviors. However, they are still working to analyze the data. Next year, the same operation will be implemented to allow for data comparison. It was noted that the double pulse has a positive impact for other species. Dave also reported that more hatchery sturgeon were reported below Kootenai Falls than in previous years: over 70 were below the falls this year as compared to 32 in 2012 and 7 in 2011; they are currently monitoring these changes.

Participant Question: Are the sturgeon tagged?

Response: Yes, fish are tagged using Vemco and PIT tags. However, they are not yet monitoring movement.

Participant Question: Are age and spawning classes known for the sturgeon collected in 2013?

Response: Yes, this information can be derived from the PIT tags. Most of the sturgeon collected in 2013 were hatchery fish. It takes sturgeon 11 years to reach spawning age and the majority of the hatchery fish are not old enough for spawning.

Participant Question: Were you previously aware that the system could absorb that large of a precipitation input?

Response: The project was lucky that there was not a lot of snowpack when the heavy rains hit, if so, the project would have had to spill more. Forecasting is vital for the Libby operation, so refining the forecast to be as accurate as possible is important. The project adjusts reservoir space in June, however, weather is unpredictable and they had never seen this large of input in the last half of June prior to 2013. Large summer precipitation events coming from the Rockies and NW occurred in 2012 and 2013 and may be a new trend.

Joel reported on the Kootenai habitat work, which has been ongoing for the last three years and will continue through the next three years. For two months prior to the in-water work, two units were out for maintenance and only three units were running. In September, the in-water restoration work required that the project target 2,449'; the project released 8kcfs instead of the normal 6kcfs in September. For the 2014 season, the Kootenai project will focus on substrate restoration via barge and will not need a lower flow for in water work. TMT will set the elevation band in March and April.

Participant Comment: Montana would have like to hold the band stable from August through September. Once the flood control operation has been fulfilled, partners need to agree on outflows that meet the needs of the project and benefit downstream fish. One idea is to target an outflow instead of an elevation.

Hungry Horse Operations - John Roache, BOR

John reported that overall, Hungry Horse (HGH) was a little above average for both the forecasted and observed inflows. Throughout the last few years, early and higher April inflows have made the end of April target more difficult to meet. This year, HGH had to spill for a few days to help control refill; additionally, HGH had transmission restrictions which limited the hydraulic capacity of the power plant. John noted that due to farmland flooding in 2011 and 2012 and feedback from local landowners, NWS Missoula changed the flood stage at Columbia Falls from 14' (51,000cfs) to 13' (44,000cfs). The change in flood stage is not expected to have a significant impact on HGH operations and BOR will attempt to reduce HGH discharges when Columbia Falls stage exceeds 13'.

Participant Question: How and when are you going to shape the water that would have been moved?

Response: The water will still be released during the spring, however, may be reshaped by a few weeks during the spring period. The reduced flood stage will make operations a bit more challenging depending on flows.

Grand Coulee Operations - John Roache, BOR

John reported that the drum maintenance was deferred in 2013 and BOR also began overhauling the 3rd powerhouse units in 2013. A recent arc flash incident in the left powerhouse have taken the pumps and PGs out of service, fortunately it was outside of irrigation season so there is no impact to irrigation supply to the Columbia Basin Project. John also reported on the chum operation, noting that The Dalles forecast highly influences the April 30th flood control elevation at Grand Coulee. This past year drafting started in January in anticipation of near average

runoff, however, a drastic decrease of 12 Maf over 18 days in The Dalles water supply forecast meant that Grand Coulee did not have as much storage to draft out as expected. This caused a challenge for the project to find a balance between chum and spring migrants and resulted in a day by day operation for chum. The result was a reduction in the chum protection level in late February which was coordinated at TMT.

Upper Snake Flow Augmentation- *Ted Day, BOR*

The NOAA Fisheries 2008 Upper Snake BiOp requires that BOR provides up to 487 Kaf of extra water above Brownlee between April 3 and August 31, with the goal of providing at least 427 Kaf in all but the driest of years. Where possible, BOR attempts to shift flows from August to earlier periods, while staying within the parameters of the Nez Perce Agreement and state water law. Typically, the extra water is derived from a combination of rented water, natural flow water right purchases and leases, and uncontracted storage. However, 2013 was a bad water year for all of the Upper Snake basins, making it very challenging to meet the 427 Kaf target. The Snake and Boise reservoirs were not able to refill completely and there was limited water available for rent; the majority of the Snake and Boise flow augmentation water came out of the system in May. The Payette system did refill, but less rental water was available than in recent years. In order to hit the 427 Kaf target, BOR had to utilize an additional 33 Kaf from the Payette Basin normally dedicated to maintaining minimum pools and winter releases. In addition, BOR had to use a large portion (83 Kaf) of its Palisades power head account. This was the first year since 2007 that BOR was not able to provide the full 487 Kaf.

Dworshak Spring/Summer Operations - *Steve Hall, Corps Walla Walla District*

Steve noted that it was a dry year for Dworshak, between 70-80% of normal. The water season started off with a steady decline and then an increase in precipitation in April; the forecasts tracked well. The BiOp requires that the project operates to flood control as much as possible, targeting 1, 535' end of August; this target was met. Additionally, the Nez Perce Agreement requires 200Kaf release resulting in 1520' end of September; this target was also met.

There was not a shift in flood control to Grand Coulee because the early and short runoff period resulted in insufficient inflow to fill above flood control and allow for the shift in space. Even still, they were able to implement the spring augmentation. The project refilled early in June, which was possible due to early runoff and no flood concerns. Temperature augmentation took place at the end of June; there were 2 temperature exceedences that exceeded the BiOp temperature requirements. This was due to a limited amount of water to work with to augment temperatures (the project ran out of water in September), Hells Canyon releases, and a wind event that warmed the water. There were no TDG exceedences.

Review of Specific Operations: What was learned about specific operations that were requested by TMT members or other regional entities? How effective were these operations in achieving the intended goal? Should they be continued or modified in future years? Why or why not?

Juvenile Salmon Survival for 2013, Juvenile Transport Adult Returns - *Steve Smith, NMFS Science Center*

Steve provided an update on juvenile migration conditions, travel time and smolt survival. The Spring 2013 had warmer than average water conditions, higher than average spill, low flows, and

a shorter migration time. Smolt spring survival rates were below average, with a brief peak in May. Sub-yearling Chinook survival was above average, except at Lower Granite. Sub-yearling Chinook survival from the Snake River Basin hatcheries was 66.7% and 55.5% from the Upper Columbia hatcheries. Steelhead survival in the Upper Columbia was 38.4%; both species survival rates were below average in the Upper Columbia. Sub-yearling Chinook tagged at the Snake River traps had low reach survival estimates; NOAA is unsure why estimates are low. Steve reported that there were large differences in Steelhead survival in the Lower Monumental to Ice Harbor reach, as well as the McNary to Bonneville reach. This could be due to an assumption violation in the model, however, that was not confirmed. Overall, the sub-yearling Chinook survival was average, at 52.5%, and Steelhead were the lowest in the last 5 years, with 50.1%.

The transportation study includes PIT tagged yearling Chinook and Steelhead that are collected at Lower Granite and either transported or bypassed in-river. Over 1/3 of the wild and hatchery smolts were transported in 2013: 36% of wild Chinook, 31% of Chinook, 40% wild Steelhead, and 36% of hatchery steelhead. Due to improved in-river conditions, the benefit of transportation was reduced between 2008-2011. In June 2013, sub-yearling Chinook were tagged and released upstream of Lower Granite, in this sample, bypassed fish had higher survival rates than transported fish.

Bonneville Turbine Operations, SOR 2013-3 Summary, Tom Lorz, CRITFC

Tom reported on the turbine reduction devices (TRDs) installed in PH2 at Bonneville. The TRDs were installed in 2013 as a result of a 2012 change form requested by FPOM, aimed at minimizing juvenile descaling and mortality in PH2. He noted that there was a slight increase of fish moving through PH2 after installation of the TRDs, however, there was still significant Sockeye descaling. In May, FPAC submitted a SOR to address the Sockeye descaling and mortality; the SOR was partially implemented. Additionally, a change form was submitted for the turbine operations; however, it is still pending. Another change form will likely be submitted in 2014. Moving forward, there will need to be more modeling and analysis of the TRDs in order to help determine a long term solution that meets both TDG and BiOp requirements.

Performance Standard Testing, Eric Hockersmith, Corps Walla Walla District

Eric reported on the performance standards outlined in the BiOp which the action agencies are required to achieve and maintain at all of the projects. He noted that the standards require that there is a 96% passage survival rate for spring migrants (yearling Chinook and Steelhead), and 93% for summer migrants (sub-yearling Chinook). In 2013, passage survival was tested at Little Goose and Lower Monumental on the Snake; the Lower Columbia projects were not tested. For the test, run of the river juveniles were collected and tagged. They collected fish from June to July, testing 77.5% of the out migrating sub-yearlings. Snake flows during the study were low; it was the 9th driest June in the last 85 years. Eric noted that at Little Goose there was not a lot of delay in the forebay, however, the tailrace egress took longer this year. Predation increased due to the longer tailrace egress rates; it is unclear if the predation was from fish or birds. Survival at Lower Monumental was higher than at Little Goose because there was less tailrace egress delay. Regardless, for both of the projects tested, the BiOp Precision Level Standard, spill targets, and Columbia Basin Fish Accord metrics were met. The BiOp survival standard was not met at Little Goose (90.76% survival) and the region is still working to determine if the survival

standards were met at Lower Monumental (92.97% survival). The 2014 performance standard testing is planned for McNary (spring and summer migrants) and John Day (summer migrants).

Lower Granite Adult Passage Delay, *Steve Hall, Corps Walla Walla District, Doug Baus, Corps RCC, Russ Kiefer, IDFG*

Steve recapped the summer adult passage delays at Lower Granite. Warm winds in July mixed with surface water, causing temperatures in the Lower Granite forebay to increase. Water from the forebay feeds into the adult ladder, this caused the ladder temperatures to increase as well. Pumps were utilized to mix the surface water with deeper, colder water, however, despite some temporary relief, warm air and water inputs caused water temperatures in the forebay to warm to a depth of 50', causing temperature exceedences. Water that was provided from Dworshak was warmed from mixing with warm water from Anatone and additional cold water from Dworshak was not available due to a lack of water and need to maintain the Nez Perce flow period. Additionally, during the month of August there were outages associated with the roof repair as well as maintenance associated with unit 1. TMT worked diligently to address the water temperatures issues, including: unit priority modification, day and nighttime spill operations to the gas cap, and pumps in the forebay. Despite the efforts, the water remained warm until air temperatures cooled and there was an increase in precipitation. Doug noted that the region will need to continue to work together to identify how to adjust operations in the future and potential long term solutions via structural modifications. It was noted that modifying the pumps is something that may be addressed in the near term.

Russ reported on adult passage delays and impacts, noting that there were significant delays between Ice Harbor and Lower Granite. Steelhead had some delays, however, were able to catch up; fall Chinook were delayed; and Sockeye experienced extreme delays. The delays for Chinook and Steelhead were similar, however, at different time periods. Russ was uncertain as to what allowed the Steelhead and Chinook to break after the delay. He noted that when the Snake River temperatures rise, the fish stray into the Upper Columbia and warm water issues confront the fish in the Upper Columbia. Although the fish were freed, only one Sockeye made it to the Snake Basin. Around 25% of the fish from Lower Granite made it to the Snake Basin.

Participant Comment: Maybe changing the July operation to include trapping and hauling at Ice Harbor would help.

Response: This cannot be done efficiently. Additionally, it is preferable to mimic the natural migration instead of an artificial migration.

Participant Comment: Reshaping Dworshak water may hedge against the high temperatures in the future.

Other Lessons Learned? Given the review of conditions, decisions and actions throughout the day, what are the overarching lessons that could impact future work of the TMT? Are there themes that might need further discussion at a future TMT meeting or other regional work group?

Participants were given time to reflect on the lessons learned during the Year End Review session and were asked to record the lessons learned on the comment sheets. The comments will

be compiled and provided to TMT for review and discussion in early 2014. Additionally, the group shared highlights from the day:

- The visual modeling provided in the Lower Granite adult passage delay presentation was helpful in clearly telling the story.
- The projects and partners have improved data and monitoring, allowing more detailed information to help identify solutions to issues.
- The water supply forecast has a large impact on operations; however, it is very unpredictable. The region should spend time working to refine forecasting.
 - The ESP is shifting from a 3 day to 5 day forecast.
 - An update on the ESP forecast change will be provided at the January TMT meeting.
 - The Columbia River Forecast Group is also working to refine forecasting and can report to TMT.
- The 2013 water year looks similar to the 2001 water year; sun spot predictions also look similar for those years.

[Facilitator's note: the final question will be asked again at a future TMT meeting, allowing the group time to think about what they saw, heard and thought about at today's meeting]

Present for all or part of the meeting:

Doug Baus (Corps), Richelle Beck (Grant County PUD), Scott Bettin (BPA), Brandon Chockley (Fish Passage Center), Ted Day (Reclamation), Kyle Dittmer (CRITFC), Scott English (Corps), Berry Espenson (Columbia Basin Bulletin), Joel Fenolio (Corps), Russell George (Water Resources Consultants), Steve Hall (Corps), Laura Hamilton (Corps), Pete Hassamer (Idaho), Eric Hockersmith (Corps), Russ Kiefer (ID), Jim Litchfield (MT), Tom Lorz, (CRITFC/CTUIR), Agnes Lut (BPA), Sara Marxen (public), Mary Melema (BOR), Charles Morrill (Washington), Tony Norris (BPA), Christine Peterson (public), Bill Proctor (Corps), John Roache (Reclamation), Kasi Rodgers (Corps), Tom Skiles (CRITFC), Steve Smith (NMFS Science Center), Dave Statler (Nez Perce Tribe), Joel Turkheimer (?), Pat Vivian (Note taker), Paul Wagner (NOAA), Dave Wills (USFWS), Lisa Wright (Corps)

Robin Gumpert, Jan Kelley, Emily Plummer and Donna Silverberg, DS Consulting Facilitation Team

**Columbia River Regional Forum
TECHNICAL MANAGEMENT TEAM – OFFICIAL MINUTES**

2013 Annual Review of Lessons Learned

December 12, 2013

Notes: Pat Vivian

1. Introduction

The 2013 TMT year-end review was chaired by Doug Baus (COE) and facilitated by Robin Gumpert (DS Consulting). Representatives of the COE, BPA, Washington, CRITFC, Idaho, NOAA, USFWS, Montana, BOR, Nez Perce, Idaho and others participated. This summary is an official record of the proceedings, not a verbatim transcript.

The purpose of this review was to provide an opportunity for TMT members and other interested parties to examine management decisions and operations made during the 2013 passage season in search of lessons learned that could enlighten the 2014 decision-making process.

2. Conditions Review

What were the water, weather and fish conditions that existed throughout the year? How did this year compare to others? Is there something we can learn from this? Is there anything unique that bears sharing?

2a. Water Management Review. Kasi Rodgers, COE, reviewed weather and water conditions and system operations in 2013. The year started out with a plentiful water supply. Monthly precipitation in 2012 was almost twice normal, which augured well for 2013 fish runs.

However, by December 2012, regionwide water supplies were slightly above normal and temperatures were warm. Then January 2013 turned completely dry, snowpack dropped by 16%, and February 2013 continued the dry trend with only 55% of normal precipitation basin-wide. Conditions in March 2013 were warm; April was cold and rainy. May brought peak runoff conditions early in the season, the result of a region-wide heat wave that hit the Pacific Northwest and Southwest simultaneously. After a second heat wave in July, snowpack throughout the Columbia River basin was depleted. Conditions remained warm and dry, with only 25% of normal precipitation basin-wide in July and August. Dry lightning ignited many wildfires in August.

While precipitation overall for 2013 was around 100% of normal, that statistic fails to reflect big disparities throughout the region. Some areas in the Snake River basin experienced severe drought in July, although 2013 was labeled a typical year.

The official COE forecast, based on the fifth working day of the month, was 105% of normal in January and never dropped below 90% of normal for the rest of the year. It ended with 87 MAF at The Dalles, about 99% of normal flows. RFC forecasts were generally accurate all year long.

Mica Dam finished the year at an elevation far below its flood control space requirement. The Dalles Dam, a measuring point for system flood control, had a peak unregulated flow of 507 kcfs. (Peak unregulated flow represents what flows would have been with no dams in place.) This year, actual peak flows at The Dalles were 338 kcfs during the first heat wave in May. This year had the 49th highest flow volume from 1929-2013, with an April-August runoff volume of 87 MAF at The Dalles.

Questions and comments:

- **Q:** Are the differences between actual flood control elevations and the required flood control elevations a management issue, or are other factors involved besides flood control (Dave Statler, Nez Perce Tribe)? **A:** At Libby, if there is a December January draft and inflows don't match minimum flows, there will be extra draft (Bill Proctor, COE). Mica Dam, which drafted heavily for power, also had a complete powerhouse outage during the freshet in May-June and drafted deeper into its reservoir. This is not unusual for Mica in spring.
- **Q:** Regarding the 2013 water supply forecast at The Dalles, given that the critical time for water availability is the migration period from March-May, what was the operational decision process this year? How did January-February precipitation and snowpack influence the decision on when to start refilling projects? (Pete Hassemer, Idaho) **A:** While the RFC in general could better answer this question, the COE in January and February 2013 started inquiring when the projects should be refilled (Kasi Rodgers, COE). Some water management data points don't show in the analysis posted online for discussion, and the Action Agencies keep adjusting operations based on what is known at the time (Tony Norris).
- **Comment:** The ESP forecasts are timely for water management purposes, but shape can be critical if not predicted correctly (David Wills, USFWS).

2b. Weather Review in 2013 and Forecast for 2014. Kyle Dittmer, CRITFC, gave a presentation. While 2013 was extremely dry, it could have been hotter given the prevailing conditions. Precipitation throughout the year was below average. There were three major snow events and an inch of snow in the Portland area. It was a poor year for snowpack. The 2013 water supply forecast was 102 MAF, 92% of normal, which came close to the actual amount of 97.7 MAF. The December forecast is for below normal temperatures across the Northwest over the next several months, with slightly more precipitation in Montana than normal.

In terms of La Nina/El Nino cycles, which are related to sun spots and sea surface temperatures, the current sun spot cycle is peaking. This leads to La Nina events. Before the cycle peaks, El Nino events are more likely. Sun signals over the past 3-4 years have been unusual, with a trend toward La Nina conditions. Typically this would result in cooler, wetter conditions in the Northwest, but the sun signal is indeterminate at this time.

In early 2013, conditions briefly veered toward El Nino for one month, while in recent months the Northwest has moved toward cooler and wetter La Nina conditions. This suggests that 2014 could be a mirror image of last year, as wet as 2013 was dry. In general, the trend is toward ENSO-neutral conditions with more variability in weather.

The forecast for 2014 is for near-normal temperatures, near-average precipitation, and possibly a higher unregulated flow than in 2013. Flows in spring 2014 are likely to be 105-115% of normal, with high variability in the forecast and heavy rain events interspersed with dry spells.

The CRITFC preseason forecast for 2014 is 102 MAF for January-July on the Columbia River, 101% of normal. The RFC forecast is 95 MAF for the same period.

Questions and comments:

- **Q:** Would you characterize the weather above Lower Granite Dam last summer as not being hot? (Charles Morrill, Washington) **A:** Heat spikes came and went quickly, which was unusual (Kyle Dittmer, CRITFC).

2c. Fish Passage Conditions Review. Charles Morrill, Washington, gave an adult salmon and lamprey presentation, followed by a presentation on juvenile passage by Brandon Chockley, FPC.

2c (i). Adult salmon and lamprey passage summary: Morrill reported that 2013 was a good year for some species but not for others.

- Spring chinook adult passage at Bonneville dropped to 83,000 this year compared to a 10 year average of 141,000. The 2013 count is down from 158,000 in 2012. The 2013 Bonneville jack return was 33,800 which was above the 10 year average of 20,300. In the past, jack returns have been associated with good adult returns the following year. However, that is no longer the case for spring chinook. The 10 year average for spring chinook at Lower Granite is 53,400 fish. This year, 35,000 adult spring chinook returned to Lower Granite.
- Summer chinook returns to Bonneville were 93,000 in 2013, exceeding the 10 year average of 87,000 and the 2012 count of less than 82,000. Summer chinook jack returns to Bonneville in 2013 were 26,200 compared to a 10 year average of 17,600. The 2013 summer chinook jack return was more than double that of 2012.

- Sockeye returns at Bonneville broke records in 2012 with almost 516,000 fish. The 2013 count was 185,000 adults, just above the 10 year average of 178,000. Priest Rapids sockeye originating in the Upper Columbia broke records last year at 408,000 returns, compared to a 10 year average of 155,000. This year's count of 163,000 fish is slightly above the 10 year average.
- Sockeye returns at Lower Granite were 757 fish this year, compared to a 10 year average of 613 fish and a 2012 count of 470 fish. It was noted that in 2013, approximately 25% of the sockeye run was lost between Little Goose and Lower Granite dams. Temperature increases in the Snake River tend to hit sockeye hardest.
- Like sockeye, fall chinook returns at Bonneville had a record-setting year, with 953,000 adults compared to a 10 year average of 389,000 adults. The 2012 count was only 350,000. The 2013 fall chinook jack return was 111,000 compared to a 10 year average of 64,000.
- Fall chinook also had a good year at Lower Granite, with 57,000 adults returning, compared to a 10 year average of almost 14,000 adults. Fall chinook jack returns were 22,000 in 2013, very close to the 2012 count. The 10 year average is 14,000 fall chinook jack returns.
- Steelhead returns to Bonneville were disappointing in 2013, with only 234,000 compared to a 10 year average of 364,000 adults. The wild component count also dropped, with only 99,000 this year compared to a 10 year average of 111,000.
- Steelhead returns to Lower Granite were 179,000 for the 10 year average and 108,000 in 2013, compared to 110,000 in 2012. The wild component was 34,000 fish at Lower Granite this year, compared to a 10 year average of 44,000. The steelhead B-run took a bigger hit this year than the A-run.
- Coho passing Bonneville were only 60,000 this year, half the 10 year average of 120,000. Coho passing Priest Rapids were only 12,000 this year, compared to a 10 year average of 21,000. At Lower Granite, the 10 year average for coho adult returns is 2,700, compared to the 2013 count of 2,100 adults.
- Lamprey passage was similarly disappointing. The 10 year average at Bonneville is 34,000 adults; this year it was only 24,000, and last year, 29,000. Adult lamprey have a particularly difficult time getting past The Dalles; this year's count was 8,700 adults, an improvement over the 2012 count of 6,200. The 10 year average at The Dalles is 8,400 adult lamprey returns.

- Shad counts at Bonneville were 3.7 million this year, compared to a 10 year average of 2.8 million. Shad counts at McNary were 1.2 million this year, compared to a 10 year average of 923,000. Shad counts on the Snake River at Ice Harbor were 194,000 this year compared to a 10 year average of 179,000. The 2012 shad count at Ice Harbor was 176,000.

Morrill will provide a final update on run sizing at the Columbia River mouth when this year's data are all summarized. The data presented today are preliminary and subject to revision.

Questions and comments:

- **Comment:** Lamprey counts at Bonneville are based on day counts only, which don't give a clear picture of adult lamprey passage. For example, at Lower Granite the estimated passage would be 180 lamprey according to the day and night counts combined, instead of 119 according to the day count only. Suggest the Action Agencies consider overall adult lamprey passage efficiency from Bonneville to Lower Granite, which is currently around 0.2% (Dave Statler, Nez Perce Tribe).
- **Q:** Do the mid Columbia counts for lamprey indicate that passage is improving? (Paul Wagner, NOAA). **A:** There's no clear answer on this at present (Morrill).
- **Q:** Are there any patterns in hatchery vs. wild jack returns that could affect the 2014 run forecast? (Christine Peterson, BPA). **A:** Probably a better correlation for jack returns would be fall chinook, not spring chinook (Morrill).

2c (ii). Juvenile fish passage summary: Brandon Chockley, FPC, reported and gave a presentation showing returns in relation to flow and spill at the various projects. This year he added a black line showing court-ordered FOP spill at Lower Granite to help identify periods of spill that exceeded FOP requirements.

Lower Granite:

- Yearling chinook run timing in 2013 was similar to that of the past 10 years. The 90% passage date for subyearlings was a little earlier this year than the 10 year average. There was a brief period of spill above FOP at 20 kcfs at Lower Granite only. Fish collection began at Lower Granite on April 27, and the first barge left on April 28. Chockley noted that about 18% of spring chinook and 28% of steelhead had already passed Lower Granite this year before transport started.
- Sockeye timing at Lower Granite was tight this year, which is not unusual. The 10% passage date was May 15. When Dworshak spills in spring, kokanee may pass downstream and be counted at Lower Granite as sockeye. However, this year there was no spring spill from Dworshak, so no kokanee reached Lower Granite. This skews the 10 year average for sockeye at Lower Granite.

- Subyearling chinook passage was quite normal, with a 50% passage date of June 9 compared to the 10 year average of June 10. There was a spike in subyearling chinook numbers late in October 2013.
- This is the third year in a row that juvenile lamprey passage was monitored as a target species. Past years' suspicions that lamprey are escaping the sample tank were confirmed this year when fewer PIT tagged fish were counted leaving the sample tank than entered the previous day. This observation applies to both *macrophthalmia* (actively migrating lamprey that have eyes and mouth) and *amocetes* (juveniles in larval form). Because of escapement at the sample tank, juvenile lamprey counts since 2011 are considered to be underestimated.

McNary:

- Despite spill in excess of FOP levels at McNary, 2013 was an average year for yearling_chinook timing.
- Steelhead passage had a double peak, with a 50% passage date of May 5 compared to the 10 year average of May 15.
- Sockeye had a 50% passage date of May 16, similar to recent years. However, this year's 90% passage date of May 25 for sockeye preceded the 10 year average which is in early June. Although the juvenile sockeye run started early this year, the beginning and middle of the run timing was more normal.
- Coho and subyearling chinook had an average year at McNary in 2013. It was noted that McNary passed almost no juvenile lamprey in 2013.

Rock Island:

- This was an average year for yearling chinook passage at Rock Island Dam. The 10% passage date was later than the 10 year average, but the 50% passage date was close to normal and the 90% date landed right on the 10 year average.
- Steelhead passage occurred earlier than the 10 year average, with the 10% date on May 16.
- Sockeye and coho had an average year at Rock Island.

Bonneville:

- Yearling chinook had a good year, with a bit of extra spill above FOP levels in mid May and a 90% passage date a bit earlier than the 10 year average.

- Steelhead passage enjoyed a peak at Bonneville, with slightly earlier timing than the 10 year average.
- Sockeye and coho passage at Bonneville were similar to previous years.
- Passage data for subyearling chinook are skewed by the fact that the March release from Spring Creek Hatchery was eliminated in 2009.
- This year brought a lot fewer lamprey to Columbia sites in both the amocete and macrophthalmia form.

The most noteworthy passage event of 2012 was significant elevated mortality of subyearling chinook and sockeye at Bonneville. Mortality levels in 2013 were more normal compared to the past 10 years. (Mortality means sample mortality at the projects, not survival estimates.) According to these estimates, subyearling chinook and sockeye did better this year at Bonneville than in 2012.

Another noteworthy event is the weighted average descaling rate for subyearling chinook at Bonneville, which exceeded 1% this year for the second time in 11 years. Descaling rates at Lower Granite were similar to 2012. Clearly, something caused elevated descaling rates of subyearlings at Bonneville in August and September of the past two years. There was discussion of times and species most affected by descaling.

3. Reservoir Operations Review

How effective were the proposed actions (SORs) at achieving desired results? What changes might be necessary to enhance results in the future? How did this year compare to others?

3a. Libby Operations Panel Discussion. Joel Fenolio, COE Seattle; David Wills, USFWS; and Paul Wagner, NOAA, gave a retrospective of Libby operations this year. They discussed winter elevation targets and forecasts, spring impacts on sturgeon and salmon, and summer flows and elevation targets including the Kootenai Tribe's ongoing habitat work for sturgeon.

3a (i). Winter elevation targets and forecast modifications: Joel Fenolio gave a presentation and led a discussion of possible modifications to Libby operations. There was about an 800 KAF swing between the Libby forecasts for 2011 and 2012.

The forecast for April-August 2014 runoff volume was 5500 KAF, which set the end of December flood control elevation at 2426 feet, a full relaxation. (If the forecast is for more than 5900 KAF, the end of December target is interpolated between 2411-2426 feet.) Full relaxation will take the Libby reservoir elevation higher than ever before by the end of December; the effects of this remain to be seen. The COE is currently in the process of updating the forecast method for Libby using physical parameters such as snowpack and precipitation.

There were two major operational goals at Libby this year: a double peak in flows for the sturgeon operation per the USFWS SOR in May, and coordination for reduced outflows in September-November to support the Kootenai Tribe's sturgeon habitat restoration project.

Lake Koocanusa operations from October 1, 2012-April 30, 2013, were discussed. In January 2013 the forecast went up to 6.9 MAF due to increased snowpack, which drove the Libby flood control elevation down to 2395.2 feet. The forecast dried up after that. Refill began on May 1, 2013, and Libby began operating to VARQ flows of 2 kcfs. The sturgeon operation ran from May 11-June 10. On May 10, Libby went to full powerhouse for the next 7 days, then backed down to VARQ. For June, the project went to flat flows of 16 kcfs.

Then a major storm hit June 18-20 and inflows rose to record levels – from 30 kcfs to 90 kcfs in three days. Libby elevation peaked at 2457.8 feet on July 5. The west side of the Kootenai River basin got about a third of its total annual precipitation in those three days. The end of July elevation target was 2454 feet, 5 feet from full. Downstream, Bonners Ferry flood stage rose to elevation 1760 feet, or 4 feet shy of flood stage at 1764 feet.

3a (ii). Spring impact of Libby operations on sturgeon and salmon: David Wills, USFWS, reported. A three-year effort to move more flows into appropriate spawning areas ended in 2012 without apparent success. River stages of up to 1766.5 feet at Bonner's Ferry do not create conditions for sturgeon to spawn in the preferred spawning areas. In 2010 the sturgeon pulse didn't provide much spill, but 2011 was an unusual passage year because the project ended up having to spill for flood control not sturgeon. The following year, the sturgeon operation didn't pan out. The BiOp sturgeon study officially ended in 2012, and further requests for a sturgeon pulse are unlikely.

For passage season 2013, USFWS and the sturgeon recovery team devised an operation with two peaks to encourage sturgeon spawning. Data from this operation are still being analyzed. In terms of future efforts, USFWS is planning a radio-tagging study to track sturgeon migration on an annual basis.

Questions and comments:

- **Q:** What type of tag was used for the 2010-12 tagging studies of sturgeon? (Charles Morrill, Washington). **A:** Adults were PIT tagged and vemco tagged but not radio-tagged. (Wills)
- **Q:** How long will the current sturgeon BiOp remain in effect? Is the USFWS thinking long term about sturgeon recovery efforts? (Jim Litchfield, Montana) **A:** The 2006 BiOp has a 10 year lifespan, but 2012 was the last year of requested spill for the sturgeon pulse. USFWS biologists will probably request a similar operation in 2014 as in 2013. (Wills)

- **Q:** Is there evidence that the hatchery program is contributing to adult spawning? (Dave Statler, Nez Perce) **A:** Most of the fish that were sampled below Kootenai Falls as part of the study were hatchery fish. (Wills)
- **Comment:** The variable VARQ flow was a successful operation. It increased the probability of refilling Libby by integrating refill for the sturgeon BiOp into a defined operation. This is a good approach, although it has some potential risk. (Paul Wagner, NOAA)
- **Q:** Did the COE know ahead of time that the system could absorb a heavy precipitation event, or was that a lesson learned with the VARQ system this year? Were we just lucky there wasn't any low elevation snowpack in Bonners Ferry? (Pete Hassemer, Idaho) **A:** The last week of May and the first week of June brought record flows for Libby, which is what VARQ is designed to absorb. Precipitation in late May and early June of over 90 kcfs has never been seen before. (Joel Fenolio)
- **Q:** Is there a trend toward higher precipitation at Hungry Horse in recent years? (John Roache) **A:** Because of climate change, the strength of airflows is more energetic, which has led to more headwater events. (Kyle Dittmer)

3a (iii). Libby summer flow and elevation targets for Kootenai River habitat

restoration: Joel Fenolio reported on special operations at Libby Dam implemented in 2013 in order to facilitate the Kootenai Tribe of Idaho's Habitat Restoration Project identified in SOR 2013-01. The 2008 NOAA Fisheries FCRPS BiOp specifies drafting Libby to 2449 feet by the end of September. In order to implement operations identified in the SOR (release of 8 kcfs or less from Libby Dam during September and October) the AA's have adjusted this specification in coordination with the TMT to target 2449-2451.6 feet on August 31. The difference of 2.6 feet equates to difference in storage volume of 6-8 kcfs during the month of September.

Two units at Libby went out of service starting in July. By end August, the elevation was headed toward 2449 feet. The reservoir reached 2449.1 feet by end August, 2449 feet on September 2, and 2449.6 feet by end September.

The habitat work in 2014 will probably require an end of August elevation target 3-4 feet above 2449'. The habitat restoration work will continue for the next three years.

Questions and comments:

- **Comment:** Montana was concerned when flows dropped to 6 kcfs in mid September and wanted to hold 8 kcfs for the sake of the wetted perimeter in the Kootenai River downstream of Libby Dam. In 2014, it would be a good idea to use the cushion above 2449 feet to manage flows in September and produce a stable flow that's comparable to what was established in August. This will help

maintain productivity of the river system. Montana's main goal is to keep flows as stable as possible from the end of August into September. (Jim Litchfield, Montana)

- **Comment:** Once we get past flood control operations, it would be a good idea to agree on desired outflows from Libby that are conducive to productivity and provide additional flow augmentation for summer migrants downstream. Lesson learned: This should be our approach to the future. (Russ Kiefer, Idaho)

3b. Hungry Horse Operations. John Roache, BOR, reported. January 2013 started off with 116% of average forecasted runoff volume for the January – July period. Actual January – July runoff volume was 110% of average. In the past few years, it has become increasingly difficult to manage the reservoir to its April 30 flood control elevation target after meeting the April 10 BiOp target. This is due in large part to higher inflows during the second half of April

Recent changes in local conditions have increased the challenges in Hungry Horse operations. The current transmission restriction in the Flathead Valley means the project is restricted to 9 kcfs releases instead of the full power plant capability of 12 kcfs. Also, 2013 brought a change in the official flood stage from 14 feet to 13 feet at Columbia Falls based on local landowner concerns that arose as a result of crop inundation during the high flows of 2011-2012. The 1-foot elevation change in flood stage at Columbia Falls equates to about 7 kcfs in flow. This is not significant in terms of water management, but the Columbia Falls gage may hit flood stage more often as a result of the change in flood stage.

Hungry Horse will reduce discharges when possible as the Columbia Falls gage rises above 13 feet. Meanwhile, a backwater effect in Flathead Lake has been observed, and it is possible that flood stage determination at Columbia Falls will be linked to elevation at Flathead Lake in the future.

3c. Grand Coulee Operations. John Roache reported. The April-August forecast for The Dalles is a major controlling factor for flood control operations at Grand Coulee. After hitting the April 10 BiOp elevation, the project drafts to its April 30 flood control elevation, then typically refills.

After January 2013, drastic decreases in The Dalles forecast increased the April 10 elevation target. According to the mid January forecast, the April 10 target was 1252.8 feet. The February forecast raised the April 10 elevation by 12 feet to 1276.7 feet.

In February the project drafted to 1272 feet in order to hold 13.5 feet elevation in the Bonneville tailwater for chum. TMT had to choose between keeping chum redds inundated and providing water for spring migrants. Releases were stepped down, and the Bonneville tailwater dropped to 11.8 feet on February 26. Even if Grand Coulee had filled to 1288 feet before drafting for the chum operation, it would have been possible to maintain 13.5 feet below Bonneville only until March 1 due to lack of water, Tony Norris,

BPA, said. Holding 13.5 feet until March 15 would have drafted Grand Coulee to about 1268 feet.

Roache pointed out two factors to keep in mind for 2014:

- Drum gate maintenance has to be done every 3 years at Grand Coulee, and it was deferred in 2013 because the flood control elevation was so high. Deferring it in 2014 would mean that it has to be done in 2015 regardless of water supply.
- In March 2013, the overhaul of Grand Coulee 3rd powerplant units began and will continue for the next 12 years.

Questions and comments:

- **Q:** How will the water releases needed to meet a newly defined flood stage of 13 feet at Columbia Falls be shaped? When was that water moved in 2013? (Russ Kiefer, Idaho) **A:** It was still released during the spring period, just reshaped by a few weeks. (Roache)

3d. Upper Snake Flow Augmentation. Ted Day, BOR, reported. Working within state water law and the Nez Perce agreement, the BOR in 2013 was able to provide 427 kaf for flow augmentation, and attempted to shift the water into an earlier timeframe when it's most effective for fish.

This was a very poor water year on the upper Snake River. Inflows were only 50% of average in the Boise basin, 62% of average in the Payette basin, and 70% of average on the Snake above Milner. There were no flood control releases at all on upper Snake projects in 2013.

Given such scarce water supplies, it was barely possible to meet the 427 KAF BiOp target for flow augmentation this year. Meeting the 487 KAF target was out of the question. With limited rental water available, in order to provide 427 KAF of flow augmentation during April-August, the BOR resorted to using 83 KAF of powerhead space, a resource of last resort because of its difficulty to refill in subsequent years. BOR also had to utilize an additional 33 KAF from the Payette basin normally dedicated to maintaining minimum pools and winter releases. If we don't get nearly normal runoff this year, it might not be possible to provide 427 KAF of flow augmentation for upper Snake fish runs in 2014.

3e. Dworshak Spring/Summer Operations Review. Steve Hall, COE Walla Walla, discussed how the COE managed to meet BiOp requirements, flood control targets and TDG limits at Dworshak in light of the 2013 water supply. By the end of 2013, Dworshak had received only 75% of its normal water supply. The June precipitation that hit Libby and other areas bypassed Dworshak basin. The project drafted to 1535 feet by end August and released another 200 KAF for the Nez Perce Tribe in September, which brought the reservoir elevation down to 1520 feet.

Spring flow augmentation in April 2013 was 10 kcfs as coordinated at TMT. There was no flood control shift at Coulee this year because the project was on minimum discharges in spring and didn't have the capacity to accept a shift. One objective at Dworshak is to refill the reservoir when inflows meet or drop below powerhouse flows of about 10 kcfs. The purpose is to provide optimal flexibility for a successful refill operation.

A snow flight over the basin in early June found only 8% snow covered area compared to the 20-30% snow covered area forecasted. The COE was able to refill the reservoir by June 6-7 and keep it full through June, thanks to a flood control requirement based on snow covered area. Summer augmentation flows began on June 30, earlier than normal due to warm temperatures downstream and lack of water.

There were two periods in summer 2013 when Lower Granite tailwater temperatures exceeded the 68 degree BiOp target. The first event in August was caused by surprises in Hells Canyon releases. The second event occurred when wind mixed the Lower Granite pool, warming it at deeper levels than expected and increasing spill temperatures. This summer, Dworshak came close to its 110% TDG limit. However, the COE managed to conserve water, and the rest of the year was not a problem in terms of TDG values.

Questions and comments:

- **Q:** What happened in May when flows were reduced and volume runoff was less than expected? (Wagner). **A:** There was an augmentation period at the beginning of May when flood control operations conflicted with refill. In a dry year like 2013, high priority is placed on refill at Dworshak. Starting in mid April, any time the reservoir elevation falls below the refill curve, refill is jeopardized (Hall).

4. Review of Specific Operations

What was learned about specific operations that were requested by TMT members of other regional entities? How effective were these operations in achieving the intended goal? Should they be continued or modified in future years? Why or why not?

4a. 2013 Juvenile Salmon Survival/Juvenile Transport Adult Returns. Steve Smith, NMFS Science Center, discussed findings from the preliminary 2013 survival memo released August 28, 2013. The memo includes data gathered through mid November.

Survival: Flows were below average all year except for a peak in mid May. Water temperatures were cool at the beginning of the season, then rose to higher than average. Spill percentages were also above average, especially in April when flows were at their lowest.

These conditions resulted in shorter travel times and faster migration in 2013 than seen over the past 4-5 years. No doubt this is also the result of surface structure improvements and increased BiOp spill.

Survival rates for spring and summer chinook and steelhead from the head of Lower Granite reservoir to the Bonneville tailwater were a bit above 50% for 2013. About a third of smolts were transported this year. Survival for fish passing to Lower Granite pool was unremarkable this year at 66.7%. It was a similarly unexceptional year for yearling chinook in the upper Columbia.

In terms of travel times, yearling chinook followed the usual pattern. Despite low flows, travel times were shorter than in the past few years. For yearling chinook, survival in every reach was higher than average in 2013, except for extremely low survival of fish tagged at the Lower Granite trap (84.5% compared to more than 90% most years). These were hatchery and wild fish combined.

Steelhead survival was more mixed. Steelhead passage timing was similar to the last 4-5 years, taking from 8-18 days on average. However, there were discrepancies in the reaches between Lower Monumental and Ice Harbor dams, and again in the lower river from McNary to Bonneville dams. Something unusual is happening that resulted in disparate experiences for detected and non-detected fish. Estimated returns on a season-wide basis for fish that were never in a bypass system are apparently higher than those for fish that were bypassed.

Transport: Analysis of transported vs. bypassed adult returns from 2009-11 does not yet include 2011 adult returns, but it's clear the benefit of transport has been reduced over the past 4-5 years relative to early years. This is probably due to improved conditions for in-river migrants. To evaluate the benefits of transport, transported SARs are compared to bypassed SARs. If the ratio is less than 1:1, bypassed fish are returning at a greater rate than transported fish. If the ratio is greater than 1:1, the reverse is true.

In most cases, the adult return rate for transported fish is higher than that for bypassed fish. There isn't much difference in the survival rates of transported vs. bypassed chinook. Furthermore, estimated returns on a seasonwide basis for fish that were never in a bypass system tend to be higher than those for bypassed fish. Chinook that were never detected have an estimated 20% higher rate of returns. The estimated return rate is also higher for undetected hatchery steelhead.

After May 1, transported wild chinook almost always did better than bypassed fish. Until June 15, SARs for subyearling fall chinook that were bypassed are higher than for transported fish. Results were similar for fish arriving at Lower Granite, Little Goose and Lower Monumental. Not enough data were collected from McNary to evaluate survival. There was discussion of how to account for nondetected fish vs. bypassed fish.

Questions and comments:

Q: From Lower Monumental to Ice Harbor, survival is 99.6%, while from Ice Harbor to McNary it's 76.3%. But isn't the survival estimate for the Ice Harbor-McNary reach a combination of the two? (Jim Litchfield, Montana). **A:** The low percentage reflects that fact that detection rates at Ice Harbor are low. (Steve Smith)

Q: So far, your reports have made no dramatic observation in terms of the relative performance of transport post-2006. Have we crossed the threshold to dramatic change now? (Paul Wagner). **A:** Transport survival rates are still higher than bypassed rates, but not that much higher. The ratio of benefits clearly has decreased, but transport is still more beneficial during most of May, particularly for wild steelhead. (Smith)

4b. Bonneville Turbine Operations and SOR 2013-3. Tom Lorz, CRITFC, reported on mortality and descaling issues in the Bonneville 2nd powerhouse juvenile bypass system. He gave the background leading to these problems. By 2007, modifications to increase flow to the gatewells were made and it became apparent that the higher flows were causing increased descaling and mortality. The first reliable data on these issues were released in 2012. FPOM presented a change form to the COE, which awaits a response in 2014. The change form requested operational modifications at Bonneville until a structural fix can be found.

In 2013 the COE continued the ongoing effort to address Bonneville turbine flow issues with installation and testing of turbine reduction devices. Test results indicate the TRDs did reduce gatewell turbulence, but did not result in a commensurate reduction in descaling/mortality so the COE continues to look for ways to control flows across the full band of operations without descaling/mortality issues.

On May 28, 2013, SOR 2013-3 was submitted to the COE and partially implemented in response to high descaling and mortality rates of mainly sockeye. COE researchers are currently reviewing four years of survival data from performance testing at Bonneville in search of effective solutions. FFDRWG is addressing this technical challenge in detail. The FPP change forms for 2014 are being reviewed now. Meanwhile, the response to the change form submitted in 2012 will determine whether TMT remains the primary forum for addressing gatewell issues at Bonneville.

Lorz asked the region to consider what should happen if flows get so high that powerhouse 1 is fully loaded and powerhouse 2 is at the mid point of 1%. Should excess water be directed to powerhouse 2, where we know it will increase descaling and mortality? Or should it go over the spillway, where it will raise TDG levels? This will be a tough dilemma for decision makers to resolve.

4c. Performance Standards Testing. Eric Hockersmith, COE Walla Walla, reported on performance testing at Little Goose and Lower Monumental dams this year. Both tests were for summer migrants only in the Snake; there was no testing of lower Columbia River projects in 2013.

Approximately 11,000 subyearlings were acoustic-tagged for the evaluations, using run of river subyearlings collected at Lower Monumental. Fish too small to survive the tagging process (less than 95 mm fork length) were rejected, as well as those that were previously tagged. This year's rejection rate of 18.5% was significantly higher than last year's 9% rate, mainly due to poorer condition of subyearlings this year. The tests were conducted from June 3-July 8, in sync with run timing.

The study findings represent the likelihood of survival for 77% of the subyearling chinook and steelhead that passed LGS and LMN in 2013. The BiOp survival standard for summer migrants is 93% (for spring migrants, 96%) with a standard error of no more than 1.5%. Study results were:

Little Goose test:

- While the standard error met the criteria, dam passage survival (via all potential routes) at just over 90% was 2.3% below the BiOp standard. A possible cause is that low flows exacerbate eddies in the Little Goose tailrace that affect survival.
- The project held 30% spill consistently throughout the study period.
- FPE (the proportion of fish that pass the dam via any other route than turbines) was 95% this year, which is good.
- Forebay residence time was 6.8-16.3 hours historically; in 2013 it was only 3.7 hours. Reduced time spent in the forebay is probably the main reason losses this year were only 0.7%.
- Tailrace egress median time was 1.2 hours, meaning 2013 migrants spent 30% longer in the tailrace in 2013 than in 2012. Longer egress times increase the risk of predation.
- Surface spill: 65% of subs passed via the spillway weir with 91.4% survival. The entire test was conducted with the crest at its higher elevation, due to low flows.
- Deep spill: 12% of subyearlings passed via the spillway with 91.1% survival.
- JBS: 18% of subyearlings used the JBS with 89.8% survival.
- Turbines: 5% of subyearlings passed via turbine with 84% survival.

Lower Monumental test:

- Dam passage survival was 92.97%. Whether this satisfies the BiOp standard of 93% is a policy question. Survival in the forebay was 91.6%, with forebay losses that were 1.2% higher in the forebay than in the tailrace. Standard error was 1.05% which meets the BiOp standard.

- The project maintained spill targets throughout the study period.
- FPE was 95% or higher – like Little Goose, a good value.
- Forebay residence time was 2.99 hours, which is within the goals of the fish accords.
- Tailrace egress median was 0.67 hours, similar to 2012.
- RSW: 68% of subyearlings passed with 94.1% survival.
- Deep spill: 21% of subyearlings passed via the spillway with 91.8% survival.
- JBS: 6% of subyearlings with 95.7% survival.
- Turbines: 5% of subyearlings with 83.5% survival.

Both tests met the BiOp precision standard. Spill targets were maintained and all fish accord measures were met. However, the Little Goose survival estimate was 2.3% below the BiOp survival standard, and whether Lower Monumental met the standard is debatable.

Future efforts will include data mining to examine why survival at Little Goose was so poor and how problems could be mitigated. This might include ERDC modeling of tailrace conditions to devise better spill patterns for low flow conditions.

In 2014 the COE will evaluate performance at McNary Dam for spring and summer migrants (yearling and subyearling chinook and juvenile steelhead) and at John Day for summer migrants (subyearling chinook and juvenile steelhead).

4d. Panel Discussion – Lower Granite Adult Passage Delay. Steve Hall, COE Walla Walla; Doug Baus, COE RCC, and Russ Kiefer, Idaho, discussed the main passage issue of 2013, adult delay in the Lower Granite fish ladder.

4d (i). Temperature differentials: Steve Hall gave a dashboard-style presentation on temperature management at Lower Granite Dam this year, focusing on the complex chain of interactions between releases from Hells Canyon Dam, Dworshak temperature augmentation, and conditions in the Lower Granite ladder and tailrace.

On July 1, Dworshak was at 1599.6 feet with 9.5 kcfs out. Lower Granite was spilling 18.4 kcfs and passing 29.4 kcfs through the powerhouse. Temperatures were cool. On July 25, 2013, with 2 temperature exceedances in the Lower Granite tailrace, the COE turned on the fish pumps to augment flows into the ladder. Several wind events mixed hot water deep into the forebay, significantly raising temperatures in the Lower Granite tailwater.

By August 5, the warm layers had penetrated 40 feet deep into Lower Granite forebay, and by August 23, they were 50 feet deep. By September 2, with Nez Perce entitlement water flowing, the Lower Granite tailrace was already at its BiOp threshold of 68 degrees F and Dworshak was out of water for temperature augmentation. By September 20, Dworshak was down to 1520 feet elevation and Lower Granite tailrace exceeded the 68 degree threshold. On September 21 the project went to minimum flows after the Nez Perce flows ended. Finally the temperatures at Lower Granite tailrace began to moderate.

4d (ii). July-October operations review: Doug Baus reported on COE operations in 2013 to address elevated temperatures at Lower Granite Dam. A number of steps were taken, including modifications to unit priorities and spill operations. Next steps include possible structural modifications and a juvenile fish facility upgrade to introduce more cool water into the fishway. Additional possibilities include pump extensions that would result in cooler water being provided to diffuser #14 and modifications to the fish ladder or adult trap.

Questions and comments:

- **Comment:** Extending the pump tubes to move cooler water into the diffuser should be considered a midterm solution while a longer term solution is sought (Dave Statler, Nez Perce Tribe).

4d (iii). Adult delays and impacts: Russ Kiefer, Idaho, gave a slideshow presentation. In a typical year, passage numbers match closely at Little Goose and Lower Granite with a bit of fallback, as occurred in 2012. However, throughout the 2013 passage season, Lower Granite adult counts consistently didn't match those at Little Goose. Presumably this was due to passage issues in the Lower Granite ladder. A short term solution in 2014 would be to re-route pump 3 to provide water to the trap instead of pumping water from diffuser 14 into the trap.

Among the findings in 2013 were:

- Adult fall chinook experienced delays between Ice Harbor and Lower Granite but later caught up with average run timing. Steelhead followed the same general pattern, with periods of delay, then they caught up.
- The impacts of adult delay are worse for sockeye than for chinook and steelhead due to overwintering issues.
- This year TMT discussed adult chinook delay at Lower Monumental. Steelhead generally followed the same pattern on a different time scale. When the water temperatures below Lower Monumental dropped, it freed up passage of both chinook and steelhead.

- Sockeye were lost between Little Goose and Lower Monumental this year. Conversion rates from Ice Harbor to Lower Granite dropped off at 19 degrees C in the Ice Harbor tailrace. Once temperatures rose above 19 degrees, migrants tended to stray into the mid Columbia or elsewhere; some even returned to Bonneville. Generally, early in the season conversion rates weren't bad, then they dropped dramatically. Overall only 25% of sockeye (428 fish) made it from Lower Granite to the basin.

Questions and comments:

- **Q:** Should adult passage considerations take priority over juvenile passage in 2014? (Scott Bettin, BPA). **A:** That is Idaho's goal at present. One possibility is trapping fish at Ice Harbor and transporting them upstream. This is a slow process of moving a few fish per hour, so it's not very effective. Sample rates at Lower Granite are limited to no more than 15-20% of the run. (Kiefer).
- **Q:** How about reshaping DWR augmentation releases later for a temperature hedge? (Tony Norris, BPA). **A:** We did as well as we could with managing DWR flows until we ran out of water in September. We could ask for permission to use more water and go below 1520 feet elevation at DWR under these conditions (Kiefer).

4e. Lessons Learned from These Specific Operations

- The dashboard-style visuals in Steve Hall's Lower Granite presentation give a clear picture of what was going on in the system (Charles Morrill, Washington).
- **Q:** It was noteworthy how the Lower Granite juvenile fish facility stayed cool at around 68-69 degrees F as measured from the collection sample tank. Does upwelling feed the JFF cooler water? (Charles Morrill). **A:** The JFF is actually fed by water from deep in the forebay, which is why it stayed cool (Steve Hall).
- Performance standards testing numbers at Little Goose are noteworthy, with around 90% survival and an 18% rejection rate for tagging. The rejected fish were probably wild because they tend to be smaller. Perhaps we should devise a better way to conduct tagging studies (Dave Wills, USFWS).
- We've gotten good at measuring small things now, such as routes of passage and why passage counts might be low. We now have plenty of detailed information on transport, such as the weekly counts included in Steve Smith's presentation (Paul Wagner, NOAA).
- The impact of water supplies on operations, whether at Libby or elsewhere, is huge and highly unpredictable. This leads to the biggest challenges (Laura Hamilton, COE).

