Dworshak Reservoir Regulation
Water Year 2012

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Walla Walla District

December 5th, 2012

US Army Corps of Engineers
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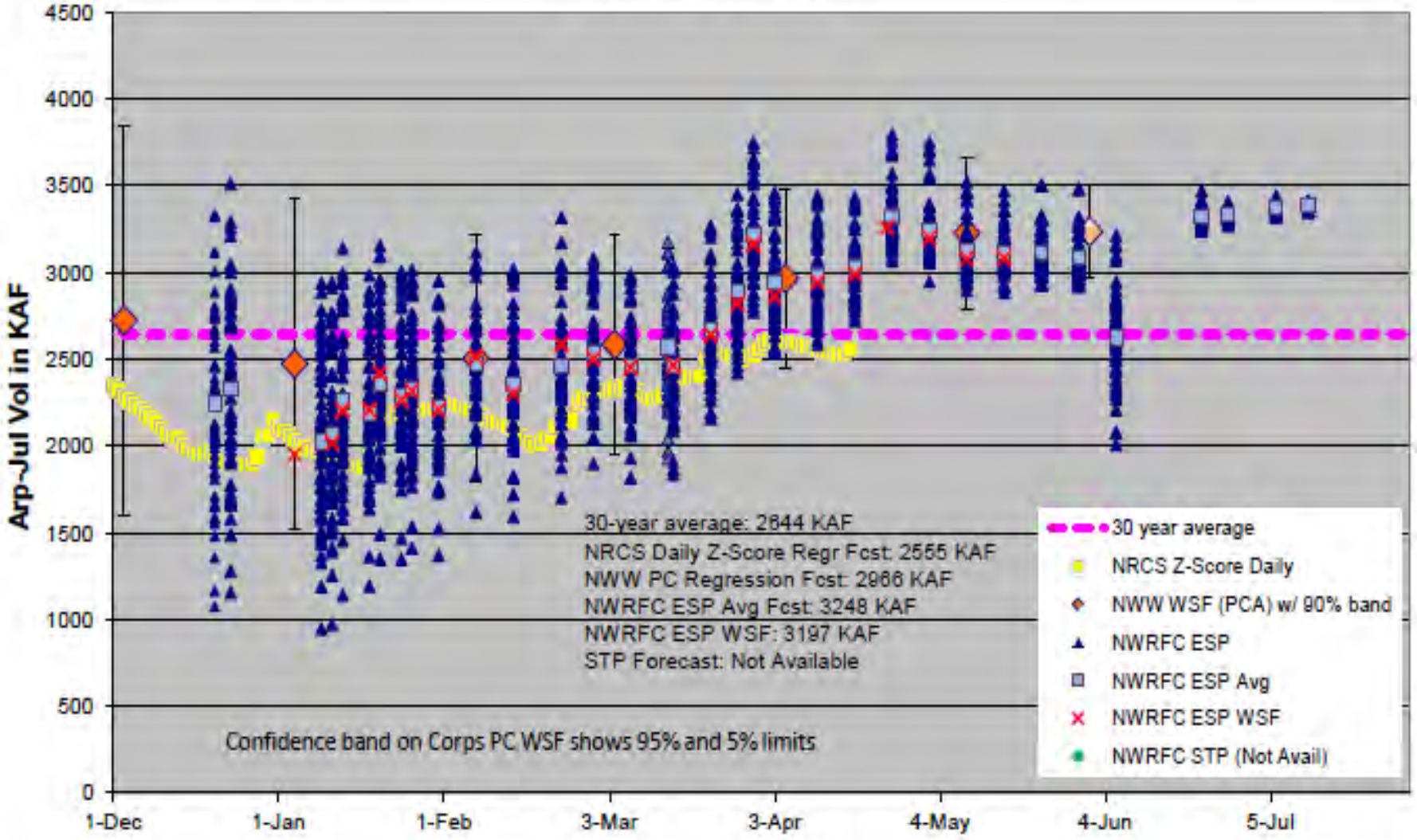
Dworshak Operations Review

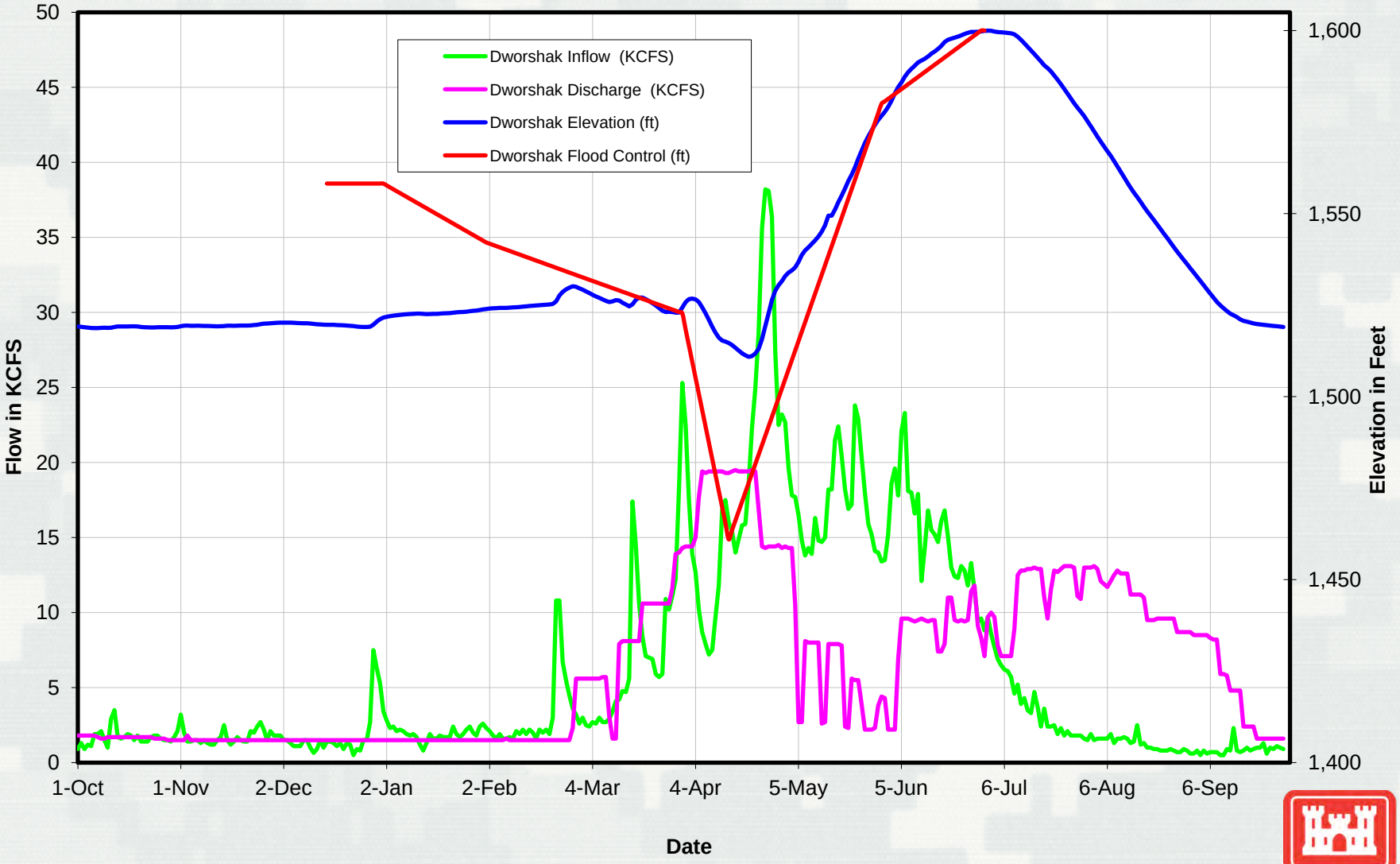
- Water Supply Forecast
- BiOp Operations
- Flood Control Space Shift to Grand Coulee & Spring Flow Augmentation
- Final Refill & Temperature Augmentation
- Summer Temperature Operations
- Total Dissolved Gas Operations

Dworshak, ID April-July Inflow Volume Forecast Comparison

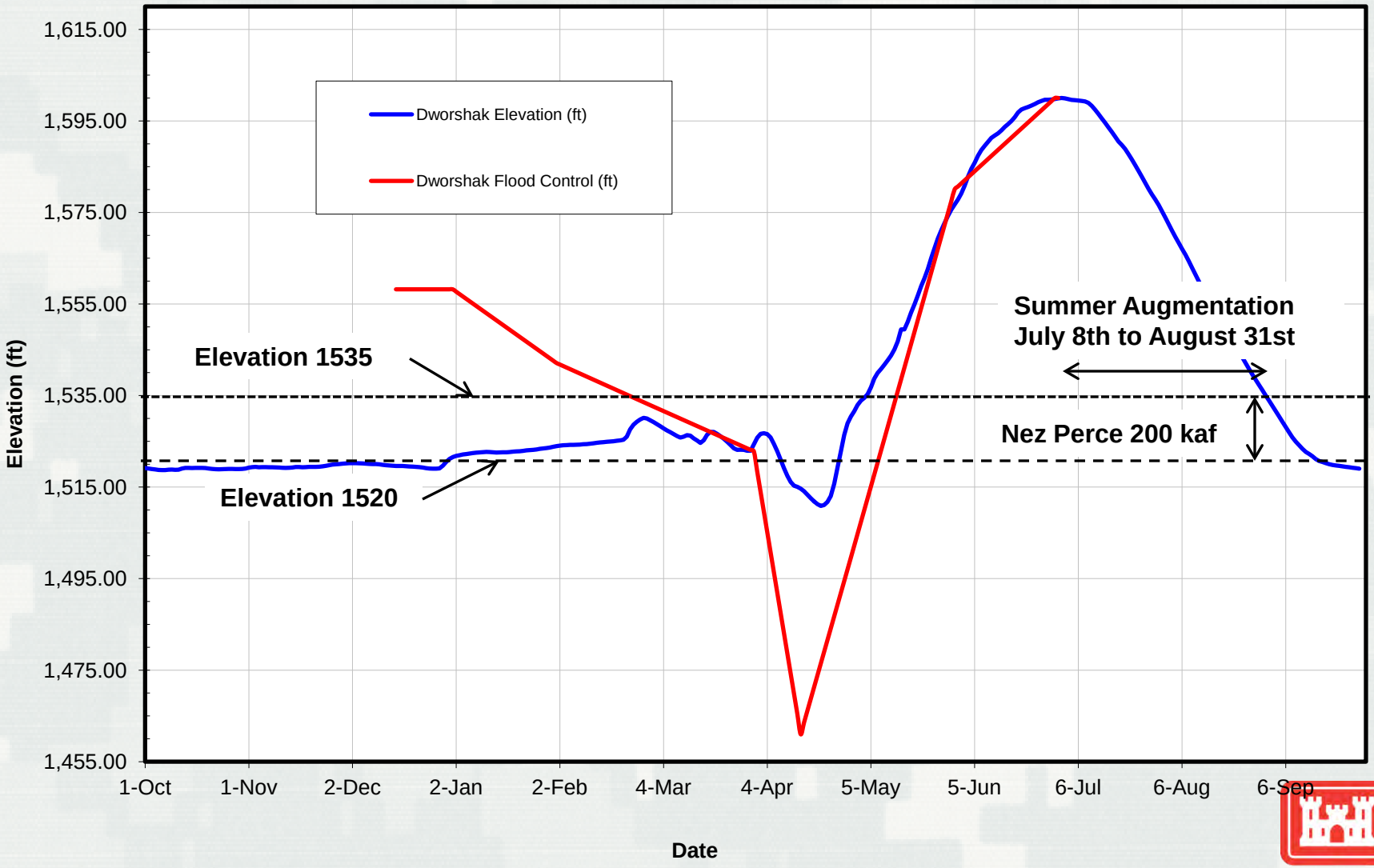
updated 12-Jul-2012



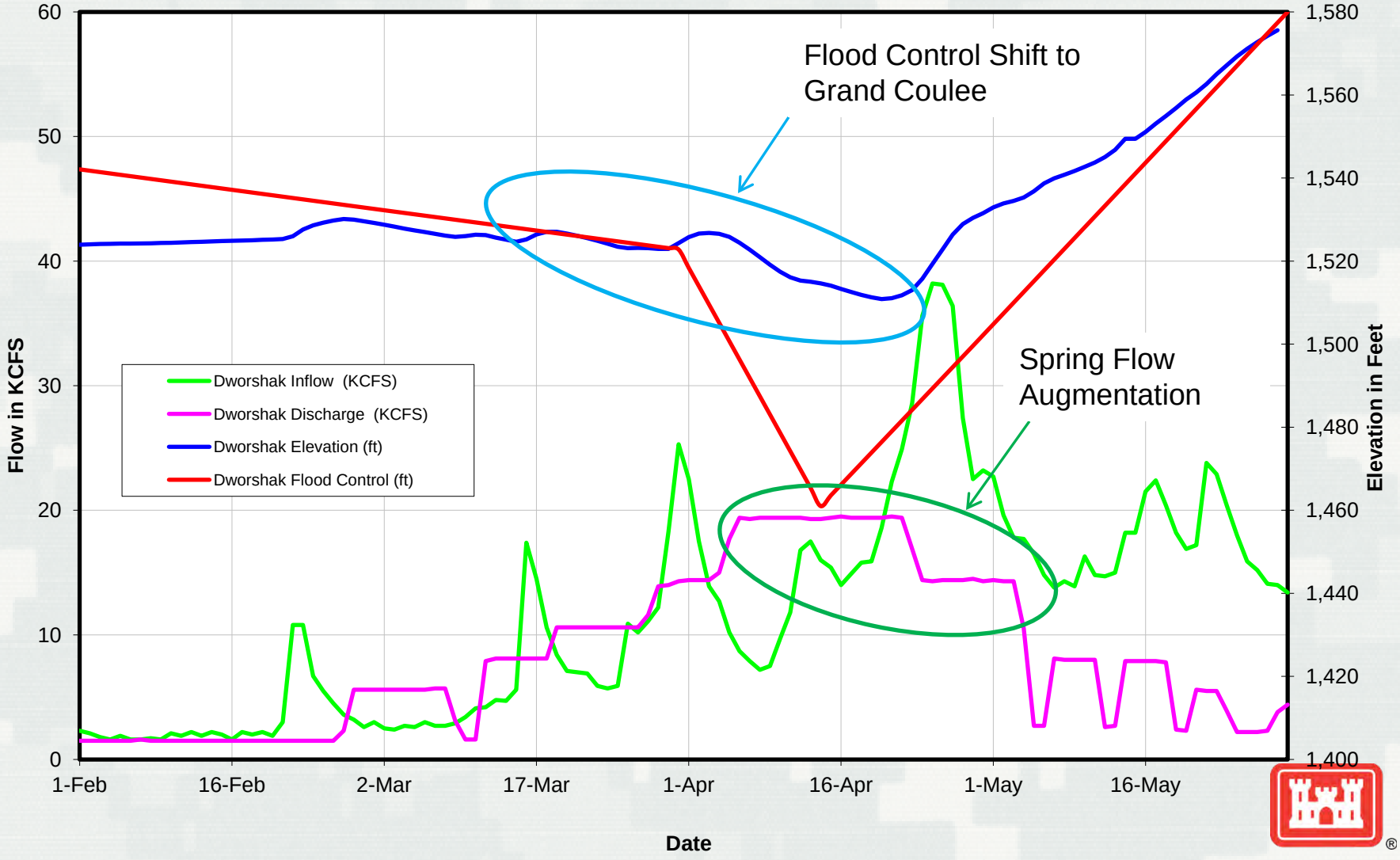
2012 Dworshak Operations



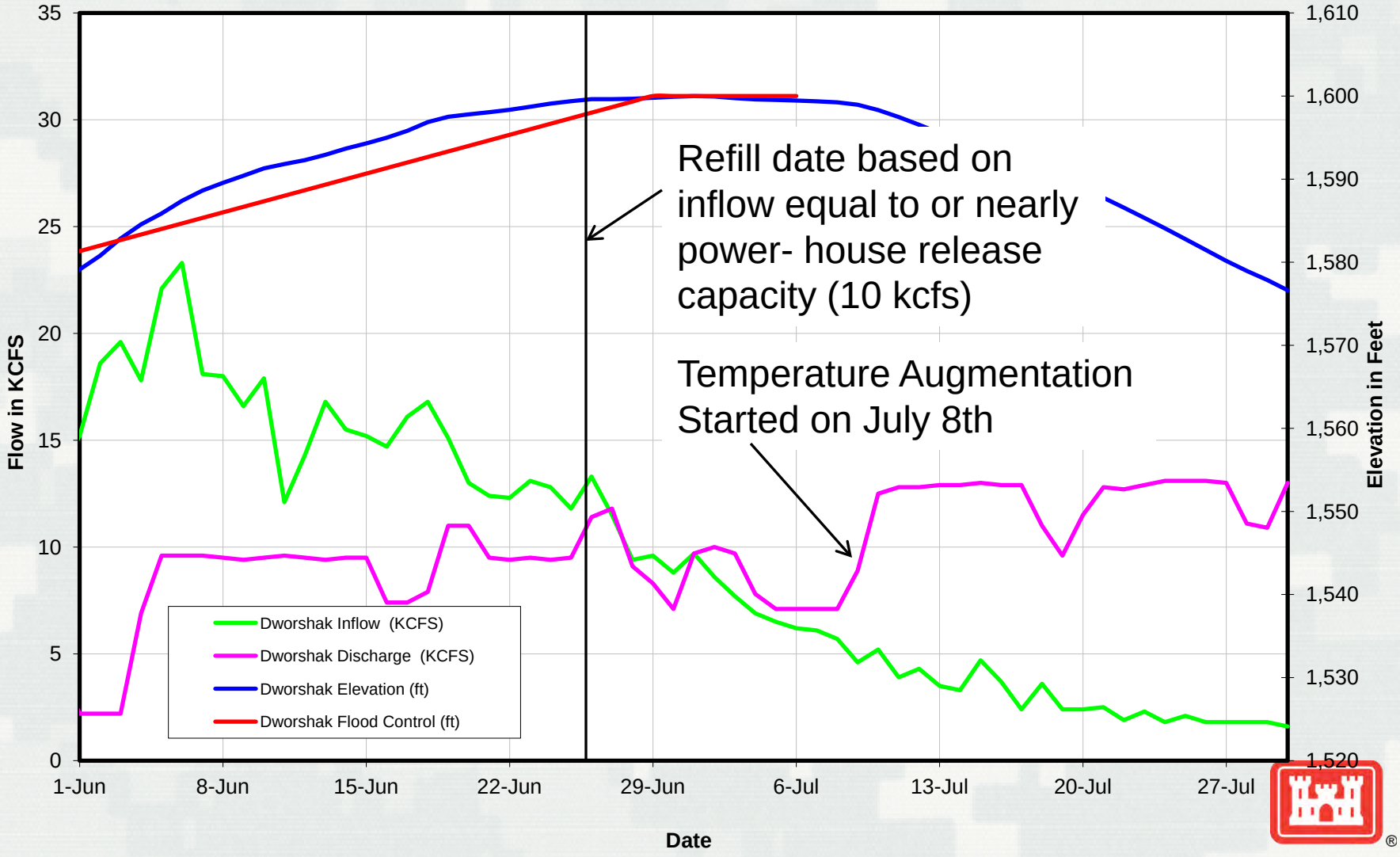
BiOp Operations



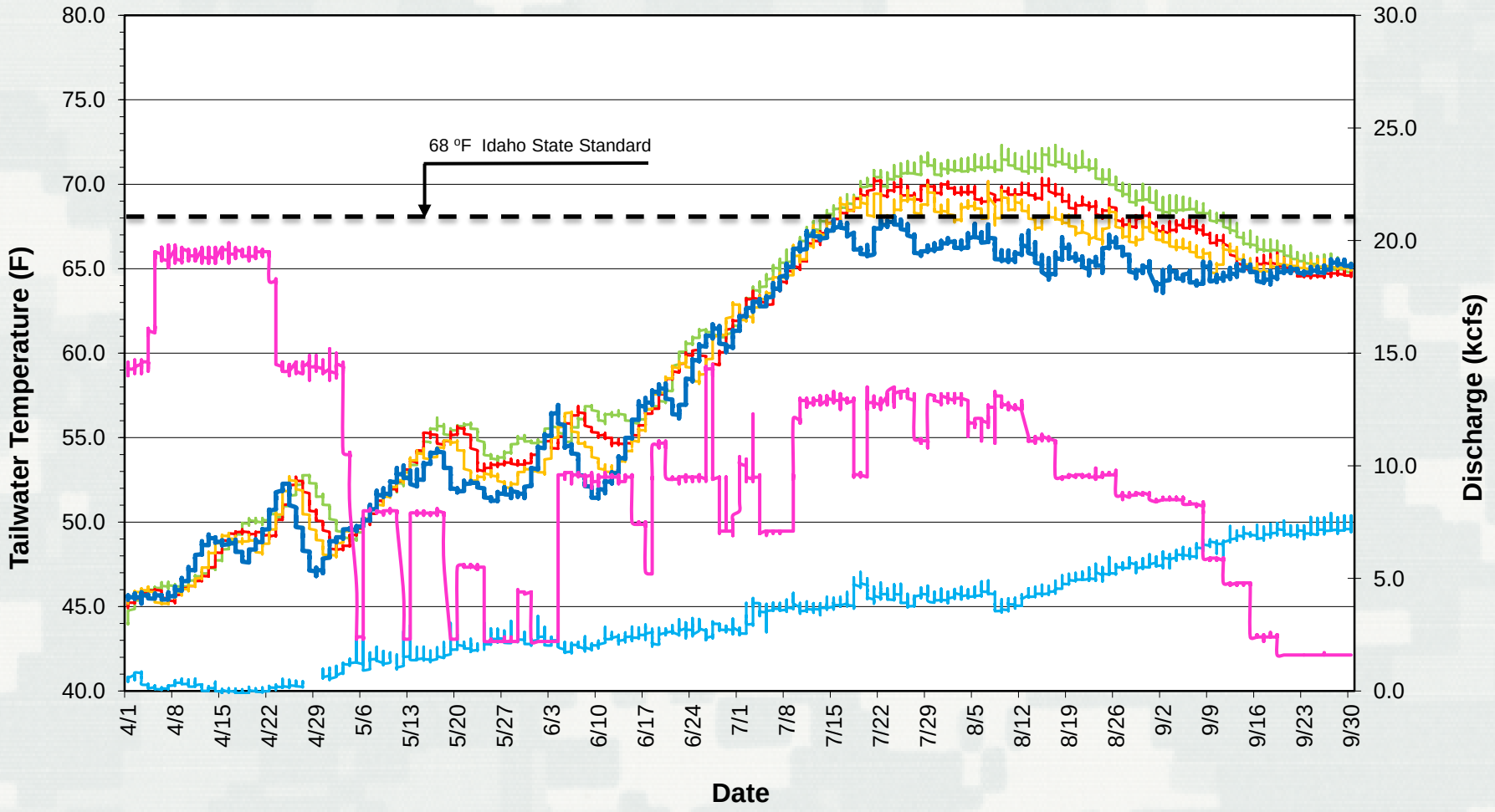
Grand Coulee Shift & Spring Augmentation



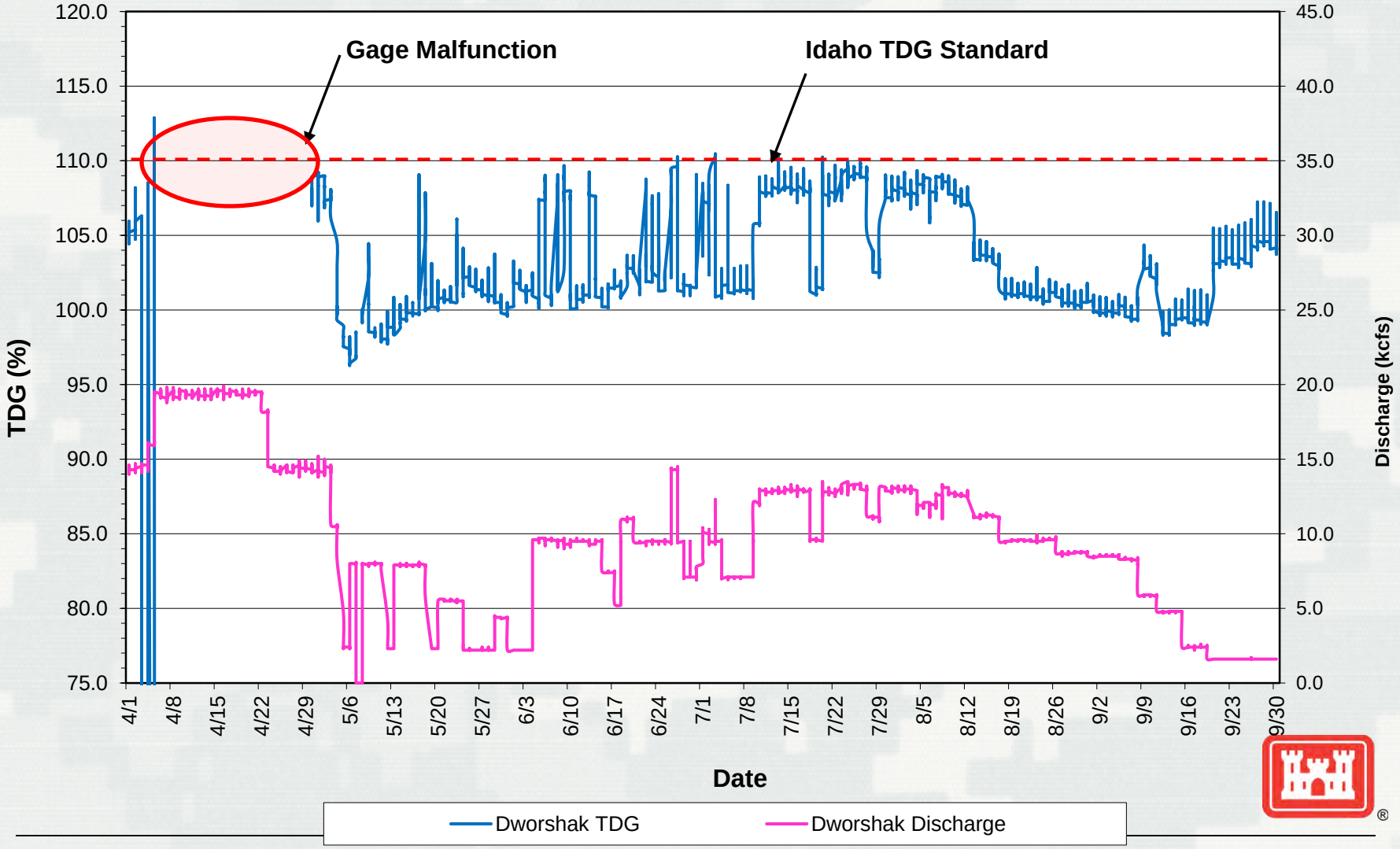
Final Refill & Temperature Augmentation



Temperature Operations



Total Dissolved Gas Operations



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Questions?

RECLAMATION

Managing Water in the West

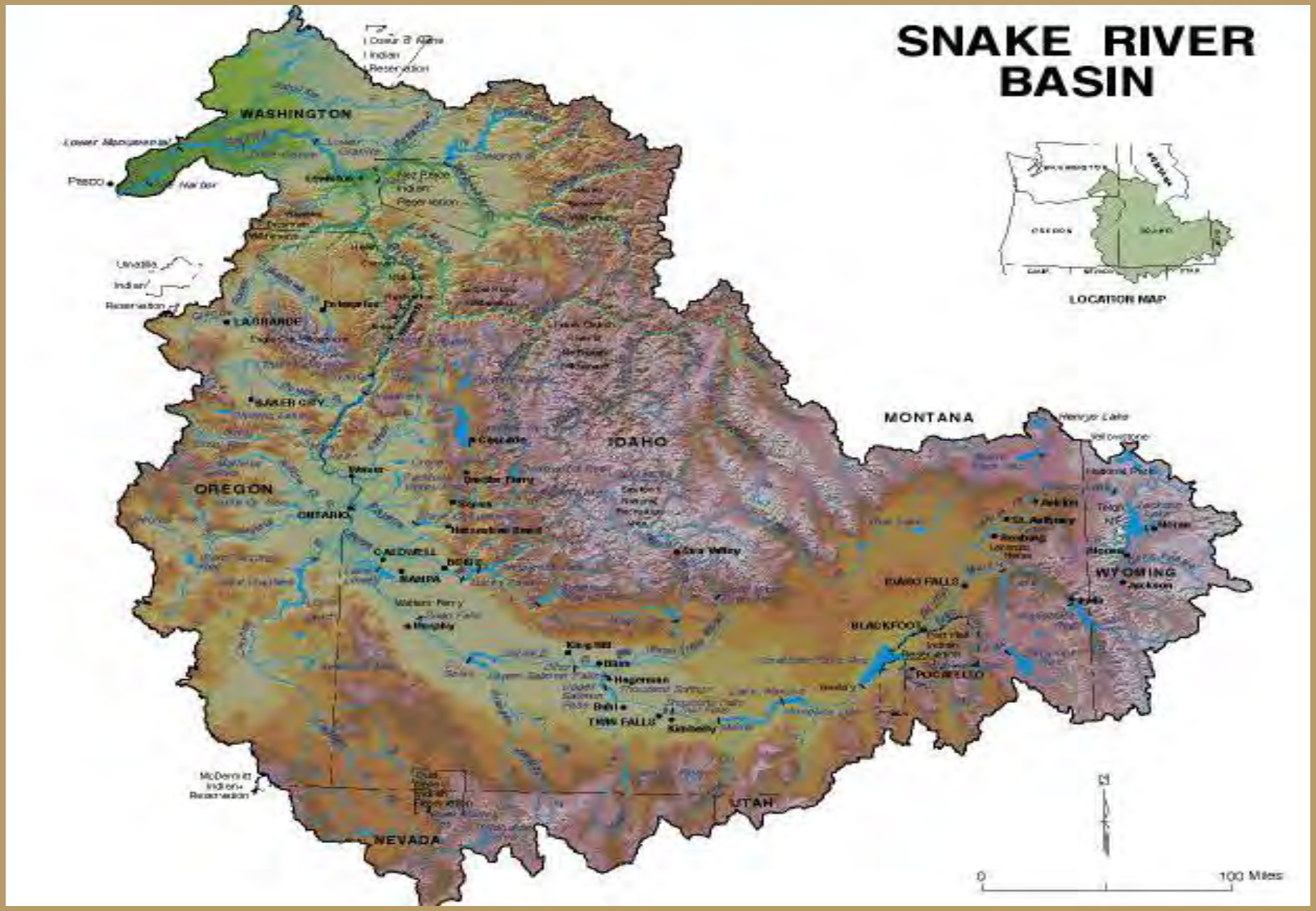
Upper Snake Flow Augmentation 2012

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



RECLAMATION

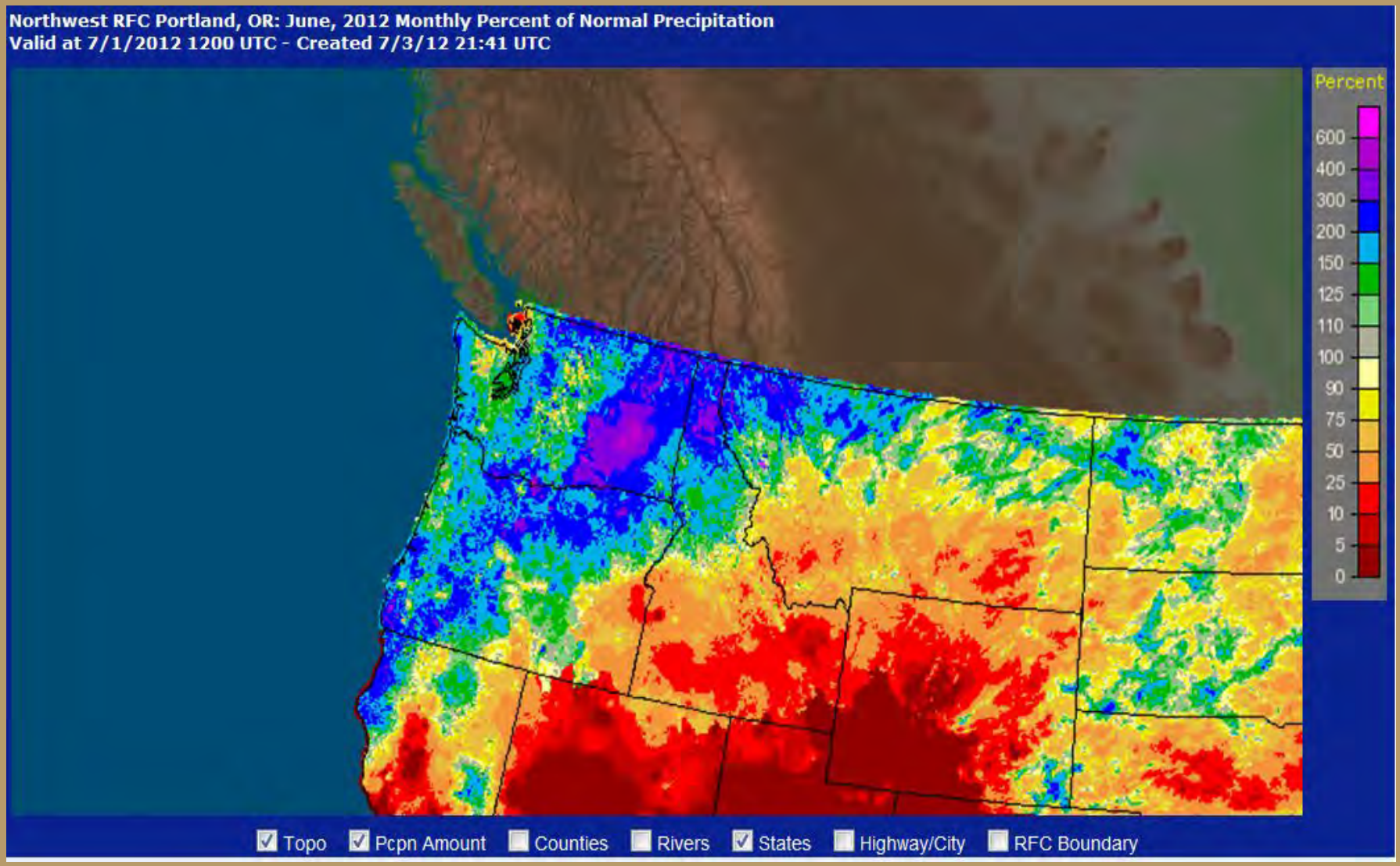
2012 Highlights

- Slightly above average runoff on Payette and Boise (108% and 111%)
- Below average runoff above Milner (82%)
- Near record peak inflows for April
- Muted runoff pattern above Milner, system did not refill completely

System and Source		
Upper Snake		
WD01 rentals	170000	
Reclamation Space	20179	Released Jun. 8 – Jul. 8
Natural Flows		
Idaho	60000	
Skyline	17649	
Payette		
Reclamation Space	95608	
WD65 rentals	72060	Released Jun. 20 – Aug. 31
Boise		
Lucky Peak	40204	
WD63 rentals	11300	Released Jun. 8 – Jul. 19
Total	487000	

