TECHNICAL MANAGEMENT TEAM			
BOR :	*John Roache / Mary Mellema / Pat McGrane*	**BPA :**	*Robyn MacKay / Tony Norris / Scott Bettin*
NOAA-F :	*Paul Wagner / Richard Dominigue*	**USFWS :**	*David Wills / Steve Haeseker*
OR :	*Rick Kruger / Ron Boyce*	**ID :**	*Russ Kiefer*
WDFW :	*Cindy LeFleur*	**MT :**	*Jim Litchfield / Brian Marotz*
COE :	*Jim Adams / Cathy Hlebechuk / Bob Buchholz*		

COLUMBIA RIVER REGIONAL FORUM

Wednesday November 28, 2007 09:00 am - 4:00 pm

Meeting Location: Portland District, COE
Robert Duncan Plaza,3rd Floor Conference Room
333 S.W. First Avenue Portland, OR 97208
(203) 310-2162 PASS CODE = 4703150
To avoid disruptions to the meeting, please MUTE your Phone after you dial in!
Questions about the meeting may be referred to Robin Gumpert at (503) 248-4703

AGENDA: Annual Review of Lessons Learned 2007

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 2007 season in order to learn lessons that can enhance choices and decision making for 2008. 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.

1. **9:00 Welcome, get settled and introductions** - *Donna Silverberg, Facilitator*

2. **9:15 Conditions Review:** What were the water, weather and fish conditions that existed throughout the year? How did this year compare to others?
   a. Weather - *Kyle Dittmer, CRITFC*
      1. [Summary of WY 2007 Weather]
      2. [Winter 2007-08 Climate Forecast]
      3. [Forecast Summary]
   b. 2007 Water and Runoff Patterns - Comparison to Previous Years, project operations - *Cathy Hlebechuk, COE*
      1. [2007 TMT Runoff YE Review]
   c. Temperature/TDG Level Variations - *Jim Adams, COE*
      1. [TMT 2007 Year end Review - Water Quality]
   d. Fish Conditions: Spring/Summer Migrants, Survival Rates and Timing, Transportation Percentages - *Paul Wagner, Bill Muir, Steve Smith, NOAA; NMFS Science Center*
      1. [Direct Survival of Migrating Salmonid Smolts]
   e. Adult Fish Runs/Fisheries Review - *Cindy LeFleur, WDFW*
      1. [Columbia River Salmon & Steelhead Returns & 2007 Fisheries]
   f. Spring/Summer/Fall Fish Passage - *Jerry McCann, Fish Passage Center*
      1. [Hatchery Subyearling Survival LWG to MCN 1998-2007]
   g. Lessons Learned from the 2007 Conditions Review?

(NOTE: A break will be taken around 10:30)

3. **11:15 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?
   a. Vernita Bar Operations - *Russell Langshaw, Grant County PUD*
      1. [Hanford Reach Fall Chinook Protection Program - 2006-2007]
   b. Transportation Operations - *Paul Wagner, NOAA*
   c. TDG Management & Impacts on Fish Passage - *FPAC*
      1. [Lo Mo Spill Operations 2007 -*NOAAF*]
   d. Emergency Spill Operations at LoMo - *Paul Wagner, NOAA*
      1. [LMN Emergency Spill Operation]
   e. MOP Operations - Summary of Operations and Impacts -*COE*
   f. Navigation Issues - *Summary from Towboaters Assoc or COE*
      1. [NWW Navigation - *COE*]
   g. Mechanical Issues/Scheduled Outages - *FPAC will address any specific "surprises"*
      1. [End of Year Equipment Challenges - *NOAAF*]
   h. Lessons Learned from these specific operations?

(NOTE: NOON LUNCH: 1:00pm CONTINUE MEETING. From 12:40-1:00 pm, there will be a short TMT business meeting. Topics will include: 1) Chum Operations and 2) Snake River Zero flow)

4. **Approx. 2:00 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?
   a. Libby & Hungry Horse Spring/Summer Operations [Libby 2007 Operations]
      1. VARQ - *Cathy Hlebechuk, COE, Brian Marotz, MT, and John Roache, BOR*
      2. [Hungry Horse Operations 2007]
   b. Dworshak Spring/Summer Operations - *Greg Haller, Nez Perce and Jim Adams, COE*
   c. Upper Snake/Hells Canyon Operations - *John Roache, BOR and Rich Domingue, NOAA*
      1. [Upper Snake Operations 2007]
      2. [Hells Canyon Interim Agreement]
   d. Grand Coulee Operations - *John Roache, BOR*
      1. [Grand Coulee Operations 2007]
      2. [SOR 2007-1]
      3. Other
   e. Bonneville Operations
      1. Spring Creek Operations - *Dave Wills, USFWS*
      2. Chum Operations - *Paul Wagner, NOAA*
   f. Lessons Learned from the 2007 Reservoir Operations Review?

5. **3:30 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?

6. **4:00 Adjourn**

(NOTE: Lunch will be brought in for all participating in or attending the meeting.) **A $6 contribution is requested.** RSVP date is November 21. Your RSVP is required to guarantee enough food for everyone! To RSVP and to make special food requests (e.g. vegetarian) please call 503-248-4703 and speak with Erin Halton. **Please note:** Due to security at the location, you will need to be on the security list in advance of the meeting and will need identification to get into the building. Please call Jim Adams, COE at 503-808-3938.

Technical Management Team 2007 Year End Review

Runoff and Operations

Cathy Hlebechuk

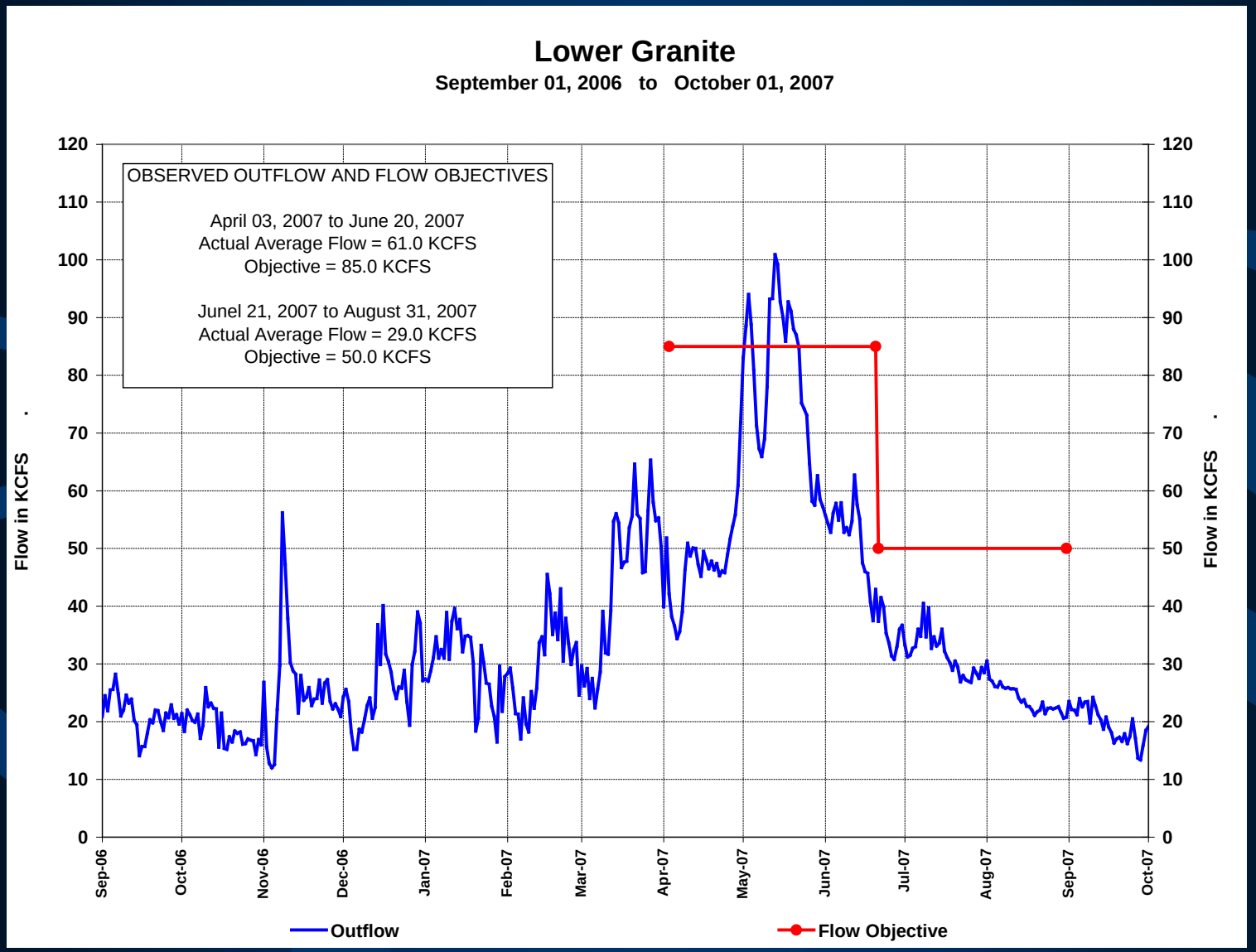
November 28, 2007

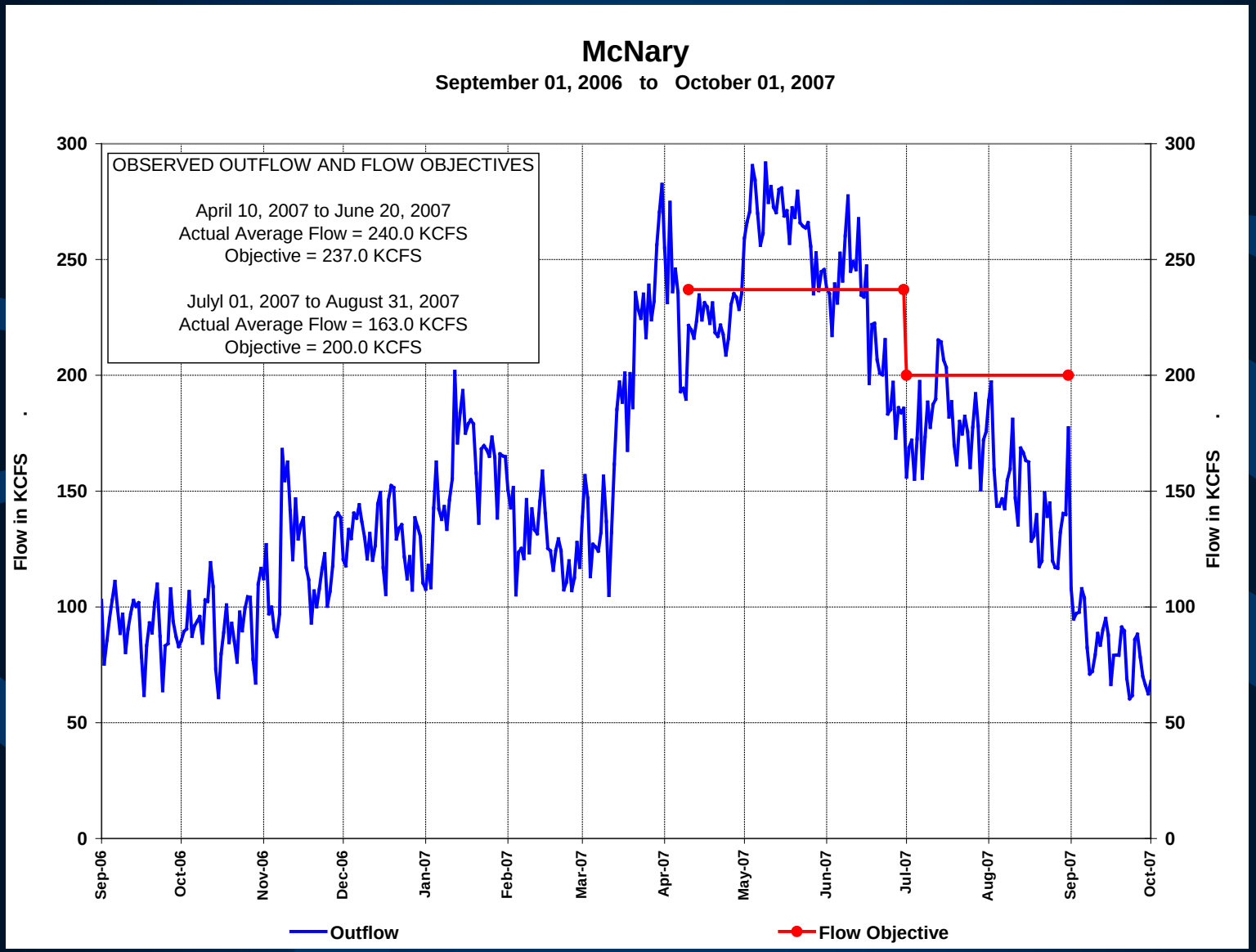
Runoff Volumes

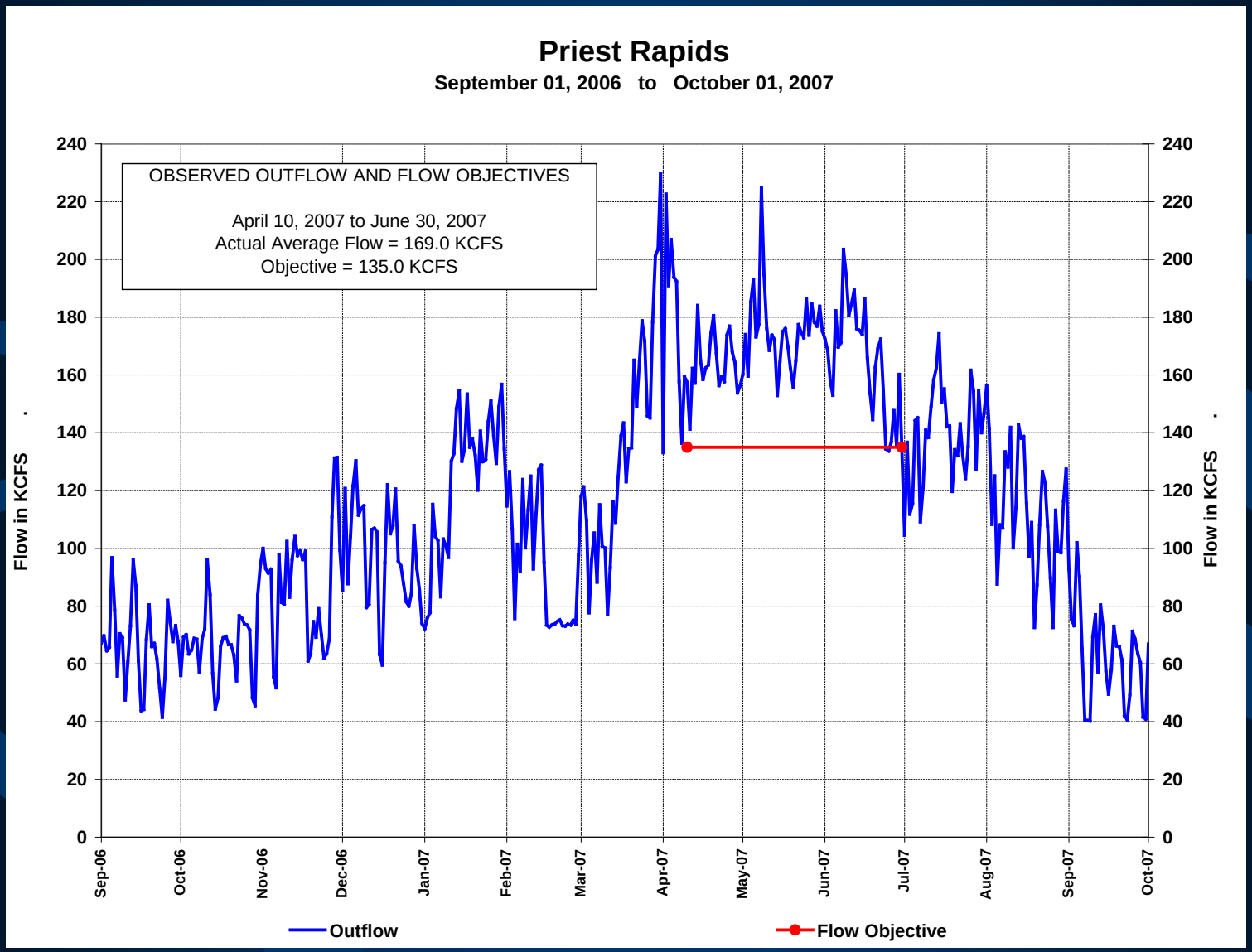
- **OBSERVED 2004, 2005, 2006 AND 2007 VOLUME RUNOFF IN MILLION ACRE FEET**

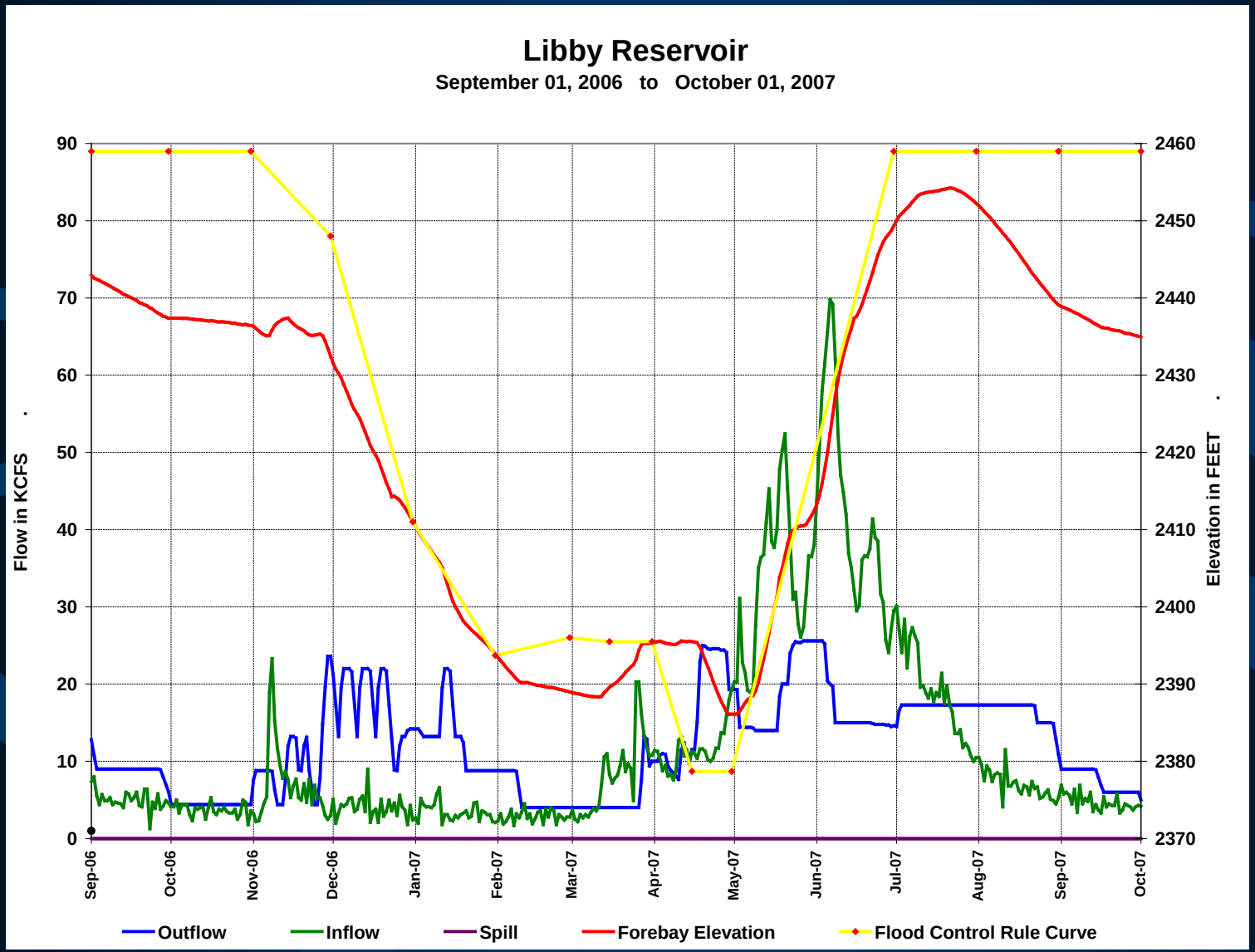
	JAN-JUL 04		JAN-JUL 05		JAN-JUL 06		JAN-JUL 07	
PROJECT	OBS	%	OBS	%	OBS	%	OBS	%
HUNGRY HORSE	1.9	85	1.8	80	2.4	106	1.9	86
LIBBY	4.6	73	5.9	94	6.9	110	7.3	115
ALBENI FALLS	11.6	76	11.9	78	16.2	106	13.1	86
GRAND COULEE	50.3	80	54.4	86	66.9	106	63.9	102
DWORSHAK	3.0	85	2.5	69	3.5	99	2.7	77
LOWER GRANITE	20.7	69	18.1	60	32.2	107	18.9	63
THE DALLES	83.0	77	81.3	76	114.7	107	95.7	89

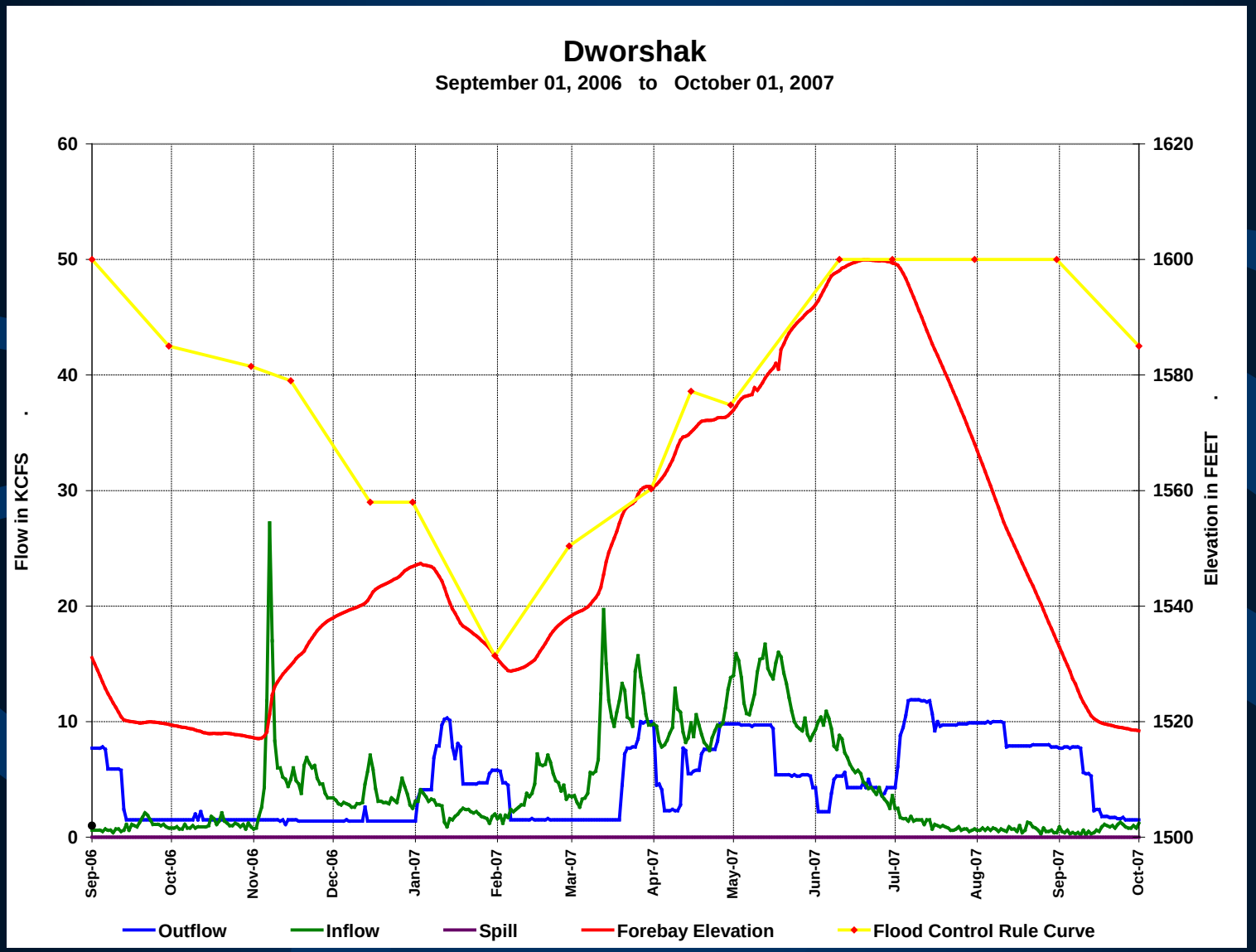
	APR-AUG 04		APR-AUG 05		APR-AUG 06		APR-AUG 07	
PROJECT	OBS	%	OBS	%	OBS	%	OBS	%
HUNGRY HORSE	1.8	86	1.5	71	2.1	104	1.6	77
LIBBY	4.7	75	5.6	89	6.6	106	6.8	109
ALBENI FALLS	10.4	77	9.6	71	13.9	104	10.1	76
GRAND COULEE	49.3	82	48.8	81	61.2	101	57.4	95
DWORSHAK	2.5	91	1.7	62	2.7	100	1.8	67
LOWER GRANITE	16.1	70	14.4	63	25.6	112	13.5	59
THE DALLES	73.0	78	68.5	74	97.5	105	78.9	85


Lower Granite
September 01, 2006 to October 01, 2007
OBSERVED OUTFLOW AND FLOW OBJECTIVES
April 03, 2007 to June 20, 2007
Actual Average Flow = 61.0 KCFS
Objective = 85.0 KCFS
Junel 21, 2007 to August 31, 2007
Actual Average Flow = 29.0 KCFS
Objective = 50.0 KCFS
Flow in KCFS
Flow in KCFS
120
110
100
90
80
70
60
50
40
30
20
10
0
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Outflow
Flow Objective


McNary
September 01, 2006 to October 01, 2007
OBSERVED OUTFLOW AND FLOW OBJECTIVES
April 10, 2007 to June 20, 2007
Actual Average Flow = 240.0 KCFS
Objective = 237.0 KCFS
Julyl 01, 2007 to August 31, 2007
Actual Average Flow = 163.0 KCFS
Objective = 200.0 KCFS
Flow in KCFS
300
250
200
150
100
50
0
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Outflow
Flow Objective


Priest Rapids
September 01, 2006 to October 01, 2007
OBSERVED OUTFLOW AND FLOW OBJECTIVES
April 10, 2007 to June 30, 2007
Actual Average Flow = 169.0 KCFS
Objective = 135.0 KCFS
Flow in KCFS
240
220
200
180
160
140
120
100
80
60
40
20
0
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Outflow
Flow Objective