- The RFC recently stopped producing a 3-day ESP forecast and switched to a 5-day ESP forecast, which has become the official forecast. It is hoped that the change will improve the predictability of weather patterns. Suggests the RFC give TMT a presentation on this new methodology (Tony Norris, BPA).
- The 2013 water year was reminiscent of 2001, which also got off to a great start, then dried up for months. The sunspot cycle peaked 12 years ago, as it is doing now. Suggests the Columbia River forecasting group report to TMT on interagency efforts and new tools to improve forecasting (Kyle Dittmer, CRITFC).
- Problems with low flows in 2013 were managed significantly better than in 2001, a similar water year. Kudos to TMT and the COE for operational improvements over the past 12 years (Kyle Dittmer and Donna Silverberg).

<i>Name</i>	<i>Affiliation</i>
Doug Baus	COE
Tony Norris	BPA
Charles Morrill	Washington
Tom Skiles	CRITFC
Brandon Chockley	FPC
Joel Terkheimer	Energy GPS
Pete Hassemer	Idaho
Doug Baus	COE
Kyle Dittmer	CRITFC
Scott English	COE
Michael Bryant	CBB
Kasi Rodgers	COE
Paul Wagner	NOAA
Dave Wills	USFWS
Eric Hockersmith	COE Walla Walla
Jim Litchfield	Montana
Steve Hall	COE
Ted Day	BOR
Joel Fenolio	COE
John Roache	BOR
Dave Statler	Nez Perce Tribe
Lisa Wright	COE
Russ Kiefer	Idaho
Bill Proctor	COE
Richelle Beck	Grant PUD
Christine Peterson	BPA
Scott Bettin	BPA
Tom Lorz	CRITFC
Sara Warren	COE
Brandon Chockley	FPC
Emily Plummer	DSC

Robin Gumpert
Donna Silverberg

DSC
DSC

RECLAMATION

Managing Water in the West

Grand Coulee Operations 2013



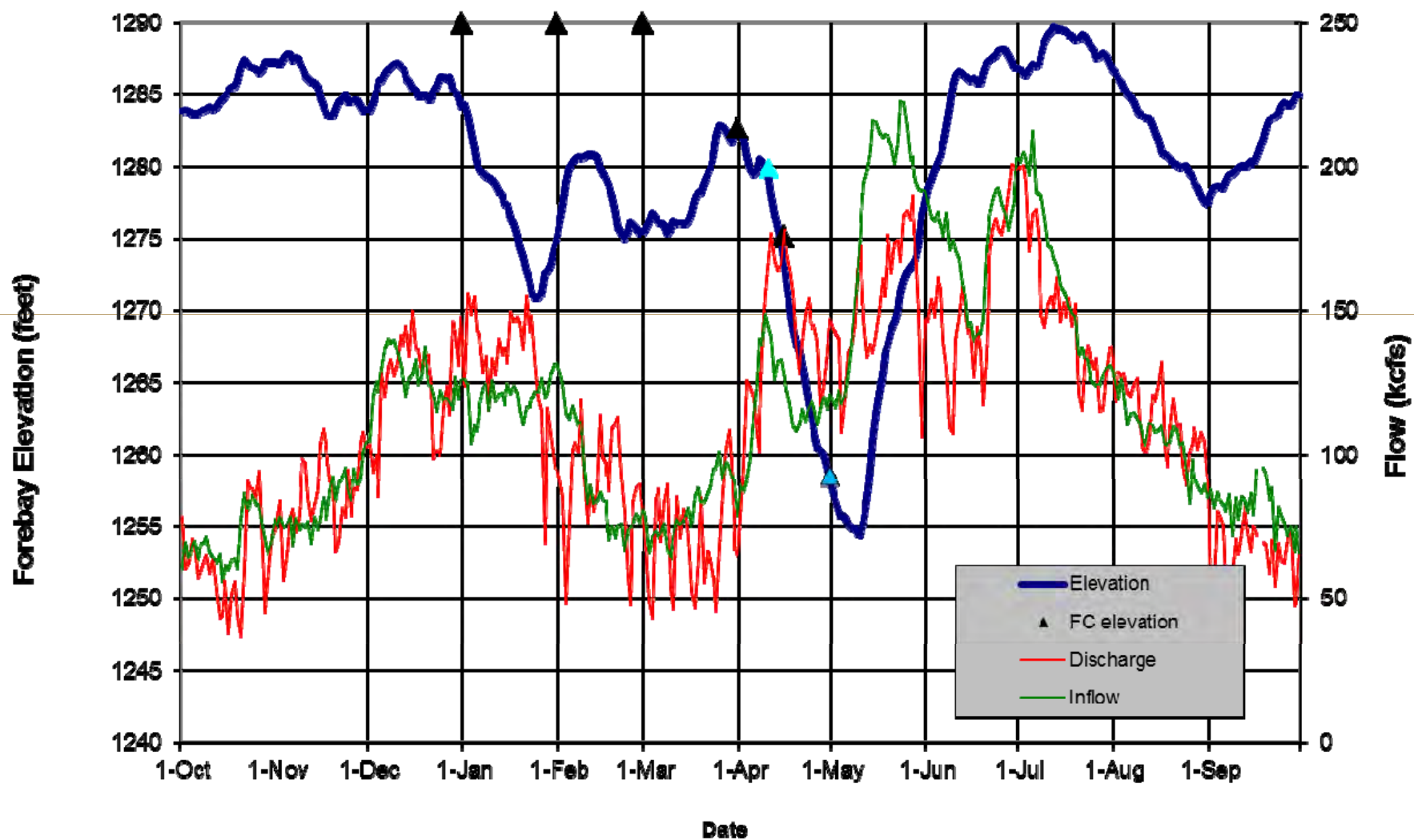
U.S. Department of the Interior
Bureau of Reclamation

Water Supply Forecasts and Flood Control Elevations

	Jan	Feb	Mar	Apr	May	Jun	Jul
The Dalles Apr-Aug forecast (% of average)	105	94	92	93	94	96	100
Grand Coulee Apr 30 flood control elevation (feet)	1235.7	1260.8	1265.1	1258.5			

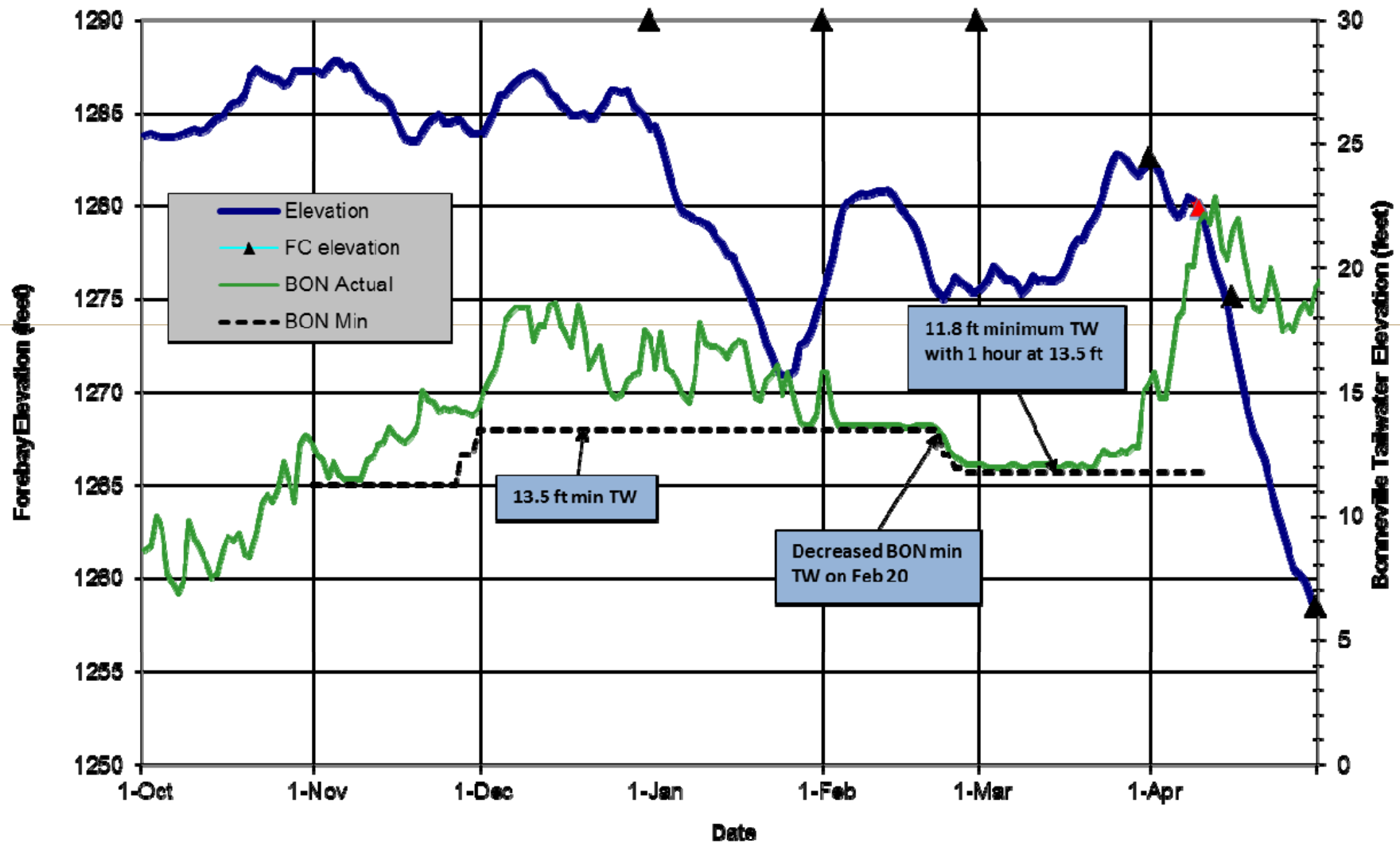
RECLAMATION

Grand Coulee Operations (Oct 2012- Sep 2013)



RECLAMATION

Grand Coulee and Chum Operations (Oct 2012- Apr 2013)



RECLAMATION

- Drum gate maintenance was deferred in 2013
- Began Overhaul on Third Power Plant Units (G-24, March 2013)
- Total volume of water released in 2013 for the Lake Roosevelt Incremental Storage Release Project was 25,500 acre-ft. Draft to 1277.4 ft on August 31

RECLAMATION

RECLAMATION

Managing Water in the West

Hungry Horse Operations 2013



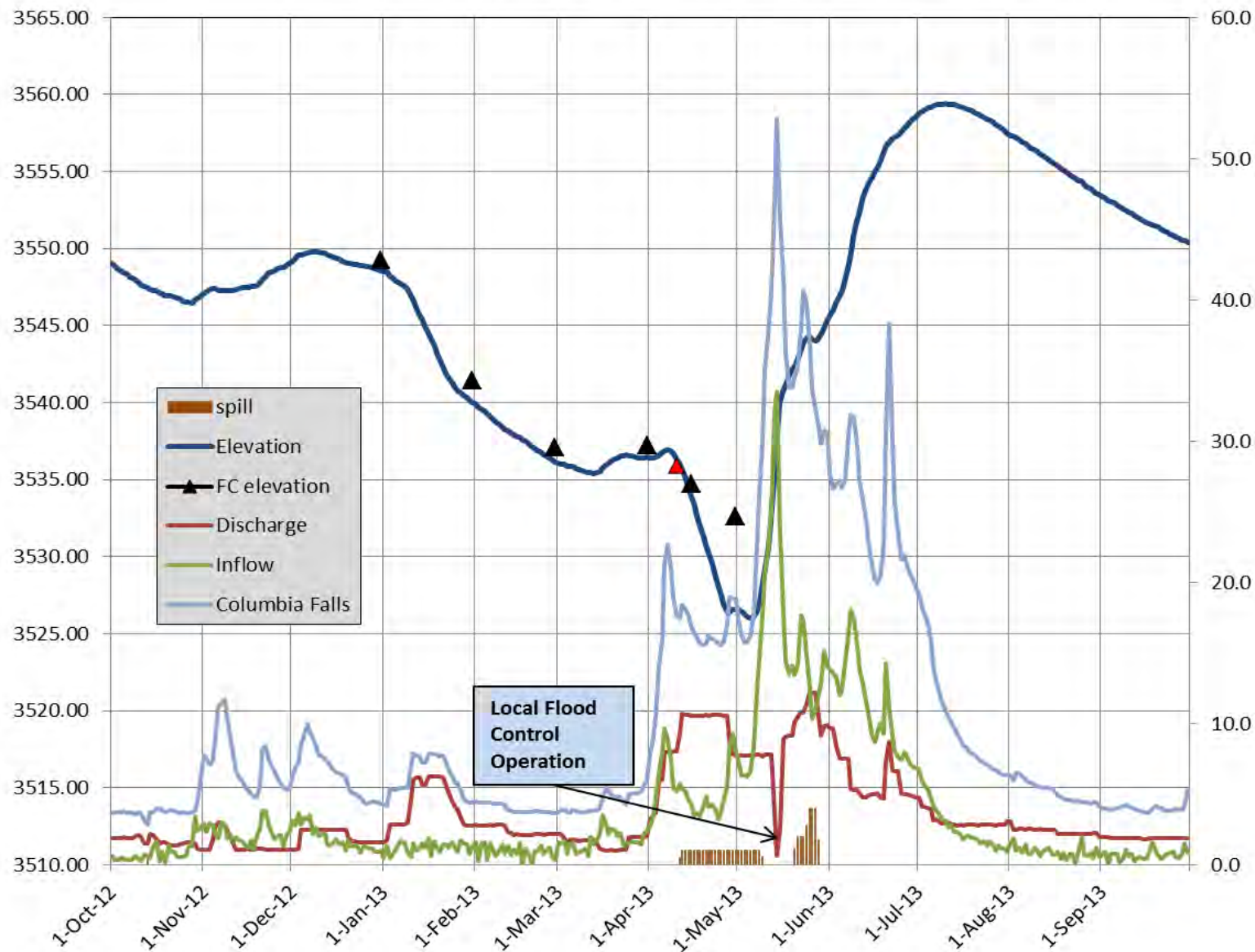
U.S. Department of the Interior
Bureau of Reclamation

Hungry Horse Forecasted and Actual Inflow for 2013

Forecast Month	Forecast Volume Jan-Jul (% of average)	Forecast Volume May-Sep (% of average)
Jan	116	116
Feb	111	111
Mar	103	103
Apr	103	103
May	106	106
June	106	104
Actual	110	109

RECLAMATION

Hungry Horse Operations (Oct 2012 - Sep 2013)



RECLAMATION

Columbia Falls Flood Stage

- The flood stage at Columbia Falls was changed from 14 feet (51,000 cfs) to 13 feet (44,000 cfs) in the spring of 2013
- The NWS Missoula made the change based on input from local area land owners (Flathead River above Flathead Lake) and Flathead County
- Localized flooding occurred in low-lying farmland during the spring of 2011 and 2012

RECLAMATION

River Observations

River Forecasts

Experimental
Long-Range Flood Risk

Precipitation

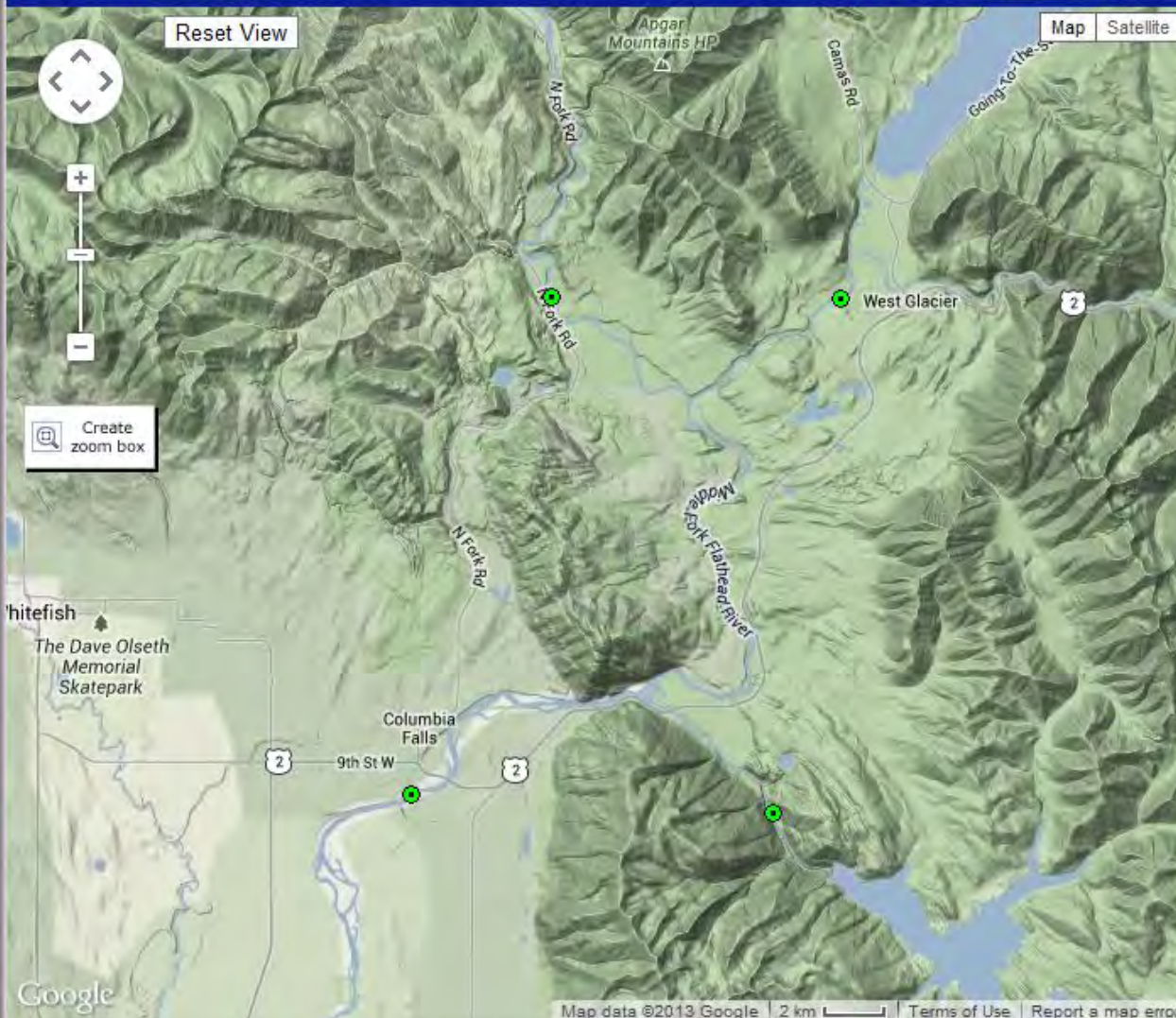
Download

166 total gauges 0 gauges in flood

How to print this map

Permalink

BOOKMARK



RECLAMATION

Hungry Horse Operations for Local Flood Control

- Hungry Horse will reduce discharges to help minimize flooding on the Flathead River dependent upon on reservoir space and remaining runoff
- Generally, Hungry Horse will start reducing discharges when CFMM hits and begins to exceed 13 feet
- However depending on remaining runoff and available reservoir space, discharge reduction may start at a level higher than 13 feet

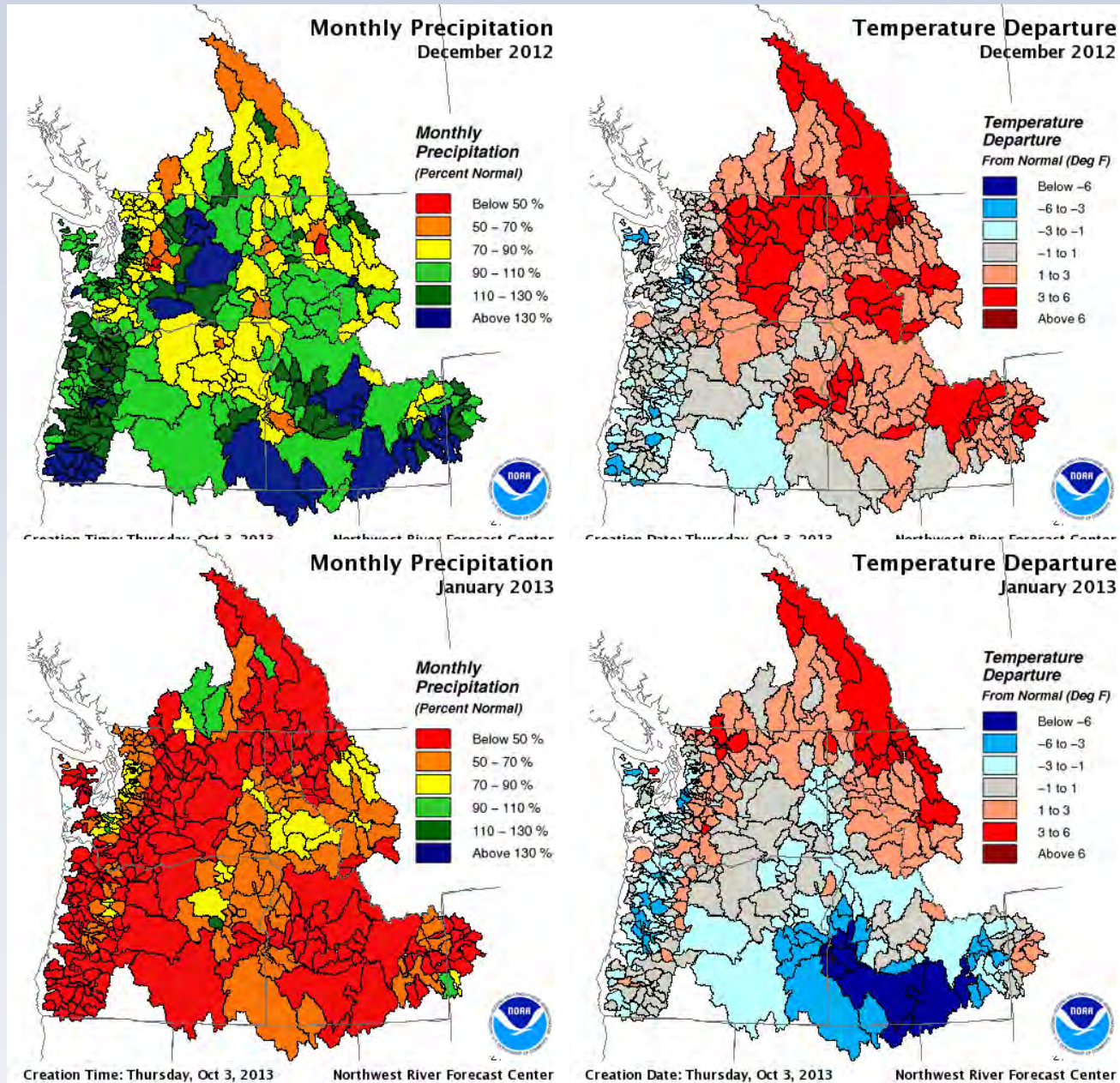
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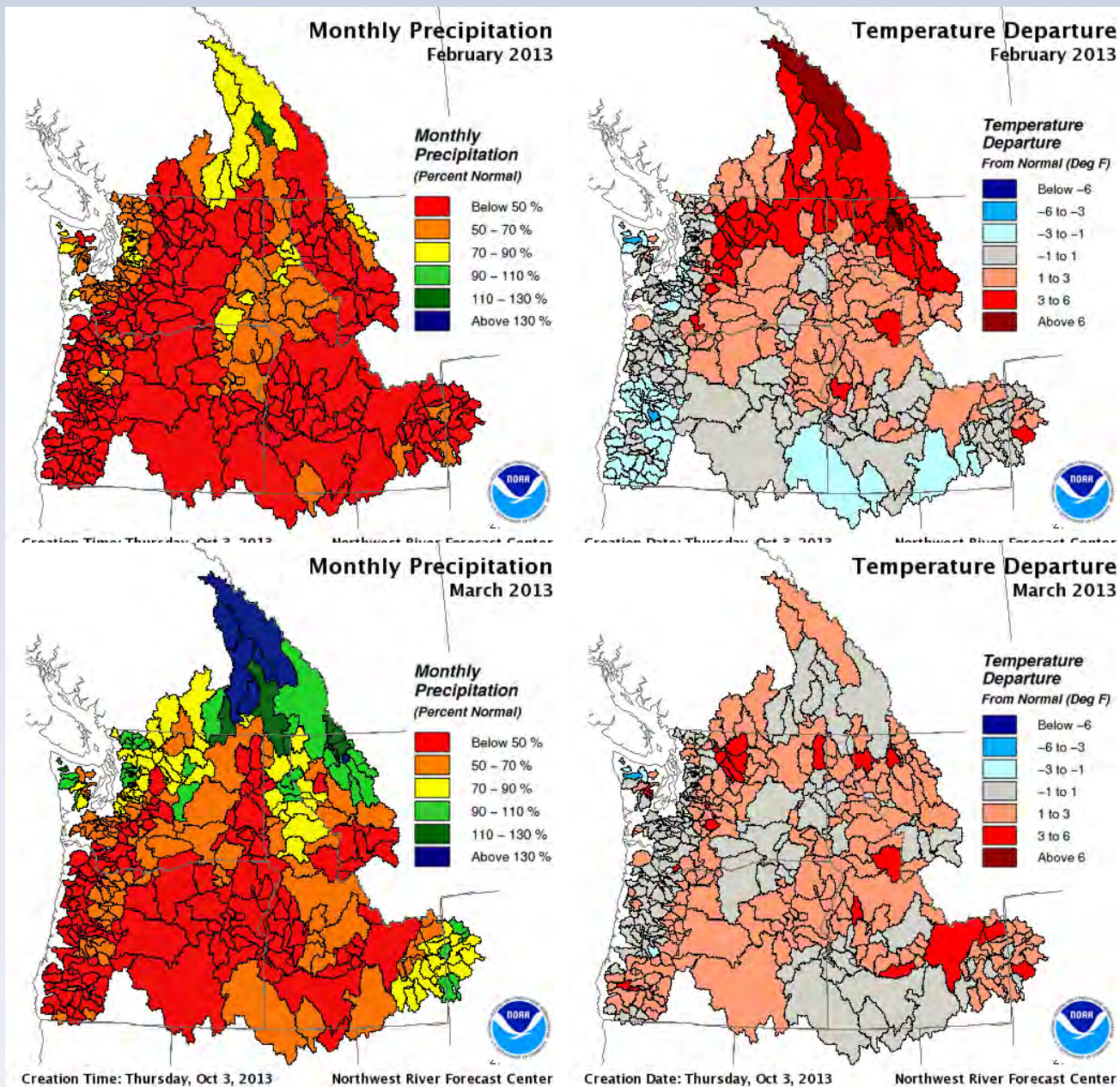
TMT Year End Review System Review

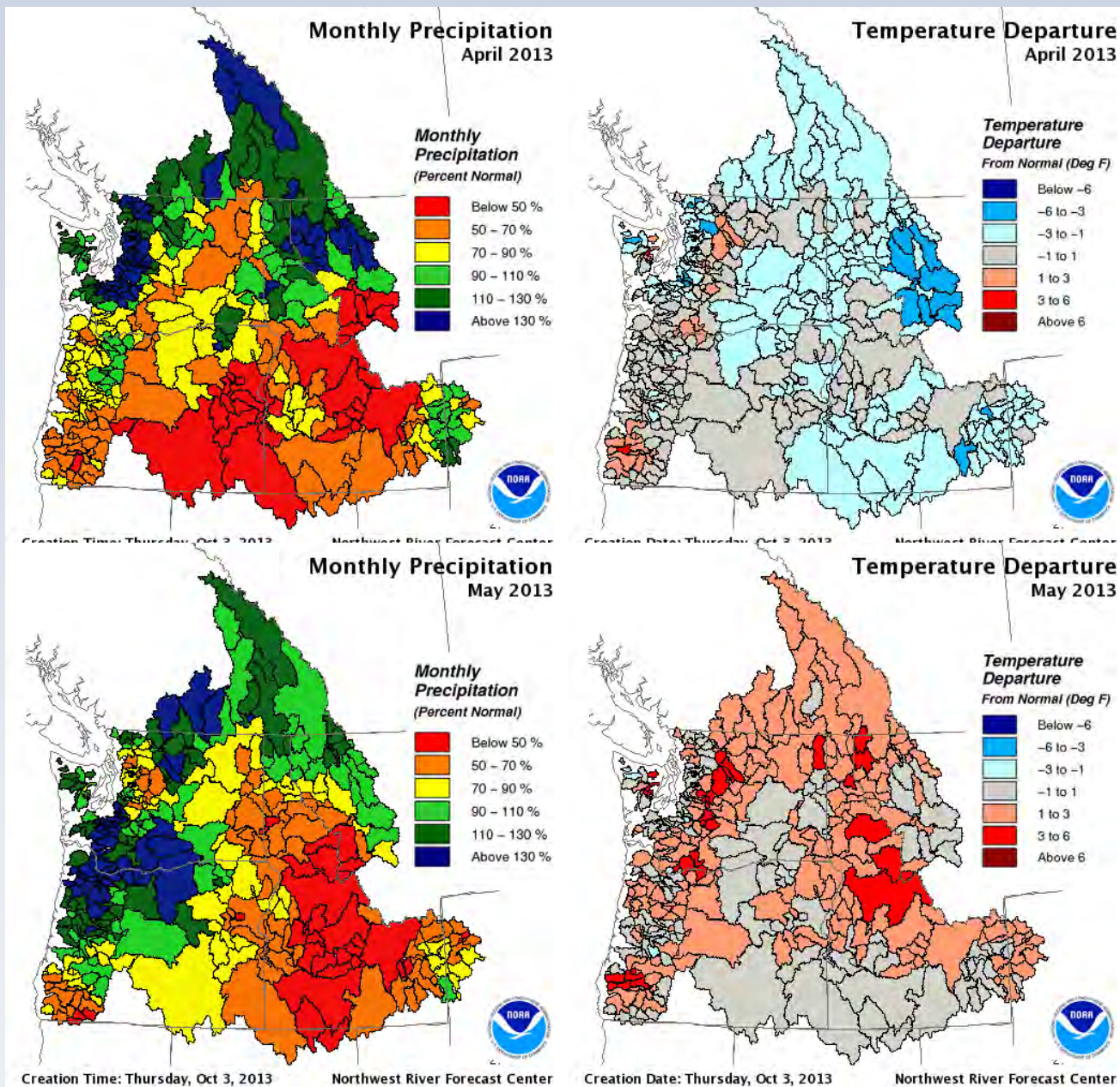
Presented by
Kasi Rodgers
USACE, Water Management Division

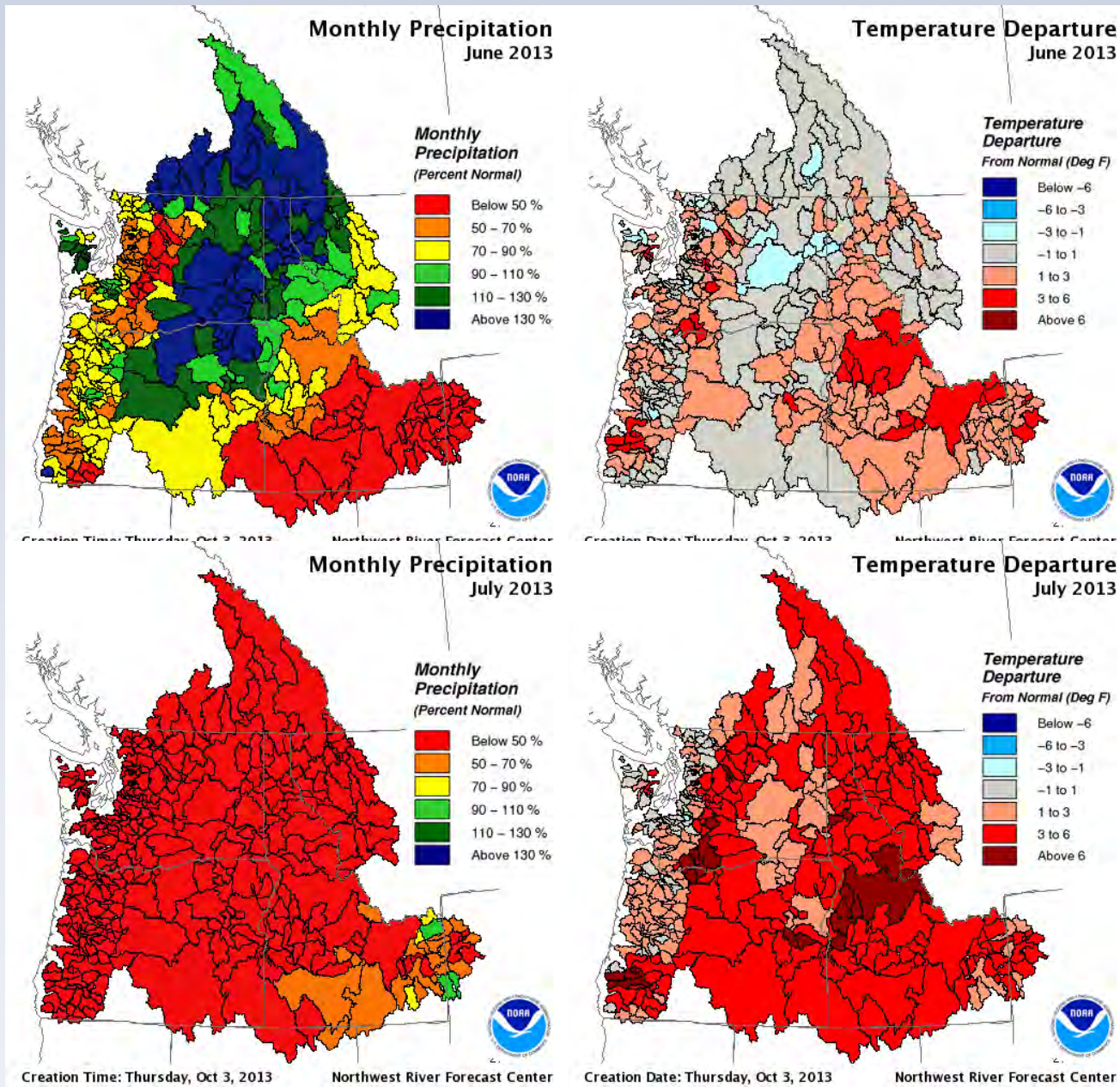
December 12, 2013













In fact...

U.S. Drought Monitor West

July 23, 2013

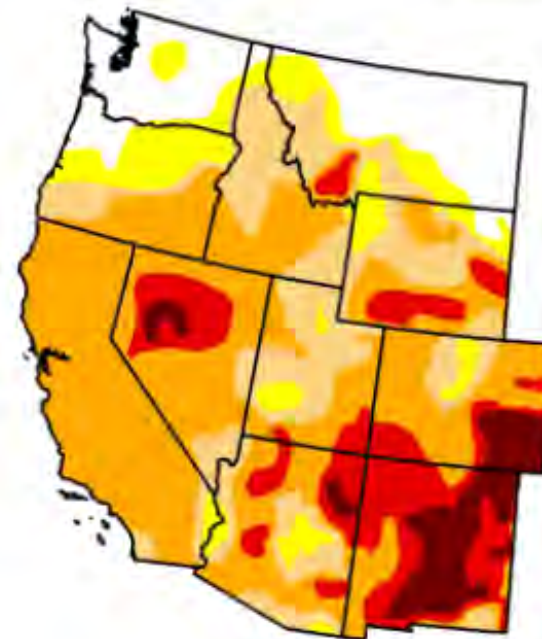
Valid 7 a.m. EST

<http://droughtmonitor.unl.edu>

Drought Conditions (Percent Area)

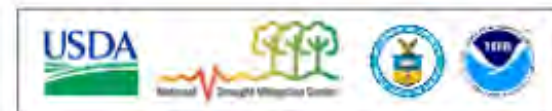
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	13.24	86.76	77.17	57.79	18.07	5.86
Last Week (07/16/2013 map)	14.44	85.56	76.84	59.31	18.96	6.15
3 Months Ago (04/23/2013 map)	20.28	79.72	66.00	43.41	16.10	1.87
Start of Calendar Year (01/01/2013 map)	24.39	75.61	68.31	45.04	18.01	2.15
Start of Water Year (09/25/2012 map)	15.12	84.88	77.15	43.65	16.85	1.77
One Year Ago (07/17/2012 map)	20.03	79.97	67.65	49.00	15.87	0.16

Intensity:



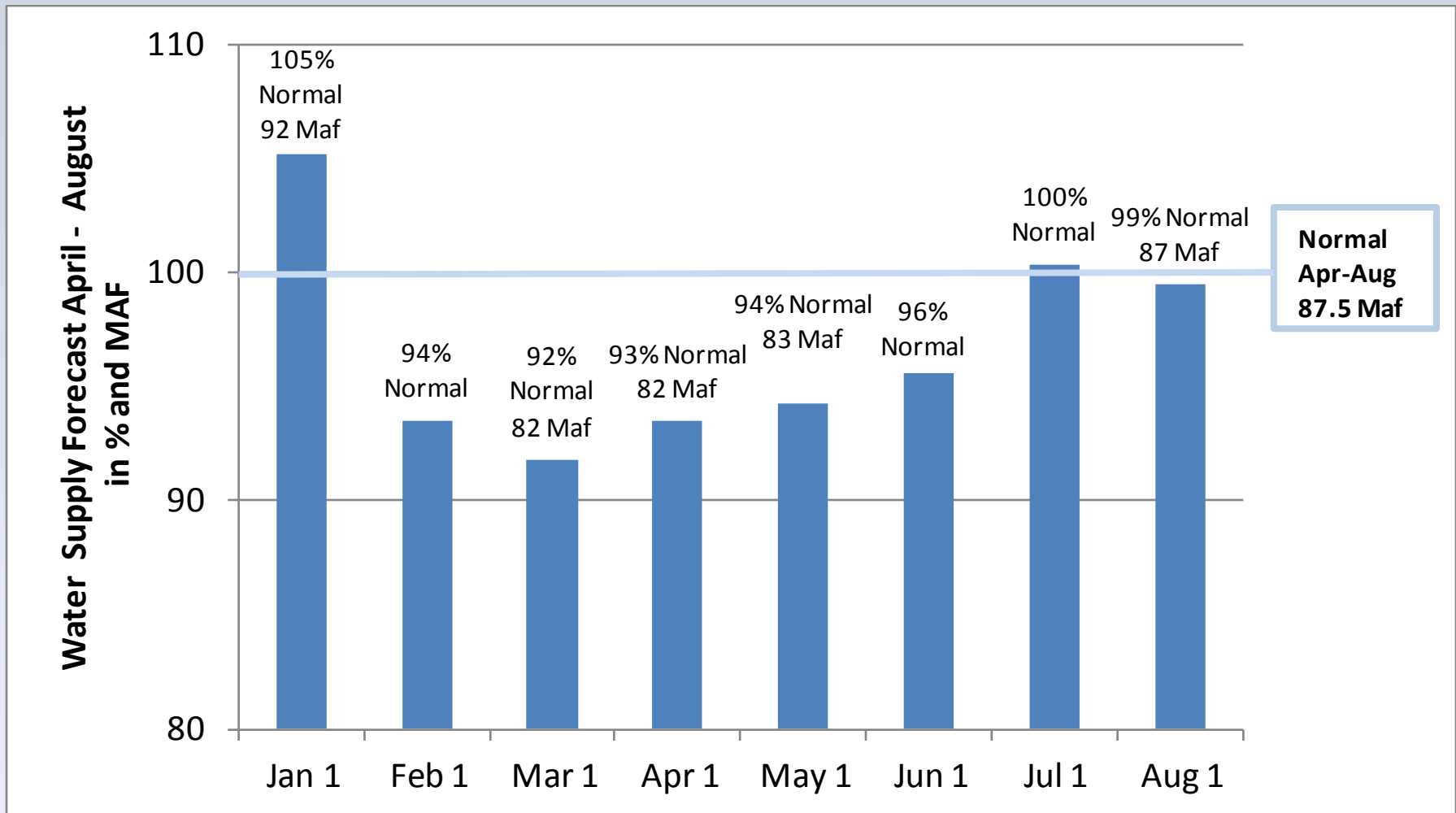
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu>

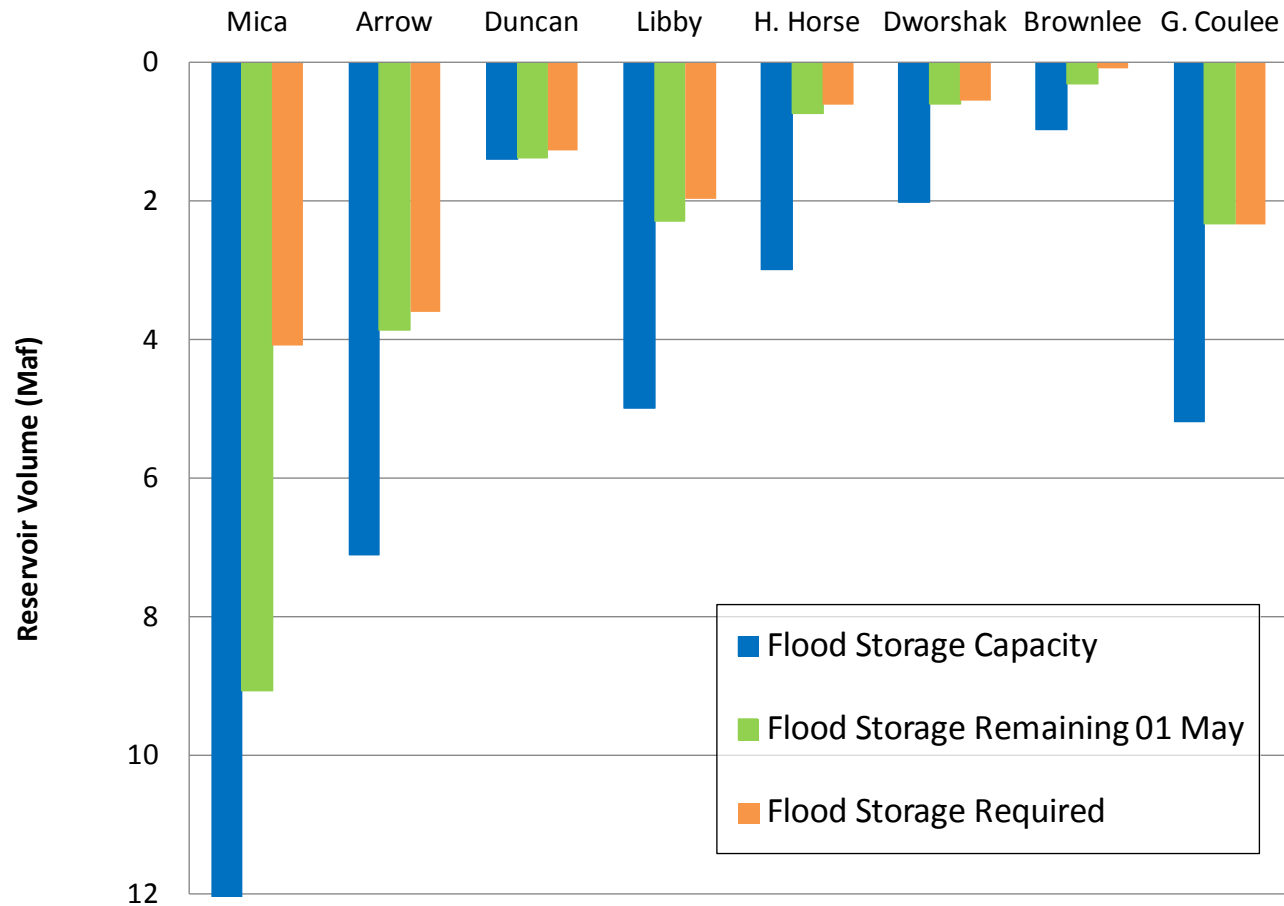


Released Thursday, July 25, 2013
Richard Helm, National Climatic Data Center, NOAA

2013 Water Supply Forecast at The Dalles (Apr – Aug)

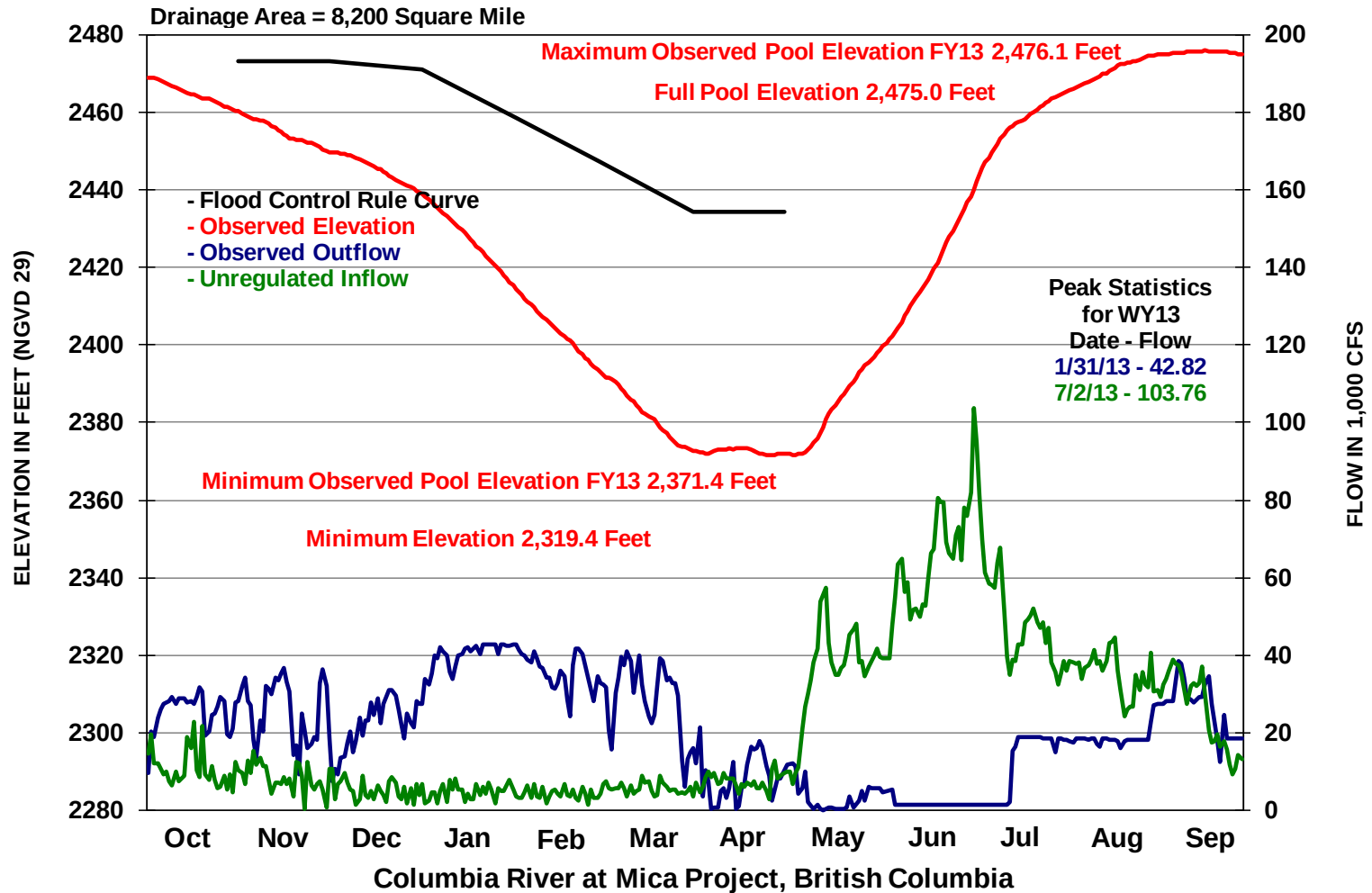


2013 Reservoir Space Available for Flood Risk Mgmt



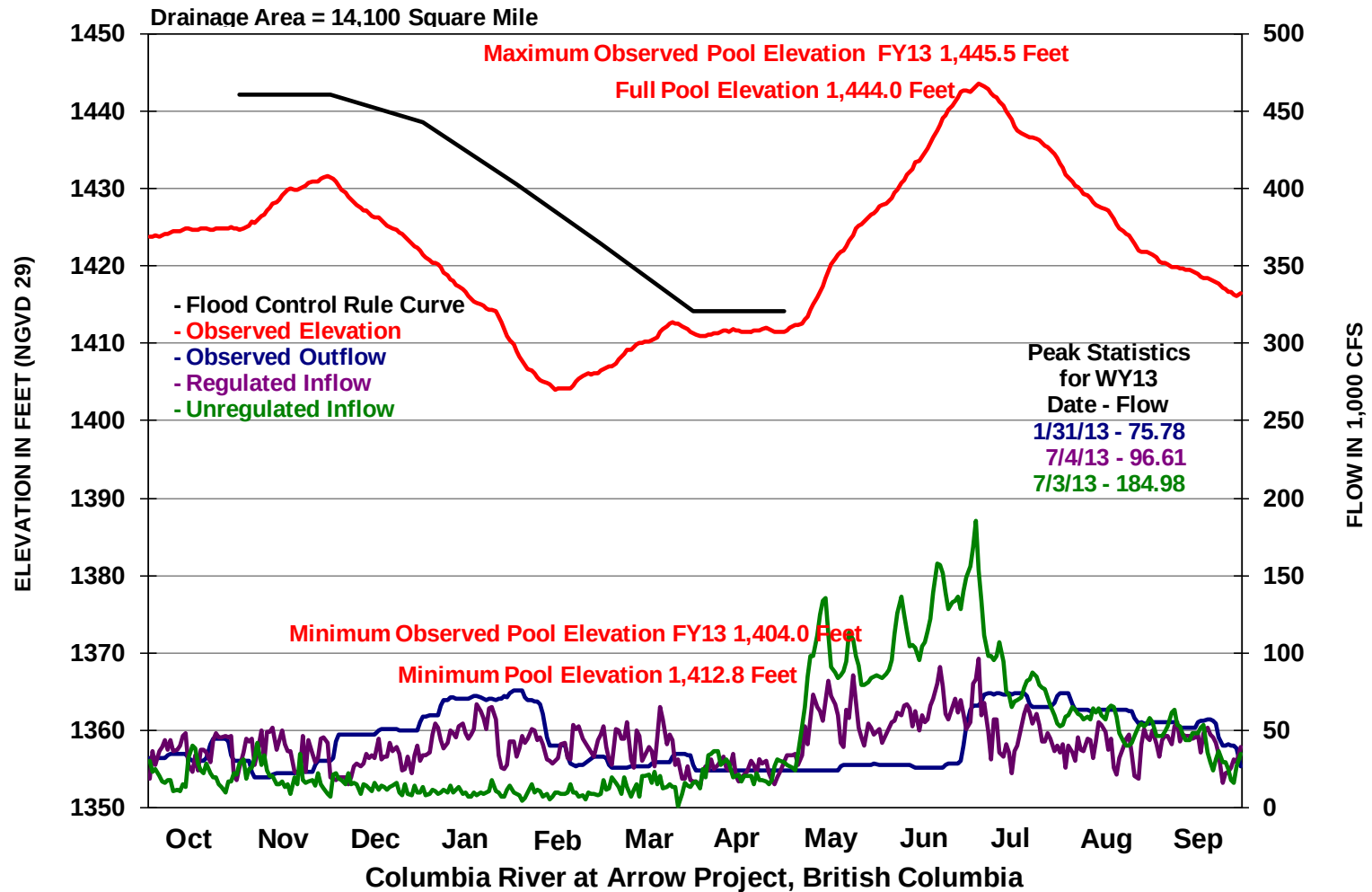
MICA

Elevation and Streamflow Hydrographs
October 1, 2012 to September 30, 2013



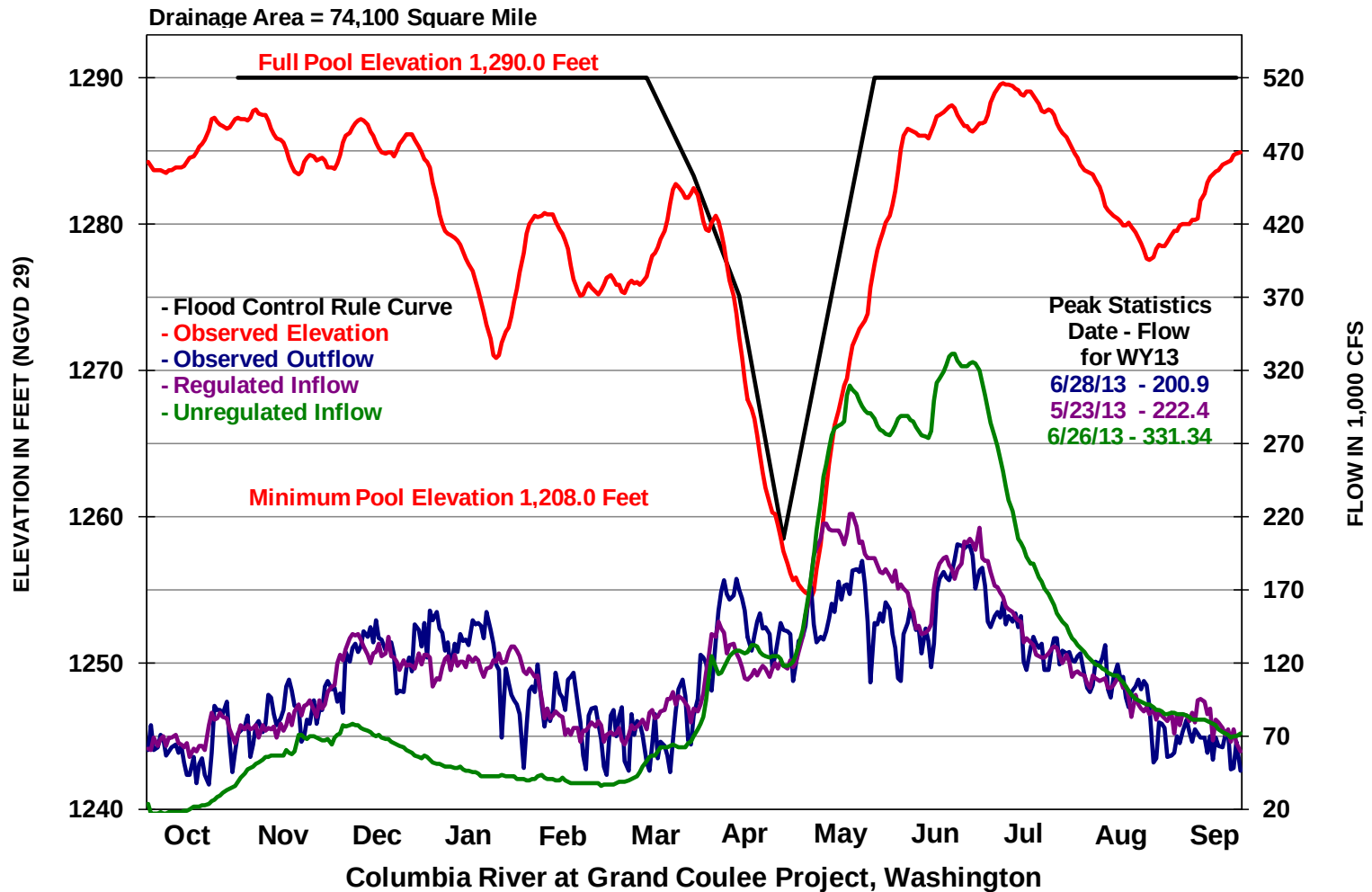
ARROW

Elevation and Streamflow Hydrographs
October 1, 2012 to September 30, 2013



GRAND COULEE

Elevation and Streamflow Hydrographs
October 1, 2012 to September 30, 2013



The Dalles Average Daily Flow 2013



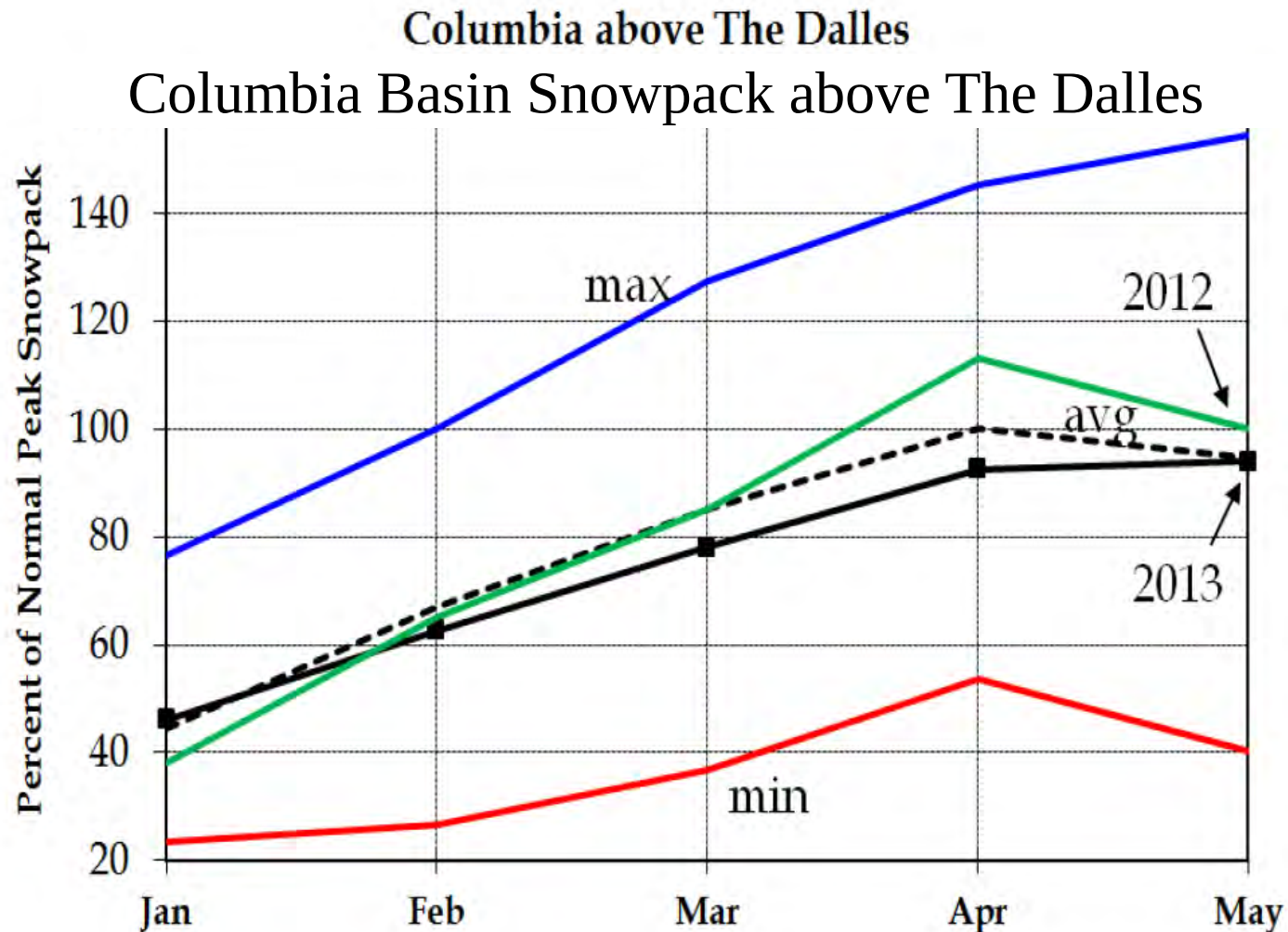
The year in comparison to highest years

Rank	Year (1929 to 2012)	Apr-Aug TDA Runoff Volume (Maf)
1	1974	134
2	1997	133
3	1972	129
4	2011	127
5	1956	126
.....		
.....		
48	1980	87
49	2013	87
50	1936	87

Questions?