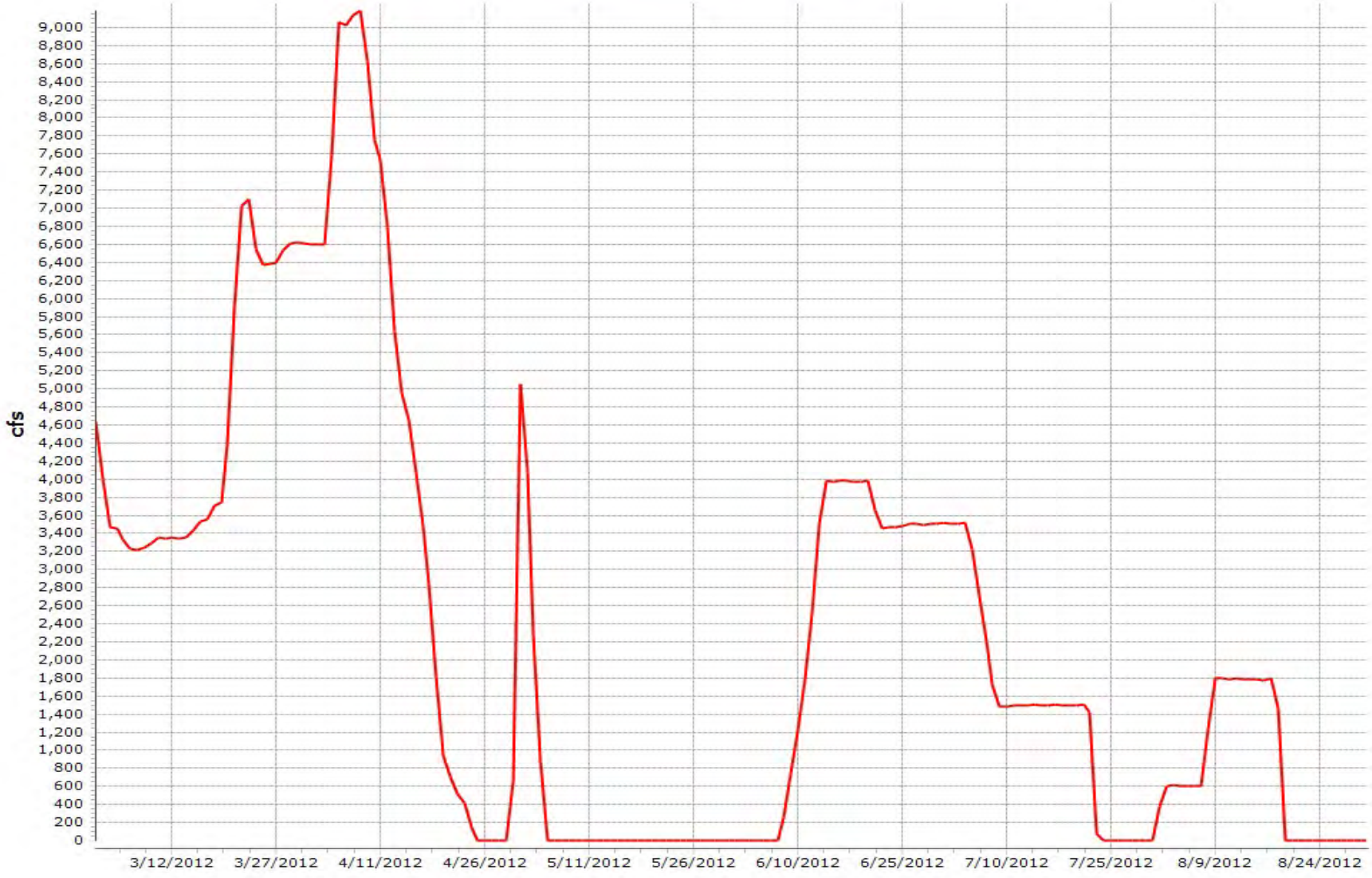
RECLAMATION

June 2012 Precipitation (% of average)



RECLAMATION

2012 Snake River at Milner, Idaho (total flow)



RECLAMATION

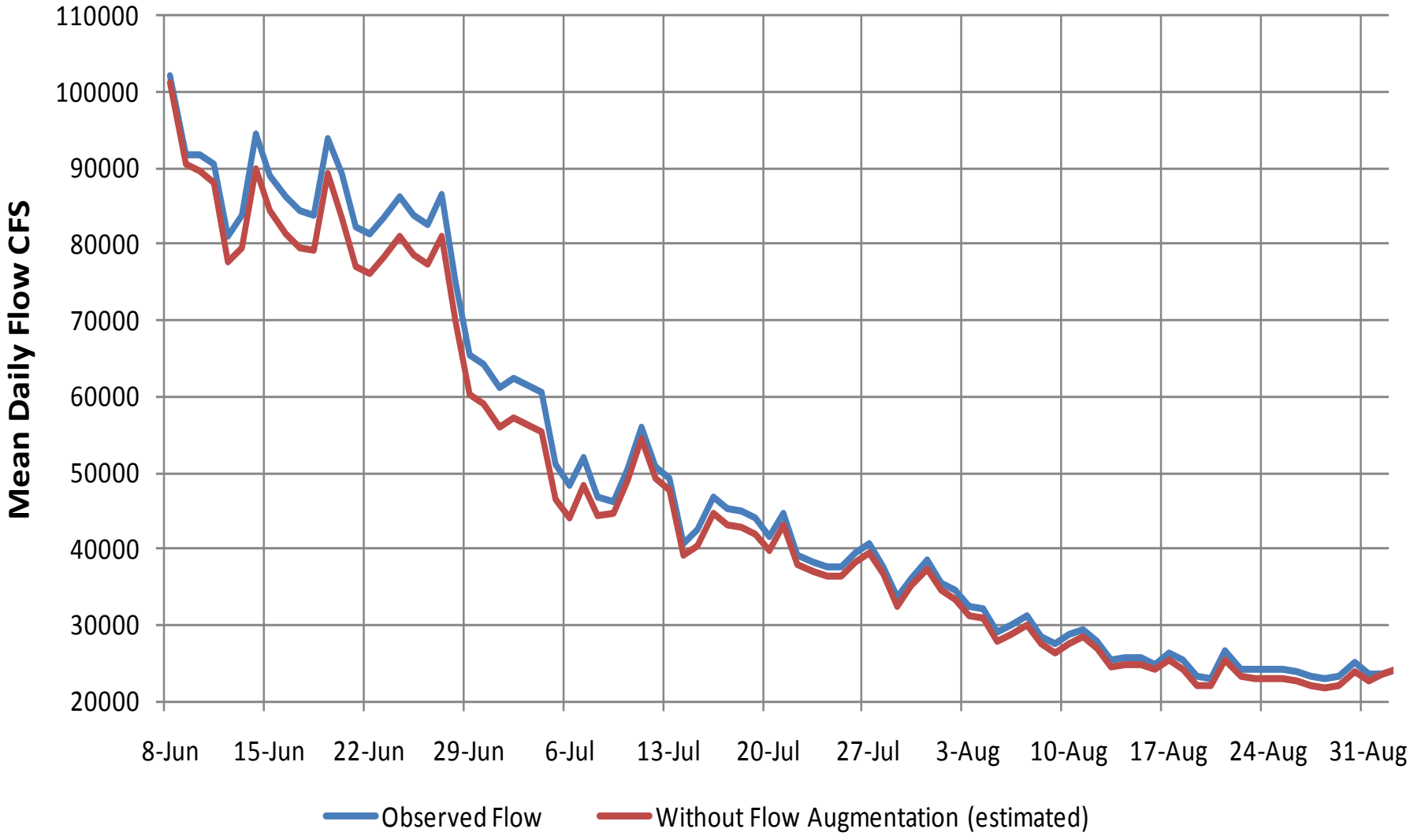
Snake River at Milner, Idaho (total flow)

RECLAMATION

Upper Snake Flow Augmentation 2012

RECLAMATION

Snake River at Lower Granite 2012



RECLAMATION

Smolt Survival and Travel Time and Adult Return Rates for Salmonids in the Snake and Columbia Rivers

Update with 2012 Data

Technical Management Team
Year-End Review
December 5, 2012

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
  - October 12 Memo; Report to BPA in process

- Information from return of PIT-tagged adults – transported from and bypassed at Lower Granite
  - Report to USACE in revision; completion imminent

PIT-tag Data Sources

Hatchery Releases

Chief Joseph

Wells

Grand Coulee

Rocky Reach

Rock Island

Wanapum

Priest Rapids

Ice Harbor

Snake R. trap

Juvenile detectors

Lower Granite

Little Goose

Lower Monumental

McNary

PIT tag trawl

Bonneville

The Dalles

John Day

Hatchery & Trap Releases

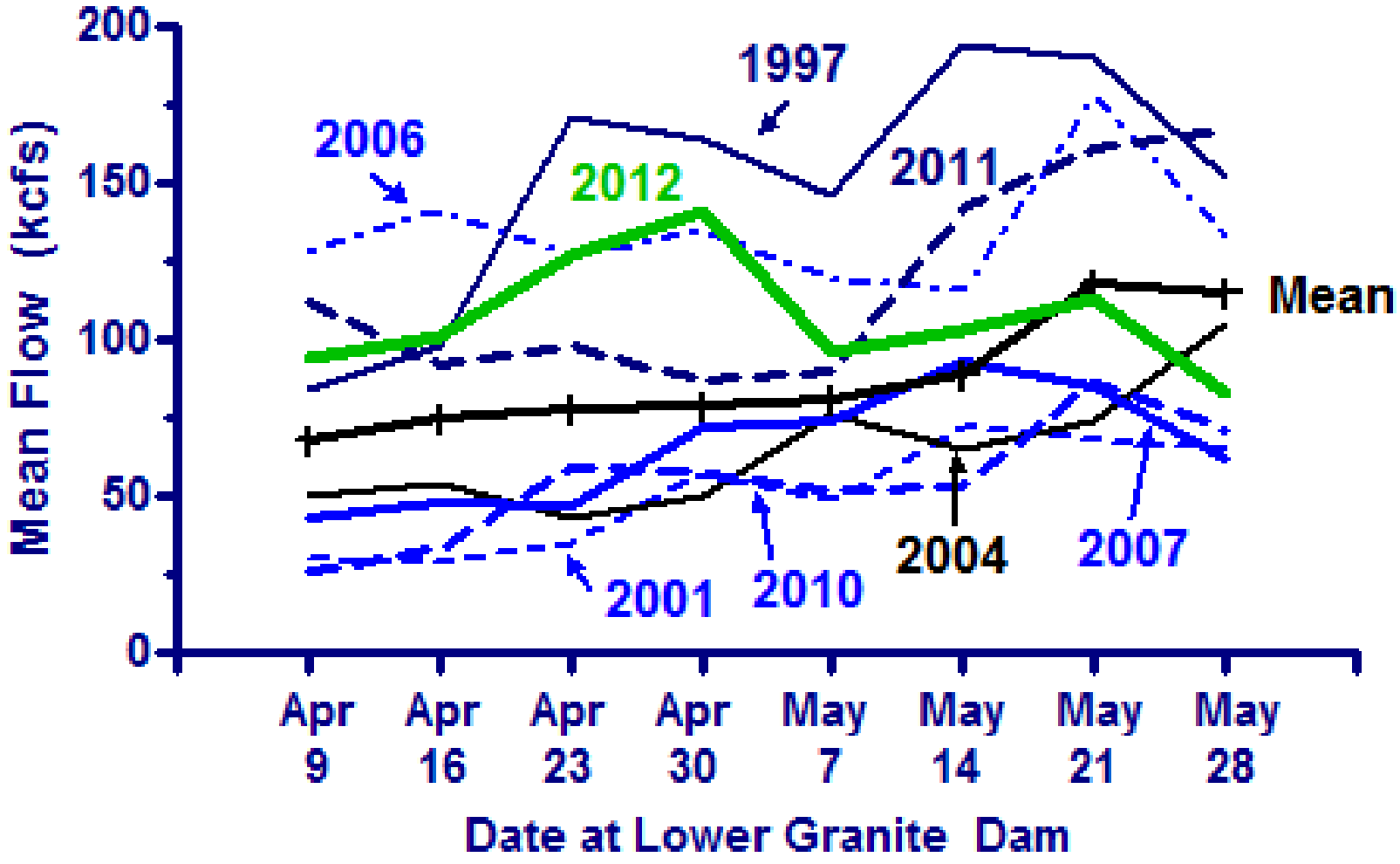
Hells Canyon

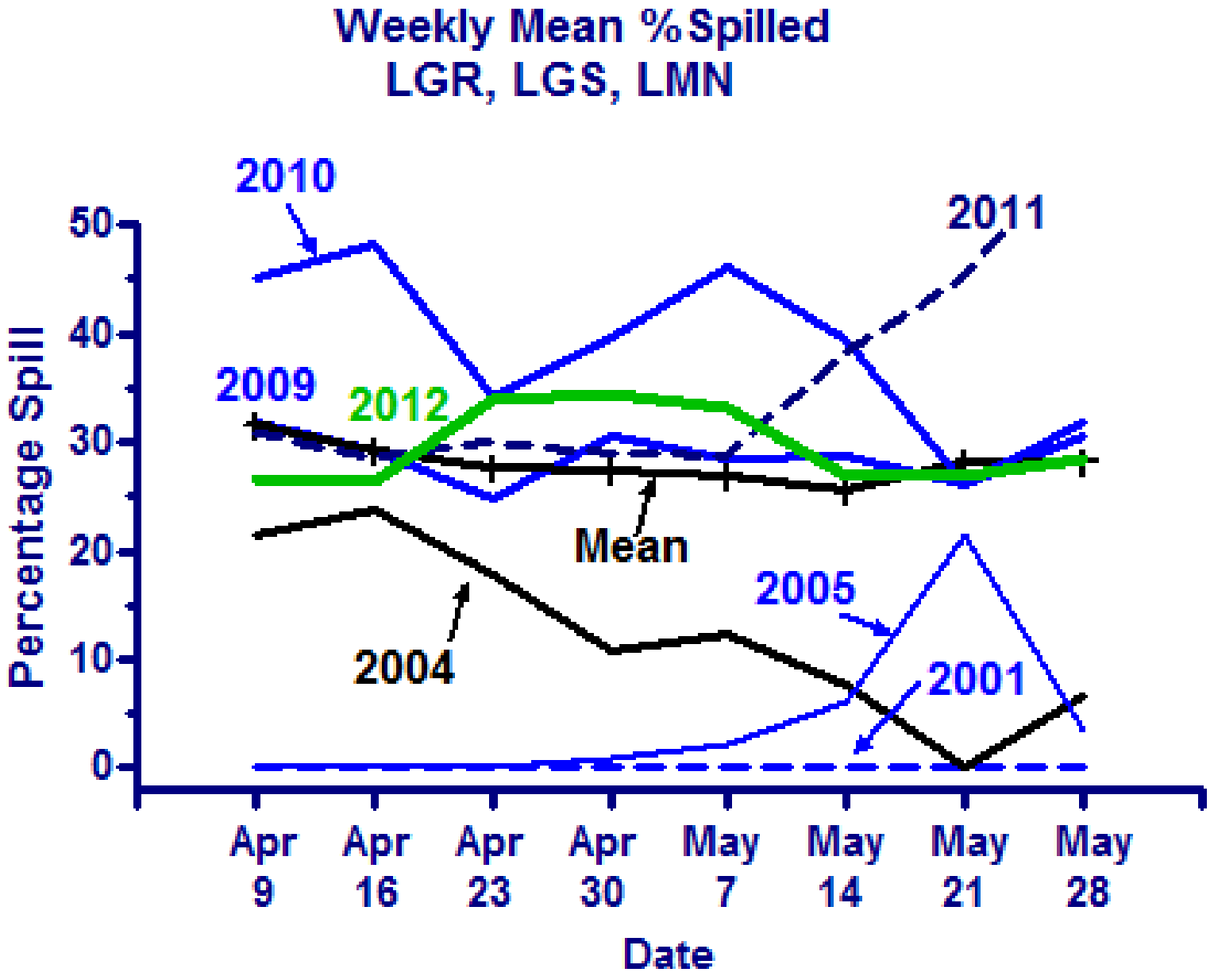
Oxbow

Brownlee

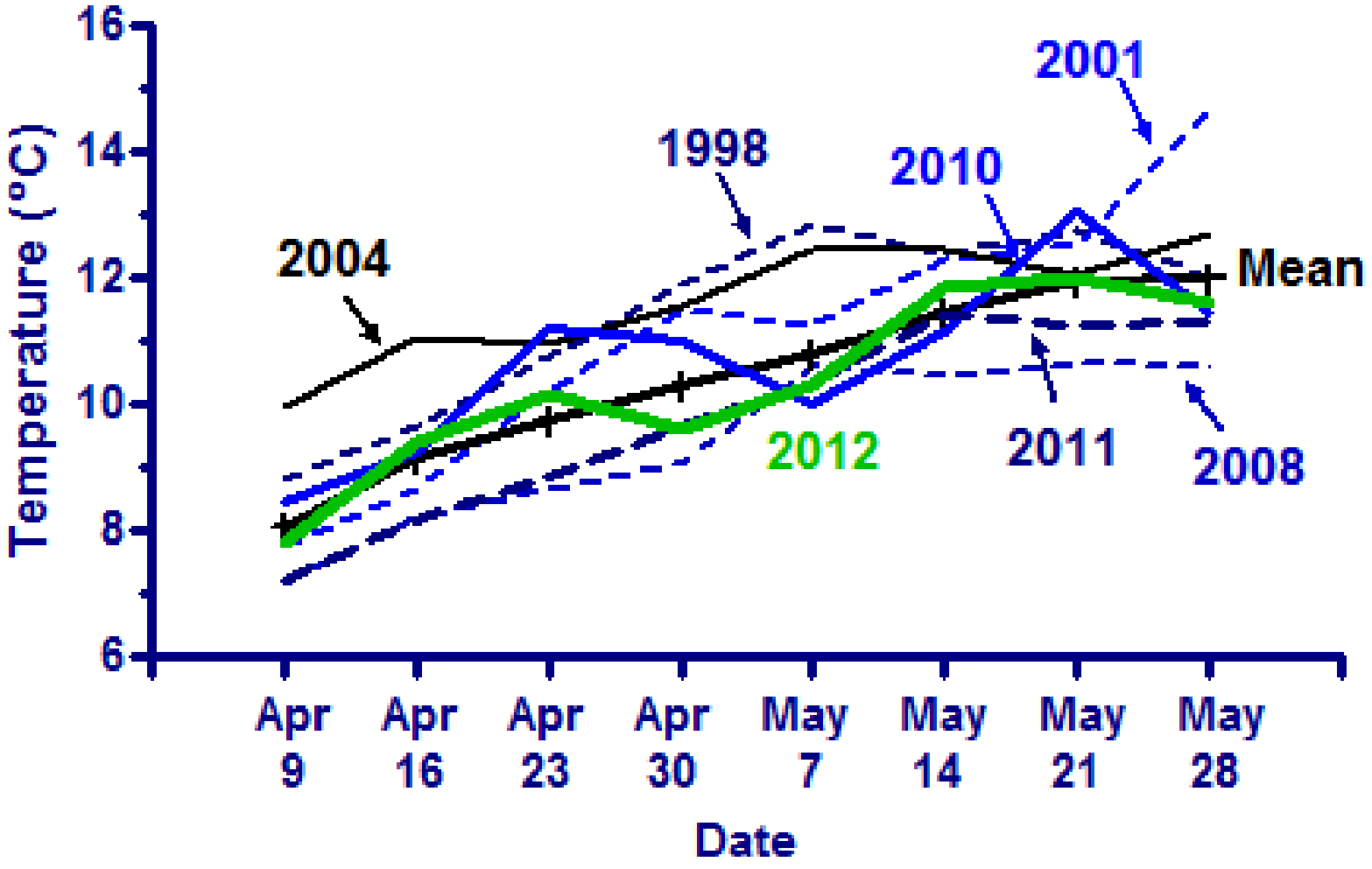
N

Weekly Mean Flow (kcfs)
Lower Granite Dam

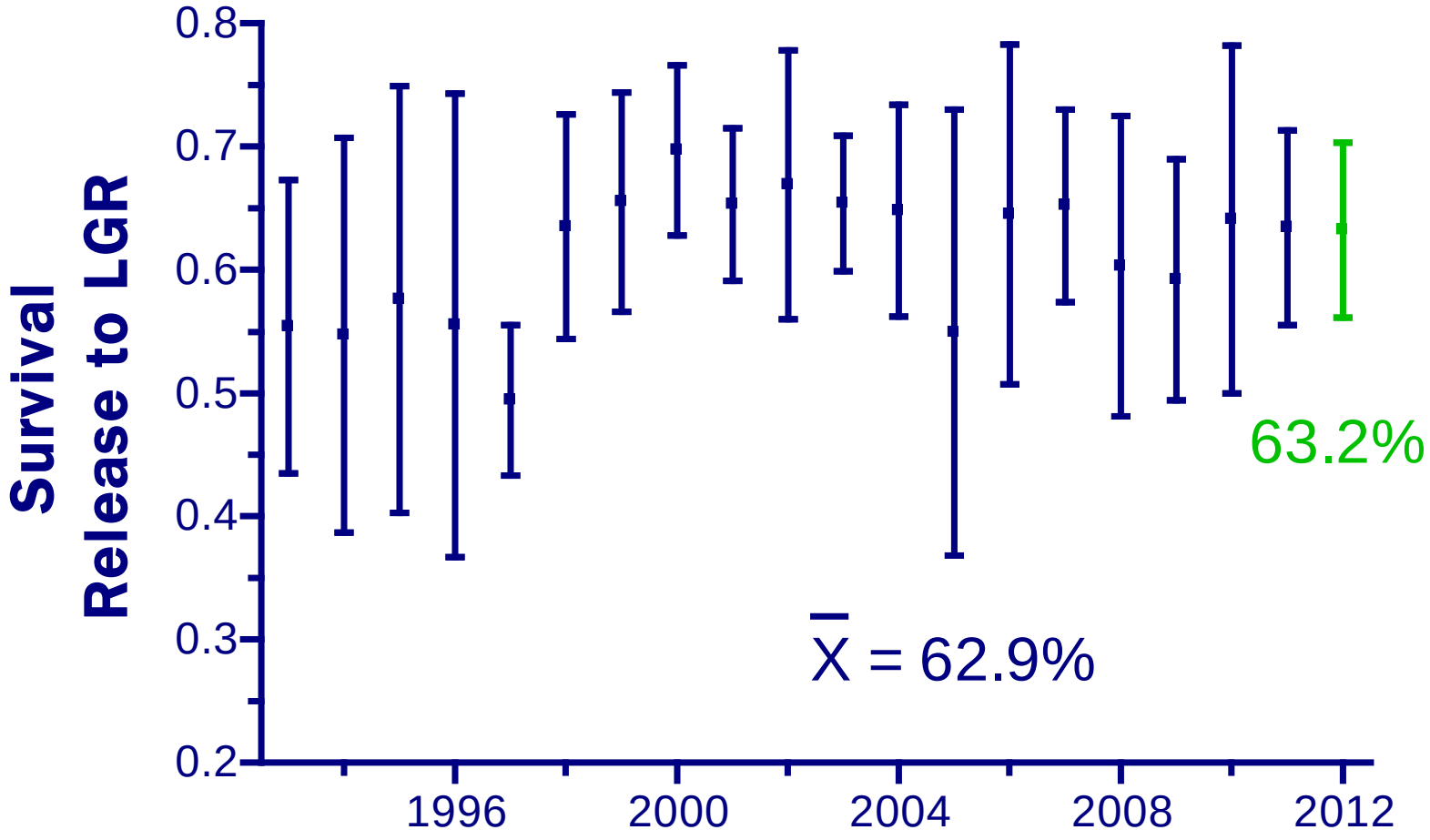



Weekly Mean %Spilled
LGR, LGS, LMN
2010
2011
2009
2012
Mean
2005
2004
2001
Percentage Spill
50
40
30
20
10
0
Apr 9
Apr 16
Apr 23
Apr 30
May 7
May 14
May 21
May 28
Date

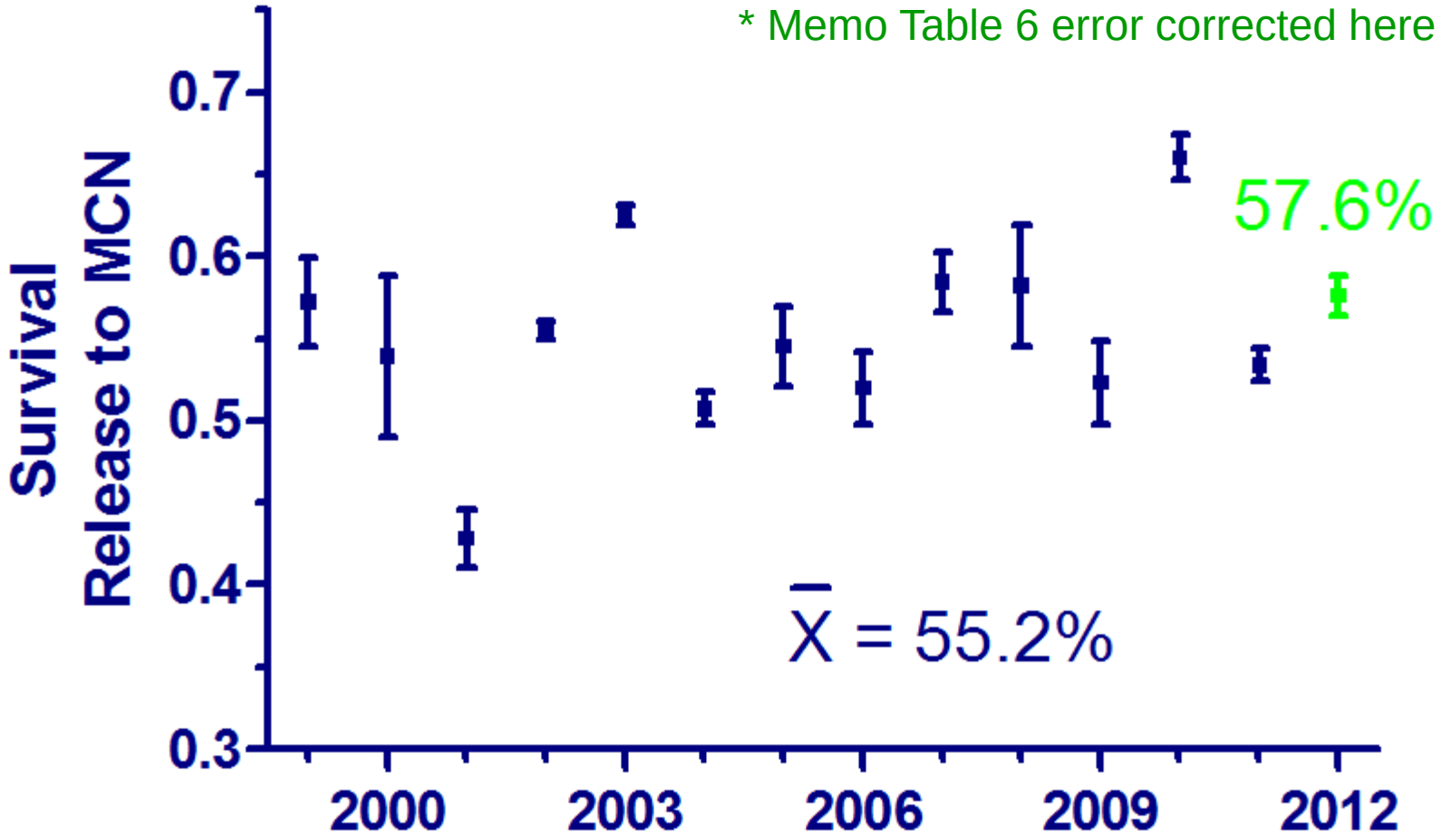
Weekly Mean Temperature
Little Goose Dam



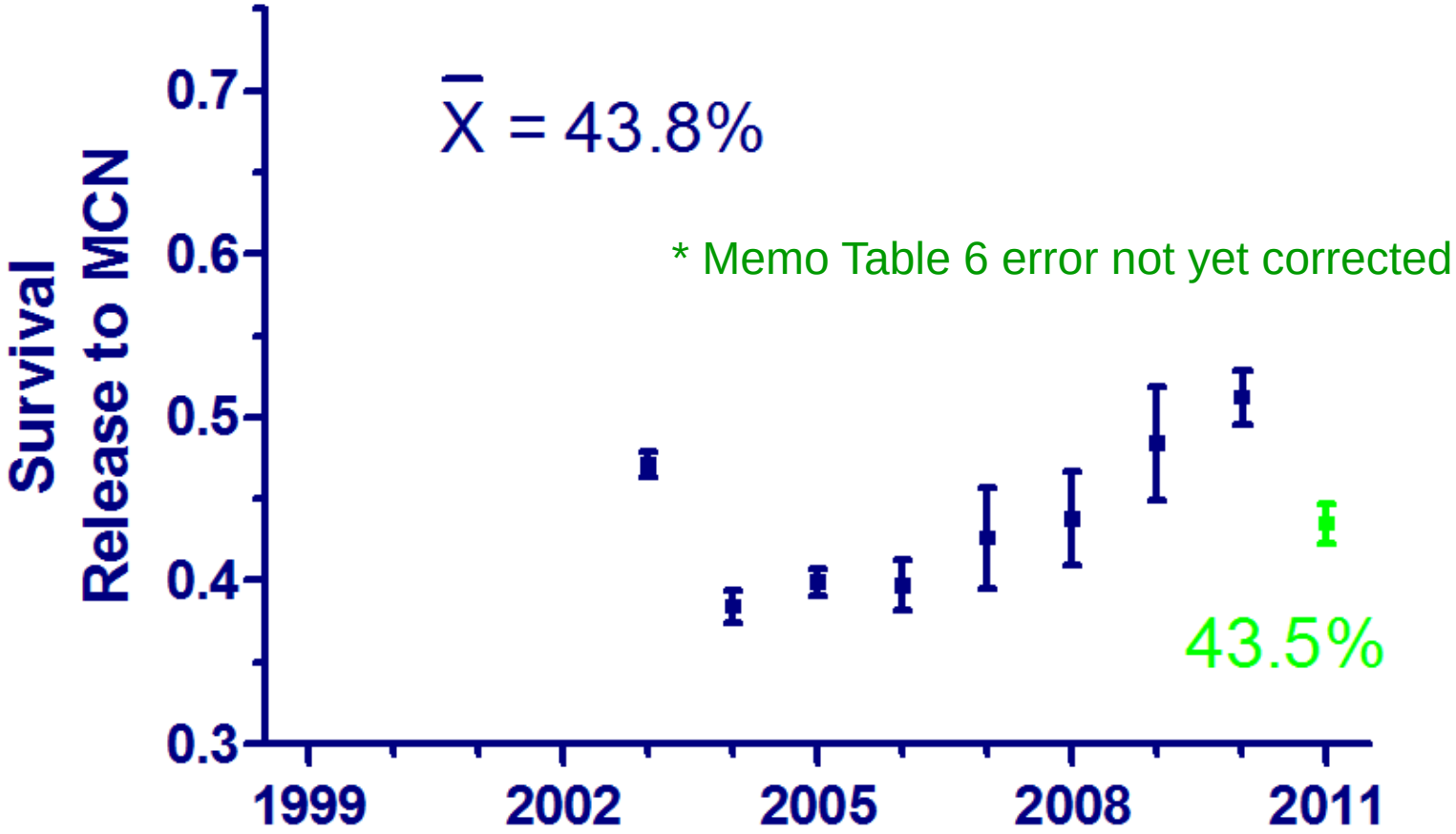
Yearling Chinook
Snake River Basin Hatcheries
Mean of Index Groups



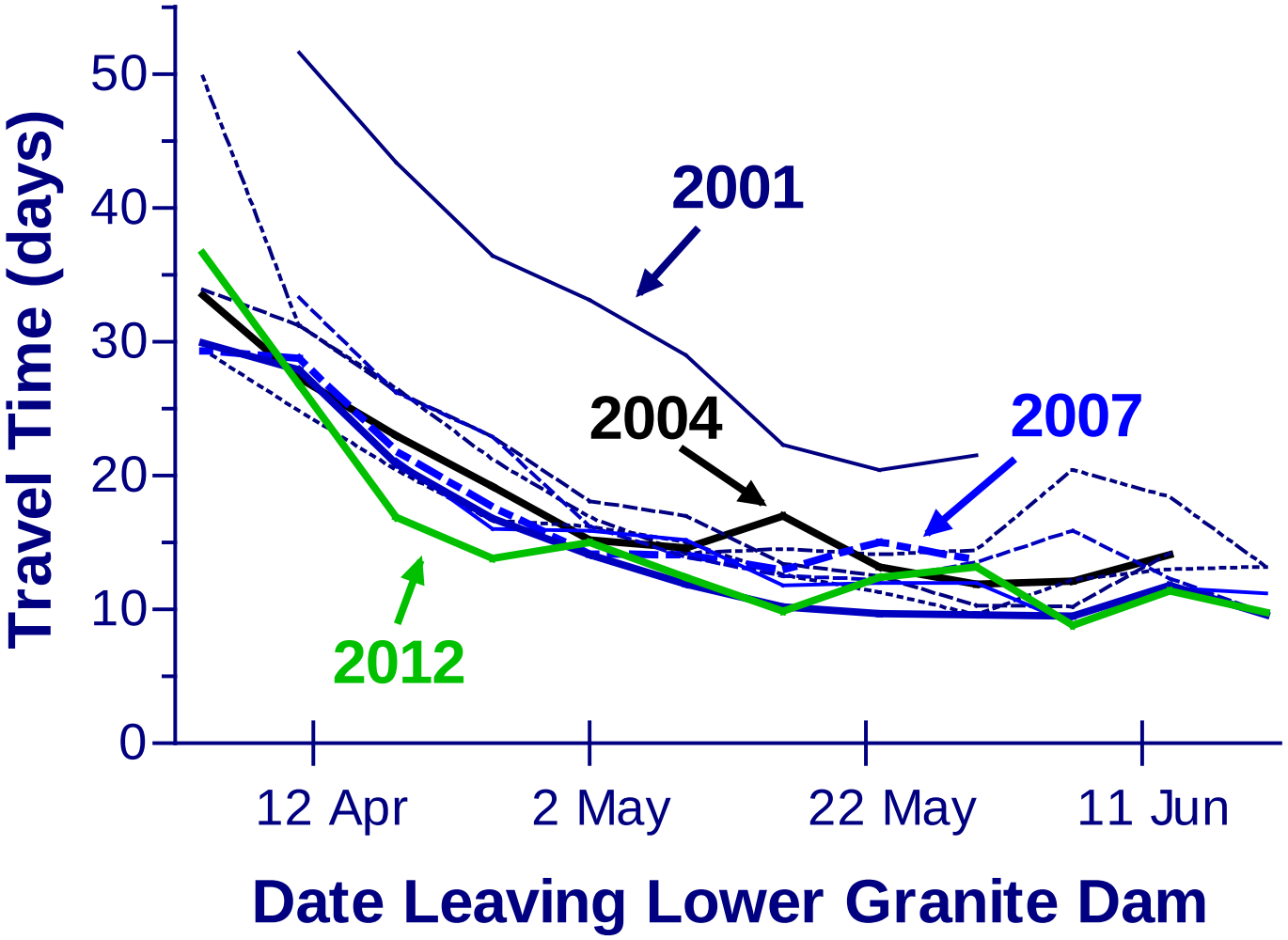
Yearling Chinook
Upper Columbia River Hatcheries



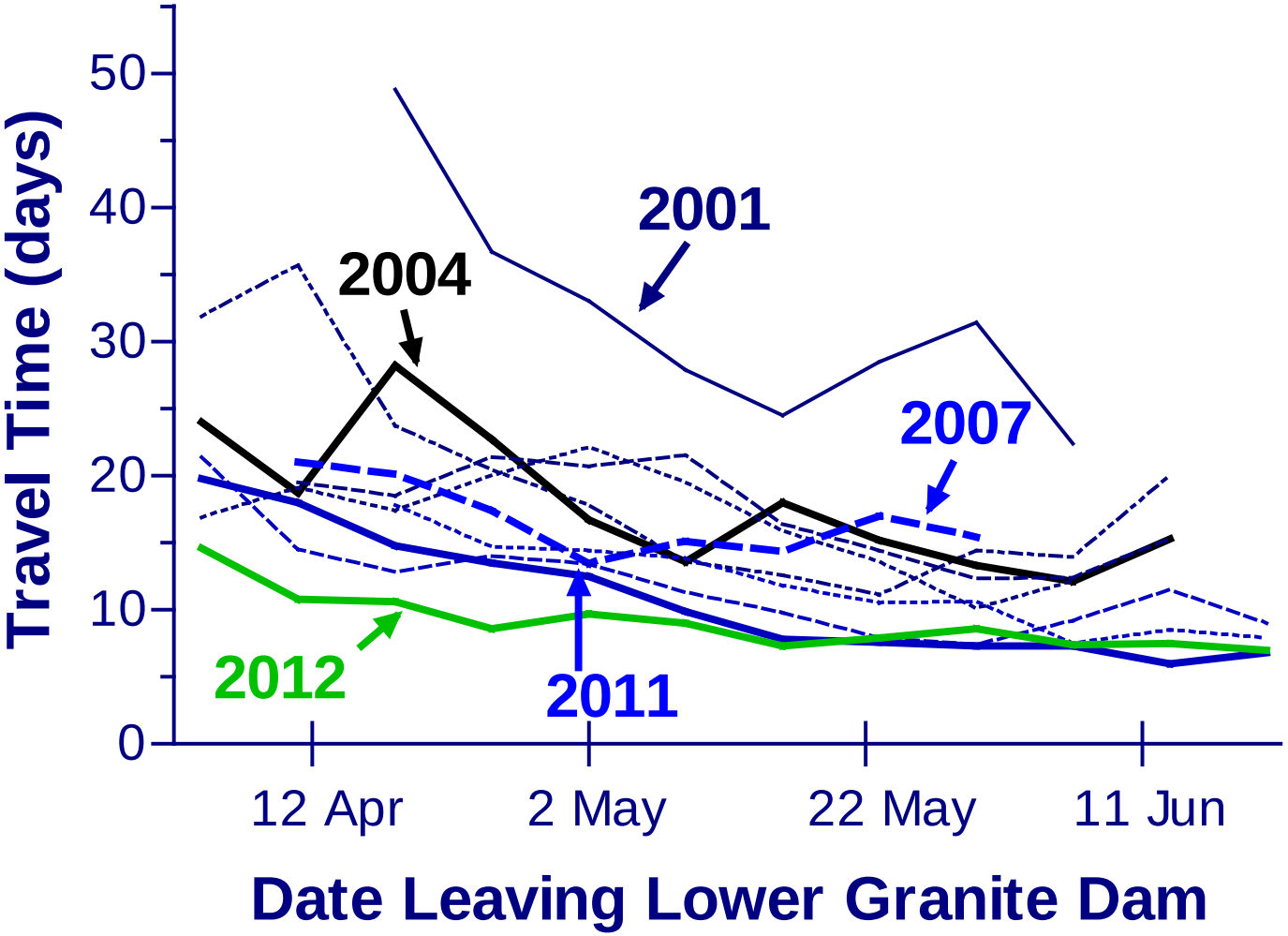
Steelhead
Upper Columbia River Hatcheries