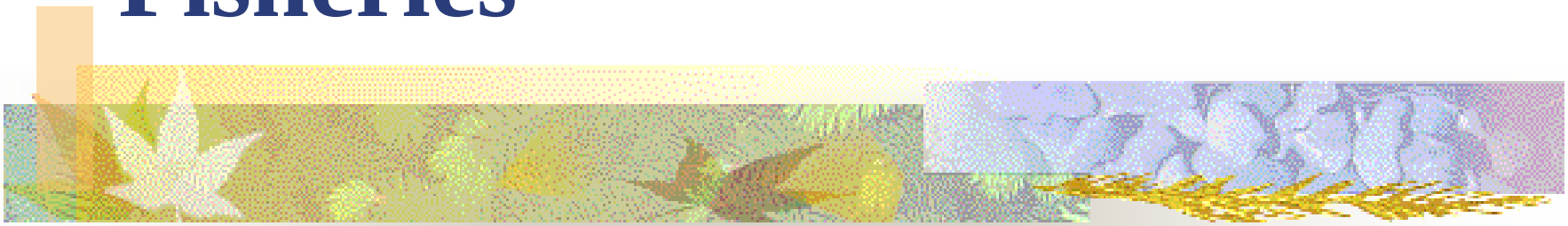

Libby Reservoir
September 01, 2006 to October 01, 2007
Flow in KCFS
Elevation in FEET
90
80
70
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
2390
2380
2370
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Outflow
Inflow
Spill
Forebay Elevation
Flood Control Rule Curve


Dworshak
September 01, 2006 to October 01, 2007
Flow in KCFS
Elevation in FEET
60
50
40
30
20
10
0
1620
1600
1580
1560
1540
1520
1500
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Outflow
Inflow
Spill
Forebay Elevation
Flood Control Rule Curve

Equipment Challenges

- McNary spill gate hoists - 2007
- John Day line outage/turbines 1-4 - 2006
- The Dalles wire ropes - 2005
- Bonneville Tie Cranes - 2007

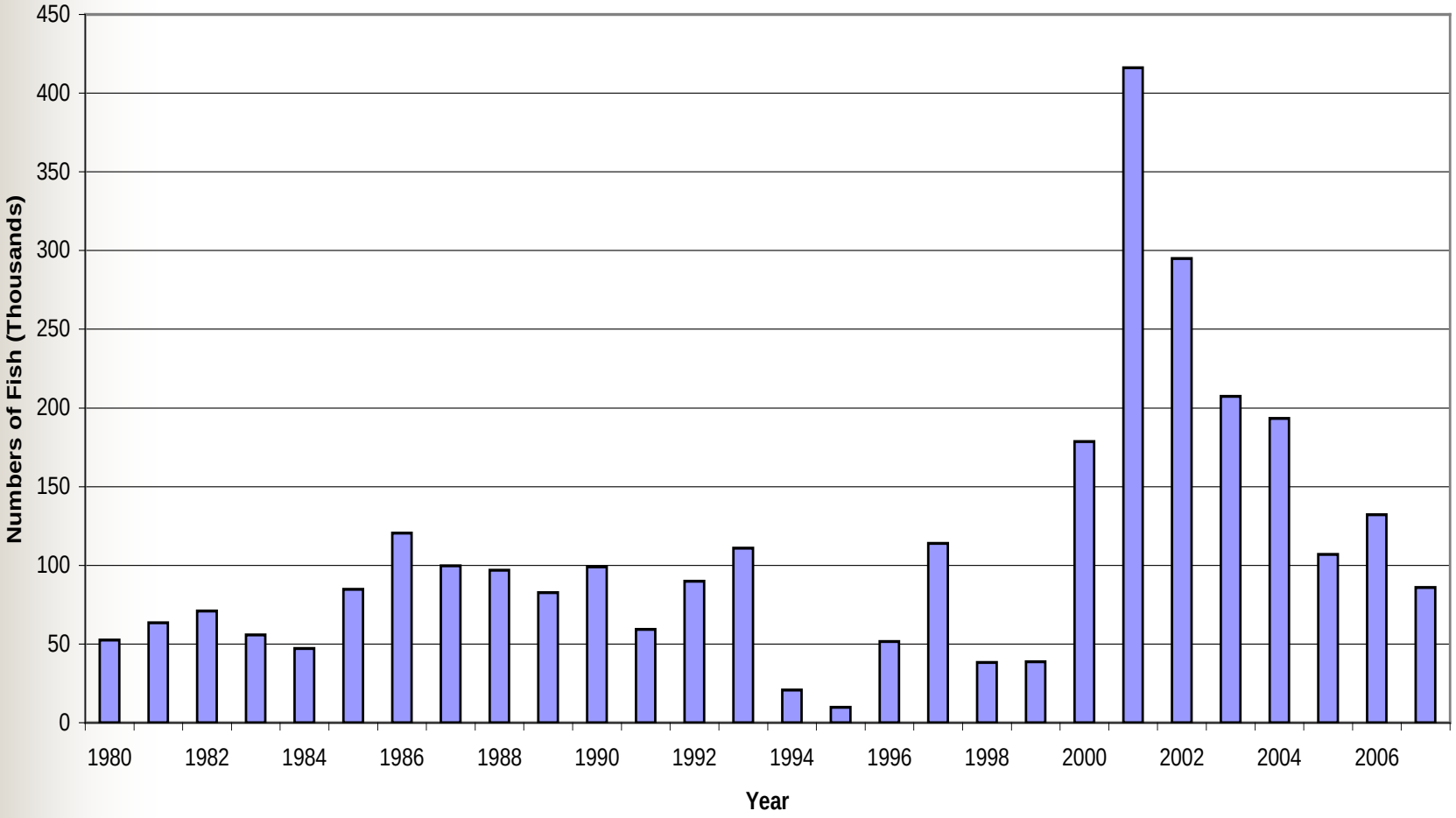
Columbia River Salmon and Steelhead Returns and 2007 Fisheries



TMT – November 28, 2007

Presented by Cindy LeFleur - WDFW

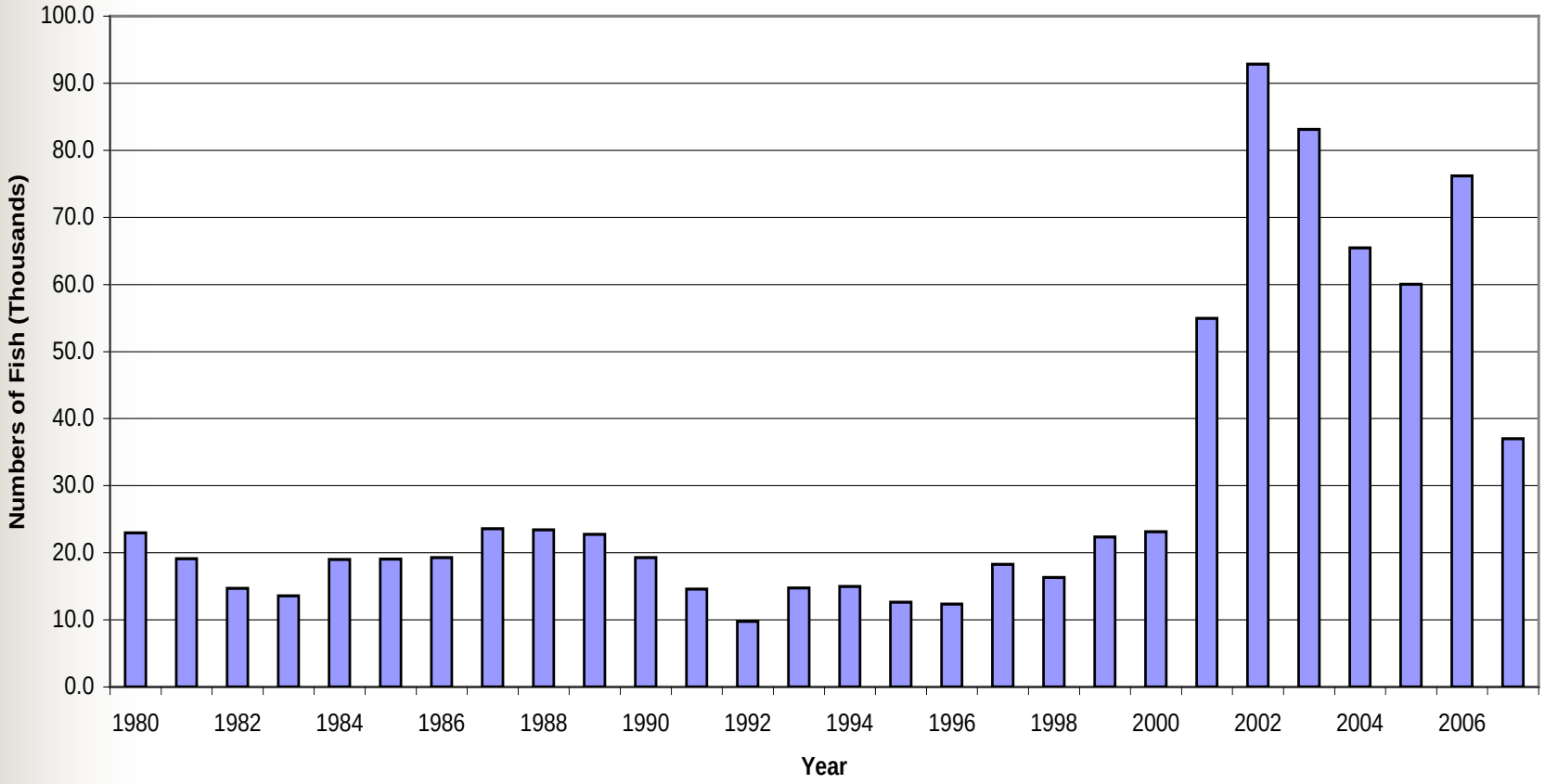
Returns to the Columbia River of Upriver Spring Chinook



Spring Chinook Fisheries

- Sport
  - ~83,000 angler trips and 6,500 Chinook below Bonneville – 600 Chinook above Bonneville
- Commercial
  - ~2,700 Chinook – average $7.50/pound
- Treaty
  - C&S Catch ~6,100 Chinook

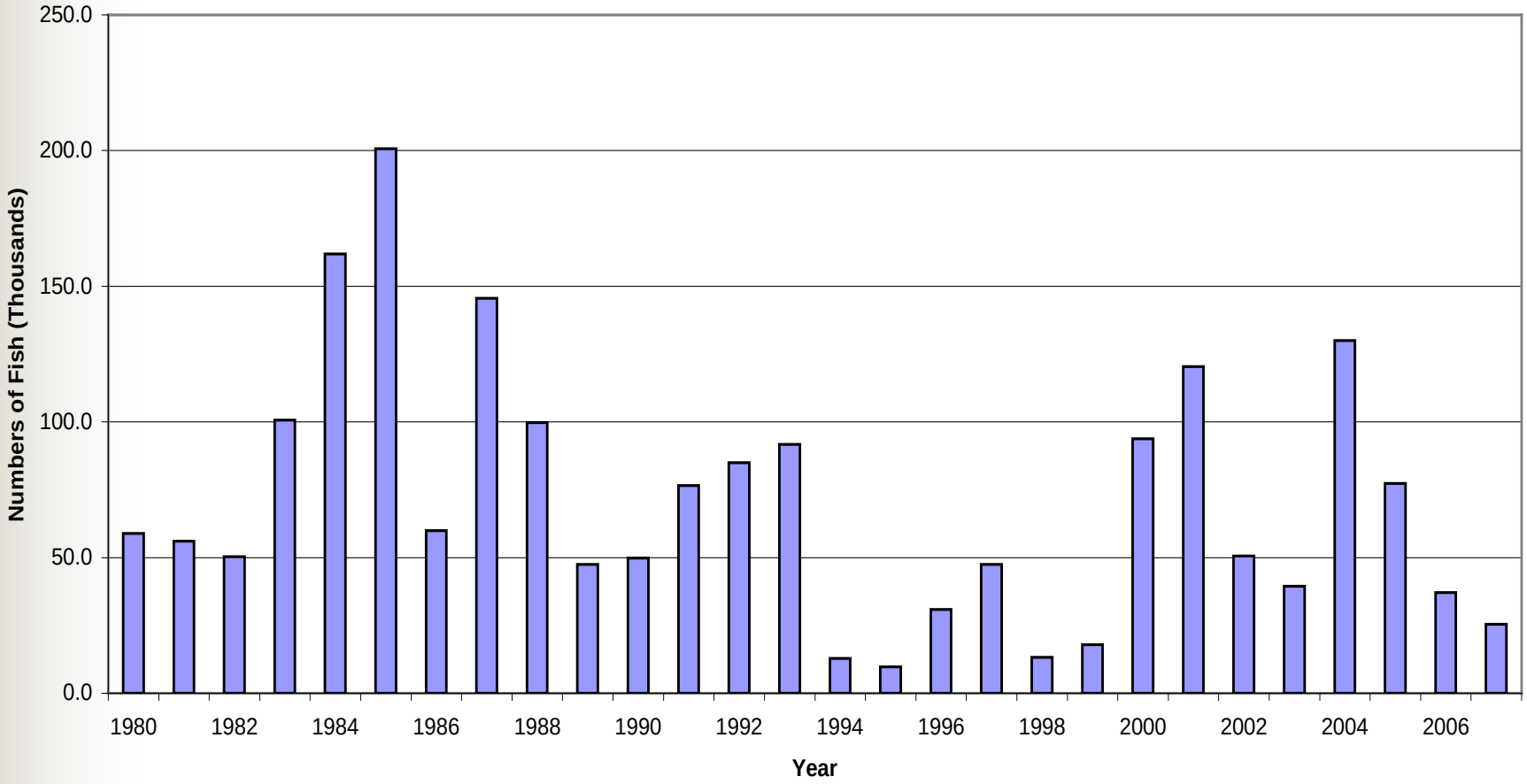
Returns to the Columbia River of Upper Columbia Summer Chinook (Wenatchee/Okanogan)



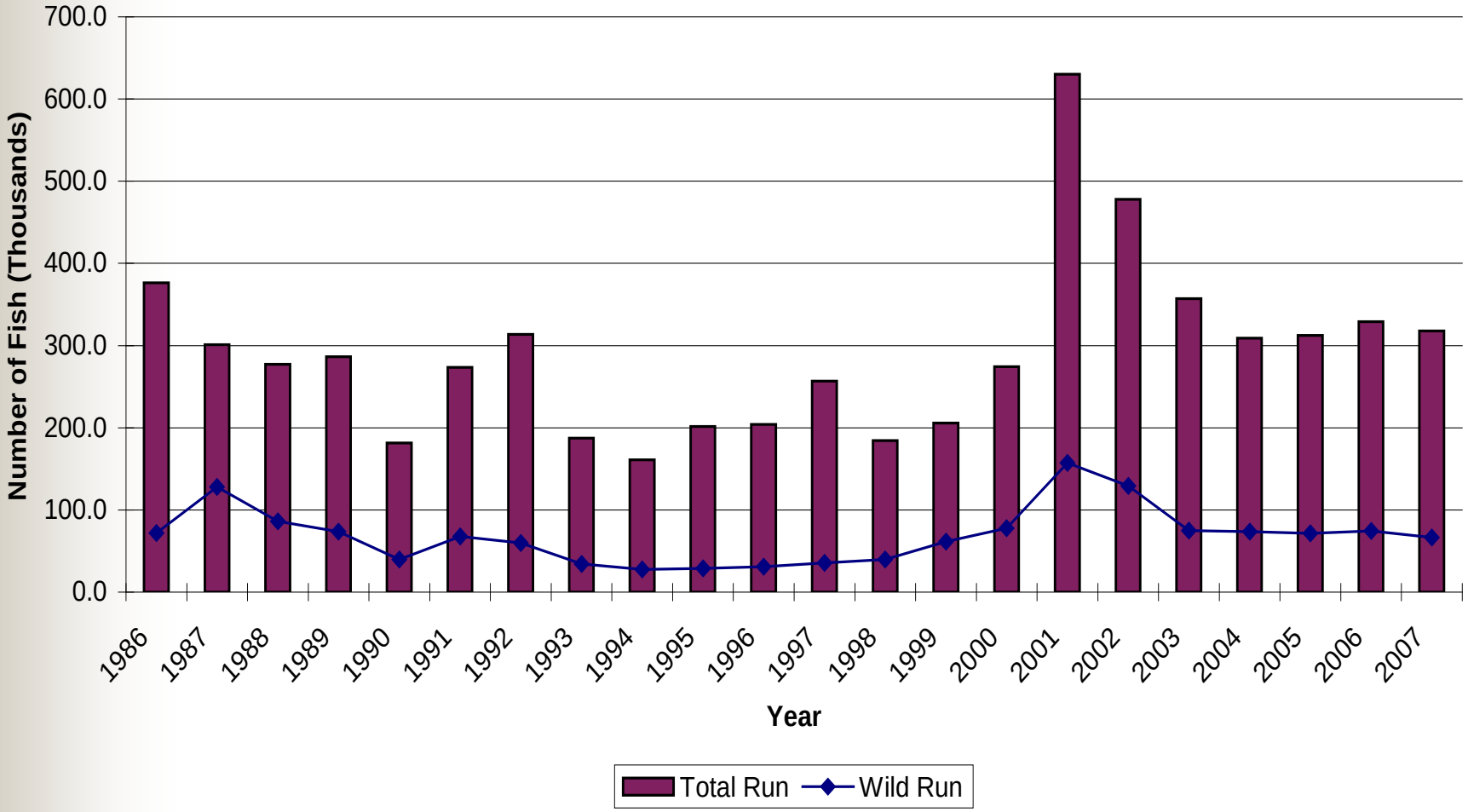
Summer Chinook Fisheries

- Sport
  - ~23,700 angler trips and 2,400 Chinook below Bonneville – 60 Chinook above Bonneville
- Commercial
  - ~1,100 Chinook – average $2.90/pound
- Treaty
  - 4,600 Chinook (commercial)

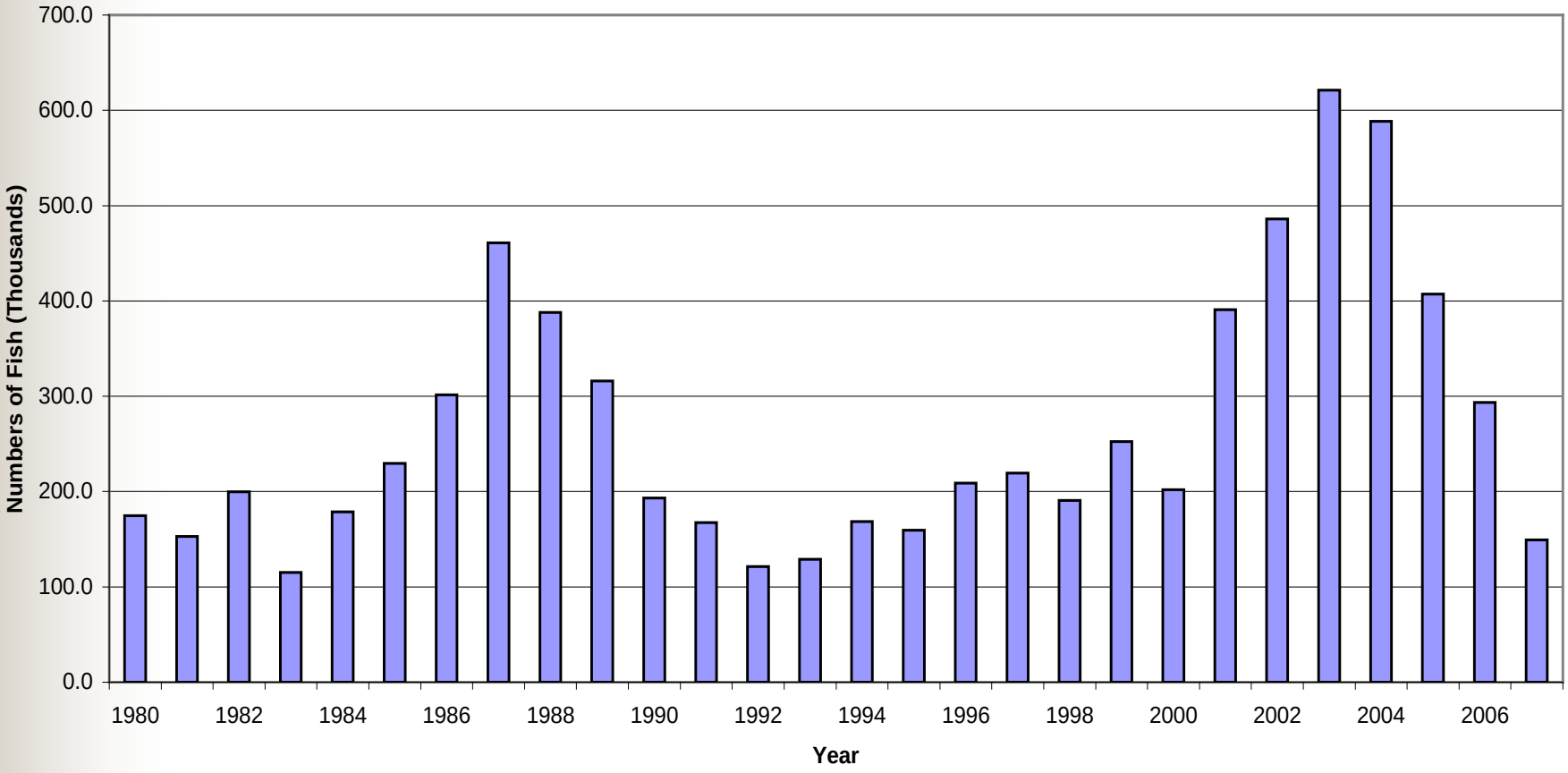
Returns to the Columbia River of Sockeye



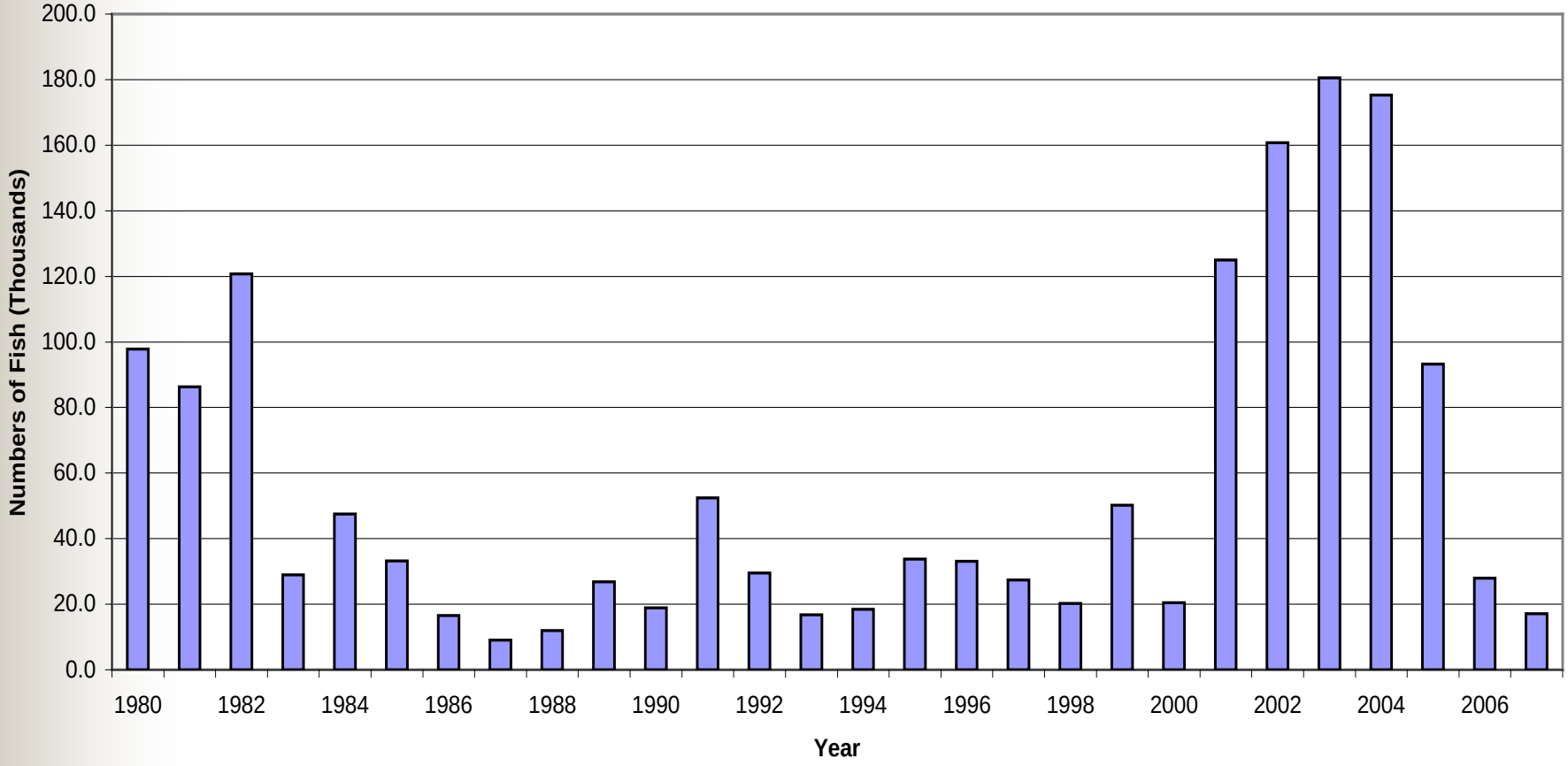
Bonneville Dam Counts of Summer Steelhead



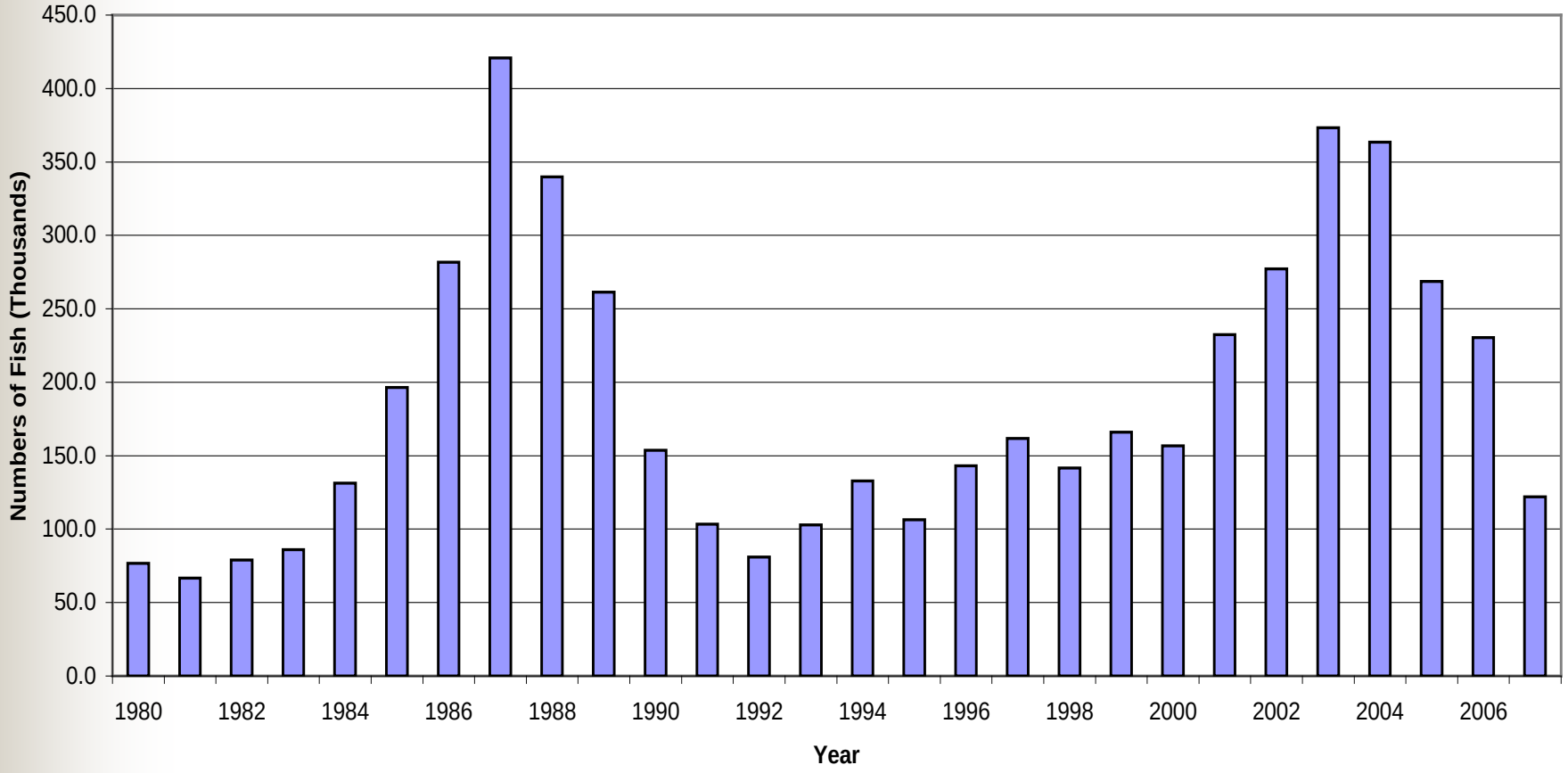
Returns to the Columbia River of Upriver Fall Chinook