Kasi.A.Rodgers@usace.army.mil
503-808-3950

Snowpack progression



Smolt Survival and Travel Time and Seasonal Transportation Evaluation for Salmonids in the Snake and Columbia Rivers

Update with 2013 Data

**Technical Management Team
Year-End Review
December 12, 2013**

**Steve Smith steven.g.smith@noaa.gov
Northwest Fisheries Science Center
NOAA Fisheries**



Outline

- **Summary of migration conditions, travel time and survival of PIT-tagged smolts through the hydropower system**
 - **August 28 Memo; Draft report submitted to BPA December 6**
- **Information from return of PIT-tagged adults – transported from and bypassed at Lower Granite**
 - **Spring migrants: Final report (returns through 2010) to USACE March 2013 (updated with returns through 2013 here)**
 - **Fall chinook: Draft report to be submitted to COE January**



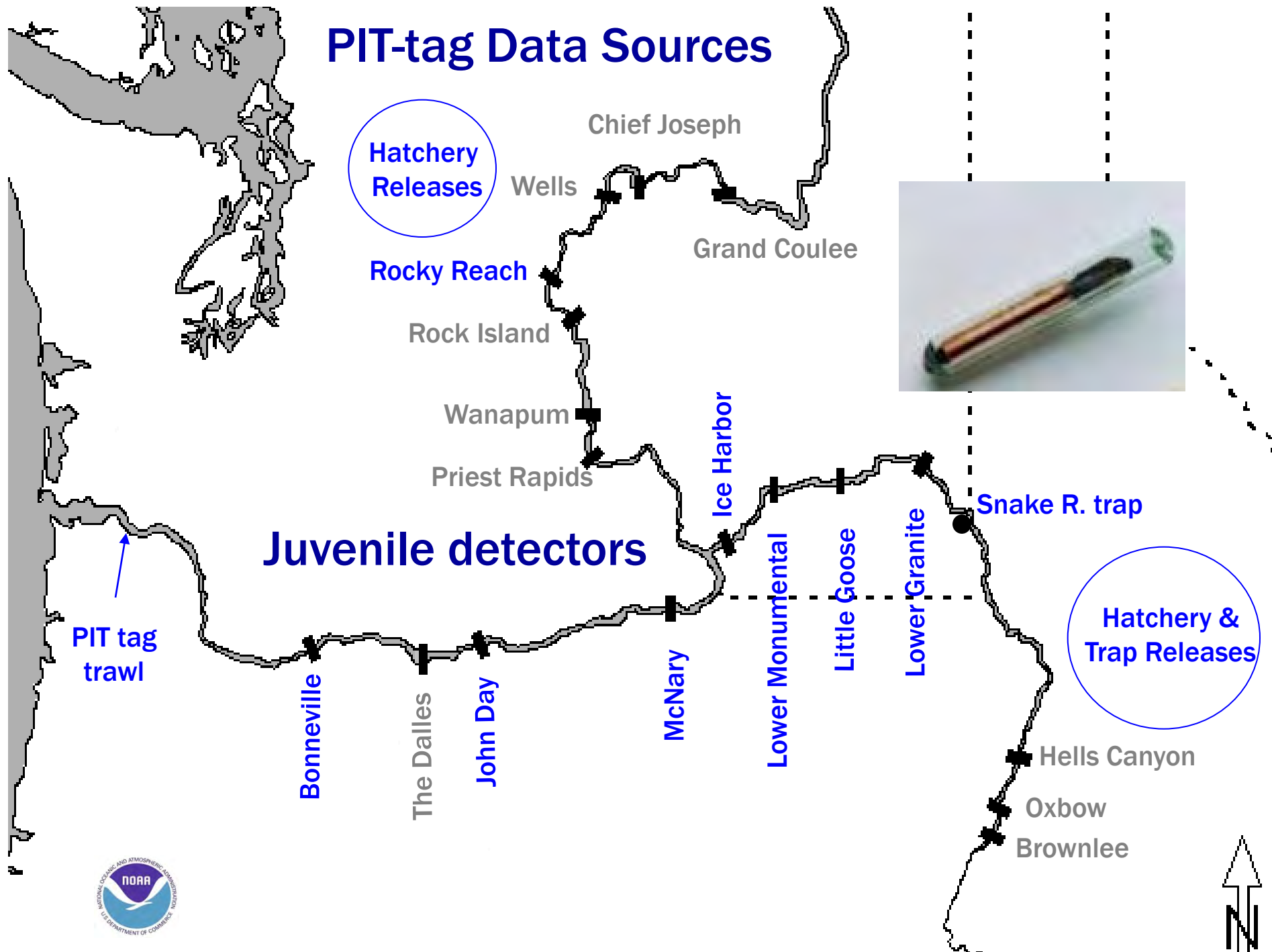
2013 Spring Survival Summary

- below average flow except for peak in mid-May
- warmer-than-average water
- spill percentage above average, especially in April

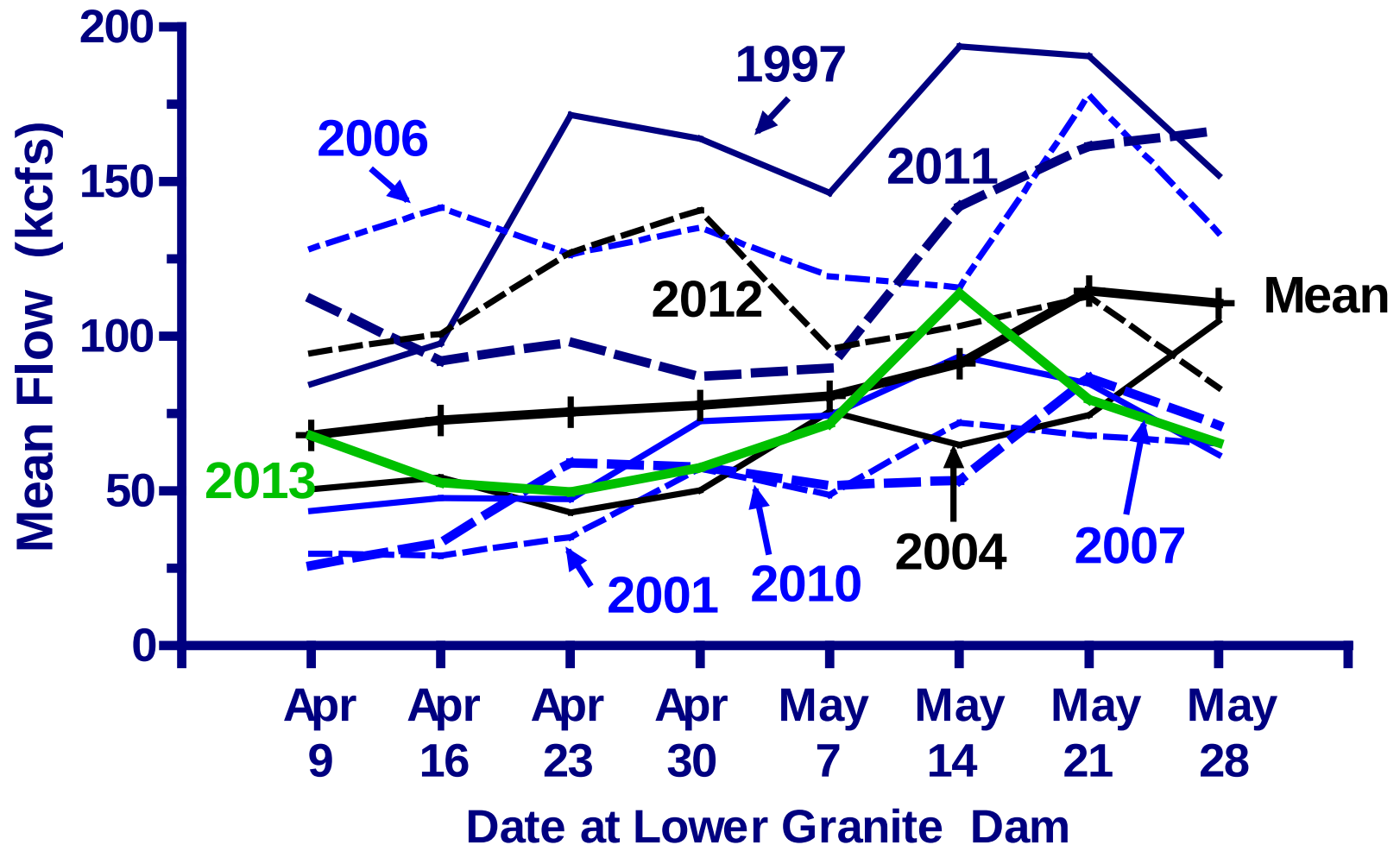
2013 Spring Survival Summary

- Surface passage and spill continue to promote shorter travel times
- Above-average survival for yearling chinook except for Lower Granite pool
- Hydrosystem survival for both species a bit above 50%

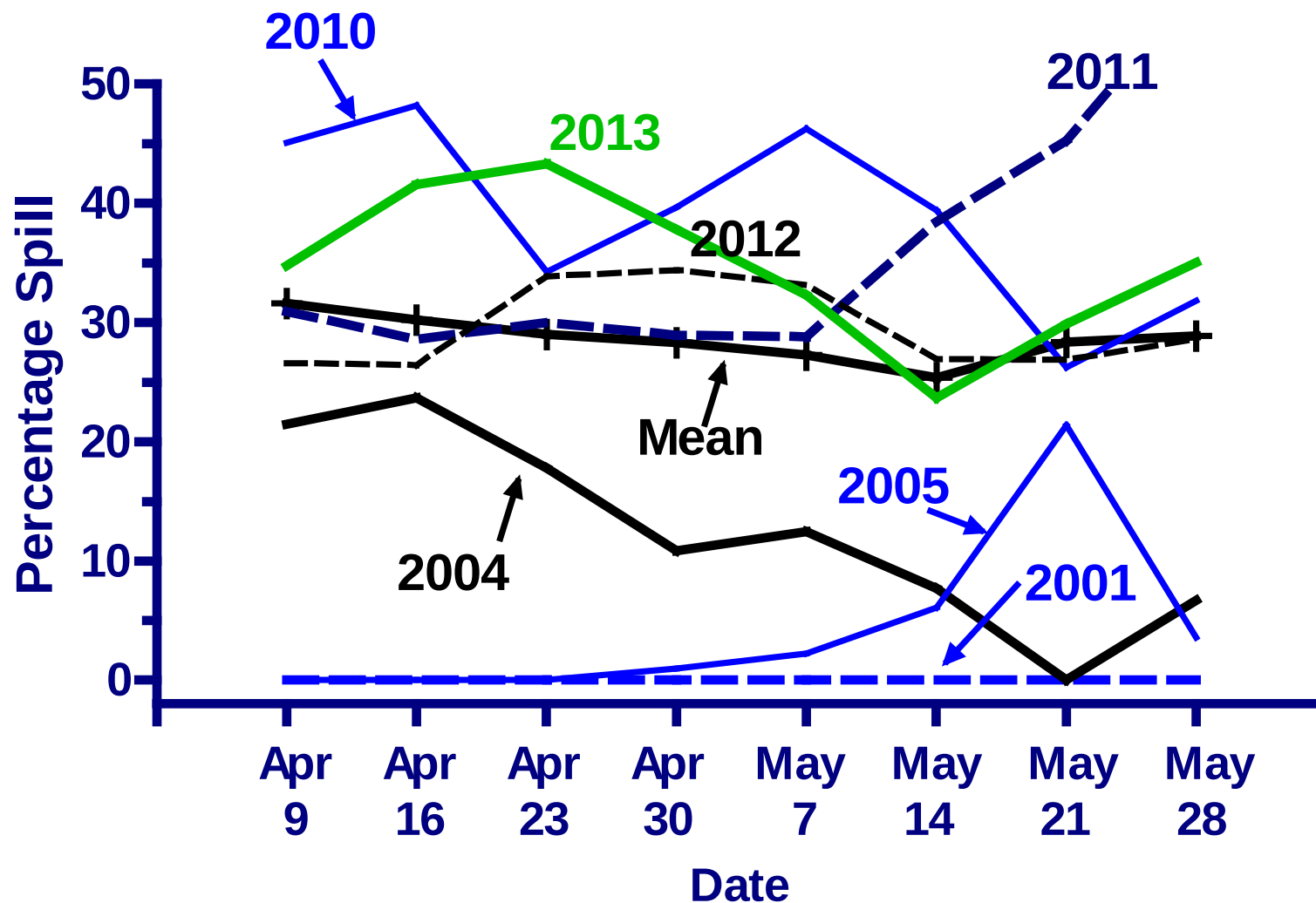
PIT-tag Data Sources



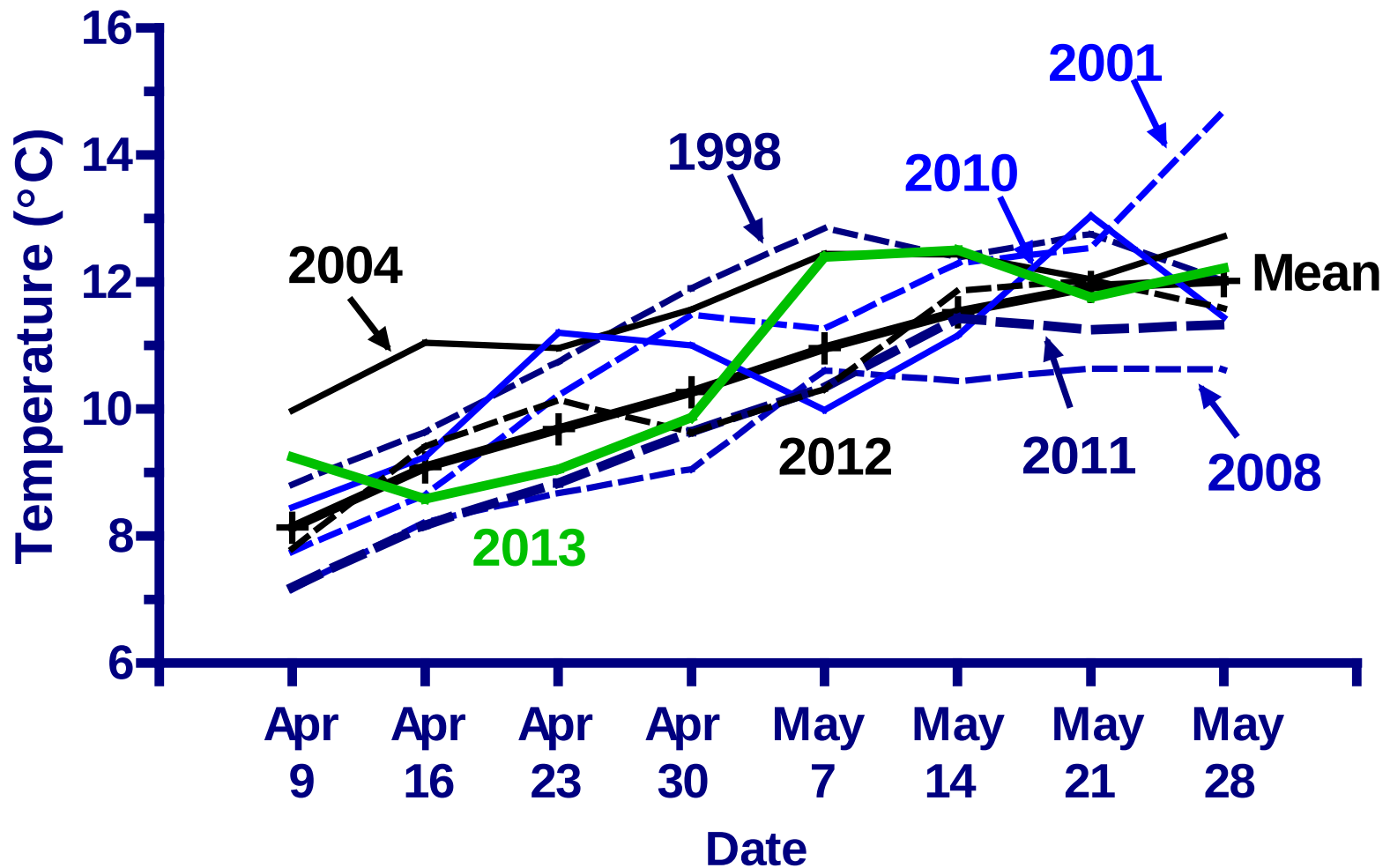
Weekly Mean Flow (kcfs) Lower Granite Dam



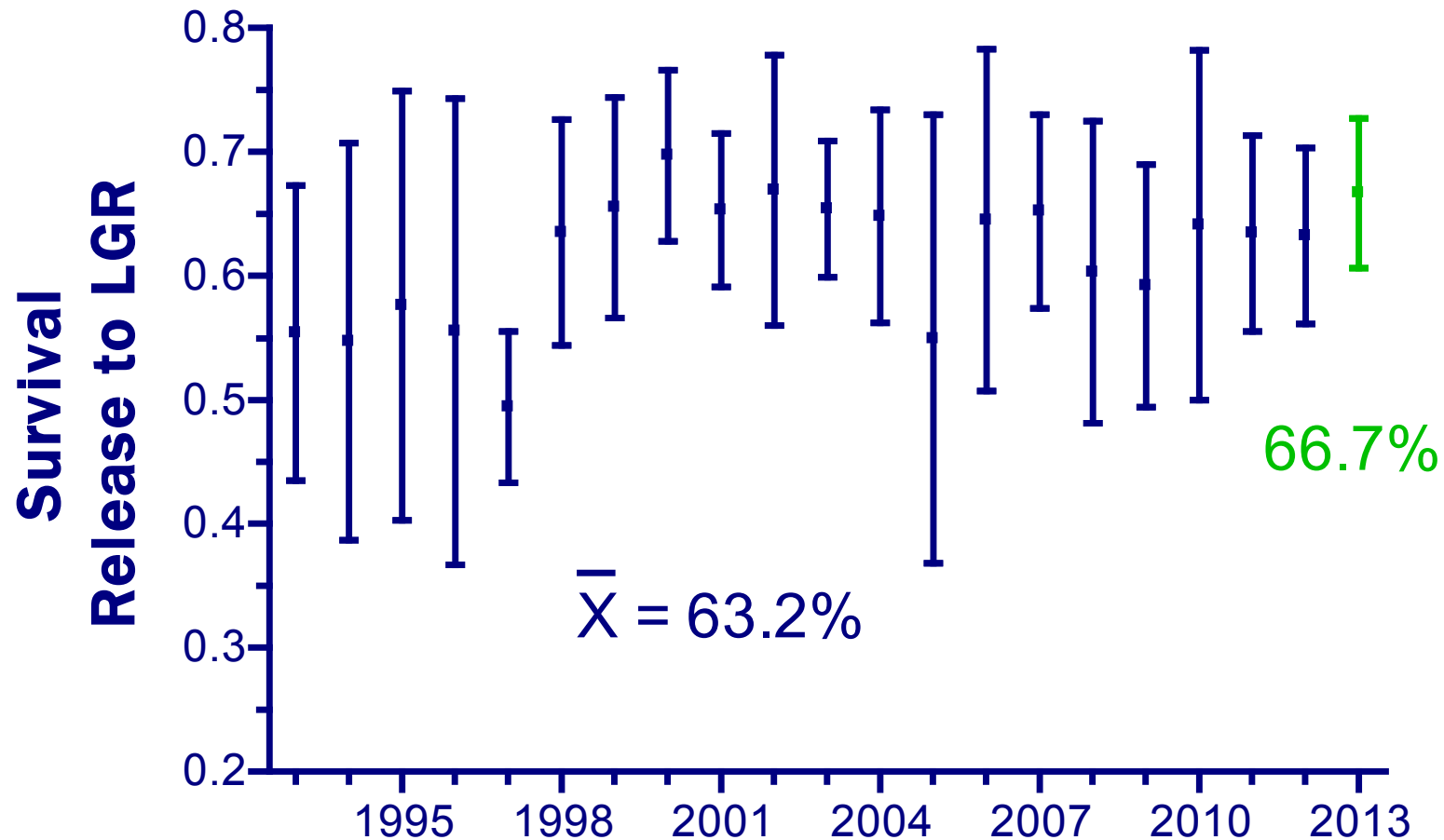
Weekly Mean %Spilled LGR, LGS, LMN



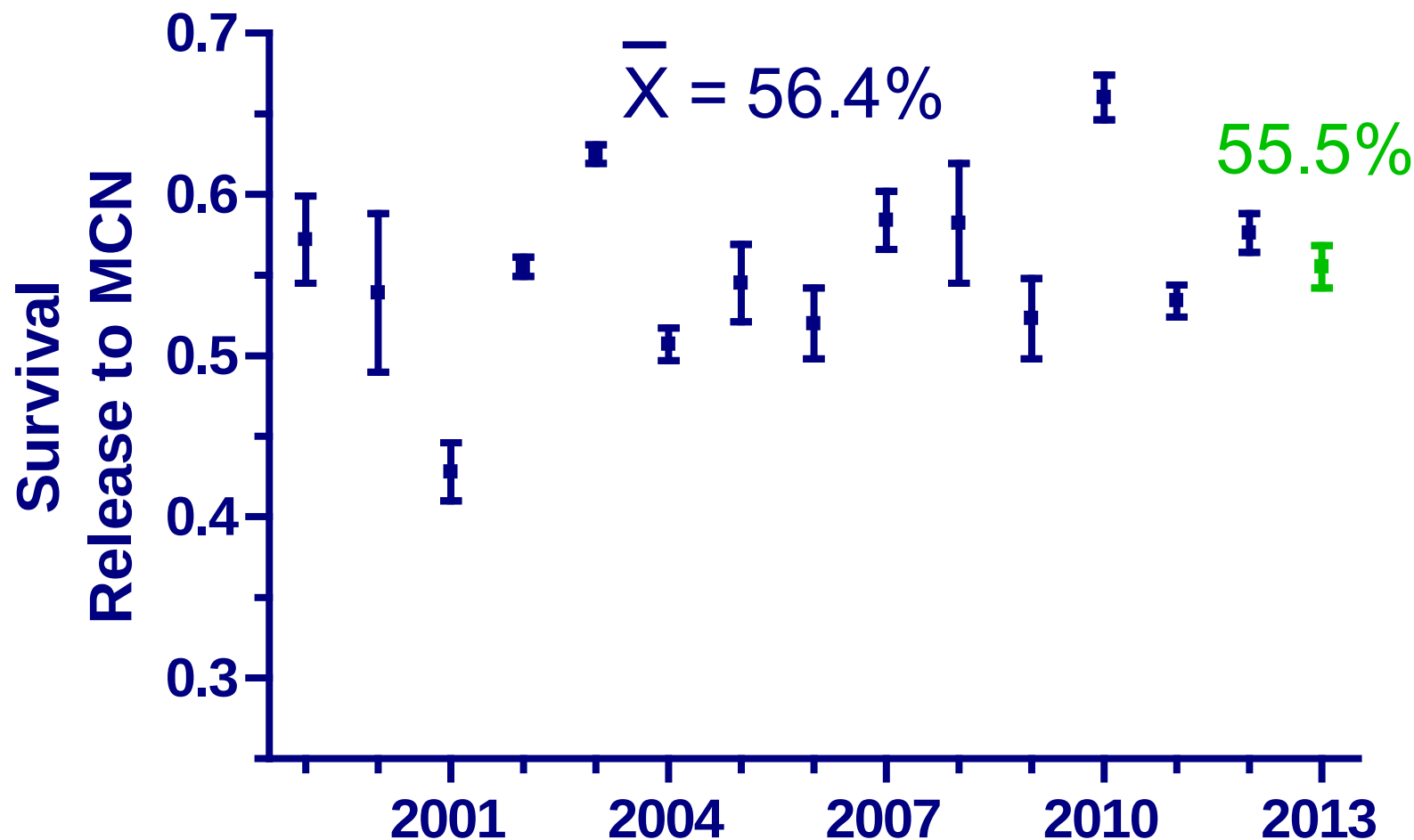
Weekly Mean Temperature Little Goose Dam



Yearling Chinook Snake River Basin Hatcheries Mean of Index Groups

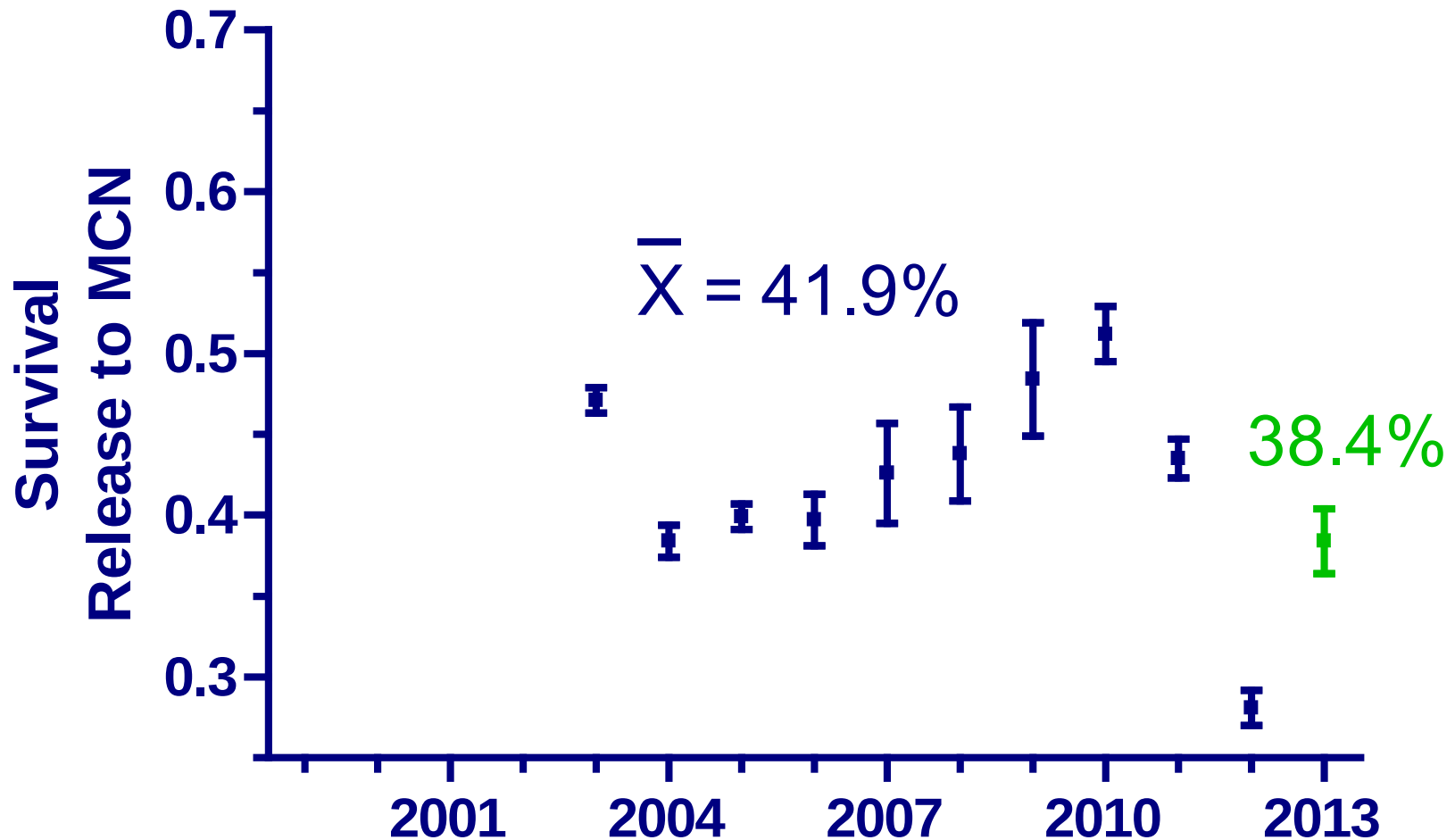


Yearling Chinook Upper Columbia River Hatcheries

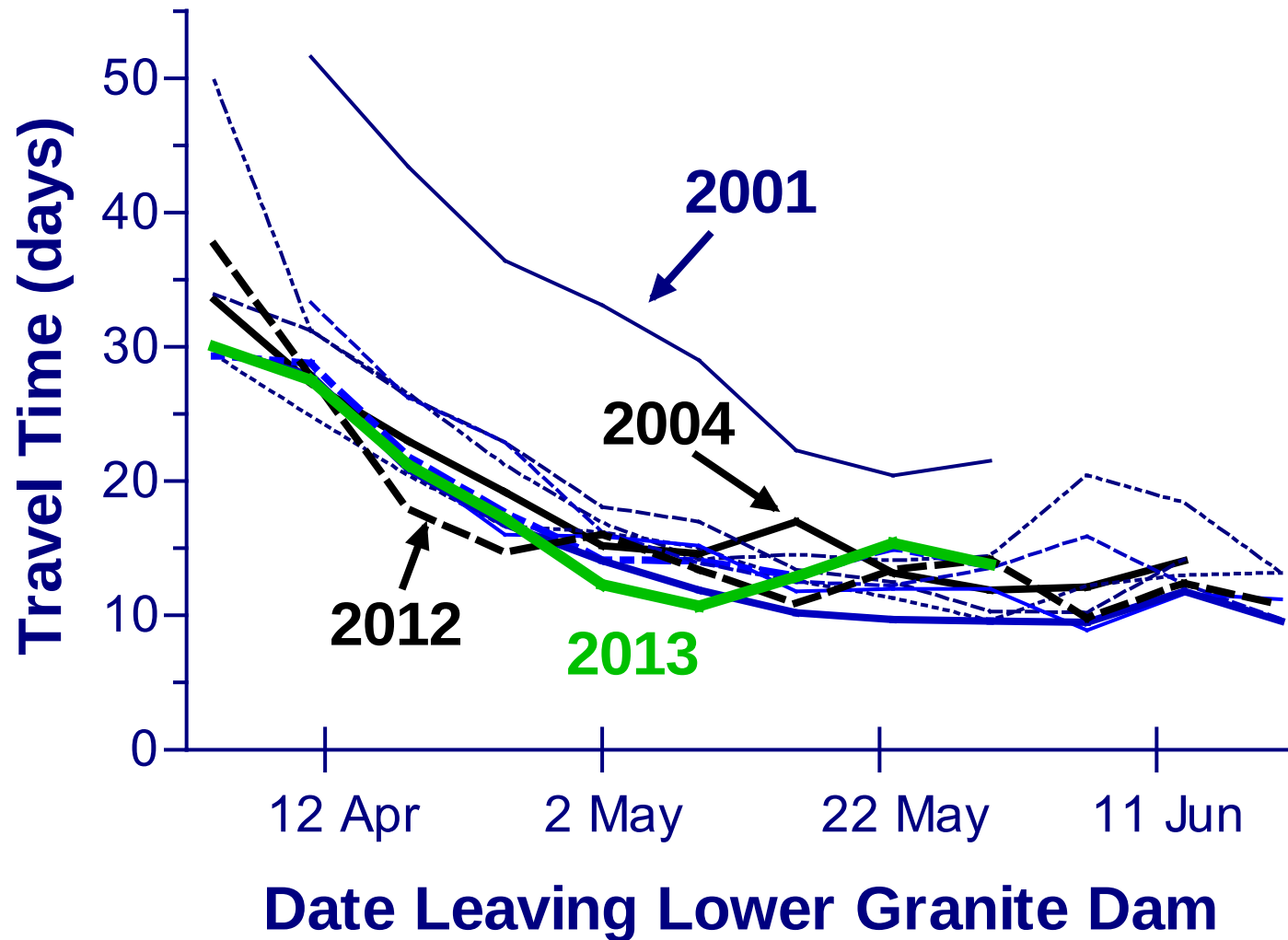


Steelhead

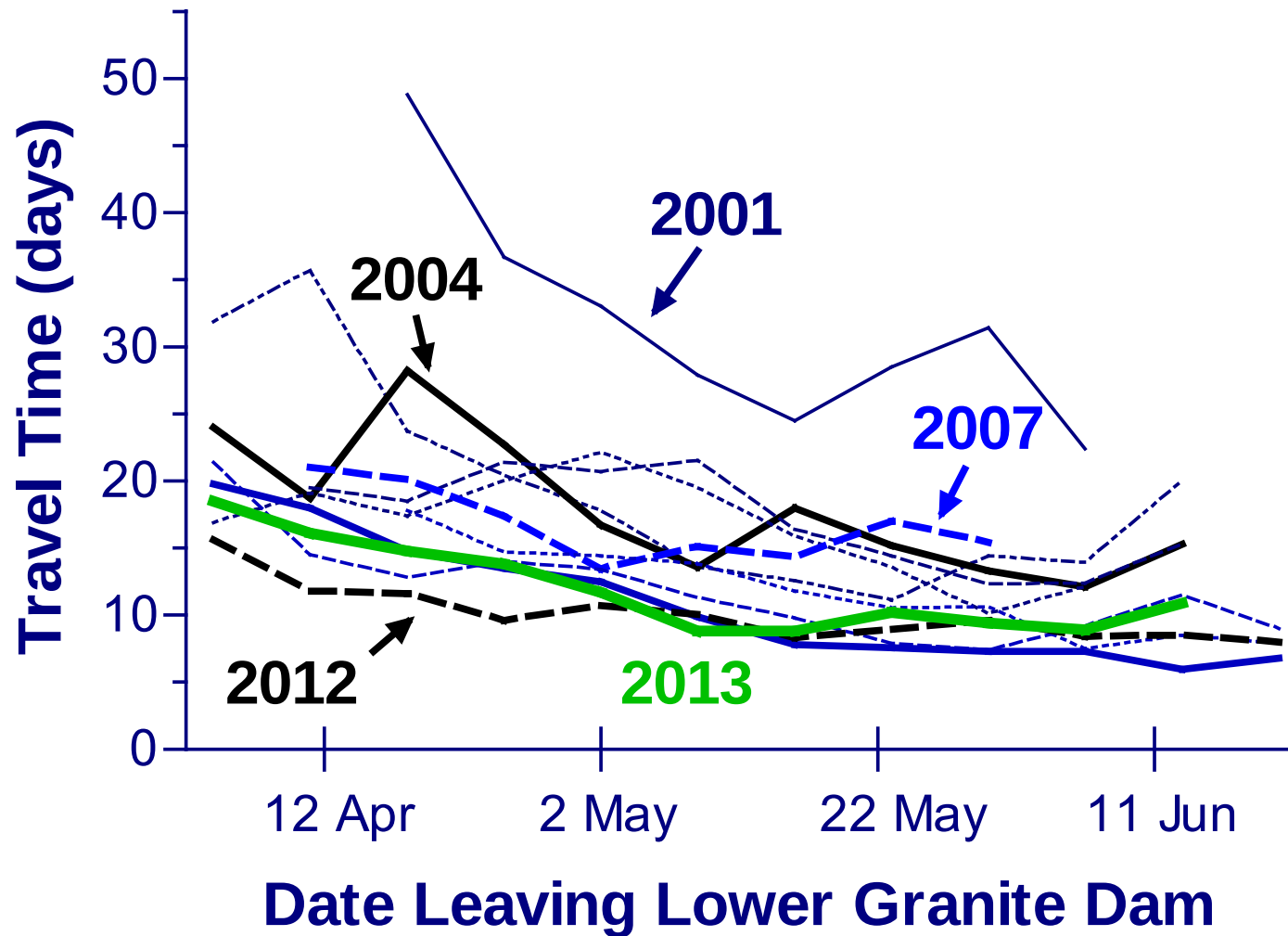
Upper Columbia River Hatcheries



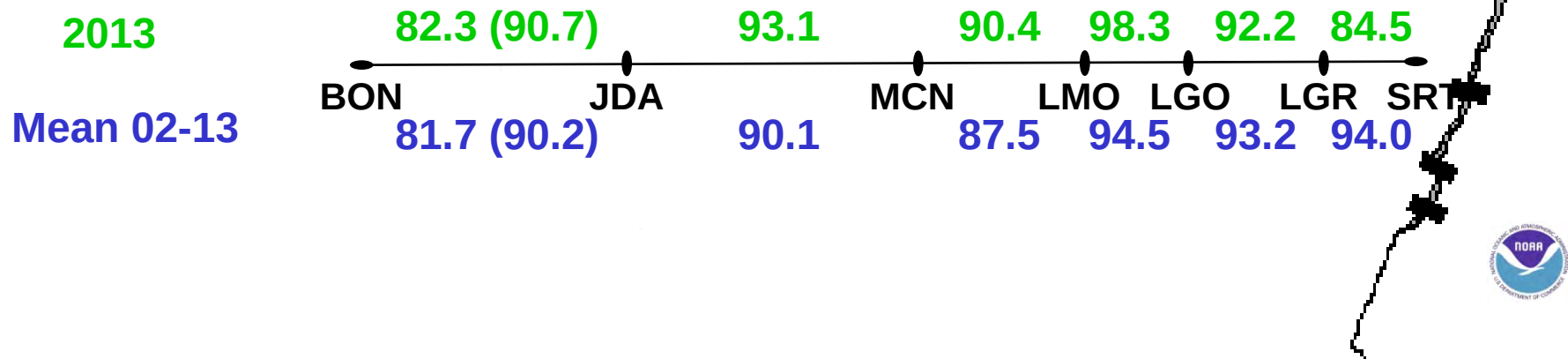
Yearling Chinook Median Travel Time Lower Granite to Bonneville (461 km)



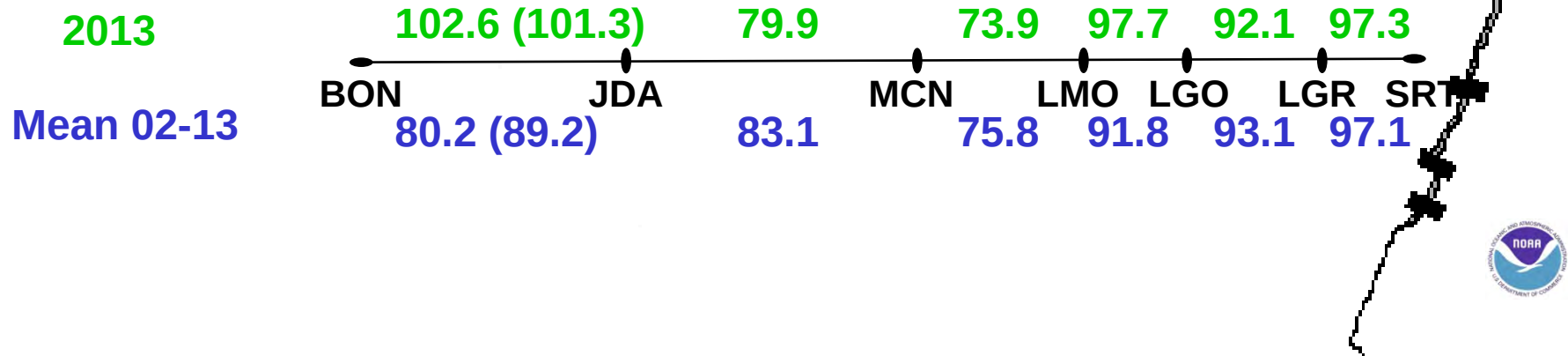
Steelhead Median Travel Time Lower Granite to Bonneville (461 km)