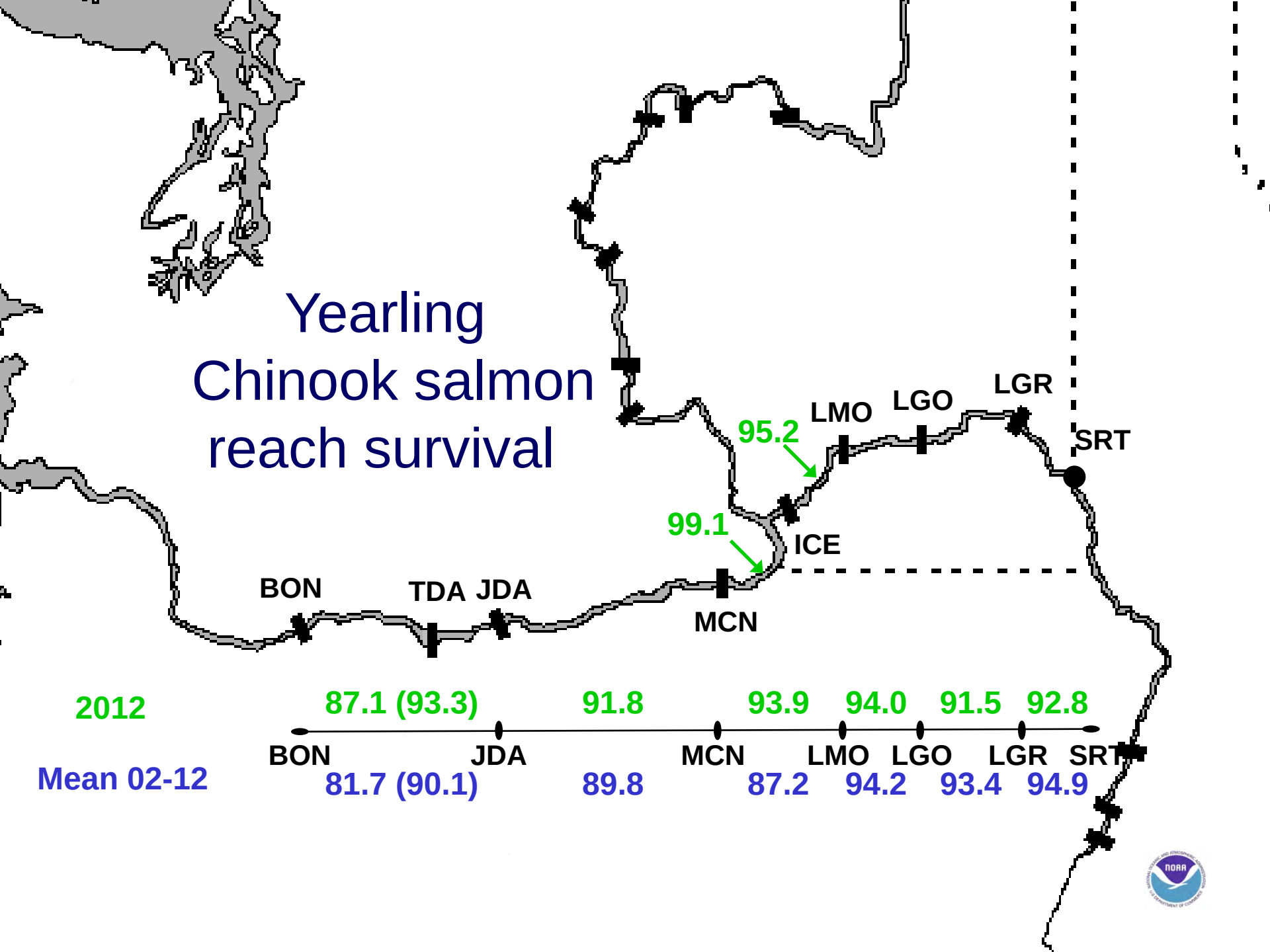


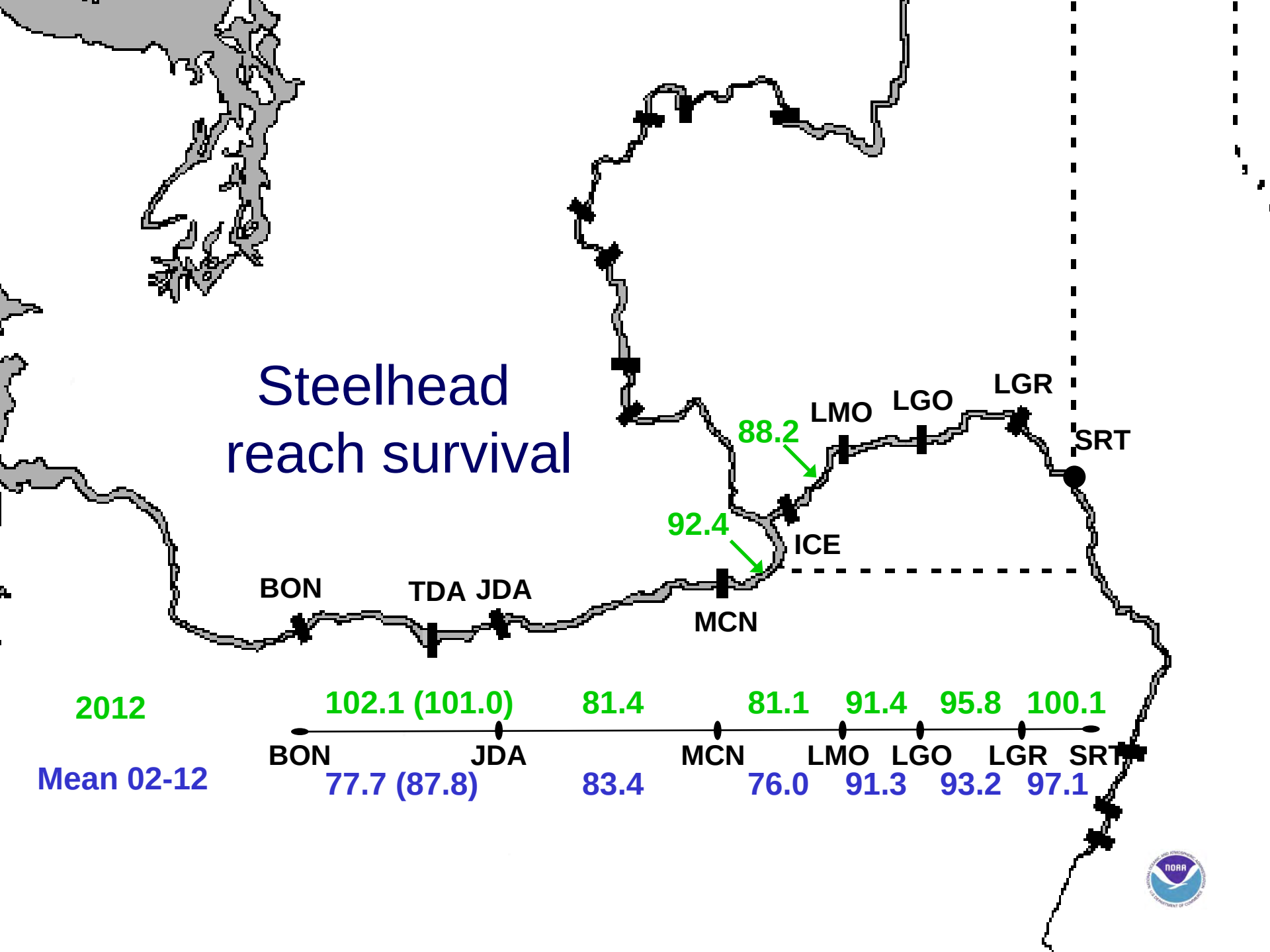
Yearling Chinook Median Travel Time
Lower Granite to Bonneville (461 km)



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

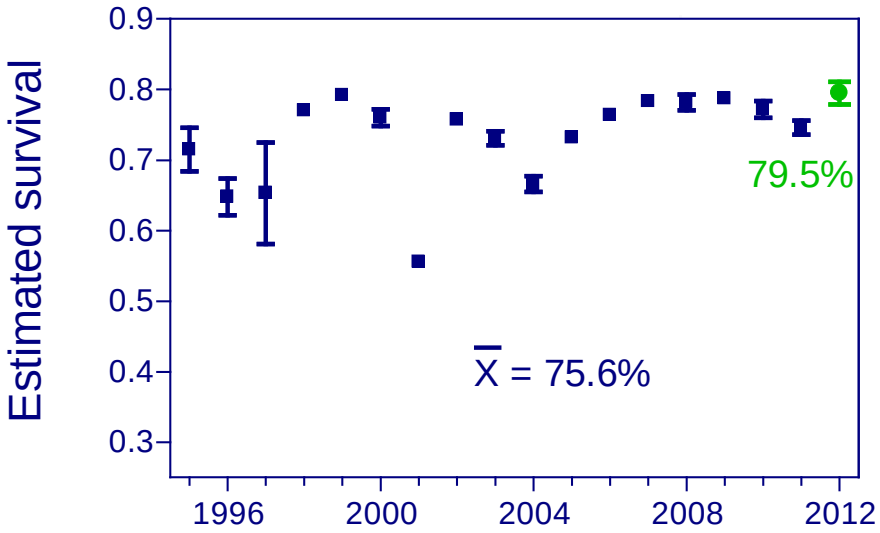



Yearling
Chinook salmon
reach survival
95.2
99.1
LMO
LGO
LGR
SRT
ICE
BON
TDA
JDA
MCN
2012
87.1 (93.3)
91.8
93.9
94.0
91.5
92.8
BON
JDA
MCN
LMO
LGO
LGR
SRT
Mean 02-12
81.7 (90.1)
89.8
87.2
94.2
93.4
94.9

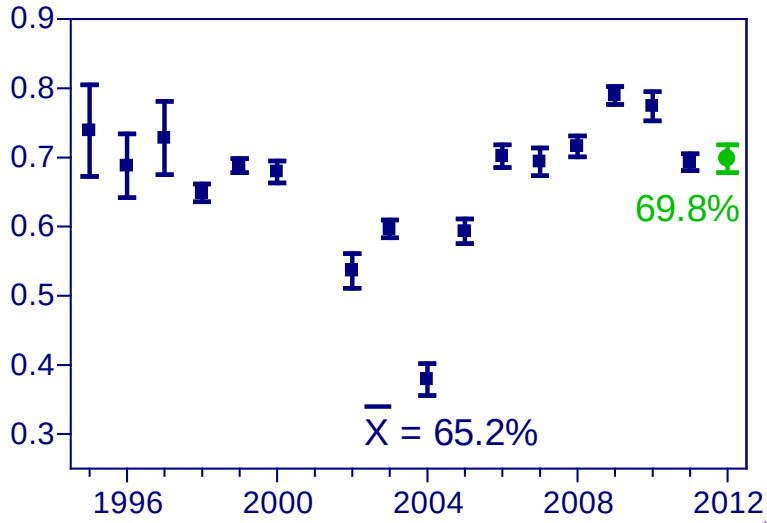

Steelhead
reach survival
BON
TDA
JDA
MCN
ICE
LMO
LGO
LGR
SRT
88.2
92.4
2012
102.1 (101.0)
81.4
81.1
91.4
95.8
100.1
BON
JDA
MCN
LMO
LGO
LGR
SRT
Mean 02-12
77.7 (87.8)
83.4
76.0
91.3
93.2
97.1

Lower Granite to McNary

Yearling Chinook

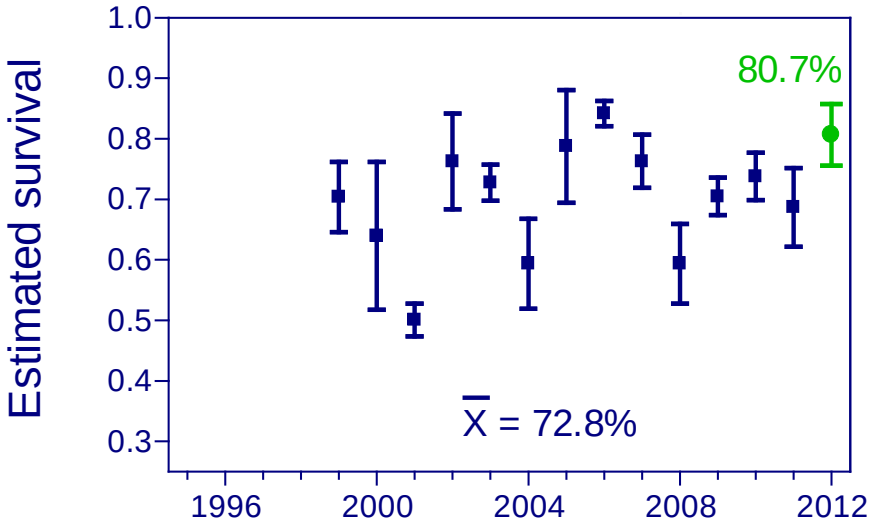


Steelhead

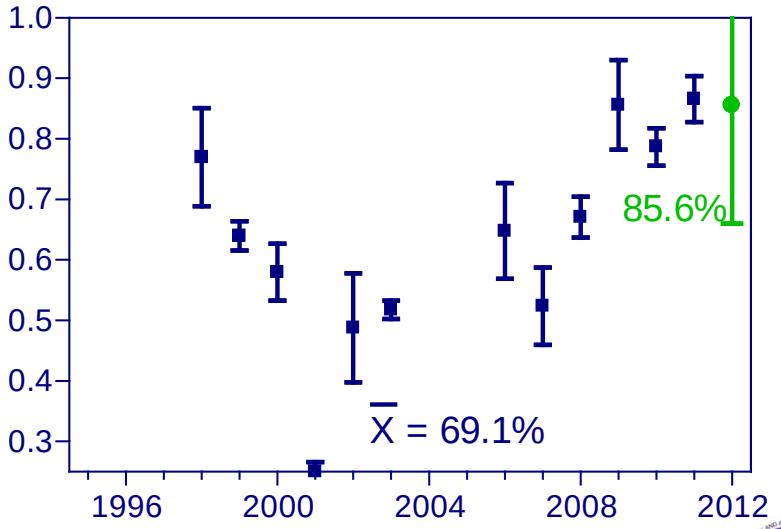


McNary to Bonneville
Fish From Snake River

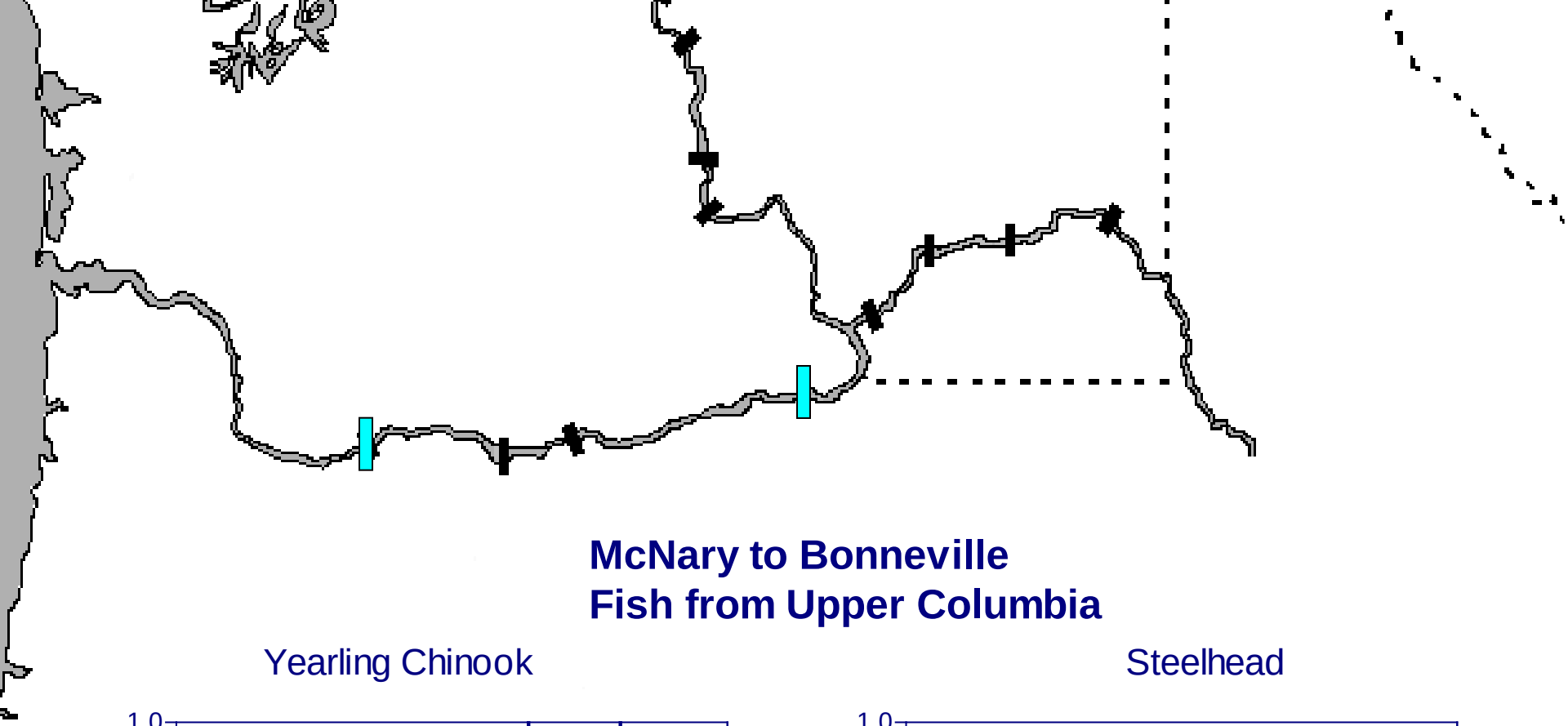
Yearling Chinook



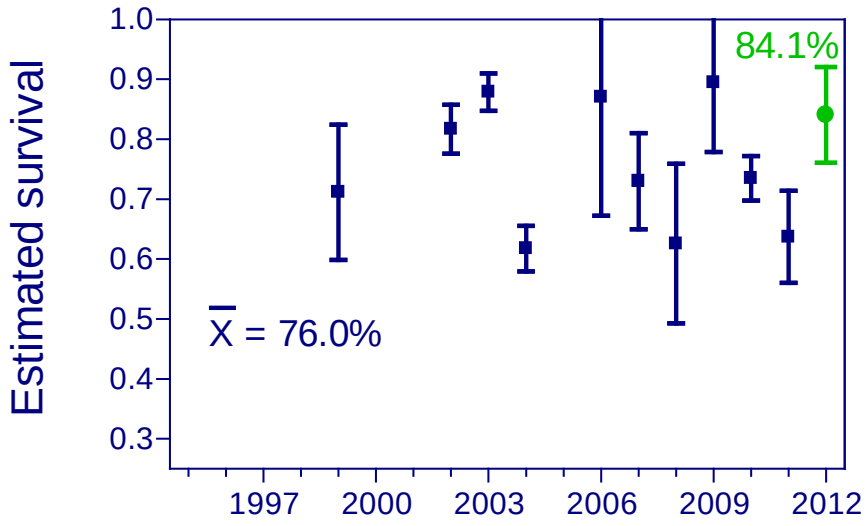
Steelhead



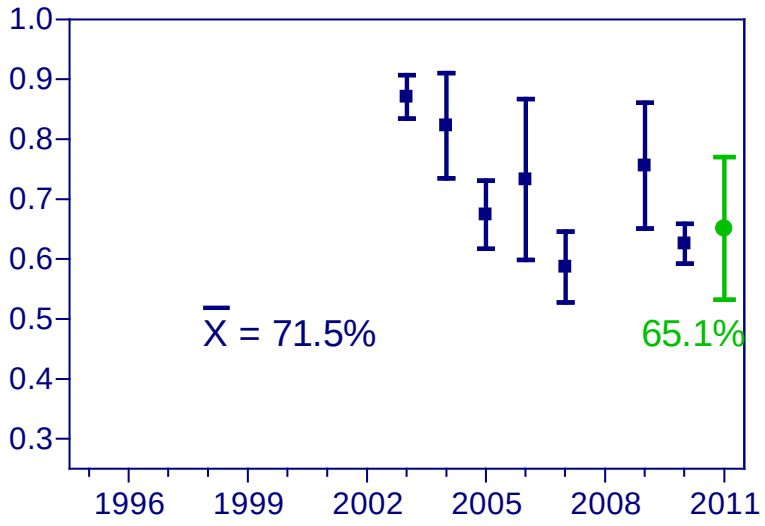
McNary to Bonneville
Fish from Upper Columbia



Yearling Chinook

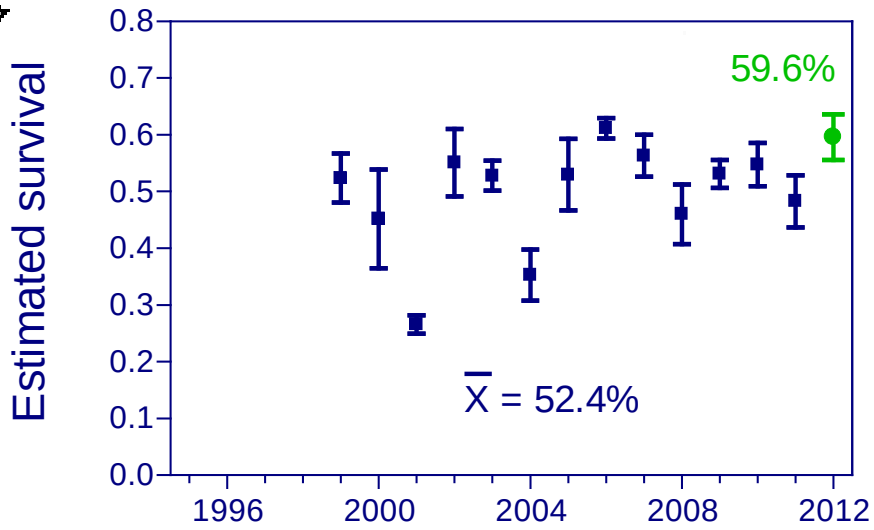


Steelhead

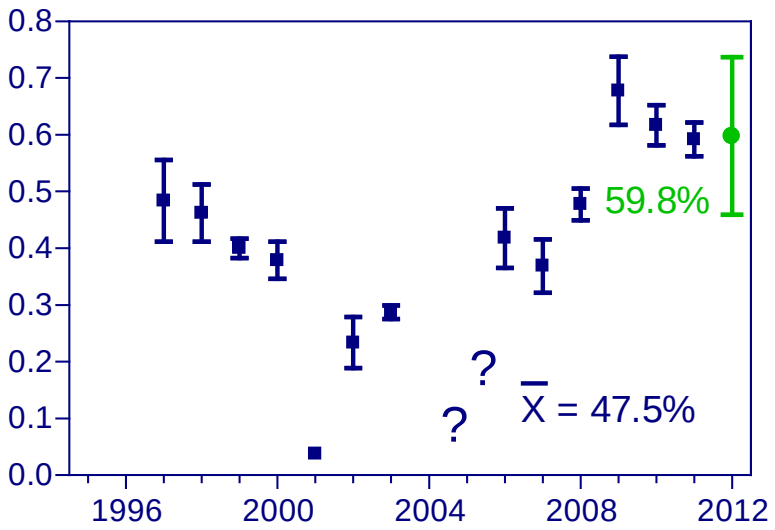


Snake River Trap to Bonneville

Yearling Chinook

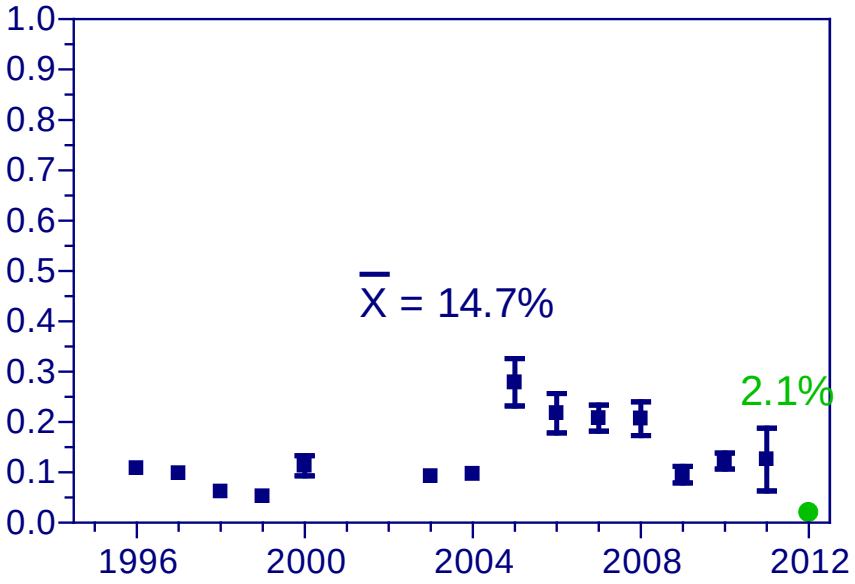


Steelhead

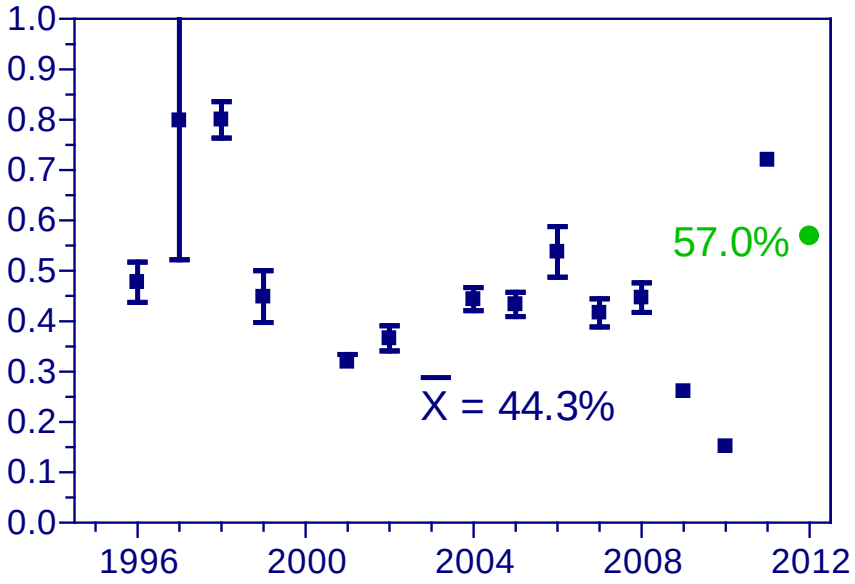


Snake River Sockeye
Redfish Lake to Lower Granite

Released as parr in fall

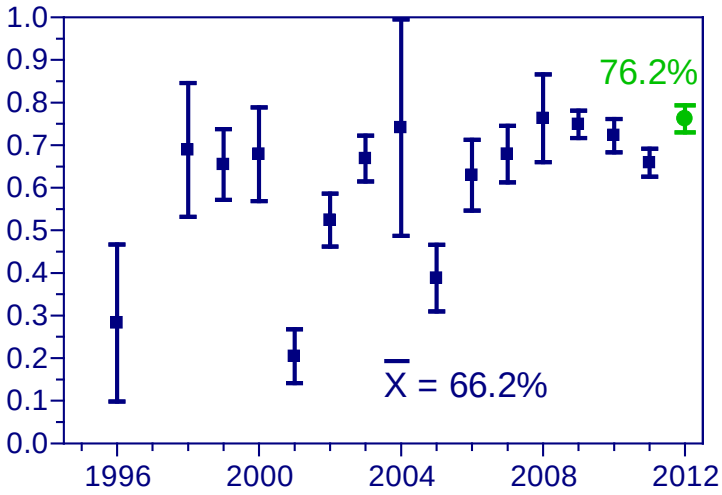


Released as smolts in spring

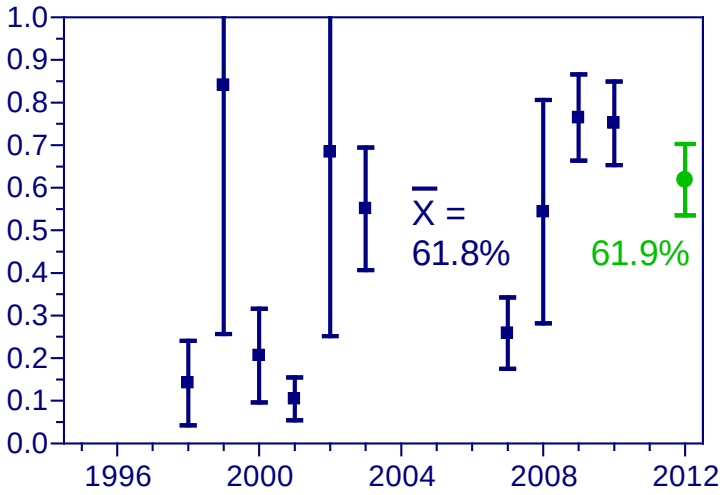


Snake River Sockeye
Smolts Migrating in Spring

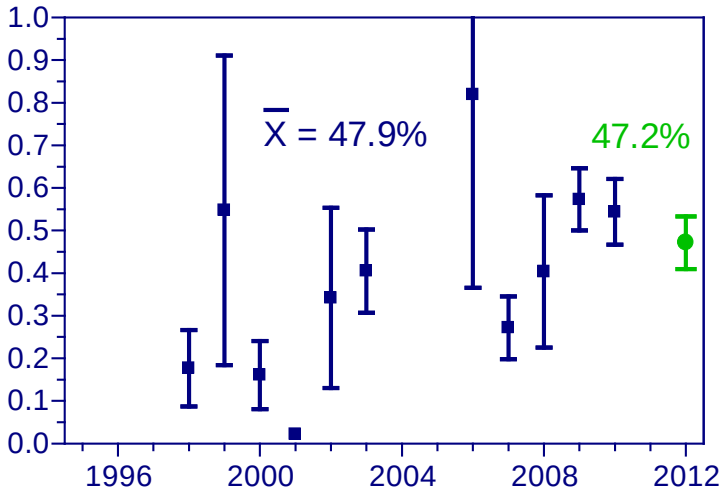
Lower Granite to McNary



McNary to Bonneville



Lower Granite to Bonneville



Conclusions

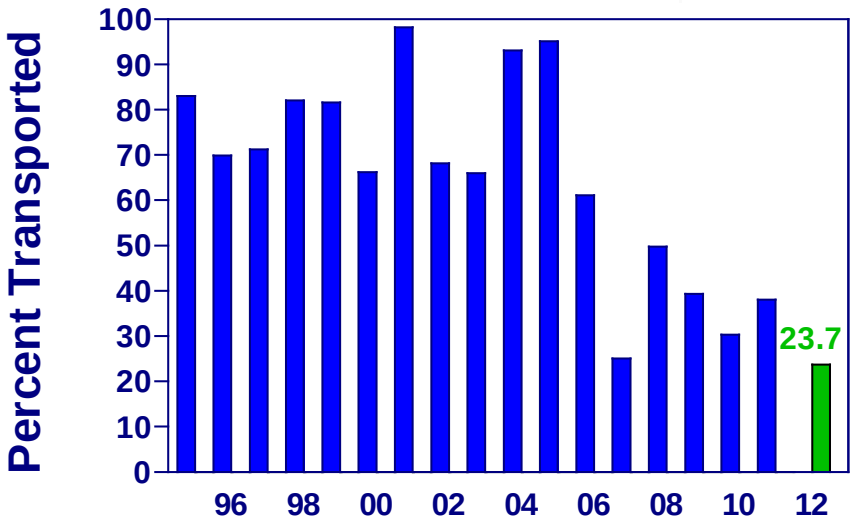
- 2009 through 2012 juvenile steelhead survival estimates are the highest in the time series
- Likely contributing factors include relatively high spill rates and increased migration rate, promoted by additional surface passage structures
- Residualization is reduced when time in river is reduced

Preliminary estimates of transport % for 2012 based on PIT-tag data

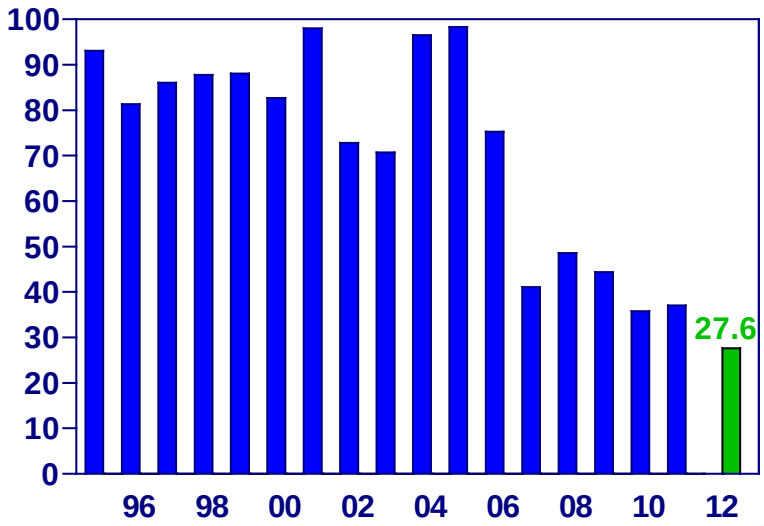
- **23% wild Chinook**
- **25% hatchery Chinook**
- **28% wild steelhead**
- **27% hatchery steelhead**

Percent Transported to Below Bonneville

Yearling Chinook



Steelhead



Preliminary estimates of transport %

- 67% of Chinook and 59% of steelhead passed LGR before transportation began on May 2

- After transportation started: about 58% of smolts that arrived at LGR were transported

Conclusions

- Through direct and indirect effects, recent management actions have:
  - increased number of in-river migrants
  - increased survival of those remaining in-river (esp. steelhead)

  - not necessarily increased smolt-to-adult survival for the population

  - to improve survival to adult for population, in-river increases have to exceed benefit of transport

Estimating SAR with PIT-tags

- Estimates of smolt-to-adult return using PIT-tagged fish may be 10%-35% lower than SAR for unmarked fish
- USFWS study under way at Carson NFH – first adults in 2012
- NOAA developing proposal to study in Alaska hatcheries

Estimating Seasonal SAR

- Need a “time-stamp”
- We use fish detected at LGR – transported vs. bypassed
- Relative SAR = “T:B Ratio”

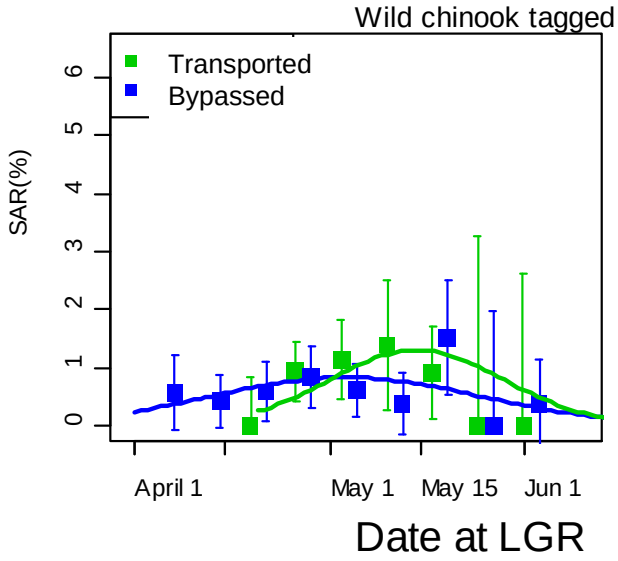
T:B Standards

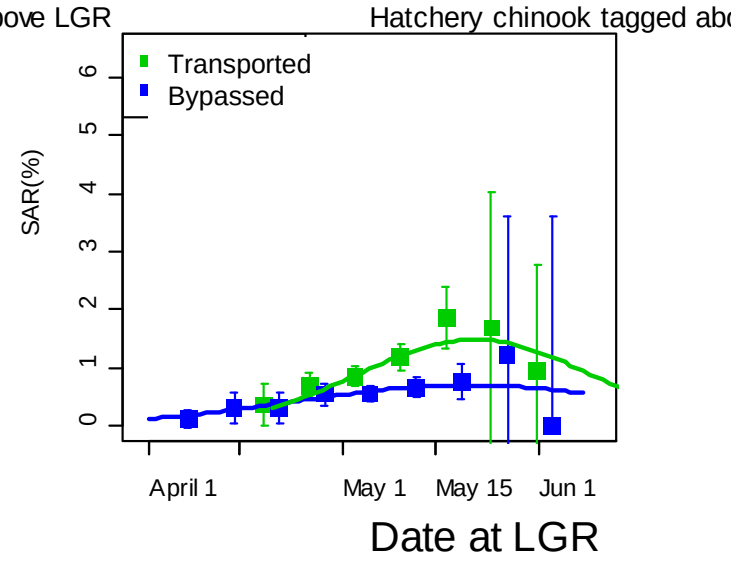
Table 2. Ratios of estimated annual *SAR* of PIT-tagged fish not detected at Lower Granite, Little Goose, or Lower Monumental Dams (includes detected and not-detected fish at McNary Dam) to estimated annual *SAR* of PIT-tagged fish bypassed at Lower Granite Dam with any subsequent downstream detection history.