Returns to the Columbia River of Bonneville Pool Hatchery Fall Chinook (Spring Creek Hatchery)



Returns to the Columbia River of Upriver Bright Fall Chinook (Hanford/Snake River)



Fall Chinook Fisheries

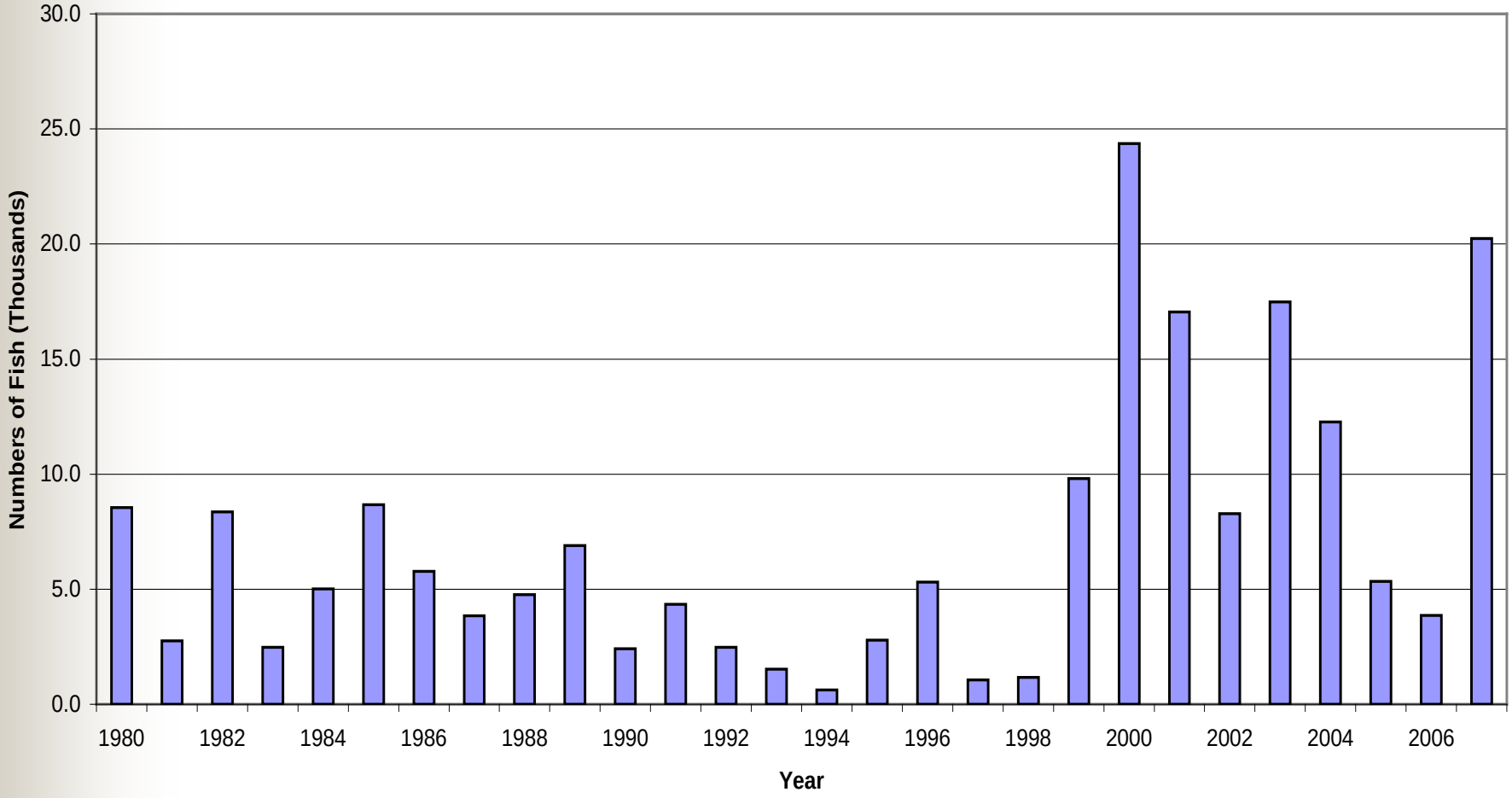
- Sport
  - ~13,400 Chinook and 8,300 coho
  - ~4,700 steelhead
- Commercial
  - ~11,900 Chinook and 30,200 coho
- Treaty
  - ~35,000 Chinook and 16,000 steelhead

Chum Returns

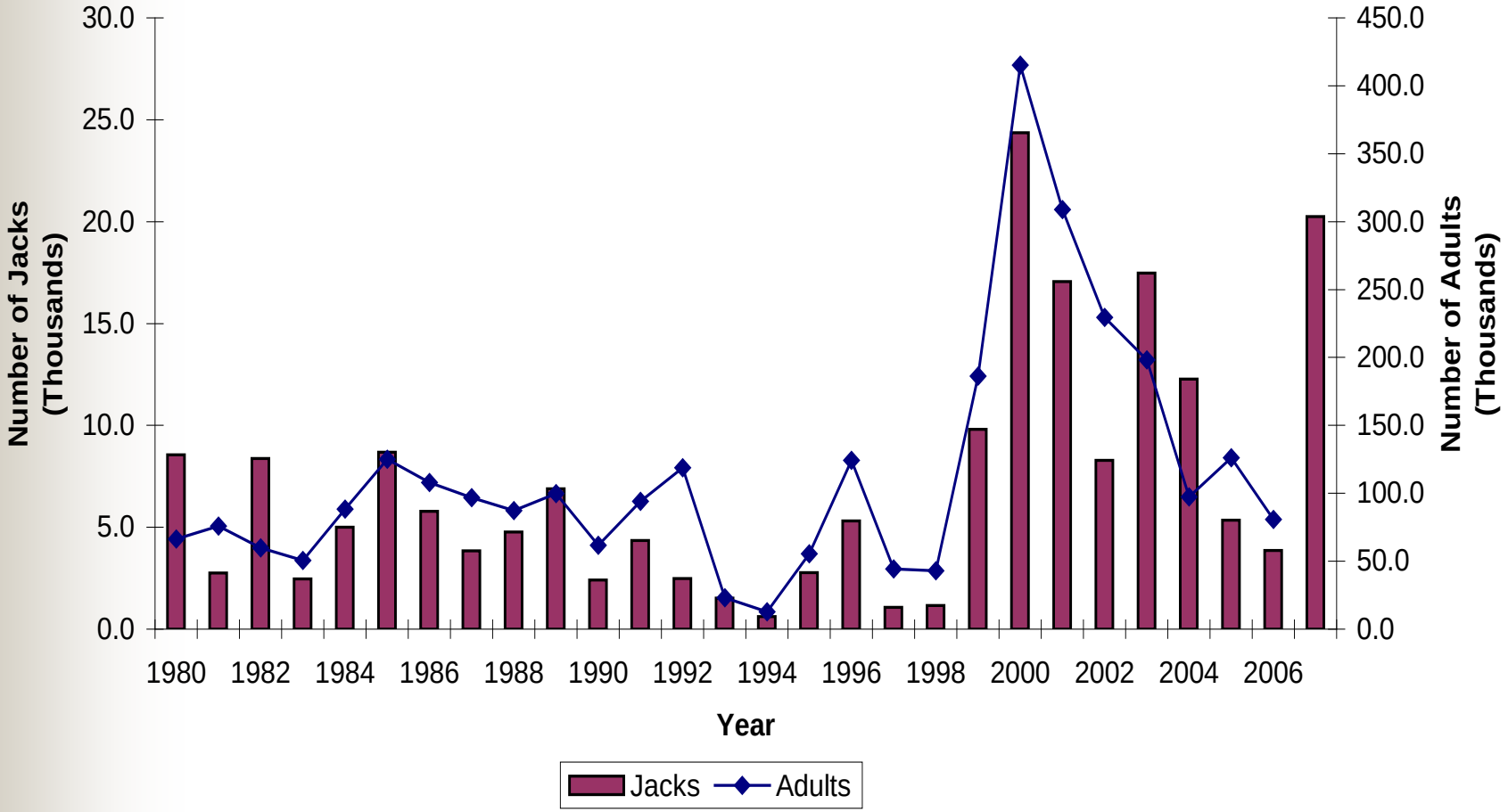
Grays River System	
Year	Peak Count
2003	8,114
2004	10,932
2005	3,032
2006	4,498
2007	1,400 *
* Thru Nov. 13. Peak count likely not occurred yet.	

Ives Island	
Year	Peak Live Count
2003	296
2004	110
2005	63
2006	127
2007	58 *
* Thru Nov. 21. Peak count may not have occurred yet.	

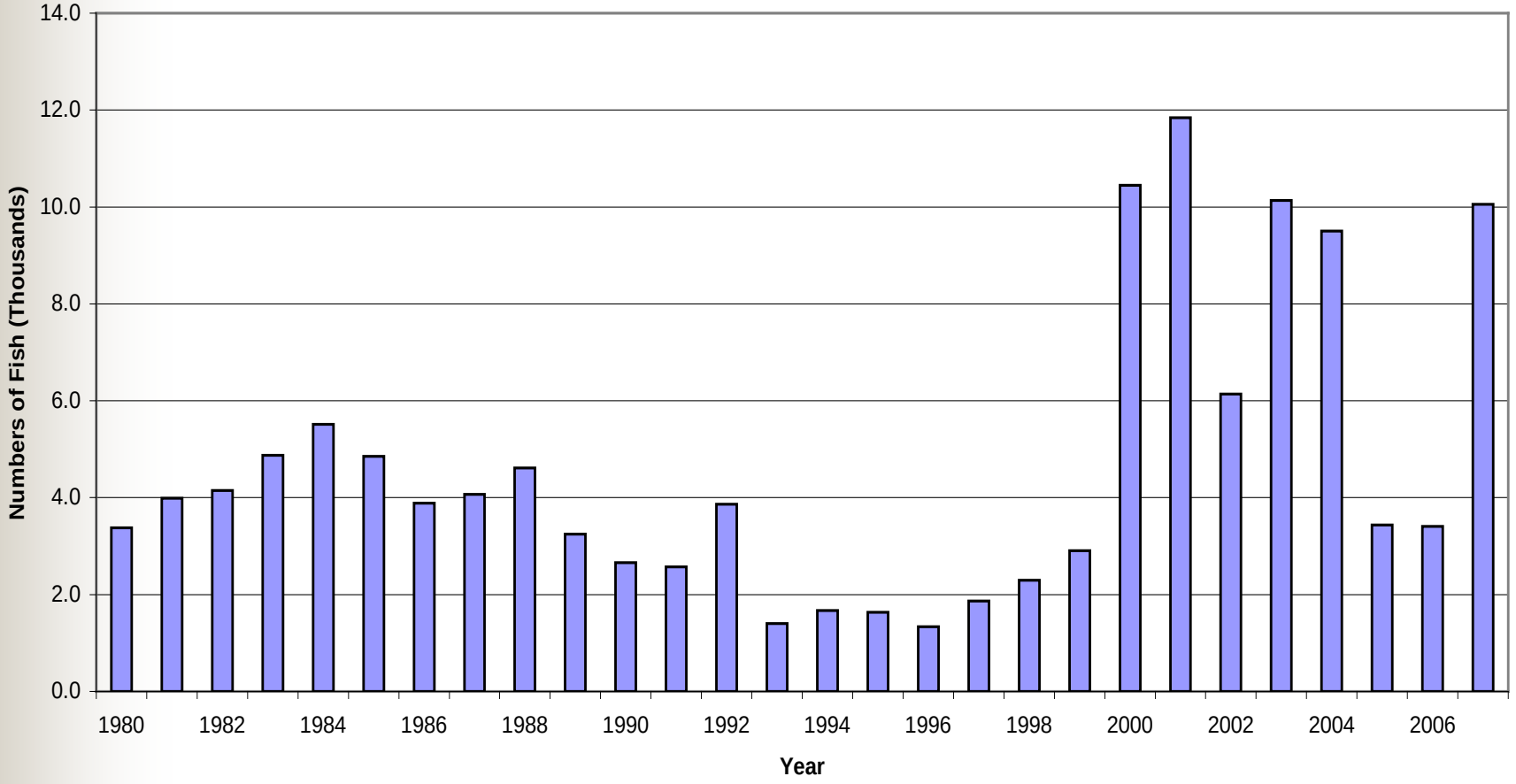
Bonneville Dam Counts of Spring Chinook Jacks



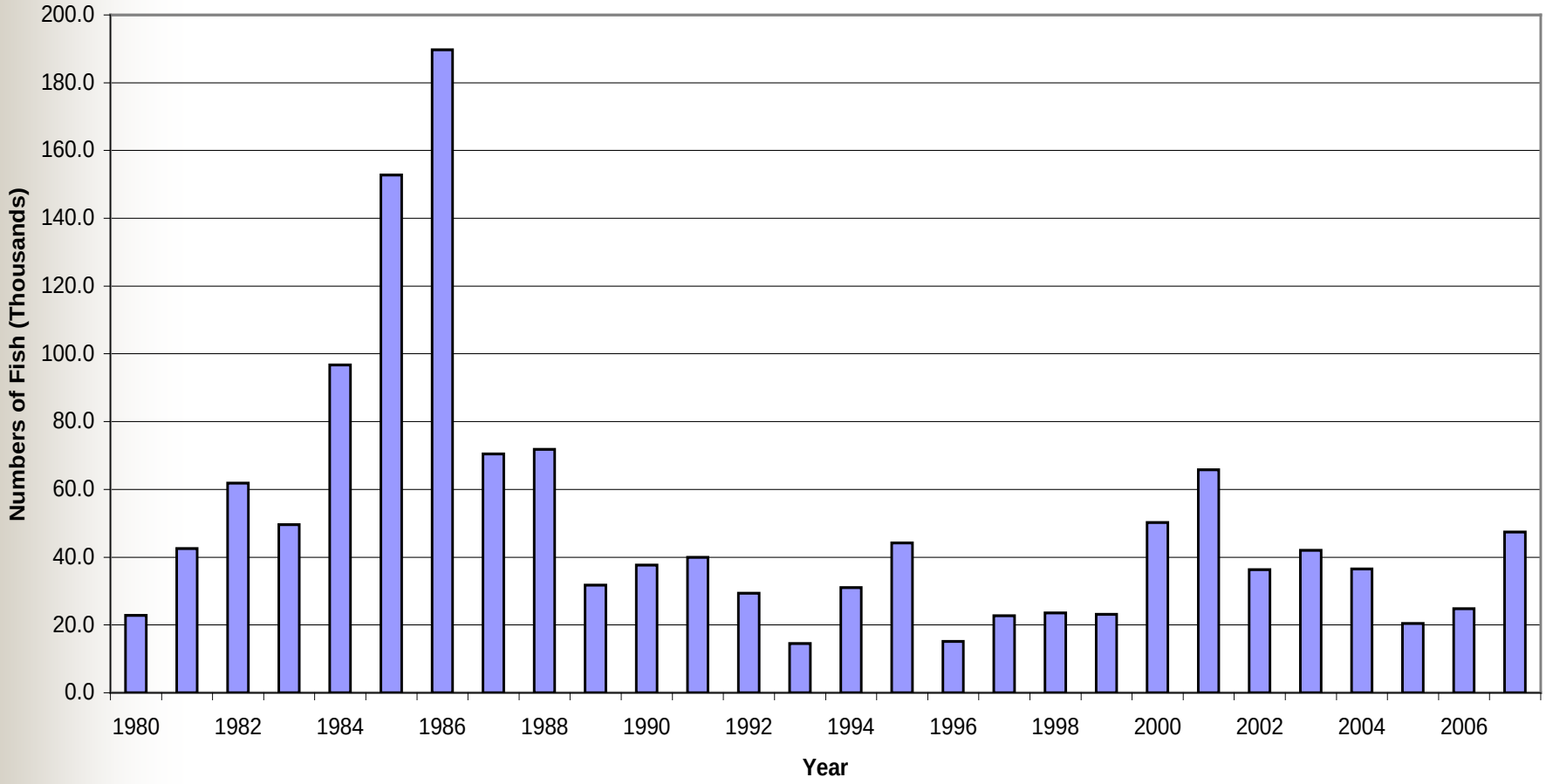
Bonneville Dam Counts
Spring Chinook Jacks versus
Adult Counts the Next Year



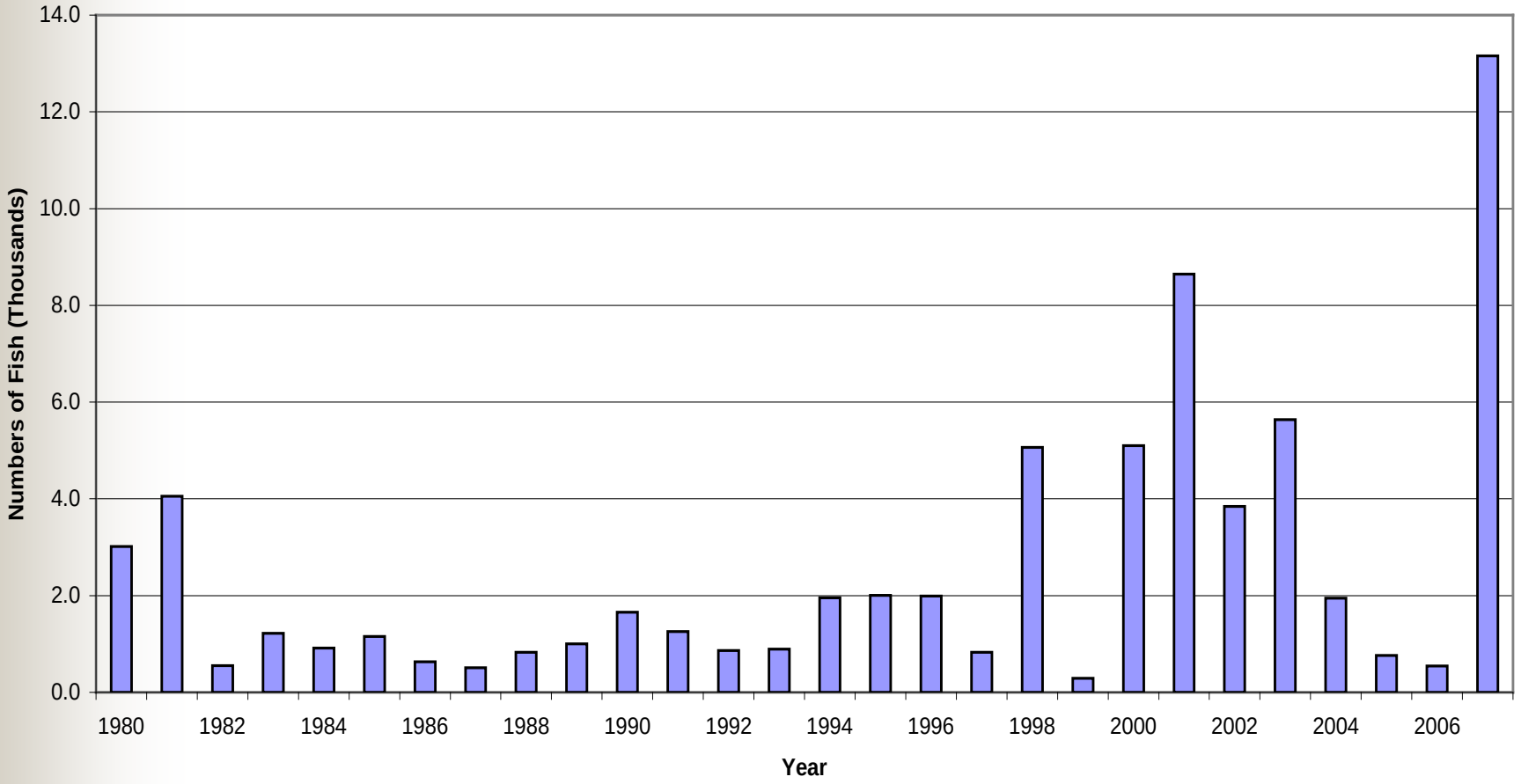
Bonneville Dam Counts of Summer Chinook Jacks

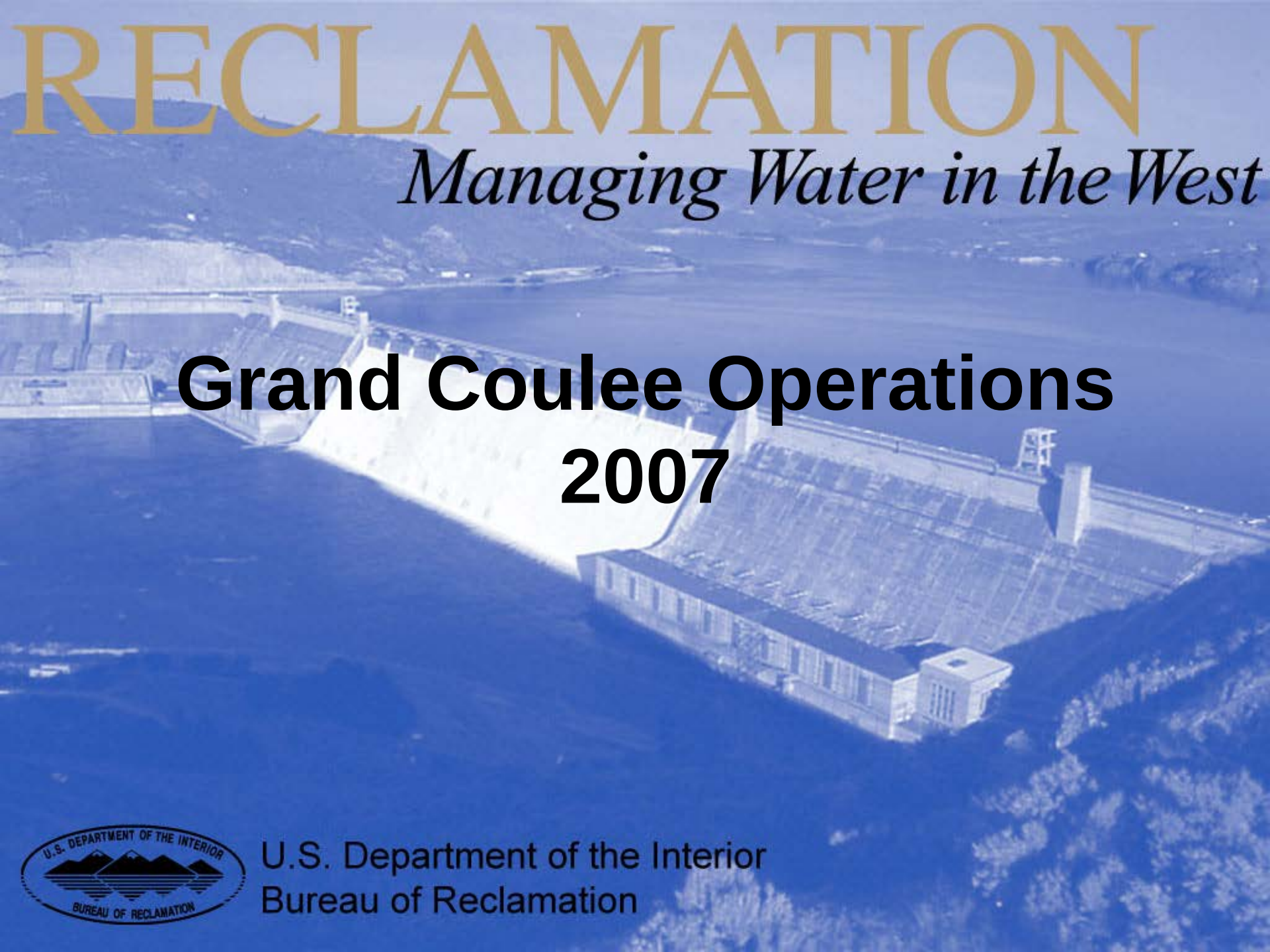


Bonneville Dam Counts of "Bright" Fall Chinook Jacks



Bonneville Dam Counts of "Tule" Fall Chinook Jacks





Grand Coulee Operations 2007

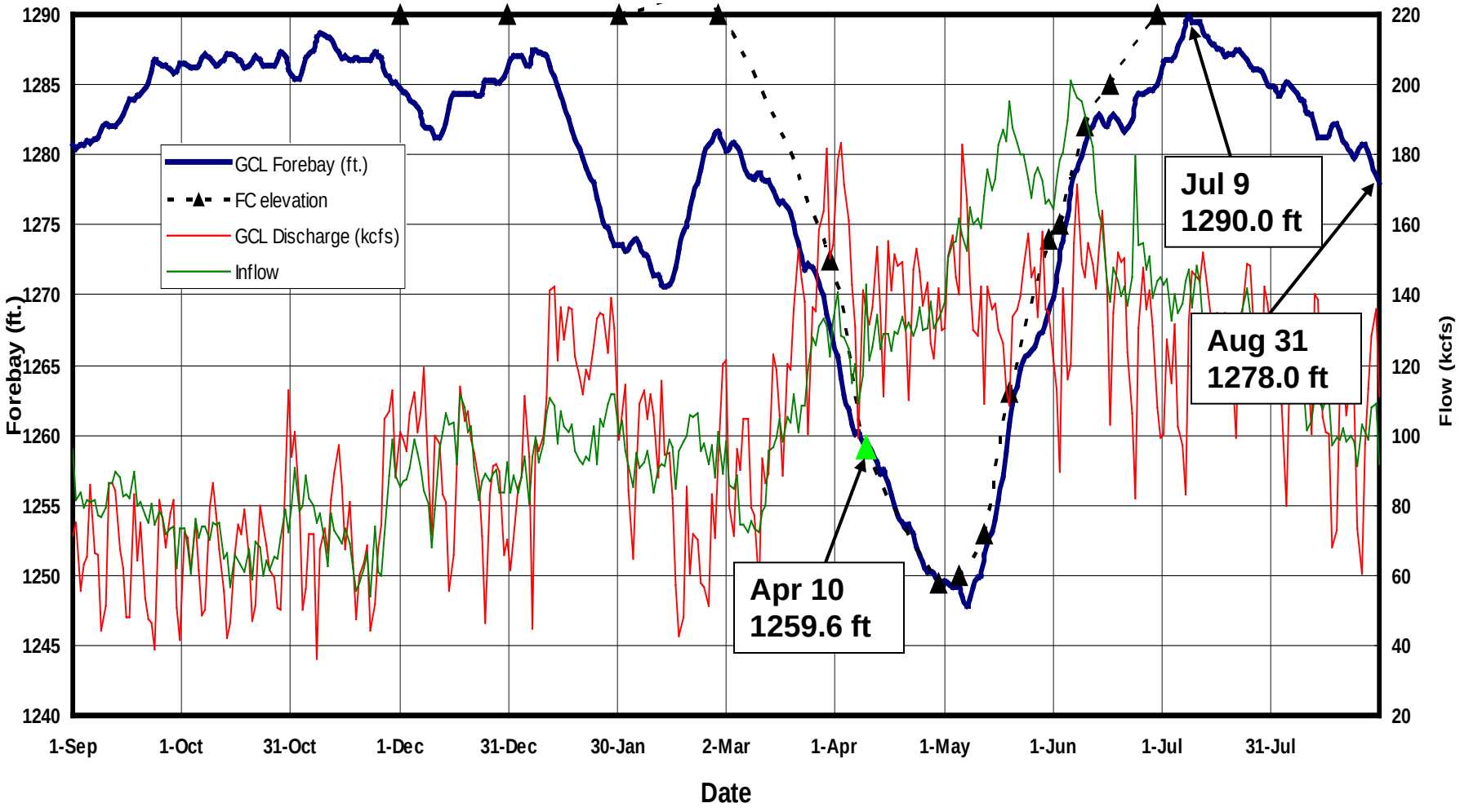
U.S. Department of the Interior
Bureau of Reclamation