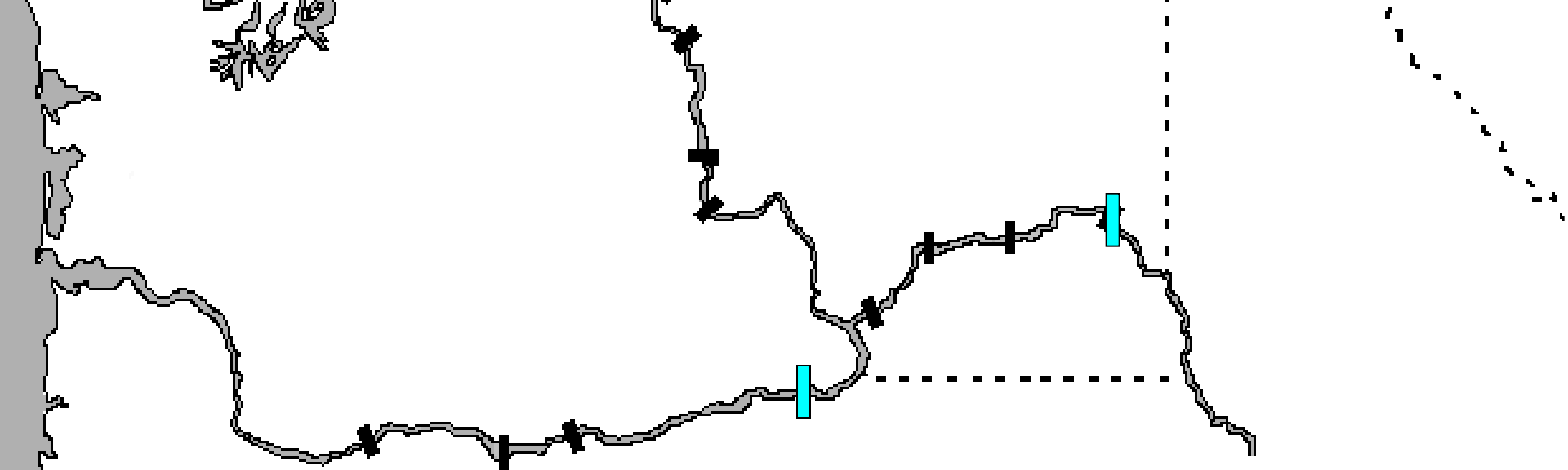


Yearling Chinook salmon reach survival



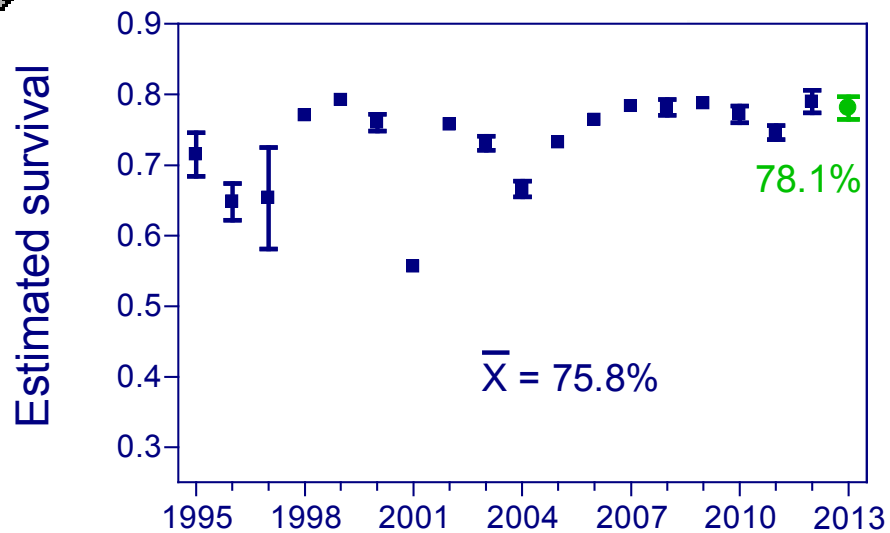
Steelhead reach survival



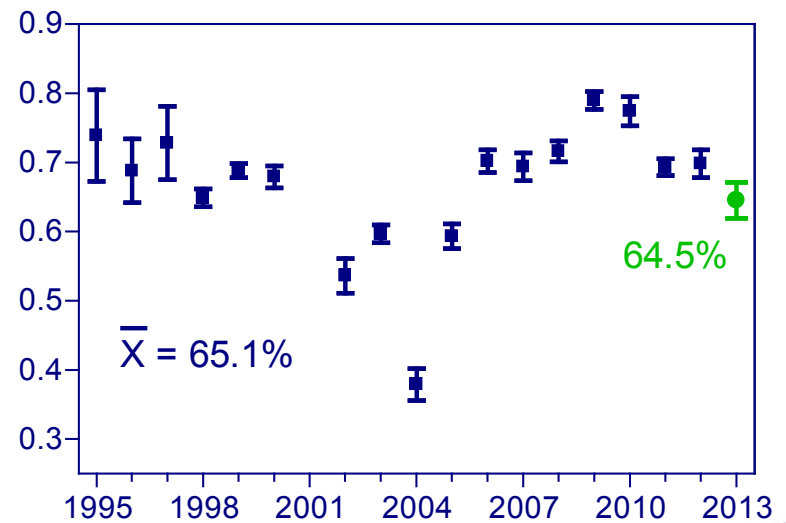


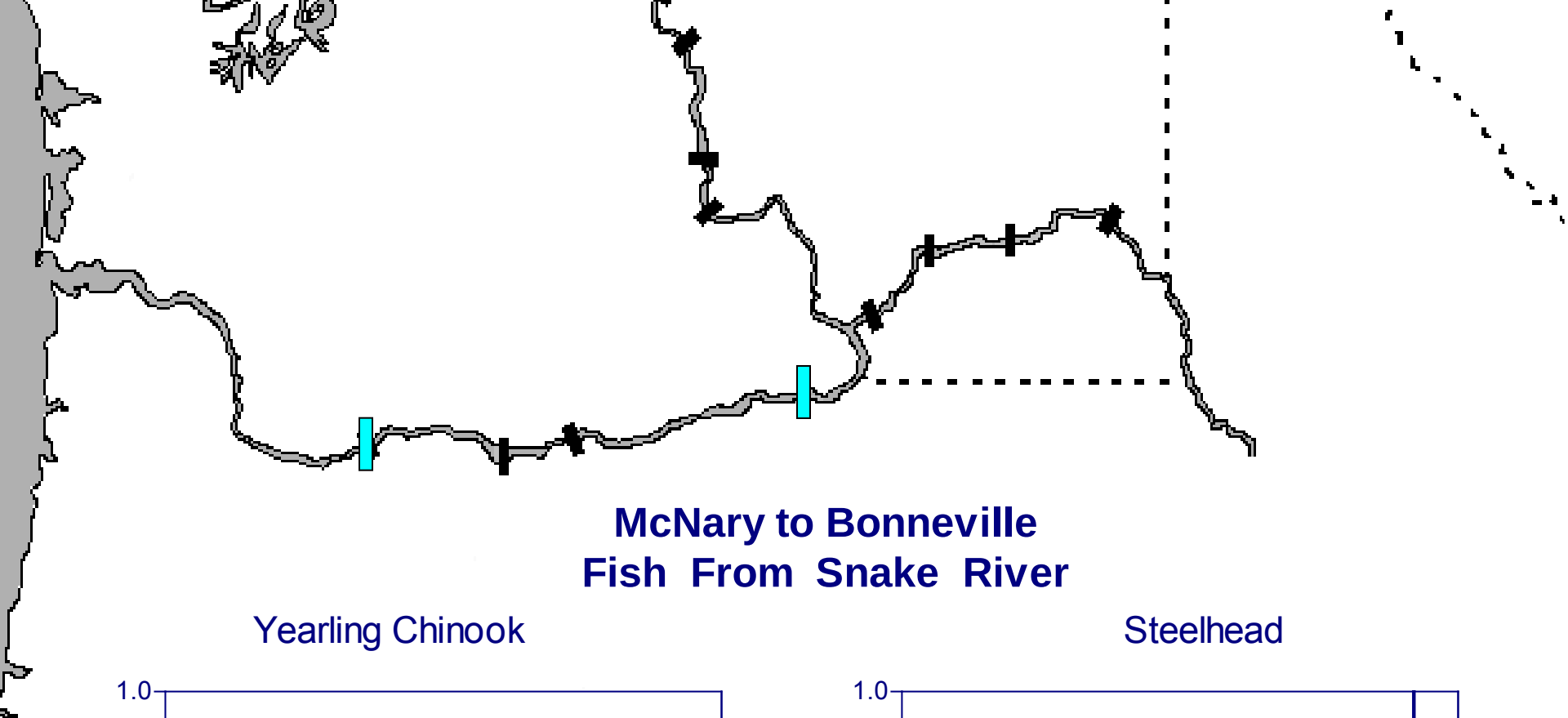
Lower Granite to McNary

Yearling Chinook

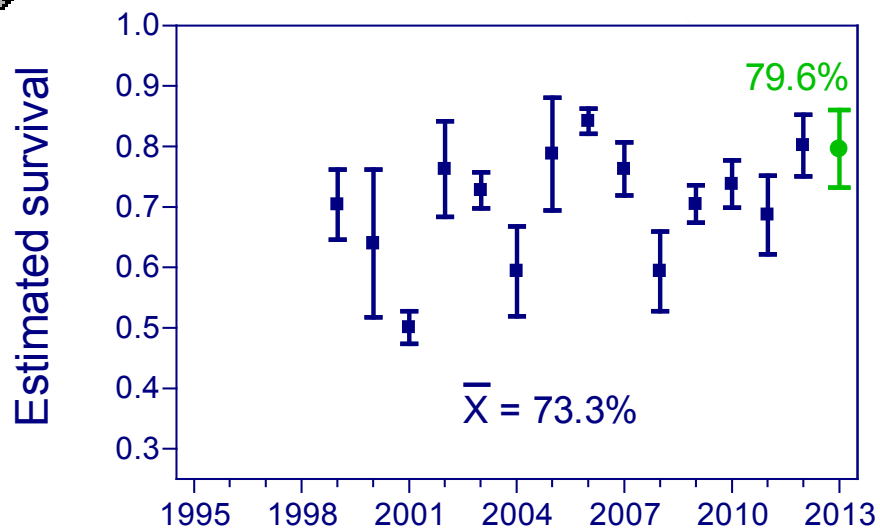


Steelhead

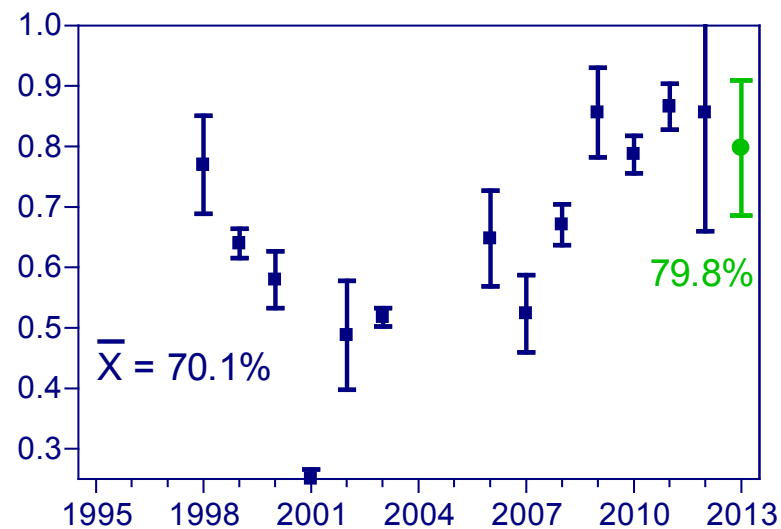


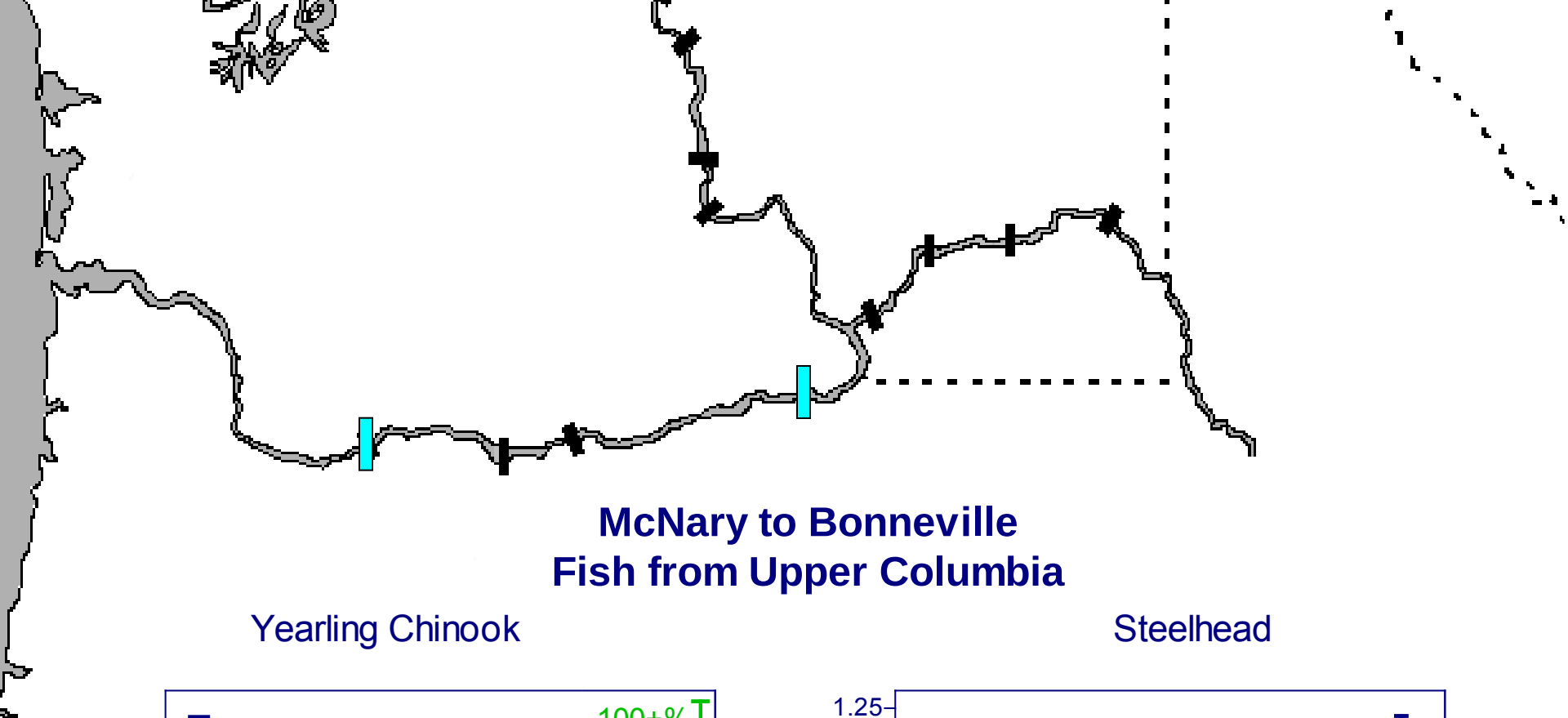


Yearling Chinook

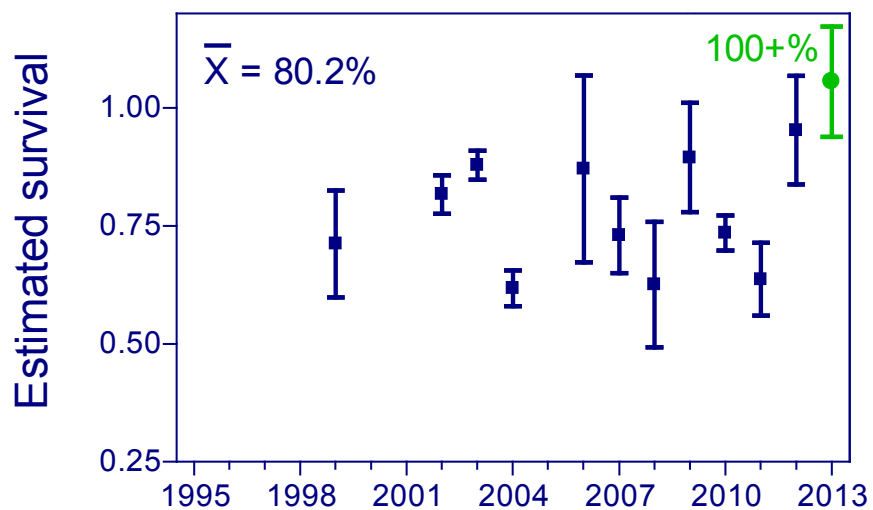


Steelhead

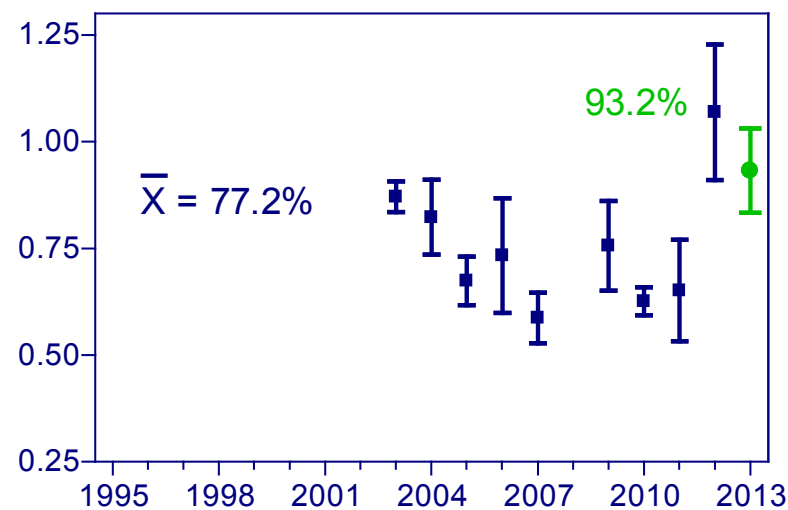


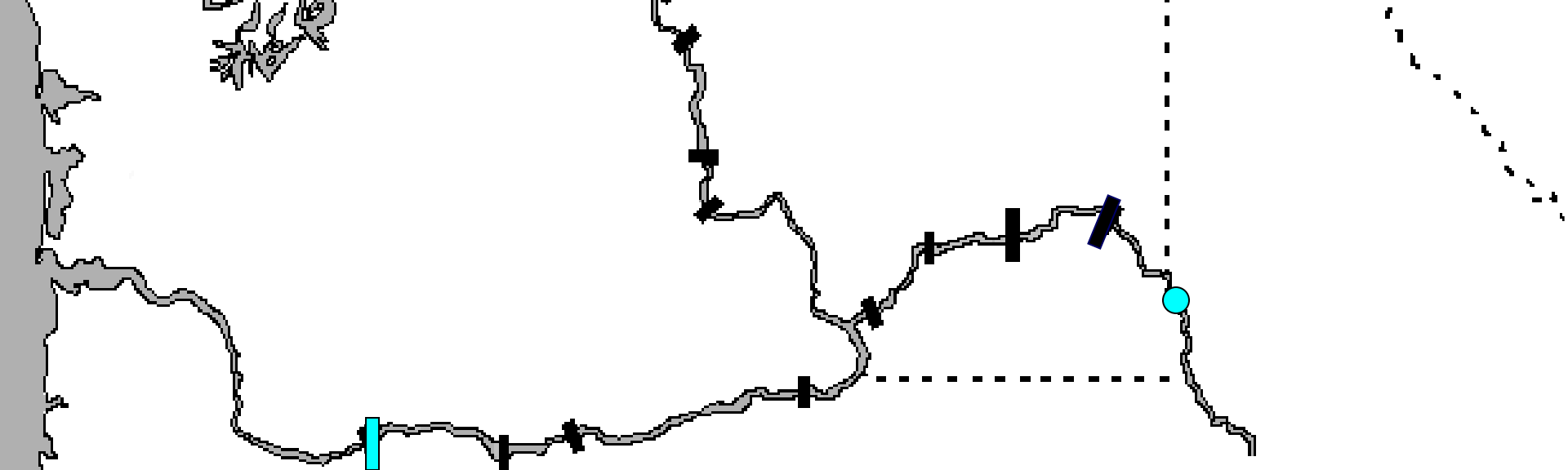


Yearling Chinook



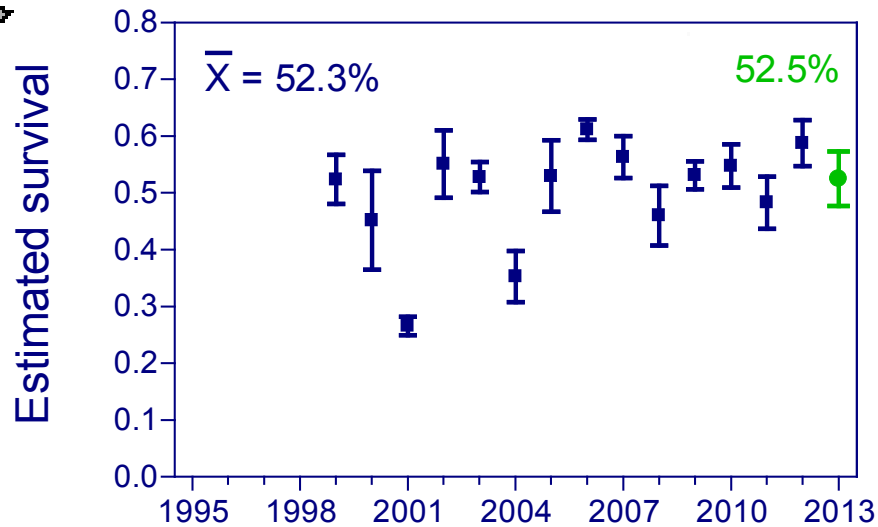
Steelhead



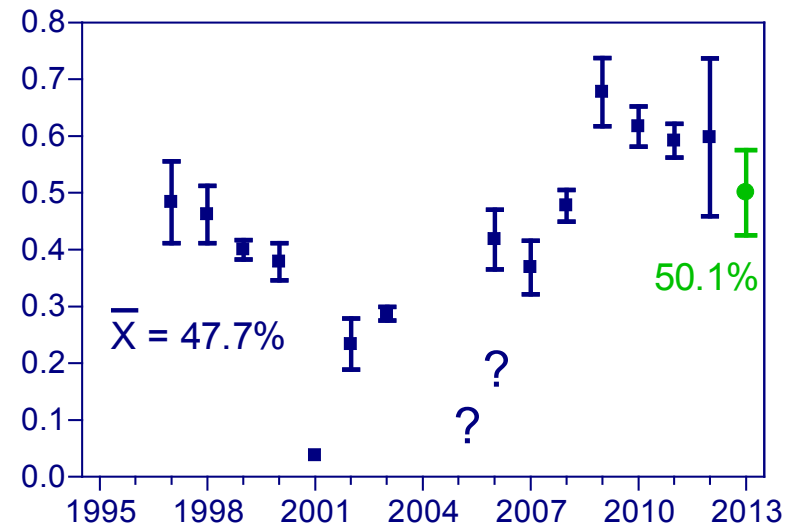


Snake River Trap to Bonneville

Yearling Chinook



Steelhead



Preliminary estimates of transport % for 2013

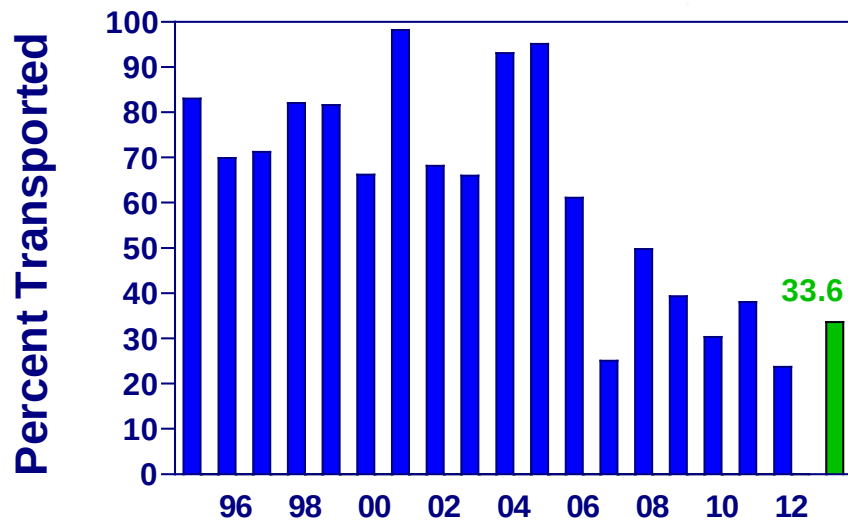


- **36% wild Chinook**
- **31% hatchery Chinook**
- **40% wild steelhead**
- **36% hatchery steelhead**

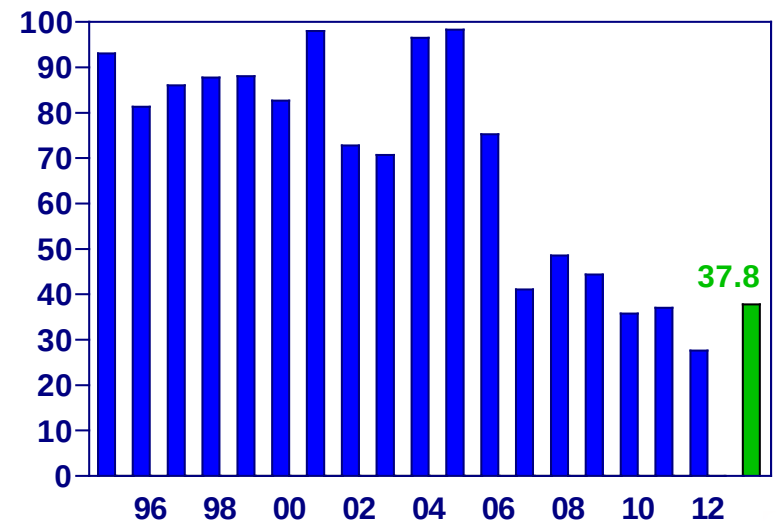


Percent Transported to Below Bonneville

Yearling Chinook



Steelhead



Smolt Transportation Seasonal Analyses

Yearling Chinook & Steelhead
Migration Years 2008-2011

Estimating Seasonal SAR Patterns

- Need a “time-stamp”
- We use fish detected at LGR –
transported or bypassed

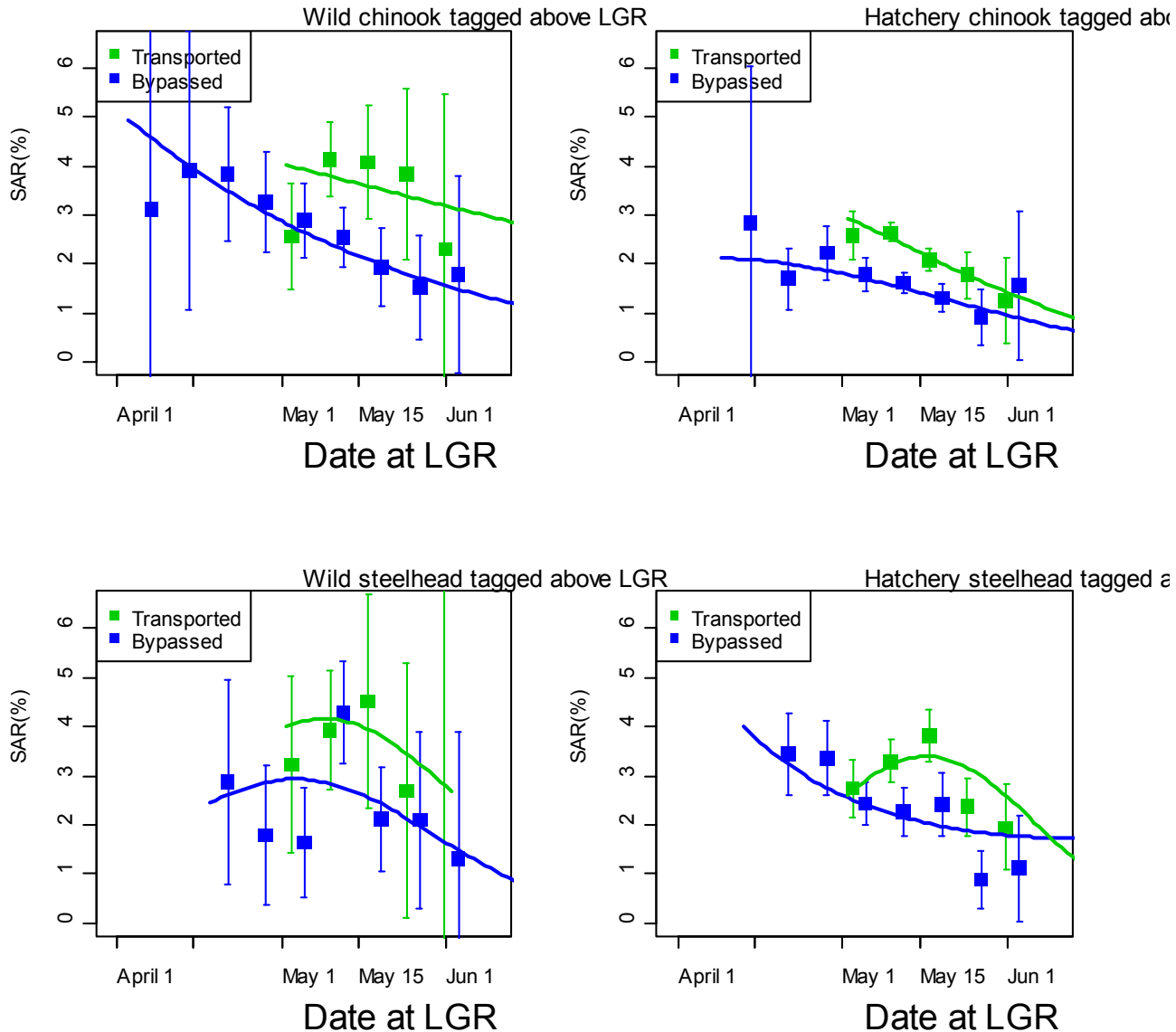
Transportation Summary

Yearling Chinook & Steelhead

- Benefit of transportation was reduced in 2008-20011 relative to earlier years
 - due to improved conditions for in-river migrants
- SAR for transported fish tagged upstream of LGR still exceeded that for bypassed fish for most of the season (except incomplete-return 2011?)

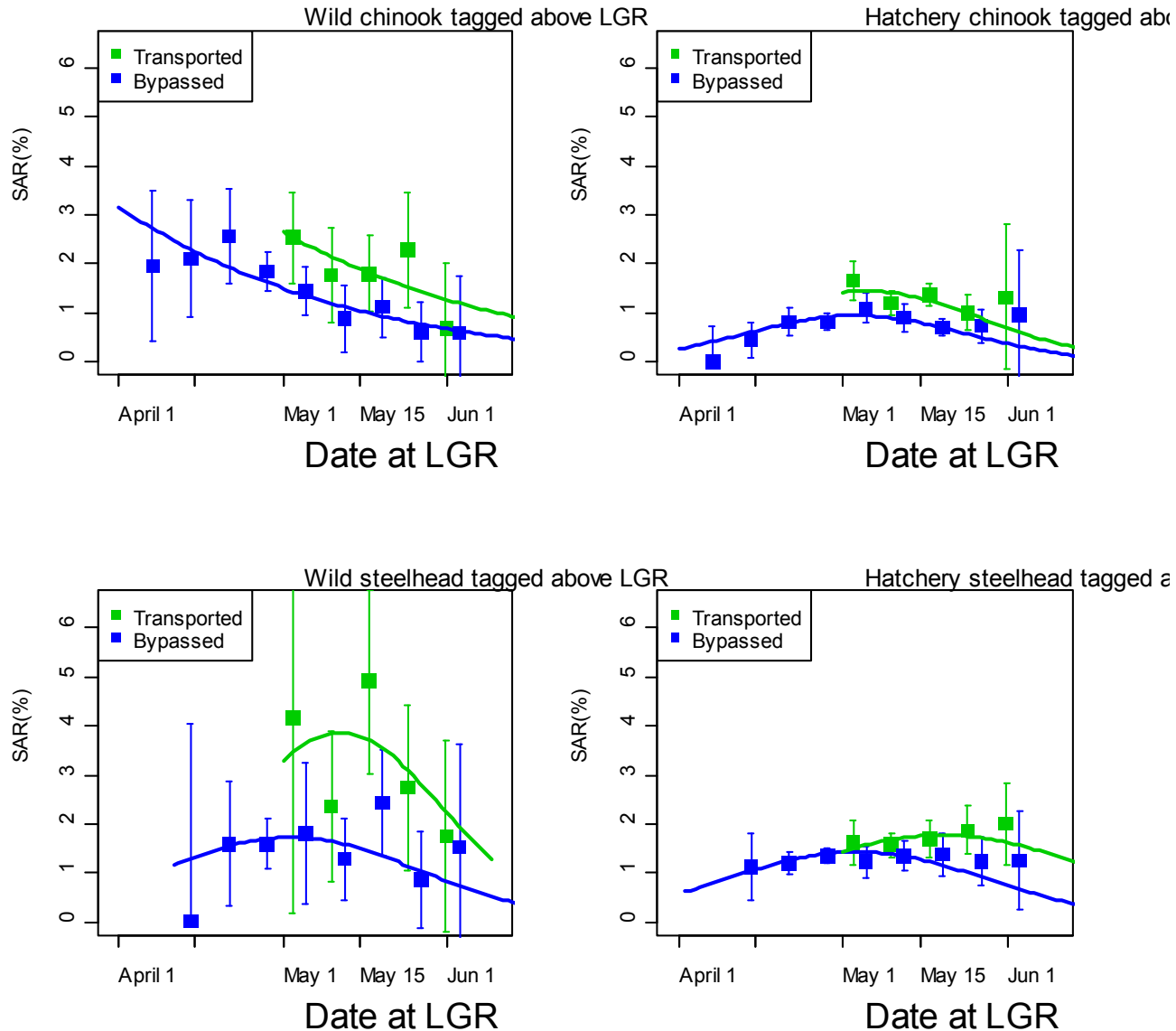
MY 2008

Model-Averaged - Descriptive



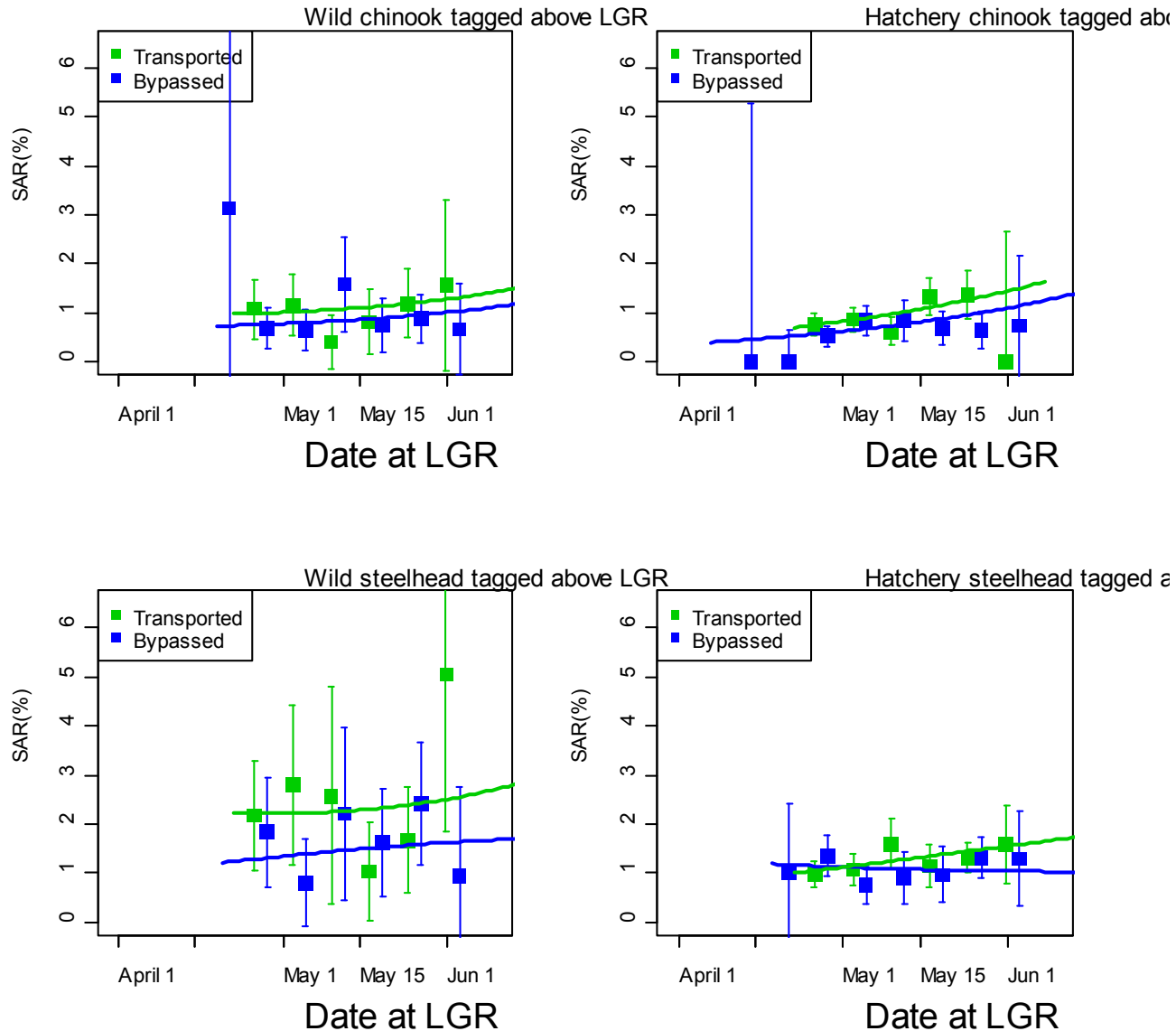
MY 2009

Model-Averaged - Descriptive



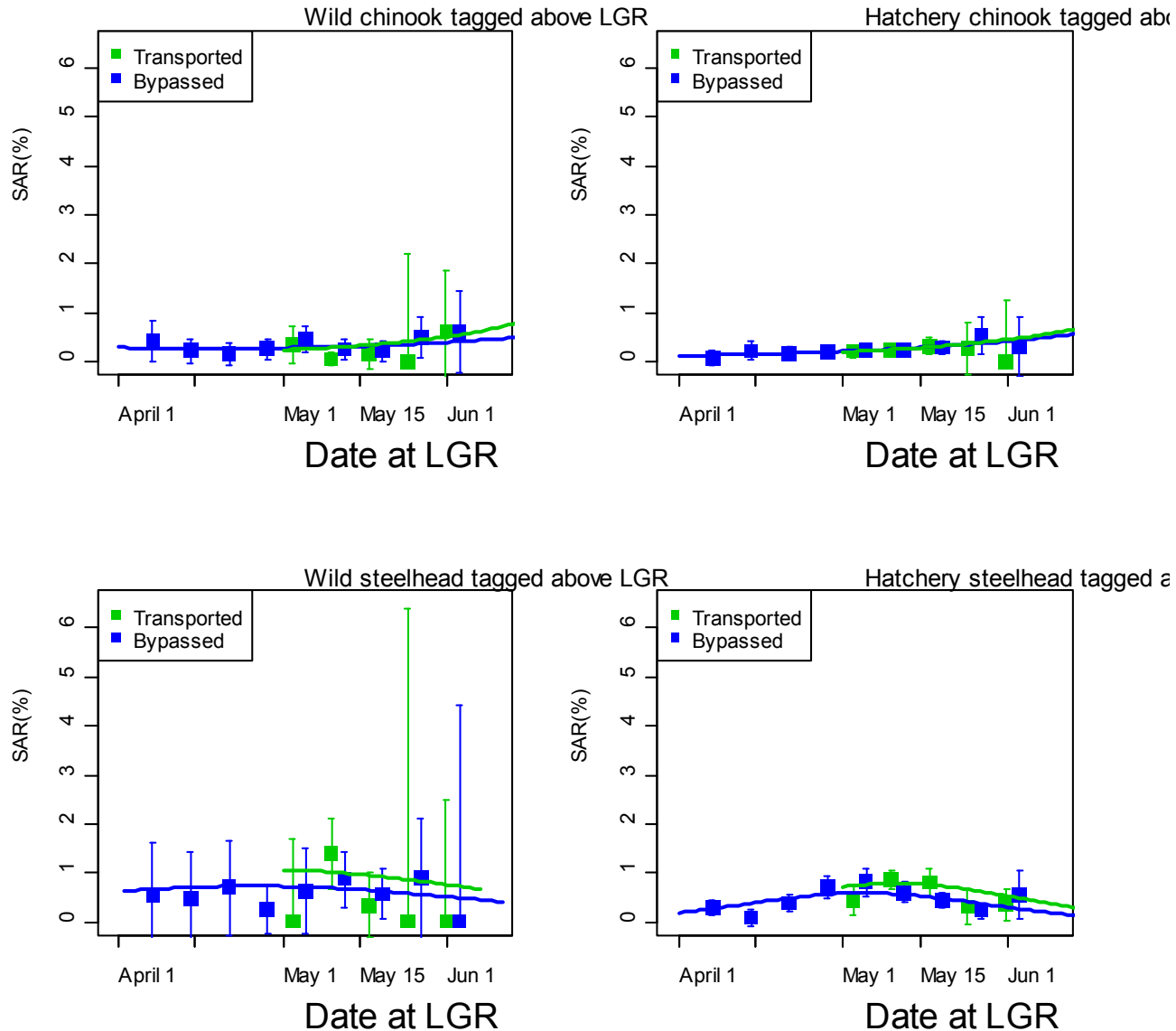
MY 2010

Model-Averaged - Descriptive



MY 2011

Model-Averaged - Descriptive



Transportation Evaluation

- Relative SAR = “T:B Ratio”
 - $T:B > 1$:
transported SAR > bypassed SAR

Transportation Evaluation

- Relative SAR = “T:B Ratio”
 - $T:B > 1$:
transported SAR > bypassed SAR
- What about fish never in a collection system?

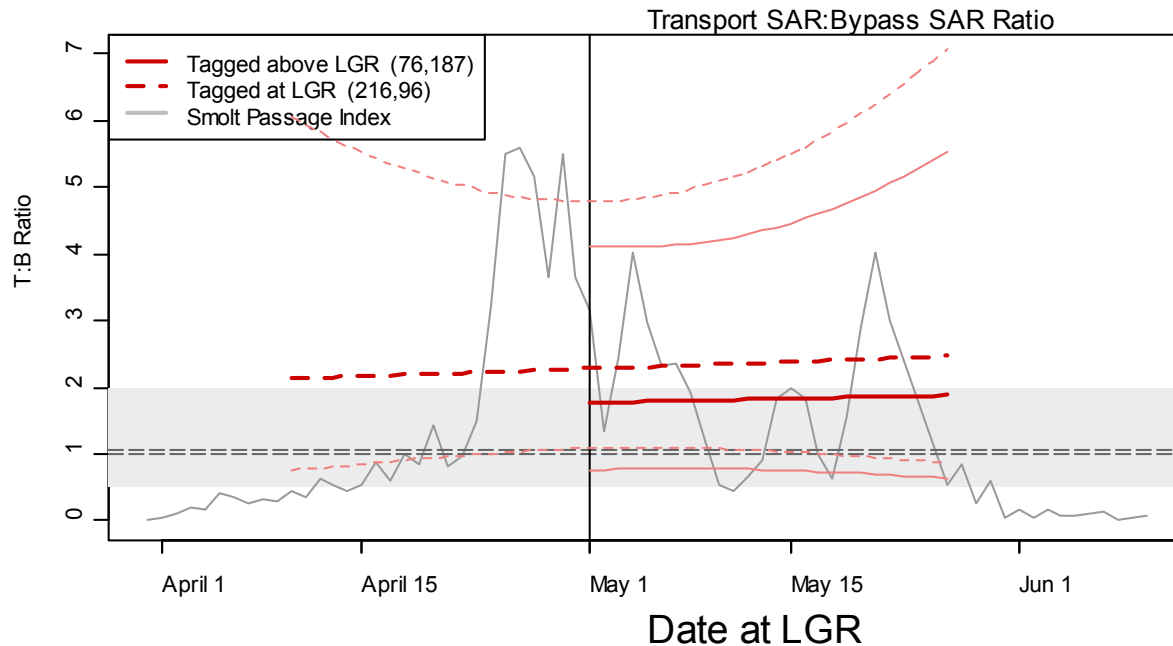
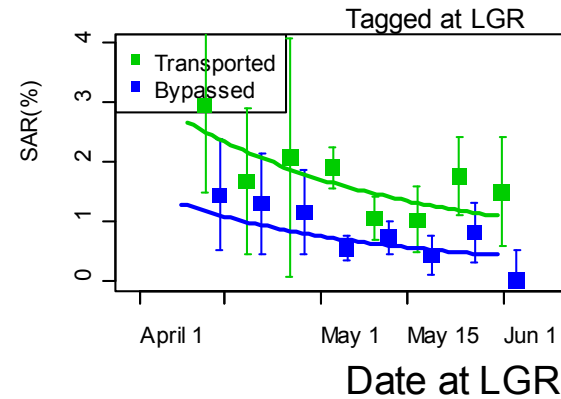
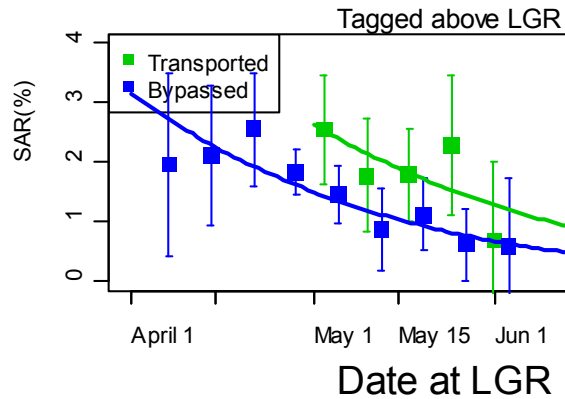
SAR Ratio Standards

Ratios of estimated annual *SAR* of PIT-tagged fish not detected at Lower Granite, Little Goose, or Lower Monumental Dams (includes detected and not-detected fish at McNary Dam) to estimated annual *SAR* of PIT-tagged fish bypassed at Lower Granite Dam with any subsequent downstream detection history.

Migration Year	Wild Chinook	Hatchery Chinook	Wild steelhead	Hatchery steelhead
1998	1.25	1.55	3.32	3.49
1999	1.10	1.07	1.40	1.89
2000	0.84	0.96	0.90	0.90
2002	1.40	1.09	0.79	1.10
2003	1.42	1.15	0.83	2.01
2004	2.11	2.14	NA	3.29
2005	0.44	1.67	NA	2.40
2006	1.54	1.19	1.70	1.33
2007	1.00	1.17	0.95	1.60
2008	1.07	0.90	1.33	1.20
2009	0.86	0.94	1.59	1.15
2010	1.50	1.42	0.98	1.51
2011	1.84	1.13	2.53	1.20
Geometric means:				
2006-2011	1.26	1.11		
2006-2008			1.27	1.35
1998-2011 (excl. 2001)	1.18	1.22		1.63
1998-2011 (excl. 2001,4,5)			1.33	

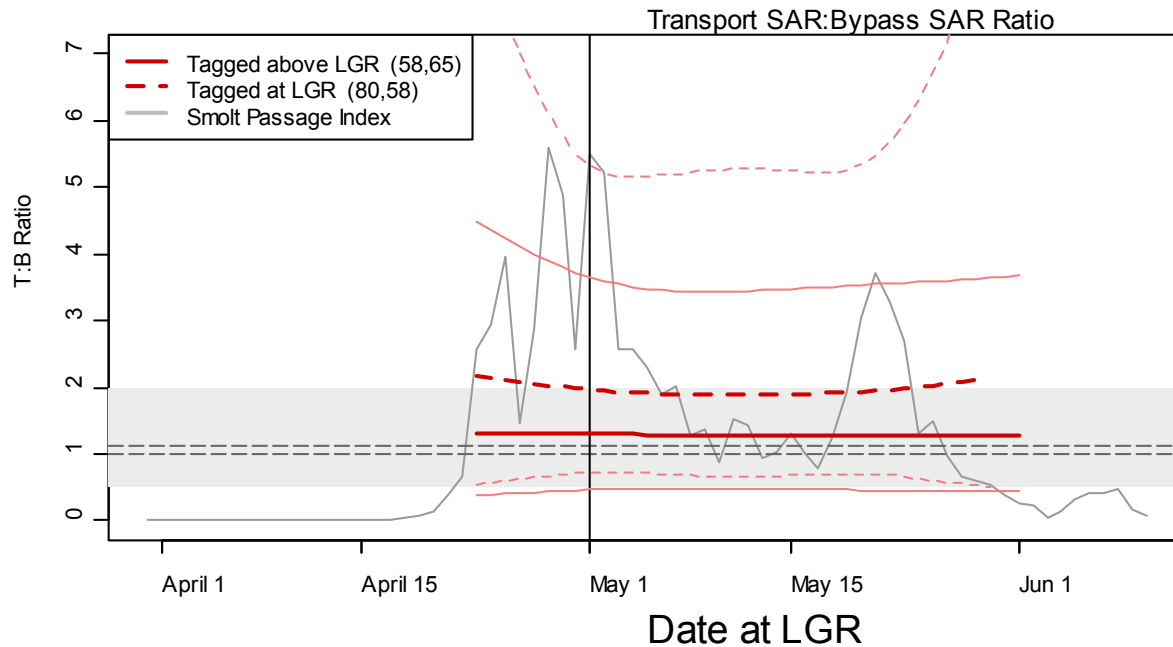
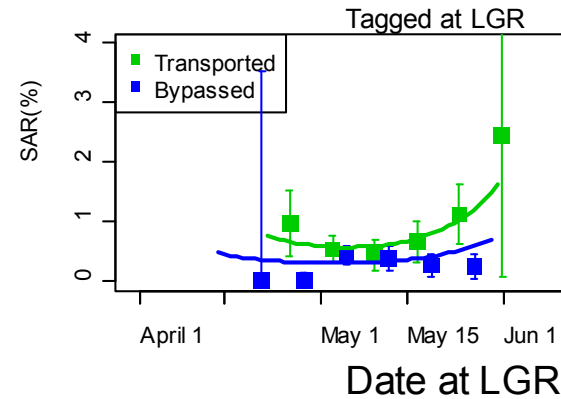
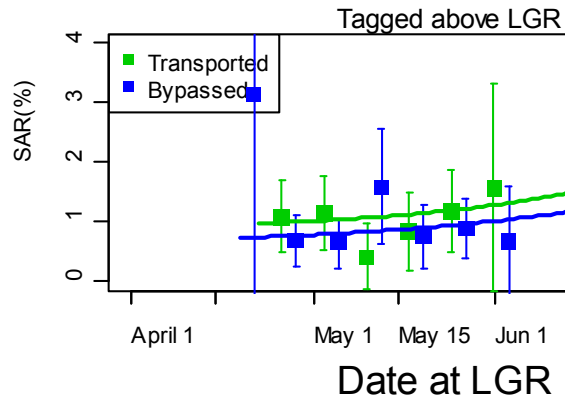
Wild Chinook 2009

Model-Averaged - Descriptive



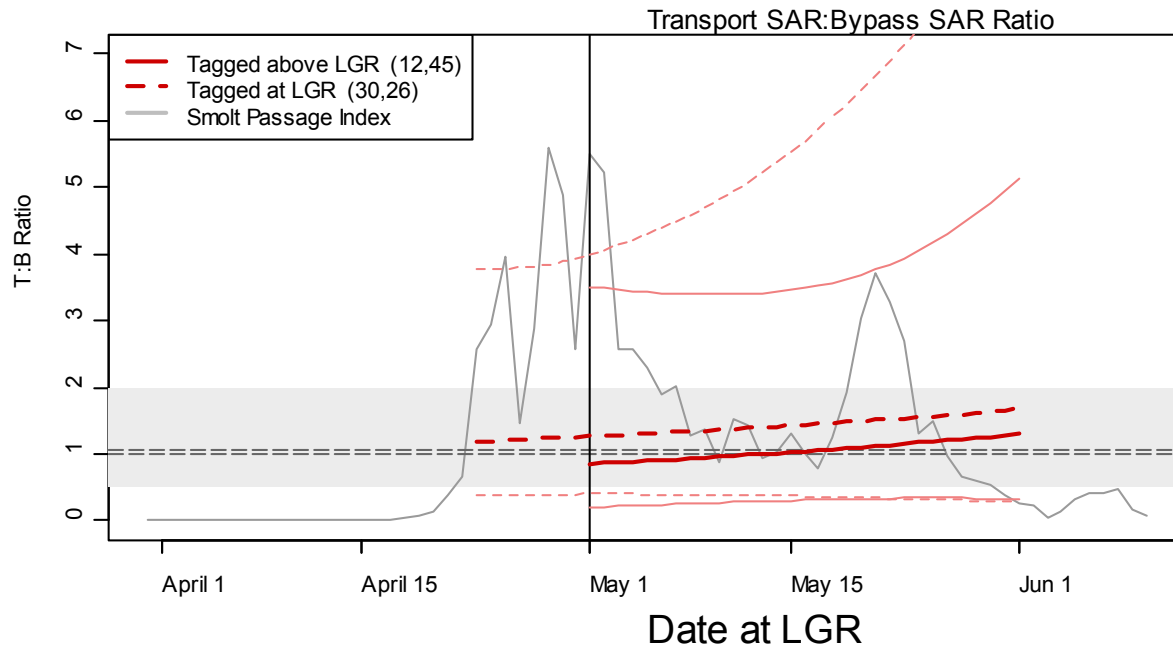
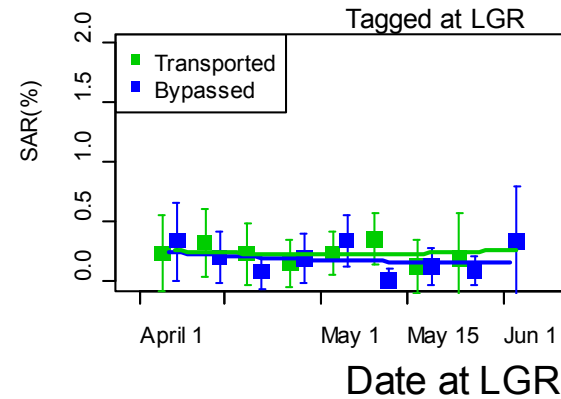
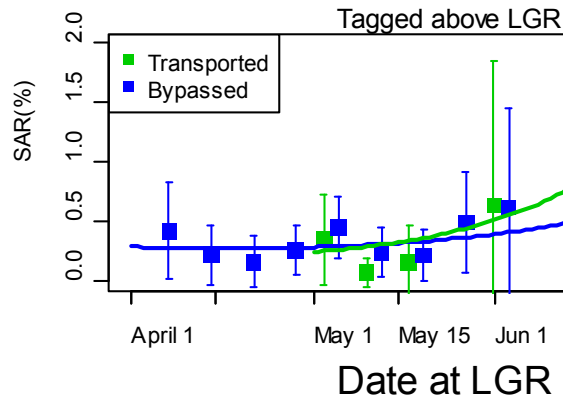
Wild Chinook 2010

Model-Averaged - Descriptive



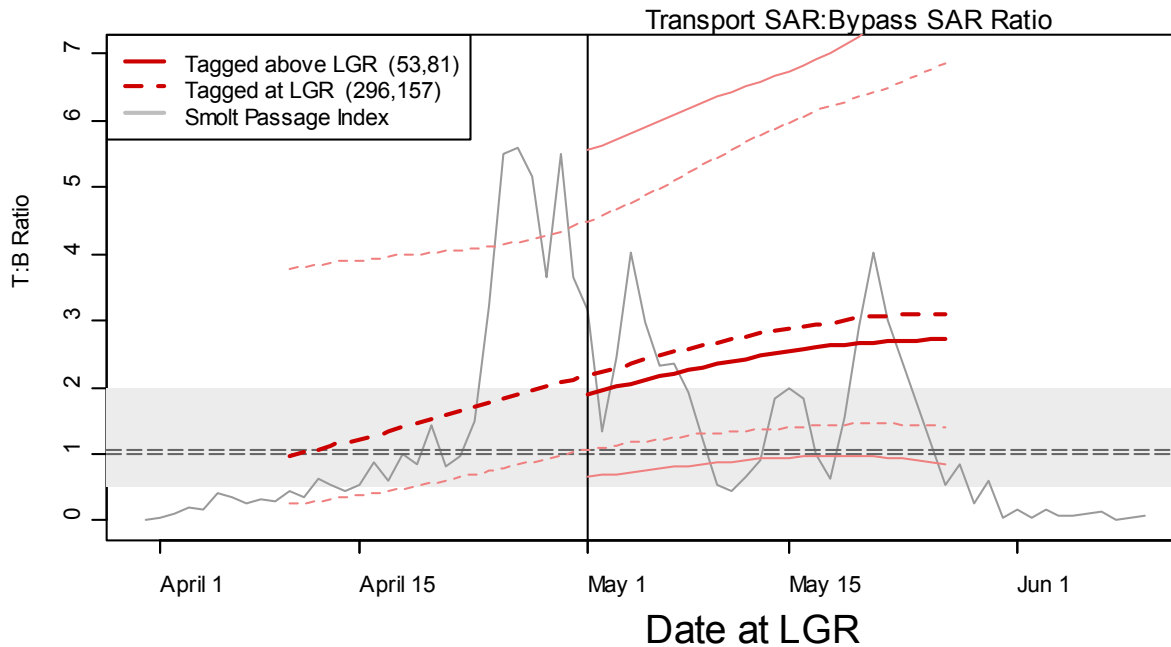
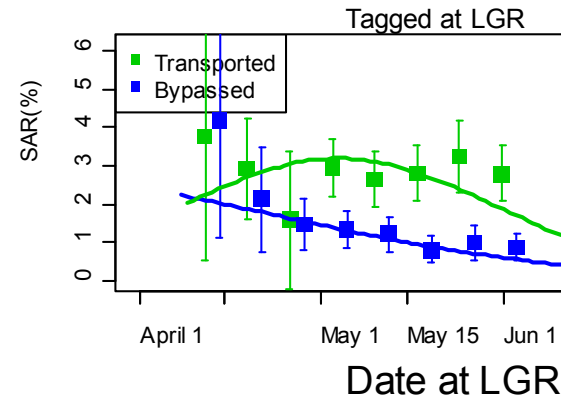
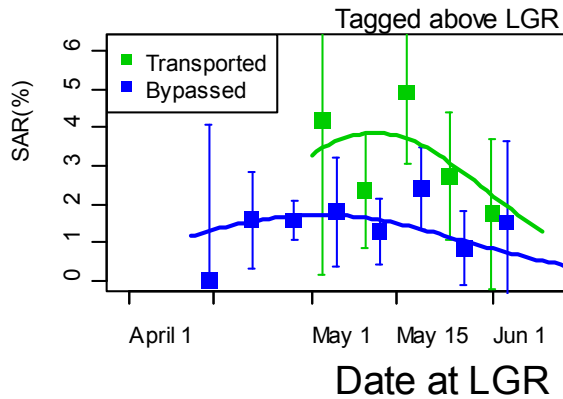
Wild Chinook 2011