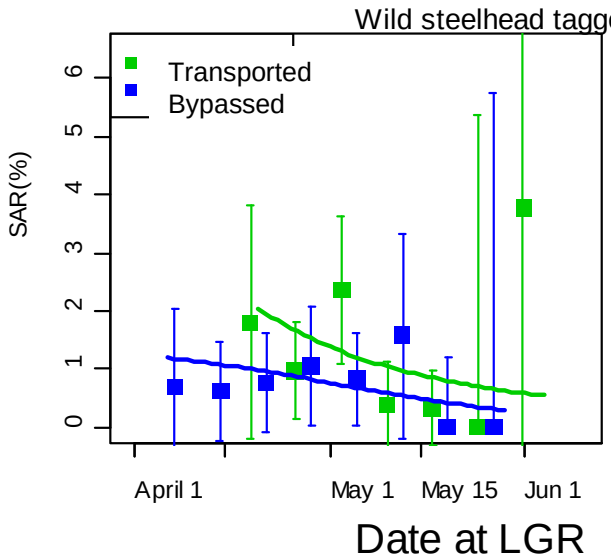
Migration Year	Wild Chinook	Hatchery Chinook	Wild steelhead	Hatchery steelhead
1998	1.25	1.55	3.32	3.49
1999	1.10	1.07	1.40	1.89
2000	0.84	0.96	0.90	0.90
2002	1.40	1.09	0.79	1.10
2003	1.42	1.15	0.83	2.01
2004	2.11	2.14	NA	3.29
2005	0.44	1.67	NA	2.40
2006	1.01	1.18	2.23	1.32
2007	1.02	1.27	0.93	1.57
2008	1.05	0.95	1.54	1.15
2009	0.84	0.97		
Geometric means:				
2006-2009	0.98	1.08		
2006-2008			1.47	1.33
1998-2009 (excl. 2001)	**1.06**	**1.23**		
1998-2008 (excl. 2001)				**1.69**
1998-2008 (excl. 2001,4,5)			**1.31**	

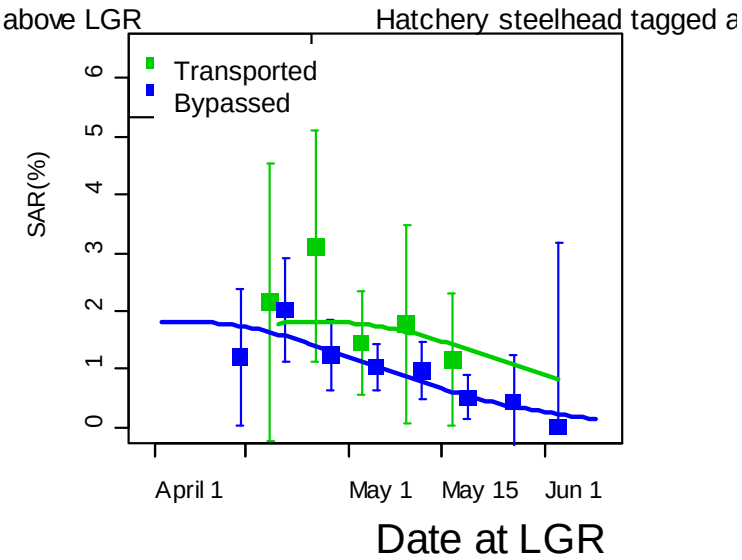
MY 2006

Model-Averaged - Descriptive



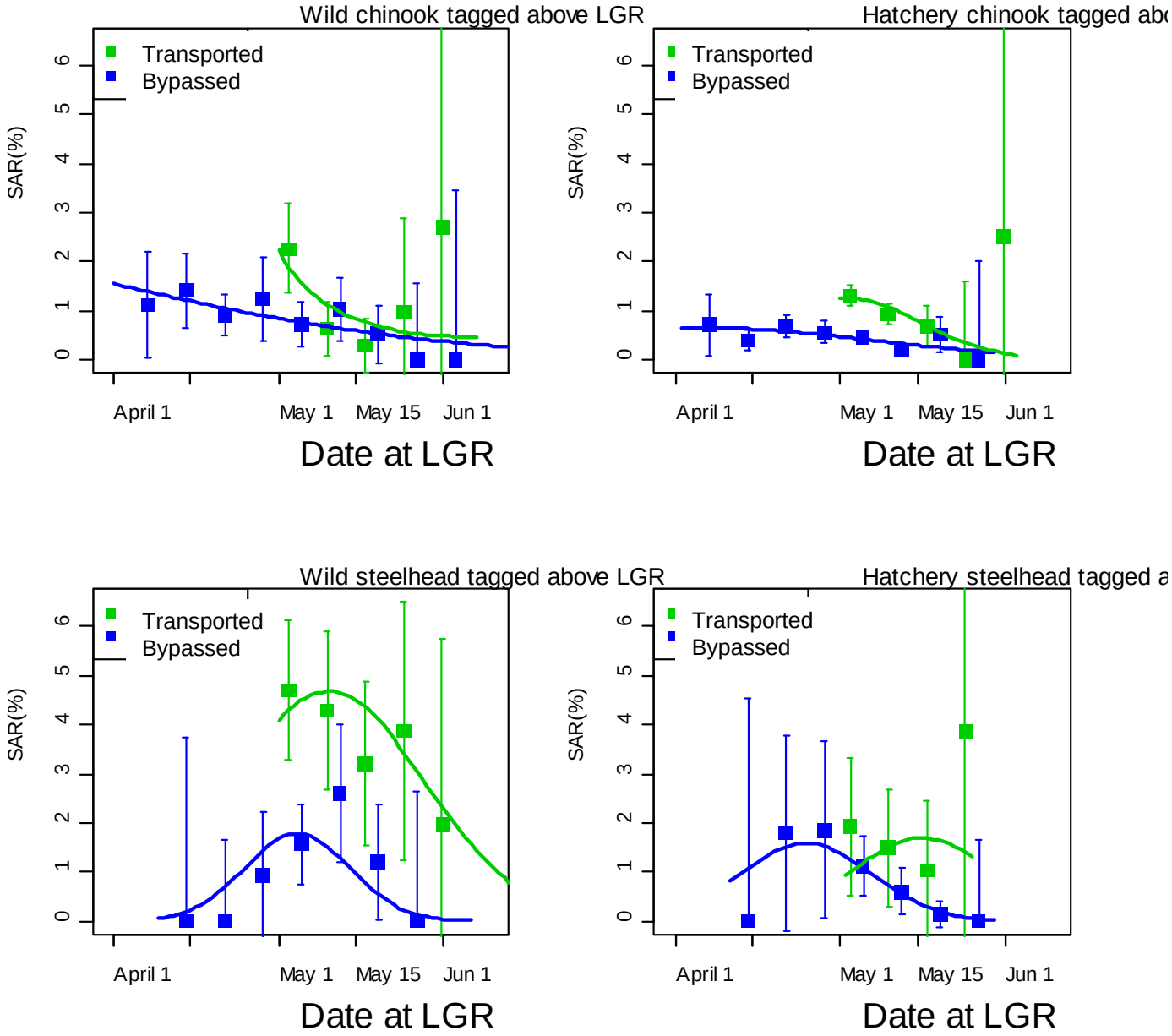






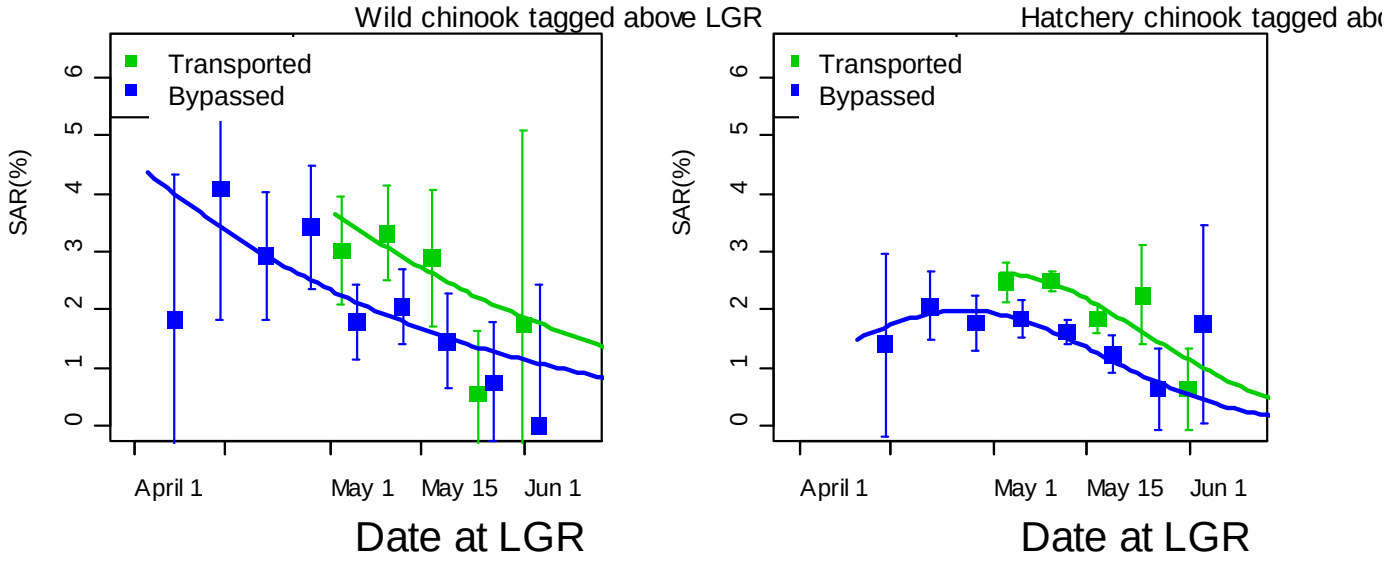
MY 2007

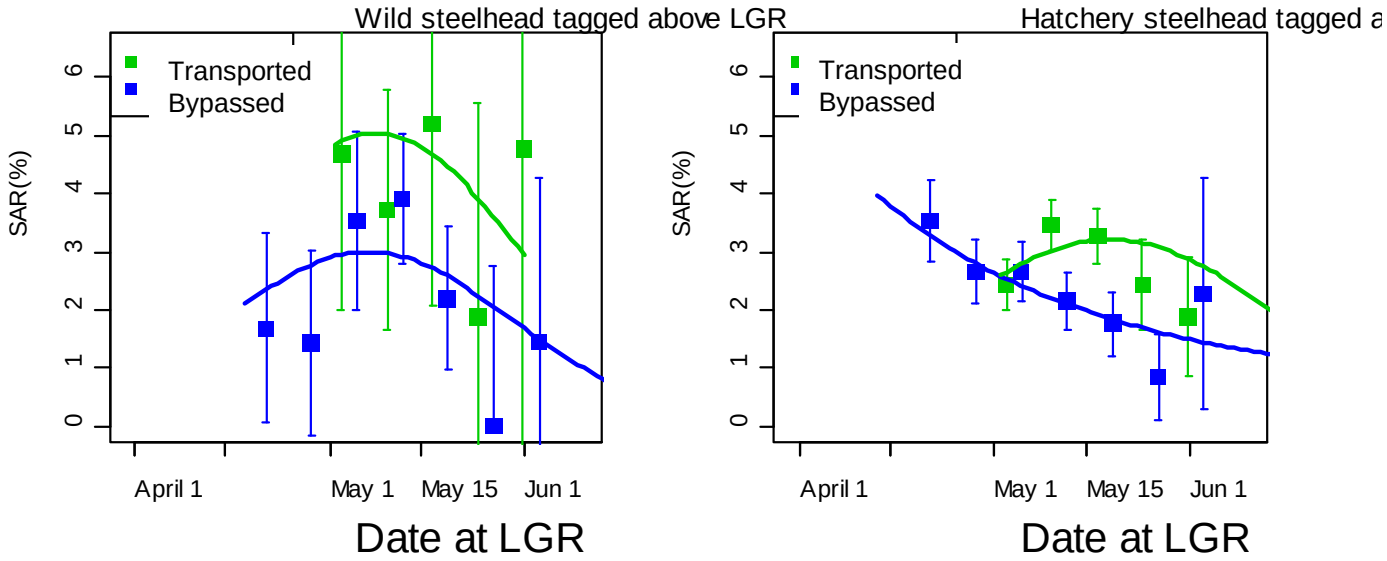
Model-Averaged - Descriptive



MY 2008

Model-Averaged - Descriptive





Wild Steelhead 2006

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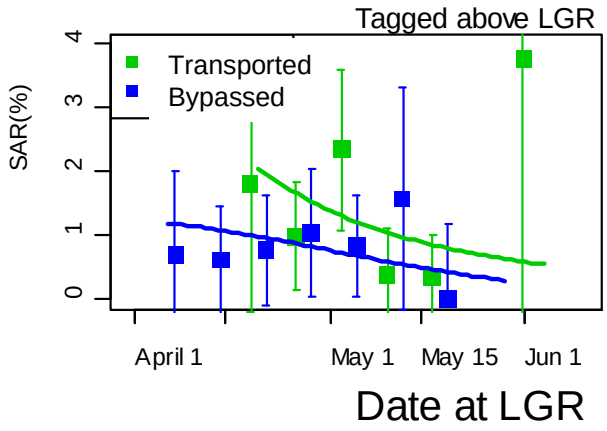

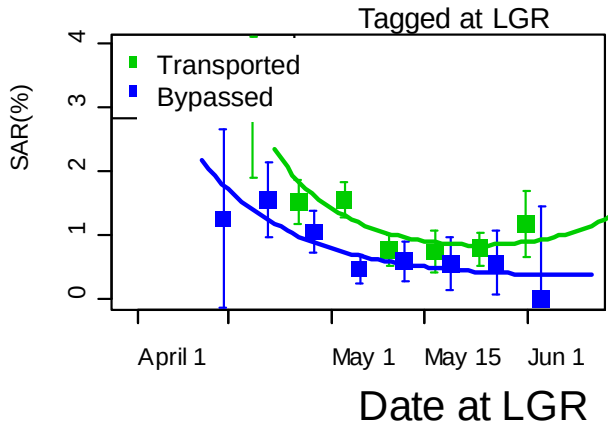

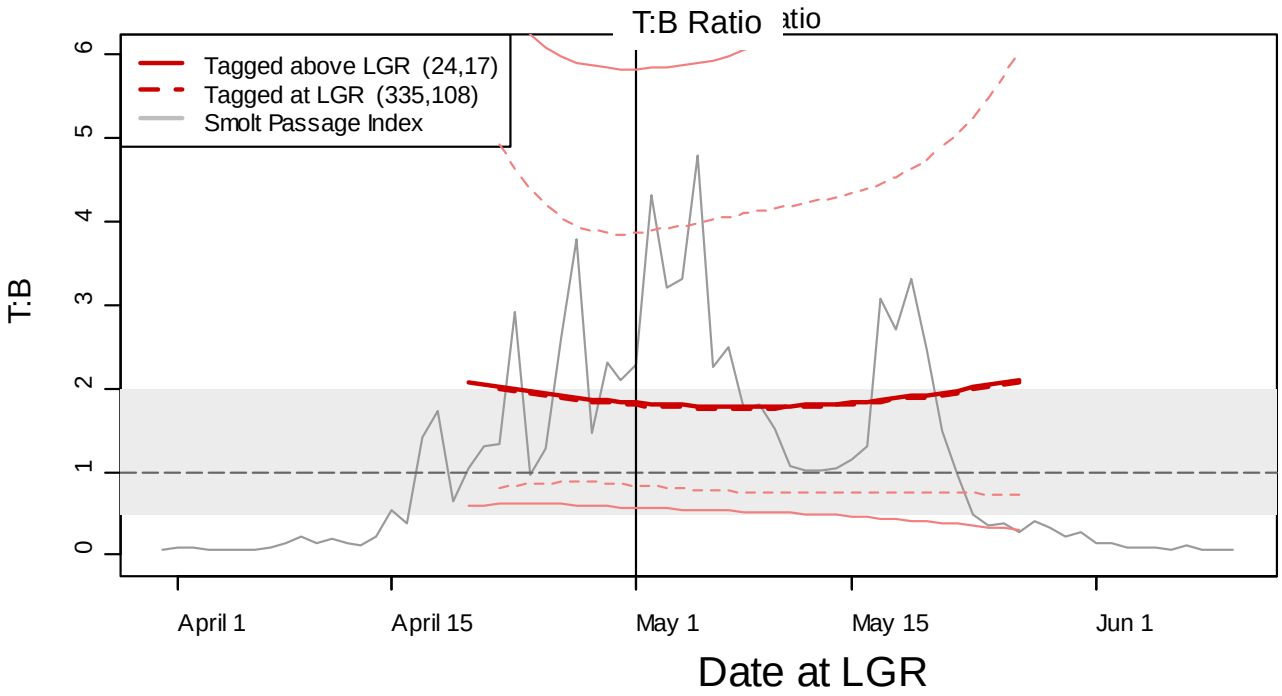

Wild Steelhead 2007

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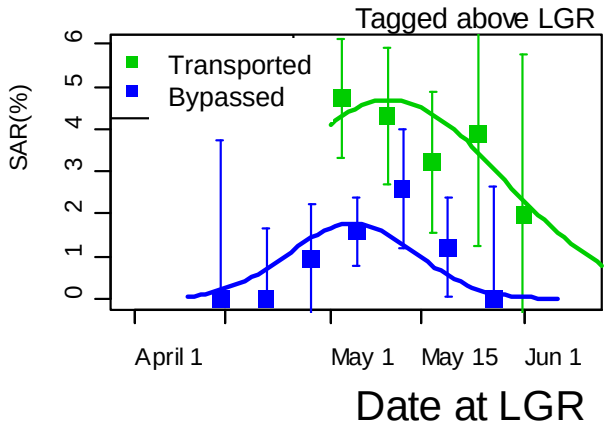

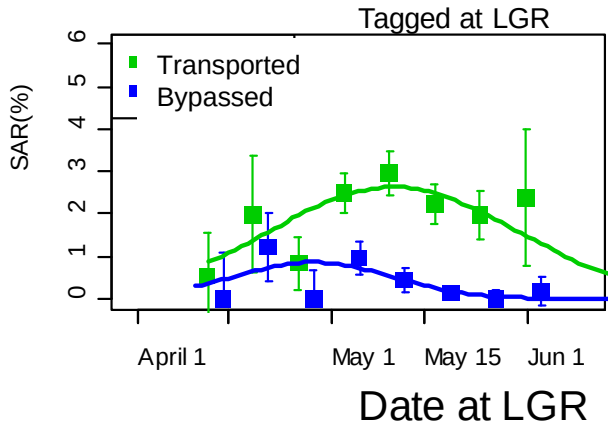

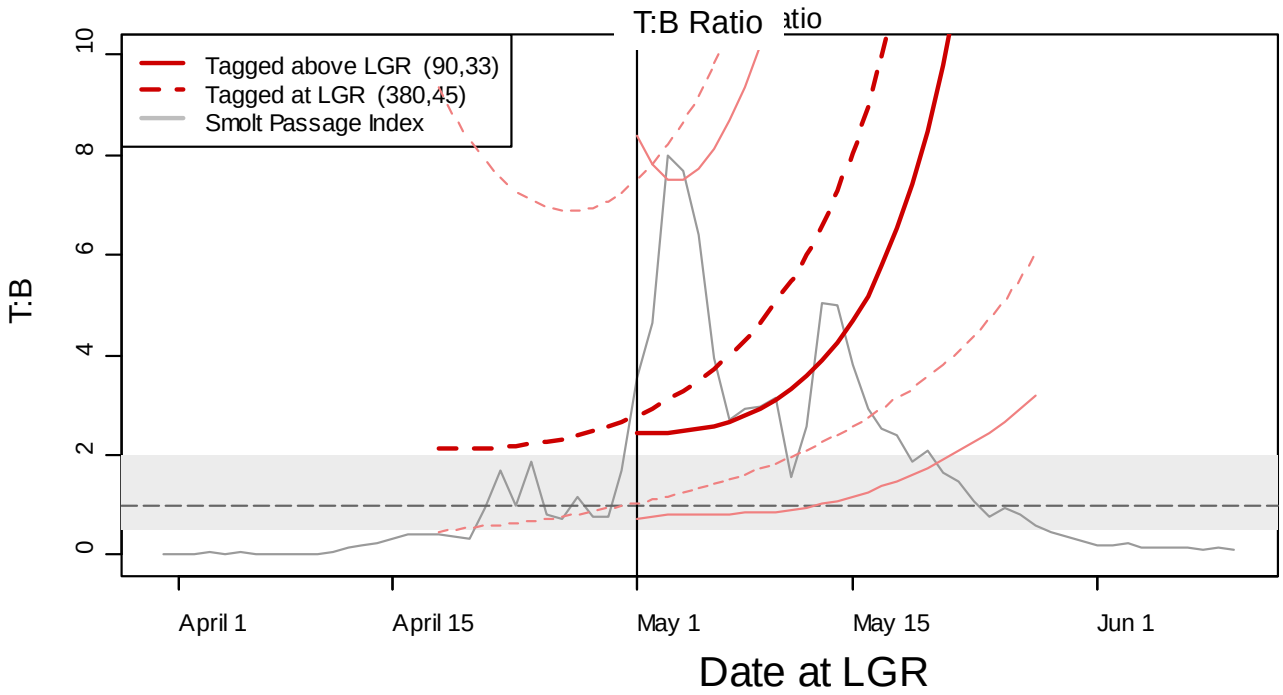

Wild Steelhead 2008

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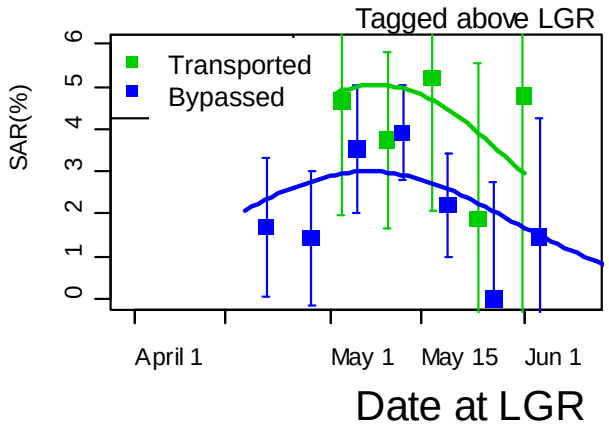
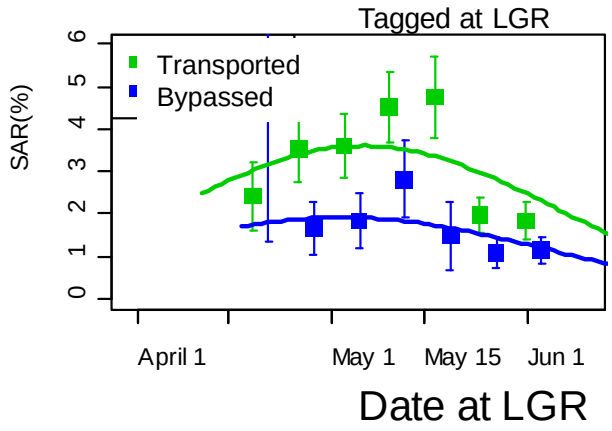
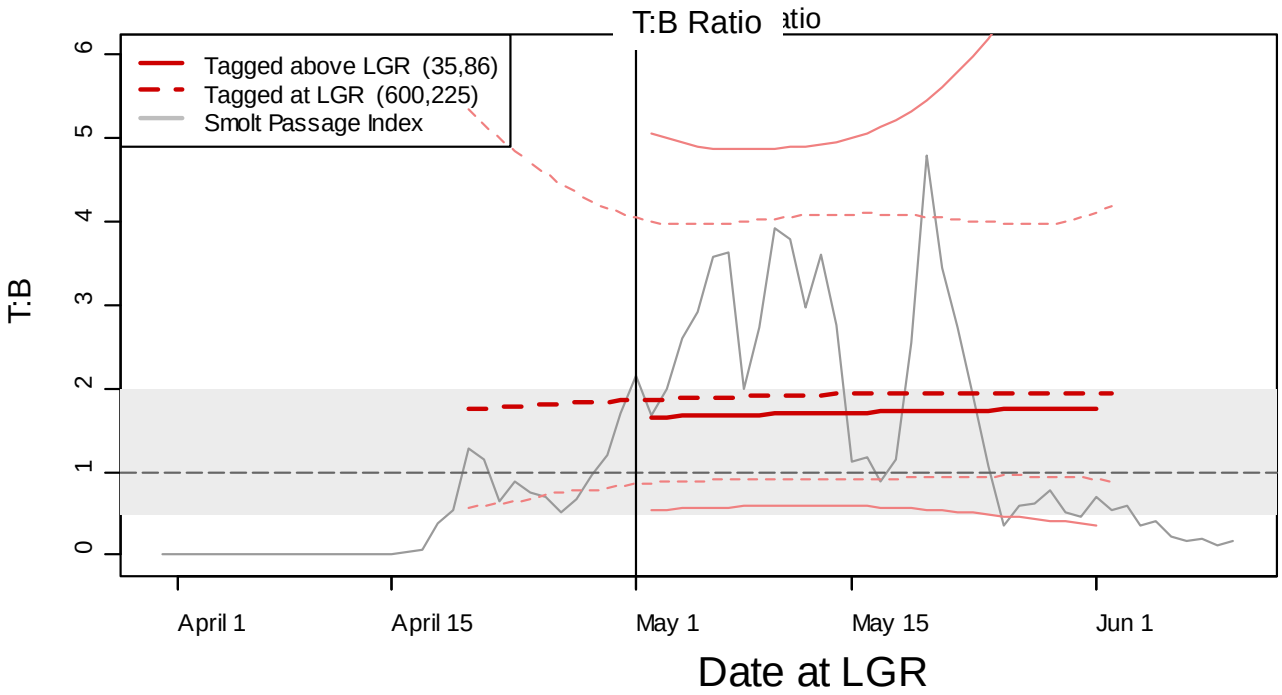
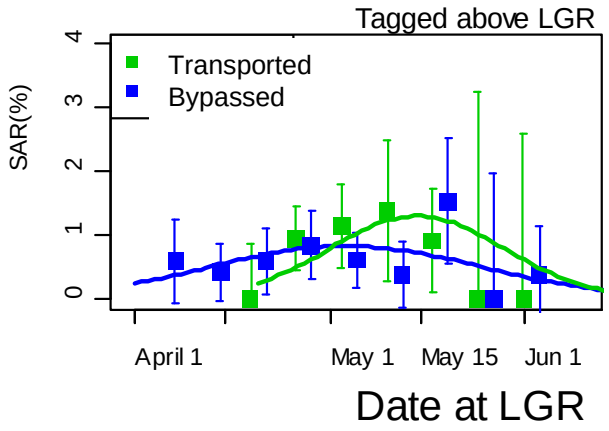