2007 Water Supply Forecast and Flood Control

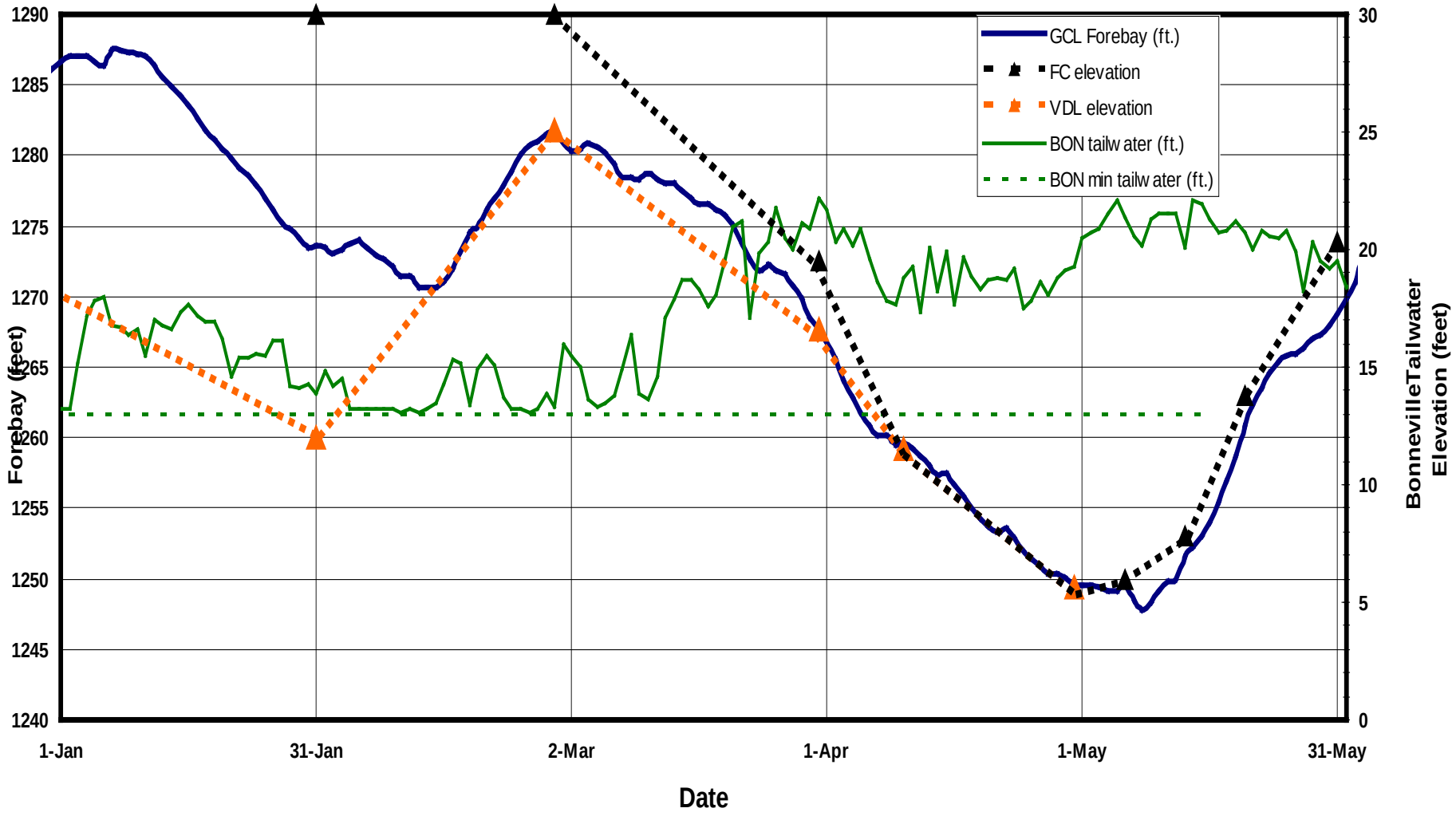
	Jan	Feb	Mar	Apr
The Dalles Forecast (Apr-Aug)	91.3 maf (98%)	88.2 maf (95%)	88.3 maf (95%)	85.2 maf (92%)
GCL April 30 FC Elevation	1236.2 ft	1241.9 ft	1239.8 ft	1249.4 ft

RECLAMATION

Grand Coulee Operations (Sep 2006 - Aug 2007)



Grand Coulee Operations (Jan - May, 2007)



Hells Canyon Interim Agreement Dec. 2004

- Refill Brownlee on or around June 20th each year.
- Provide 237 kaf of stored water for Snake River flow augmentation between June 21 and August 7.

Can IPC capture water released by USBR and thereby diminish the value of flow augmentation?

- No. With or without USBR's flow aug. program, IPC would attempt to refill Brownlee by June 20. While some water would be released by USBR before June 20, while Brownlee is filling and could be captured, such capture would only slightly rearrange the date the water would be delivered to the lower Snake River. Following refill, all inflow would be released plus a portion of the water stored in Brownlee in accordance with the agreement.

- The Interim Agreement also has a clause that states that IPC would cooperate with USBR's flow augmentation program as long as it had a cost less than $2 million per annum to IPC.

- Given past cooperative agreements, the current regulatory environment, and the growing summer electricity market, there is little to suggest that IPC would take any measures substantially adverse to USBR's program.

RECLAMATION

Managing Water in the West

Hungry Horse Operations 2007

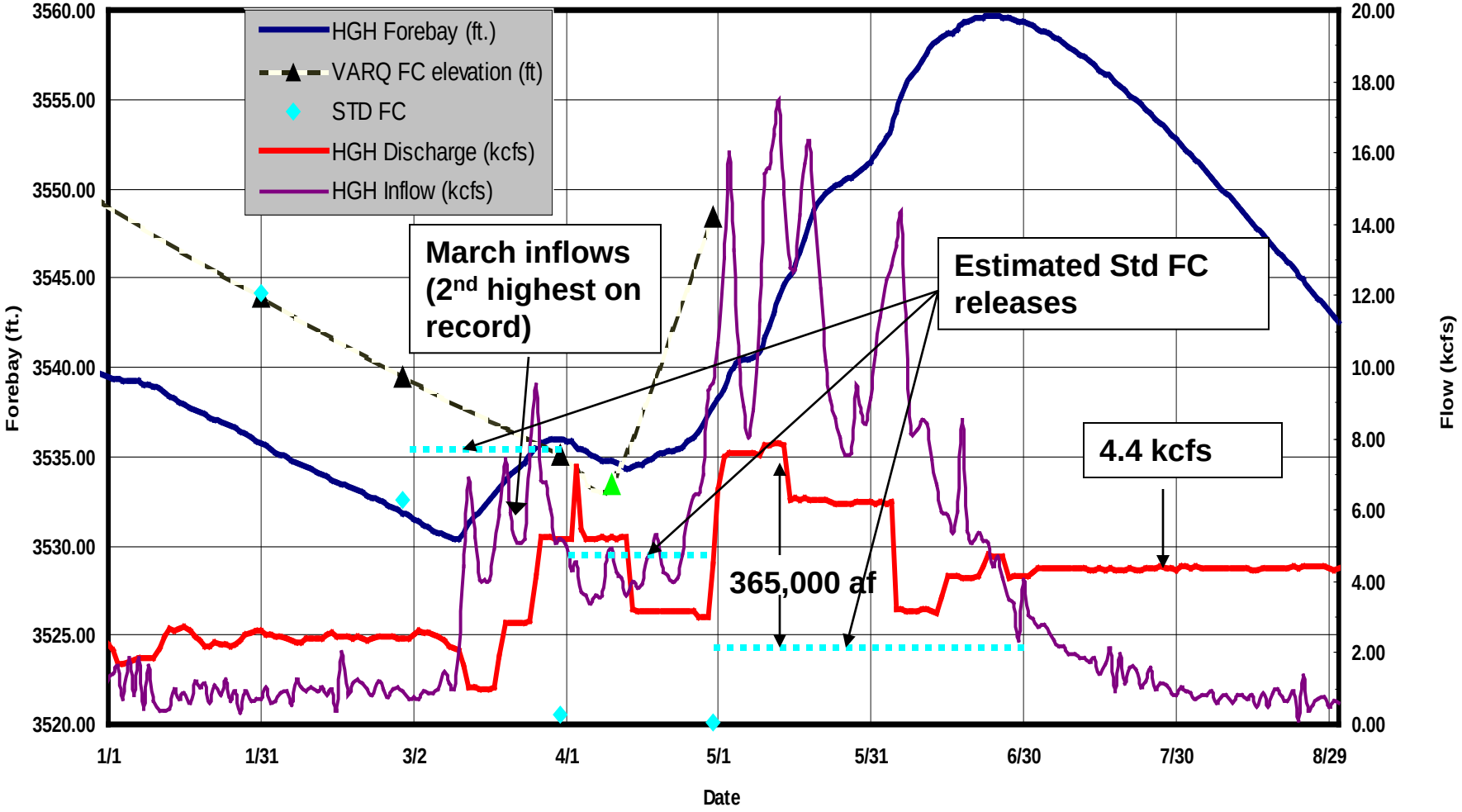
U.S. Department of the Interior
Bureau of Reclamation

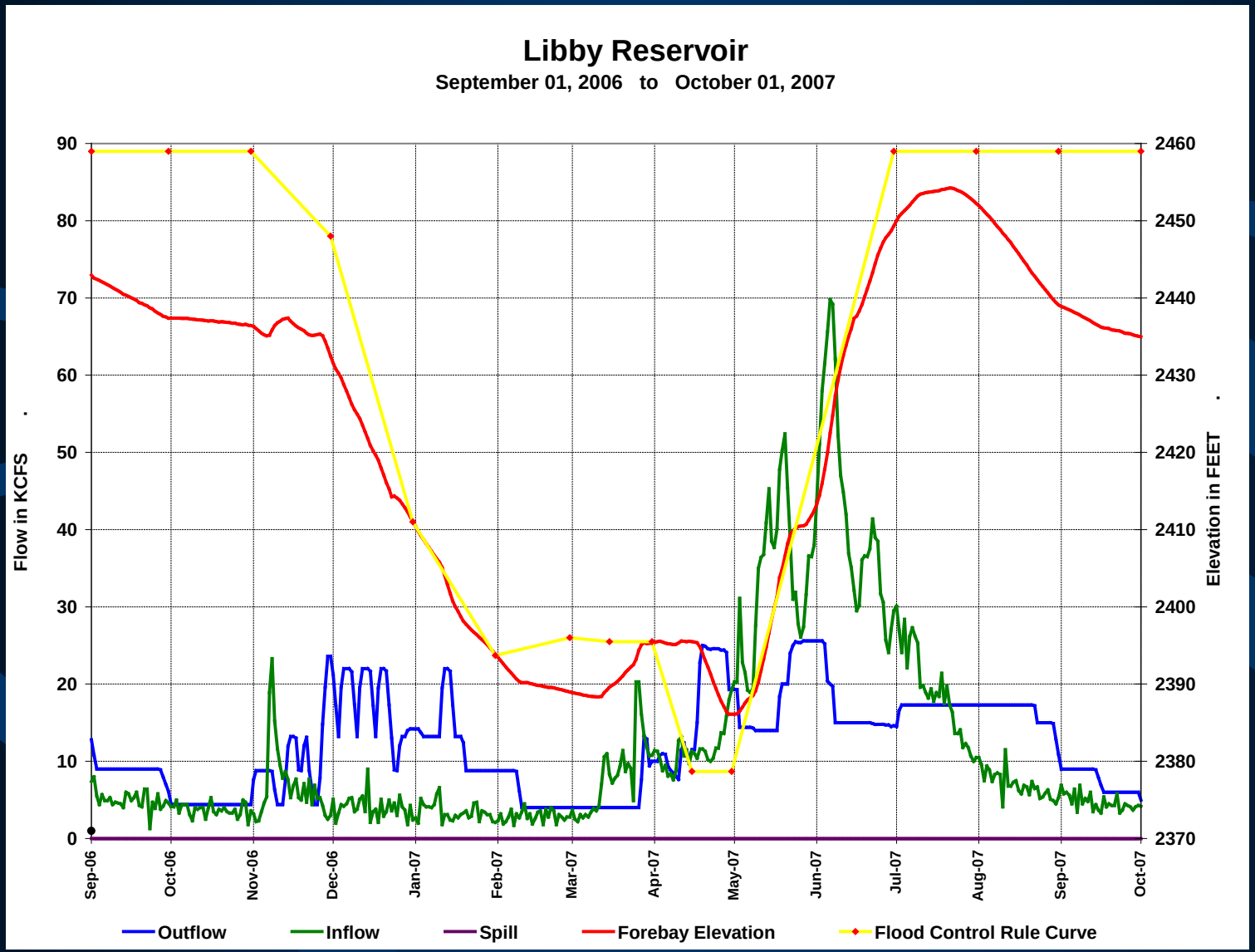
Water Supply Forecast Volumes

Period	Jan Final (kaf)	Feb Final (kaf)	Mar Final (kaf)	Apr Final (kaf)	Actual (kaf)
Jan-Jul	**2210 (99%)**	**2178 (98%)**	**2149 (97%)**	**1989 (89%)**	**1914 (86%)**
May-Sep	**1823 (99%)**	**1803 (98%)**	**1787 (97%)**	**1493 (81%)**	**1335 (73%)**

RECLAMATION

Hungry Horse Operations 2007




Libby Reservoir
September 01, 2006 to October 01, 2007
Flow in KCFS
Elevation in FEET
90
80
70
60
50
40
30
20
10
0
2460
2450
2440
2430
2420
2410
2400
2390
2380
2370
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Outflow
Inflow
Spill
Forebay Elevation
Flood Control Rule Curve

Lower Monumental Dam Emergency Spill Operation

- A large number of juveniles observed in the forebay.

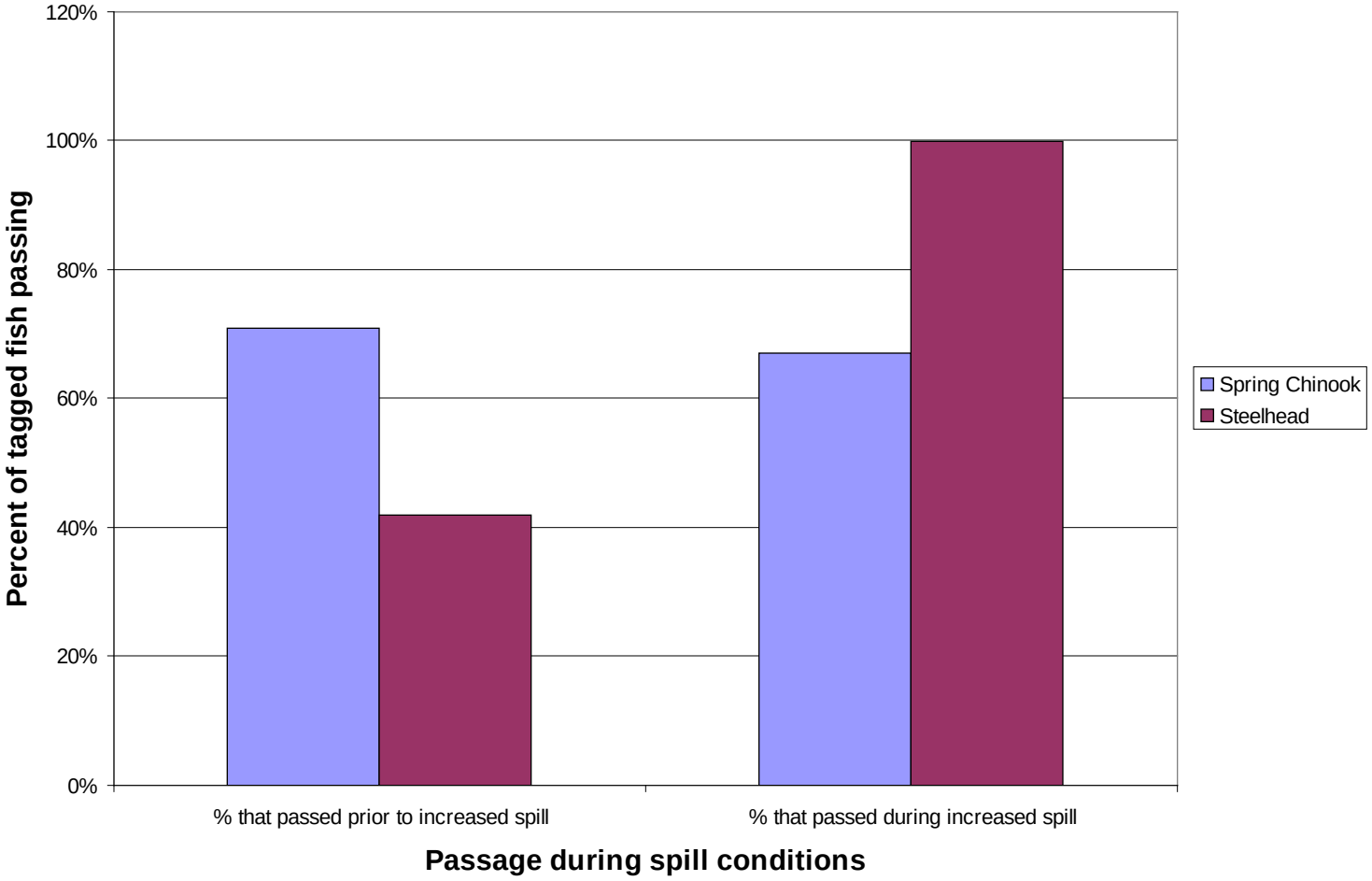
- Spill was increased from 13.5 kcfs to 31.5 kcfs for a four hour period.

Radio Tag Data

Comparison of Spring Chinook (SC) and Steelhead (SH) observed behavior.

- May 1: 1600 hours to May 2, 1800 hours (26 hours) 34 SC and 33 SH
- May 2: 1800 hours to 2200 hours (4 hours) 3 SC and 4 SH

Juvenile Passage at LoMo during 2 spill conditions



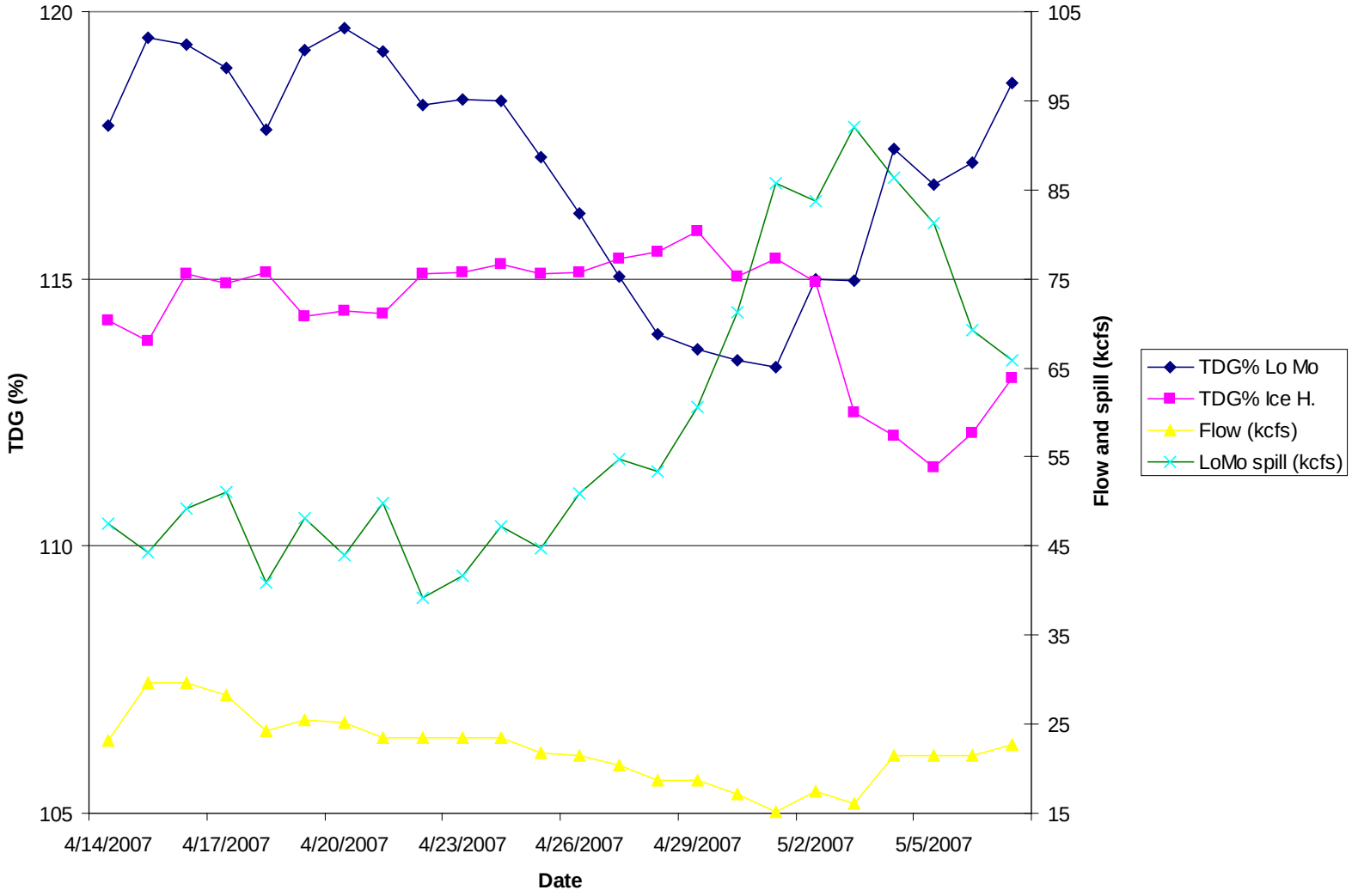
Spill Operations 2007

- When not defined as a spill percentage or fixed quantity, a project's spill to aid fish passage is managed to gas waiver limits which are:
  - Tailrace TDG 120%
  - Forebay TDG 115%
  - Biological monitoring for excessive GBT symptoms

Case Study LoMo 2007

- An issue fish managers struggle with is how spill is managed when the TDG limits are exceeded.
- Managing to a forebay exceedance is a cumbersome process because of the time lag (days) between a tailrace action and a forebay response.

Lower Monumental TDG, flow, and spill April 14-May 5, 2007



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Walla Walla District Navigation

- Navigation problems at McNary and Lower Granite locks reported to TMT by Shaver Transportation (Ken Ritter) on August 1, 2007. He reported near-grounding incidents when spill was at the 40% of total outflow level at McNary.

- Discussion among TMT suggested a flatter spill pattern should be developed and implemented instead of shutting spill down as in past years.

- August 8, 2007, alternate spill patterns were presented to TMT. These patterns were prepared by Walla Walla District with input from Project Operators.

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Walla Walla District Navigation

- John Pigott, CRTA Chairman, stated alternate spill patterns would only be necessary for loaded barges. He reported that on the average 4-5 lockages per day for a period of 20-30 minutes would need the flatter spill pattern.

- The operation was approved by the Salmon Managers and TMT members.

- McNary: At the August 15, 2007, TMT meeting it was reported that six barges passed during the August 11-12 weekend and the alternate patterns worked well for navigation.

- Lower Granite: Alternate spill patterns were requested twice during the same weekend with mixed results varying from slight improvement to no change for navigation.