Model-Averaged - Descriptive



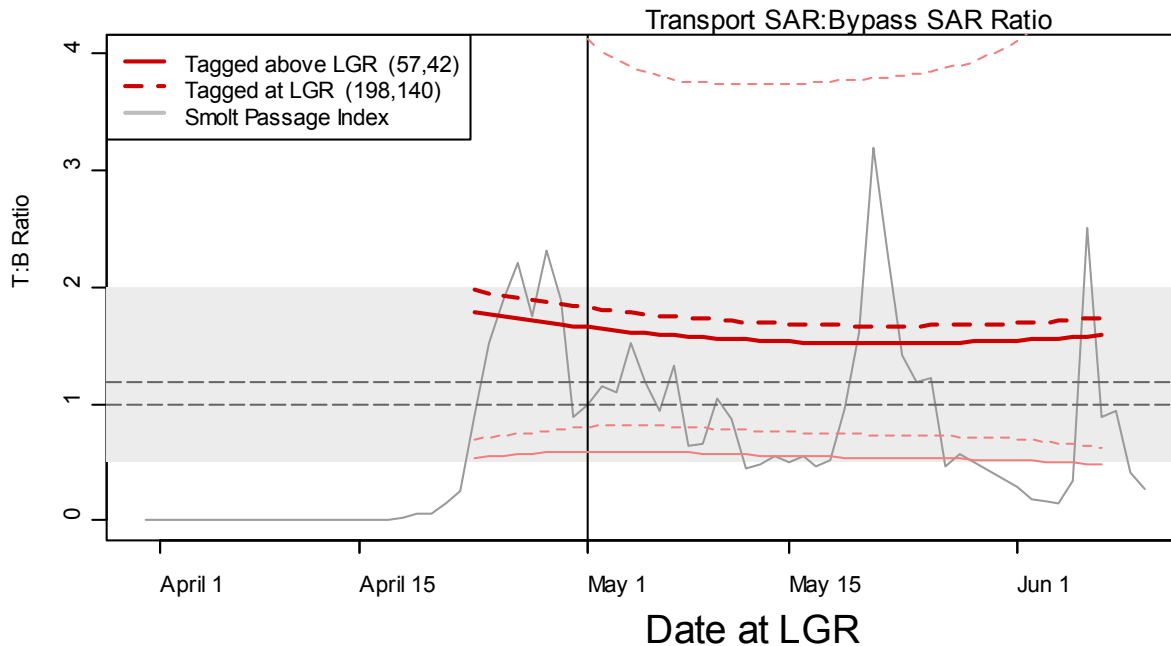
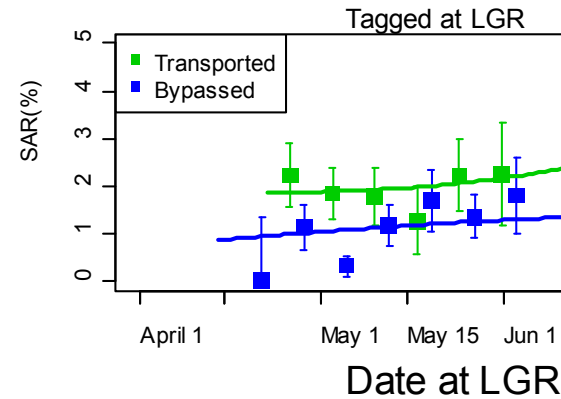
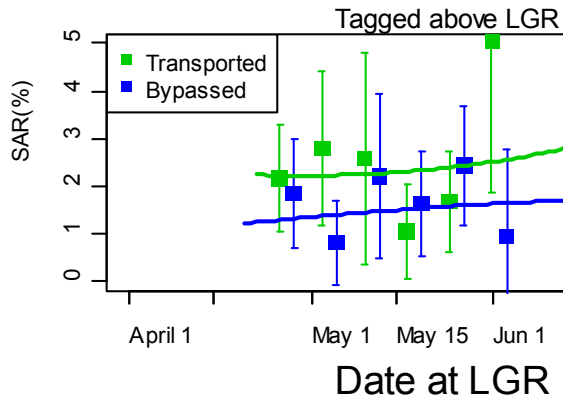
Wild Steelhead 2009

Model-Averaged - Descriptive



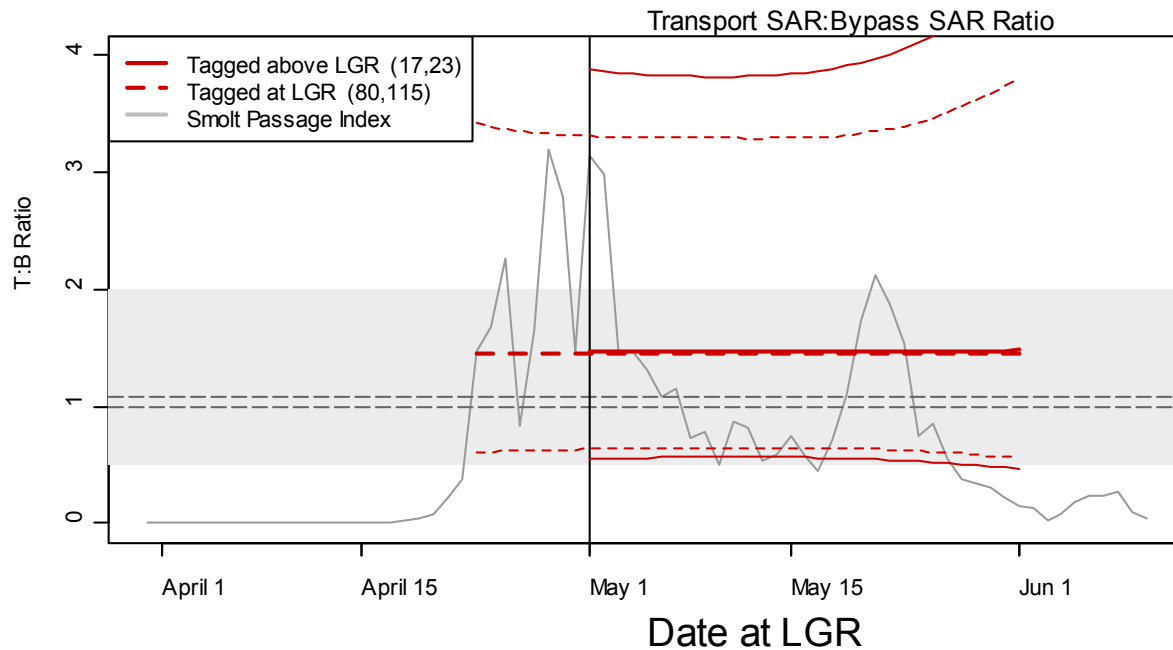
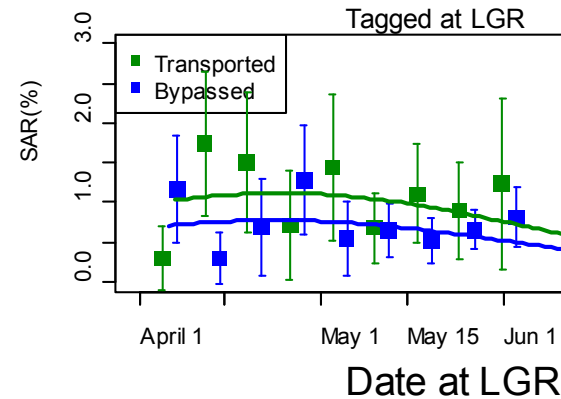
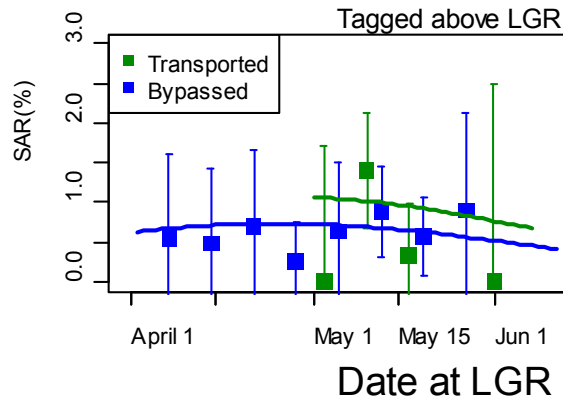
Wild Steelhead 2010

Model-Averaged - Descriptive



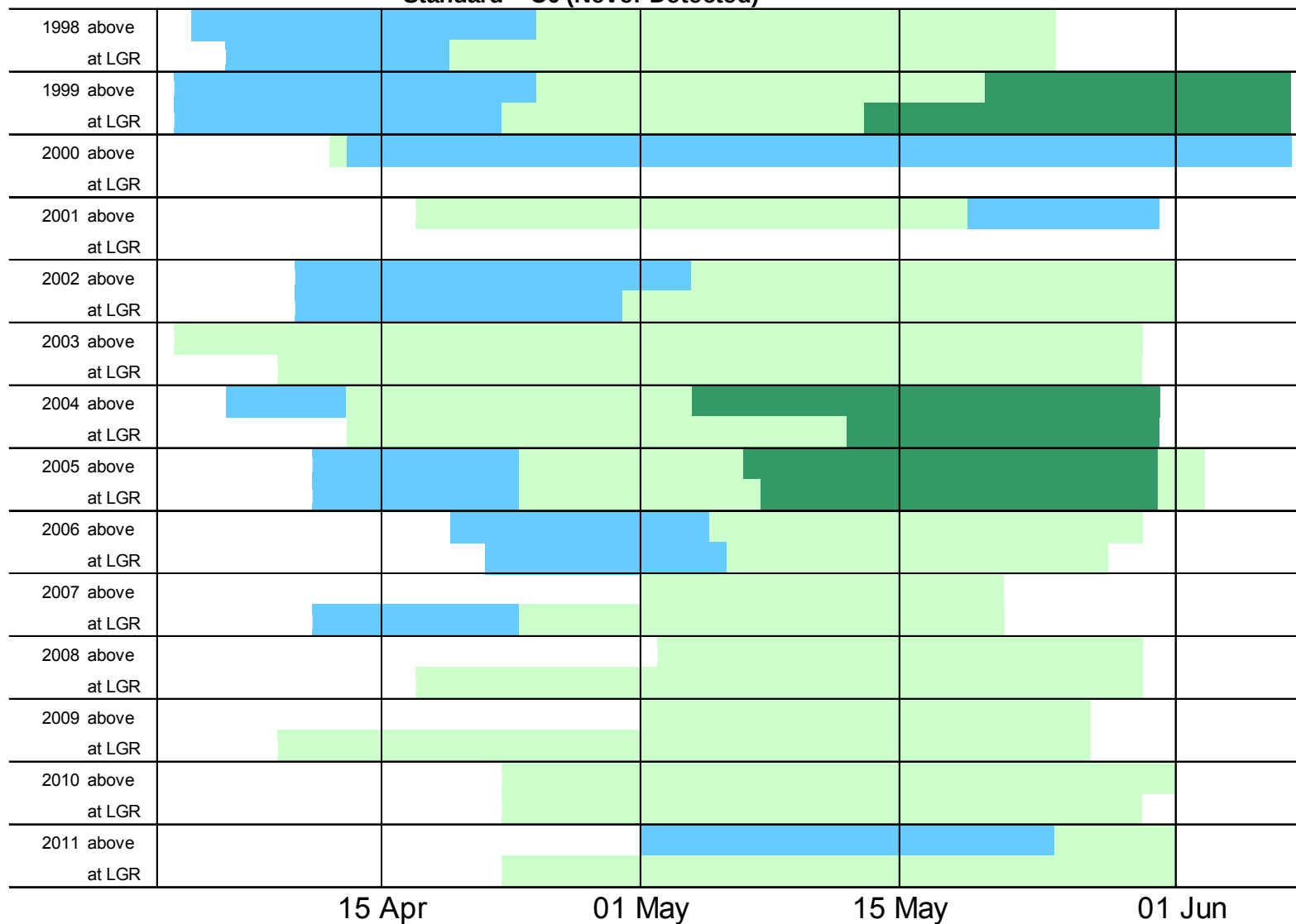
Wild Steelhead 2011

Model-Averaged - Descriptive



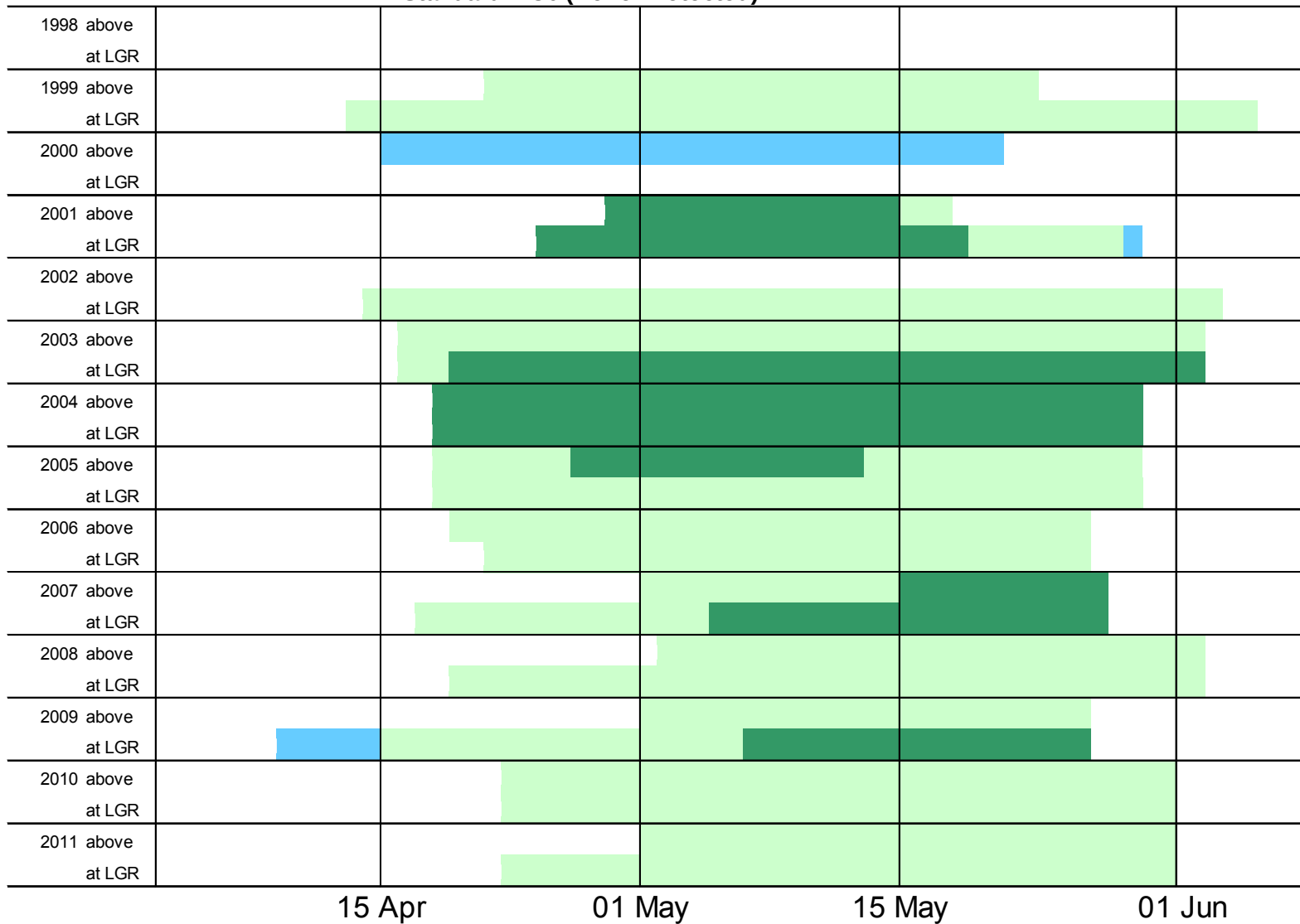
Wild Chinook Salmon - Summary of Model-Averaged T:B Values (Descriptive)

Standard = C0 (Never Detected)



Wild Steelhead - Summary of Model-Averaged T:B Values (Descriptive)

Standard = C0 (Never Detected)



Smolt Transportation Seasonal Analyses

Subyearling Fall Chinook Migration Years 2006 & 2008

Transportation Summary

Subyearling Fall Chinook &

- Bypass > Transport for fish arriving at LGR, LGO, LMN earliest (before ~June 15)
- Transport > Bypass for fish arriving at LGR, LGO, LMN after ~June 15

(Not enough data for MCN)

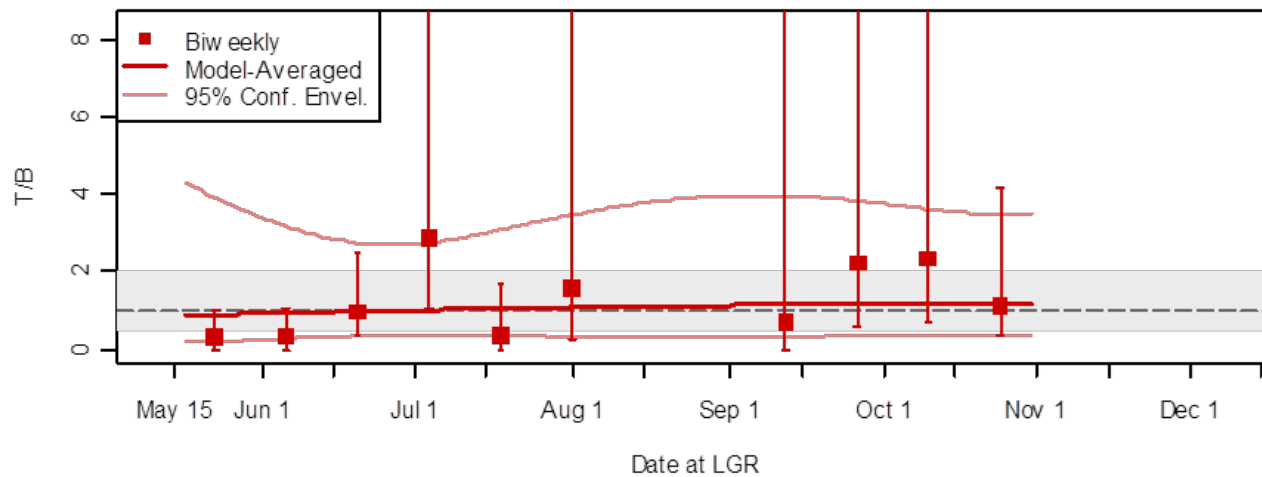
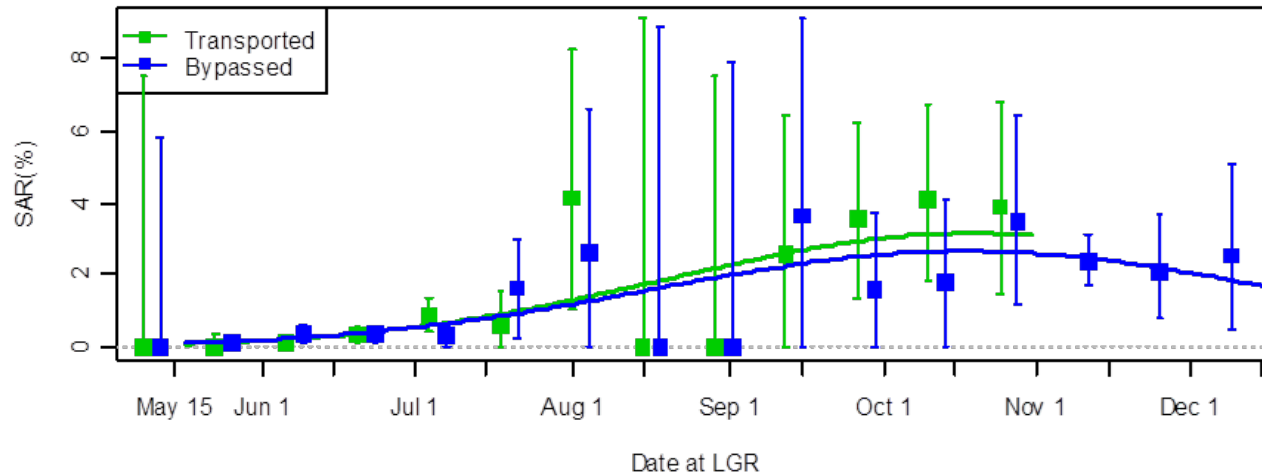
Categories of Fall Chinook Salmon

- **Natural**
 - Not enough of them to conduct a transportation evaluation
- **Hatchery Surrogates for Natural Fish**
 - Lyons Ferry fish specially reared at Dworshak NFH etc. (for study only)
- **Hatchery Production Subyearlings**
- **Hatchery Production Yearlings**
 - Lyons Ferry production rearing

2006 Surrogate Subyearlings

Lower Granite Dam

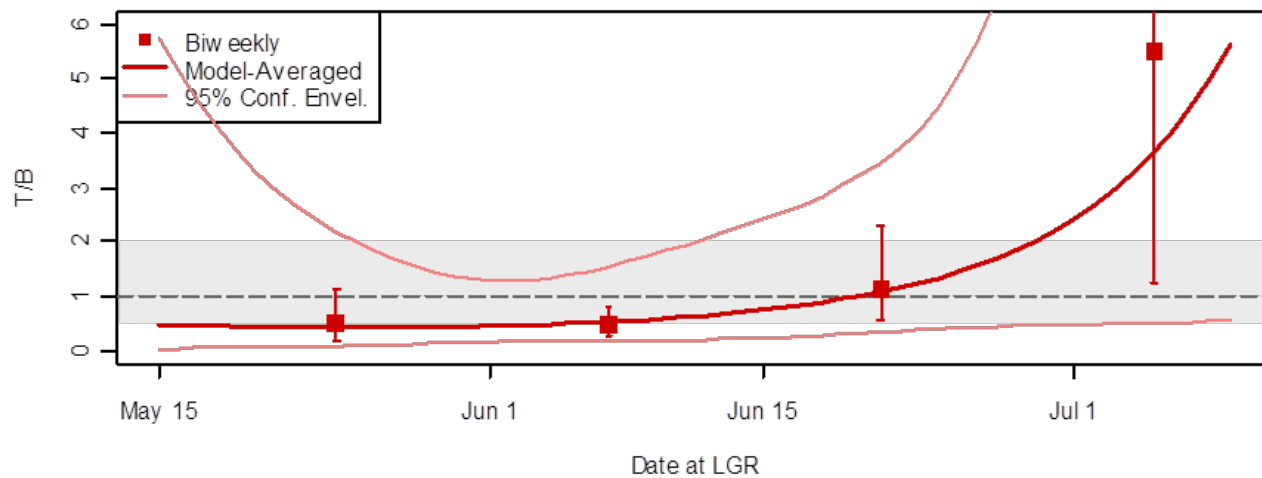
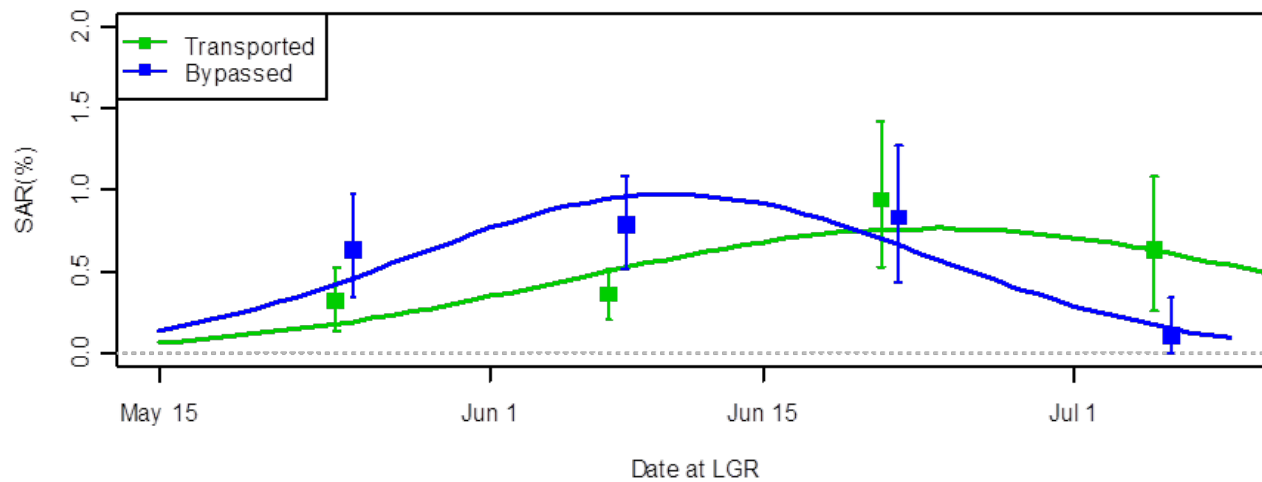
Smolt-to-Adult Return (%)



2006 Production Subyearlings

Lower Granite Dam

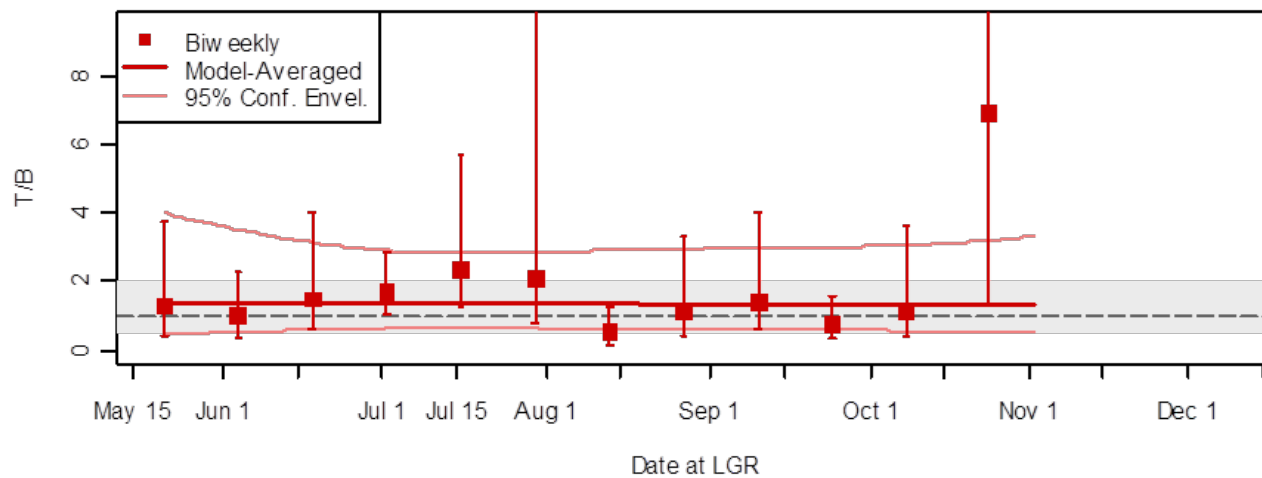
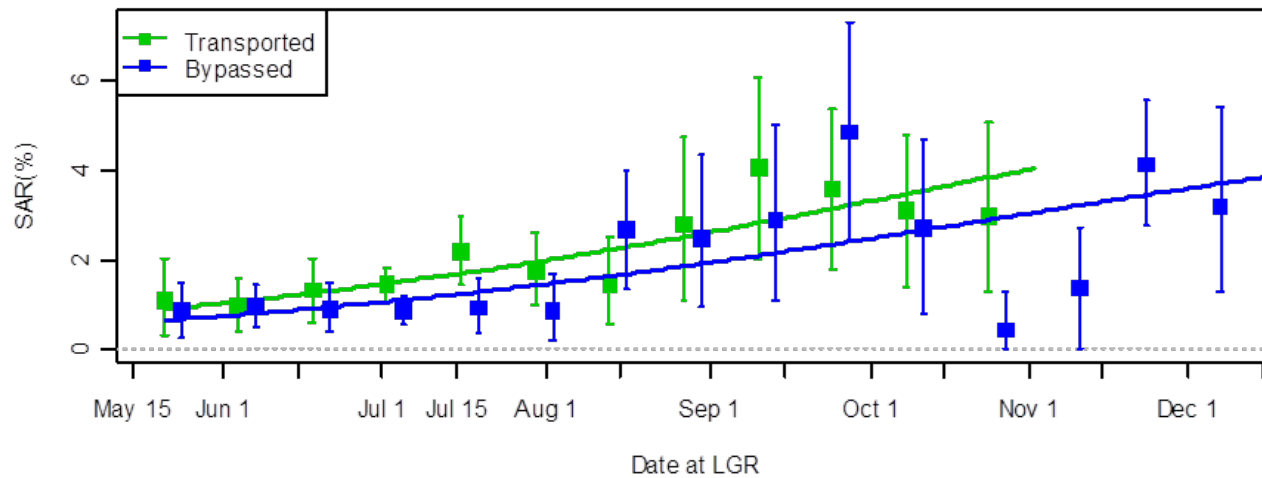
Smolt-to-Adult Return (%)



2008 Surrogate Subyearlings

Lower Granite Dam

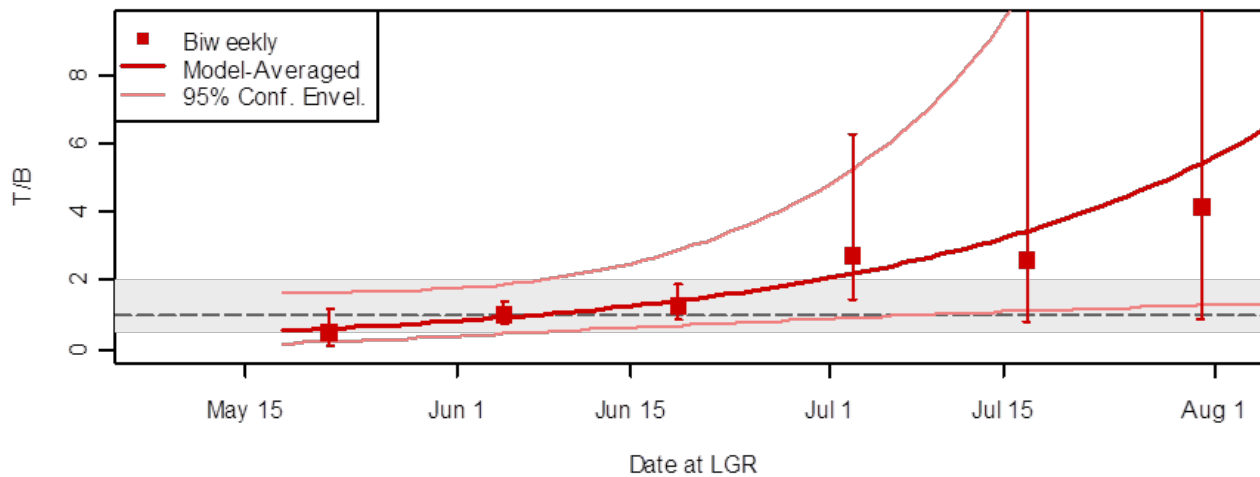
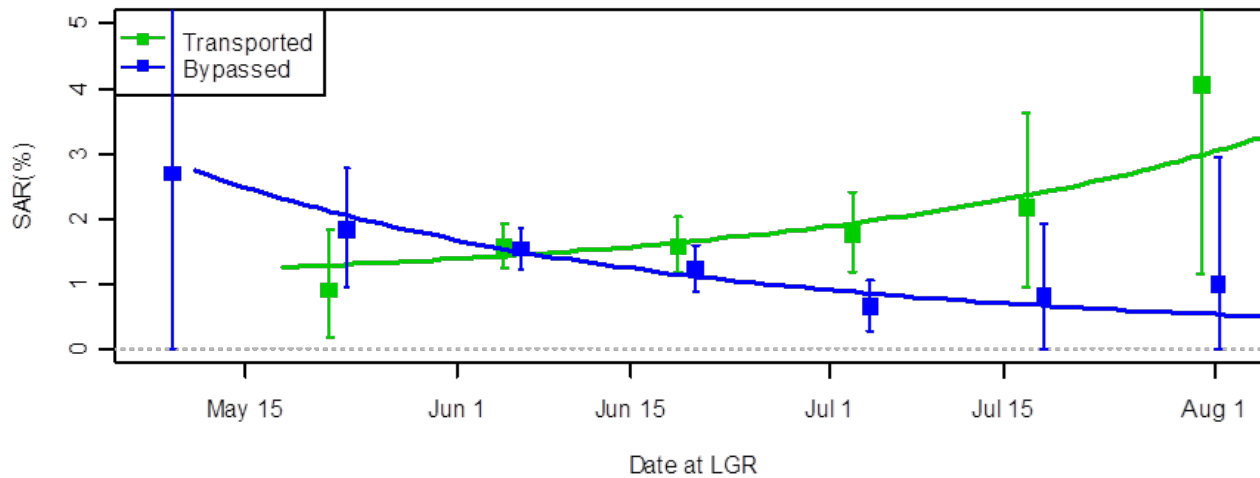
Smolt-to-Adult Return (%)



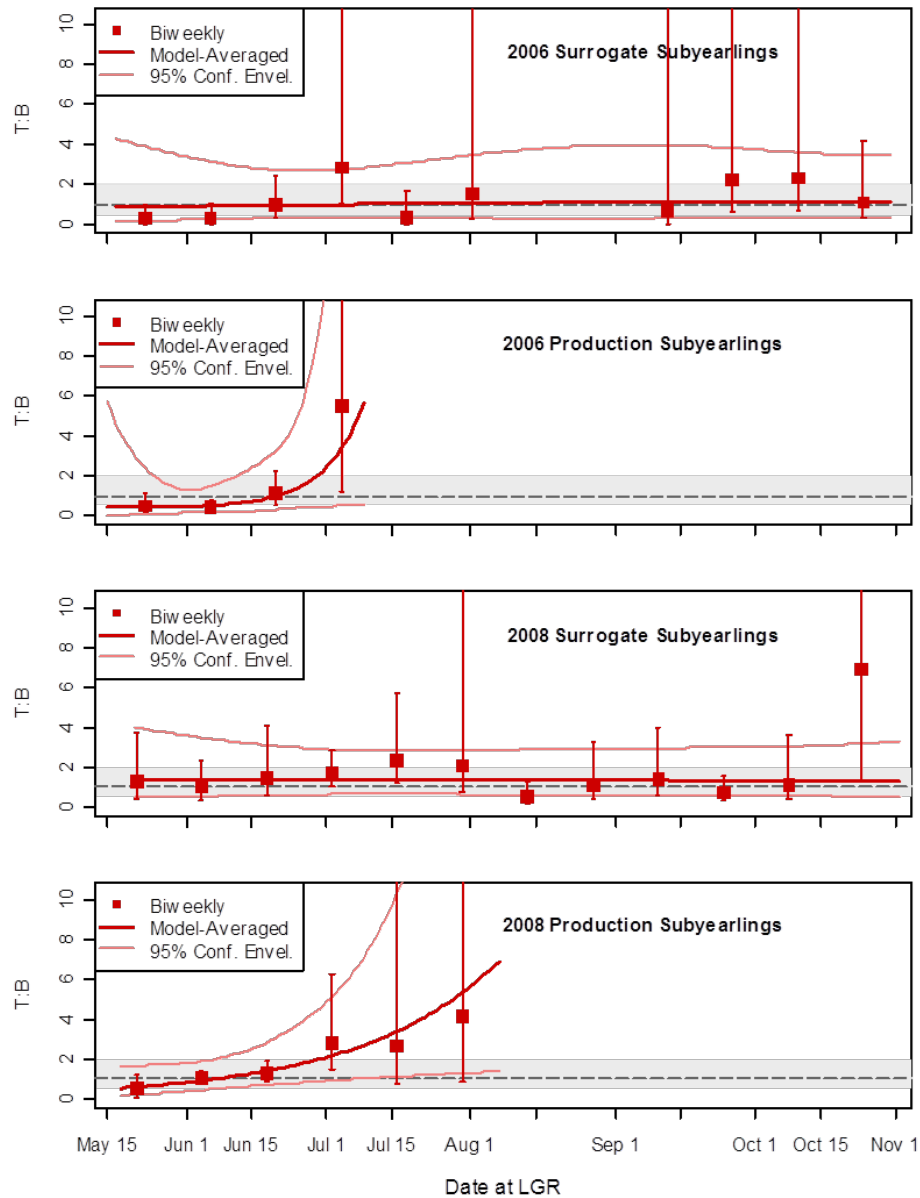
2008 Production Subyearlings

Lower Granite Dam

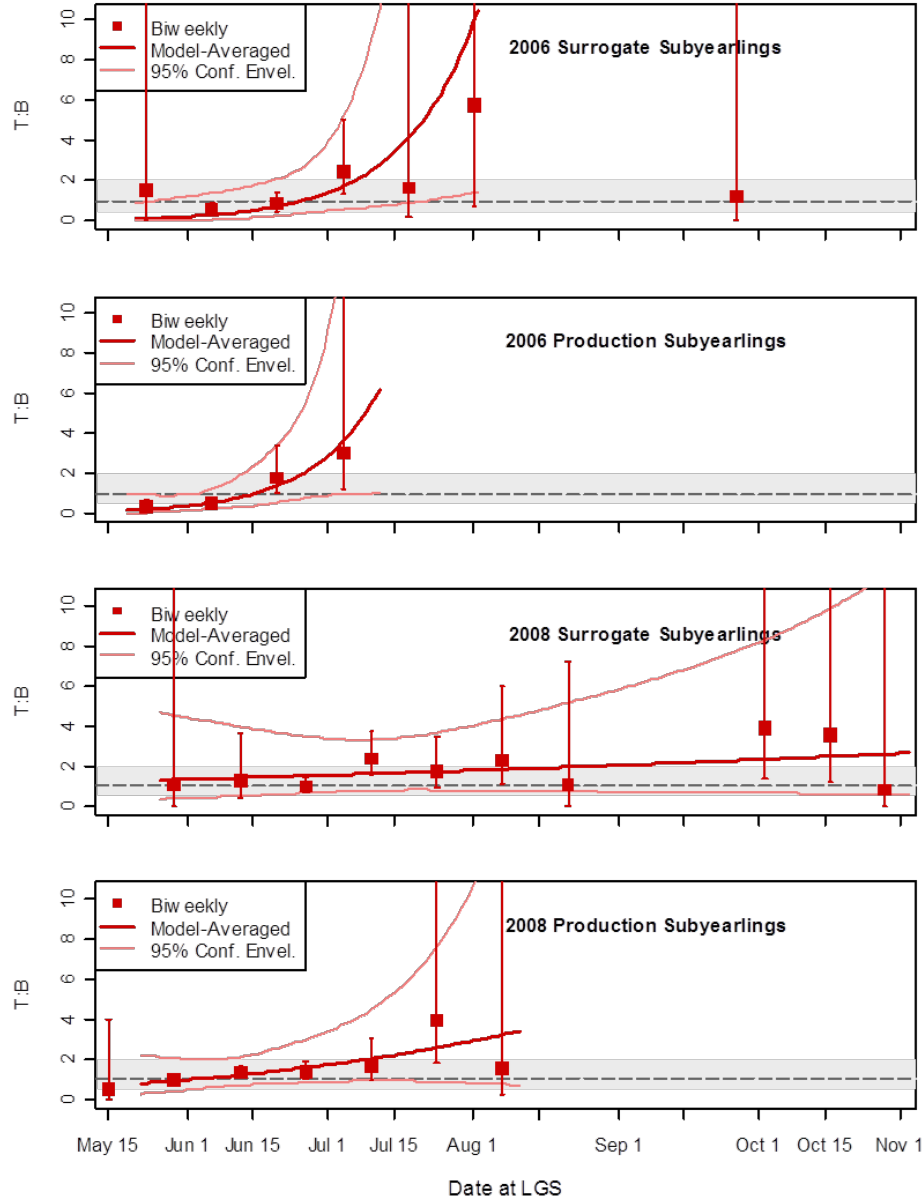
Smolt-to-Adult Return (%)



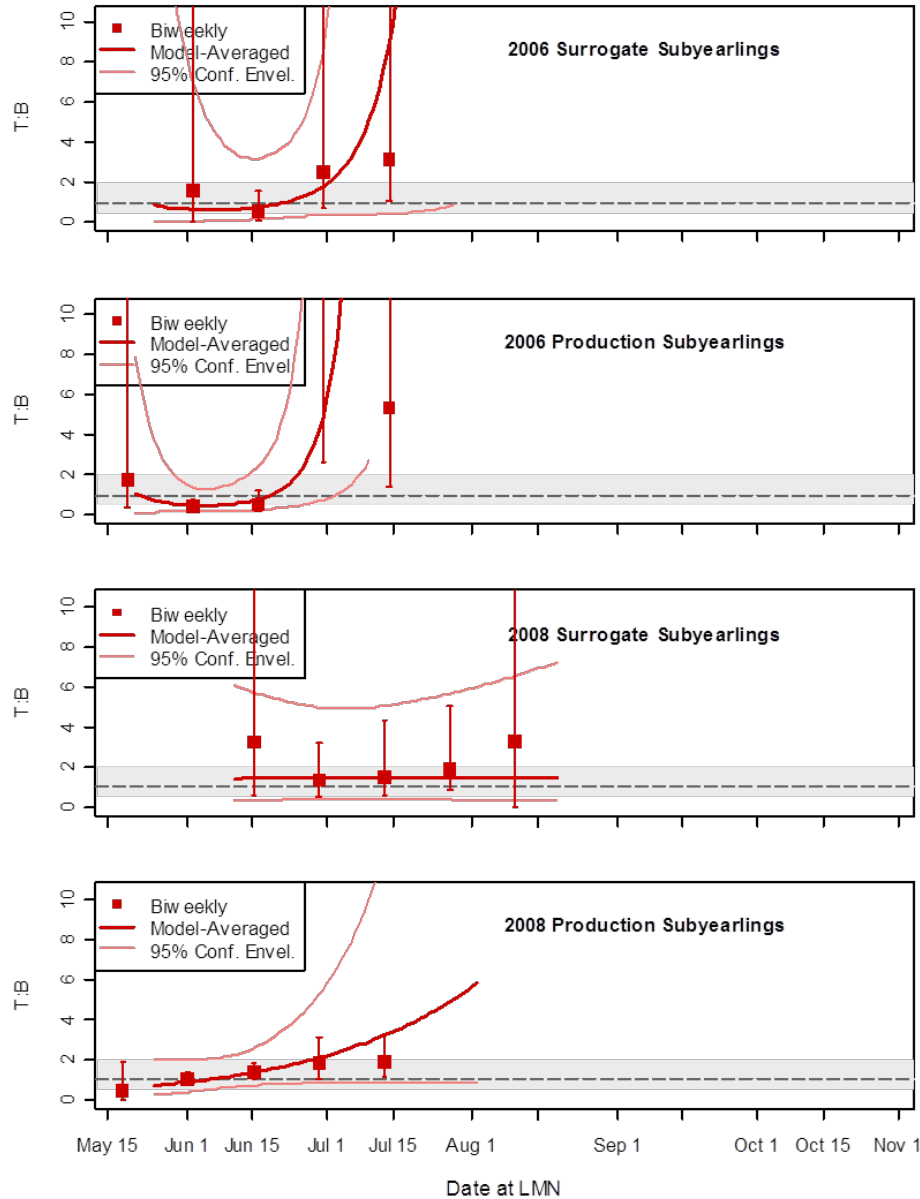
T:B Ratio by Date at Lower Granite Dam



T:B Ratio by Date at Little Goose Dam



T:B Ratio by Date at Lower Monumental Dam



Summary of estimated T:B relative to standard T:B=1.0

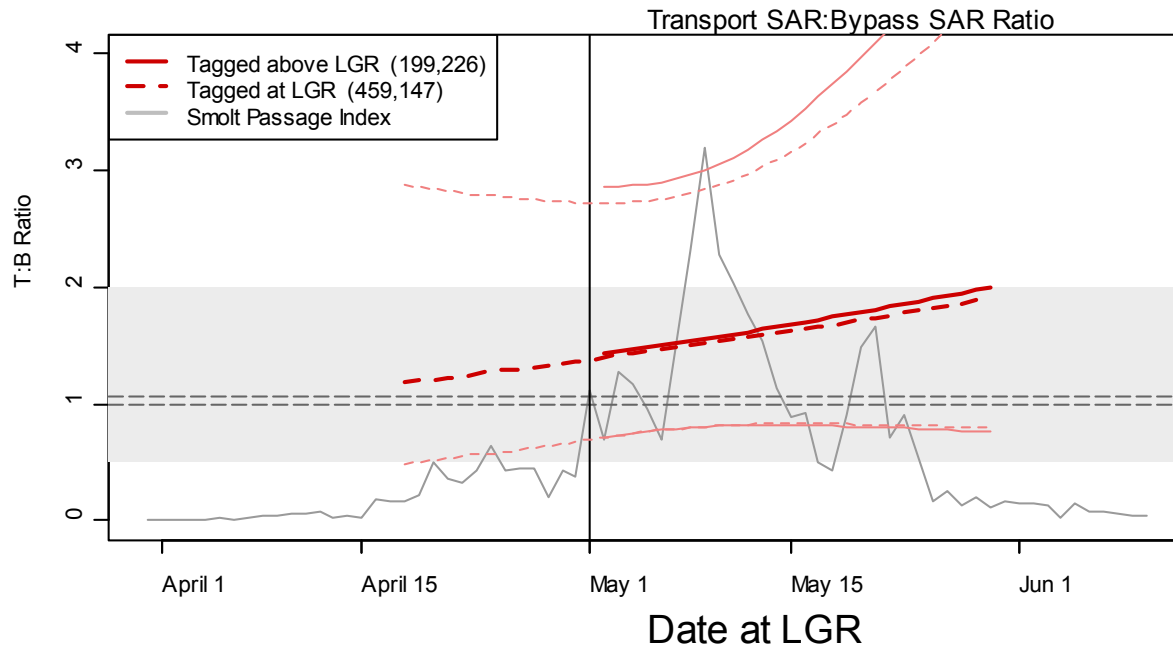
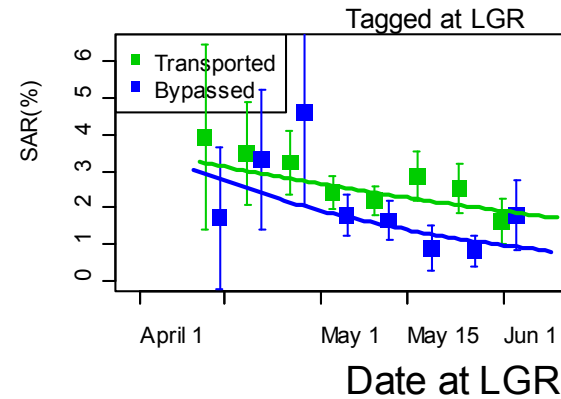
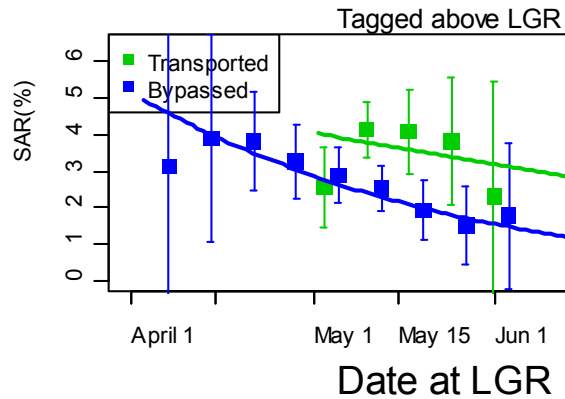


Questions

The following are for posting to
TMT website – more detail –
more comprehensive set of
figures

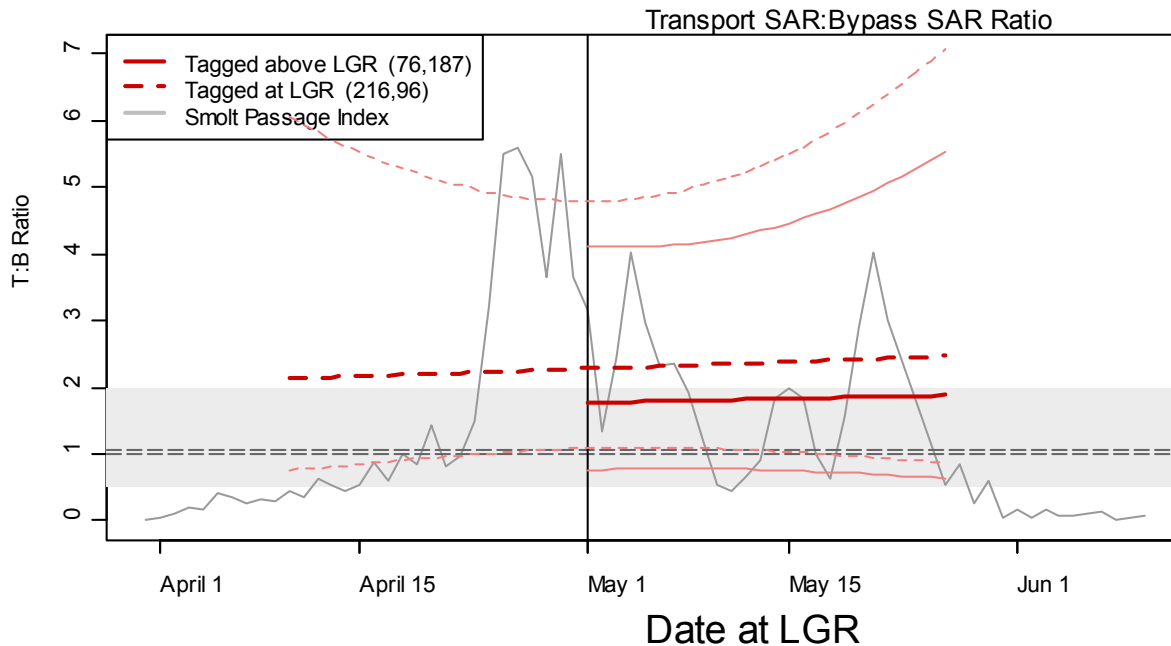
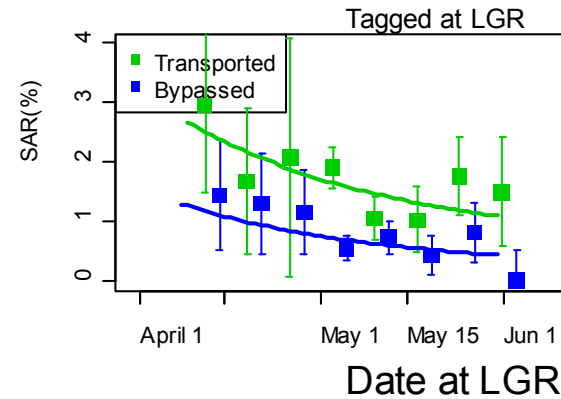
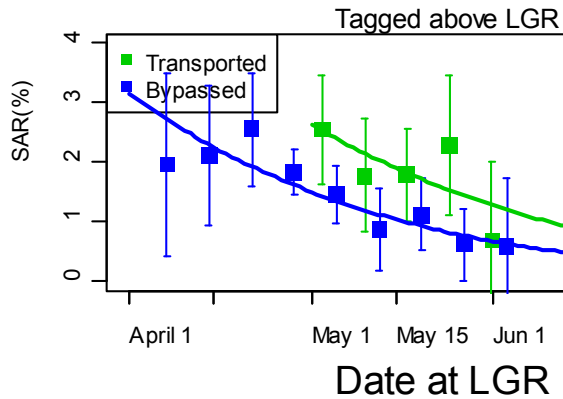
Wild Chinook 2008