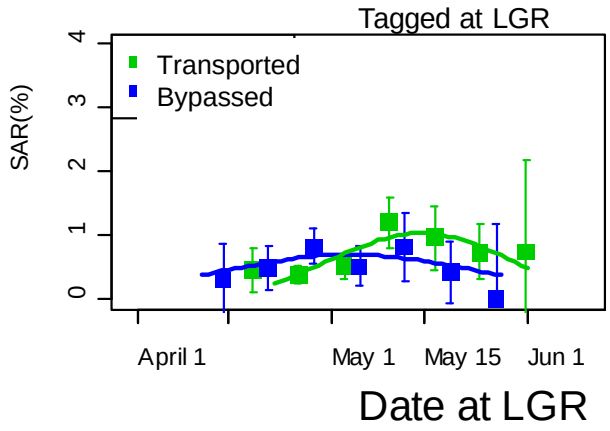


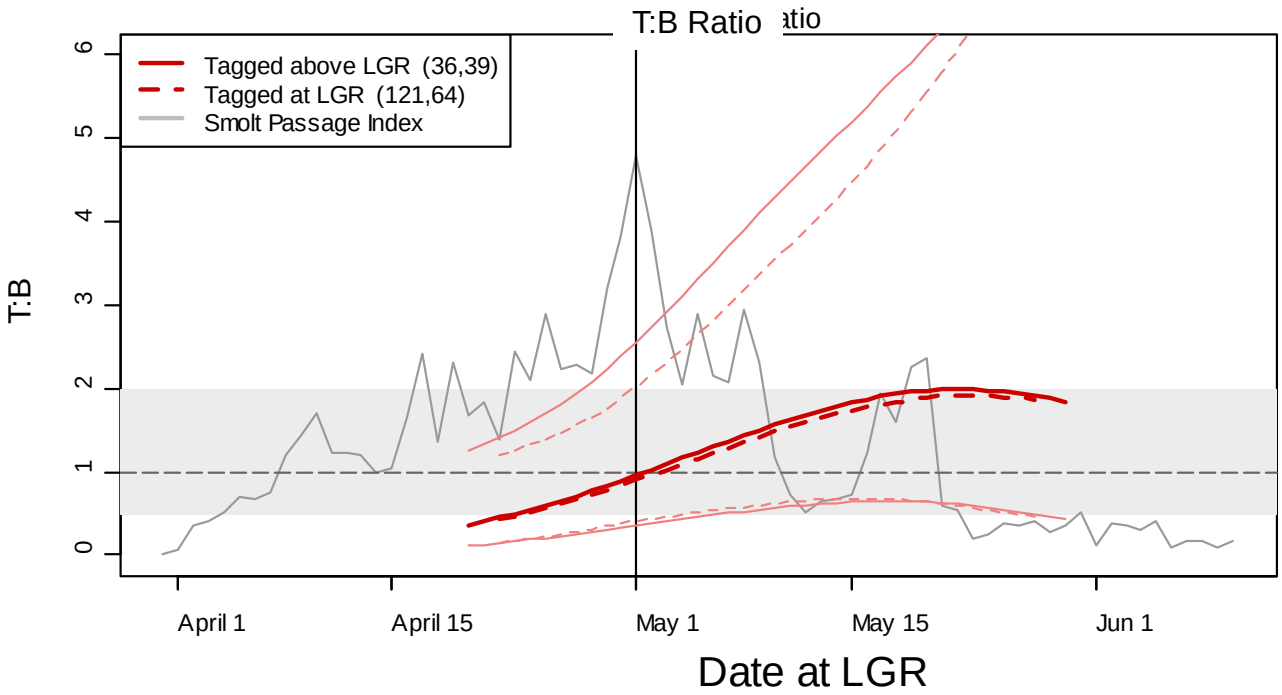


Wild Chinook 2006

Model-Averaged - Descriptive

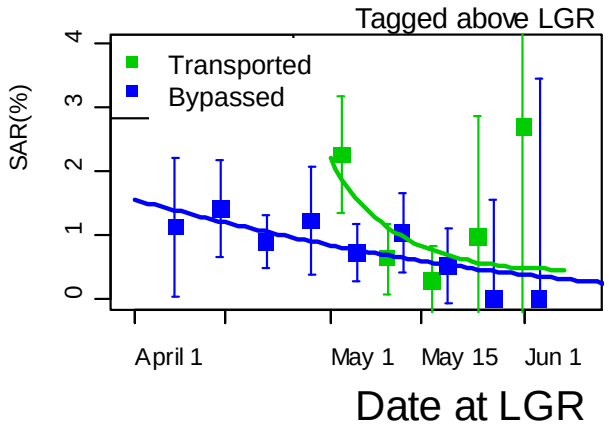


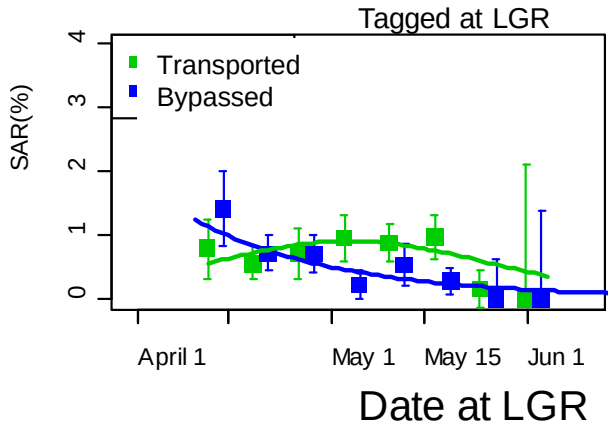


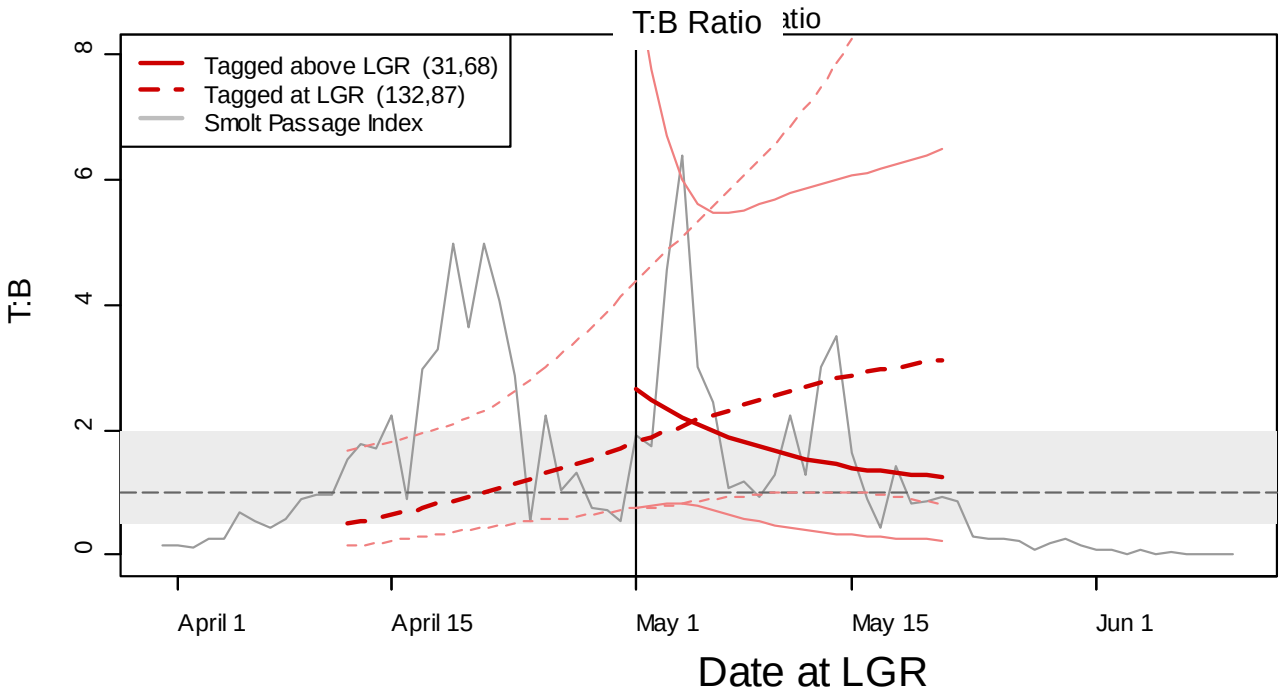


Wild Chinook 2007

Model-Averaged - Descriptive

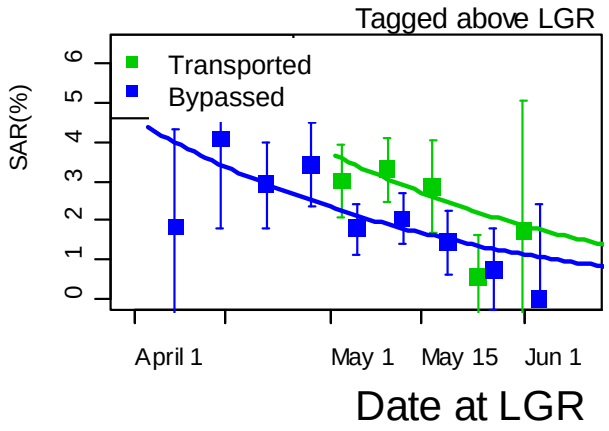


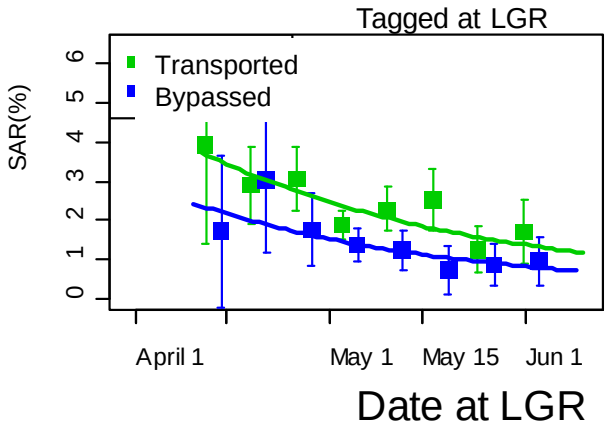


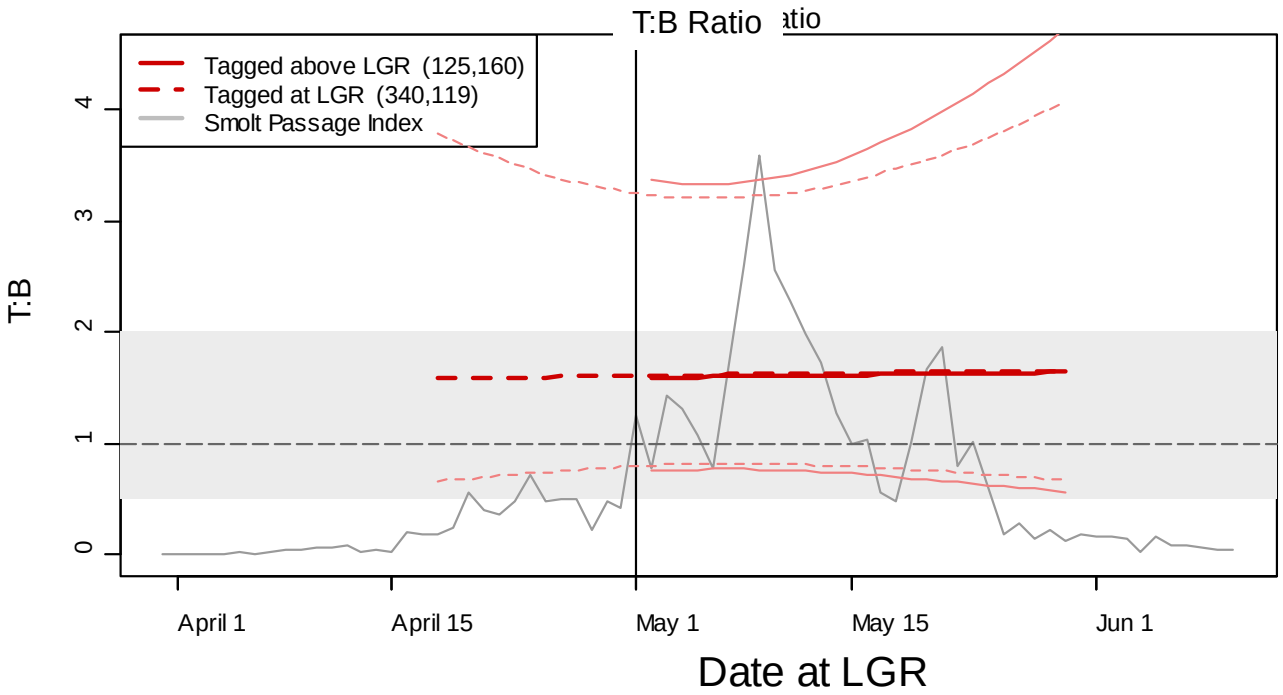


Wild Chinook 2008

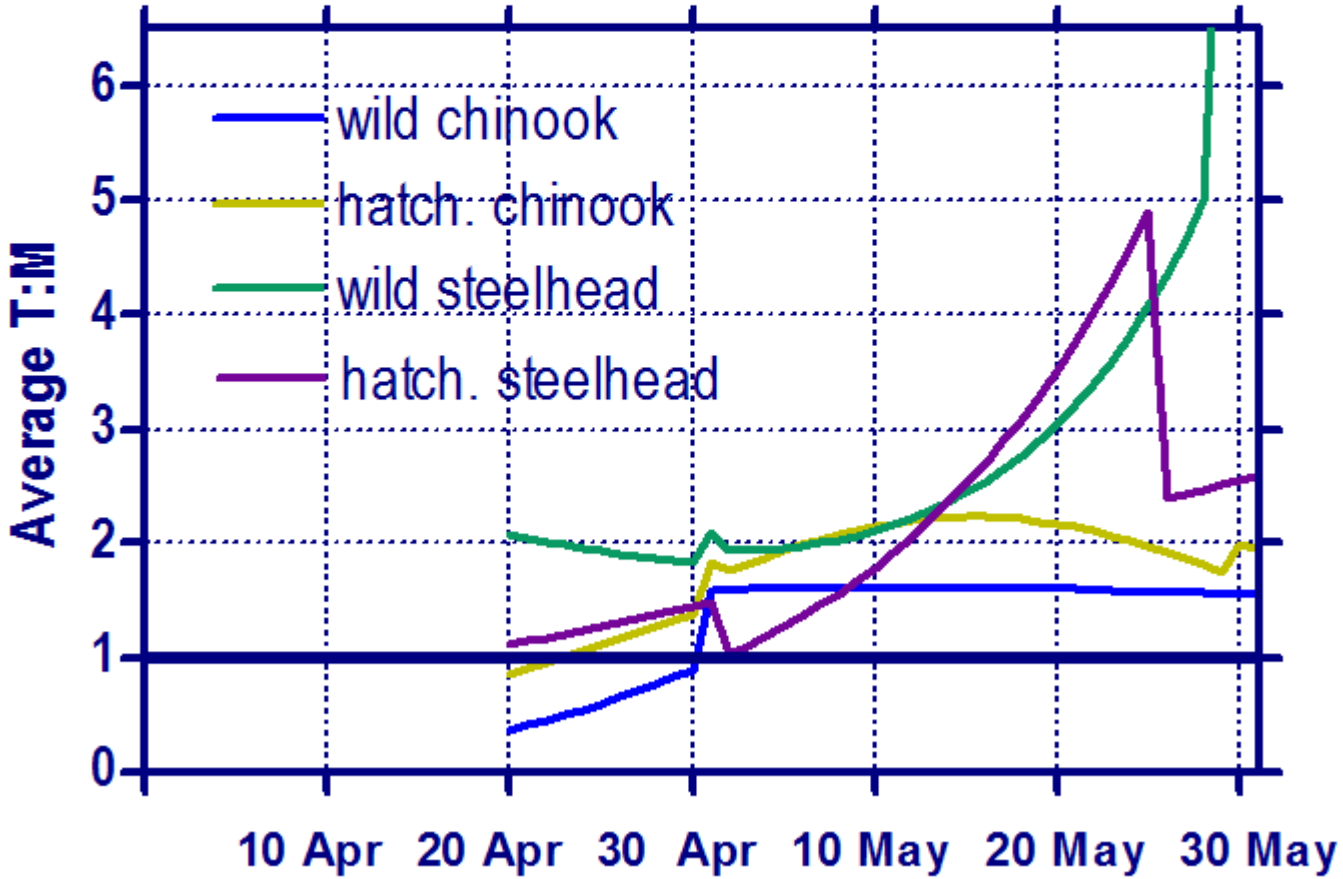
Model-Averaged - Descriptive



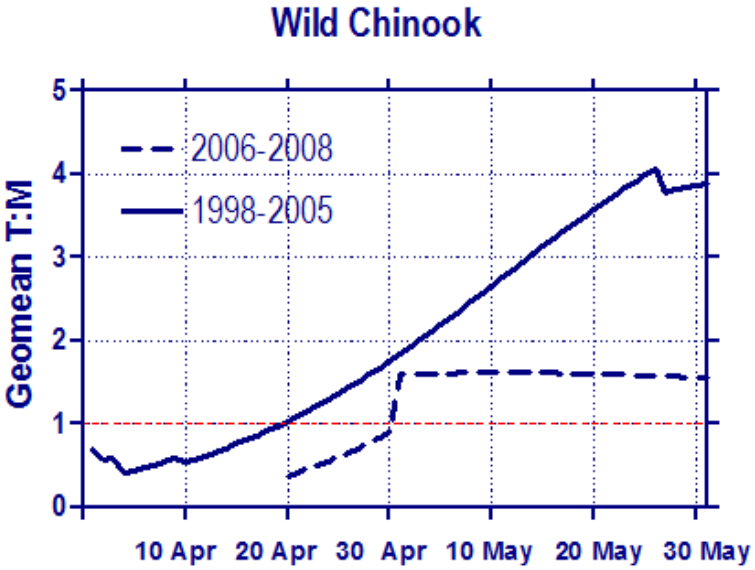


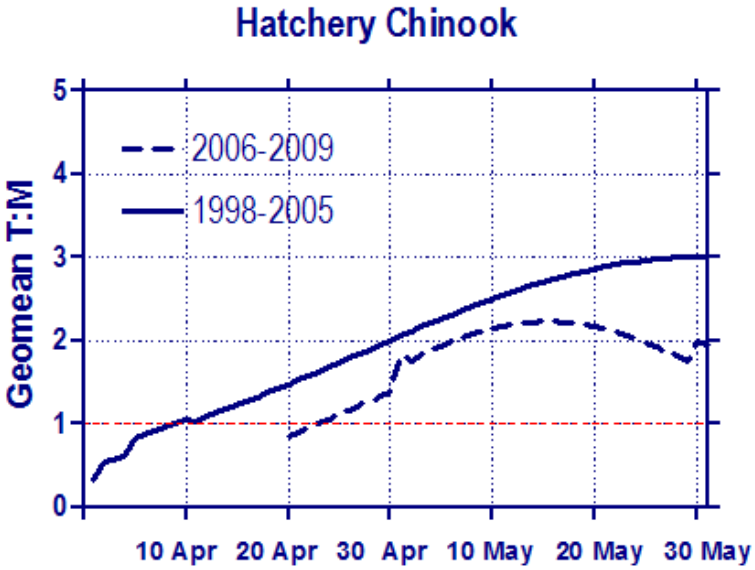


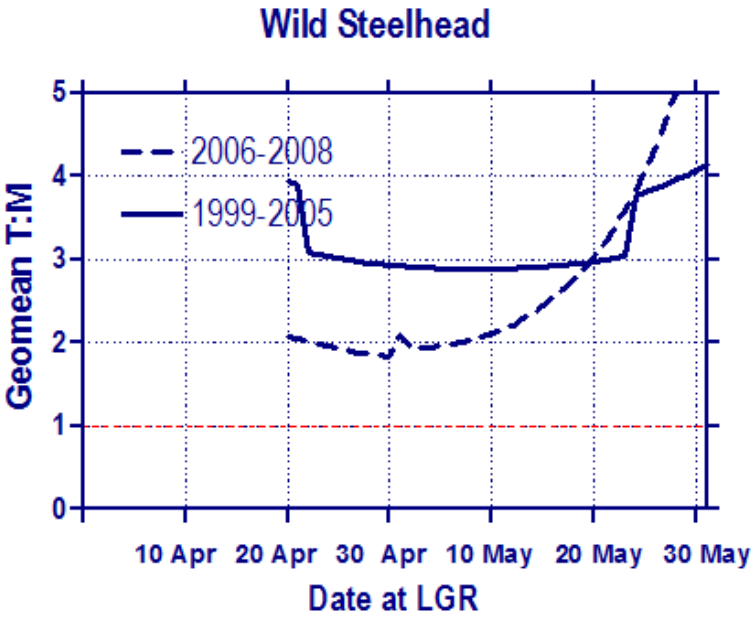
Geometric Mean
Model-Averaged T:M
2006-2008

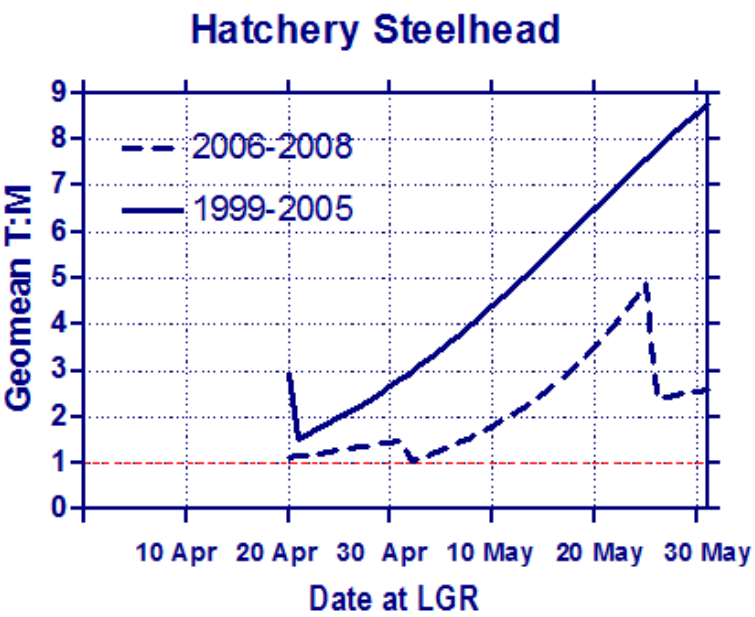


Recent Years vs. Previous

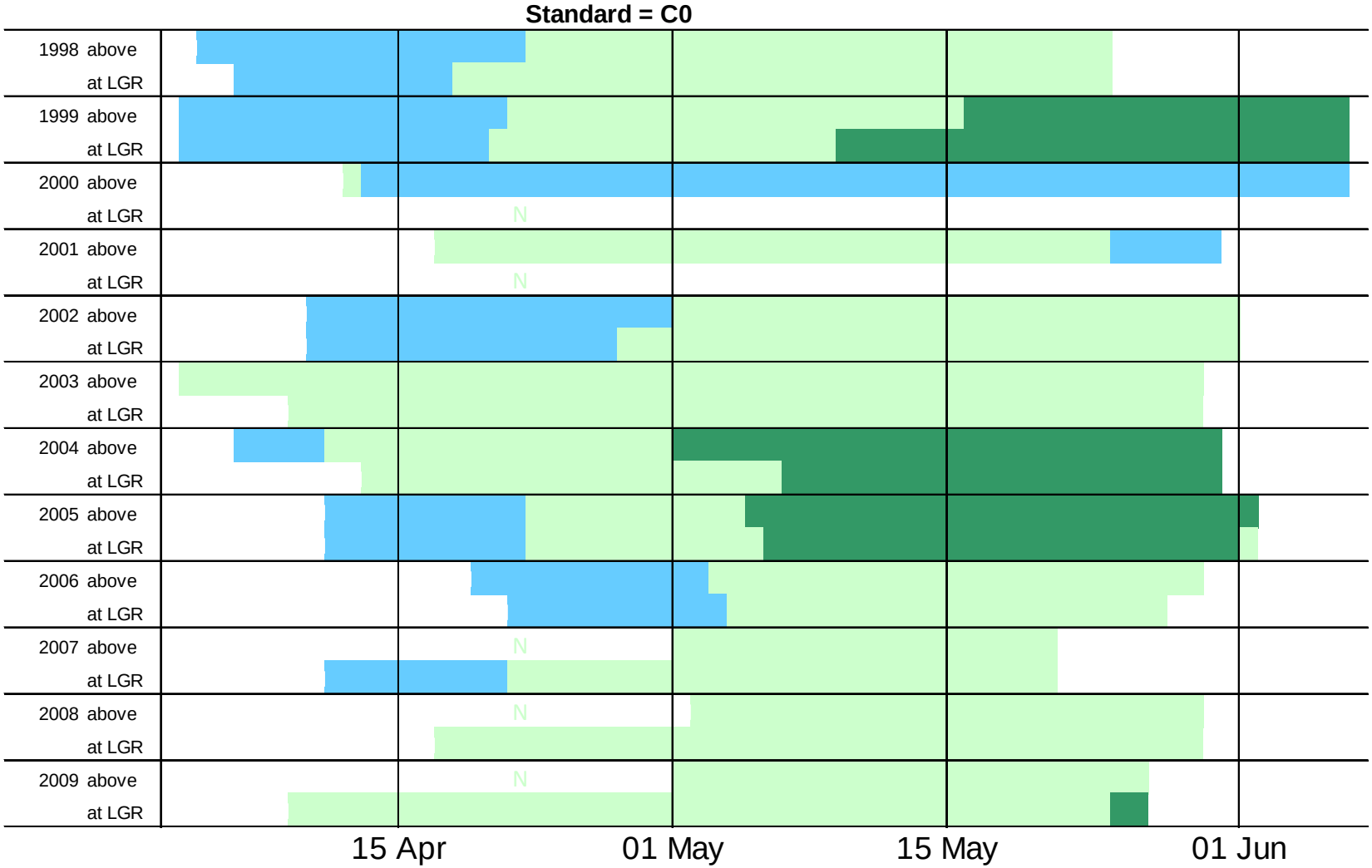


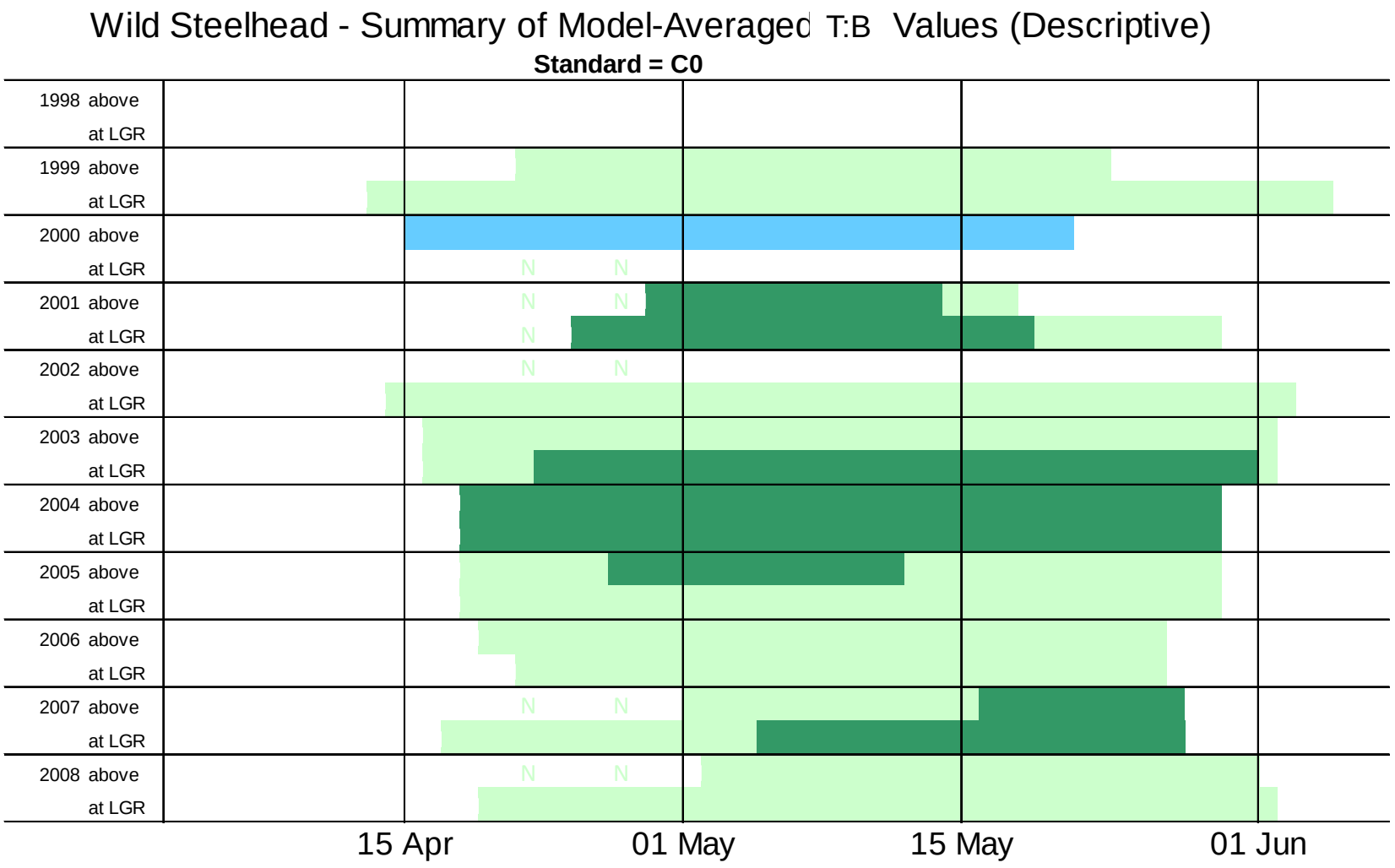






Wild Chinook Salmon - Summary of Model-Averaged T:B Values (Descriptive)

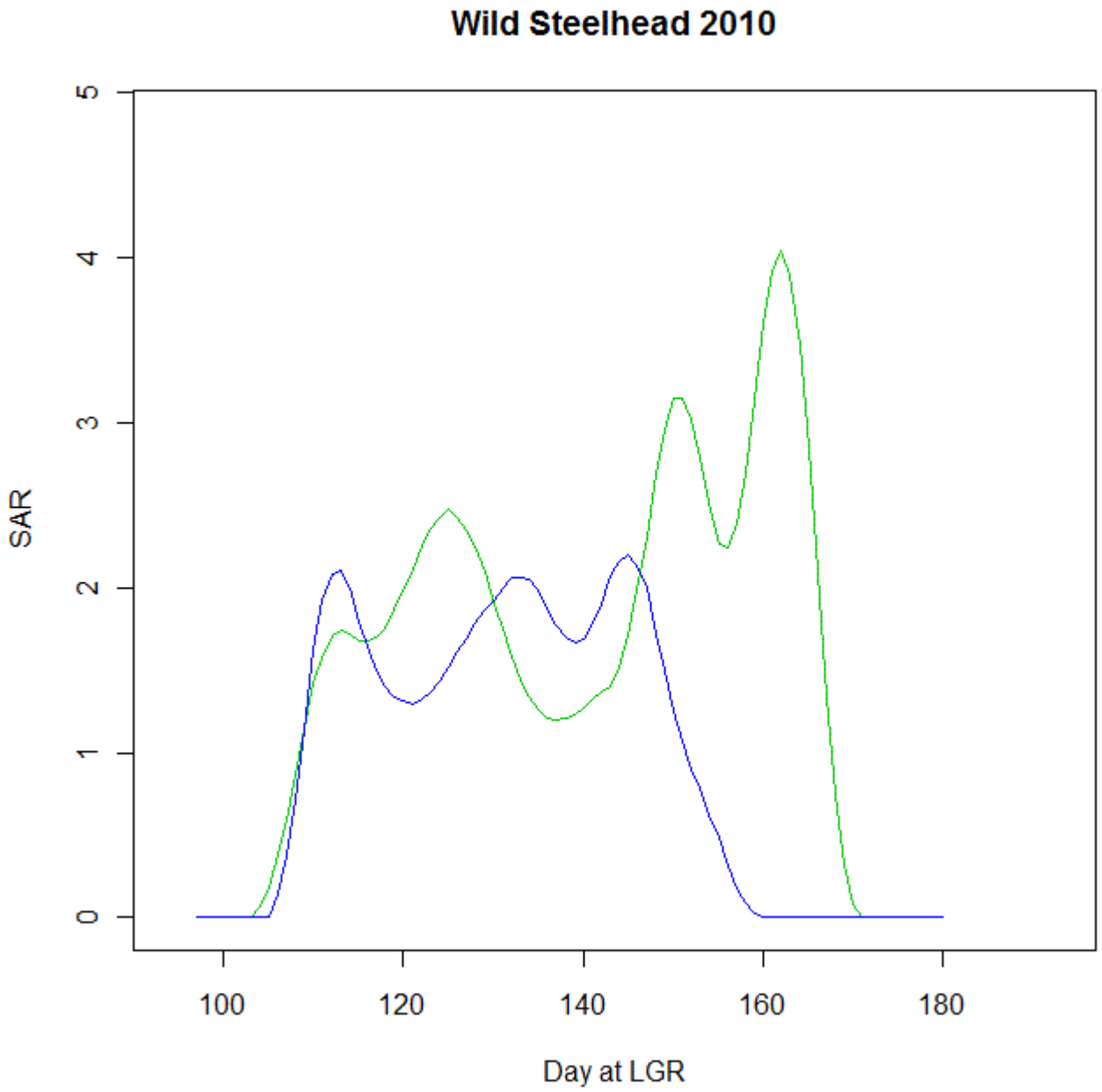


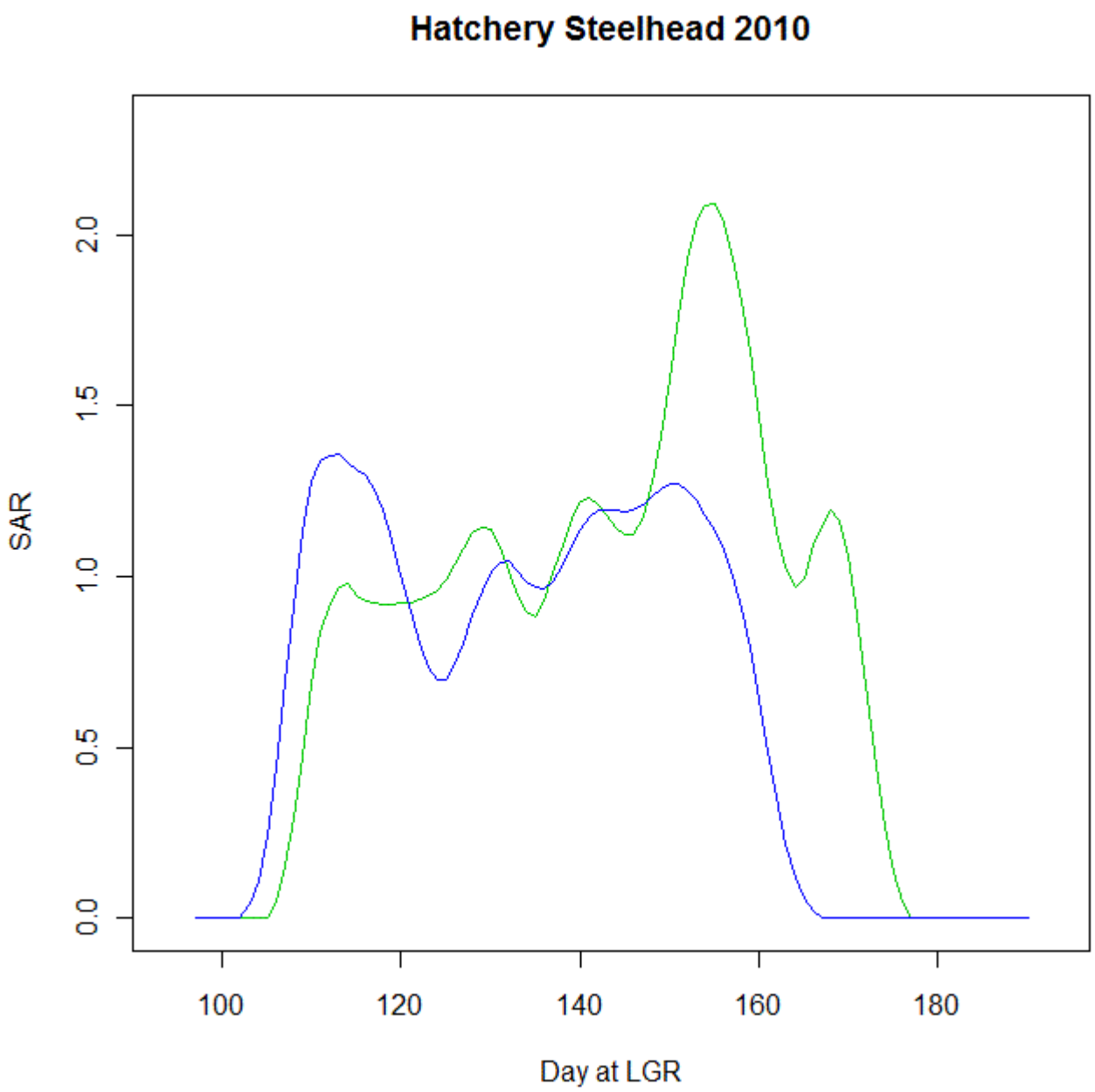

Wild Steelhead - Summary of Model-Averaged T:B Values (Descriptive)
Standard = C0
1998 above at LGR
1999 above at LGR
2000 above at LGR
2001 above at LGR
2002 above at LGR
2003 above at LGR
2004 above at LGR
2005 above at LGR
2006 above at LGR
2007 above at LGR
2008 above at LGR
N
15 Apr
01 May
15 May
01 Jun

Conclusion

- Benefit of transportation was reduced in 2006-2008 relative to earlier years
  - due to improved conditions for in-river migrants

- Return rate for transported fish still exceeded that for in-river migrants for most of the season


Wild Steelhead 2010
SAR
0
1
2
3
4
5
100
120
140
160
180
Day at LGR


Hatchery Steelhead 2010
SAR
0.0
0.5
1.0
1.5
2.0
100
120
140
160
180
Day at LGR


Questions

Subyearling Chinook Survival LGR to McN

preliminary results

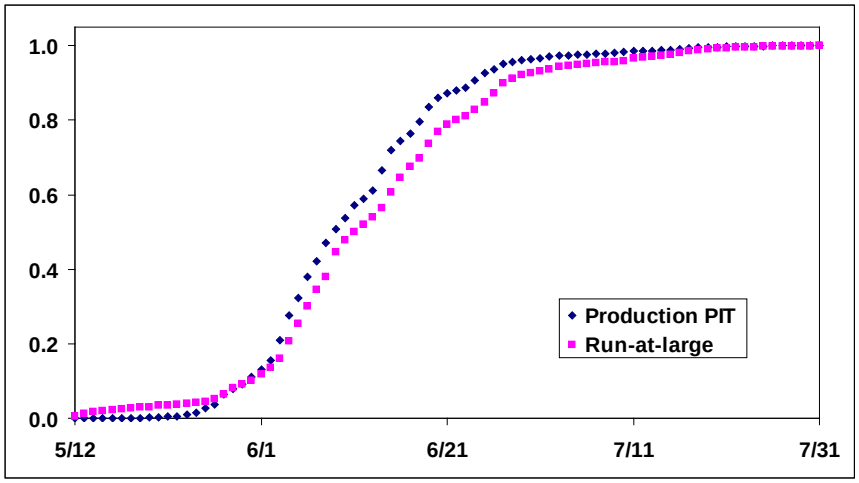
Jerry McCann

Fish Passage Center

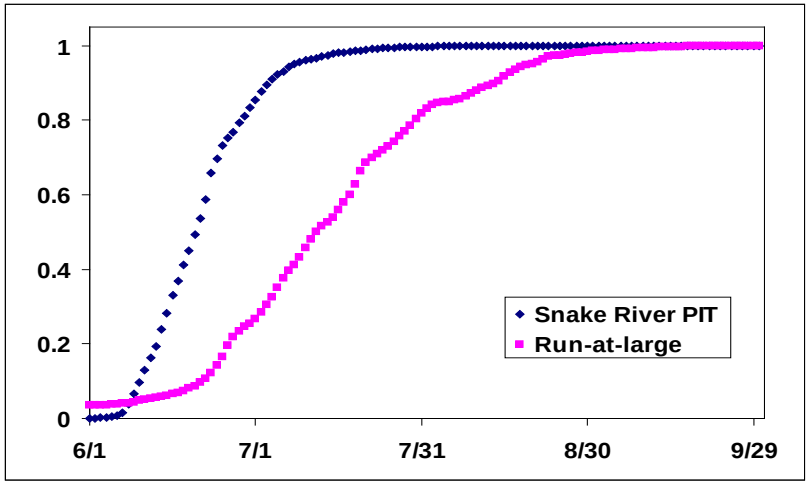
Subyearling Releases included in Survival Estimate and Transport Proportion estimate

- 4 cohorts based on LGR passage date
  5/20-6/2, 6/3-6/16, 6/17-6/30, 7/1-7/15
- Hatchery release groups included
  CJRAP,GRAND1,PLAP,SNAKE3,SNAKE4,BCCAP,CEFLAF,LUGUAF,
  NLVP,NPTH
  PIT Release dates between 5/03 and 7/6
- Wild groups
  SNAKE3,SNAKE4,CLWR
  PIT Release dates between 5/02 and 8/1

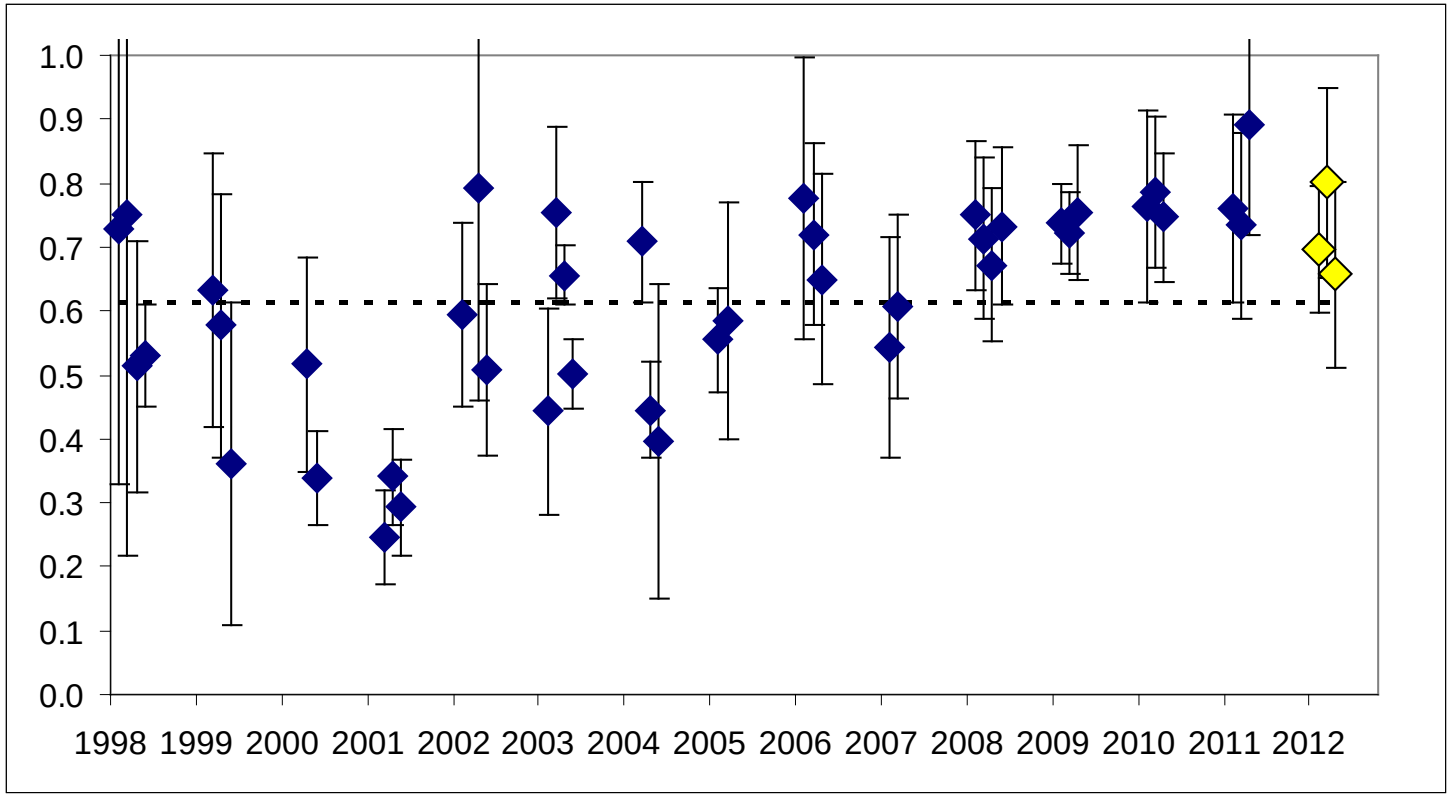
LGR Timing-Hatchery



MCN Timing-Hatchery PIT

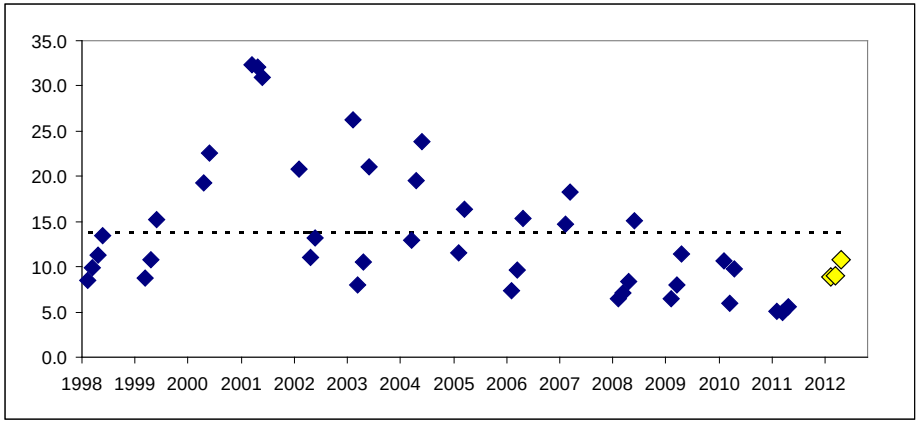


Hatchery subyearling Chinook Survival LGR to McN

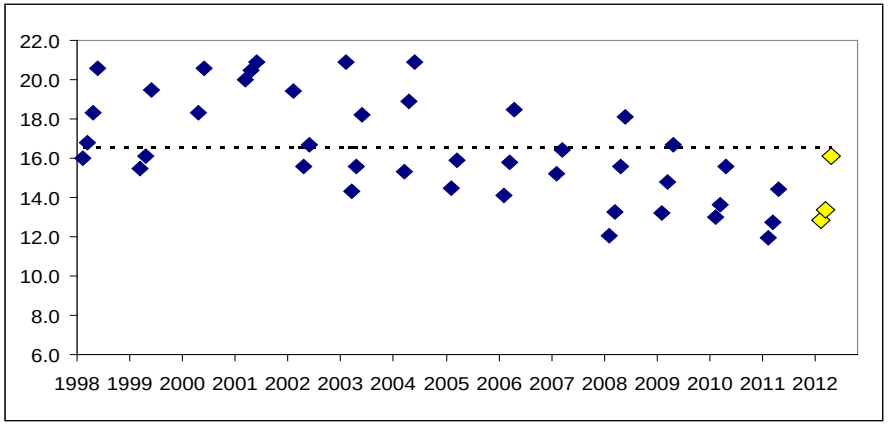


Environmental Conditions

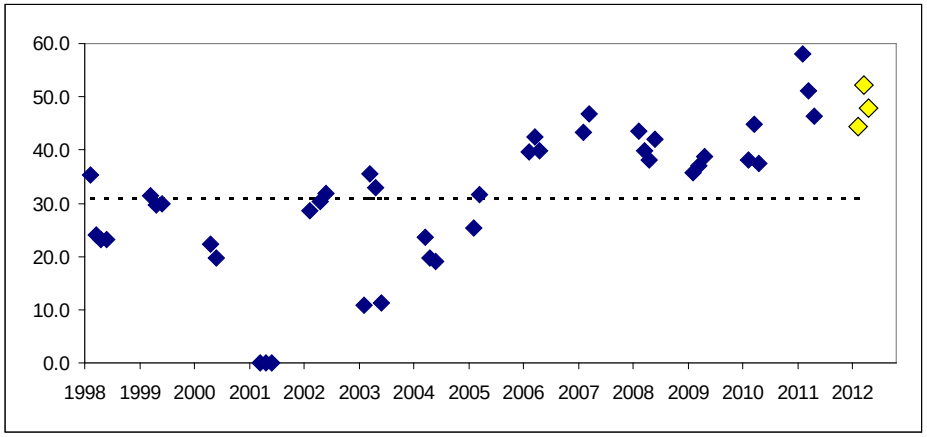
Water Transit Time



Avg Temp C



Avg Spill Proportion



Transport Proportions

	Transport Proportion by Migration Year							
	2012	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**
Subyearling Chinook	**0.42 (H)** **0.37 (W)**	0.46 (H) 0.42 (W)	0.56 (H) 0.49 (W)	0.51 (H) 0.45(W)	0.58 (H) 0.46(W)	0.35 (H) 0.35(W)	0.52 (H) 0.56(W)	0.81

Detect Probabilities for 13H

Site	**2012**	**2011**	**2010**	**2009**
LGR	0.18	0.19	0.15	0.17
LGS	0.21	0.20	0.31	0.28
LMN	0.09	0.20	0.26	0.15
MCN	0.11	0.12	0.16	0.23

Collection for Transportation began on August 18 at McNary Dam
An estimated 99% of Snake River Ch0 Prod, Wild PIT passed by that date.