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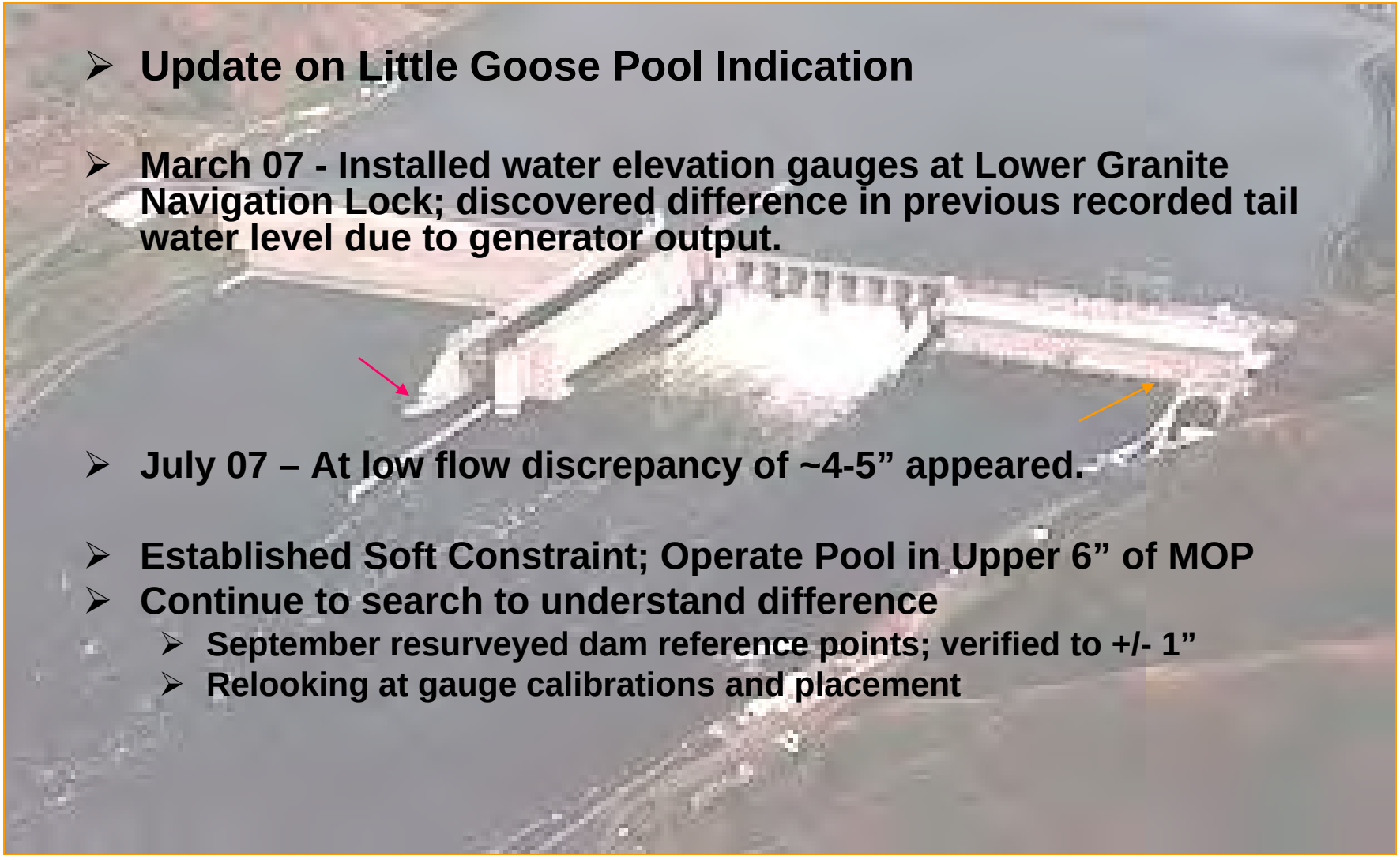
Walla Walla District Navigation



- Update on Little Goose Pool Indication
- March 07 - Installed water elevation gauges at Lower Granite Navigation Lock; discovered difference in previous recorded tail water level due to generator output.
- July 07 – At low flow discrepancy of ~4-5” appeared.
- Established Soft Constraint; Operate Pool in Upper 6” of MOP
- Continue to search to understand difference
  - September resurveyed dam reference points; verified to +/- 1”
  - Relooking at gauge calibrations and placement

Hatchery Subyearling Survival Lower Granite to McNary Dam 1998 to 2007

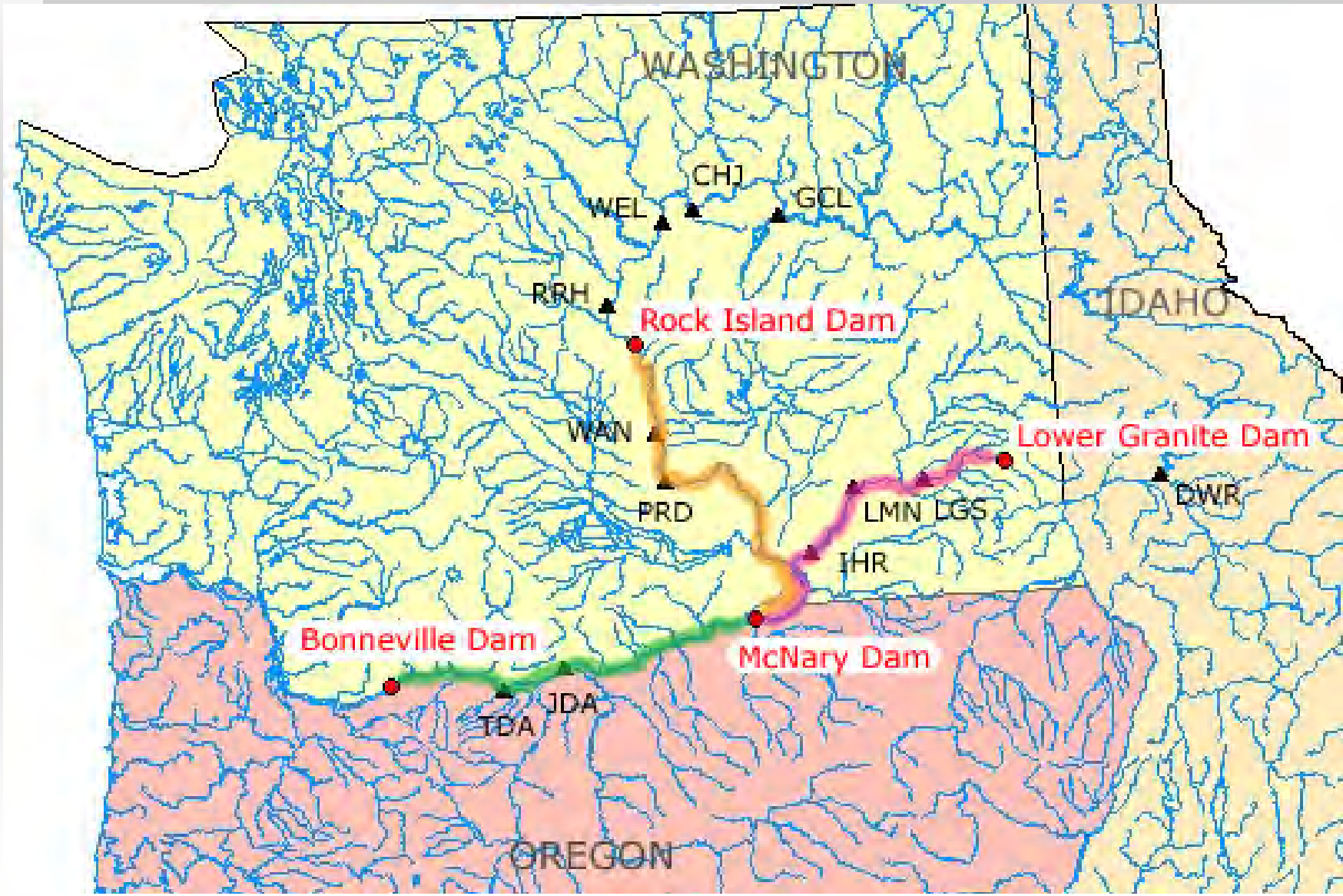
(preliminary results)

Fish Passage Center

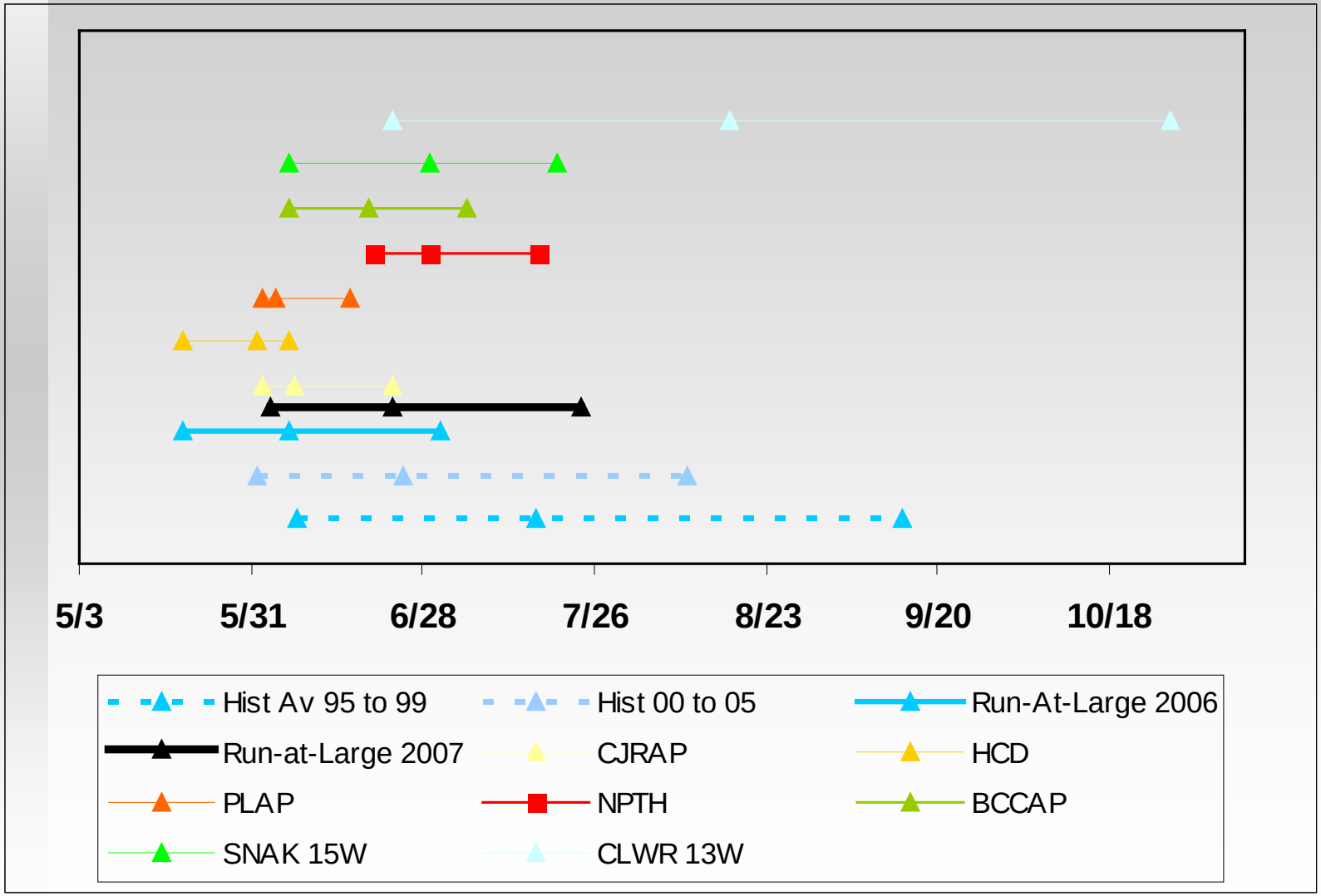
Overview

- PIT-tagged Hatchery Subyearling Chinook passing LGR dam during two-week blocks from May 20 to July 15 each year
- Estimate Survival and Travel Time for blocks
- Assign average environmental variables during passage such as Flow, Spill, Temperature and Water Transit Time
- Show bivariate plots of Reach Survival and environmental variables.

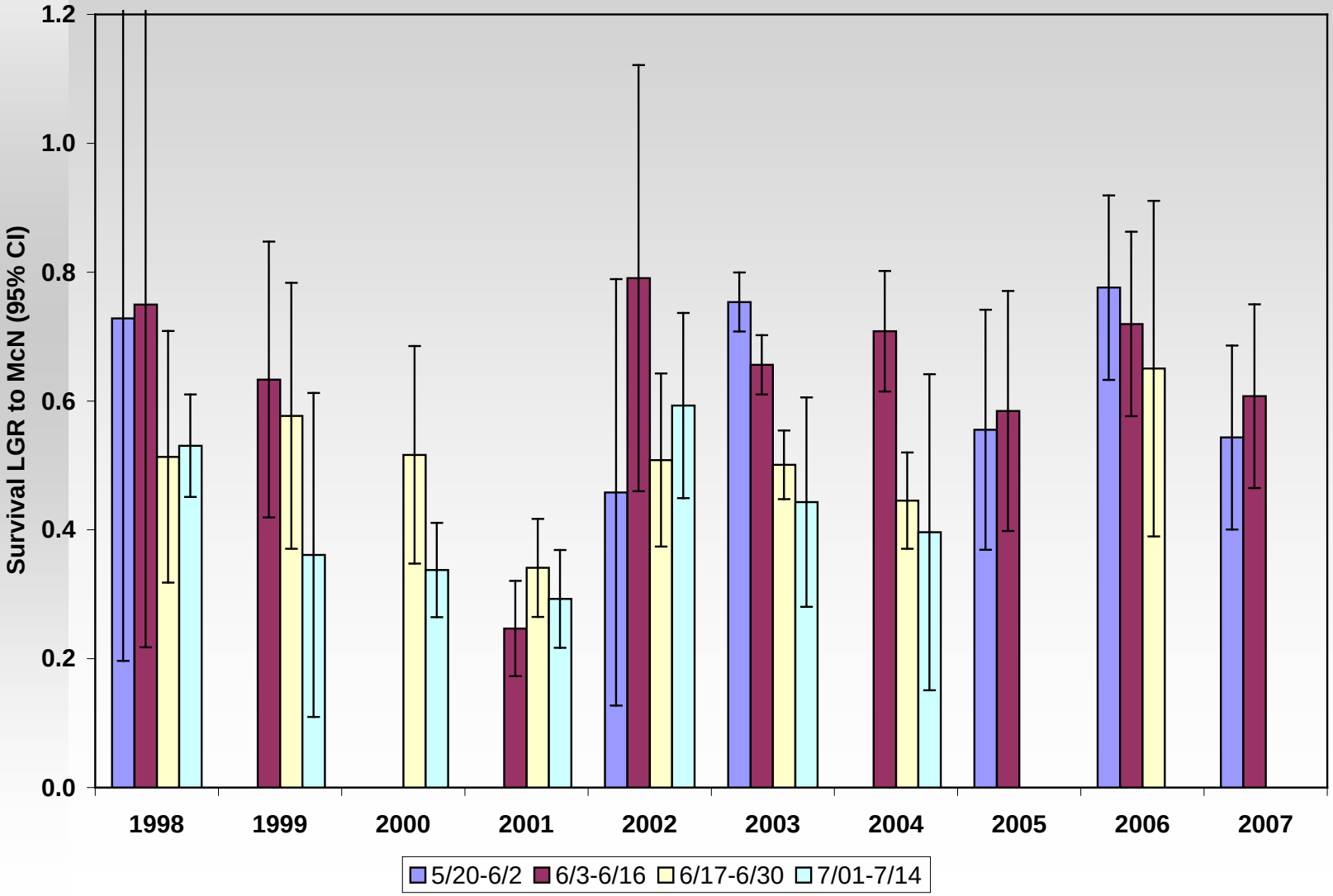
Lower Granite to McNary Dam Reach



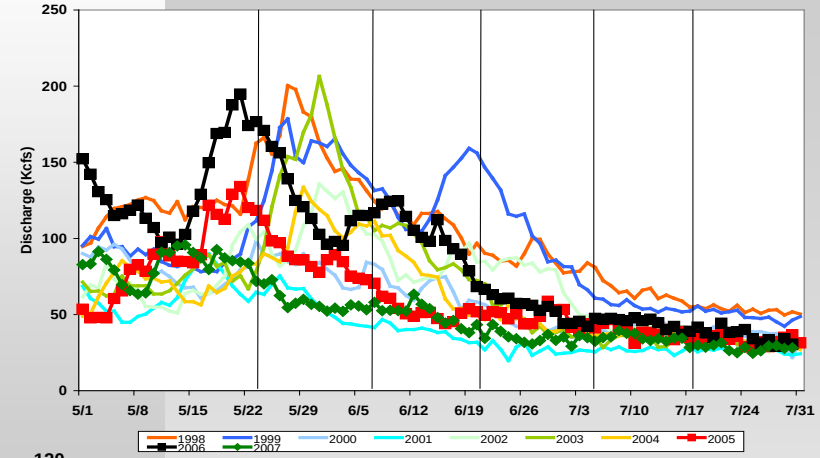
Timing of Subyearling fall Chinook at LGR Dam in 2007 compared to Historic Timing

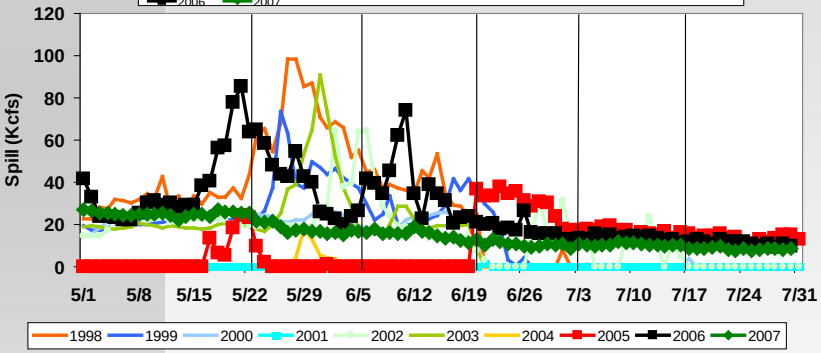


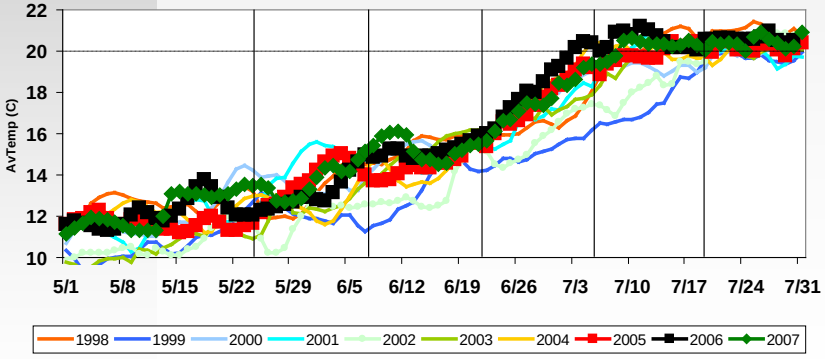
Survival for Hatchery Subyearling Chinook LGR to McN 1998 to 2006 with 95% CI's



Comparison of Environmental conditions at LGS 1998 to 2007





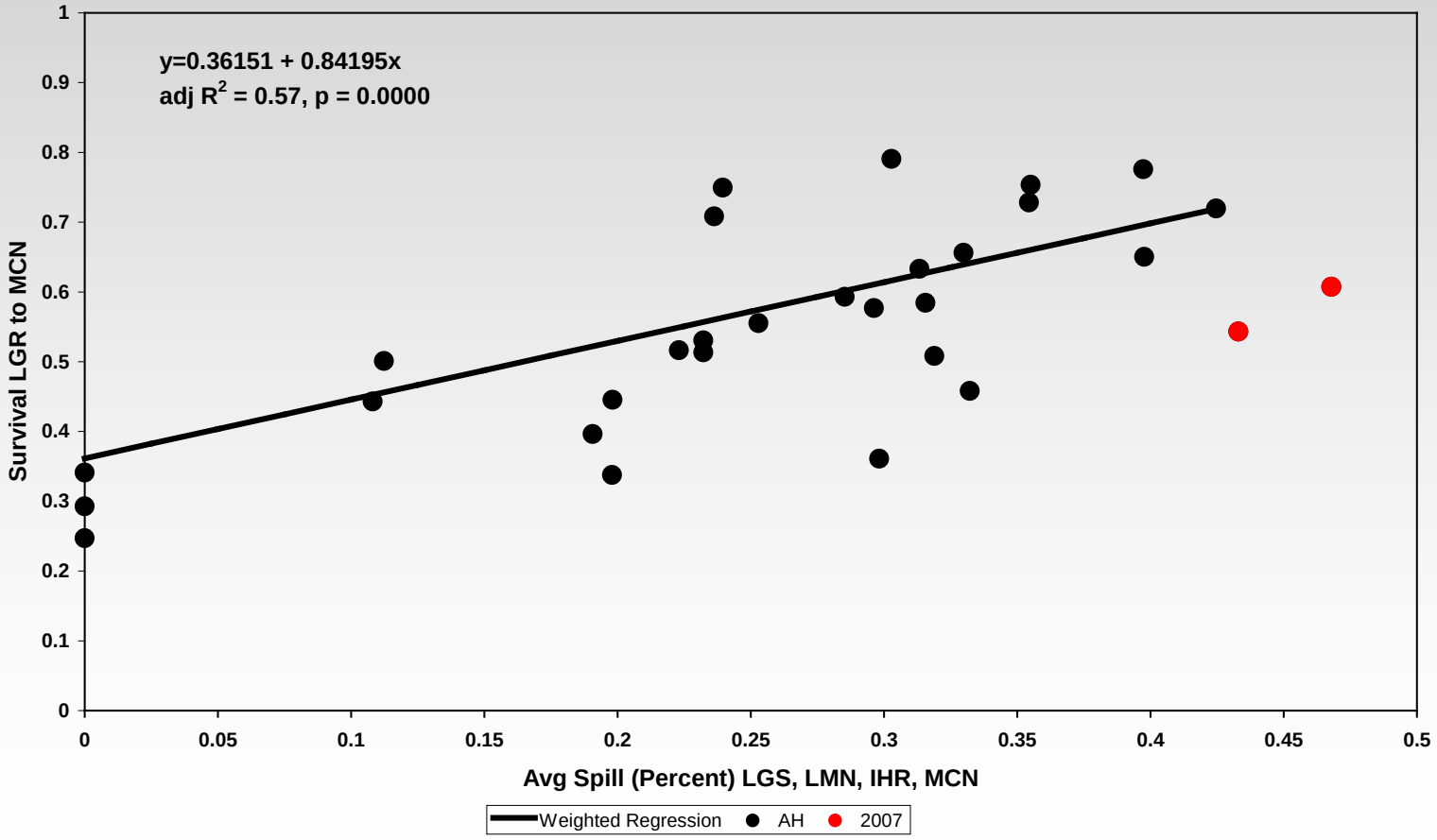


Flows in 2007 were low from late May through the end of July; similar to 2001

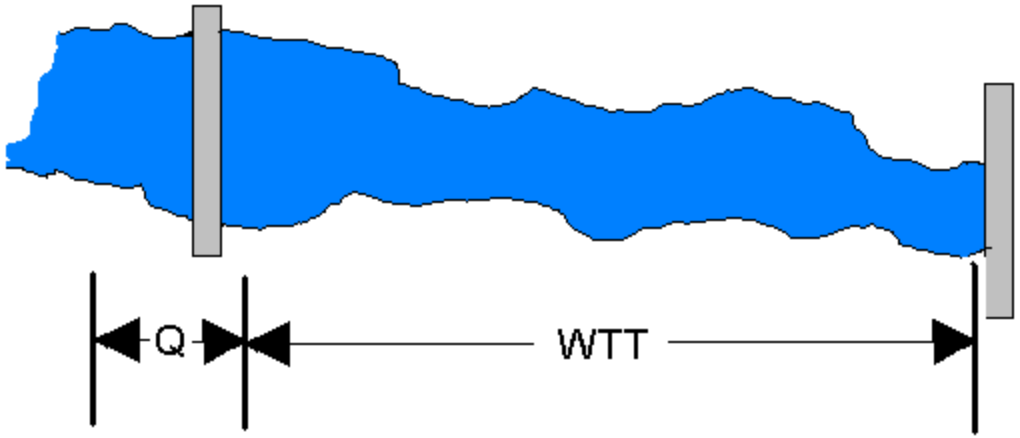
Spill proportion was high in 2007 but volumes were low