Model-Averaged - Descriptive



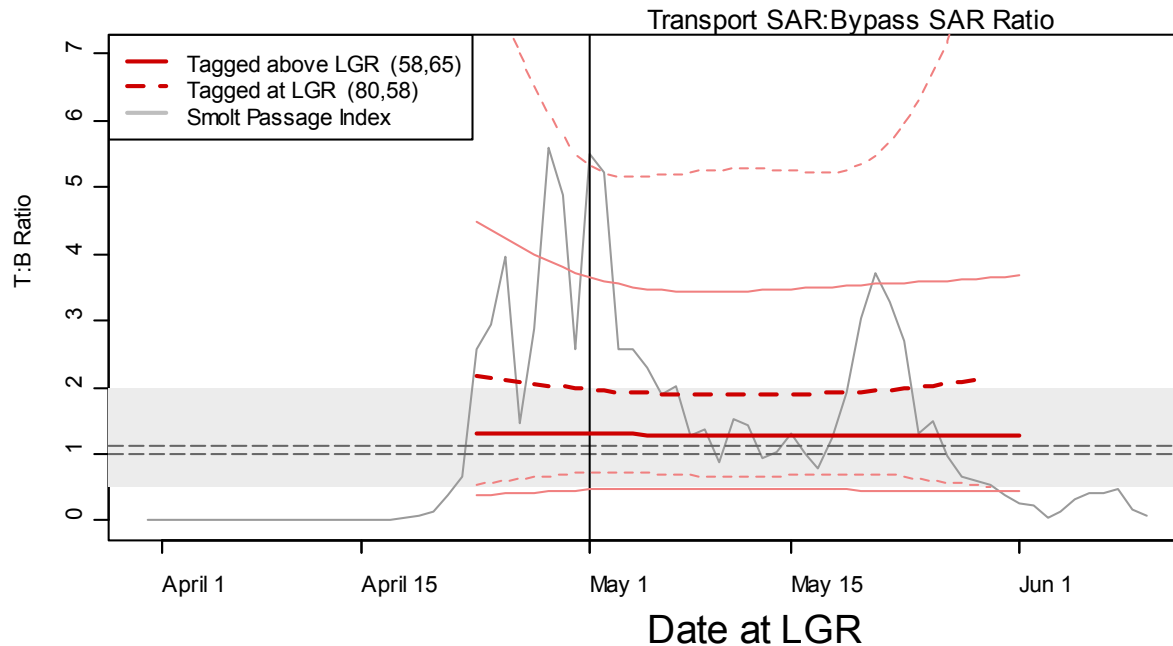
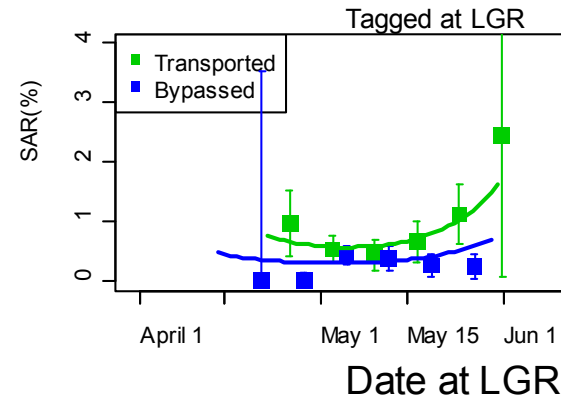
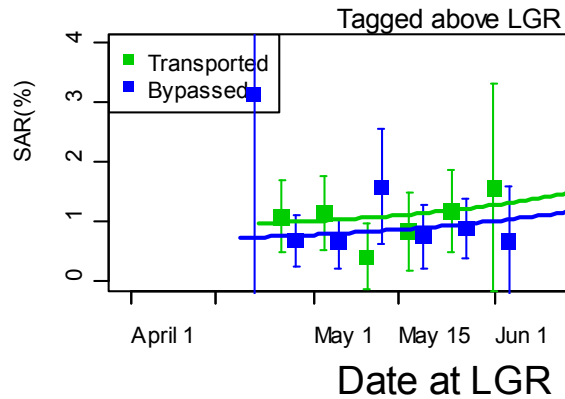
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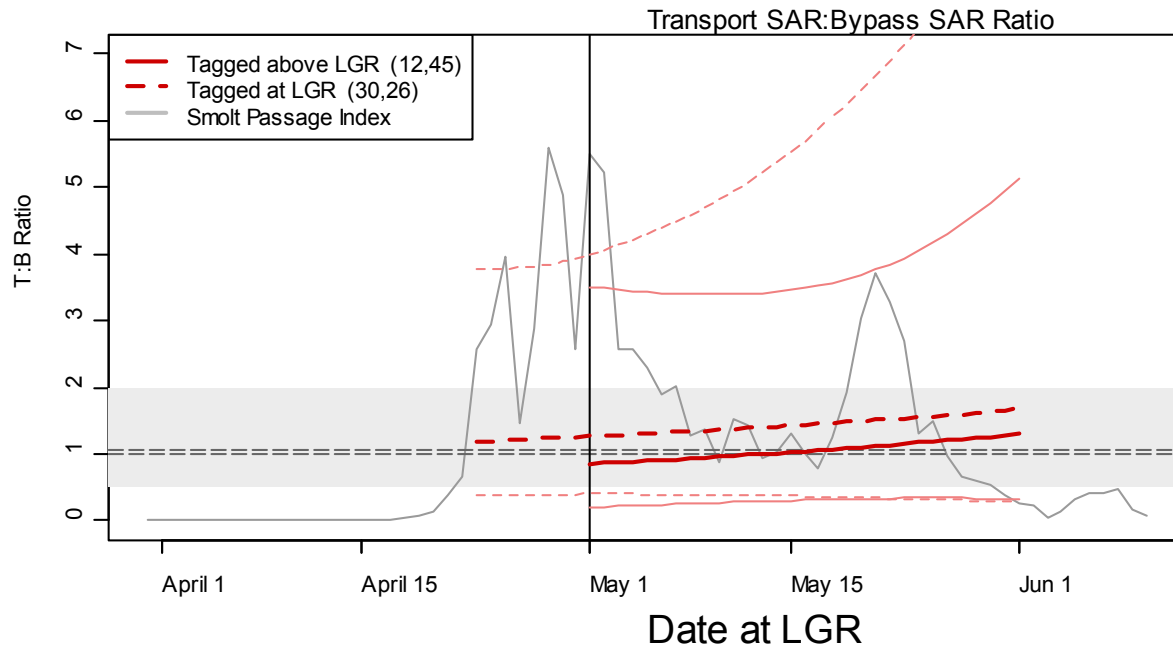
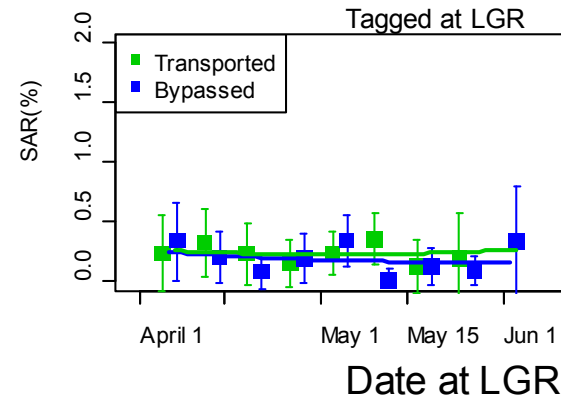
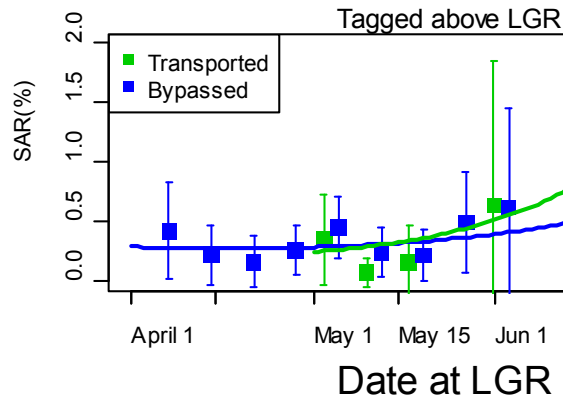
Wild Chinook 2010

Model-Averaged - Descriptive



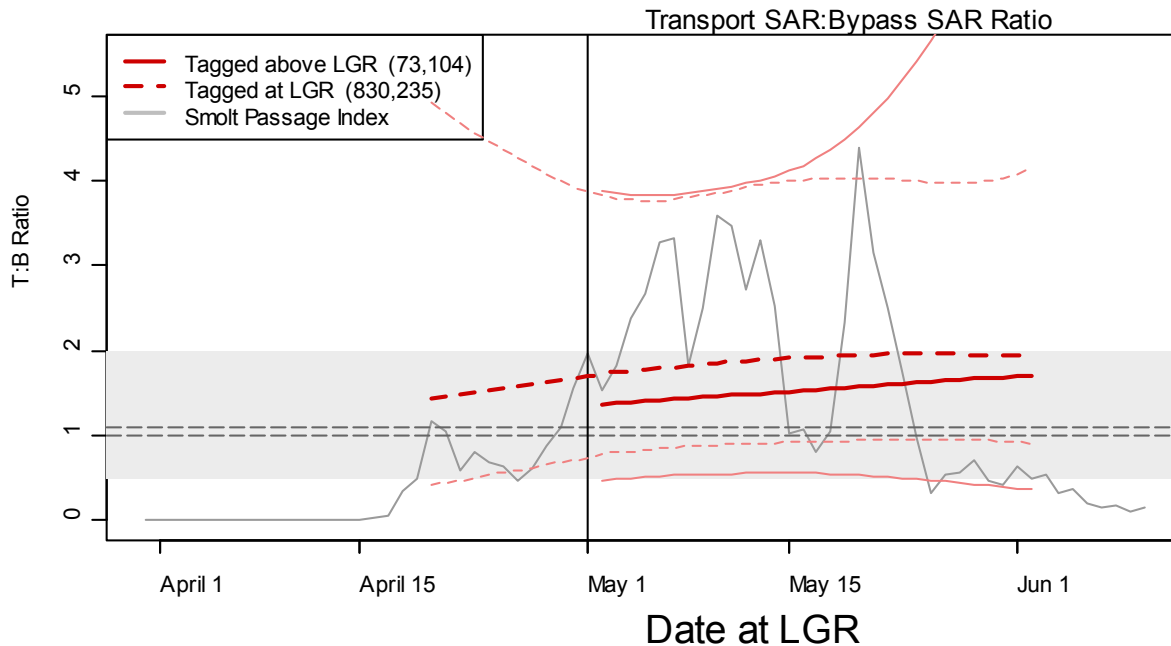
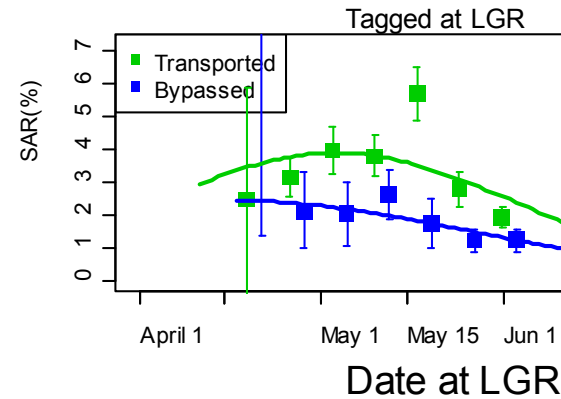
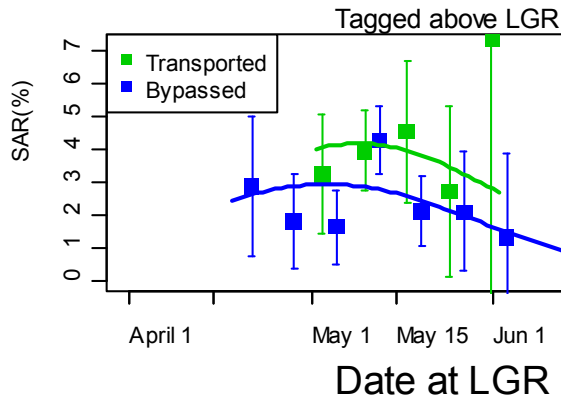
Wild Chinook 2011

Model-Averaged - Descriptive



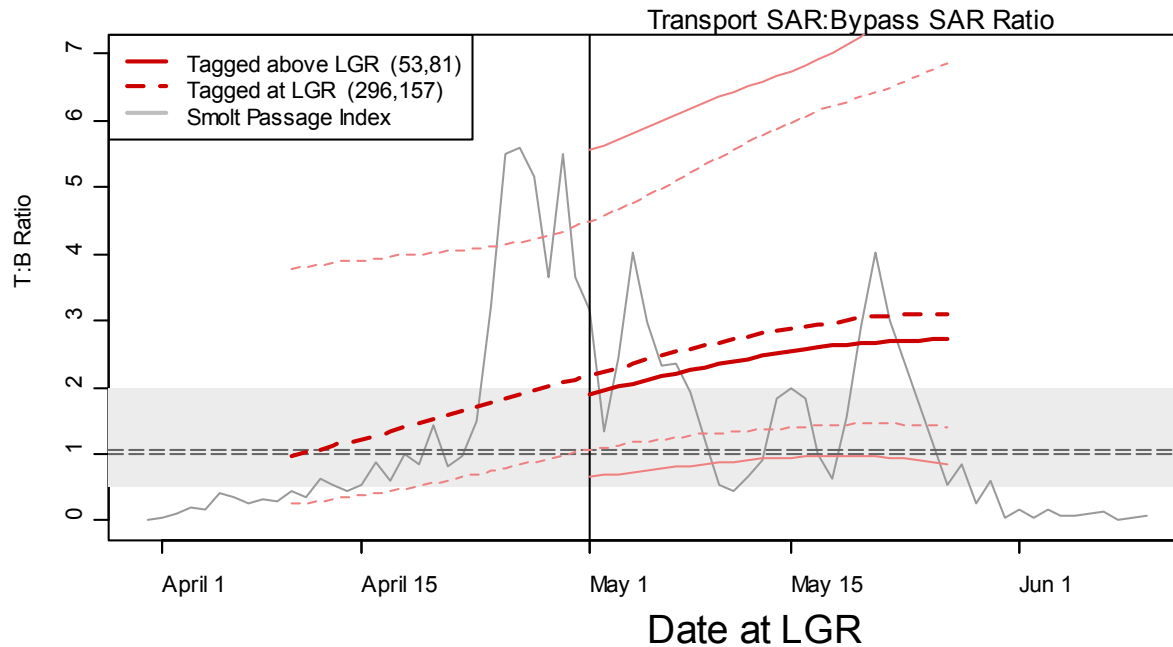
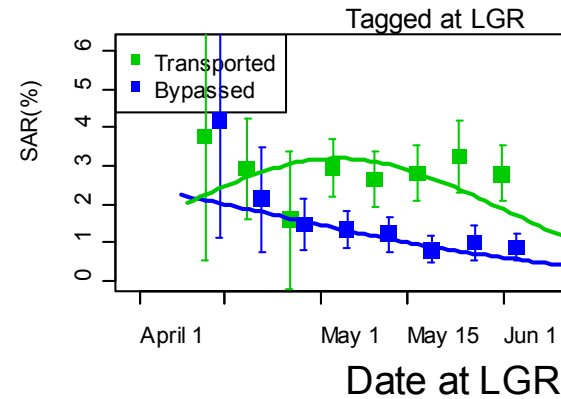
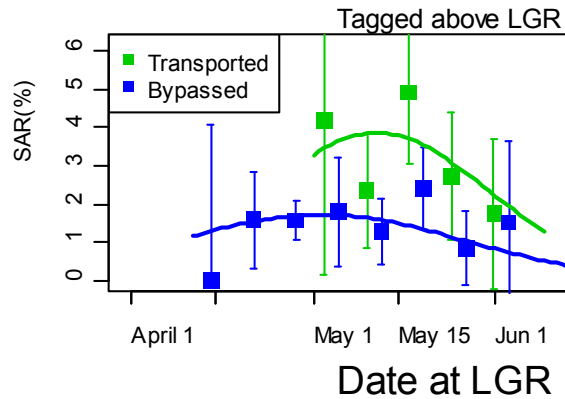
Wild Steelhead 2008

Model-Averaged - Descriptive



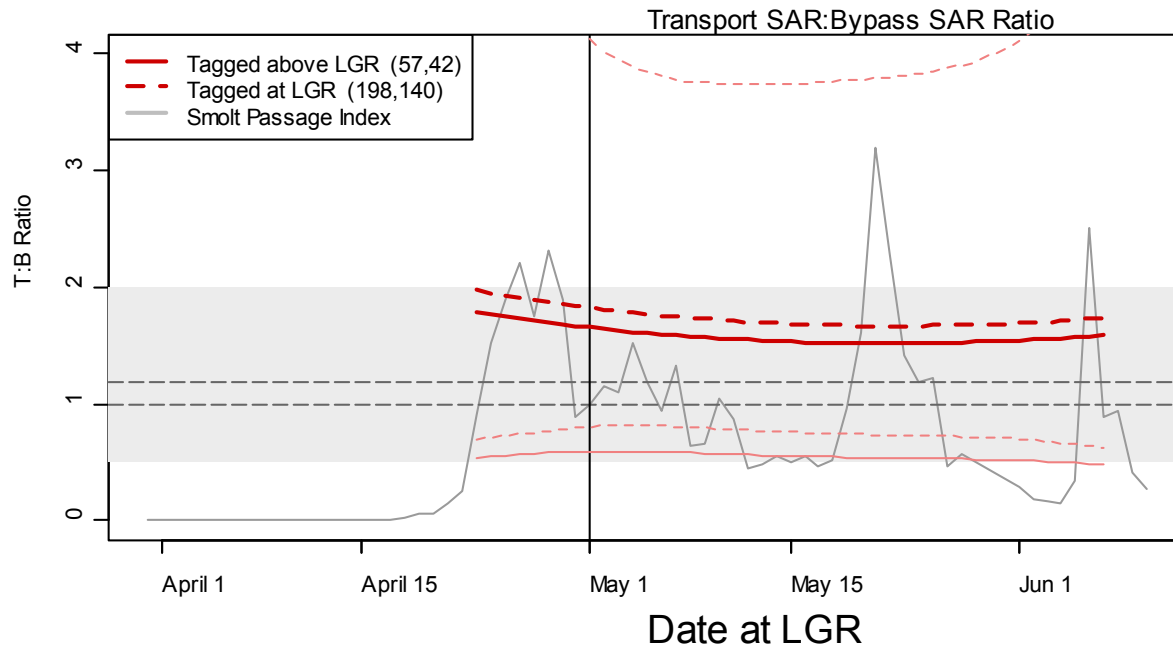
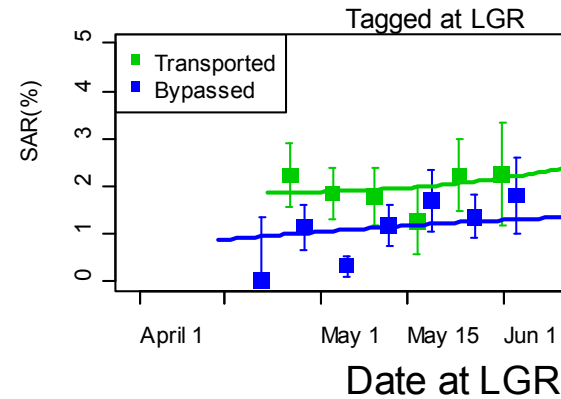
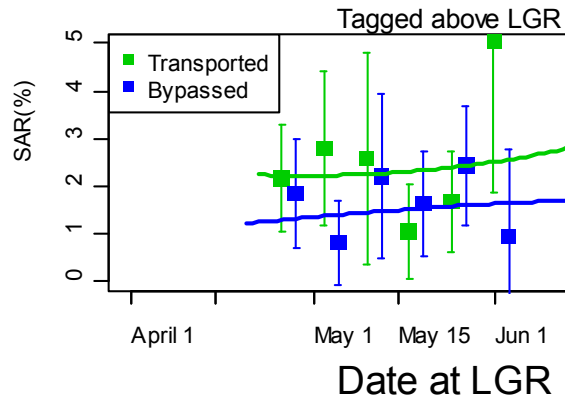
Wild Steelhead 2009

Model-Averaged - Descriptive



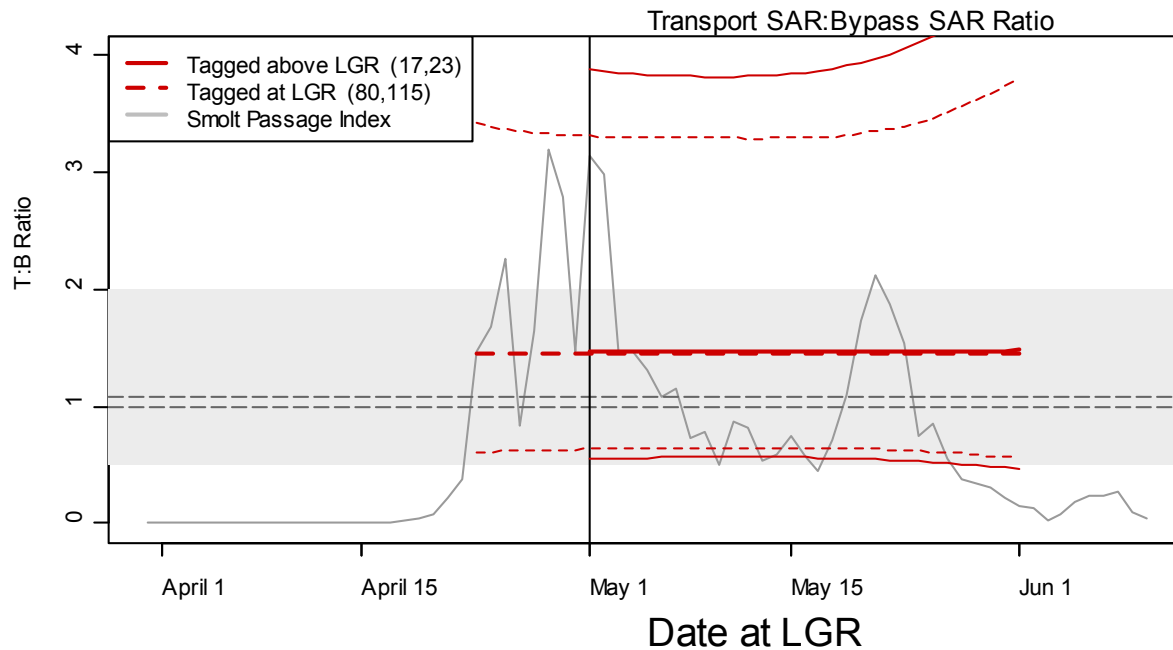
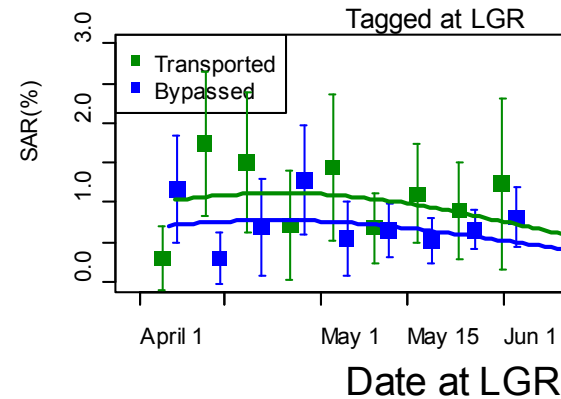
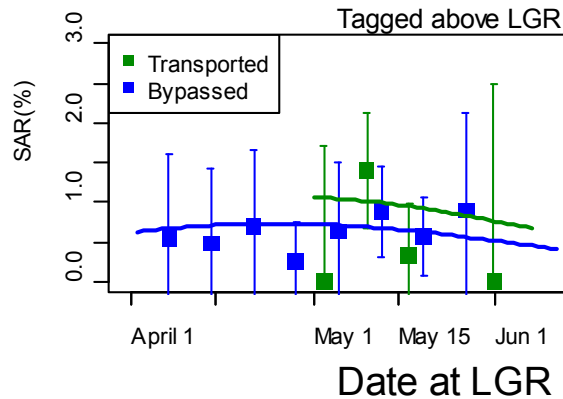
Wild Steelhead 2010

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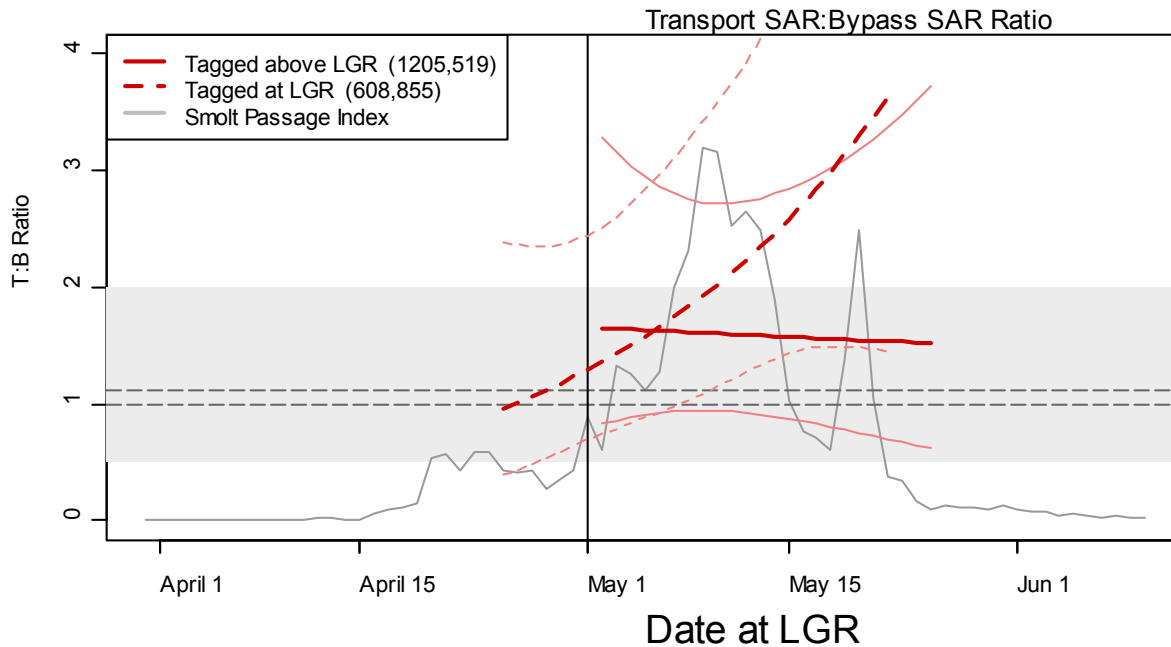
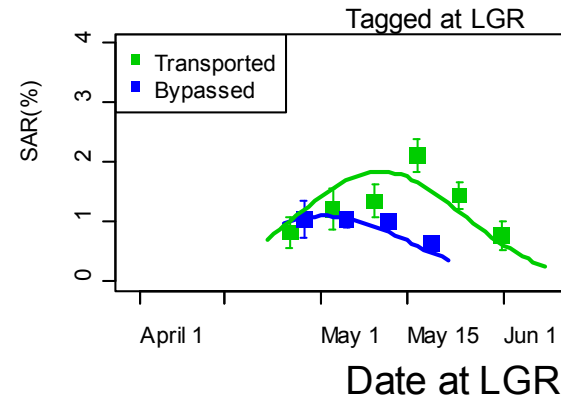
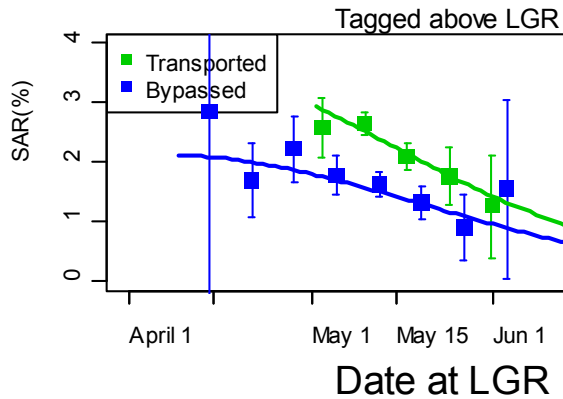
Wild Steelhead 2011

Model-Averaged - Descriptive



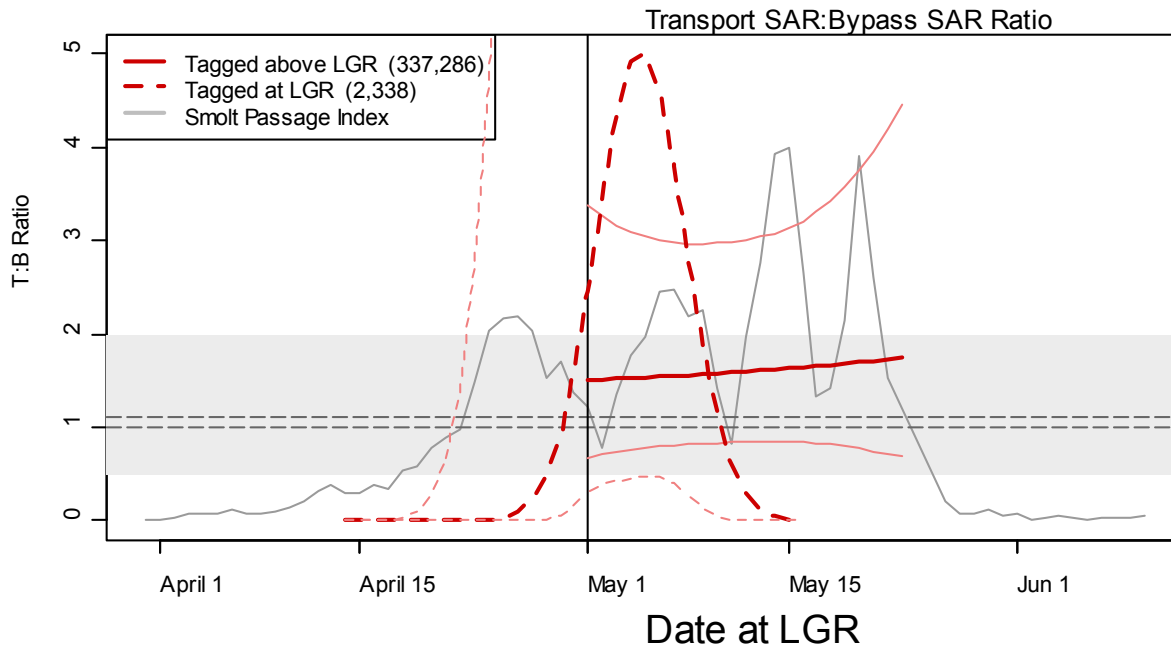
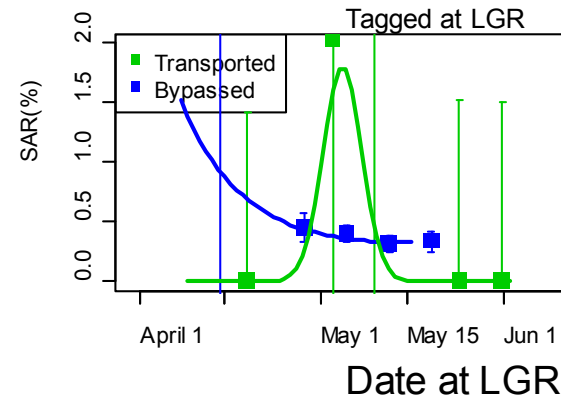
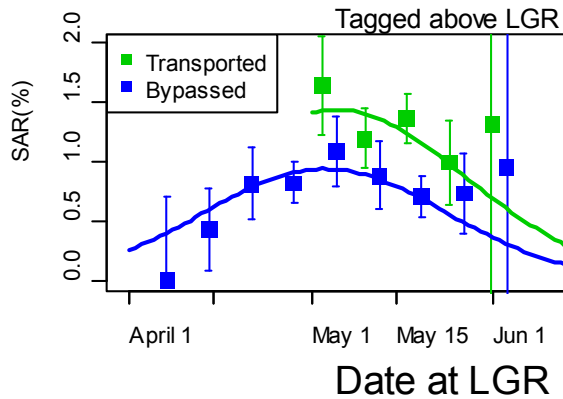
Hatchery Chinook 2008

Model-Averaged - Descriptive



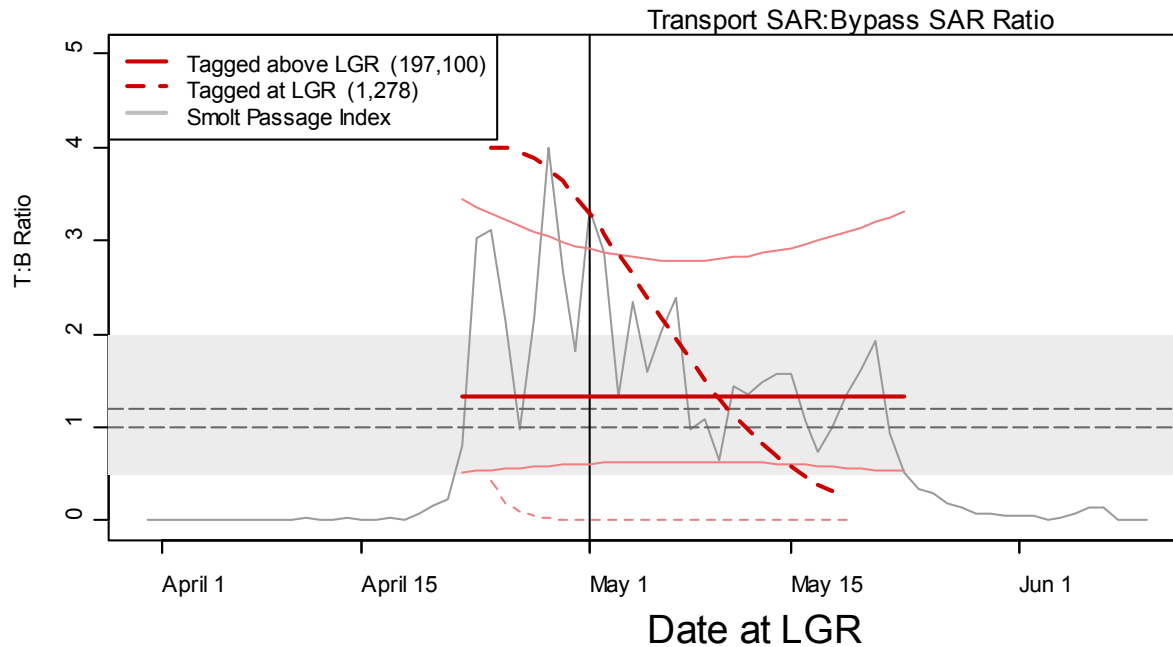
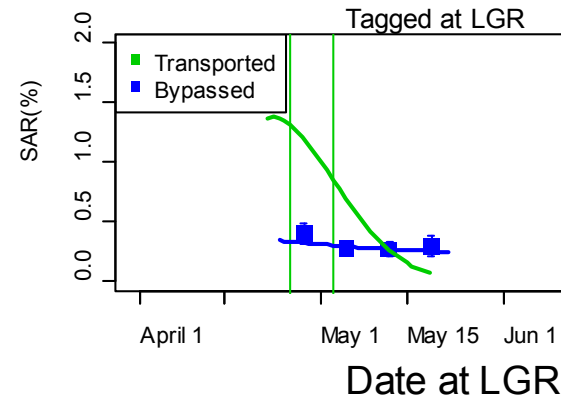
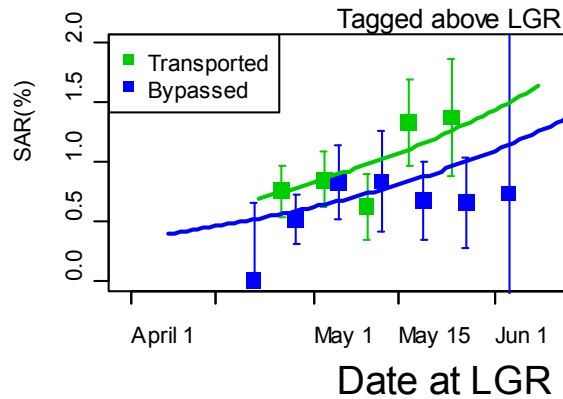
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Model-Averaged - Descriptive



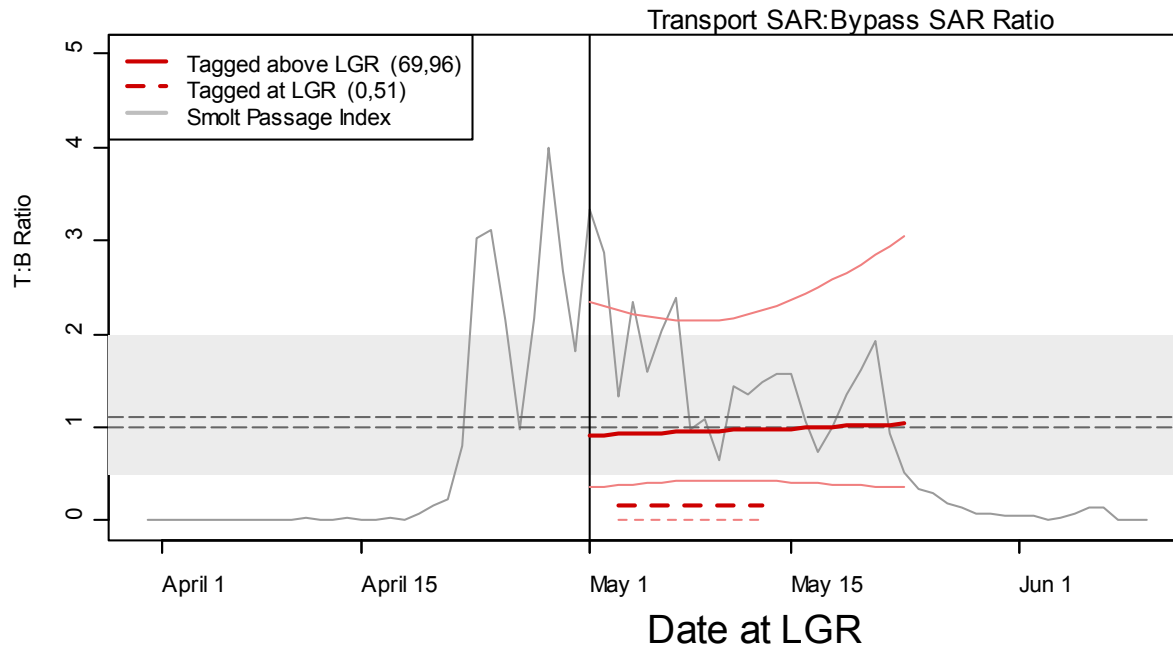
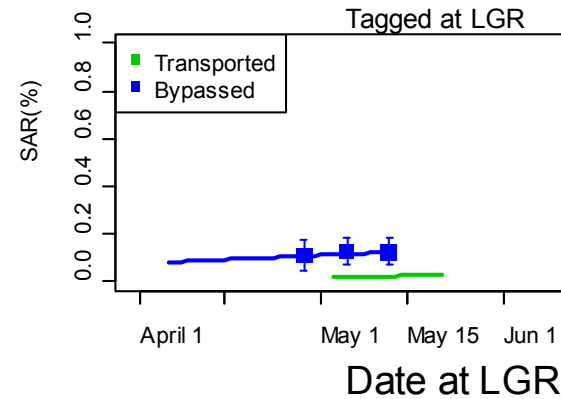
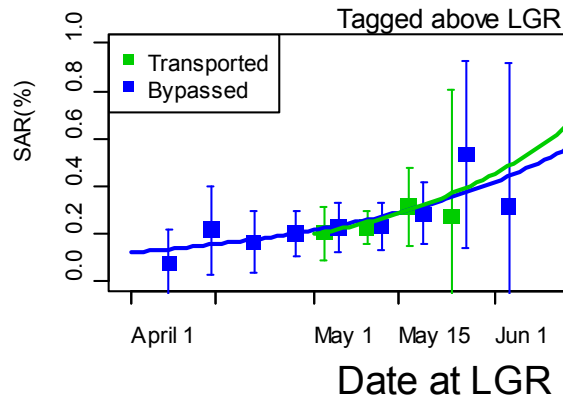
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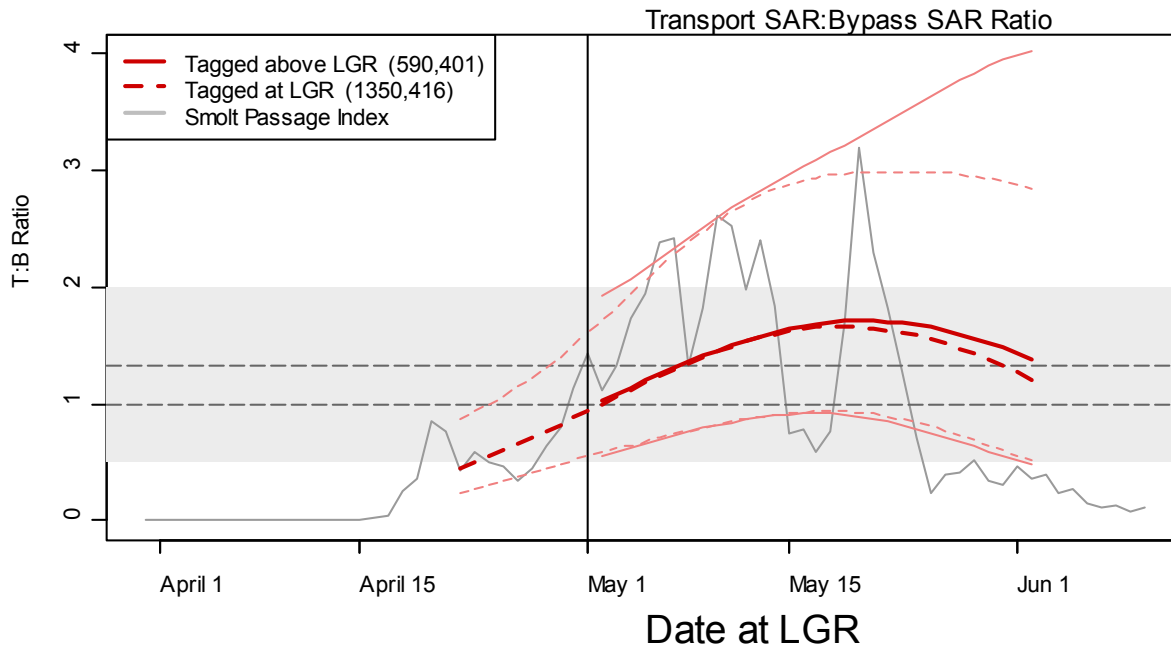
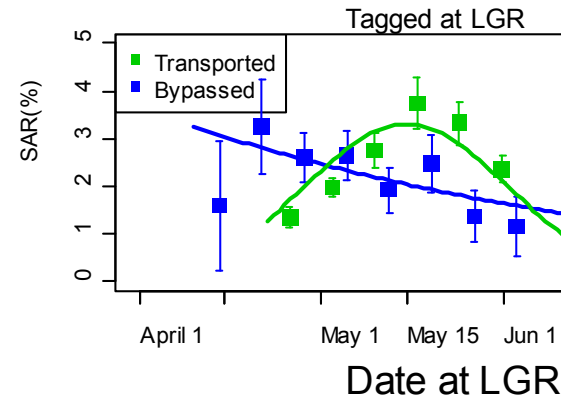
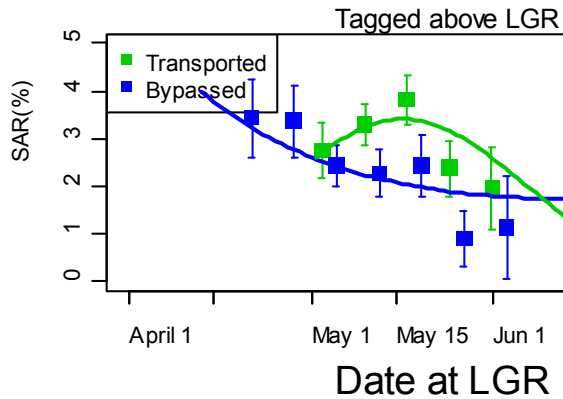
Hatchery Chinook 2011

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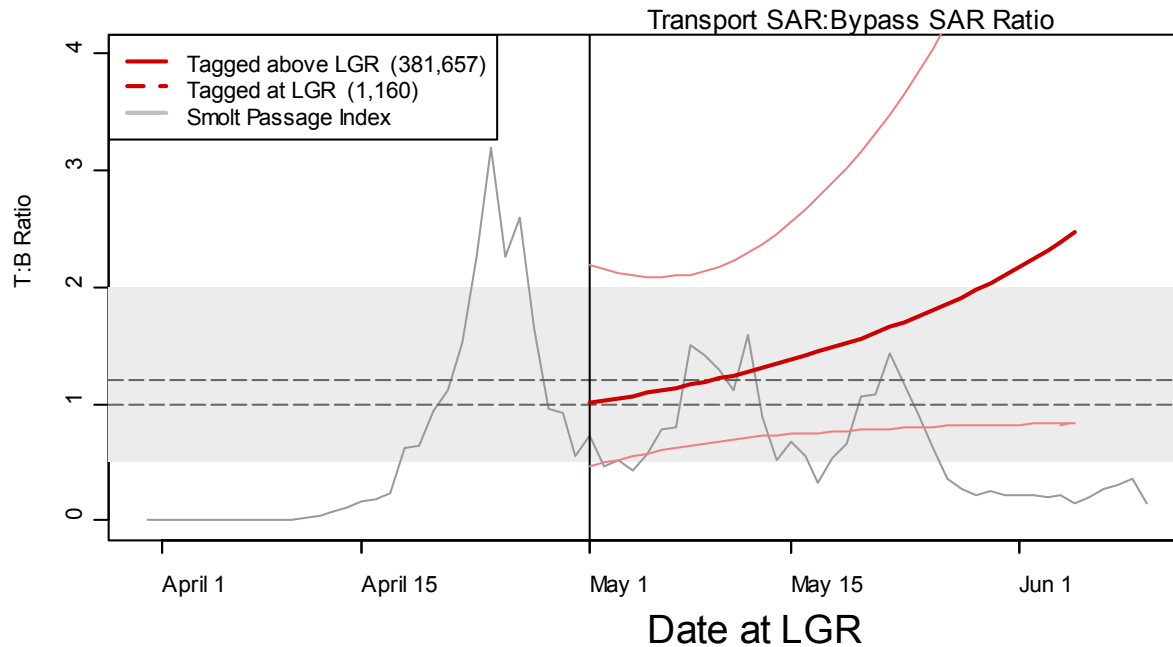
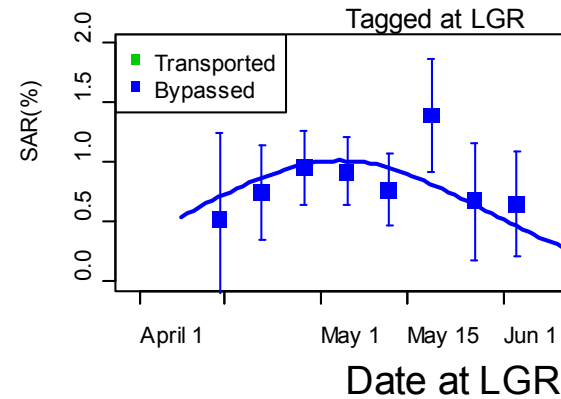
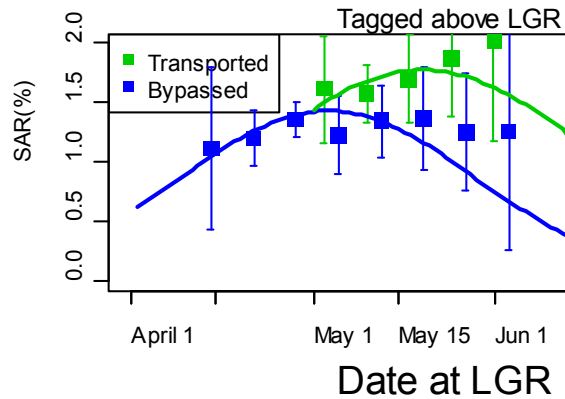
Hatchery Steelhead 2008

Model-Averaged - Descriptive



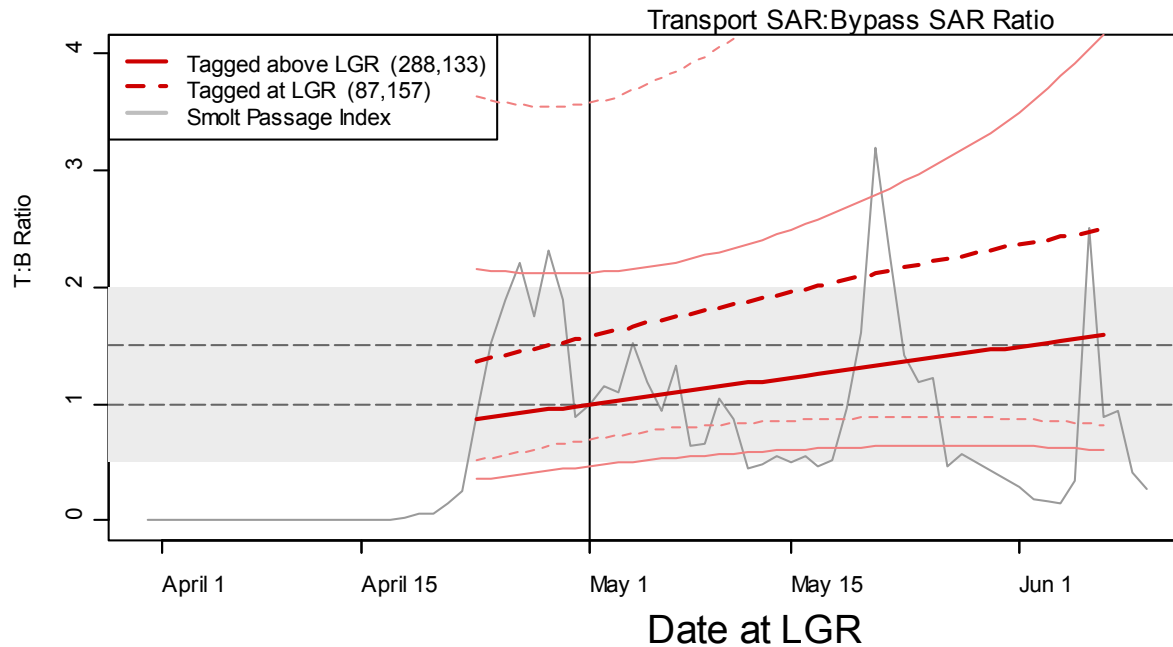
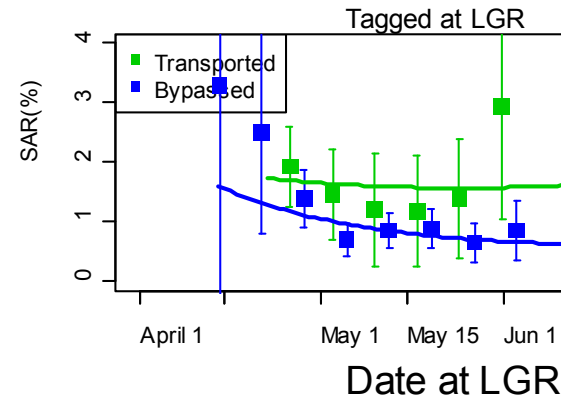
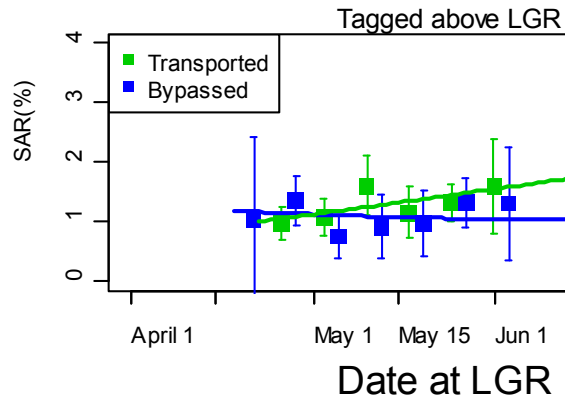
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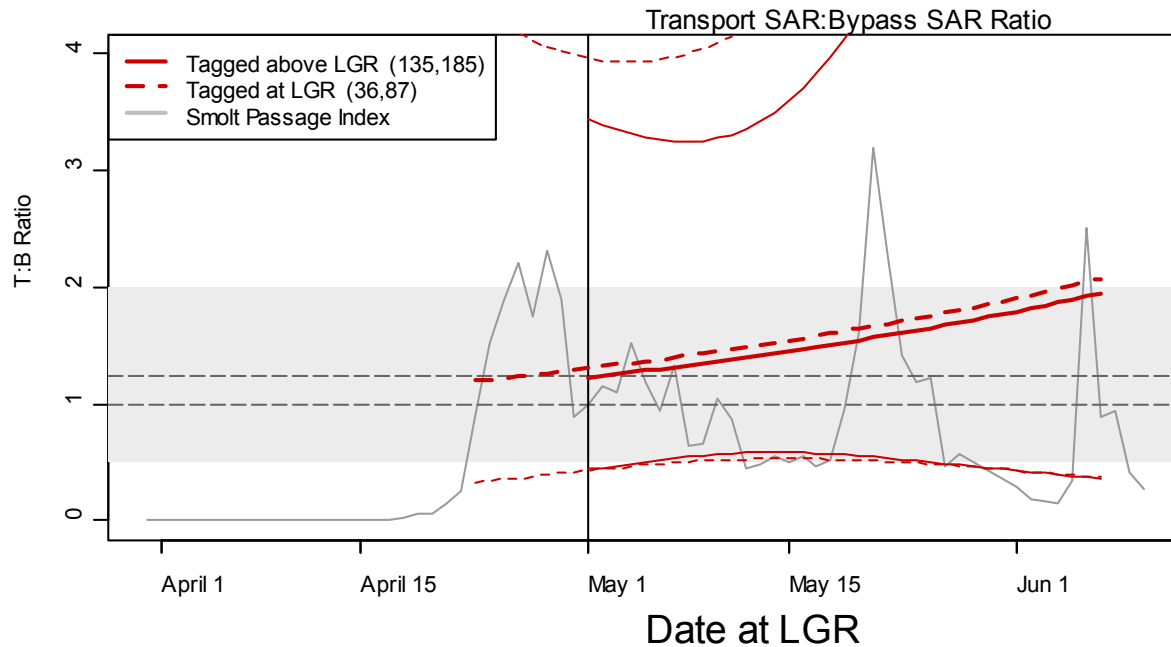
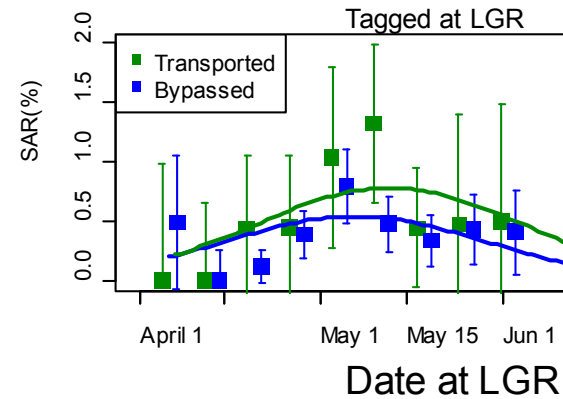
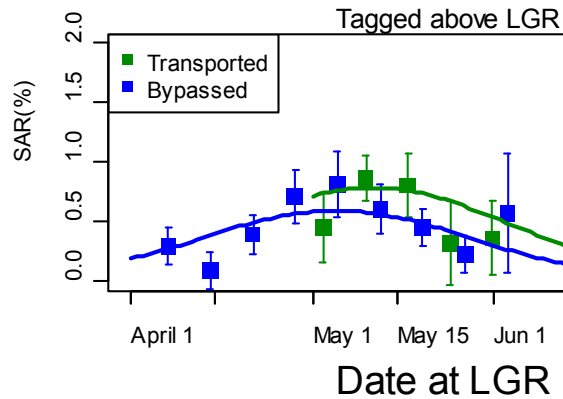
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Model-Averaged - Descriptive