Bonneville Dam
2012 Best Geometry Operational Summary

Doug Baus

Reservoir Control Center

Northwestern Division

December 5, 2012

US Army Corps of Engineers

BUILDING STRONG®

Outline

1. General overview of best geometry
2. Summarize specific dates of TMT coordinated operations
3. Next steps and forthcoming regional coordination on best geometry

Overview of Best Geometry

1. The goal of implementing the best geometry operations were to minimize juvenile descaling and mortality at Powerhouse 2 (PH2).

2. Best geometry was defined as operating Powerhouse 1 (PH1) units just below the cavitation limit.

    1. 1% operating range PH1 day average (April 12) discharge was 94 kcfs.

    2. Best geometry PH1 hourly average (April 14) discharge was 128 kcfs.

    3. These discharges are representative of real time conditions on these days only and change on an hourly basis due to real time conditions.

3. The operation was defined as a generation neutral operation that reallocated flow from PH2 to PH1.

Example of PH2 Limited 1 % Operating Range

1. The following example operation of the PH2 ranges coordinated during the June 6 TMT Meeting

0% - Lower Limit (Kcfs/unit)	25% (Kcfs/unit)	50% - Mid-point (Kcfs/unit)	75% (Kcfs/unit)	100% - Upper Limit (Kcfs/unit)
11 -8 from 100%	13 -6 from 100%	15 -4 from 100%	17 -2 from 100%	19

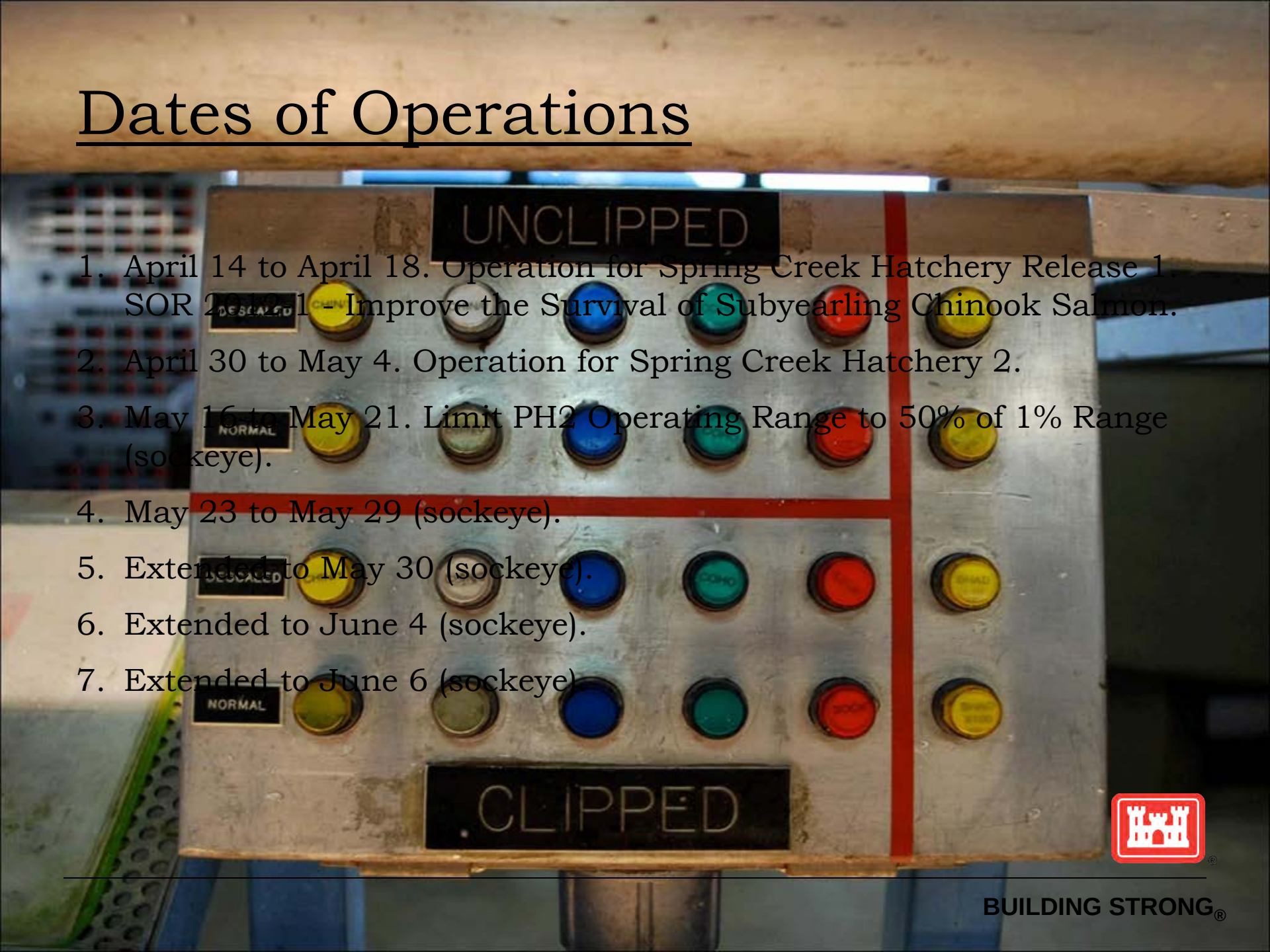
1. Equivalent rate of flow not passed via PH2 was reallocated to PH1
2. Operations resulted in targeting the 50% Mid-point column at PH2

Example of PH1/PH2 Operation

April 13 TMT Coordinated Operation for Spring Creek Hatchery Release

1. Bonneville (BON) powerhouse 2 (PH2) units will be operated at the 25% of the 1% operating range.
2. To pass additional flows, operate powerhouse 1 (PH1) units up to the 100% (full capacity) of the 1% operating range.
3. To pass additional flows after PH1 is fully loaded, increase PH2 units one at a time in the order of priority within 25-50% of the 1% operating range.
4. To pass additional flow after PH1 is fully loaded and all available PH2 units are operating at 50%, increase operation of PH1 units up to best geometry.
5. To pass additional flow after all available PH1 units are operating at best geometry, increase PH2 units one at a time in the order of priority within 50-75% of the 1% operating range.
6. To pass additional flow after all available PH2 units are operating at 75%, decrease PH1 unit operation to 100% of the 1% operating range and increase PH2 units one at a time in the order of priority within 75-100% of the 1% operating range.

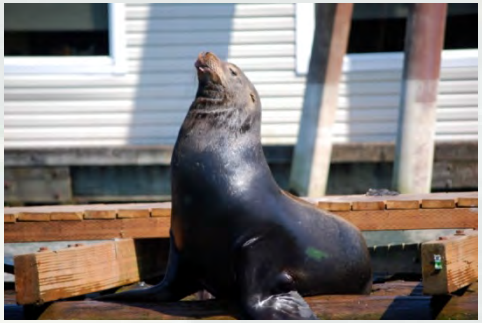
Dates of Operations



1. April 14 to April 18. Operation for Spring Creek Hatchery Release 1. SOR 2 – Improve the Survival of Subyearling Chinook Salmon.
2. April 30 to May 4. Operation for Spring Creek Hatchery 2.
3. May 16 to May 21. Limit PH2 Operating Range to 50% of 1% Range (sockeye).
4. May 23 to May 29 (sockeye).
5. Extended to May 30 (sockeye).
6. Extended to June 4 (sockeye).
7. Extended to June 6 (sockeye).

Multiple Operational Considerations

1. Corps compliance with the Total Dissolved Gas Waiver
2. Passage of juveniles though PH1
3. Adult fallback through unscreened units at PH1
4. Adult delay and predation in the tailrace
5. Juvenile survival via PH1 vs PH2



Next Steps

1. Improvements in Bonneville Dam operations resulting from the upcoming modeling exercise at the Engineer Research Design Center (ERDC) in December as coordinated through FPOM.
2. An evaluation to determine if any operational adjustments may be made at PH1 based on an evaluation on previous years tag data as coordinated through the SCT.
3. Operational adjustments in coordination with Regional Partners that may be needed associated with the new BPA TBL Transmission Limitation on the BON 115/230 kv line.
4. Improvements in PH2 gatewell conditions though continued efforts (eg Turbulence Reduction Device) through the FFDRWG.

Acknowledgements

1. Technical Management Team: John Roache, Paul Wagner, Rick Kruger, Charles Morrill, Sue Ireland, Sheri Sears, Tom Lorz, Tony Norris, David Wills, Russ Kiefer, Jim Litchfield, Deanne Pavlik-Kunkel, and Dave Statler

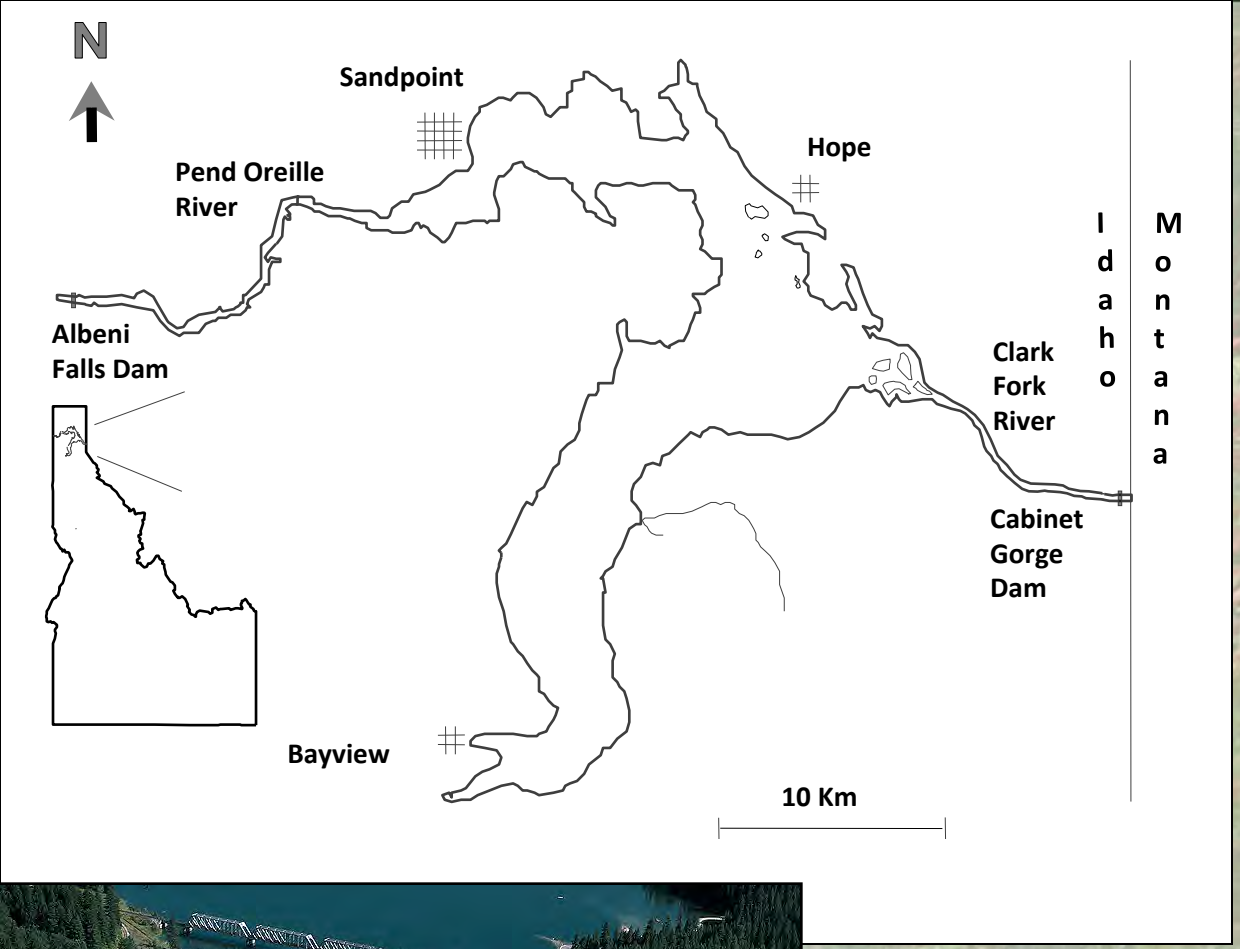
2. Fish Facilities Design Review Working Group

3. Fish Passage Operations and Maintenance Coordination Team

4. BPA Real Time and Bonneville Dam Operators

Lake Pend Oreille Fishery Recovery Update

TMT Year End Review Meeting
December 5, 2012



Lake Pend Oreille

-Upper 11.5 ft regulated by Albeni Falls Dam

-Lake level experiment started in 1996

-Winter elevation set at either 2051' or 2055'

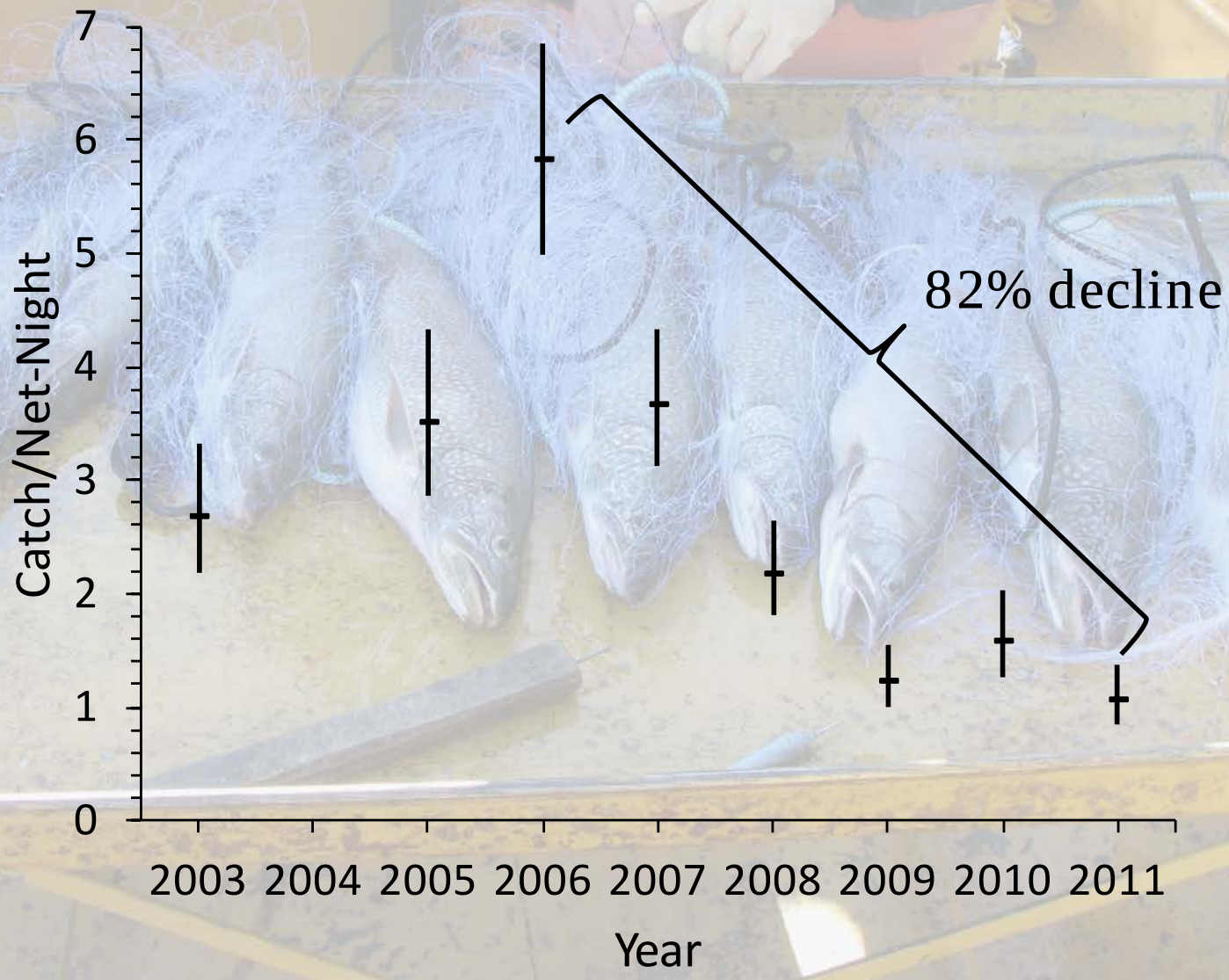
-SOR in 2012 for a 2055' lake level was approved

Albeni Falls Dam on Pend Oreille River

Kokanee Recovery: Limiting Factors

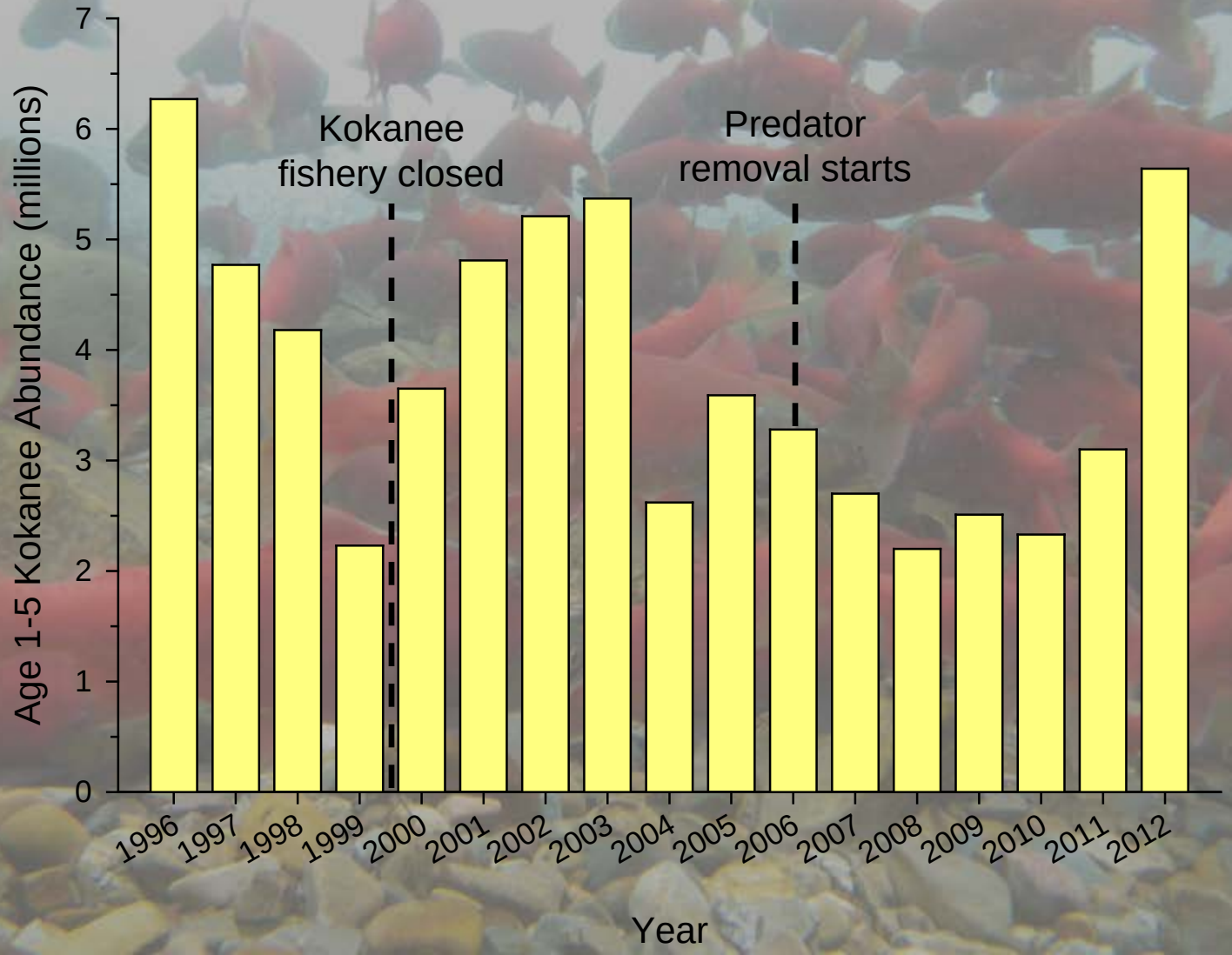
- Spawning habitat
  - Operations at Albeni Falls Dam starting in 1966; reduced lakeshore spawning habitat
- Predation
  - Lake trout population explosion
  - Surpassed spawning habitat as primary limiting factor
- Altered food web/nutrient dynamics
  - Mysis shrimp introduction caused changes
  - Extent unclear; not limiting at current kokanee densities

Adult Lake Trout Trend



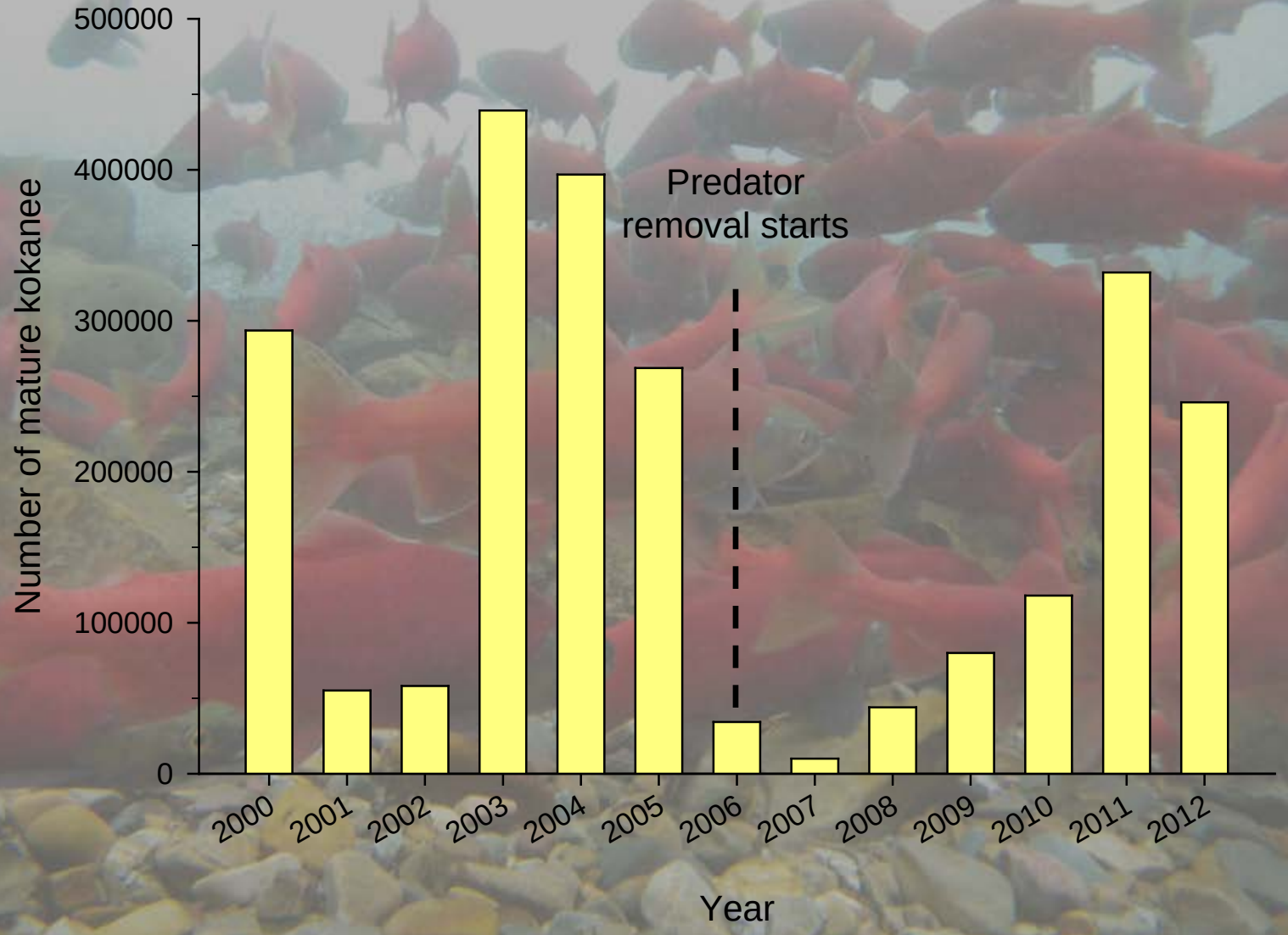
Kokanee Abundance Trend

Ages 1-5 combined

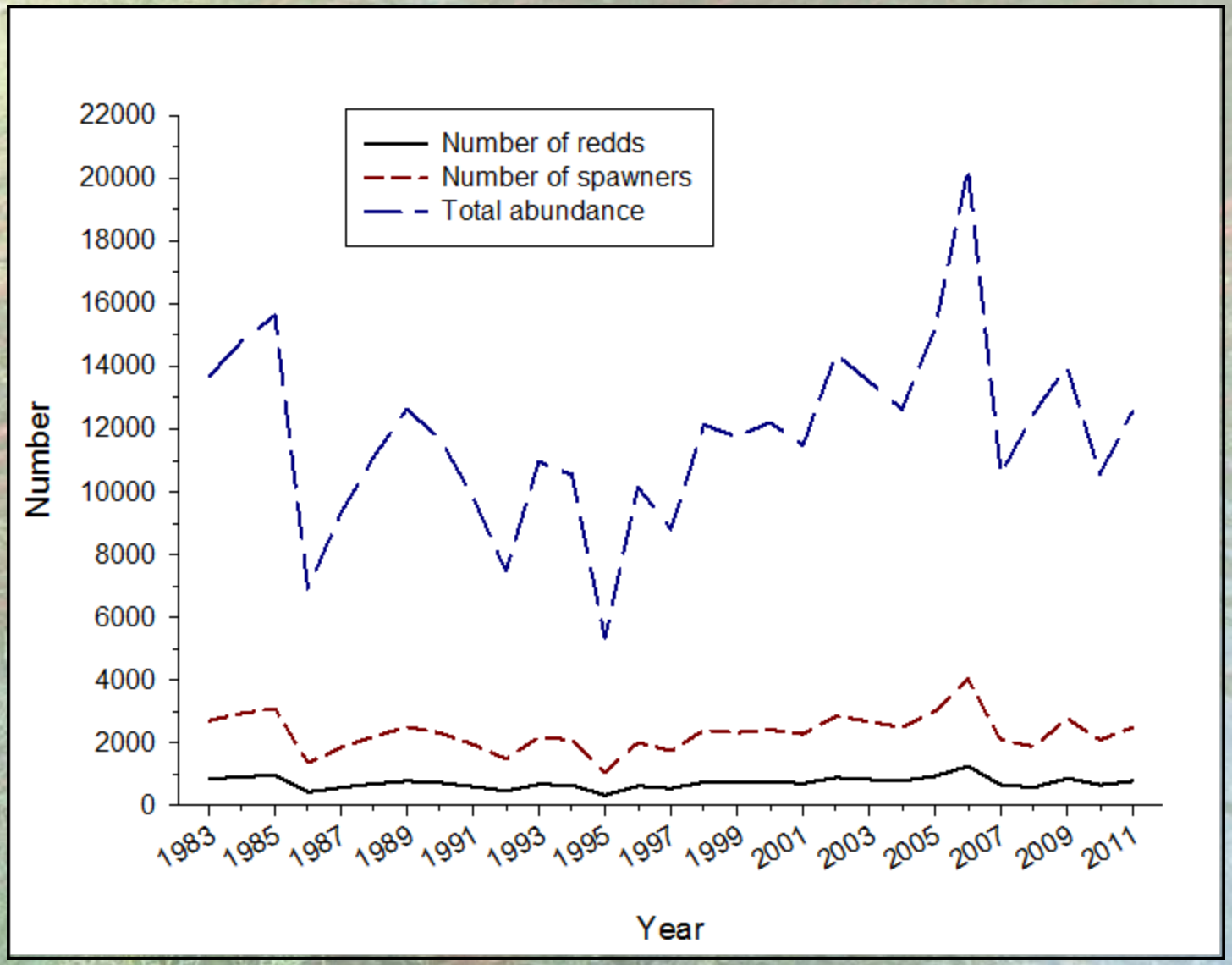


Kokanee Abundance Trend

Adult spawners



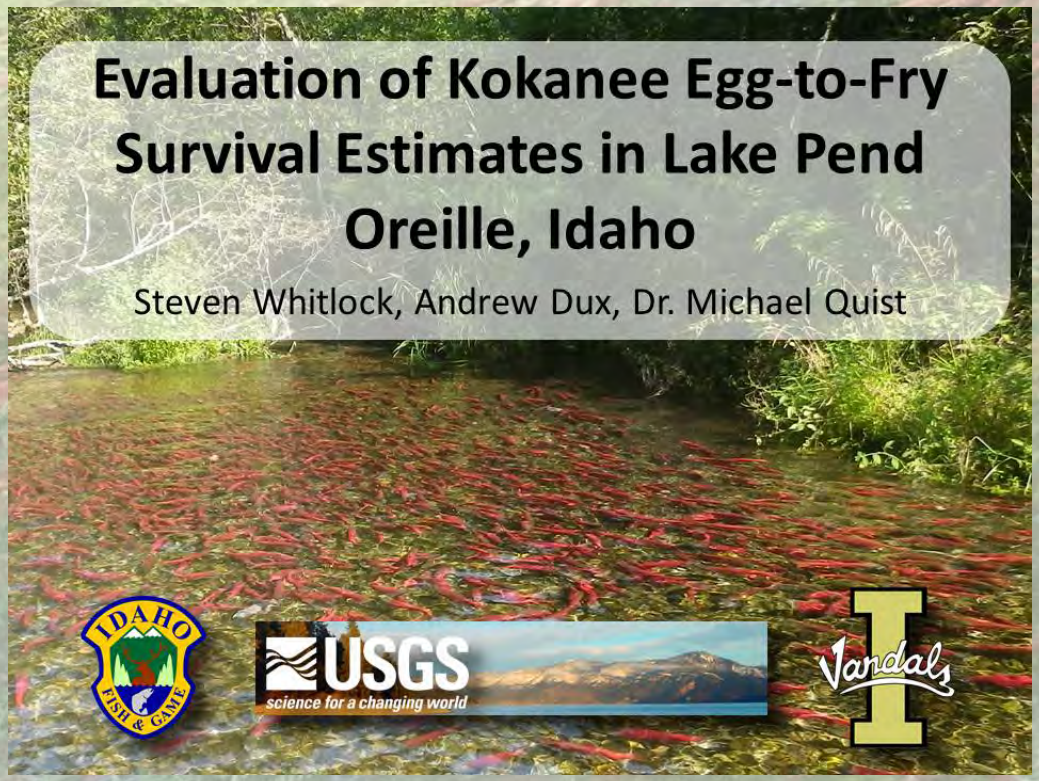
Bull Trout Trend



2012 System Operation Request

- Higher lake level provided two primary benefits
  - More habitat for another stronger return of lakeshore spawners than in recent years
    - Lakeshore spawners are more widespread on shoreline
  - Research to evaluate incubation success was possible
    - 60 embryo incubation sites established
    - Will provide better understanding of lake level effects

New Research Project: 2011-12



- Sensitivity analysis to understand which sub-estimates produce most variation in overall estimate
- Bootstrapping procedure to generate confidence intervals for annual estimates

What Have We Learned?

- The kokanee EF survival estimate is strongly influenced by sampling variability among sub-estimates
- The EF survival estimate lacks the precision to assess the influence of lake level on embryo survival
  - **Regardless of any real effect of lake level**

What Do These Results Mean?

- We cannot say whether or not lake levels have benefitted kokanee recruitment
- Does not mean that lake level is unimportant
- Different approach needed to evaluate lake level effects
  - Large data set exists; exploring whether retrospective analysis using other methods is possible (e.g., modeling)
  - Direct evaluation of embryo incubation success in various habitat types is underway
- Decision tree that guides selection of winter lake level needs to be re-visited
  - 70k female kokanee cannot currently be supported

Kokanee Recovery: Where Are We?