Temperatures were warm in 2007 similar to 2005 and 2006

Hatchery Subyearling Chinook Survival vs Avg Spill Pct LGS, LMN, IHR, McN

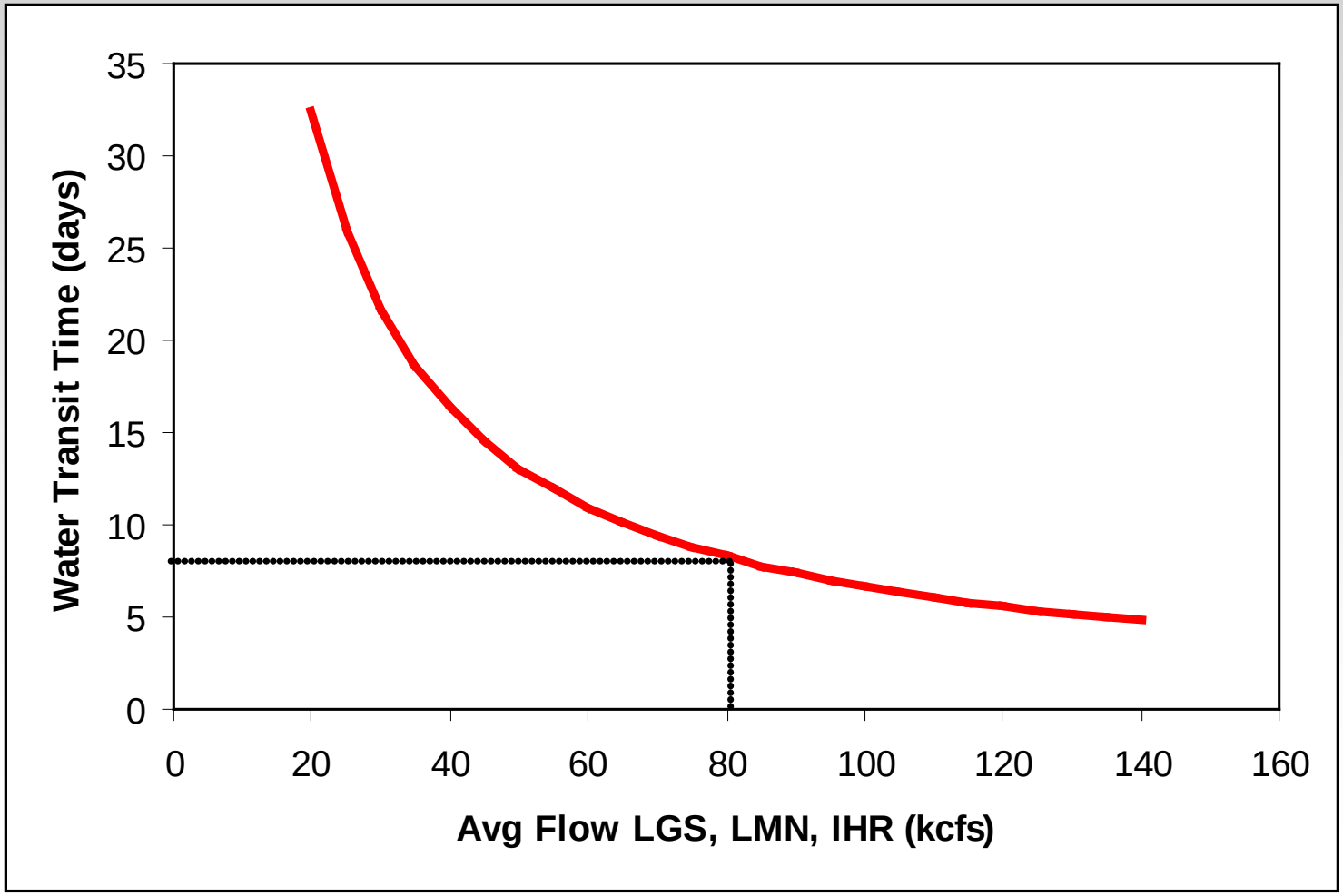


Water Transit Time

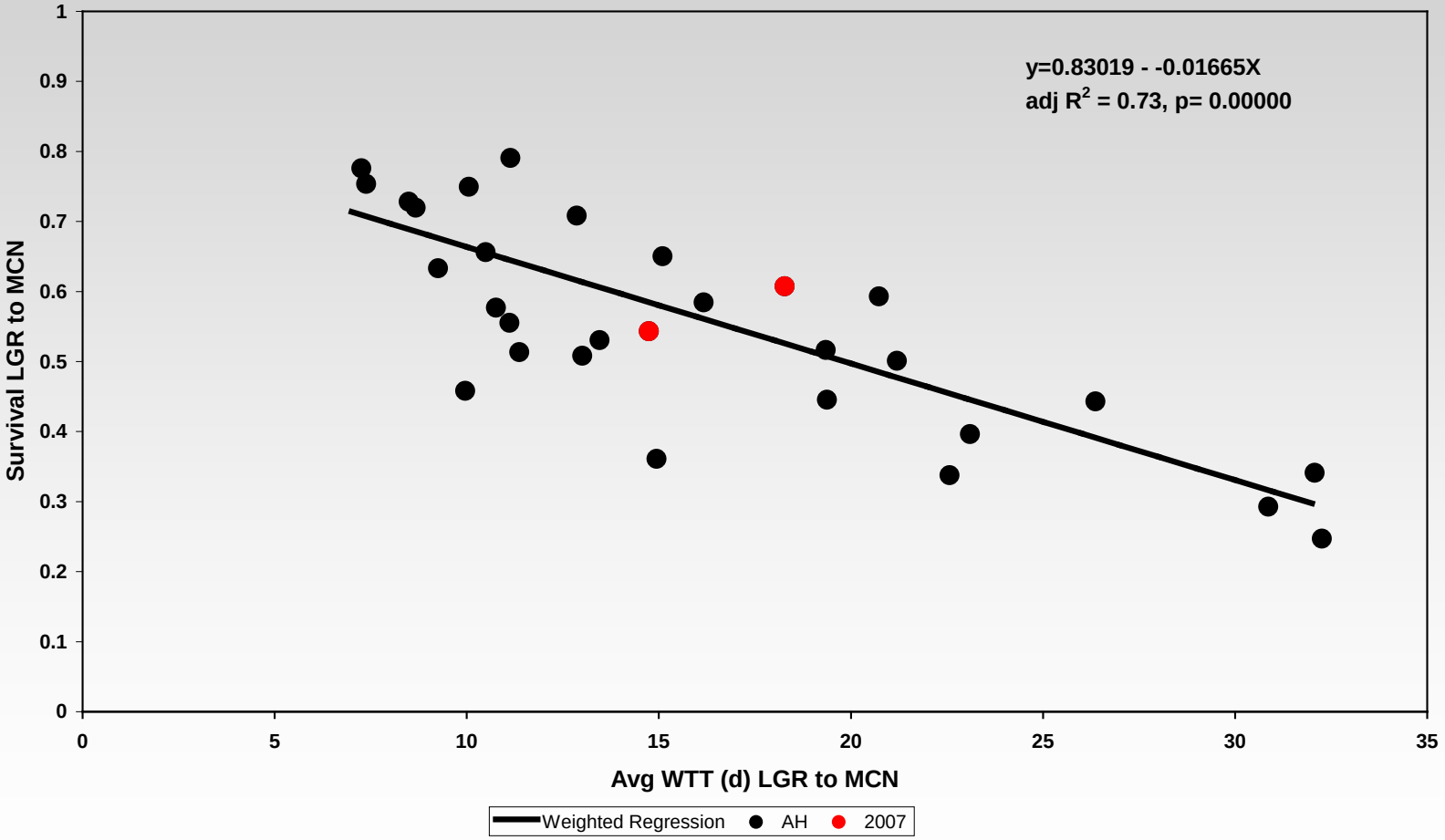


- WTT--Avg Time for Water Particle to Transit Reservoir
- Q -- discharge at dam

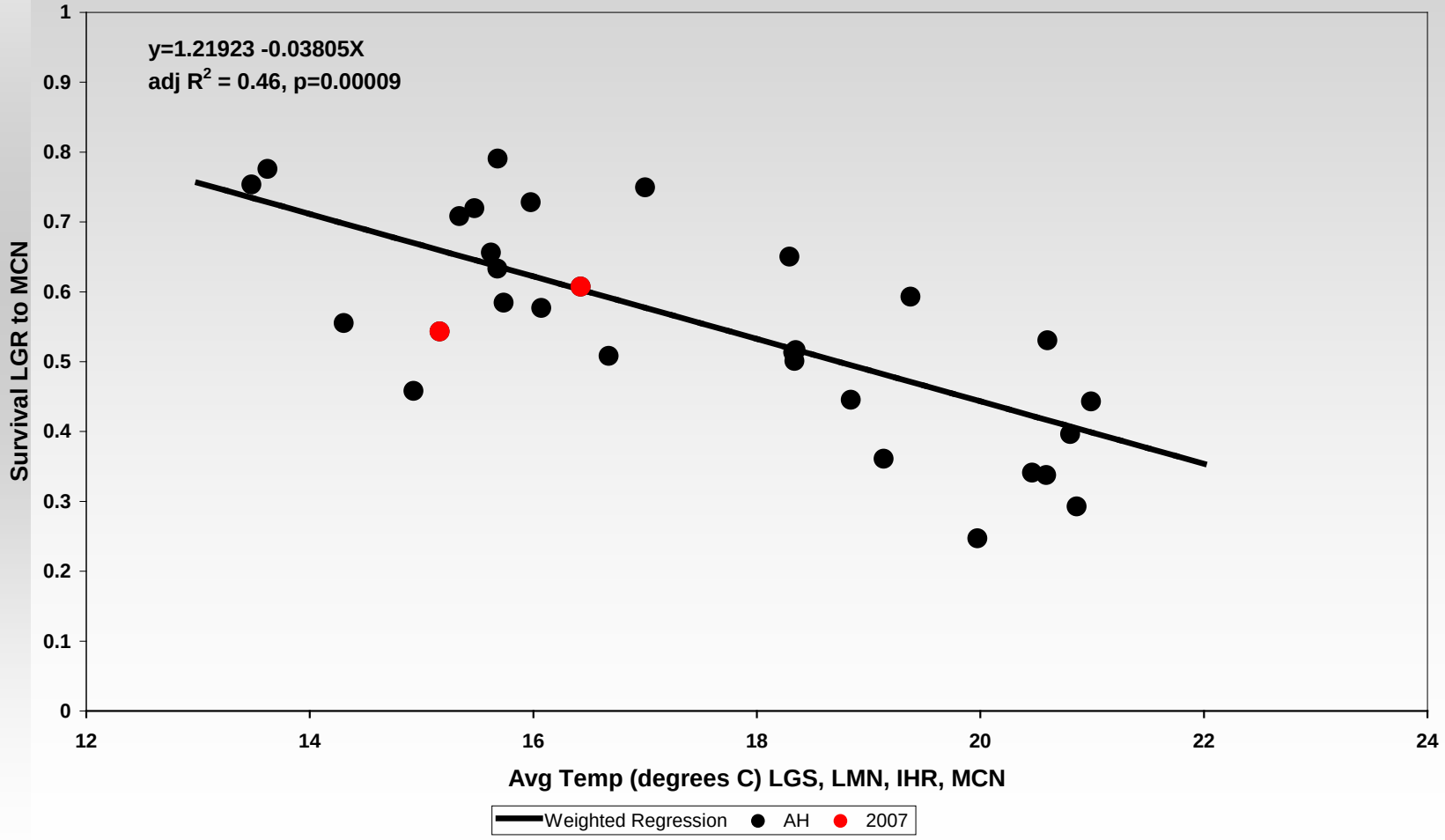
Converting Flows to Water Transit Time



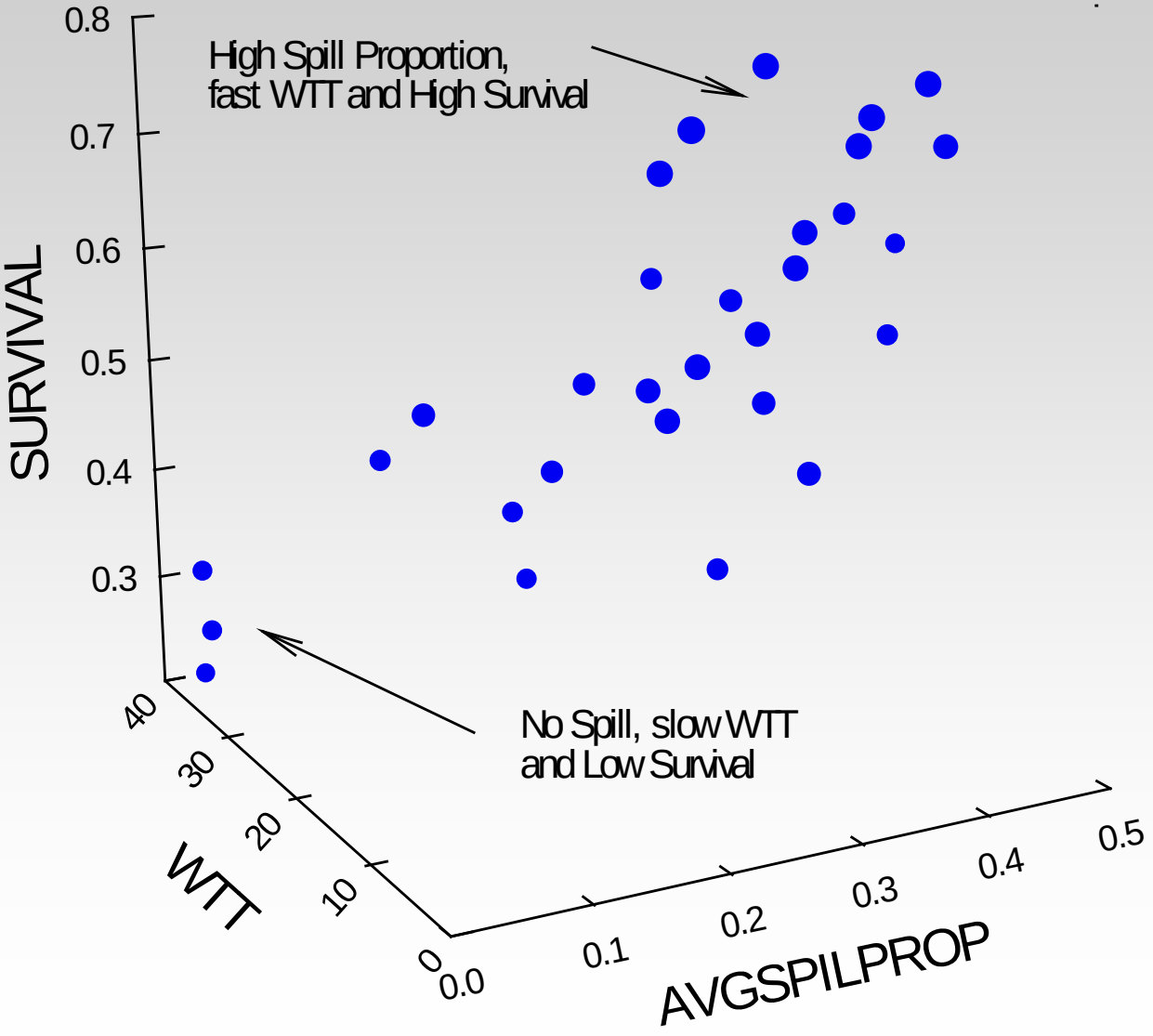
Hatchery Subyearling Chinook Survival vs sum WTT LGS, LMN, IHR, McN



Hatchery Subyearling Chinook Survival vs Avg Temp LGS, LMN, IHR, McN



Hatchery Subyearling Chinook Survival vs WTT and Spill Proportion



Conclusions

- For actively migrating subyearling Chinook, increased spill and decreased water transit time (higher flows) appear to improve survival, while higher temperatures decrease survival

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 N.E. Oregon, Suite 200, Portland, Oregon 97232 Telephone (503) 238-0667
Fax (503) 235-4228
www.critfc.org

TO: Technical Management Team (TMT)
FROM: Kyle Dittmer, *Hydrologist-Meteorologist*, CRITFC's Hydro Program
DATE: November 28, 2007

SUBJECT: **Summary of Water Year 2007 Weather**

At the request of the TMT, this memo summarizes monthly weather events that impacted basin flows and fish migrations during Water Year 2007 (October 2006 - September 2007). WY 2007 was noted for extreme variability in precipitation and temperature patterns (Figures 1 and 2).

Autumn started dry (except in the Upper Snake) then dived into a very wet November. During November 2nd -7th, 37 station records were broken. Western Oregon and Washington received as much precipitation as the February 1996 floods. Lee's Camp broke Oregon's all-time 24-hour rainfall record on Nov. 6th with 14.3 inches. Widespread major flooding and mudslides followed. Temperatures were near normal (+0.1 to +1.1), basin departures of -4.8 to +14.3 ^{o}F.

Winter started as cold, wet and ended warm, dry. The weak El Nino pattern had emerged. Powerful storms of late December and early January faded and meager storm events followed. Temperatures stayed near normal (-1.3 to +3.6) with basin departures of -10.5 to +8.5 ^{o}F.

Spring was boring, warm, and dry (with few exceptions). A powerful storm broke daily rain records on May 2, 3, 20, 21, 27 and 28, as well as June 4-6. New record highs (93 to 94 ^{o}F) were set on May 8th in the lower Snake. June 2nd-3rd had new basin-wide high records (86 to 101 ^{o}F). Temperatures stayed above normal (+0.4 to +1.6) with basin departures of -2.5 to +4.8 ^{o}F.

Summer was very warm and dry for migrating salmon. July set the highest average basin departure for WY 2007 with +5.9 ^{o}F and one of the hottest months ever for the Pacific Northwest. Record-breaking daily high temperatures hit July 5th-16th (92 to 116 ^{o}F) and August 29th-30th (95 to 105 ^{o}F). Temperatures stayed above normal (+0.8 to +5.9) with basin departures of -3.7 to +11.2 ^{o}F. Conditions moderated by September and the rain returned late month.

Cumulative precipitation totals for Water Year 2007 for Columbia at The Dalles ended at 94%. The driest basins of the Columbia (Figure 3) were the Grand Ronde (70%), Owyhee/Malheur (72%) & Snake River Plain (73%). The wettest basins were the Lower Deschutes & East Slope Wash. Cascades (107%), NW Wash. Cascades (106%), and Columbia above Castlegar (103%).

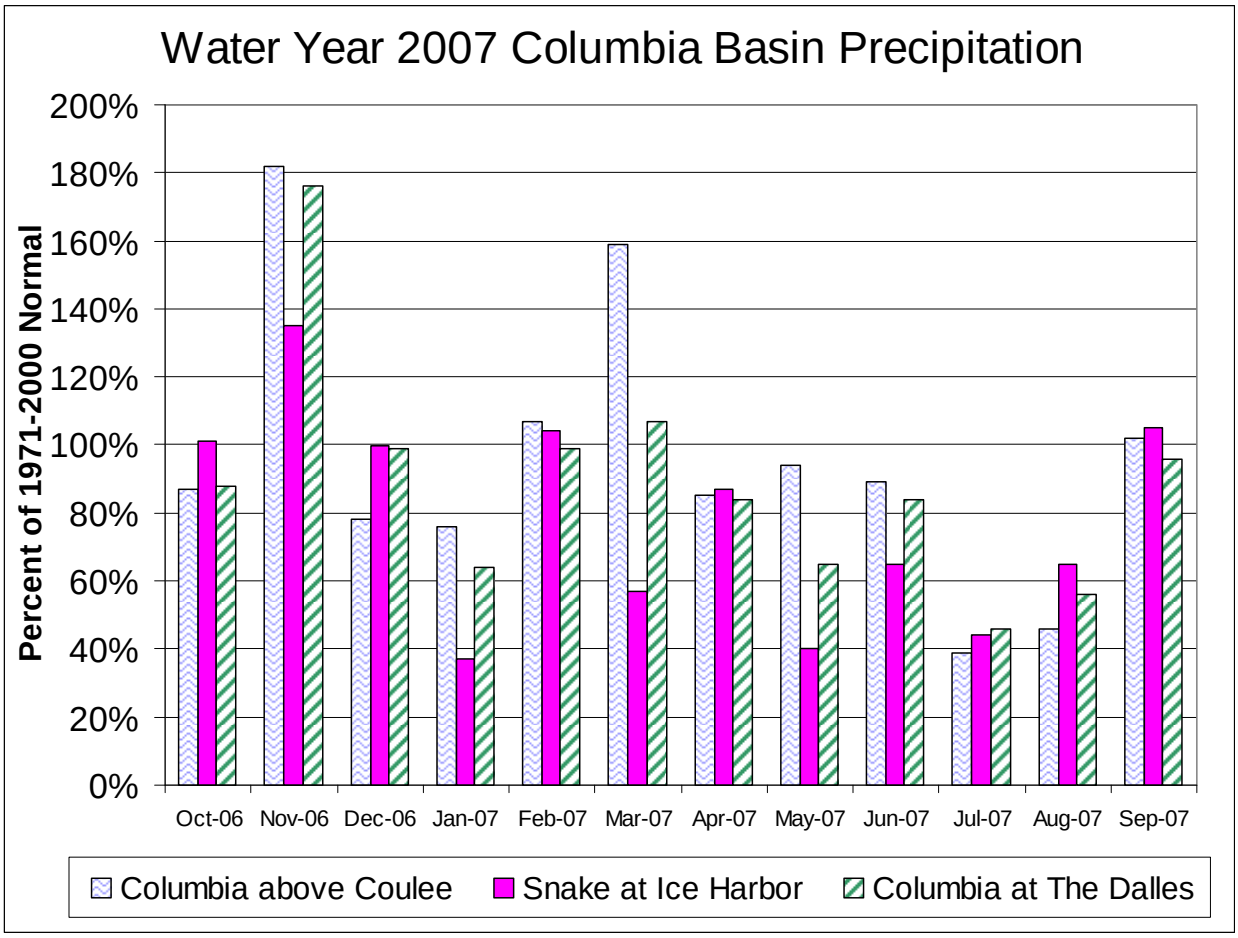


Figure 1. Water Year 2007 Division Precipitation Summary (NOAA-NWS data).

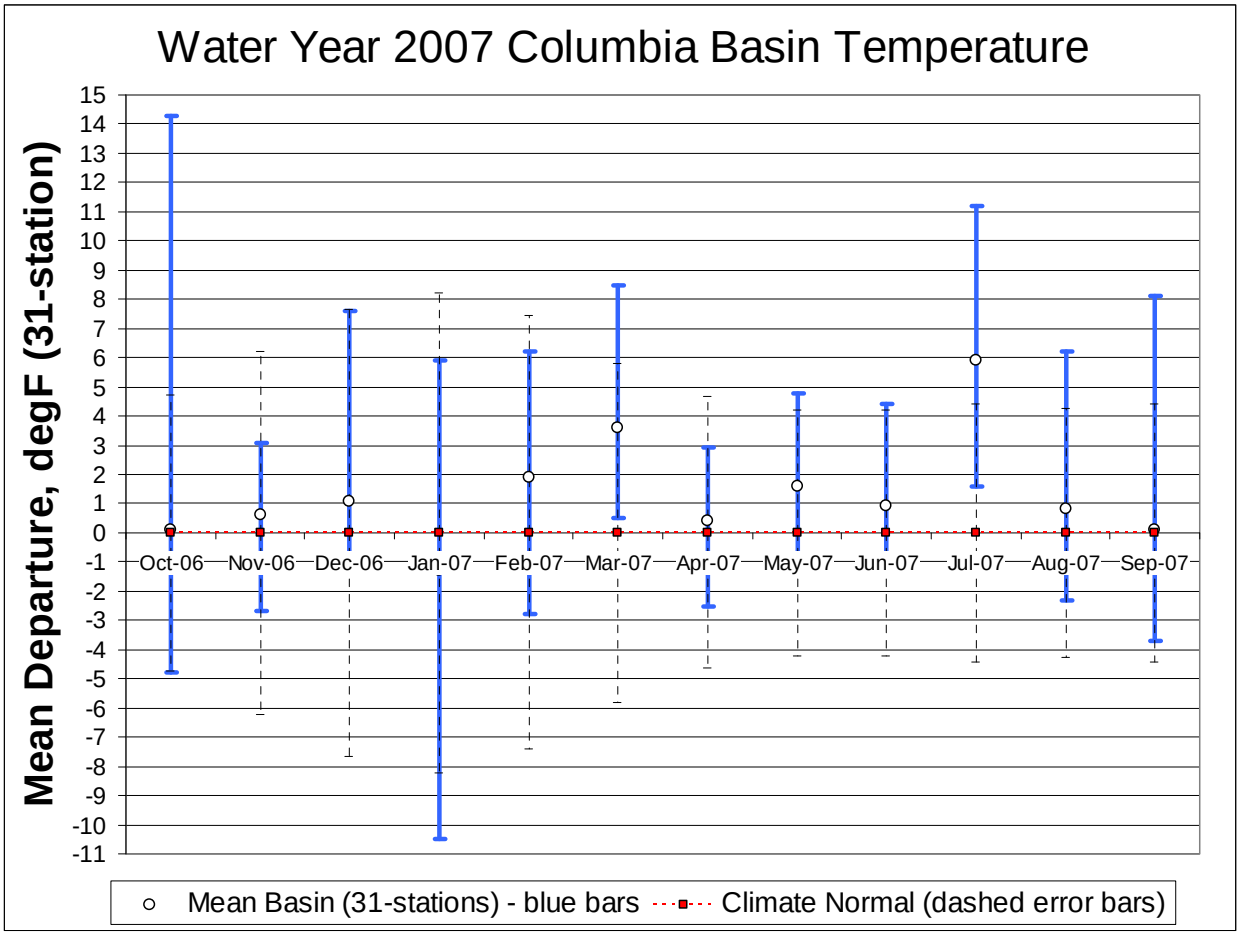


Figure 2. Water Year 2007 Temperature Departure Summary (NOAA-NWS data).

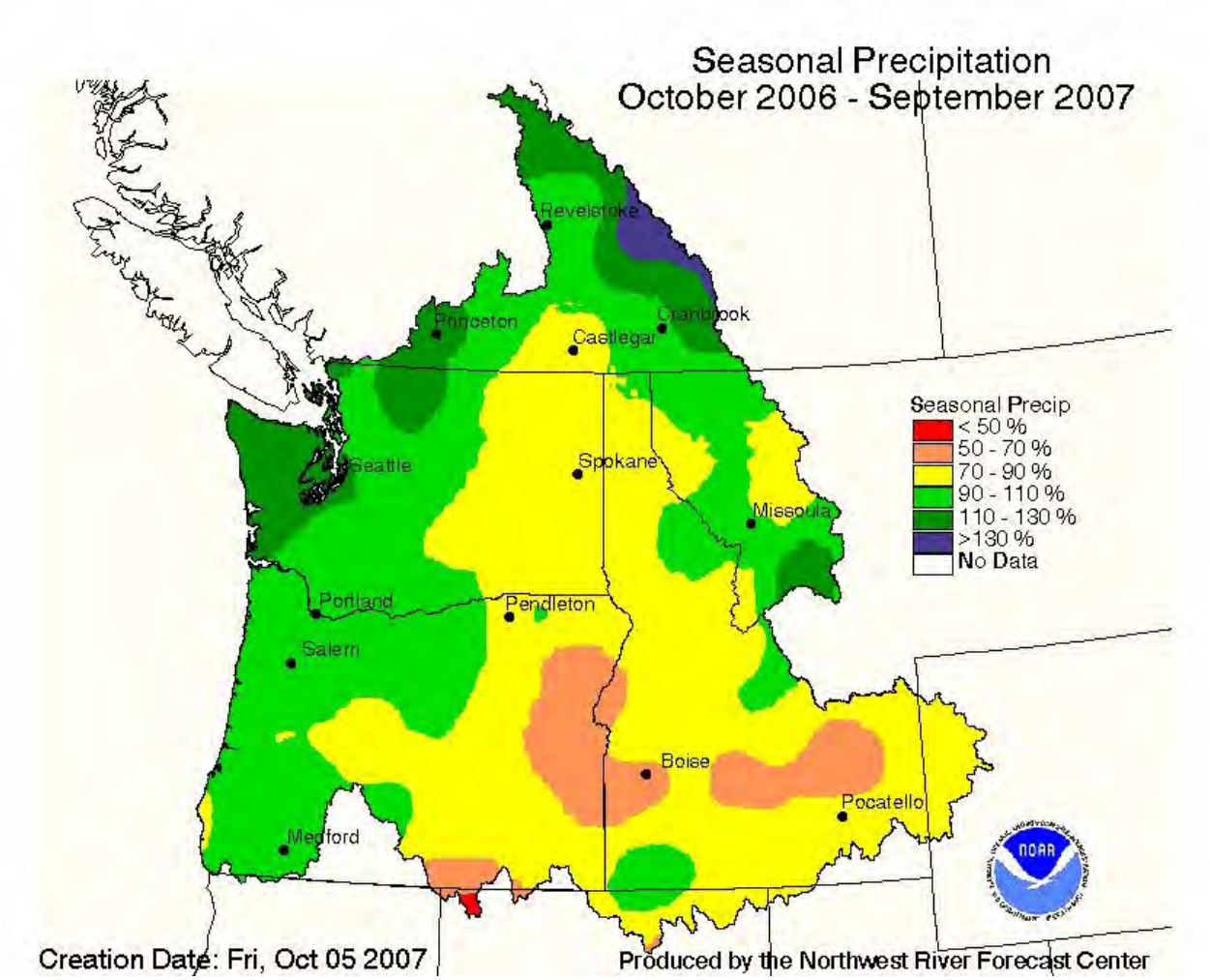


Figure 3. Water Year 2007 Columbia Basin Cumulative Seasonal Precipitation.

Technical Management Team
2007 Year End Review

Water Quality

Fixed Monitoring Stations

- Corps operated a total of 28 FMS's
  - Portland District: 8 Stations
  - Walla Walla District: 15 Stations
  - Seattle District: 5 Stations
- Bureau of Reclamation Operated 4 FMS's
- Mid-C PUD's Operated 10 FMS's
- Data can be obtained at "Dataquery"
  - http://www.nwd-wc.usace.army.mil/perl/dataquery.pl

Snake River Spill Operations

Project	Spring (April 3 – June 20)	Summer (June 21 – August 31)
Lower Granite	20 kcfs (RSW with training spill)	18 kcfs (RSW with training spill)
Little Goose	To the spill cap up to 30% of project outflow.	
Lower Monumental	To the spill cap (~27 kcfs).	To the spill cap up to 17 kcfs.
Ice Harbor	Daytime (0500-1800): 45 kcfs Nighttime (1800-0500): To the spill cap. (From April 30 – July 22, Alternate between 30% of outflow 24 hrs per day and 45 kcfs Daytime/To the spill cap at night)	

Columbia River Spill Operations

Project	Spring (April 10 – June 21)	Summer (July 1 – August 31)
McNary	40% of outflow, 24 hrs per day.	June 22 – August 31 Alternate between 40% and 60% of outflow (up to the spill cap), 24 hrs per day.
John Day	0 kcfs daytime (0600-1800)/To the spill cap up to 60% of outflow at night.	To the spill cap up to 30% of outflow, 24 hrs per day.
The Dalles	To the spill cap up to 40% of outflow, 24 hrs per day.	
Bonneville	To the spill cap up to 100 kcfs.	21 June – 15 July: 85 kcfs daytime/spill cap at night. 16 July – 31 August: 75 kcfs daytime/spill cap at night.