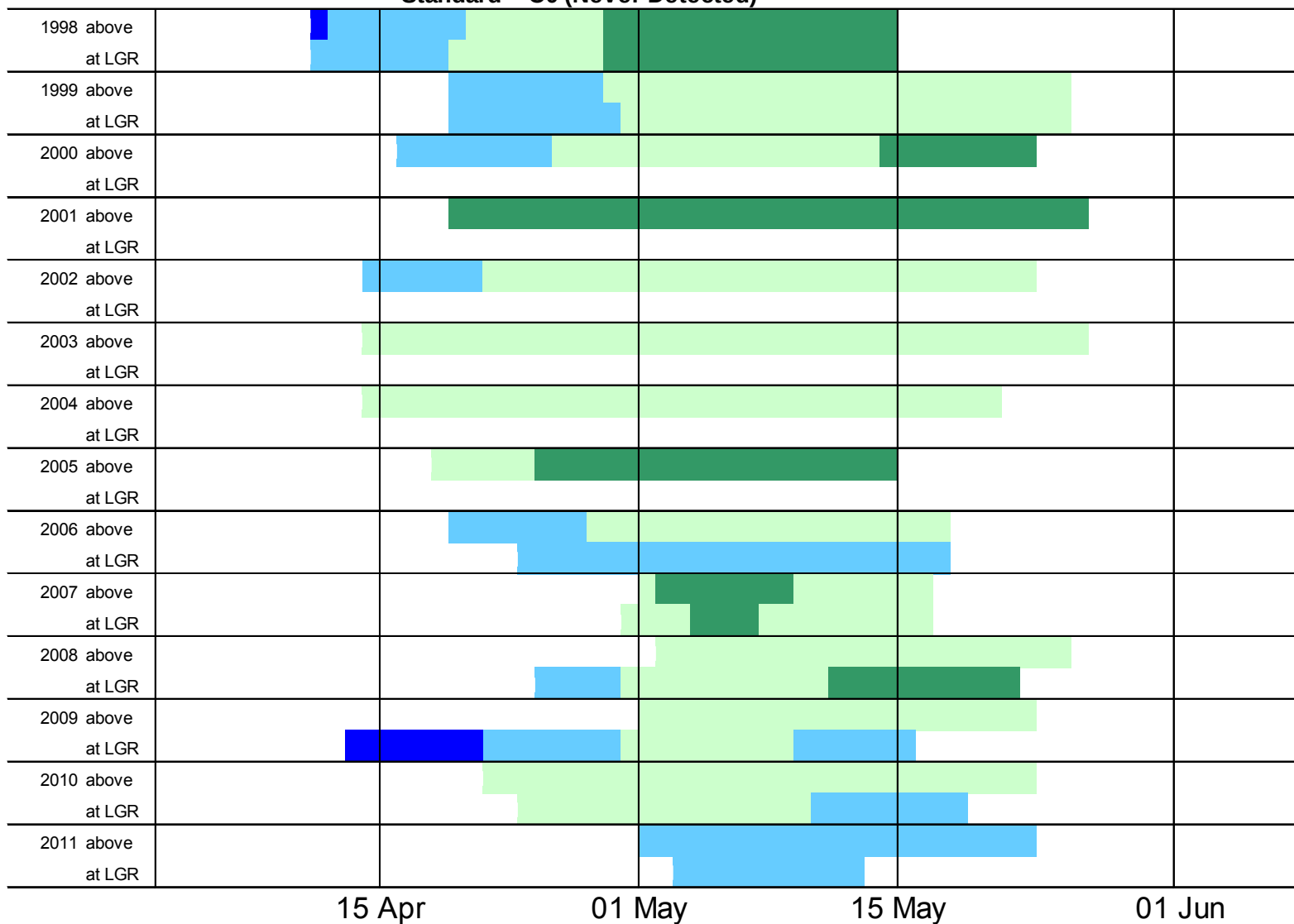
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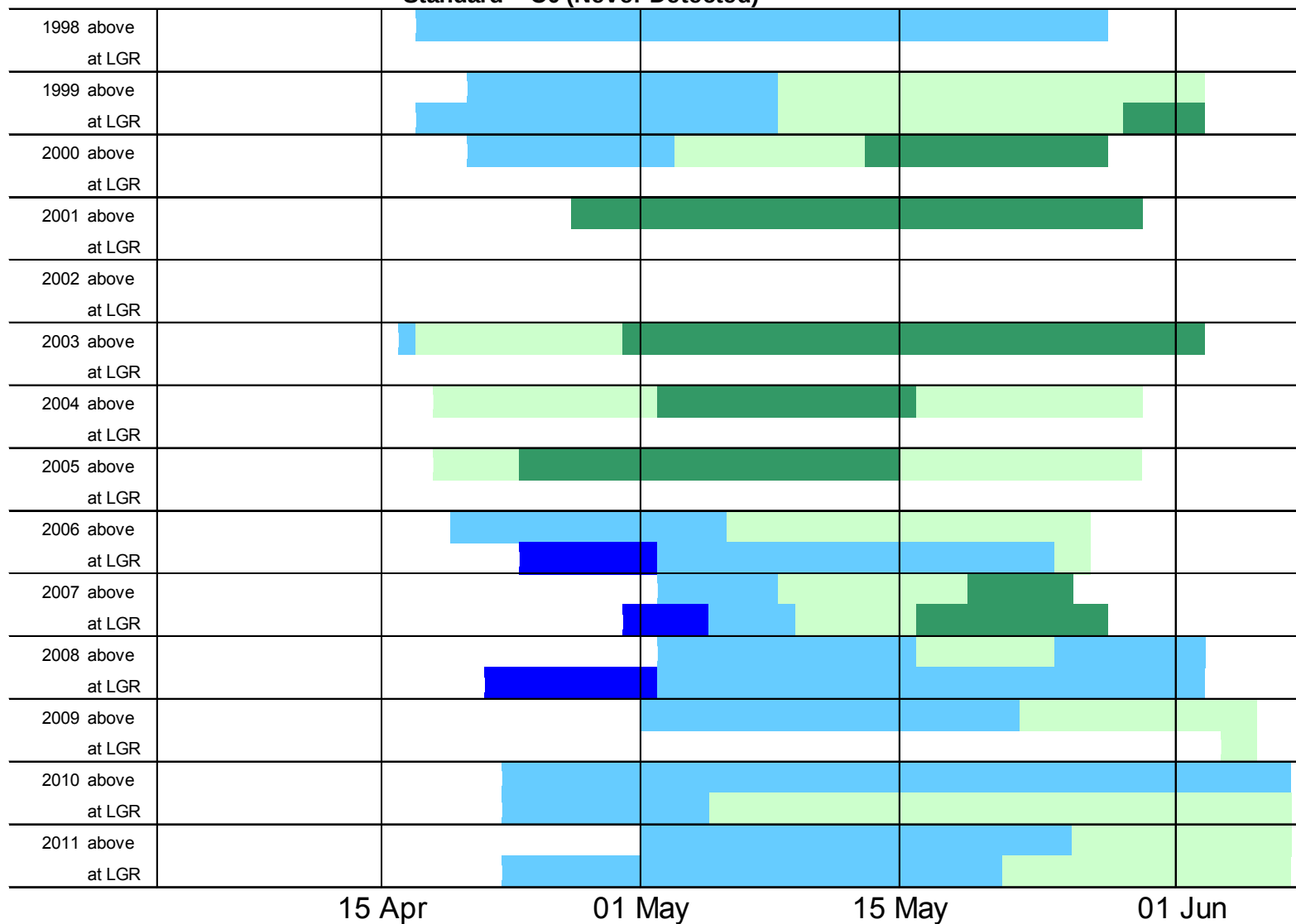
Hatchery Chinook Salmon - Summary of Model-Averaged T:B Values (Descriptive)

Standard = C0 (Never Detected)



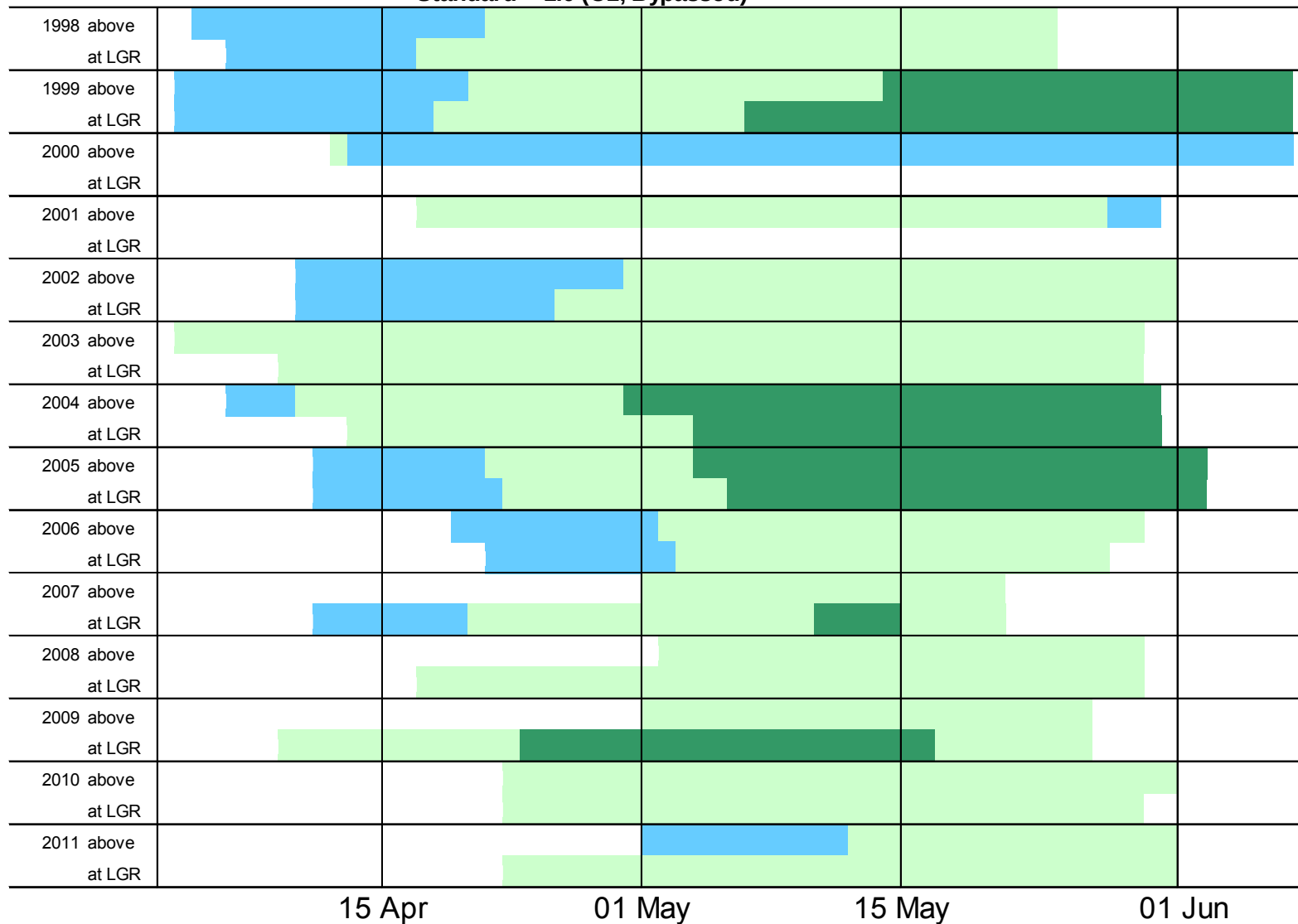
Hatchery Steelhead - Summary of Model-Averaged T:B Values (Descriptive)

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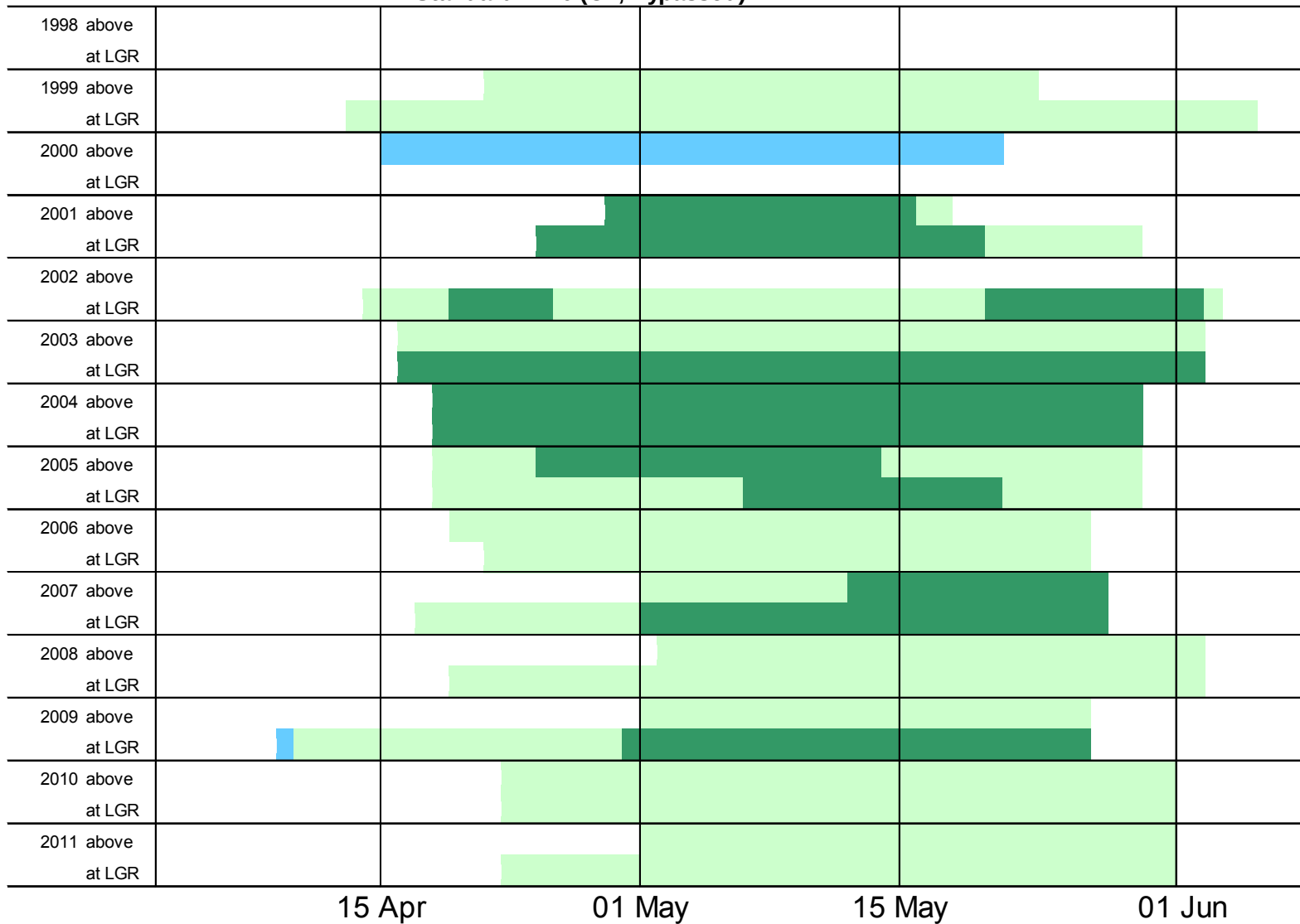
Wild Chinook Salmon - Summary of Model-Averaged T:B Values (Descriptive)

Standard = 1.0 (C1; Bypassed)



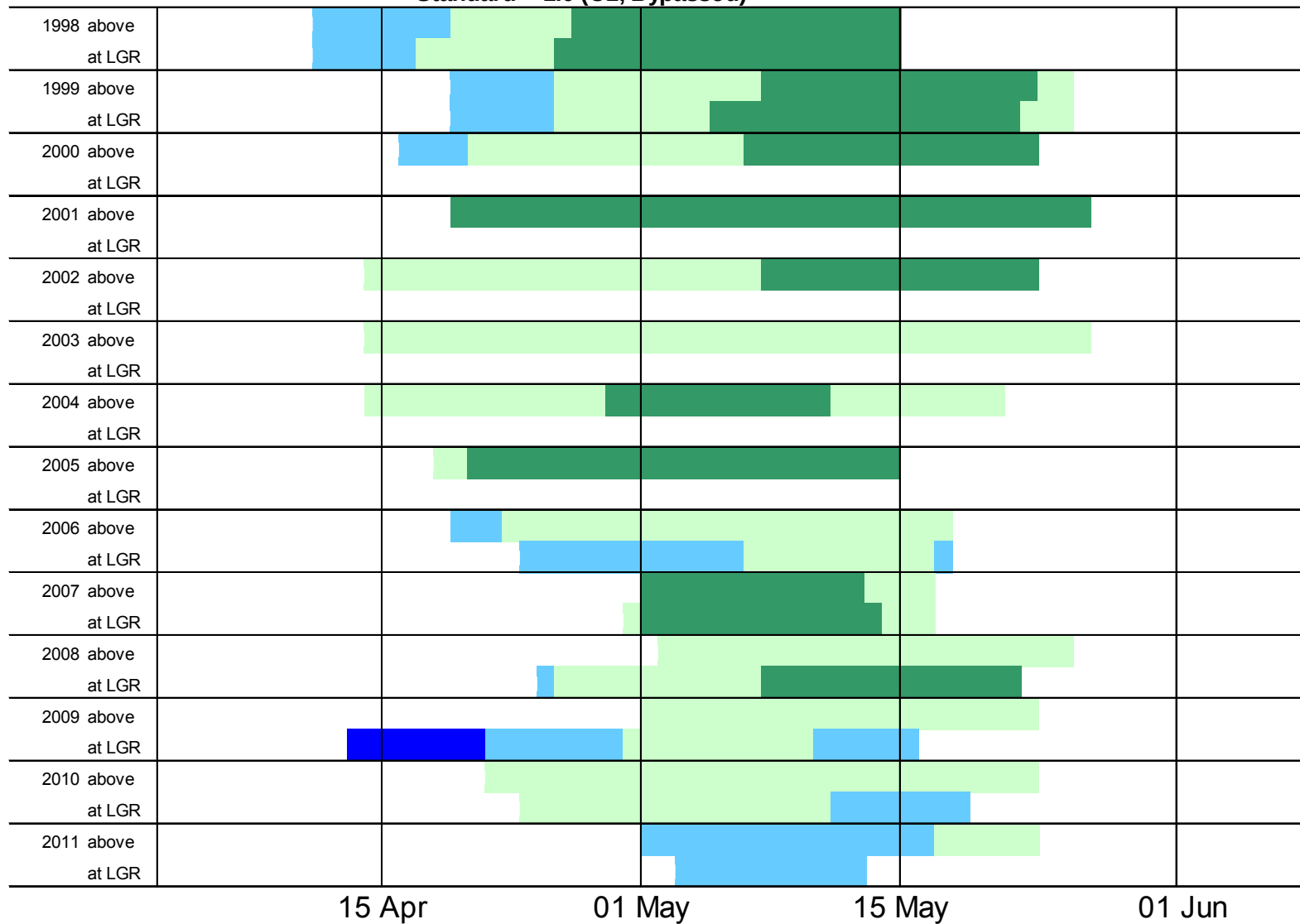
Wild Steelhead - Summary of Model-Averaged T:B Values (Descriptive)

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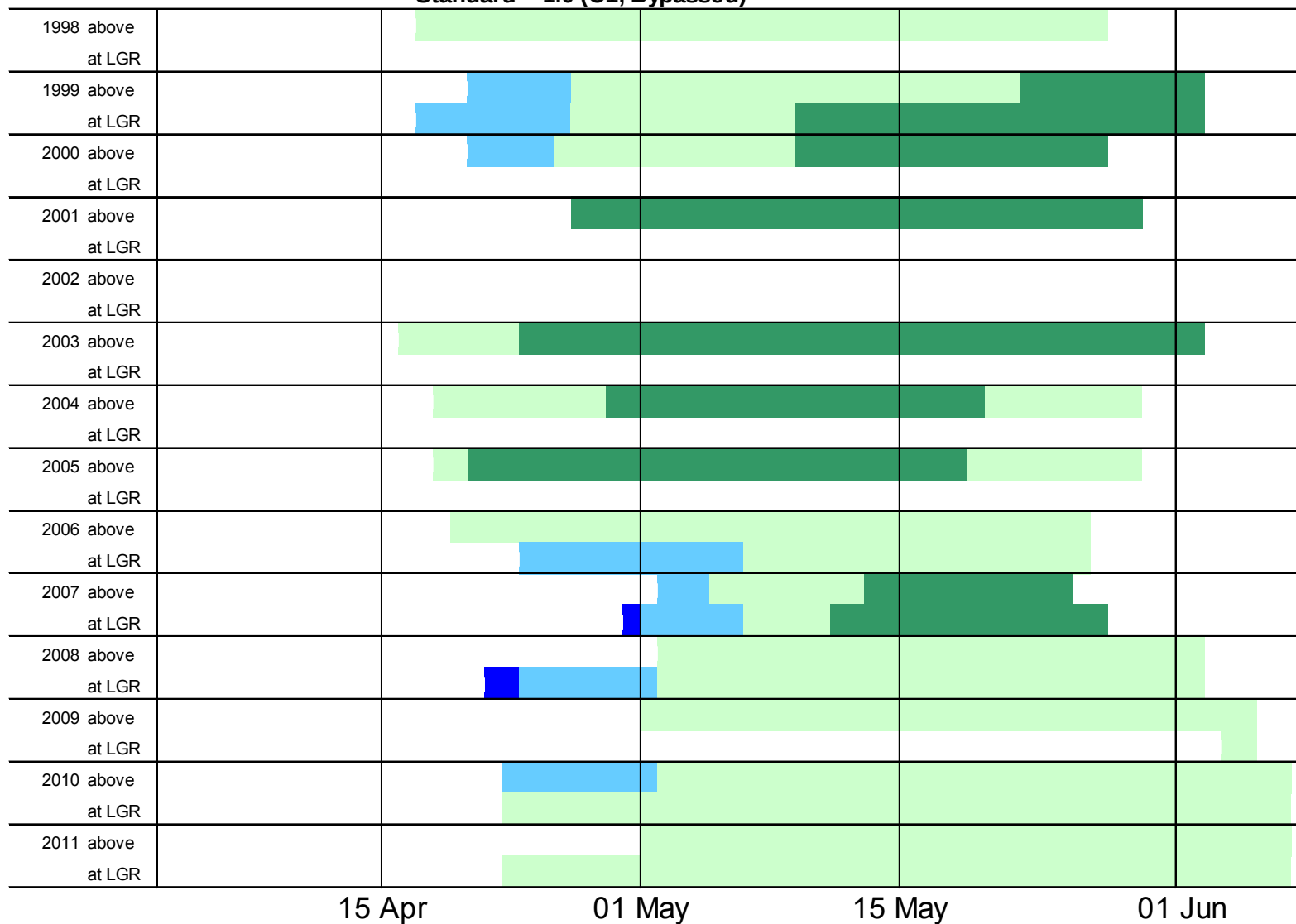
Hatchery Chinook Salmon - Summary of Model-Averaged T:B Values (Descriptive)

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Hatchery Steelhead - Summary of Model-Averaged T:B Values (Descriptive)

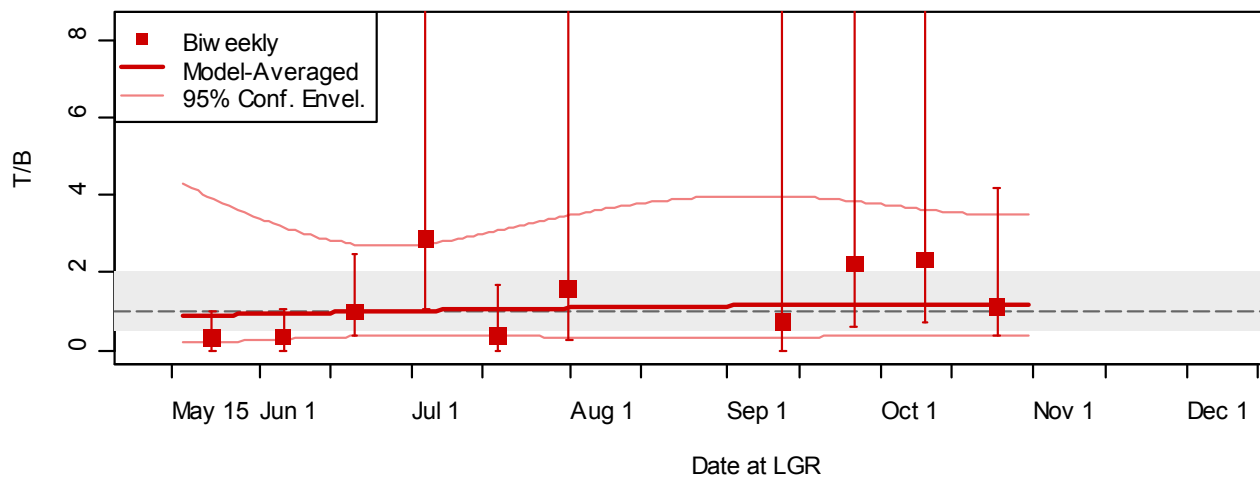
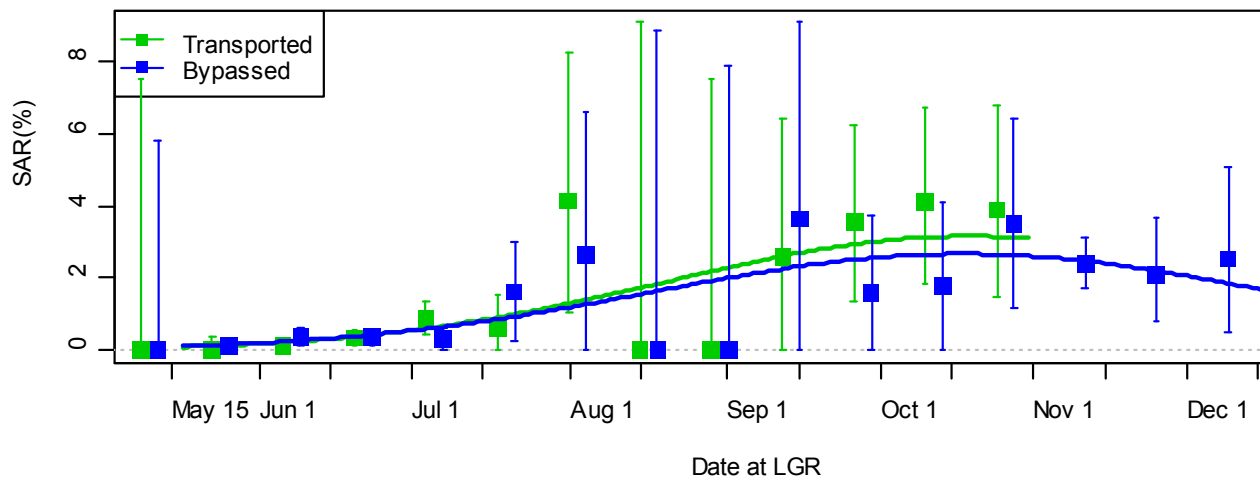
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2006 Surrogate Subyearlings

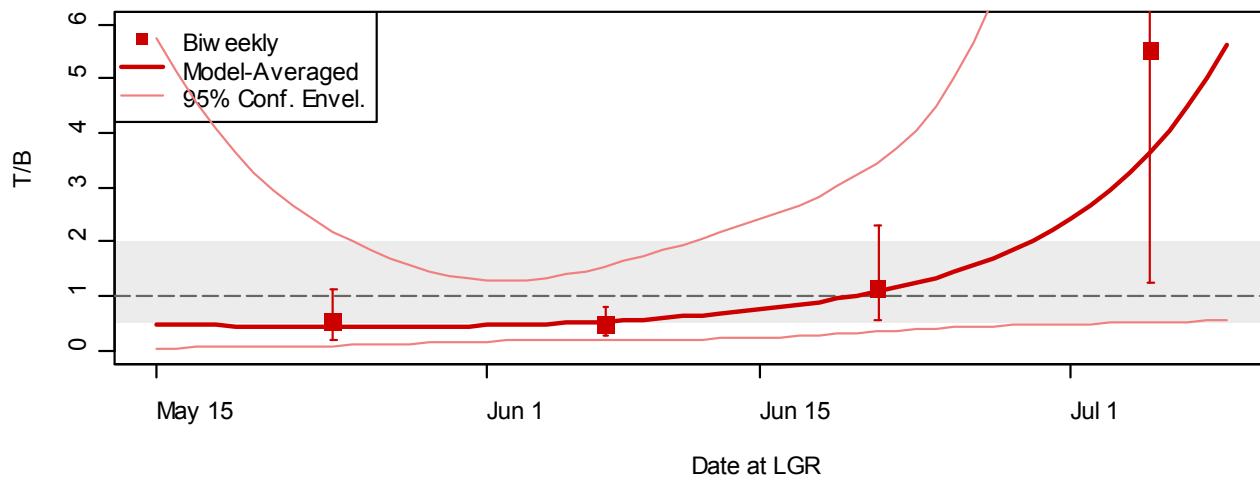
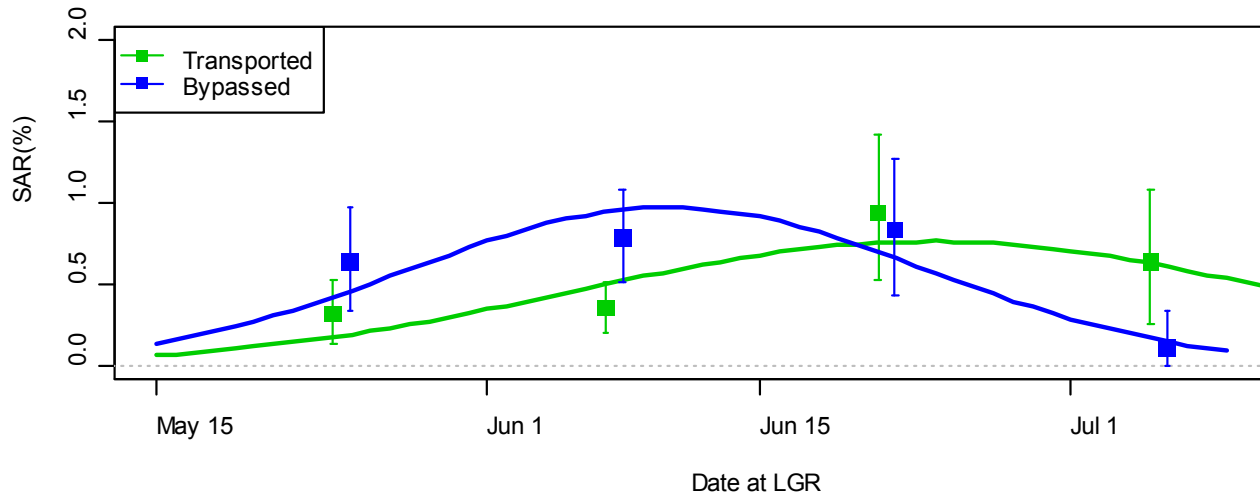
Lower Granite Dam

Smolt-to-Adult Return (%)



2006 Production Subyearlings Lower Granite Dam

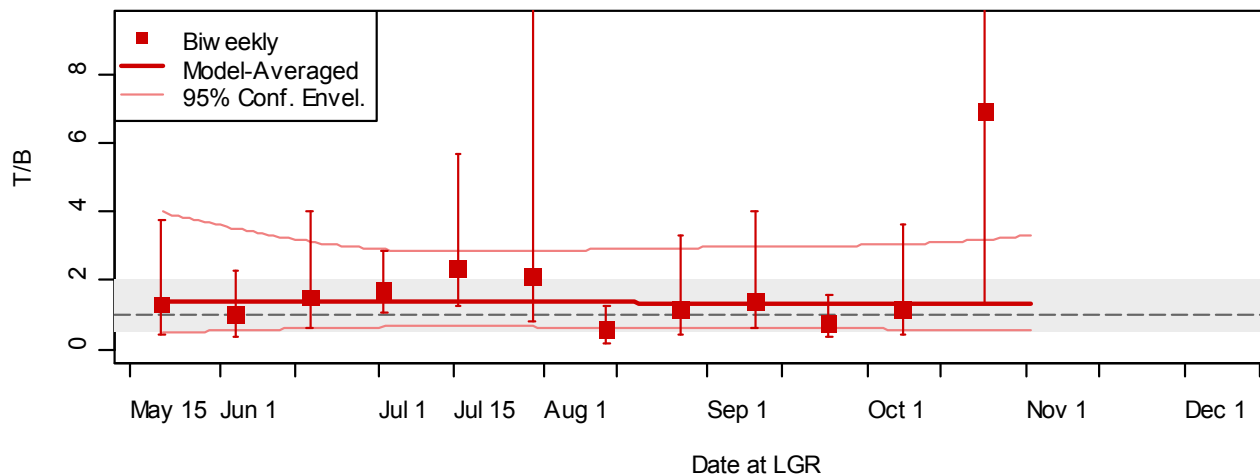
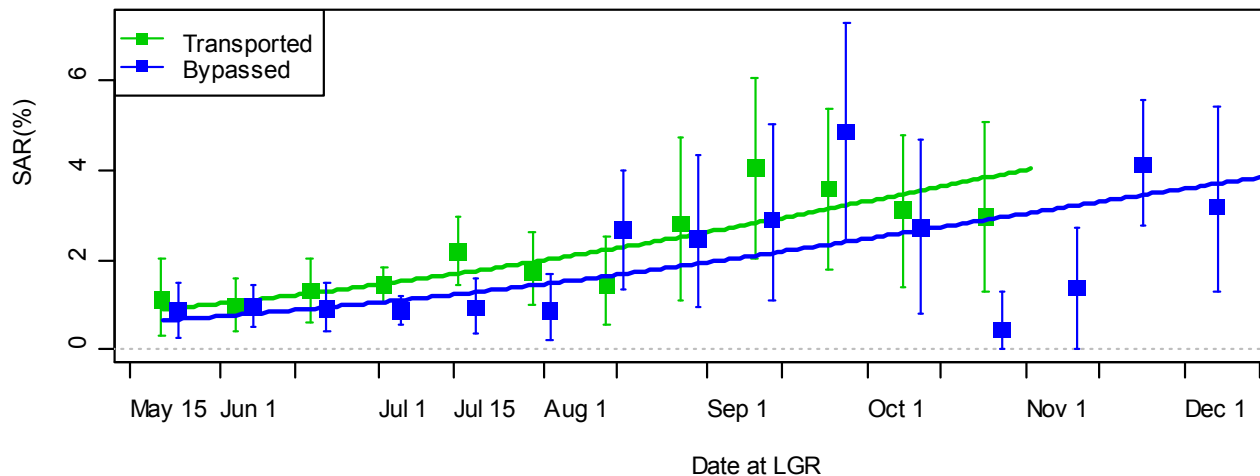
Smolt-to-Adult Return (%)



2008 Surrogate Subyearlings

Lower Granite Dam

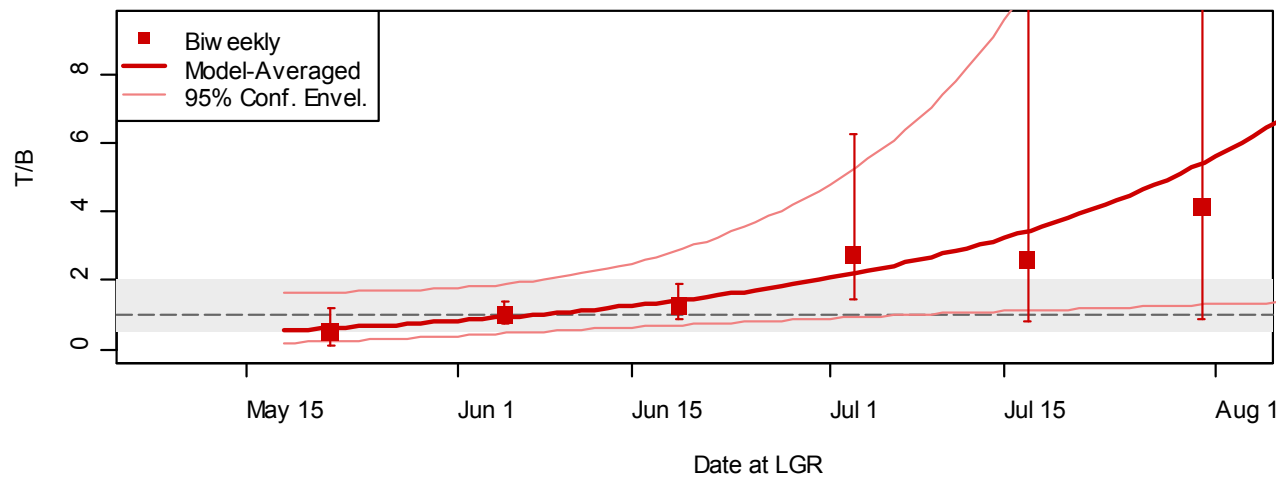
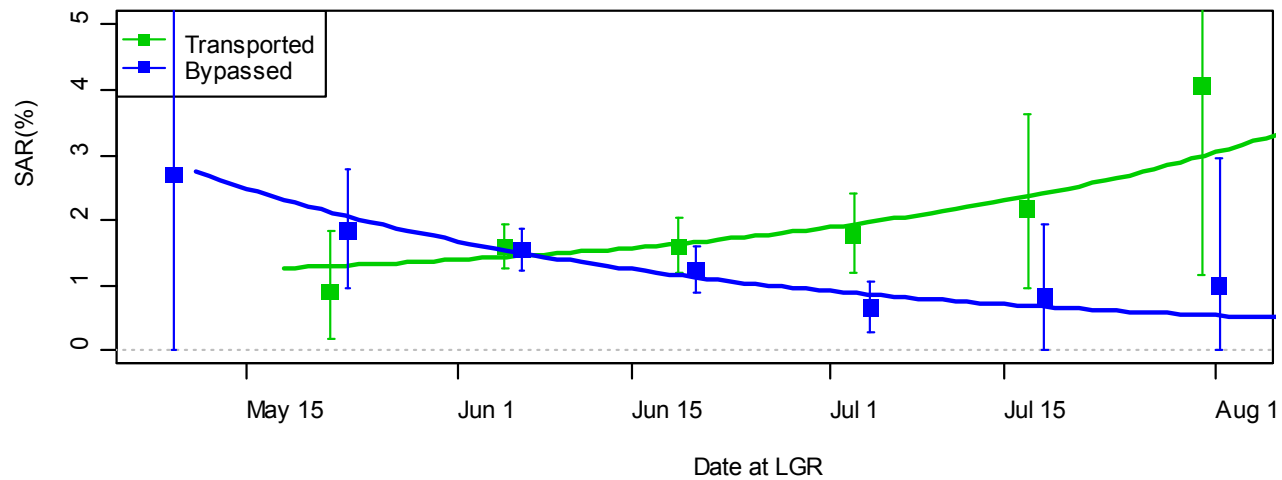
Smolt-to-Adult Return (%)



2008 Production Subyearlings

Lower Granite Dam

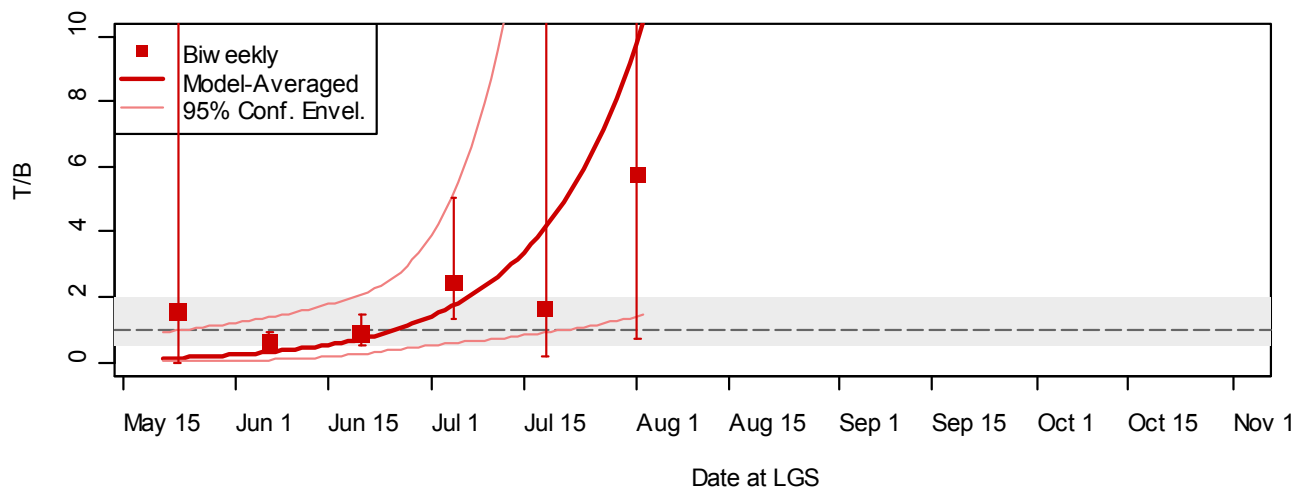
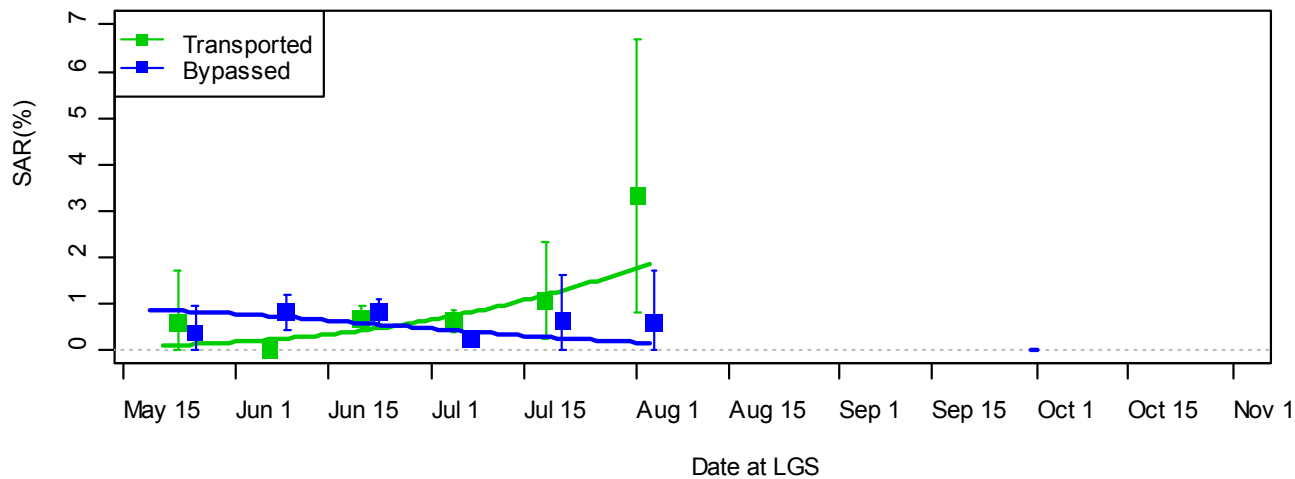
Smolt-to-Adult Return (%)



2006 Surrogate Subyearlings

Little Goose Dam

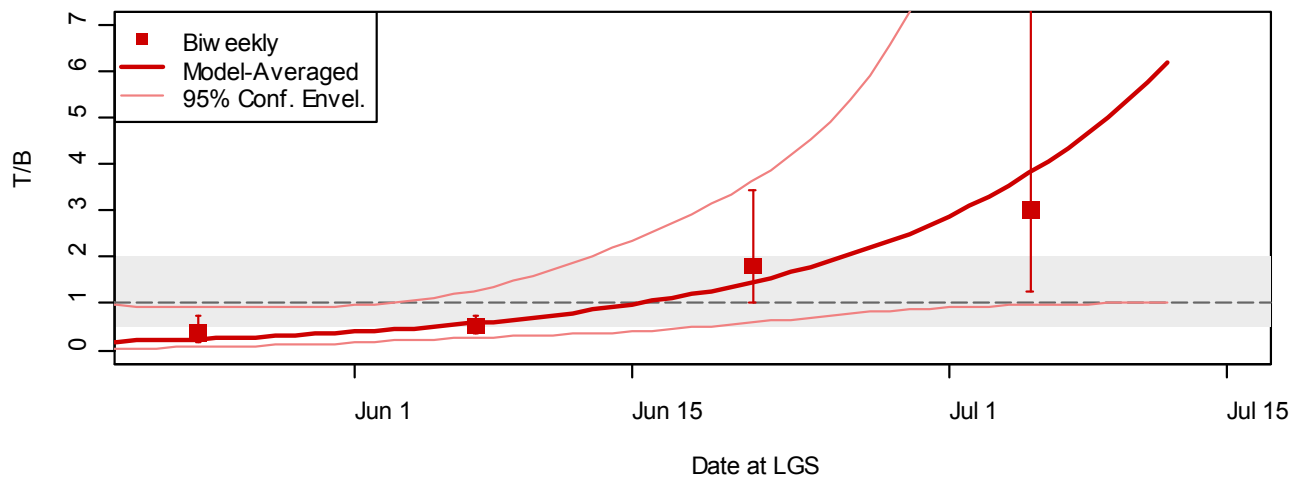
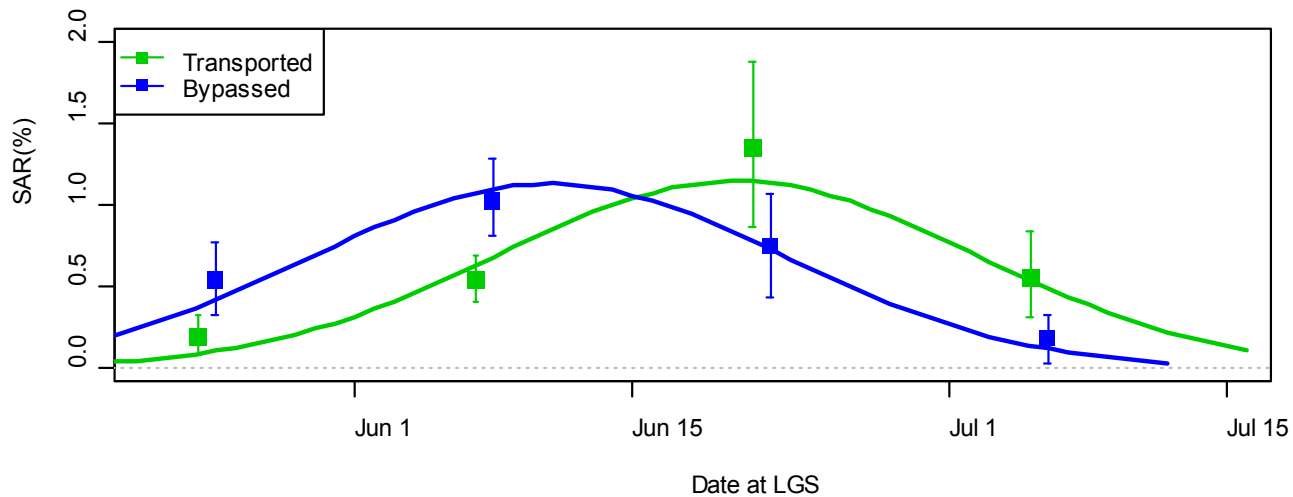
Smolt-to-Adult Return (%)



2006 Production Subyearlings

Little Goose Dam

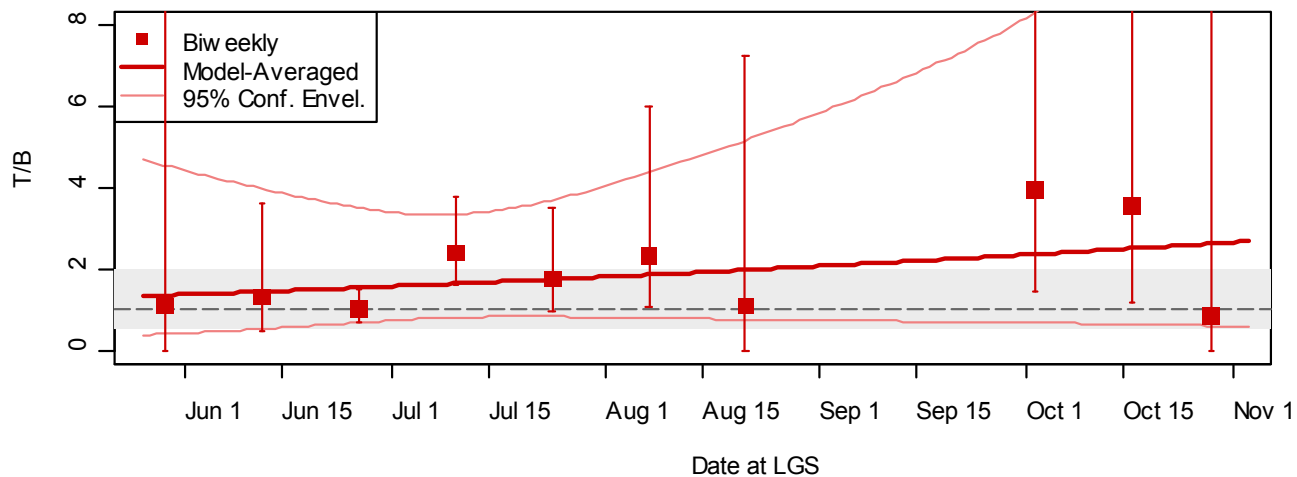
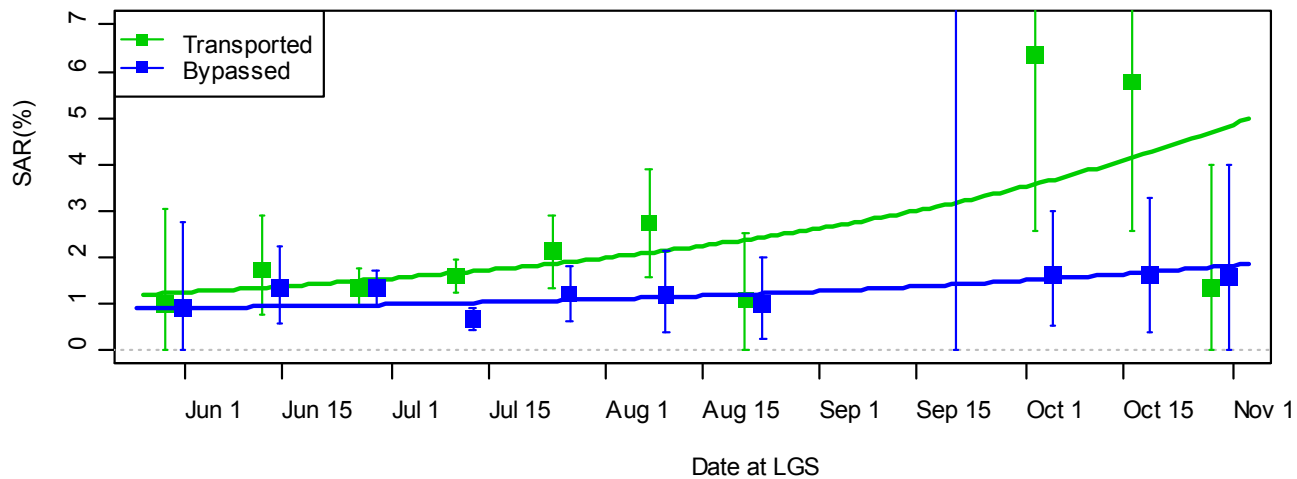
Smolt-to-Adult Return (%)