- Fishery closed in 2000 and population reached record low in 2007
  - Lake level experiment severely hampered by predation issue that emerged
- Lake trout suppression is working
  - Predation greatly reduced
- Kokanee population has responded favorably
  - Higher survival, strong year classes upcoming
  - Re-open limited fishery in 2013 (6 fish limit)
- Bull trout have remained stable
  - Huge success given threat posed by lake trout
  - More kokanee should lead to increase in bull trout population

Kokanee Recovery: Where Are We?

- With predation reduced, now need better understanding of other limiting factors (e.g., lake levels) for kokanee
- Stronger population improves our ability to evaluate other limiting factors and develop management actions


Questions?

Kootenai River Habitat Restoration Program

Presentation to Technical Management Team
Year End Review
December 5, 2012

Kootenai Tribe of Idaho

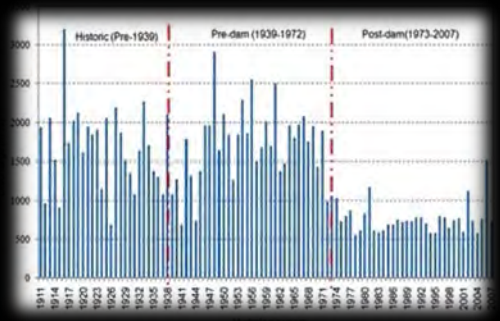
Libby Dam
Construction & Operation Impacts

Altered flow (Spring ½ of historical; Winter increase 300%, lack of flushing flows)

Nutrients trapped (reduced primary productivity)

Loss of side channel, wetlands, and floodplains & connectivity

Bank erosion & land loss



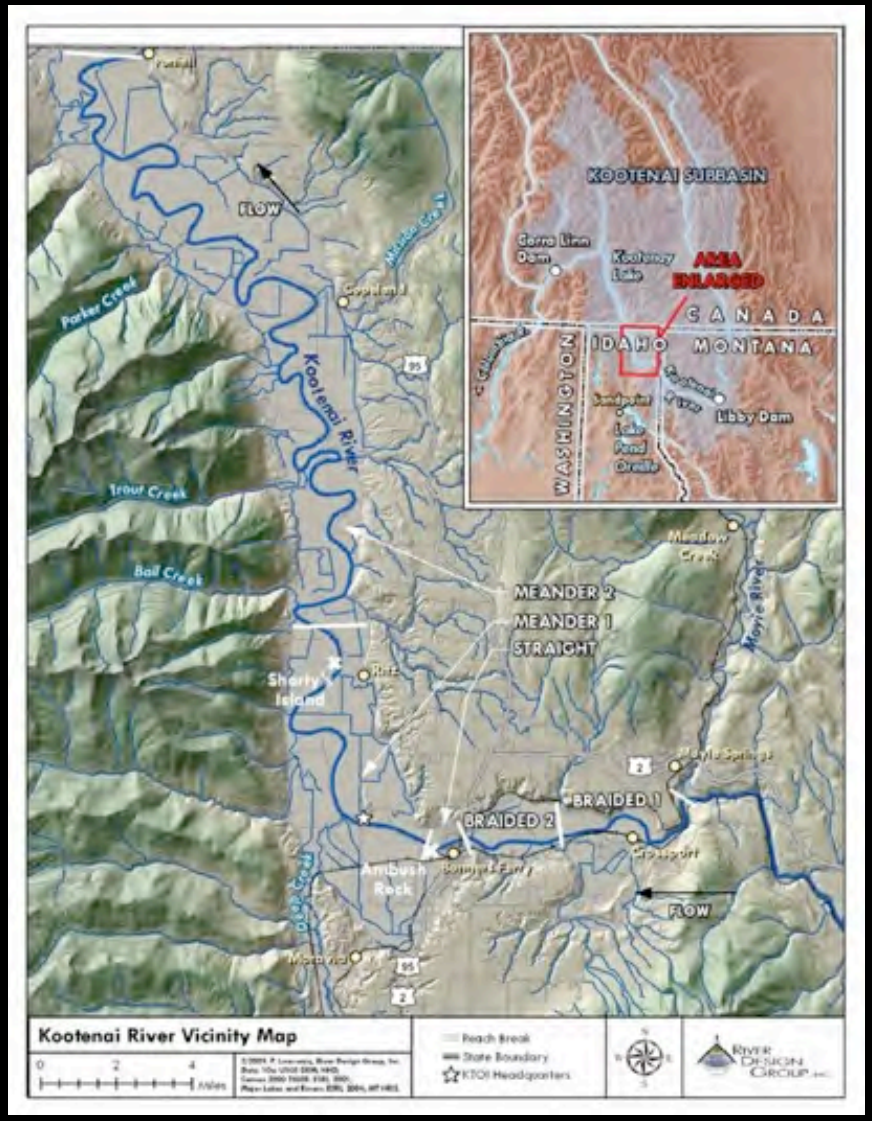
Altered thermal regime (warmer winter, cooler summer temps)

Altered sediment transport, deposition, scour

River response to altered hydraulics (morphology, depth, velocity)

Elimination and modification of critical fish & wildlife habitats

Kootenai River Habitat Restoration Program



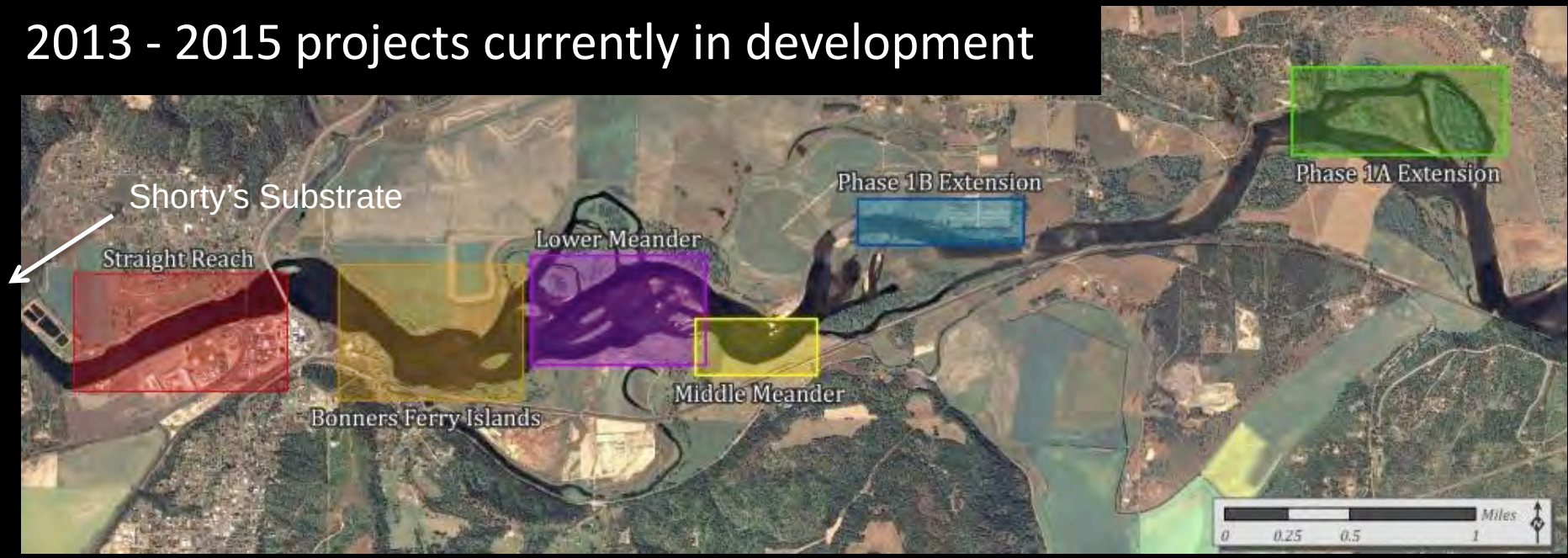
- Ecosystem-based restoration program in 55-mile reach of Kootenai River in Idaho
- Multiple projects in 3 different reaches
- 7-10 year implementation timeframe
- Libby Dam BiOp

Kootenai River Habitat Restoration Program Goals

1. Restore physical habitat
2. Restore riparian vegetation
3. Restore aquatic habitat conditions that support all life stages of native fish
4. Create opportunities for river and floodplain stewardship

Completed projects in 2011 and 2012 (TMT flow requests)

2013 - 2015 projects currently in development




Ia Project Site
Steep eroding banks do not support perennial vegetation and contribute excessive sediment to the Kootenai River

IA Project - 2011

Bank vegetation provides a riparian buffer and enhances aquatic habitat

Large wood structures improve cover, complexity and pool habitat

Large wood roughness elements protect toe of bank and promote sediment deposition

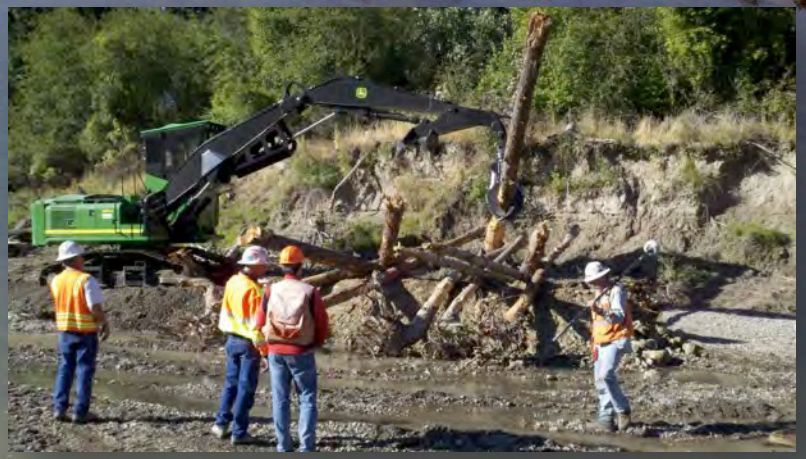
Fencing installed to prevent floodplain/bank grazing

Eroded over-steepened banks re-graded and planted with riparian trees and shrubs

2011 – Phase I

2011- Phase 1

2011 – Phase 1



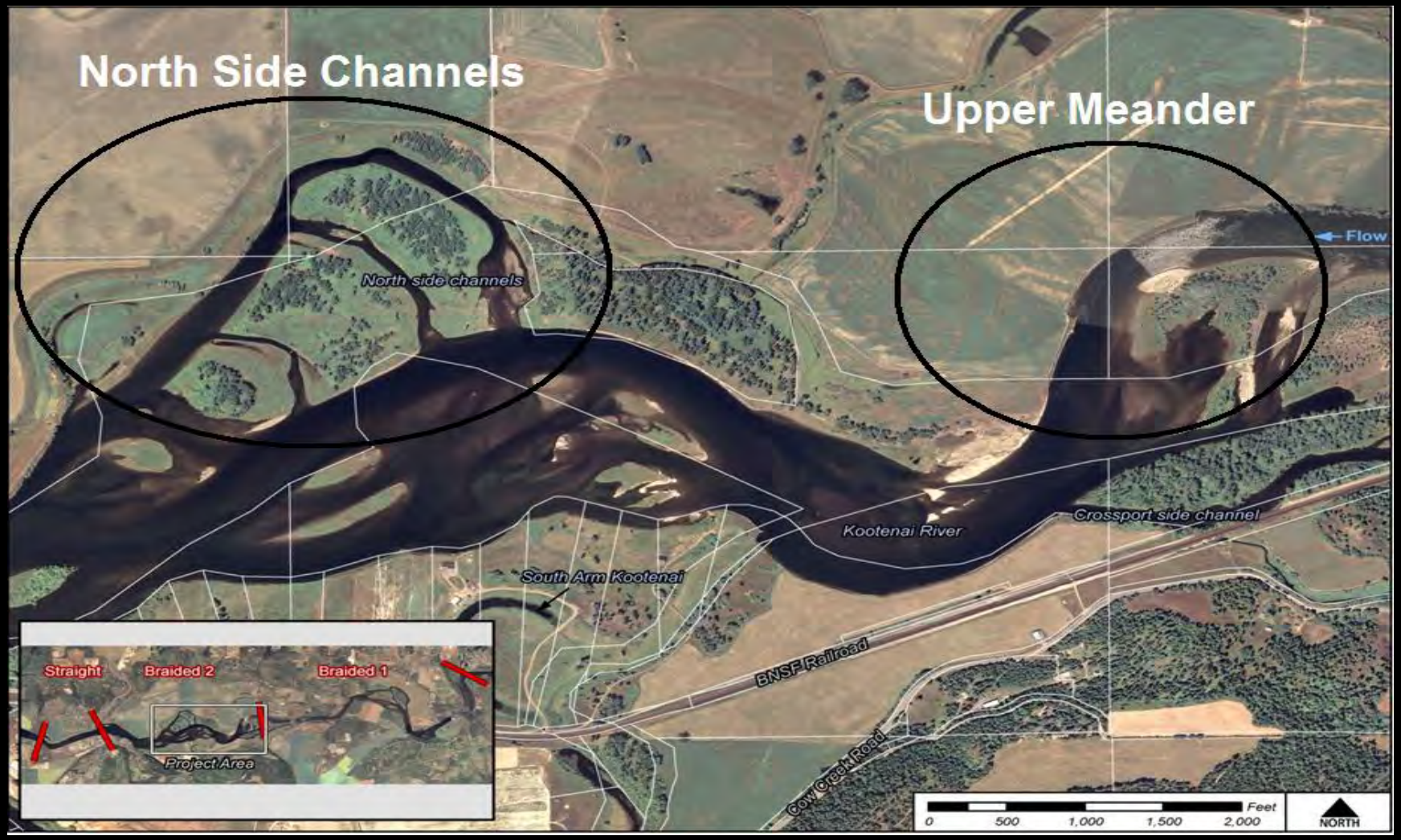

2011 – Phase I


DEERE

TMT approved lower flows during construction:

- **Supported effective dewatering**
- **Allowed construction to occur in one season**
- **Supported cost-effective and safe project implementation**

2012 Projects:
Upper Meander & North Side Channels



North Side Channels Project Area – Existing condition

<u>Limiting Factors</u>

- Lack of aquatic habitat complexity
- Lack of vegetation recruitment/diversity
- Invasive weeds
- Grazing

2012 - North Side Channels Project Concept

- Improve hydraulic complexity
- Address reed canarygrass
- Plant native trees & shrubs
- Create topographic diversity
- Add large woody debris
- Improve fish habitat and food chain


09/27/2012

TMT approved lower flows during construction:

- **Allowed for dewatering**
- **Allowed construction to occur in one season**
- **Supported cost-effective & safe implementation**

2012 - Upper Meander Project Concept

- **Improve resistance to erosion**
- **Enhance existing pools**
- **Add complexity and LWD**
- **Establish a riparian buffer**
- **Reduce land loss**


Kootenai River
mainstem flow
Eddy recirculation
zone
Habitat Type
Habitat Description
Juvenile salmonid rearing
Depth < 1ft & Velocity < 1fps
Adult salmonid holding
Depth > 3ft & Velocity < 1 fps
Hydraulic complexity
△V from <1 fps to > 3fps in ≤ 20ft
Sturgeon spawning
Depth > 16.5ft & Velocity > 3.3 fps

TMT approved lower flows during construction:

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

Thank you!
Questions?

Results of 2012 Performance Standard Tests at Snake River and Lower Columbia River Dams

Mike Langeslay, USACE NWP

Presentation to Technical Management Team

05 December 2012

BiOp Performance Standards for Dam Passage Survival

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

Monitor average Dam Passage Survival ($\bar{S}_{Dam}$) of juvenile run-of-river spring and summer migrants.

- Action Agencies operate to achieve and maintain performance standards of:
  - Spring: $\bar{S}_{Dam} \geq 96\%$ (SE $\leq 1.5\%$) across all dams for yearling Chinook and steelhead
  - Summer: $\bar{S}_{Dam} \geq 93\%$ (SE $\leq 1.5\%$) across all dams for subyearling fall Chinook salmon

2012 OBJECTIVES
Snake River Performance Standard Tests

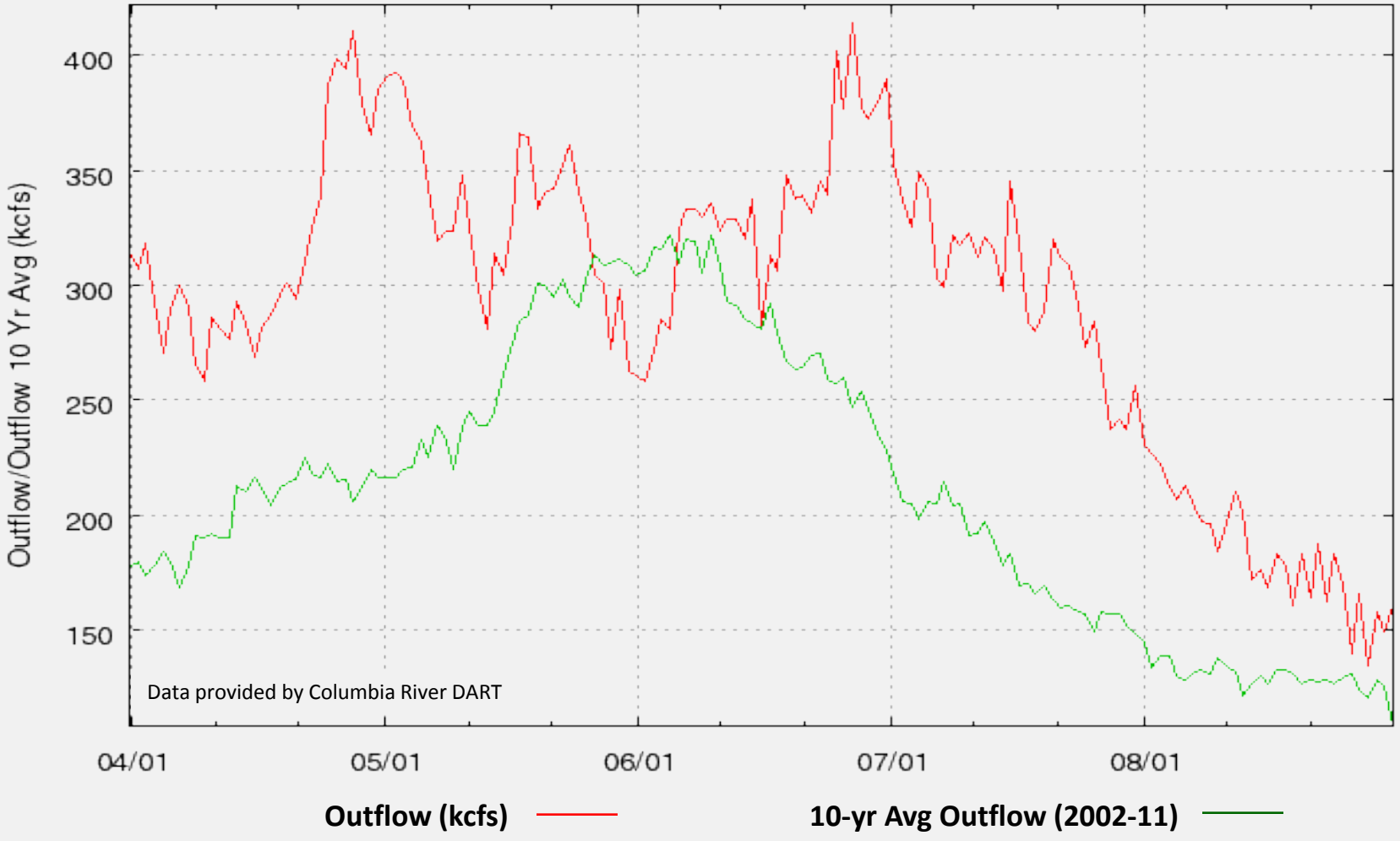
- **Little Goose Dam**
  - Spring – Measure $\bar{S}_{Dam}$ and Route-Specific ***S*** at 30% spill
  - Summer – Measure $\bar{S}_{Dam}$ and Route-Specific ***S*** at 30% spill
- **Lower Monumental Dam**
  - Spring – Measure $\bar{S}_{Dam}$ and Route-Specific ***S*** at Gas Cap spill
  - Summer – Measure $\bar{S}_{Dam}$ and Route-Specific ***S*** at 17k spill

2012 OBJECTIVES

Lower Columbia River Performance Standard Tests

- **McNary Dam**
  - Spring – Measure $\bar{S}_{Dam}$ and Route-Specific ***S*** at 40% spill
  - Summer – Measure $\bar{S}_{Dam}$ and Route-Specific ***S*** at 50% spill
- **John Day Dam**
  - Spring – Measure $\bar{S}_{Dam}$ at 30% and 40% spill
  - Summer – Measure $\bar{S}_{Dam}$ at 30% and 40% spill
- **The Dalles Dam**
  - Summer – Measure $\bar{S}_{Dam}$ at 40% spill
- **Bonneville Dam**
  - Summer – Measure $\bar{S}_{Dam}$ at 85k day/Gas Cap night and 95k spill

2012 WATER YEAR
Outflow at The Dalles Dam



2012 STUDY DESIGN
Fish Selection Criteria

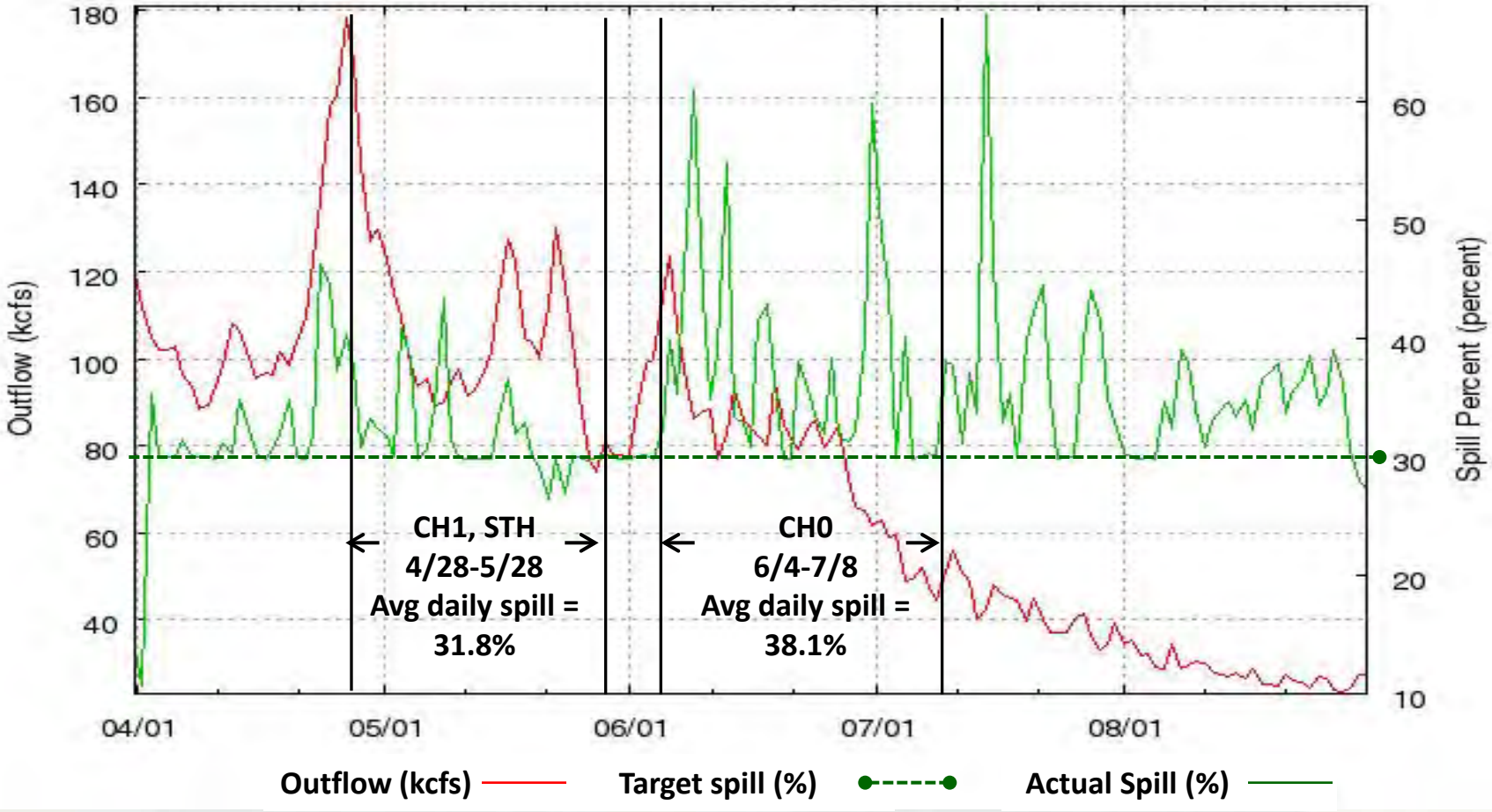
- **Run-of-River fish collected at Juvenile Fish Facilities, selected for tagging based on criteria:**
  - Species: yearling Chinook (CH1), yearling steelhead (STH), subyearling Chinook (CH0)
  - No previous PIT-tag or active tag
  - Alive with no severe or lethal injuries, diseases, etc.
  - Forklength ≥ 95.0 mm
- **Low rejection rate: 3.2-7.0%**

2012 RESULTS

- **Comparison of tagged fish vs. run-of-river fish**
  - Length and run timing similar (representative test group)
- **Snake River - # tagged & released**
  - Spring (April 28 – May 28): CH1 = 6,199, STH = 6,202
  - Summer (June 4 – July 8): CH0 = 10,963
- **Lower Columbia River - # tagged & released**
  - Spring (April 26 – June 1): CH1 = 5,848, STH = 5,838
  - Summer (June 12 – July 21): CH0 = 14,164

2012 RESULTS
Little Goose Dam

- Target spring & summer spill rate (4/3-8/31): 30%



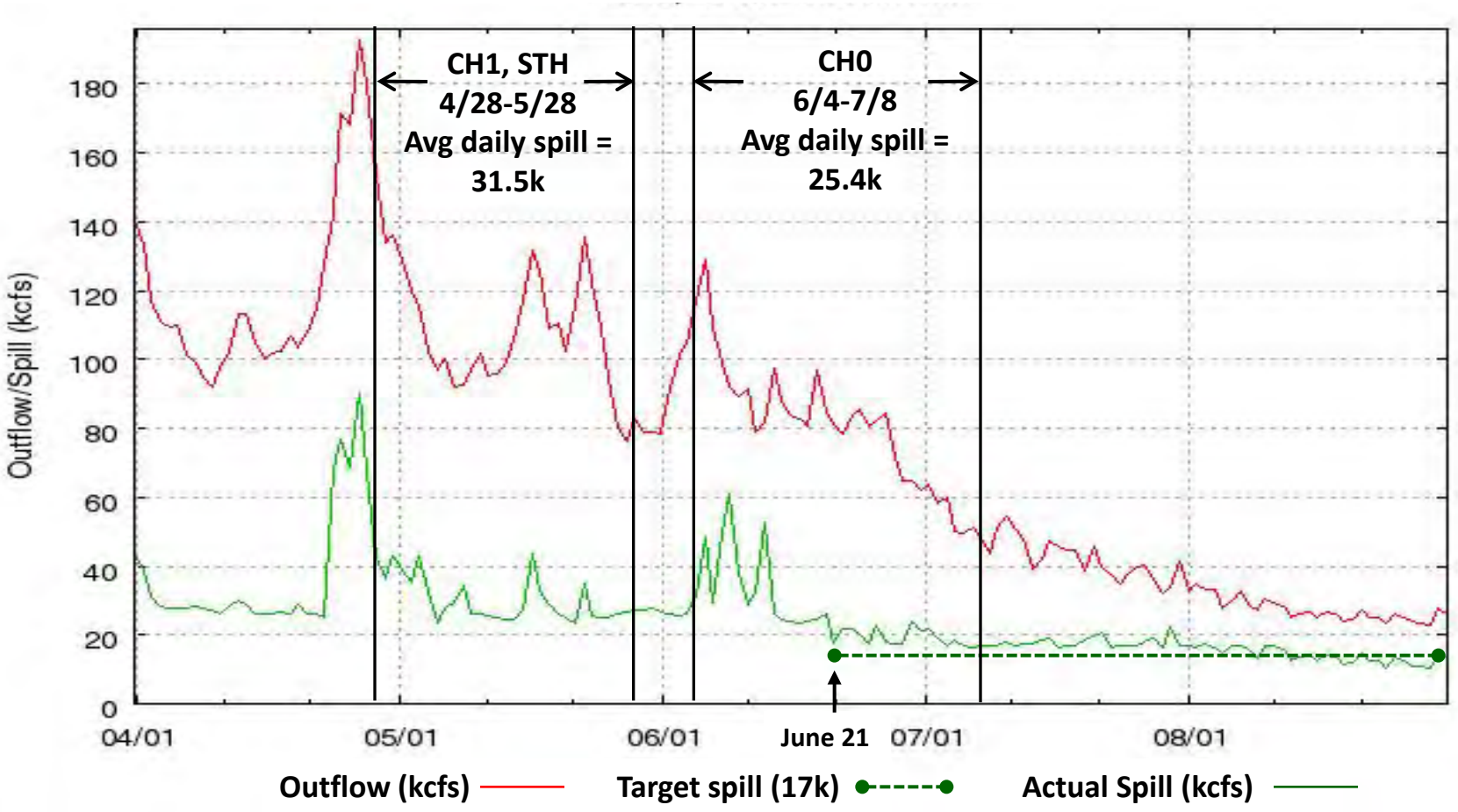
2012 RESULTS
Little Goose Dam

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Dam Passage Survival	**98.2%** (SE 0.8%)	**99.5%** (SE 0.8%)	**95.4%** (SE 0.9%)
BRZ-BRZ Survival	98.1% (SE 0.8%)	99.4% (SE 0.8%)	94.5% (SE 1.0%)
SPE (%)*	65.3%	56.1%	72.5%
FPE (%)	96.3%	98.0%	95.1%
FB Residence median (h)	2.6	2.7	2.8
TR Egress median (h)	0.6	0.7	0.8

*SPE = % passed spillway, including spillway weirs

2012 RESULTS
Lower Monumental Dam

Target spill rate: Spring (4/3-6/20) = Gas Cap (~20-29k); Summer (6/21-8/31) = 17k.



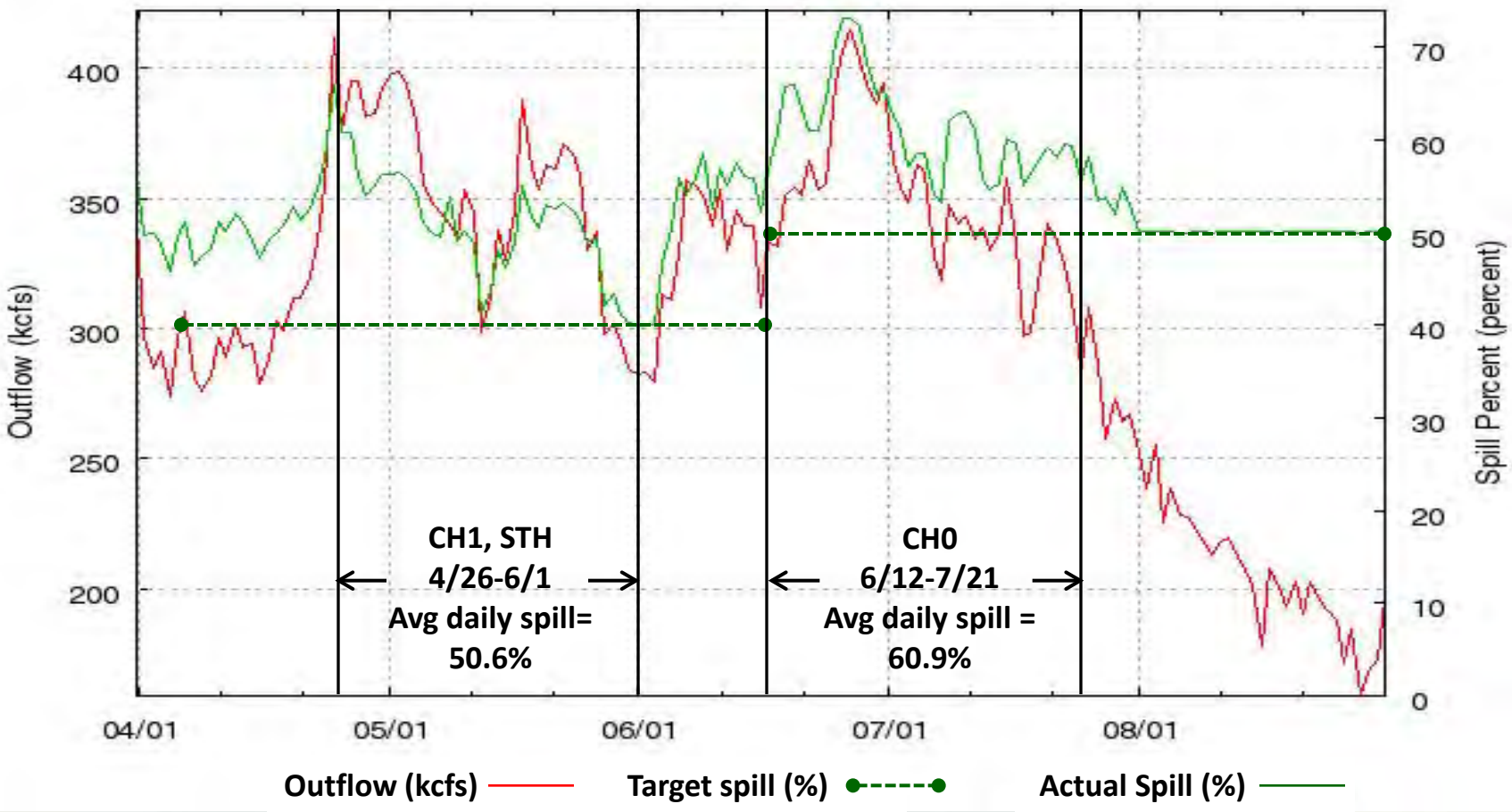
2012 RESULTS
Lower Monumental Dam

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Dam Passage Survival	**98.7%** (SE 0.9%)	**98.3%** (SE 0.2%)	**97.9%** (SE 0.8%)
BRZ-BRZ Survival	98.6% (SE 0.9%)	98.2% (SE 0.2%)	97.2% (SE 0.8%)
SPE (%)*	78.9%	65.9%	83.6%
FPE (%)	94.8%	96.5%	92.4%
FB Residence median (h)	2.4	2.2	2.6
TR Egress median (h)	0.4	0.4	0.5

*SPE = % passed spillway, including spillway weirs

2012 RESULTS
McNary Dam

Target spill rate: Spring (4/10-6/11) = 40%; Summer (6/12-8/31) = 50%.