Total Dissolved Gas

Comparison of Exceedences with Previous Years

TDG Exceedences from High 12-hr Average in 24 hours

Year	Gauge-Days in Spill Season[H]	Gauge-Days of Voluntary Spill in Spill Season	Number of Days Exceeded	Percent of Days Exceeding TDG Standard	
				All Spill	Volunt. Spill
2007	2504 '	2504 '	99	4.0%	4.0%
2006	2504 '	2504 '	581	23.2%	23.2%
2005	2639	2124	69	2.6%	3.2%
2004	2639	1591	71	2.7%	4.5%
2003	2639	1936	243	9.2%	12.6%
2002	2639	2039	490	18.6%	24.0%
2001	2639	398	13	0.5%	3.3%
Ave.	--	--	**245**	**9.5%**	**8.2**

[H] Spill Season begins on April 3rd and ends on August 31st.

' Based on 17 TDG gauges (removed MCN Forebay (Oregon Side) in 2006). All other years based on 18 TDG gauges.

Total Dissolved Gas

AVERAGE HIGH 12 HR %TDG EXCEEDANCES AT FMS FROM 1999 - 2007										
	2007	2006	2005	2004	2003	2002	2001	2000	1999	Totals
Water Quality Gages	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.	Qty.
Lower Granite Forebay	0	0	0	0	0	0	5	2	0	7
Lower Granite Tailwater	0	28	0	0	15	17	0	4	15	79
Little Goose Forebay	0	24	0	3	10	17	0	2	39	95
Little Goose Tailwater	0	19	0	0	6	6	0	9	6	46
Lower Monumental Forebay	11	56	6	1	19	49	0	28	44	214
Lower Monumental Tailwater	7	29	7	1	10	6	0	12	26	98
Ice Harbor Forebay	31	51	3	4	35	24	0	34	44	226
Ice Harbor Tailwater	0	22	3	2	4	6	0	4	12	53
McNary Forebay - Wa.	6	31	8	10	24	43	1	14	22	159
McNary Forebay - Or.	--	--	11	23	32	45	5	22	19	157
McNary Tailwater	1	32	1	7	12	31	0	17	50	151
John Day Forebay	0	20	2	0	10	11	0	1	8	52
John Day Tailwater	3	38	3	0	0	29	0	12	43	128
The Dalles Forebay	8	40	6	5	11	18	0	5	1	94
The Dalles Tailwater	0	10	0	0	4	11	0	5	5	35
Bonneville Forebay	3	51	3	1	17	30	0	14	19	138
Cascade Island	0	61	0	---	---	---	---	---	---	61
Warrendale	--	--	---	0	1	19	0	6	2	28
Camas/Washougal	29	63	16	14	33	65	2	58	51	331
Total Number of Exceedances	**99**	**575**	**69**	**71**	**243**	**427**	**13**	**249**	**406**	**2152**

Total Dissolved Gas

TDG EXCEEDANCE TRACKING
Types of Exceedances:
1. Exceedance due to high runoff flows and flood control efforts.
2. Exceedance due to Intertie line outages.
3. Exceedance due to unit outages during repair or maintenance.
4. Exceedance due to BPA inability to handle load so water was spilled.
5. Exceedance due to a break down in communication. Teletype went out but no change occurred or Project operator interpreted teletype differently than what was intended.
6. Exceedance due to uncertainties when using best professional judgment to apply the spill guidance criteria, e.g., travel time, degassing, water temperature effects, spill patterns.
7. Exceedance due to high TDG levels coming from the Mid Columbia River Dam (see Pasco FMS readings).
8. Exceedance due to high TDG levels coming from the Snake River projects (see Ice Harbor Dam FMS readings).
9. Exceedance due to a load rejection; the powerhouse was not working and the river was spilled.
10. Exceedance due to lack of information; the FMS gage malfunctioned and we had no information at the time of making spill change decisions.
11. Exceedance due to mechanical problems, e.g., gate was stuck open, passing debris.
12. Exceedance due to sharp rise in water temperature (a 3 degree F. or greater change in a day).
13. Exceedance due to bulk spill pattern being used which generated more TDG than expected.
14. Exceedance due to non-functioning of flow deflectors during tailwater elevation above 19 ft and especially above 26 ft.

Total Dissolved Gas

Snake River TDG Exceedance Types Totals									
TDG Exceedance Types	Lower Granite Forbay	Lower Granite Tailwater	Little Goose Forbay	Little Goose Tailwater	Low Monumental forebay	Low Monumental Tailwater	Ice Harbor Forbay	Ice Harbor Tailwater	Totals
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	11	7	31	0	49
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	11	7	31	0	49

Total Dissolved Gas

Columbia River TDG Exceedance Types Totals										
TDG Exceedance Types	McNary Forbay	McNary Tailwater	John Day Forbay	John Day Tailwater	The Dalles Forbay	The Dalles Tailwater	BON Forbay	BON Tailwater	Camas/ Washougal Forbay	Totals
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	0	0	1
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	1	0	0	3	8	0	3	0	29	44
7	5	0	0	0	0	0	0	0	0	5
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
Grand Total	6	1	0	3	8	0	3	0	29	50

Dworshak Summer Operations

Dworshak Dam

Lower Granite Dam Tailwater

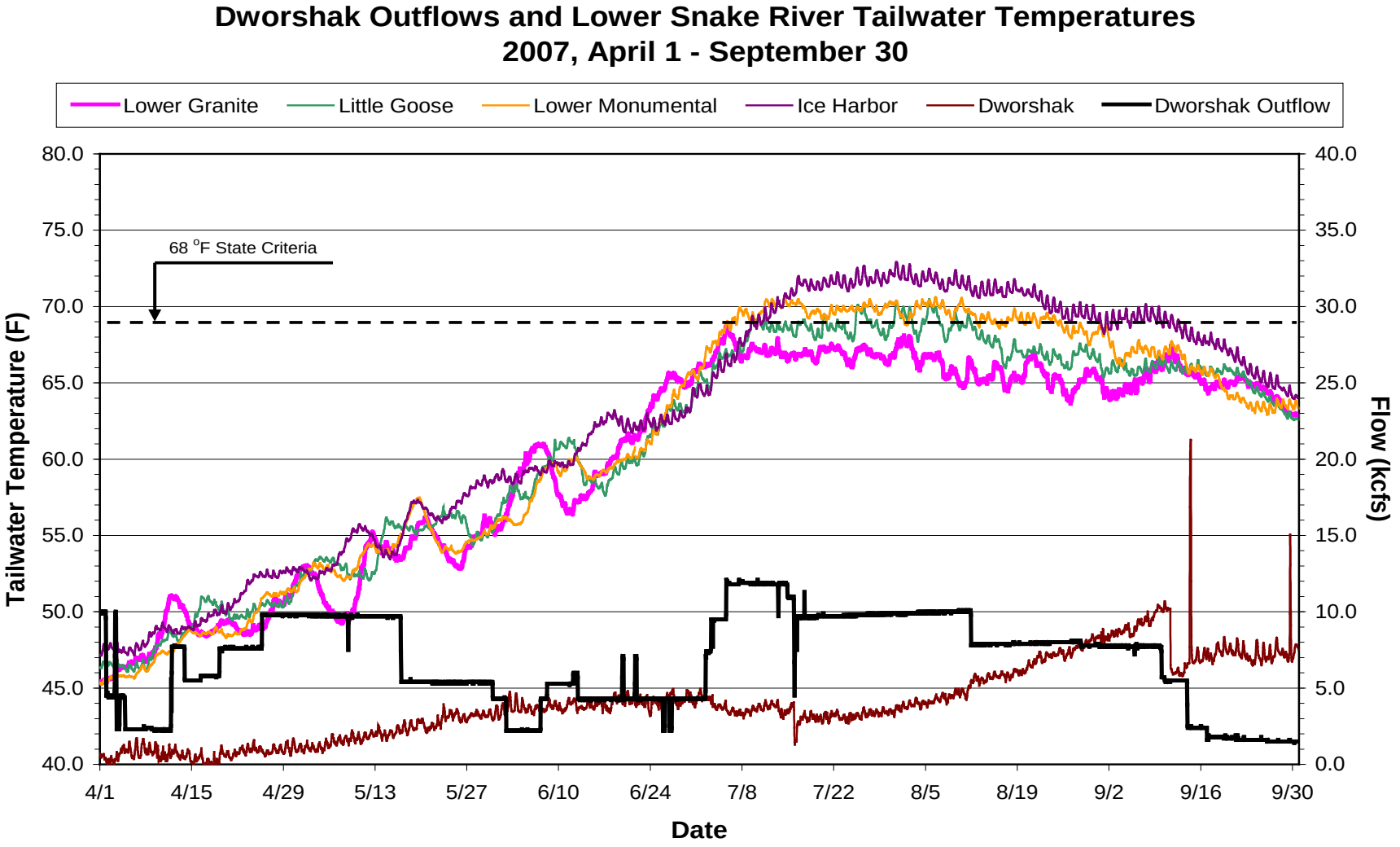
Dworshak Summer Operations

Table I-1: Dworshak Flow Augmentation/Temperature Control Operations in 2007.

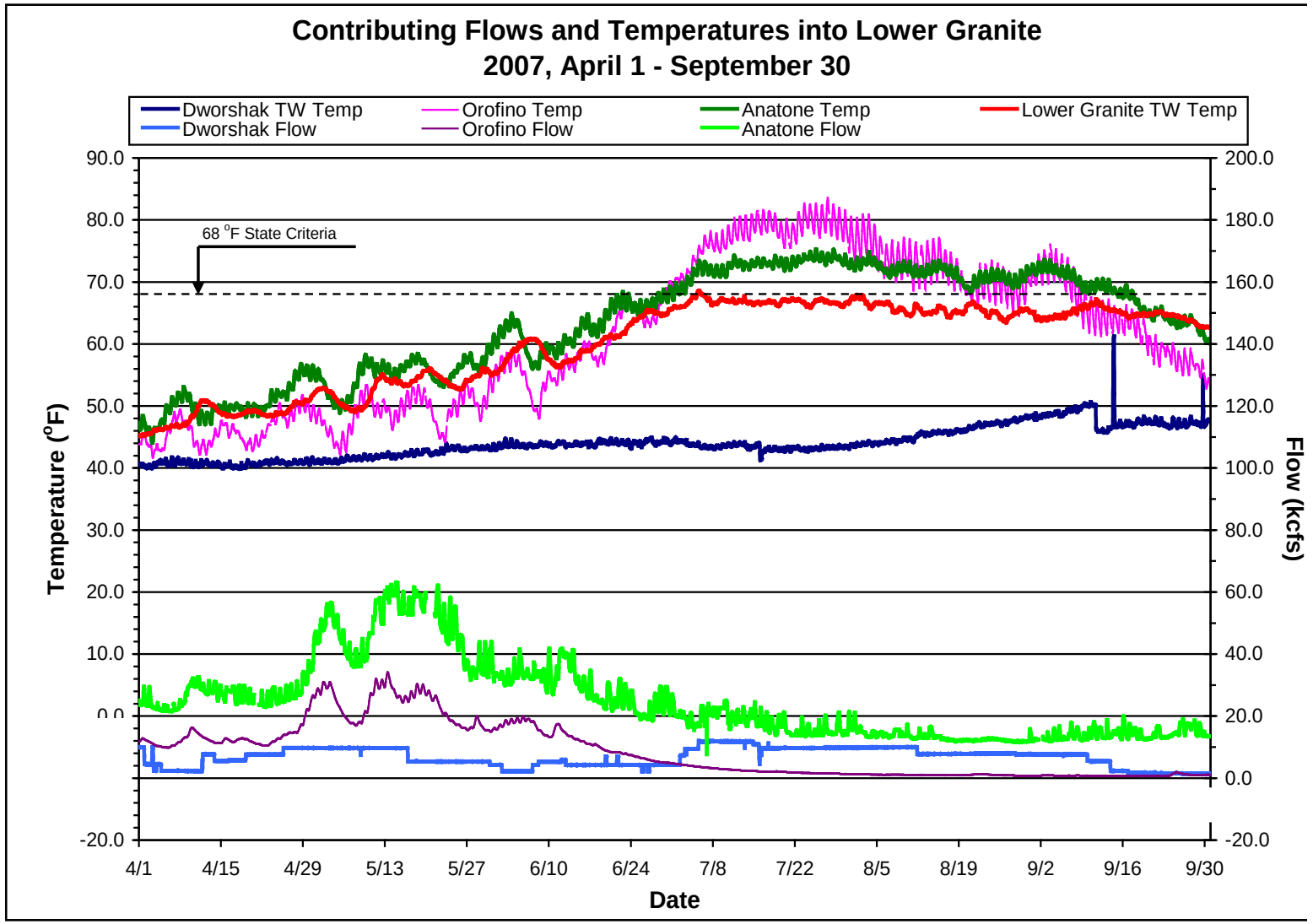
Operation Start		Operation End		Outflow (kcfs)	Ouflow Target Temperature (°F)	Selector Gate Position		
Date	Time (hrs)	Date	Time (hrs)			Small Unit	Small Unit	Big Unit
2 July	1000	3 July	0600	7.4 – 7.6	44.0 – 45.0	O		O
3 July	0600	3 July	1200	9.4 – 9.5	43.0	O	O	O
3 July	1300	5 July	1400	9.5	43.0	O	U	O
5 July	1400	13 July	1200	11.8 – 12.1	43.0	O	U	O
13 July	1300	14 July	2200	11.8 – 12.1	43.0	U	U	O
14 July	2200	15 July	2200	10.9 – 11.0	43.0	U	U	O
15 July	2300	16 July	0800	9.6	43.0	U	U	U
16 July	0900	11 Aug	2200	9.6 – 10.1	43.0	U	O	U
11 Aug	2300	9 Sep	2300	7.7 – 8.1	45.0 – 46.0		O	U
9 Sep	2400	11 Sep	0930	5.4 – 5.7	49.0 – 50.0		O	U
11 Sep	0930	13 Sep	2200	5.4 – 5.7	45.0 – 47.0			U
13 Sep	2300	16 Sep	2200	2.4 – 2.5	Lowest Possible	U		
16 Sep	2200	End of Season		1.6 – 1.8	Lowest Possible	U		

U = Undershot, O = Overshot.

Dworshak Summer Operations



Dworshak Summer Operations



Dworshak Summer Operations

Table I-4

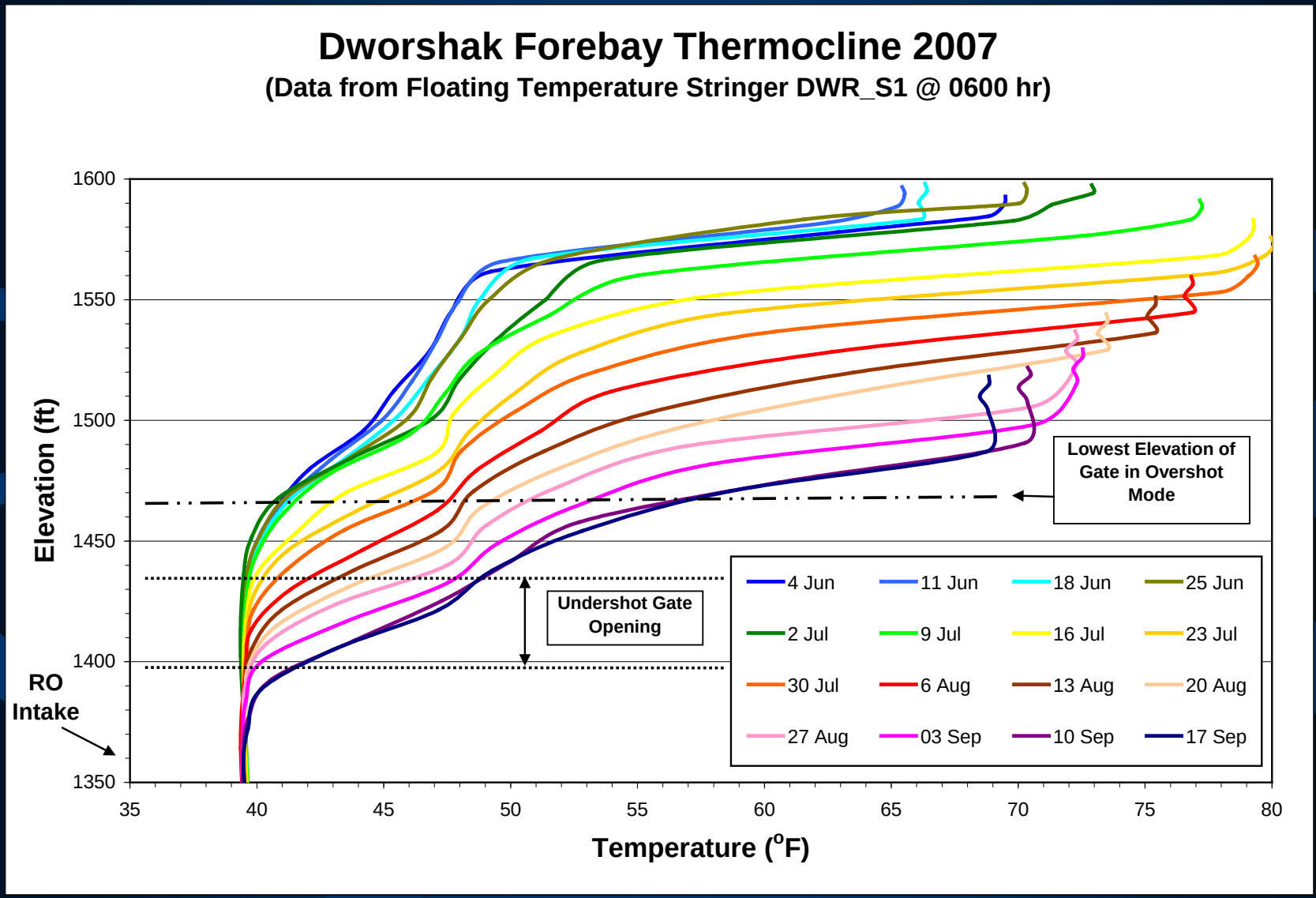
Lower Granite Tailwater State Temperature Criteria Exceedance Comparison
2007, April 1 - September 30 (Temperature in Degrees Fahrenheit)

Annual Statistics		
Year	Hours of Exceedance	Index of Exceedance
2007	31	8
2006	223	131
2005	0	0
2004	7	2
2003	63	14
2002	17	4
2001	193	125
2000	0	0
1999	23	6
1998	1184	2125
1997	137	56
1996	526	613
1995	686	399

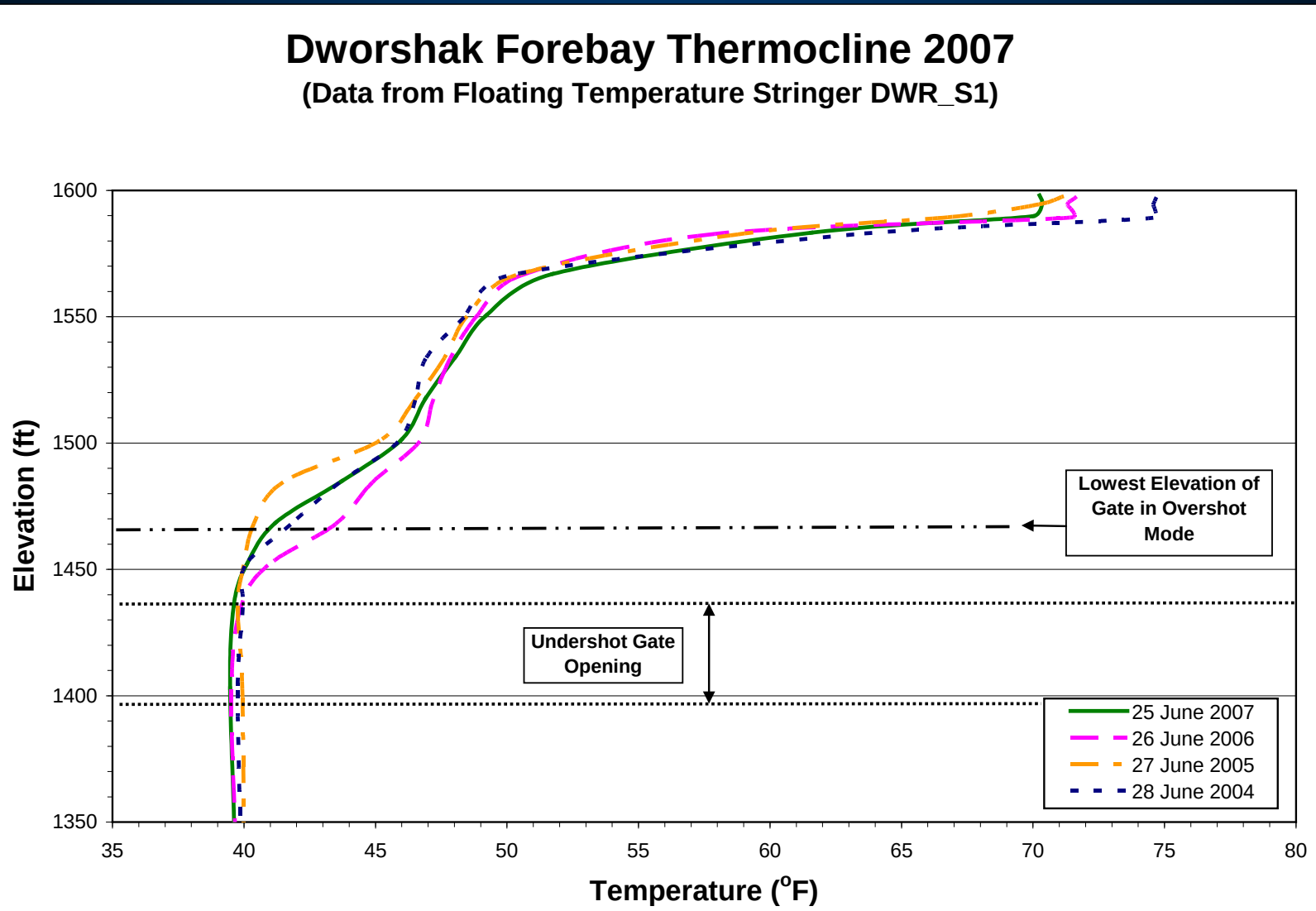
13-yr Statistics			
Hours of Exceedance		Index of Exceedance	
Range:		**Range:**	
High: 1184 hrs (1998)		High: 2,125 degree-hrs (1998)	
Low: 0 hrs (2000, 2005)		Low: 0 degree-hrs (2000, 2005)	
Overall Average:	238 hrs	**Overall Average:**	268 degree-hrs
Average 1995-1999:	511 hrs	**Average 1995-1999:**	640 degree-hrs
Average 2000-2007:	67 hrs	**Average 2000-2007:**	35 degree-hrs

Note: The Lower Granite tailwater gauge went down on 9/1/97 at 1600 hrs and did not report any further data for the rest of the year. The last temperature recorded was 69.1 F. Therefore, the 1997 Exceedance Index value should be slightly higher. During the years 1996 and 1995 the gauges went down for the season on 9/17 and 9/25, respectively, and during 1998 there was 56 hours of data missing from 9/22 - 9/24.