2008 Surrogate Subyearlings

Little Goose Dam

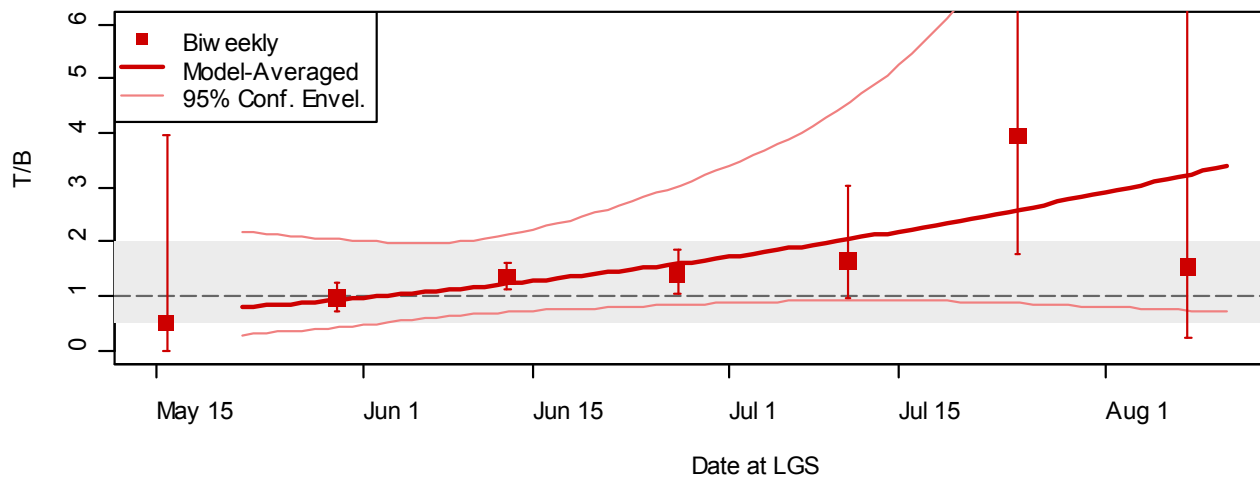
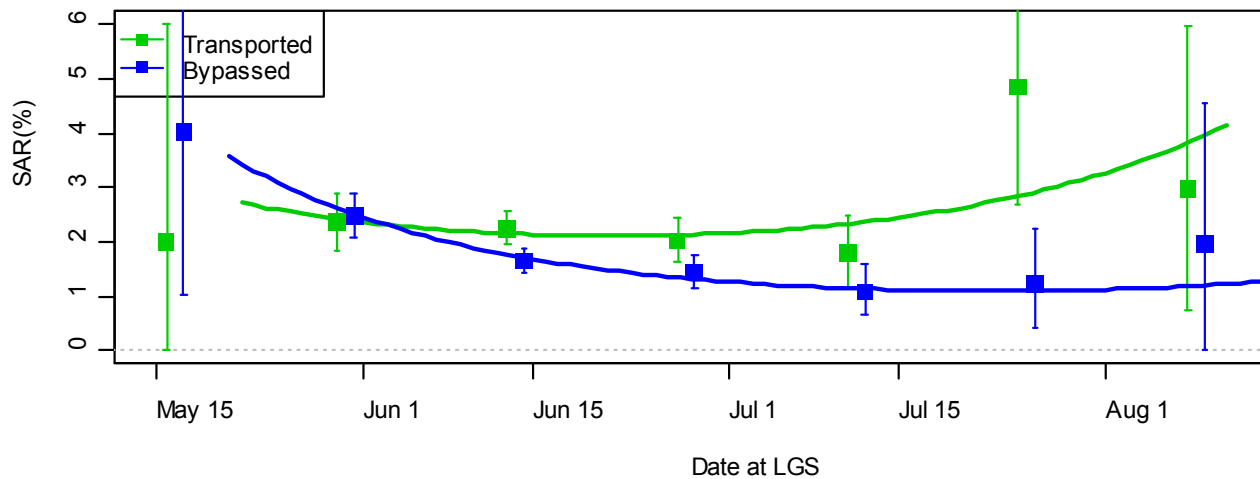
Smolt-to-Adult Return (%)



2008 Production Subyearlings

Little Goose Dam

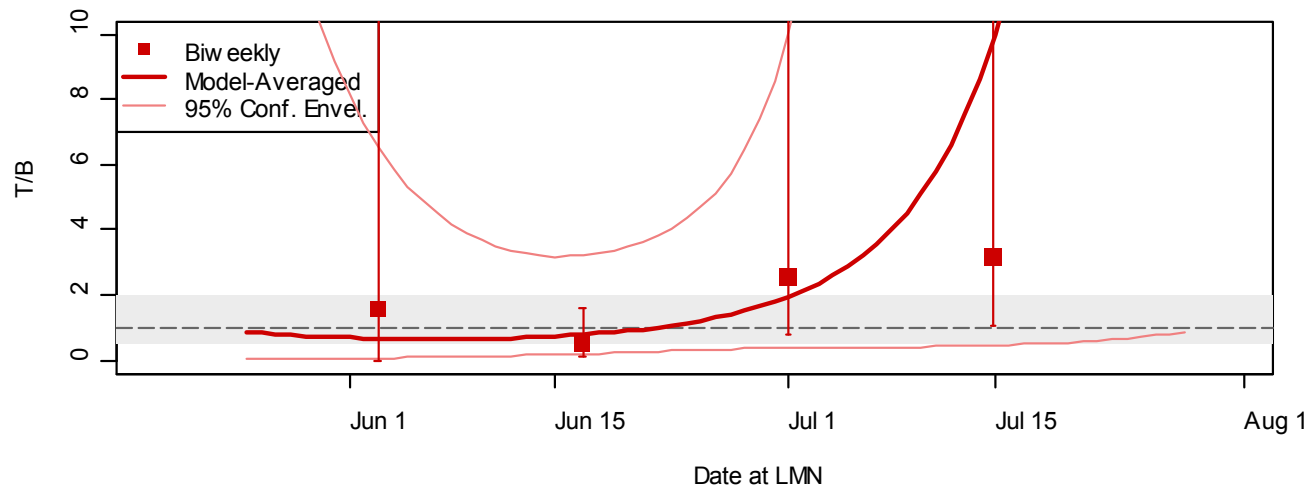
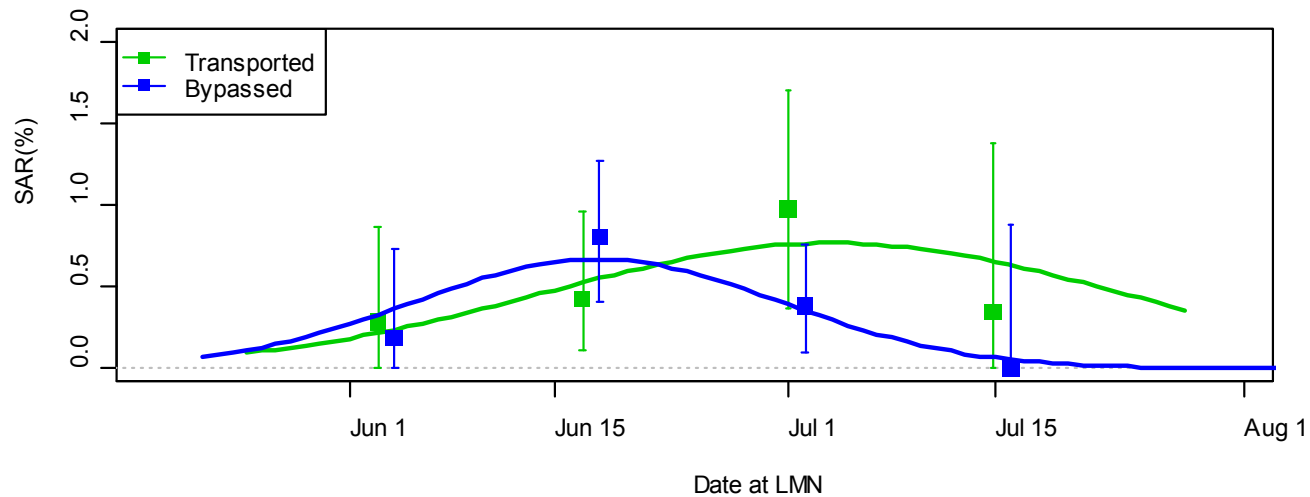
Smolt-to-Adult Return (%)



2006 Surrogate Subyearlings

Lower Monumental Dam

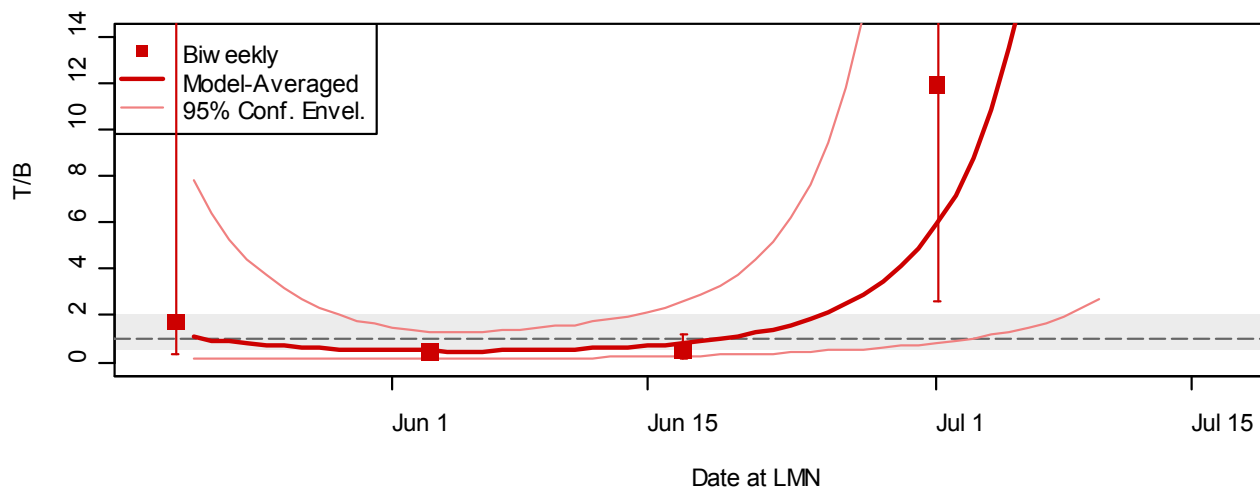
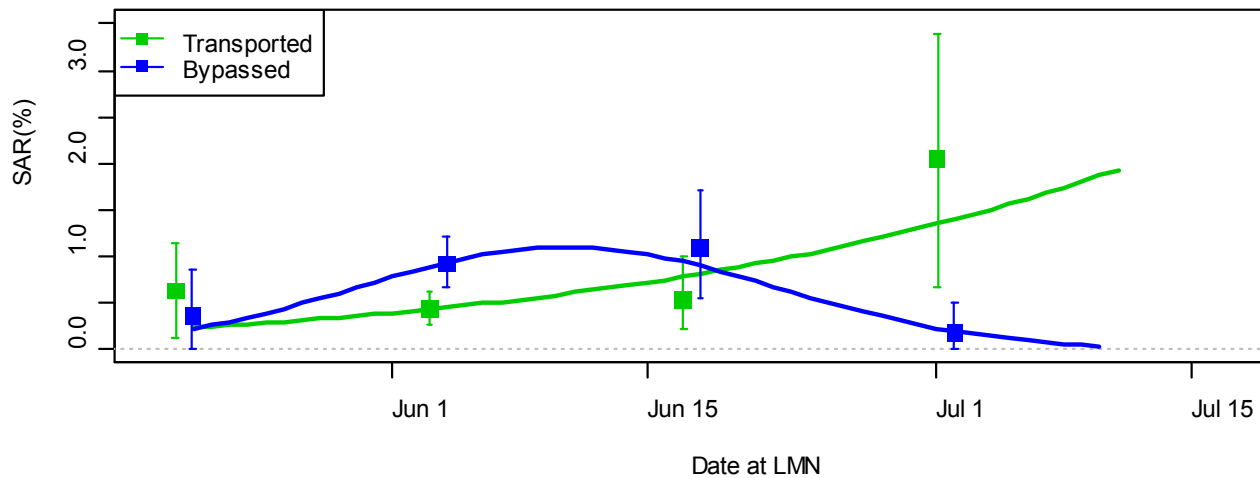
Smolt-to-Adult Return (%)



2006 Production Subyearlings

Lower Monumental Dam

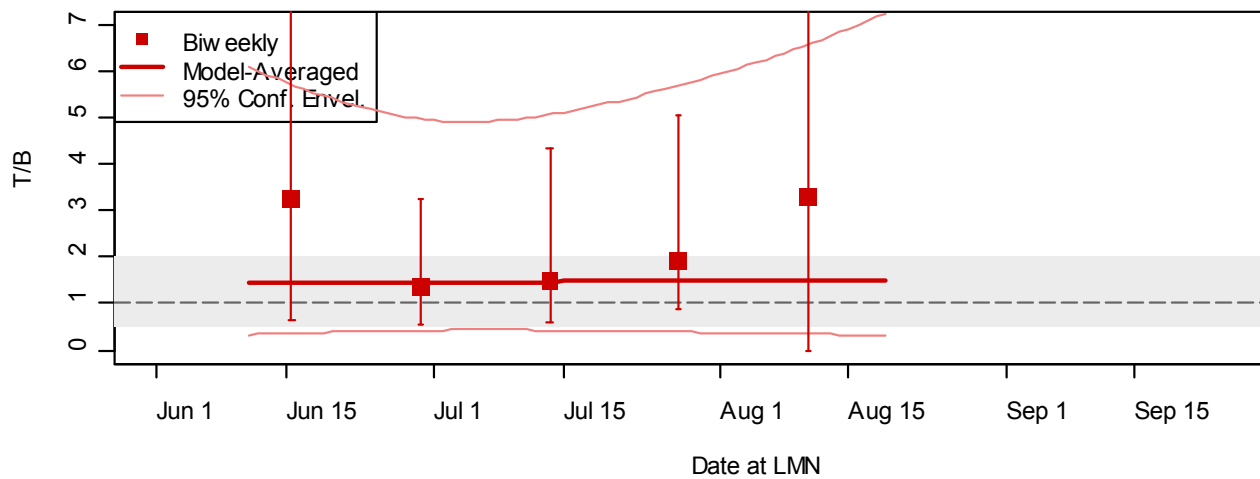
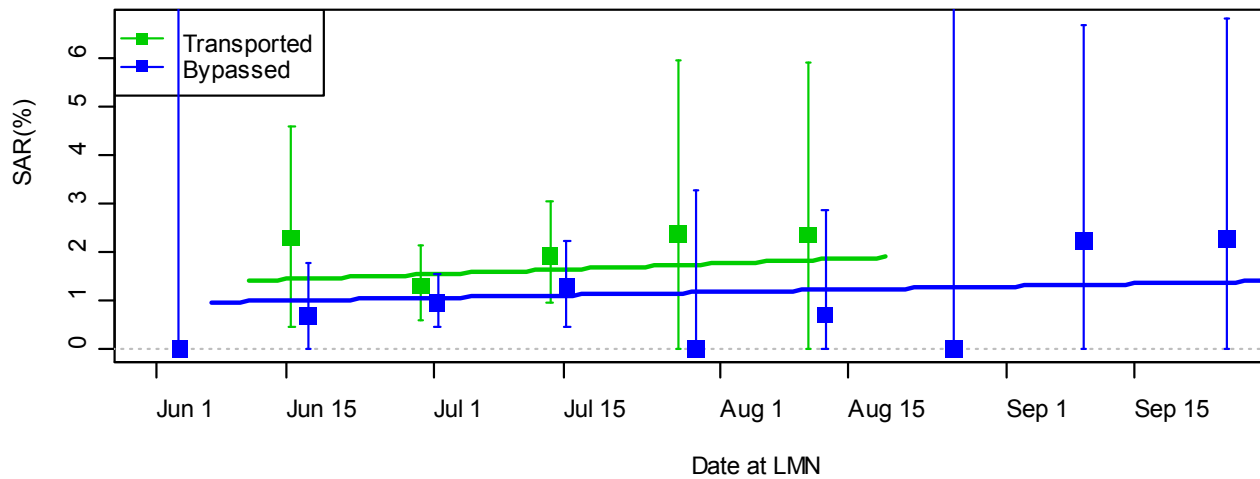
Smolt-to-Adult Return (%)



2008 Surrogate Subyearlings

Lower Monumental Dam

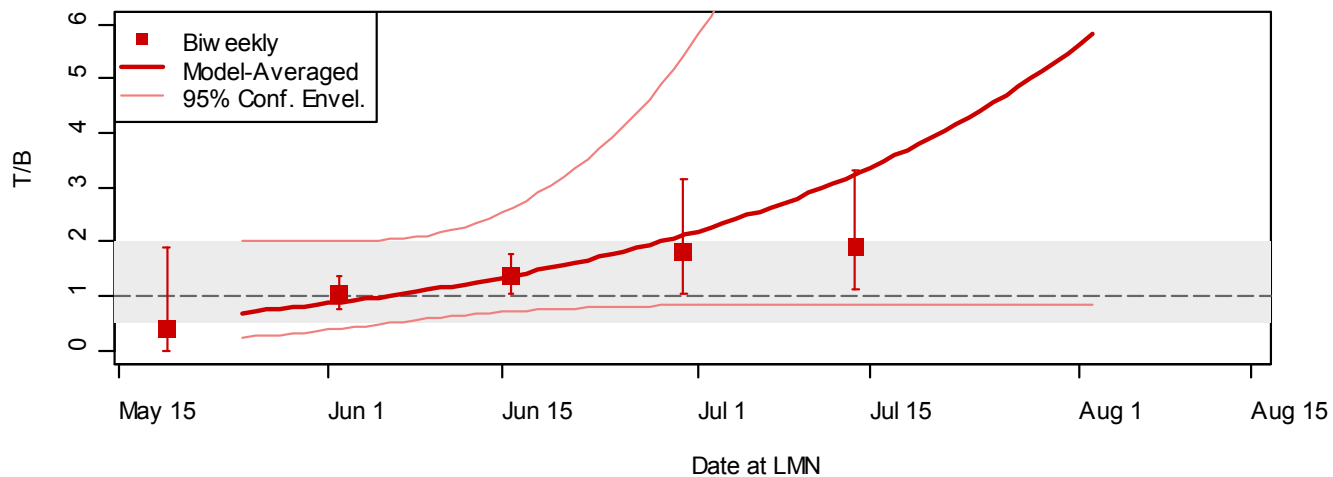
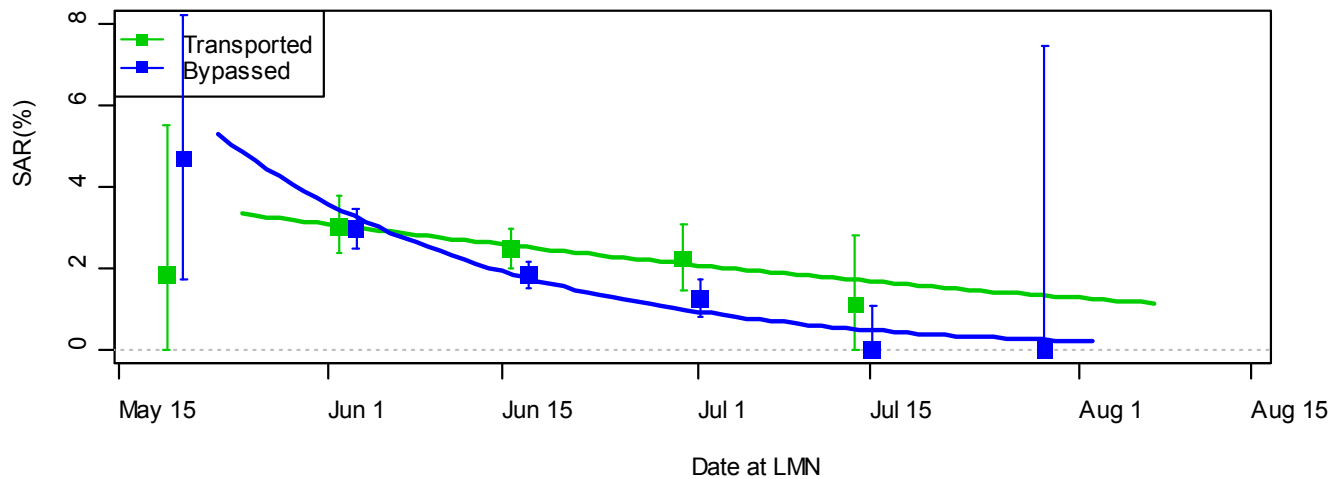
Smolt-to-Adult Return (%)



2008 Production Subyearlings

Lower Monumental Dam

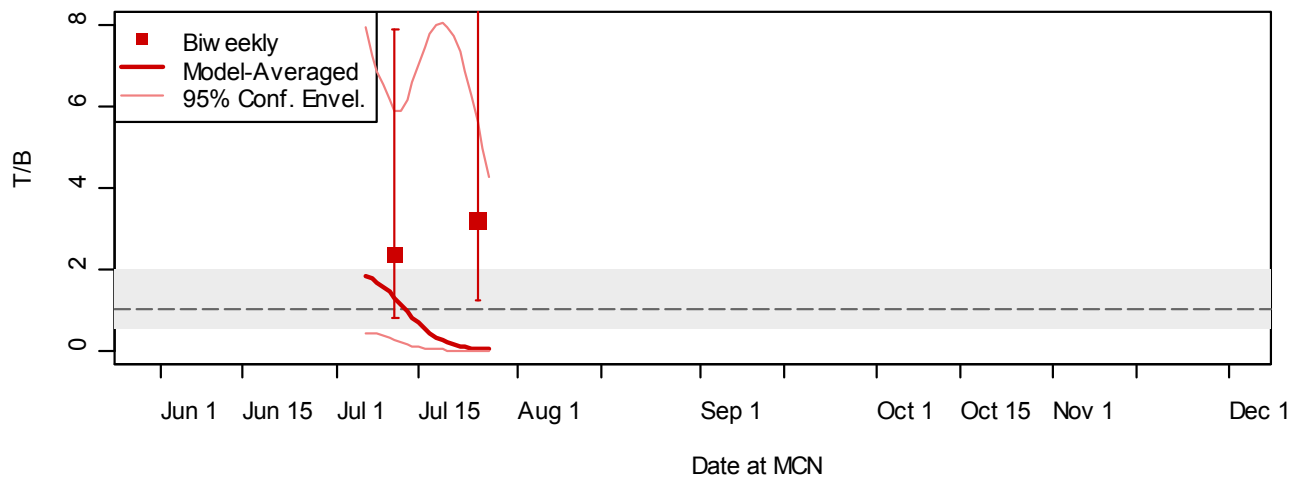
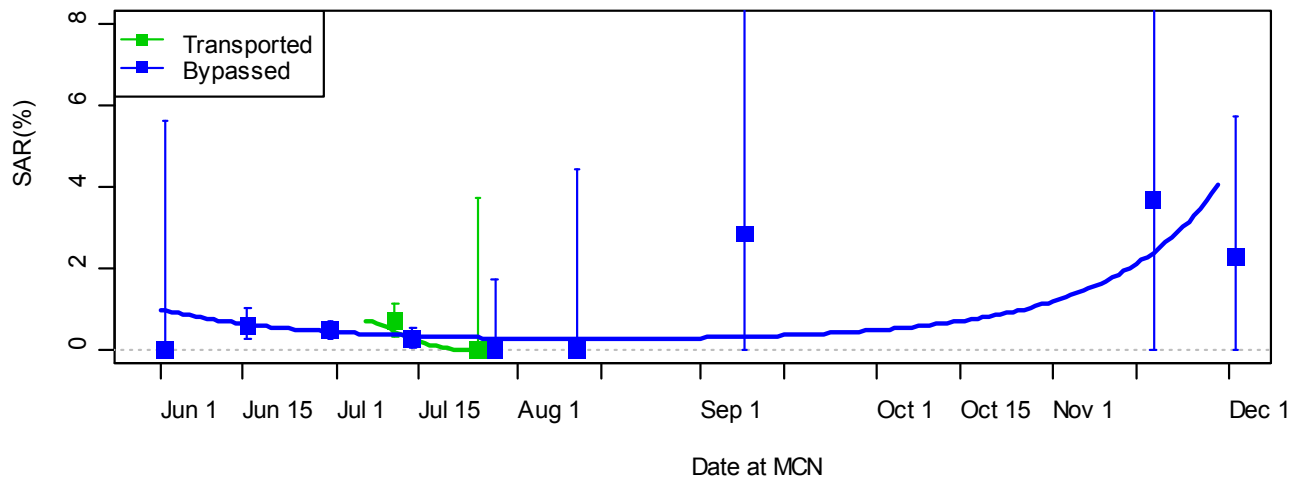
Smolt-to-Adult Return (%)



2006 Surrogate Subyearlings

McNary Dam

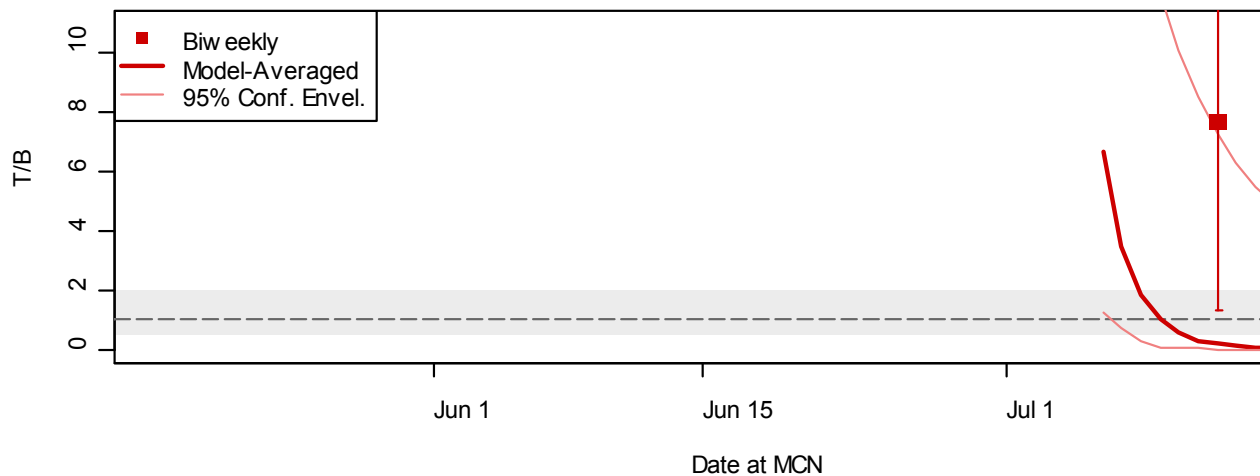
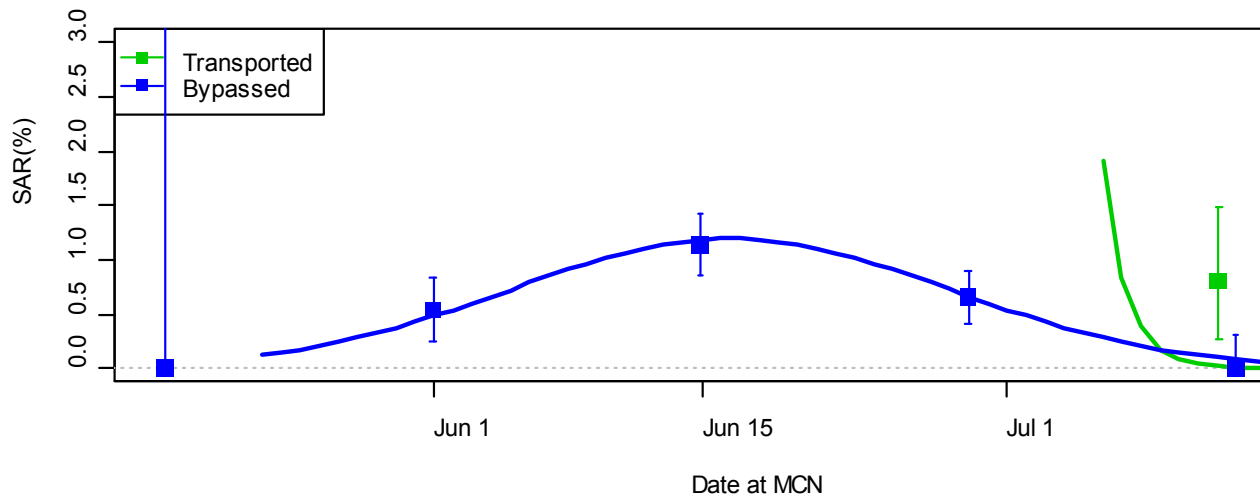
Smolt-to-Adult Return (%)



2006 Production Subyearlings

McNary Dam

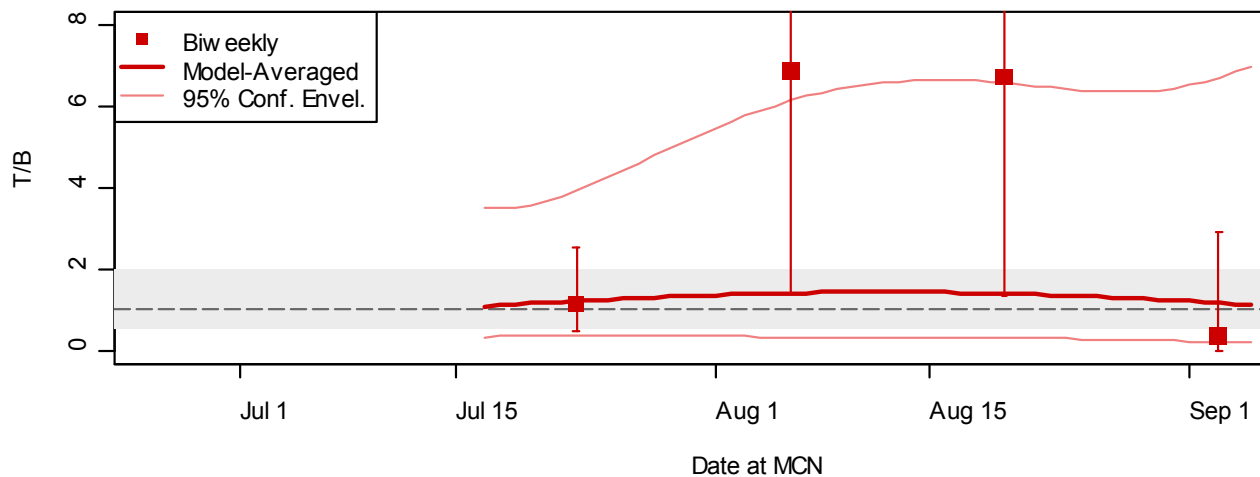
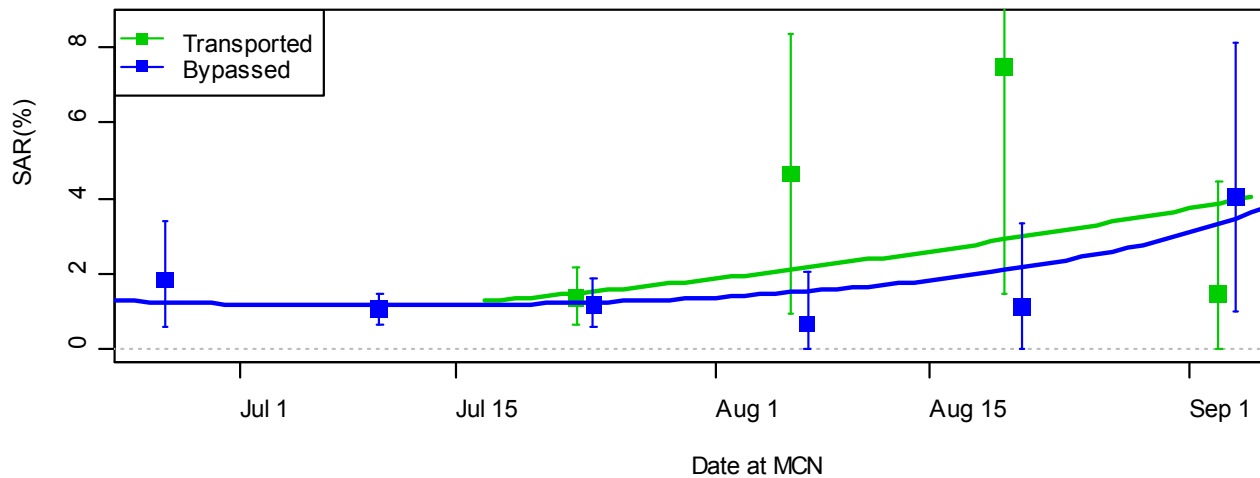
Smolt-to-Adult Return (%)



2008 Surrogate Subyearlings

McNary Dam

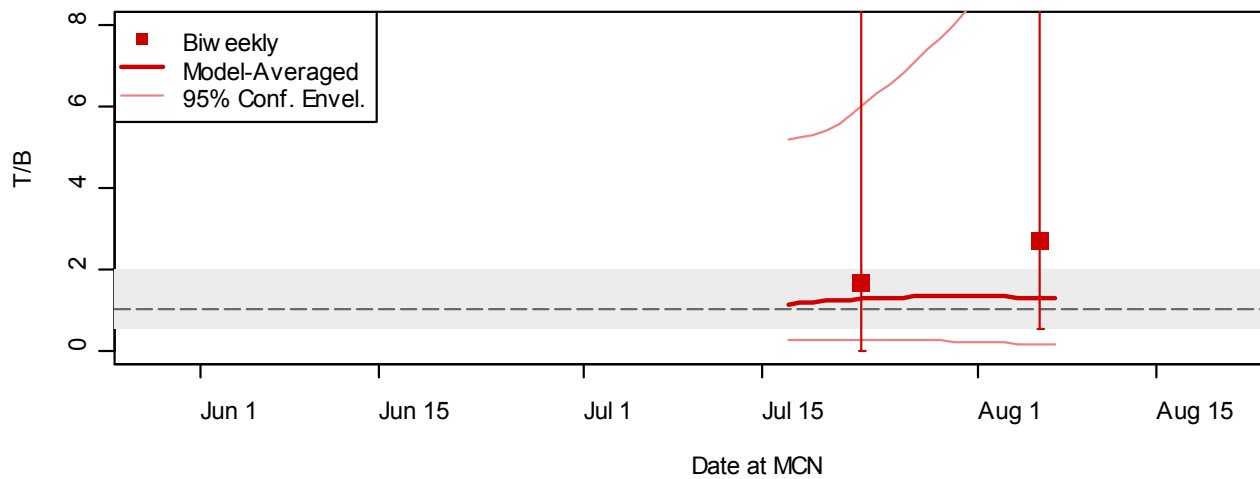
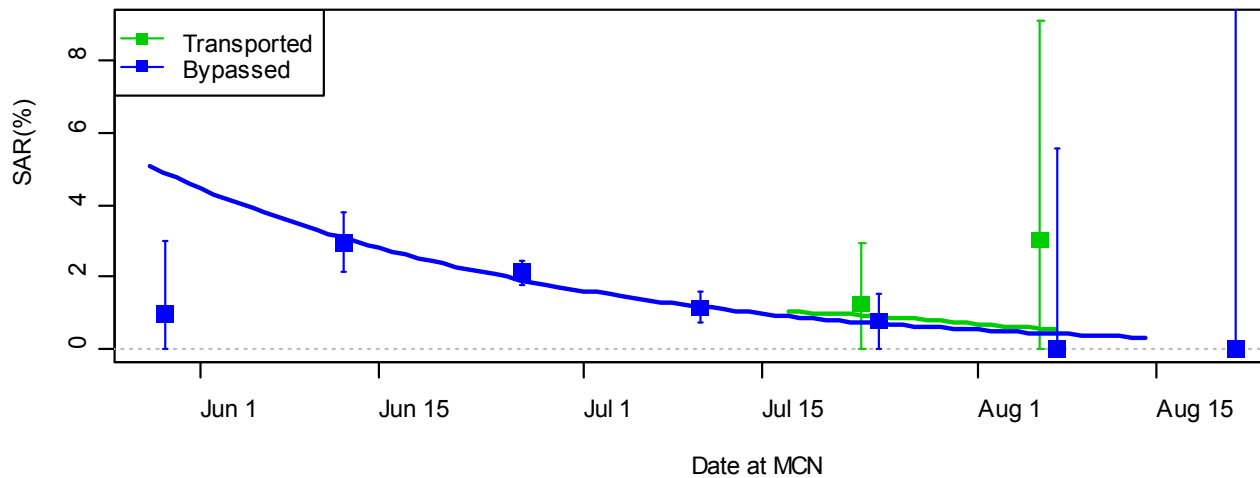
Smolt-to-Adult Return (%)



2008 Production Subyearlings

McNary Dam

Smolt-to-Adult Return (%)



2013 Libby Dam Operations for Kootenai River White Sturgeon Spawning



2013 Technical Management Team Year End Review, December 12, 2013
David Wills and Jason Flory USFWS



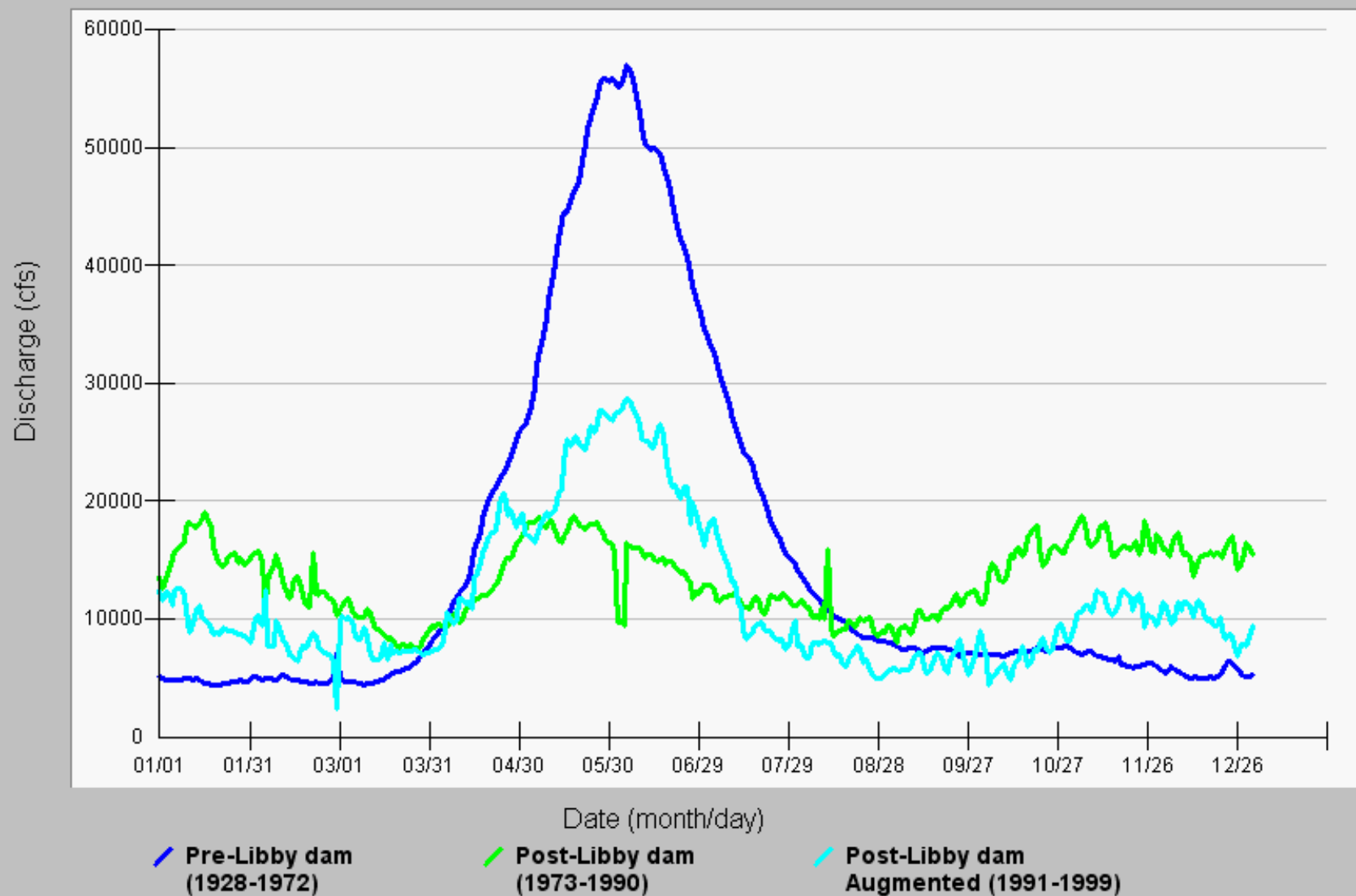
Libby Dam RM 222



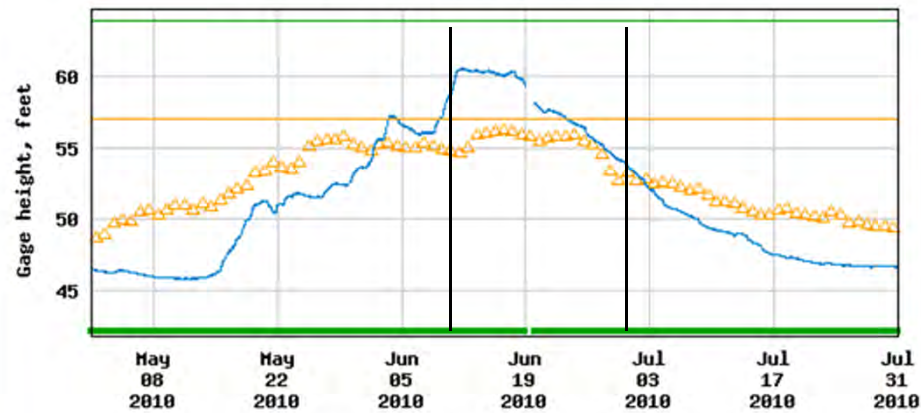
Kootenai Falls RM 192



Mean Monthly Flow Patterns in the Kootenai River at Bonner's Ferry, ID 1928-1999



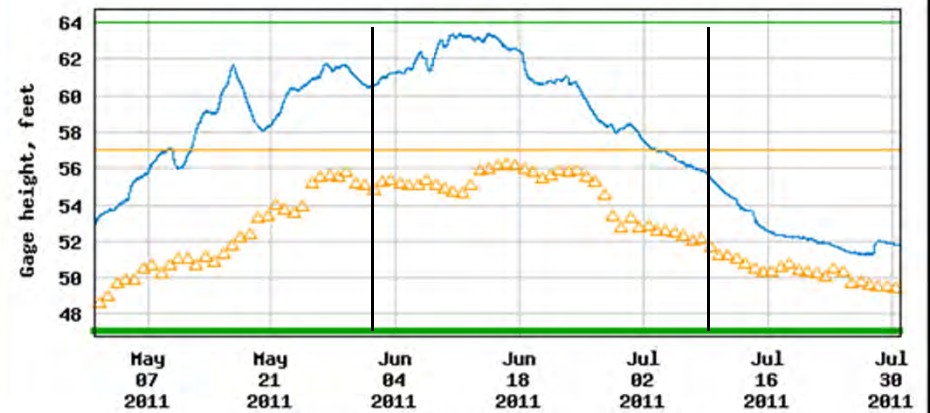
USGS 12309500 KOOTENAI RIVER AT BONNERS FERRY ID



- △ Median daily statistic (49 years)
- Gage height
- Period of approved data
- National Weather Service Flood Stage
- National Weather Service Action Stage

Graph courtesy of the U.S. Geological Survey

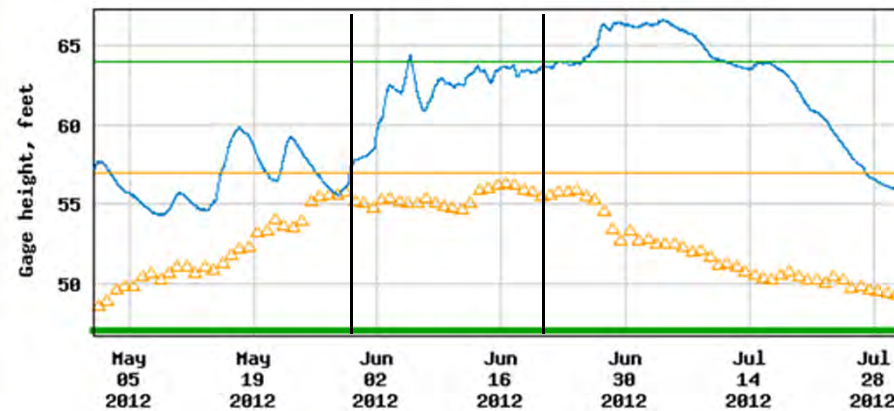
USGS 12309500 KOOTENAI RIVER AT BONNERS FERRY ID



- △ Median daily statistic (49 years)
- Gage height
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- National Weather Service Action Stage

Graph courtesy of the U.S. Geological Survey

USGS 12309500 KOOTENAI RIVER AT BONNERS FERRY ID



- △ Median daily statistic (49 years)
- Gage height
- Period of approved data
- National Weather Service Flood Stage
- National Weather Service Action Stage

Graph courtesy of the U.S. Geological Survey

Conclusions:

After three years of attempts (2010-2012) to test the effects of extra Libby Dam flows, higher river stages, and temperature management on Kootenai River white sturgeon migration and spawning behavior, it seems that:

- 1. River stages of up to 1766.5' (at Bonners Ferry) do not create conditions necessary to coax spawning sturgeon to migrate further upstream and spawn over rocky substrates.**
- 2. The conditions necessary to utilize the spillway at Libby Dam to provide extra flows for sturgeon spawning augmentation are somewhat rare and difficult to achieve.**



Calls for additional flows via spill to augment the “sturgeon pulse” became unlikely after the 2012 season.

The Service worked with co-managers and members of the Kootenai Sturgeon Recovery Team to develop an updated approach to managing the sturgeon pulse for 2013.

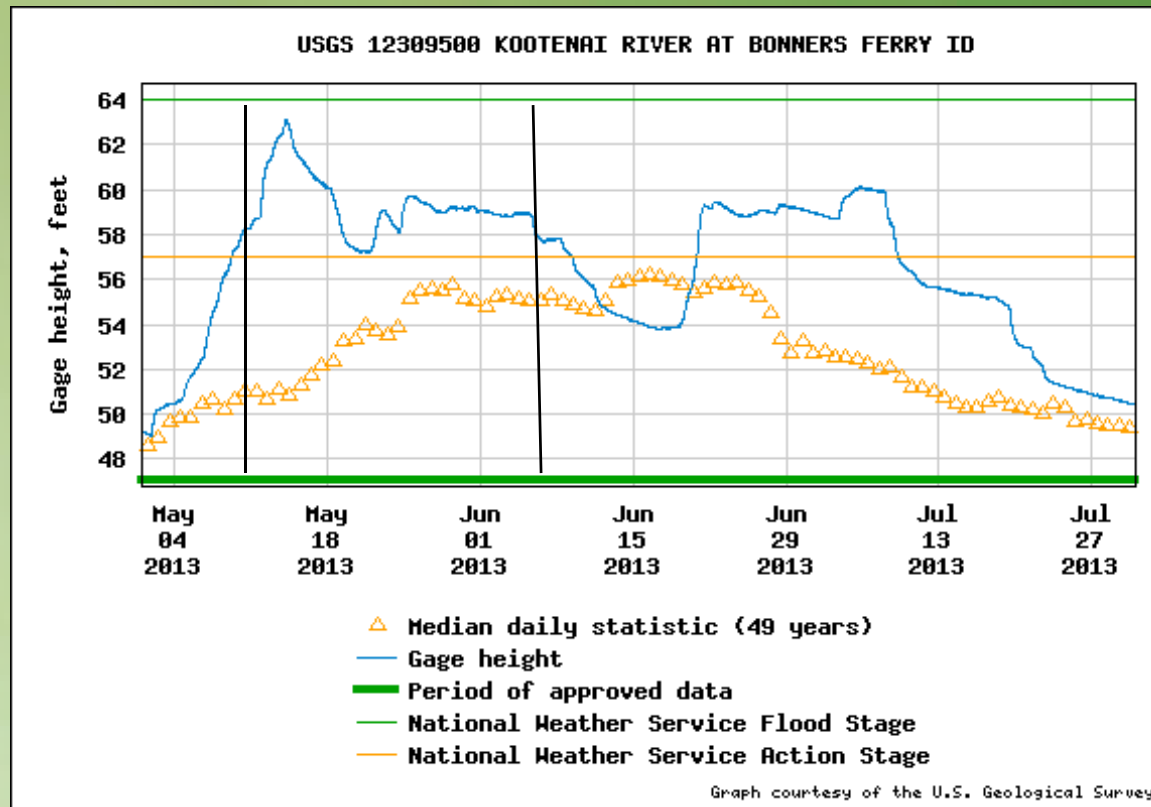
2013 “Twin Peaks” Sturgeon Flow Operation with 1.14 MAF

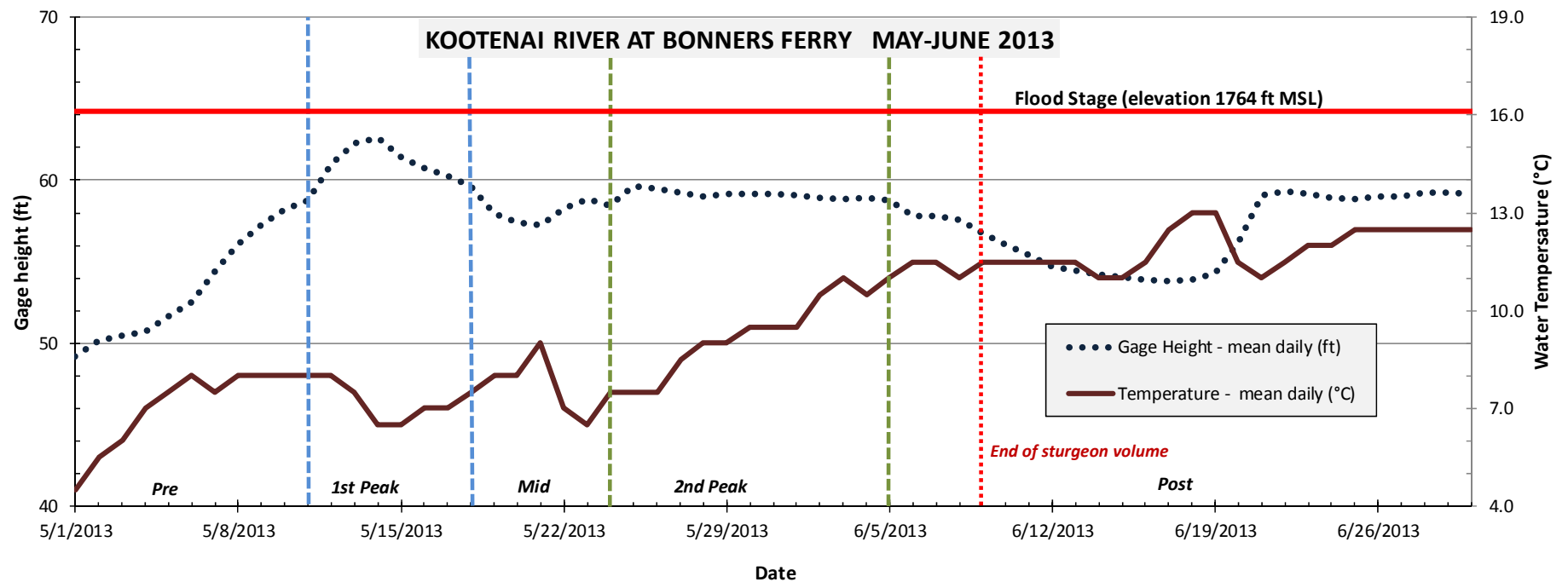
- **1st Peak – Migration & Staging (full Libby PH, 5-7 days)**
- **Pause with lower outflows (min 18 kcfs at Bonners Ferry)**
- **2nd Peak – Move & Spawn, releasing warmer water (full Libby PH, 7-9 days)**
- **Decreasing discharge towards stable summer flows**



2013 Sturgeon Spawning Releases from Libby Dam

	Peak 1 May 11 - May 17	Mid May 18 - May 23	Peak 2 May 24 - June 4
Avg Q (kcfs)	25.0	18.4	26.7
Min Q (kcfs)	20.8	18.0	24.0
Max Q (kcfs)	26.0	23.0	27.0





Flow Period*	Date	Mean Gage Height (feet)	Mean Flow Rate (kcfs)	Mean Water Temp. (C°)	Minimum Water Temp. (C°)	Maximum Water Temp. (C°)
Pre	May 1-May 10	53.05	26.0	7.0	7.5	8.0
Peak 1	May 11-May17	61.00	43.2	7.2	7.7	8.3
Mid	May 18-May23	58.22	32.7	7.7	8.2	8.9
Peak 2	May24-June 4	59.08	36.1	9.1	9.5	10.1
Post	June 5-June 30	56.94	29.2	11.8	12.3	12.8

* Denotes release periods at Libby Dam for sturgeon spawning.



What we learned

- Operationally the pattern was successful
- Perhaps more of the spawning occurred in a shorter period of time toward the end of the 2nd peak.
- Overall, doesn't look like there was a big change in migration/spawning behavior, but the data is still being analyzed.

Next Year ... will likely do the same operation.

- A 2nd year is warranted to confirm results of 2013
- A simulated spring freshet is beneficial to many species





Kootenai Falls

MFWP summer survey below Kootenai Falls

2009 – 2 sturgeon

2010 – 4 sturgeon

2011 – 7 sturgeon

2012 – 32 sturgeon

2013 – 70+ sturgeon

Most are hatchery fish.



Questions?



Thank you.