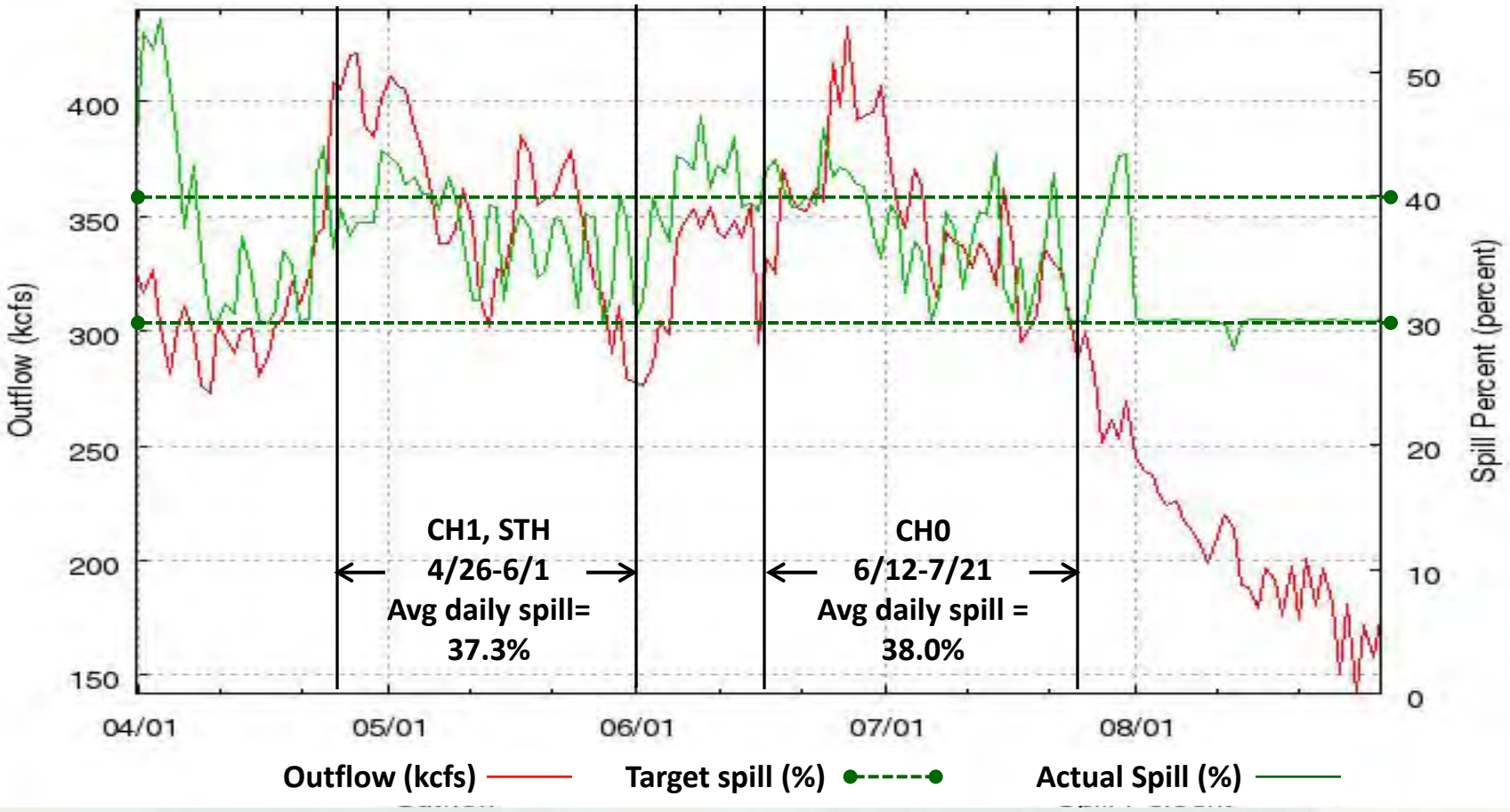
2012 RESULTS
McNary Dam

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Dam Passage Survival	**96.2%** (SE 1.4%)	**99.1%** (SE 1.8%)	**97.5%** (SE 1.1%)
BRZ-BRZ Survival	96.0% (SE 1.4%)	98.8% (SE 1.8%)	97.3% (SE 1.1%)
SPE (%)*	72.5%	83.2%	78.3%
FPE (%)	96.8%	97.7%	90.9%
FB Residence median (h)	1.8	1.8	1.8
TR Egress (h)	0.4	0.3	0.4

*SPE = % passed spillway, including spillway weirs

2012 RESULTS
John Day Dam

Target spring & summer spill rates (4/10-8/31): alternating blocks of 30% and 40%



2012 RESULTS
John Day Dam

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Dam Passage Survival	**96.7%** (SE 0.7%)	**97.4%** (SE 0.3%)	**94.1%** (SE 0.3%)
BRZ-BRZ Survival	96.6% (SE 0.7%)	96.9% (SE 0.3%)	93.9% (SE 0.3%)
SPE (%)*	74.6%	74.5%	69.6%
FPE (%)	92.7%	97.0%	85.8%
FB Residence median (h)	1.2	2.4	1.0
TR Egress (h)	0.5	0.5	0.5

*SPE = % passed spillway, including spillway weirs

John Day Dam – Dam Passage Survival
Second year of study

- **Yearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9627}{\left(\frac{0.9848}{0.9896}\right)} = \frac{0.9627}{0.9951} = 0.9673\left(\widehat{\text{SE}} = 0.0065\right)$$

- **Steelhead**

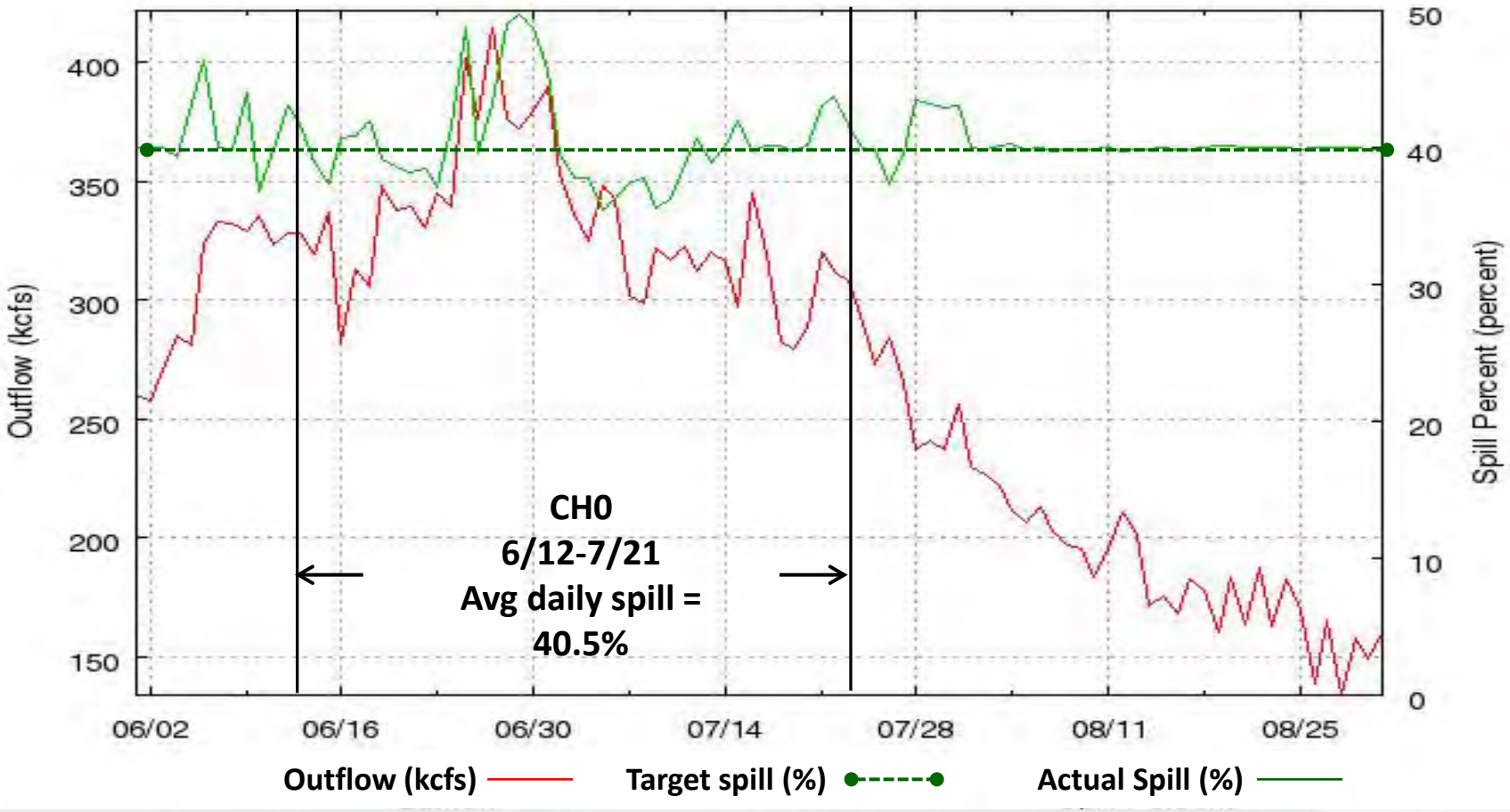
$$\hat{S}_{\text{Dam}} = \frac{0.9744}{\left(\frac{0.9781}{0.9752}\right)} = \frac{0.9744}{1.0030} \overset{\text{set}}{=} 0.9744\left(\widehat{\text{SE}} = 0.0028\right)$$

- **Subyearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9414}{\left(\frac{0.9966}{0.9925}\right)} = \frac{0.9414}{1.0041} \overset{\text{set}}{=} 0.9414\left(\widehat{\text{SE}} = 0.0031\right)$$

2012 RESULTS
The Dalles Dam (Summer only)

- Target spring & summer spill rate (4/10-8/31): 40%

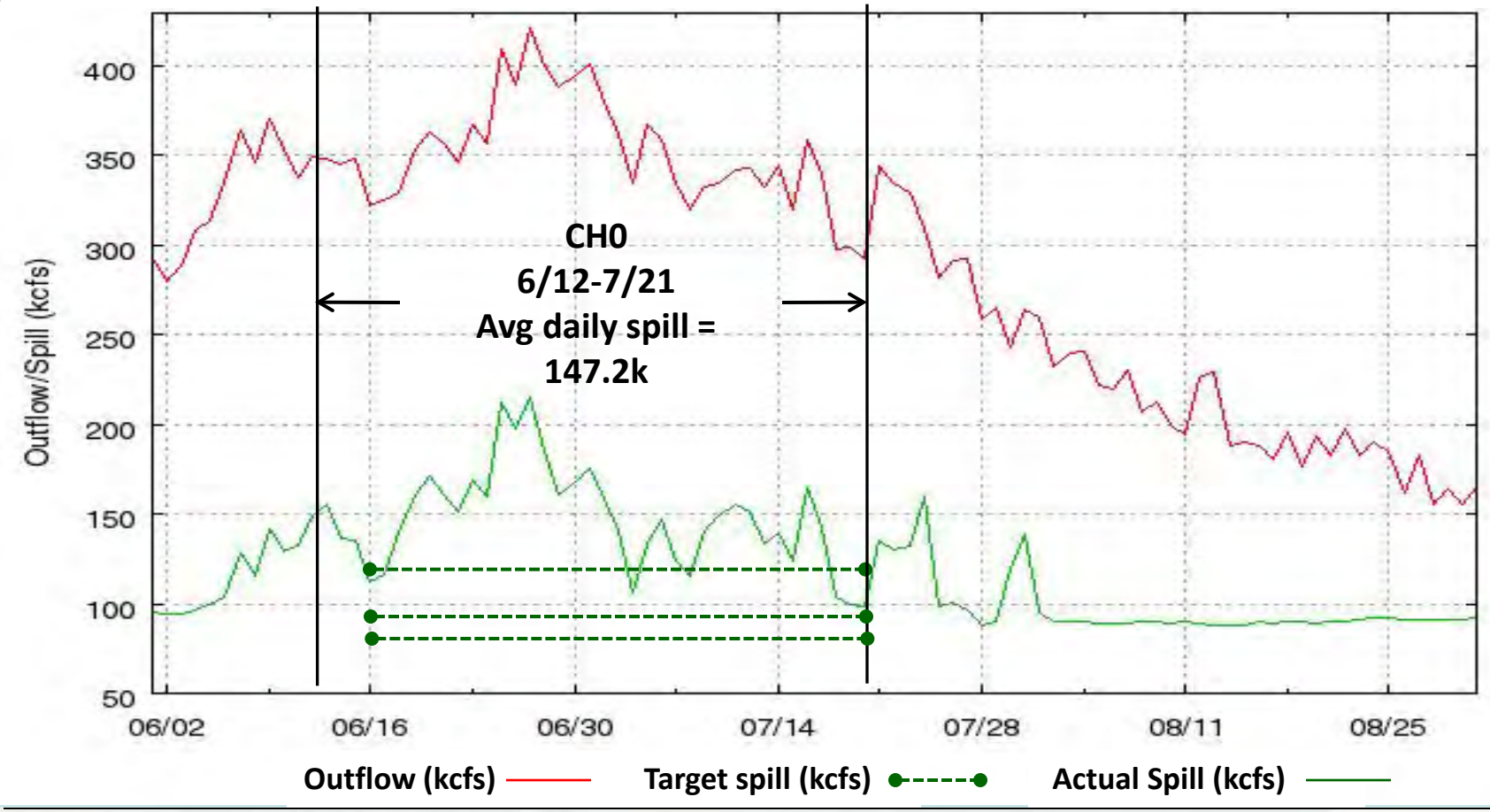


2012 RESULTS
The Dalles Dam

Metric	Subyearling Chinook Salmon
Dam Passage Survival	**94.7%** (SE 0.6%)
BRZ-BRZ Survival	94.6% (SE 0.6%)
SPE (%)	70.7%
FPE (%)	78.4%
FB Residence median (h)	1.1
TR Egress median (h)	0.2

2012 RESULTS
Bonneville Dam (Summer only)

Target summer spill rates (6/16-7/21) = alternating blocks of 85k day/120k night and 95 kcfs all hours



2012 RESULTS
Bonneville Dam

Metric	Subyearling Chinook Salmon
Dam Passage Survival	**97.4%** (SE 0.7%)
BRZ-BRZ Survival	97.4% (SE 0.5%)
SPE (%)	54.3%
FPE (%)	69.7%
FB Residence median (h)	0.5
TR Egress (h)	0.4

2012 SUMMARY

Snake and Lower Columbia River Performance Standard Tests

- **14 Survival Tests Implemented (6 SR, 8 LCR)**
  - All 14 achieved BiOp Survival Standards (9 of these did so with single-release estimates)
  - 13 of 14 achieved BiOp Precision Level Standard
- **Spill Targets Difficult to Attain Due to High Flows**
  - TDA and JDA within target range but JDA did not get enough 30% treatments to detect differences
  - All other projects spilled higher than target
  - LGS, LMN: Comparison of early spring (higher flows) vs. late spring (lower flows) showed no difference in dam survival

Next Steps

- Planned 2013 Performance Standard Testing
  - LGS – Summer (CH0)
  - LMN – Summer (CH0)

2012 RESULTS
Little Goose Dam – Route-Specific

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Spillway Weir (surface spill)	% Passed = 44% % Survival = 100.4%	% Passed = 40% % Survival = 100.1%	% Passed = 48% % Survival = 96.2%
Spillway (deep spill)	% Passed = 21% % Survival = 94.9%	% Passed = 16% % Survival = 99.2%	% Passed = 25% % Survival = 94.2%
JBS	% Passed = 31% % Survival = 98.8%	% Passed = 42% % Survival = 99.7%	% Passed = 23% % Survival = 98.1%
Turbine	% Passed = 4% % Survival = 87.0%	% Passed = 2% % Survival = 80.6%	% Passed = 5% % Survival = 81.3%

2012 RESULTS
Lower Monumental Dam – Route-Specific

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Spillway Weir (surface spill)	% Passed = 62% % Survival = 99.8%	% Passed = 53% % Survival = 99.1%	% Passed = 58% % Survival = 98.6%
Spillway (deep spill)	% Passed = 17% % Survival = 94.6%	% Passed = 13% % Survival = 97.4%	% Passed = 25% % Survival = 97.9%
JBS*	% Passed = 16% % Survival = 100.7%	% Passed = 31% % Survival = 99.1%	% Passed = 9% % Survival = 101.2%
Turbine	% Passed = 5% % Survival = 93.2%	% Passed = 3% % Survival = 81.4%	% Passed = 8% % Survival = 89.9%

*JBS Outfall flume relocated in 2012: extended downstream ~650 meters and into channel ~110 meters.

2012 RESULTS
McNary Dam – Route-Specific

Metric	Yearling Chinook Salmon	Juvenile Steelhead	Subyearling Chinook Salmon
Spillway Weir (surface spill)	% Passed = 8.1% % Survival = 97.6%	% Passed = 21.5% % Survival = 97.6%	n/a (no spillway weir in summer)
Spillway (deep spill)	% Passed = 62.3% % Survival = 97.1%	% Passed = 55.4% % Survival = 100.1%	% Passed = 76.3% % Survival = 98.0%
JBS*	% Passed = 23.4% % Survival = 93.6%	% Passed = 13.4% % Survival = 101.5%	% Passed = 12.2% % Survival = 100.8%
Turbine	% Passed = 3.1% % Survival = 95.5%	% Passed = 2.1% % Survival = 83.1%	% Passed = 8.9% % Survival = 88.1%

*JBS Outfall flume replaced and relocated in 2012.

Programmatic Sediment Management Plan Update & Lower Granite MOP

Stephen Hall P.E., PMP
Water Management Program Manager
Walla Walla District

December 5, 2012

US Army Corps of Engineers
BUILDING STRONG®

Programmatic Sediment Mgmt Program (PSMP) Purpose

- Identify / evaluate ways to manage sediment in lower Snake River reservoirs; examine sediment sources and transport means.
- Determine how to reduce sediment build-up, manage it in the reservoirs, and identify structures and/or operations changes to reduce maintenance…while providing authorized purposes.
- Actions will be consistent w/authorized project purposes
  - Commercial navigation
  - Irrigation water withdrawals
  - Recreation
  - Flow conveyance

PSMP Revision

- Original schedule:
  - PSMP/EIS complete in Dec 2012
  - Followed by a separate NEPA action for channel maintenance
  - Channel maintenance targeted for Dec 2013 – Mar 2014

- Current Schedule
  - Channel Maintenance still targeted for Dec 2013 -2014
  - Channel maintenance will be included in the PSMP/EIS, not evaluated under a separate NEPA action
  - Adding dredging to the EIS delayed public review to Dec 2012 (versus Jun 2012)

Proposed 2013/2014 Action

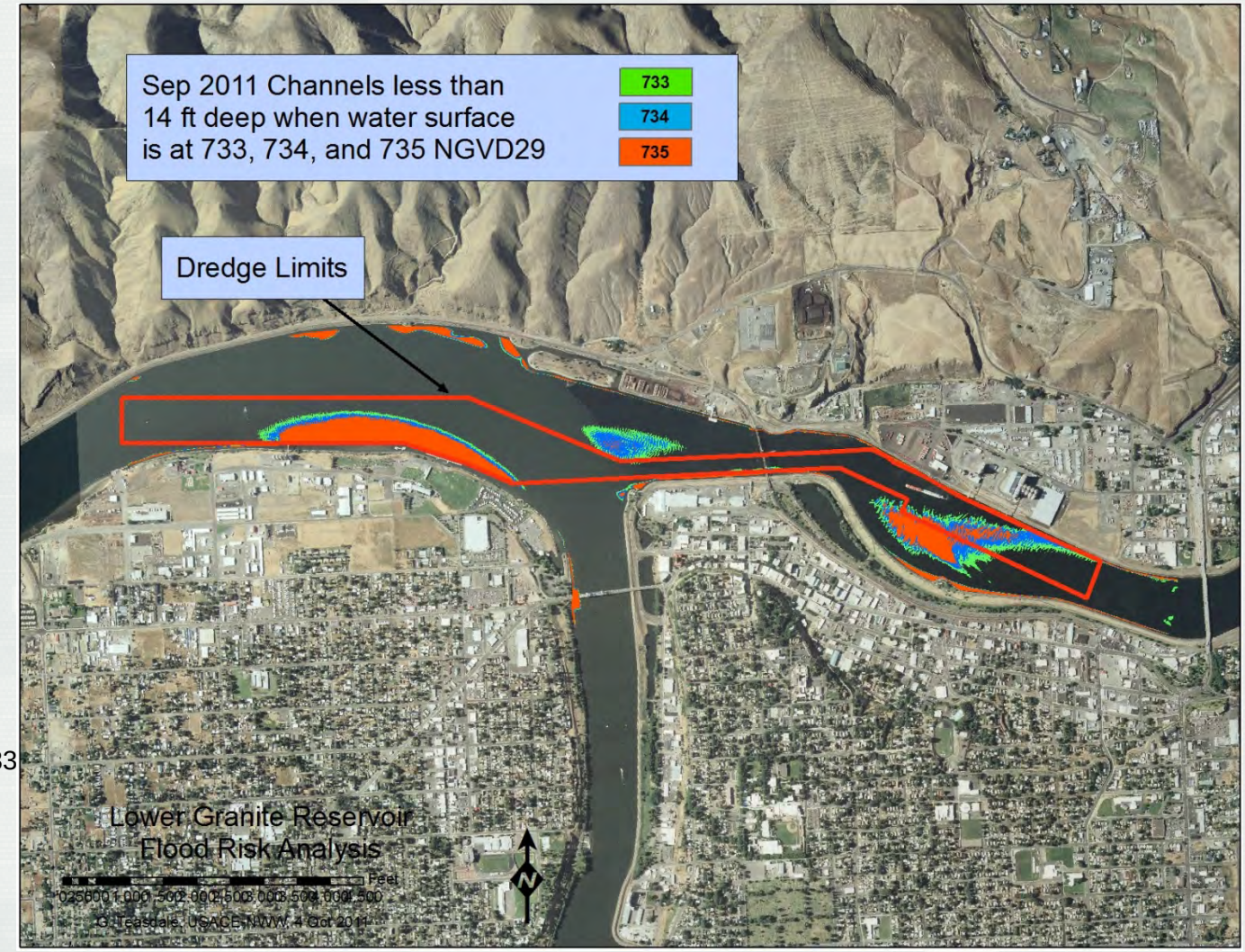
- One proposed site is the downstream navigation lock approach for Ice Harbor Dam (Snake RM 9.5)

- Sites in Lower Granite Pool
  - Federal channel (Snake RM 138 to Clearwater RM 2)
  - Berthing area for the Port of Lewiston (Clearwater RM 1-1.5)
  - Berthing area for the Port of Clarkston (Snake RM 137.9 and 139)
  - Port of Lewiston
  - Port of Clarkston

- Snake River Mile (RM) 116 just upstream of Knoxway Canyon, is the proposed in-water discharge site of the dredged materials.

Ice Harbor Approach in Snake River

Confluence of Snake and Clearwater Rivers

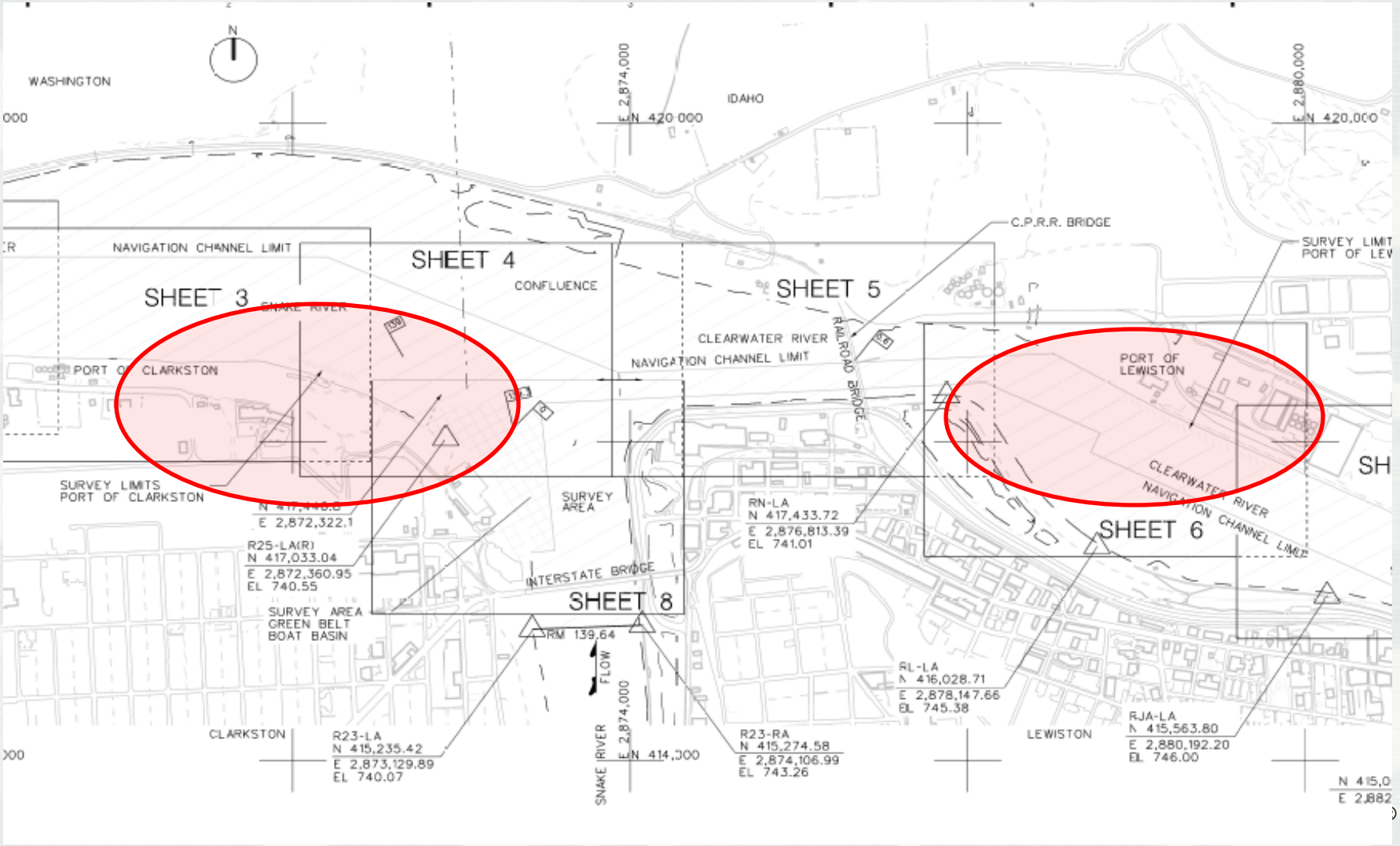


MOP is elevation 733

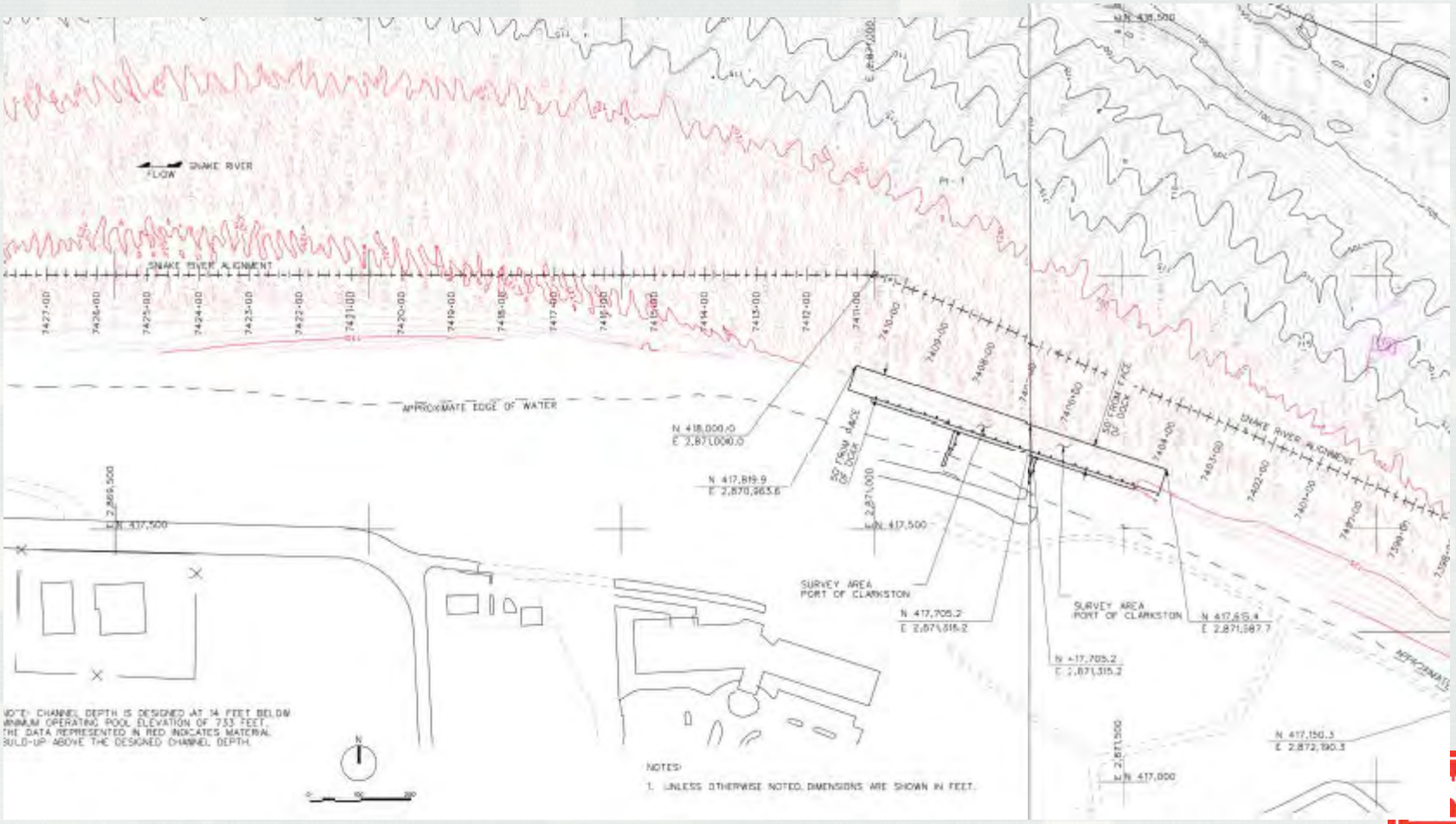
Programmatic Sediment Mgmt Program (PSMP) Schedule

- **Release Draft EIS for Public Review – 21 Dec 2012**
  - **Documents will be available at http://www.nww.usace.army.mil/**
  - **Public Information Meeting Jan 24, 2013 in Lewiston/Clarkston area**
  - **Public Comment Period Ends Feb 8, 2013**
- **Release Final EIS for Public Review – 26 Jul 2013**
- **Record of Decision – 17 Sep 2013**

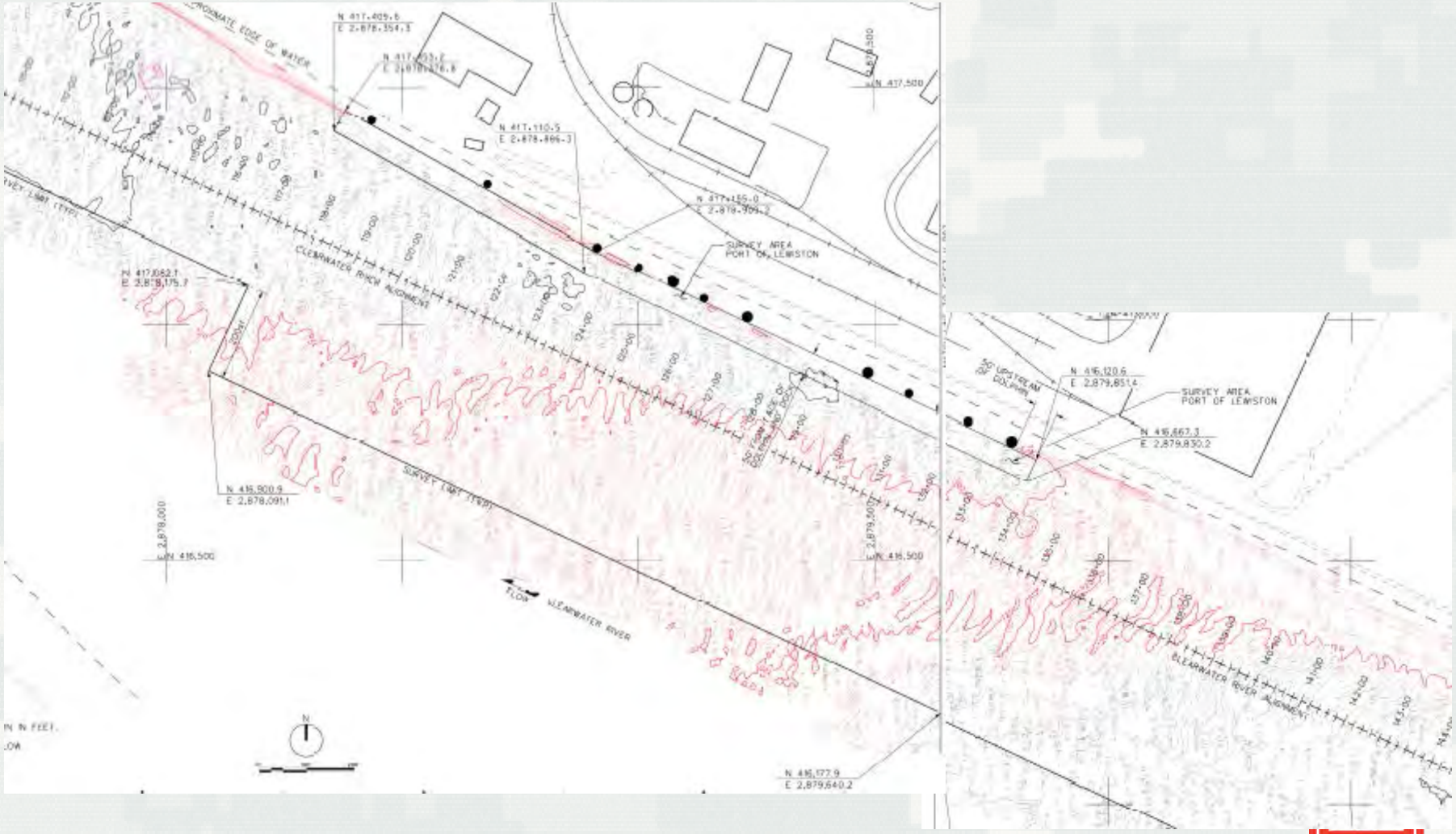
Preliminary Clearwater River Confluence Survey for 2012



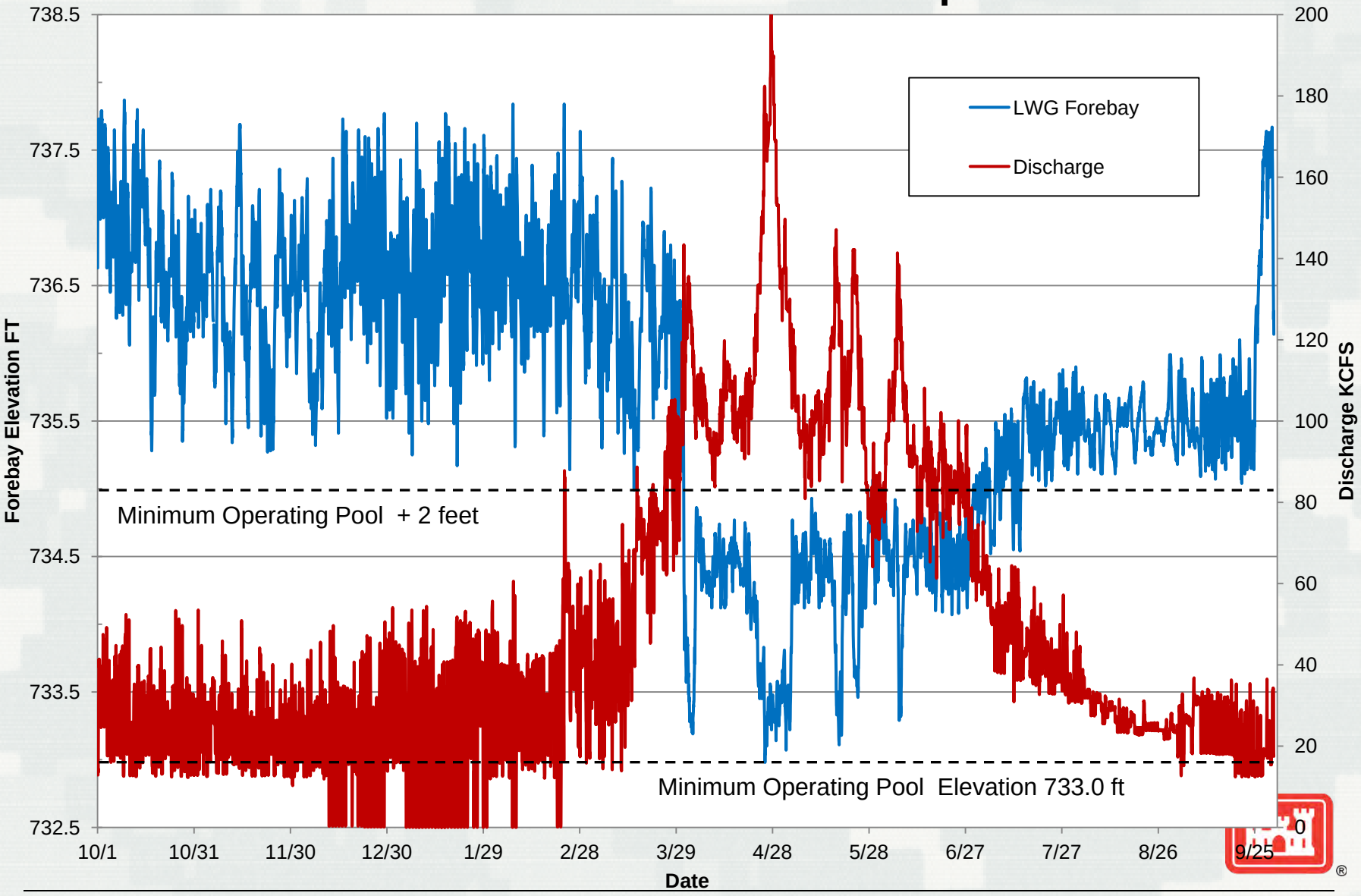
Port of Clarkston



Port of Lewiston



2012 Lower Granite Pool Operations



Questions?