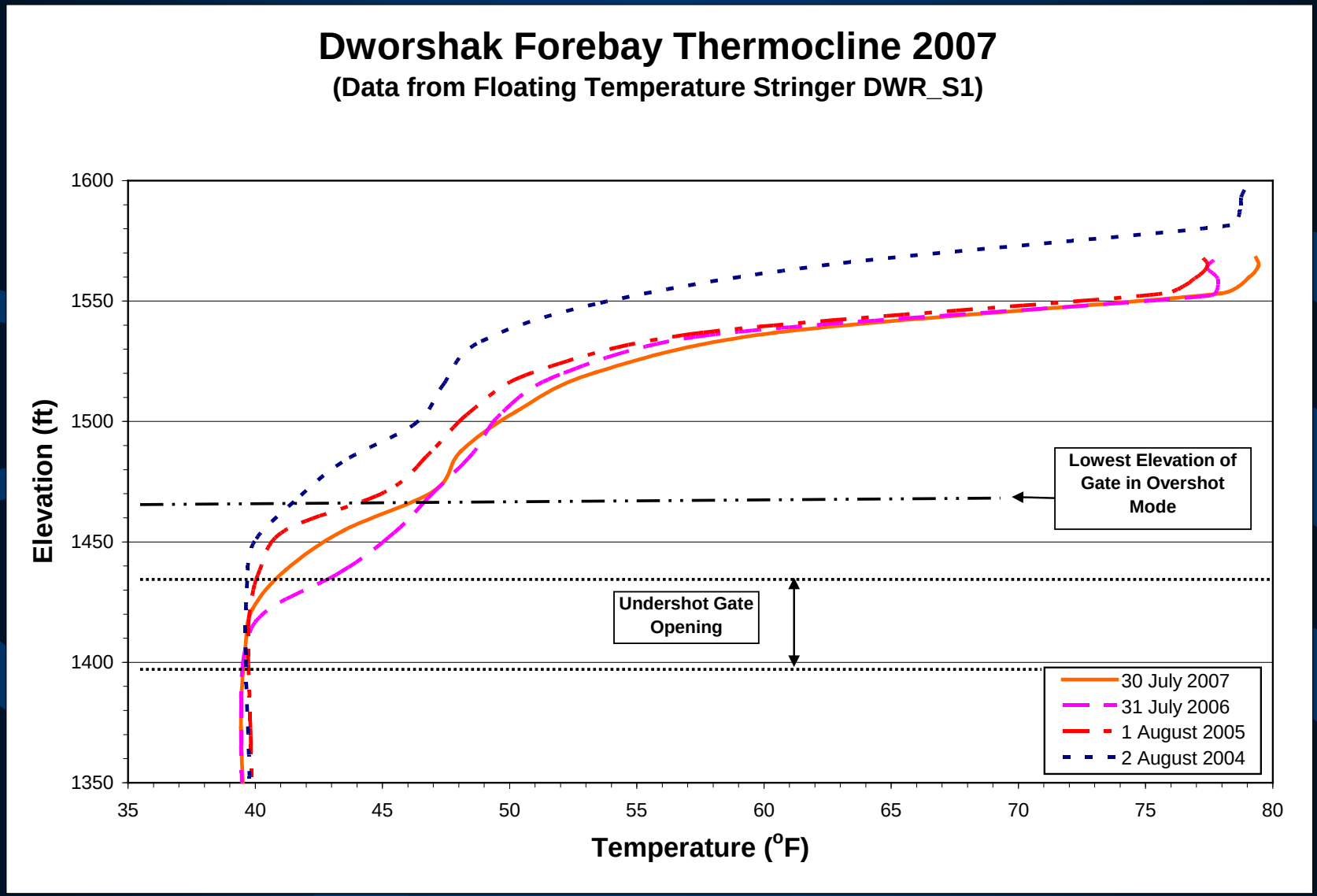
Dworshak Summer Operations



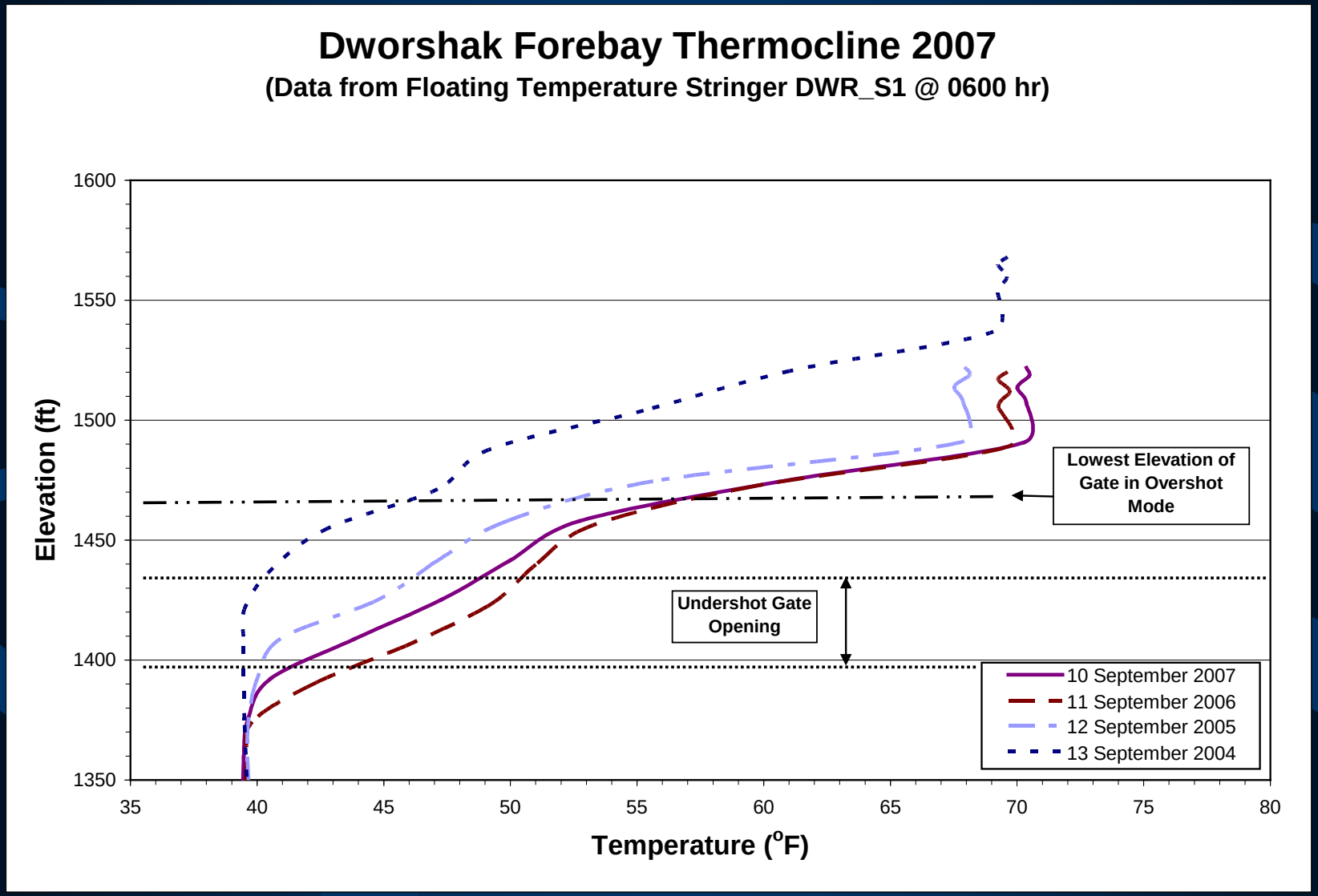
Dworshak Summer Operations



Dworshak Summer Operations



Dworshak Summer Operations



Technical Management Team
2007 Year End Review

Water Quality

RECLAMATION

Managing Water in the West

Upper Snake Flow Augmentation 2007

U.S. Department of the Interior
Bureau of Reclamation

Upper Snake Flow Augmentation 2007

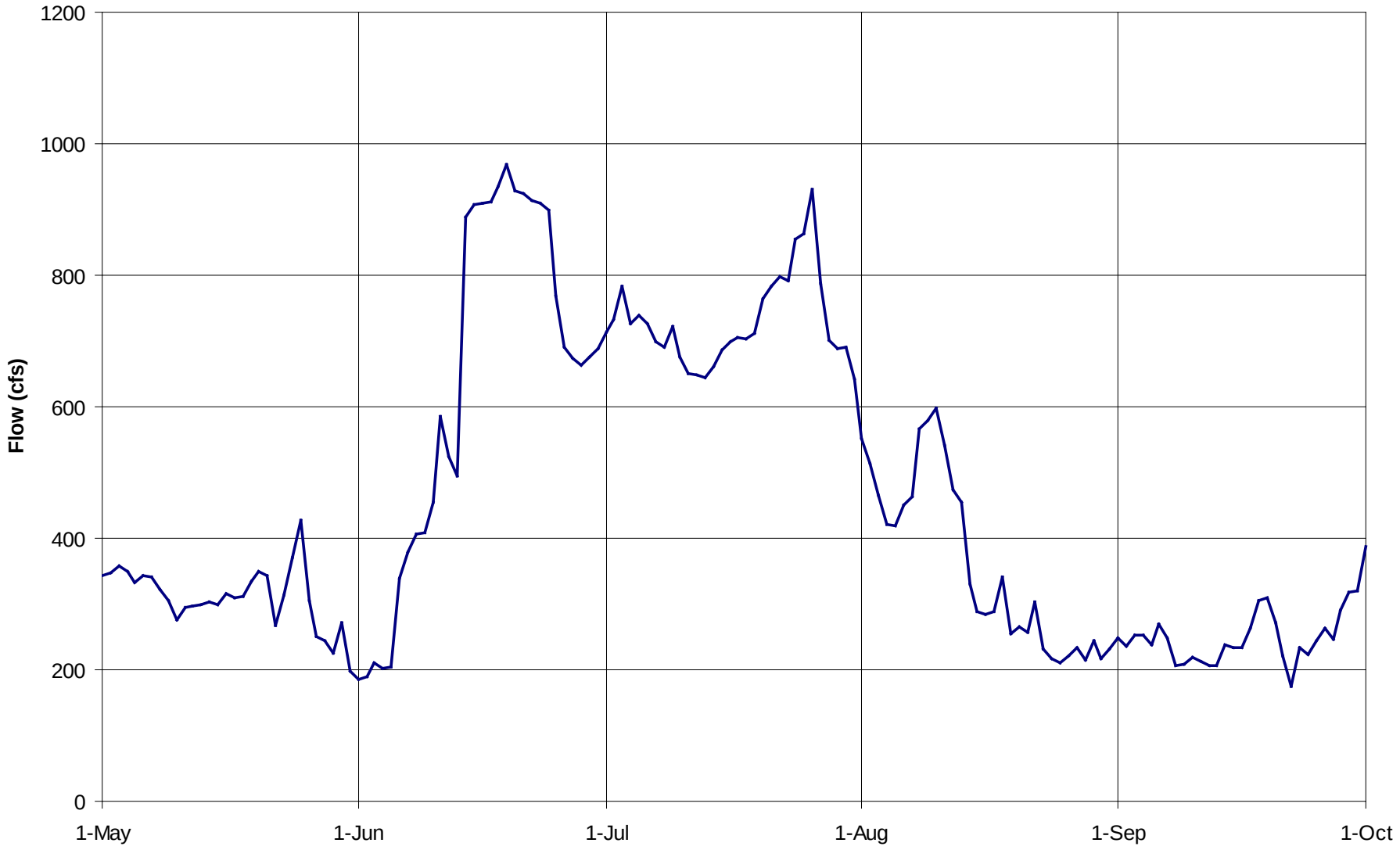
- Upper Snake above Milner – 149,649 acre-feet
- Payette – 141,000 acre-feet
- Boise – 60,127 acre-feet
- Natural Flows – 77,649 acre-feet
- Total – 428,425 acre-feet

Targeted Volume was 427,000 acre-feet, actual volume (428,425 acre-feet) calculated after corrections were made to automated stream gaging information after the migration season.

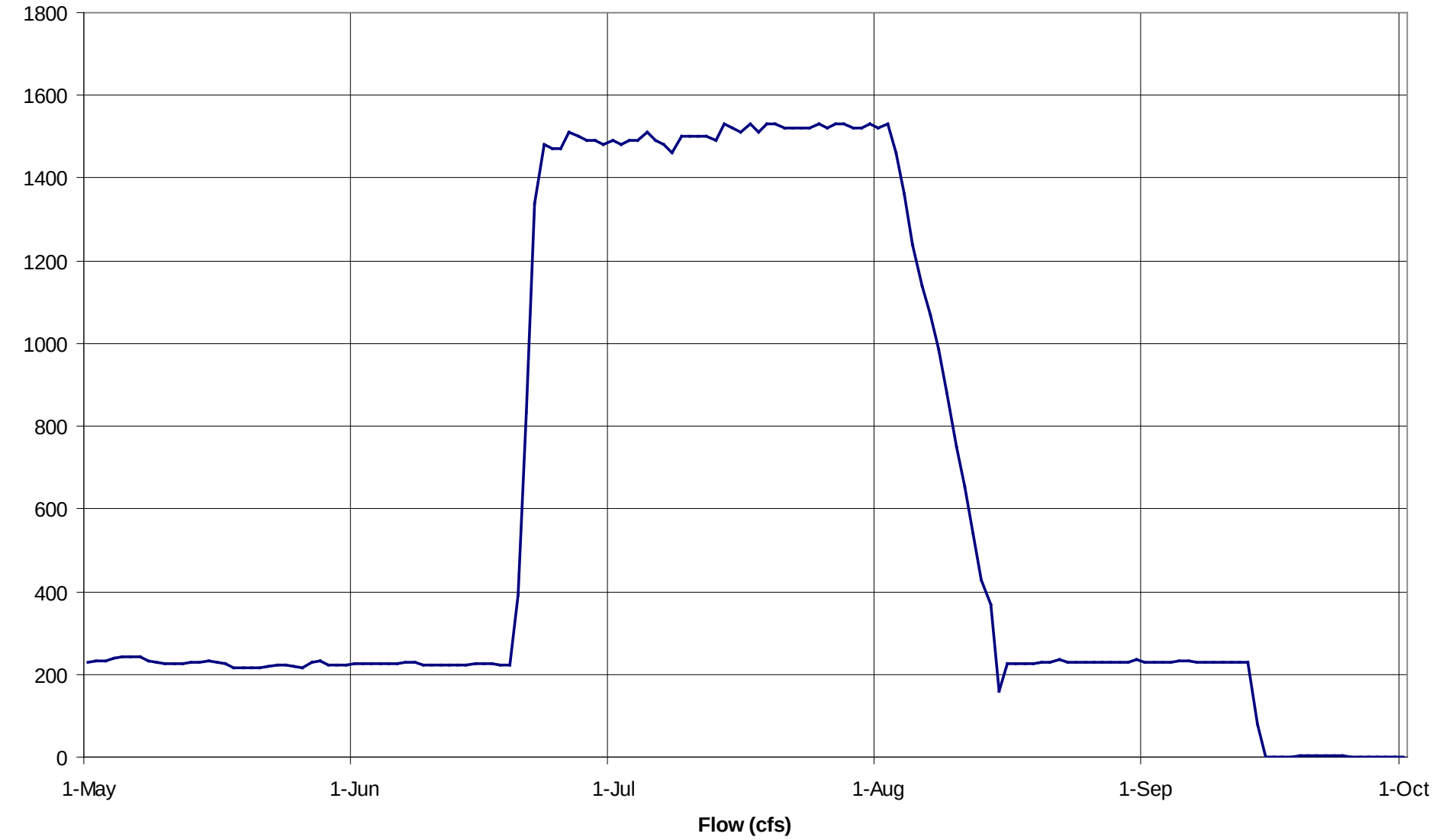
RECLAMATION

SOURCE	AMOUNT (acre-feet)	DATES OF DELIVERY
Upper Snake above Milner Dam		
Reclamation Uncontracted Space	20,091	June 20 - August 15
Reclamation Powerhead Space	87,450	
Rentals – Water District 01	0	
Rentals – Tribes	42,108	
Subtotal	***149,649***	
Payette		
Reclamation Space	95,000	June 2 – August 30
Rentals	46,000	
Subtotal	***141,000***	
Boise		
Reclamation Uncontracted Space	40,932	June 14 -August 17
Reclamation Powerhead Space	19,195	
Rentals	0	
Subtotal	***60,127***	
Natural Flows		
IWRB Lease (Idaho)	60,000	April 3 – August 31
Skyline Farms (Oregon)	17,649	
Subtotal	***77,649***	
TOTAL	**428,425**	

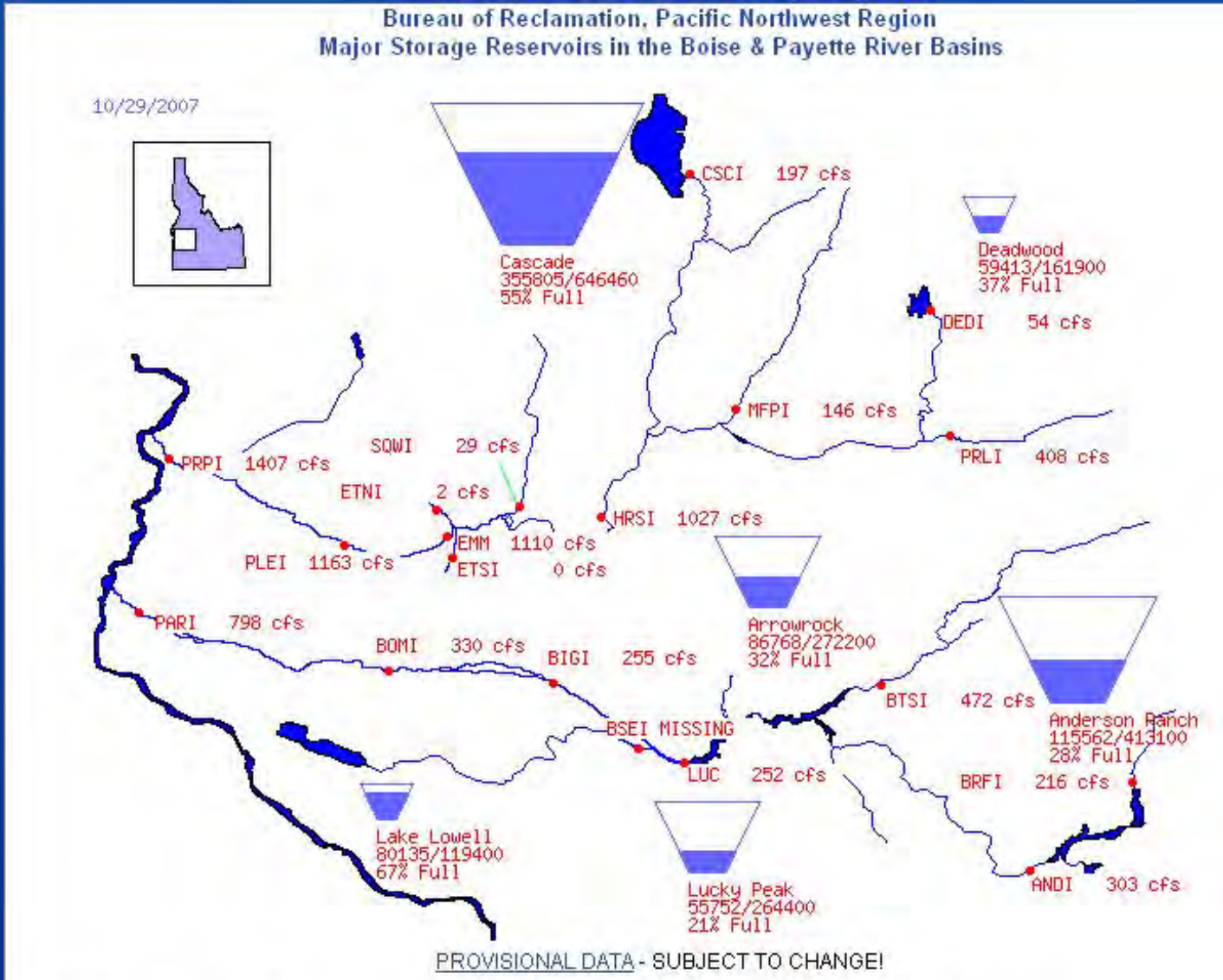
Boise River near Middleton, Idaho (2007)



Snake River at Milner, Idaho (2007)



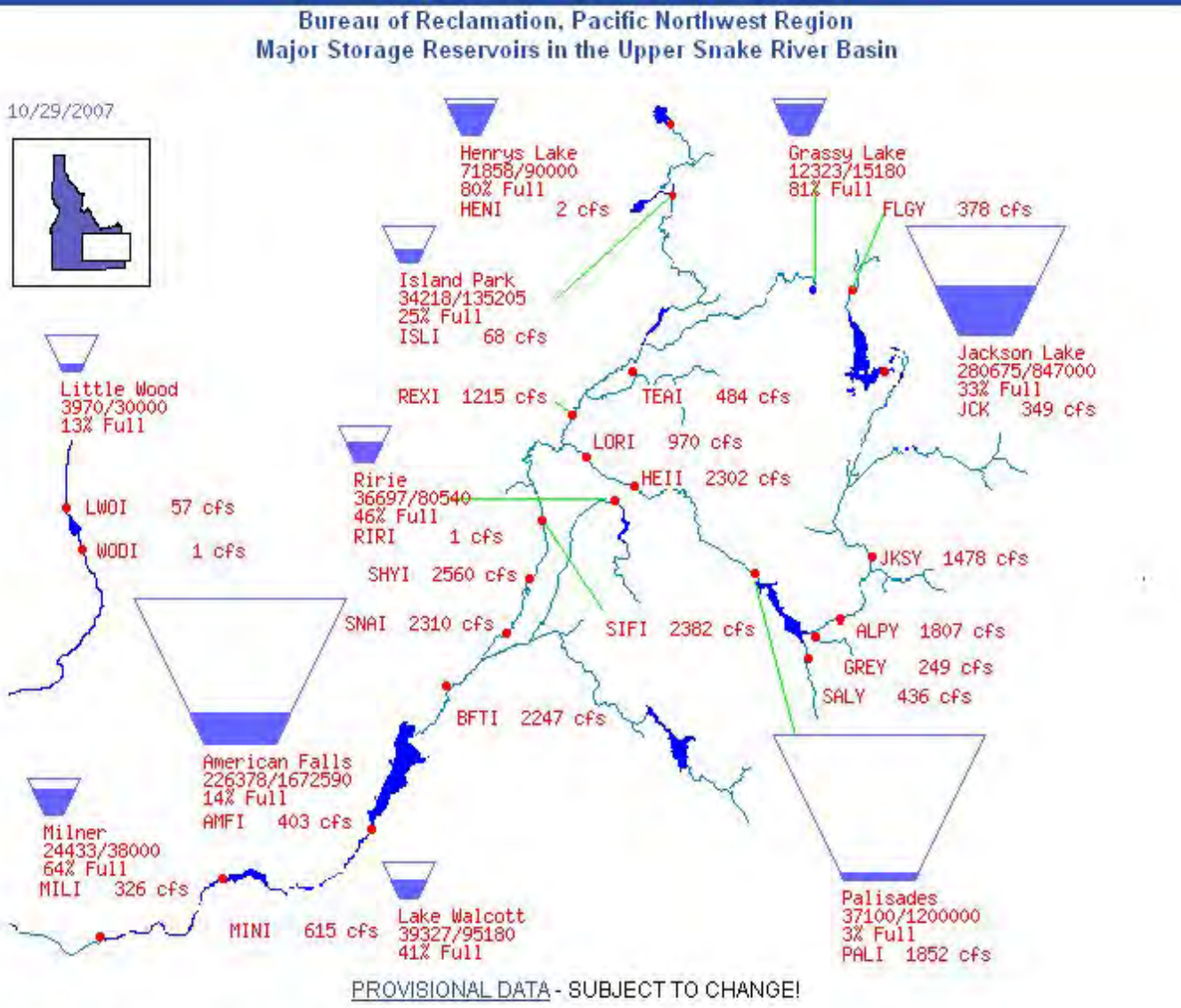
System Storage on October 29, 2007 was 27% of capacity and 71% of average for the Boise and 51% of capacity and 90% of average for the Payette



Boise River system (Anderson Ranch, Arrowrock, Lucky Peak) is at 27 % of capacity.
Total space available: 691618 AF
Total storage capacity: 949700 AF
Natural Flow: 821 CFS

Payette River system (Cascade, Deadwood) is at 51 % of capacity.
Total space available: 393141 AF
Total storage capacity: 808360 AF
Natural Flow: 1169 CFS

Storage above Milner on October 29, 2007 was 16% of capacity and 39% of average



Average daily streamflows indicated in cubic feet per second.
Reservoir levels current as of midnight on date indicated.
Click on gaging stations (red dots) for streamflow hydrographs.

```
Upper Snake River system (Jackson Lake,Palisades,
Grassy Lake,Island Park,Ririe,American Falls,LakeWalcott)
is at  16 % of capacity.
Total space available:        3378974 AF
Total storage capacity:       4045695 AF
```

Winter 2007-2008 Climate Forecast

Kyle Dittmer

Hydrologist-Meteorologist

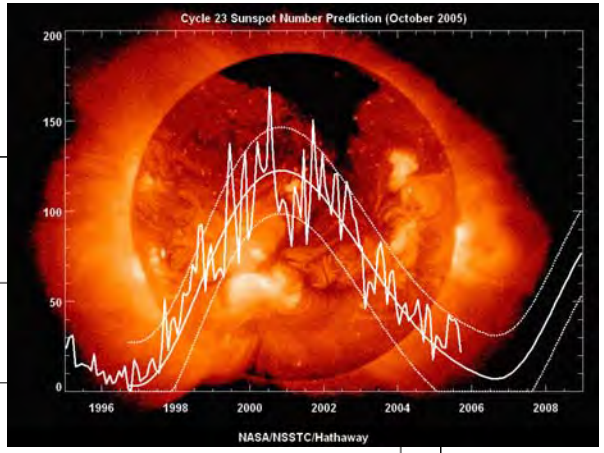
November 9th, 2007

Oregon-AMS Meeting, OMSI, Portland

Columbia River Inter-Tribal Fish Commission
Portland, Oregon

Introduction – Methods

- Forecast uses the Tribal approach-- holistic.
- Big-picture: Solar-Forcing (e.g., sunspot cycles) does influence our global weather patterns.
  In memoriam: Dr. Landscheidt, 1922 – 2004.
- Track ENSO with the Multi-variable ENSO Index.
- Sea-Surface Temperature Departure Forecasts.
- Hydro-Climate approach: Water year 2008 volume forecast used regressed Multi-variable ENSO Index vs. historic runoff for the Columbia at The Dalles.



OBSERVED SUNSPOTS

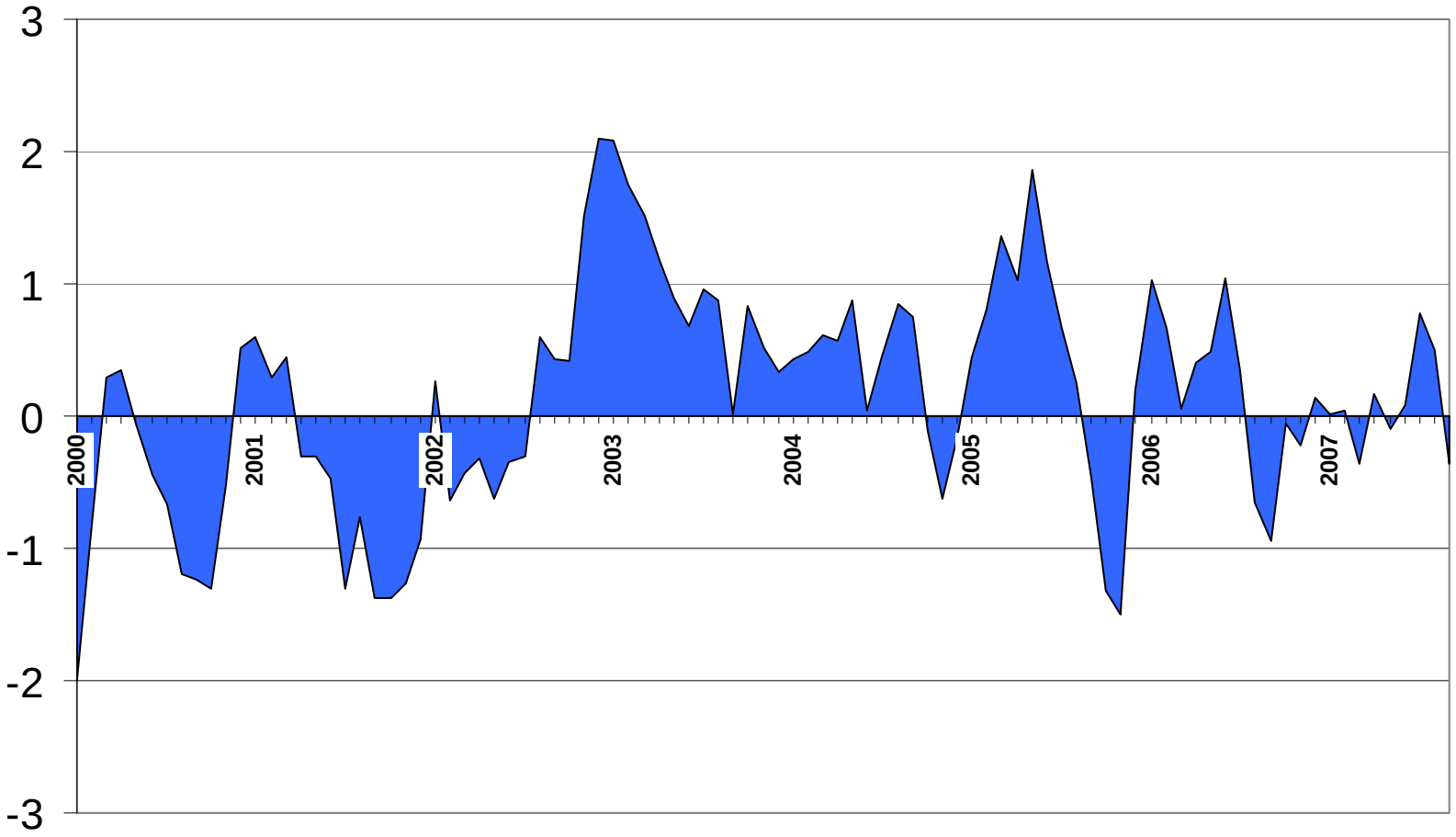
Monthly Mean Sunspot Counts

180
160
140
120
100
80
60
40
20
0

1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007

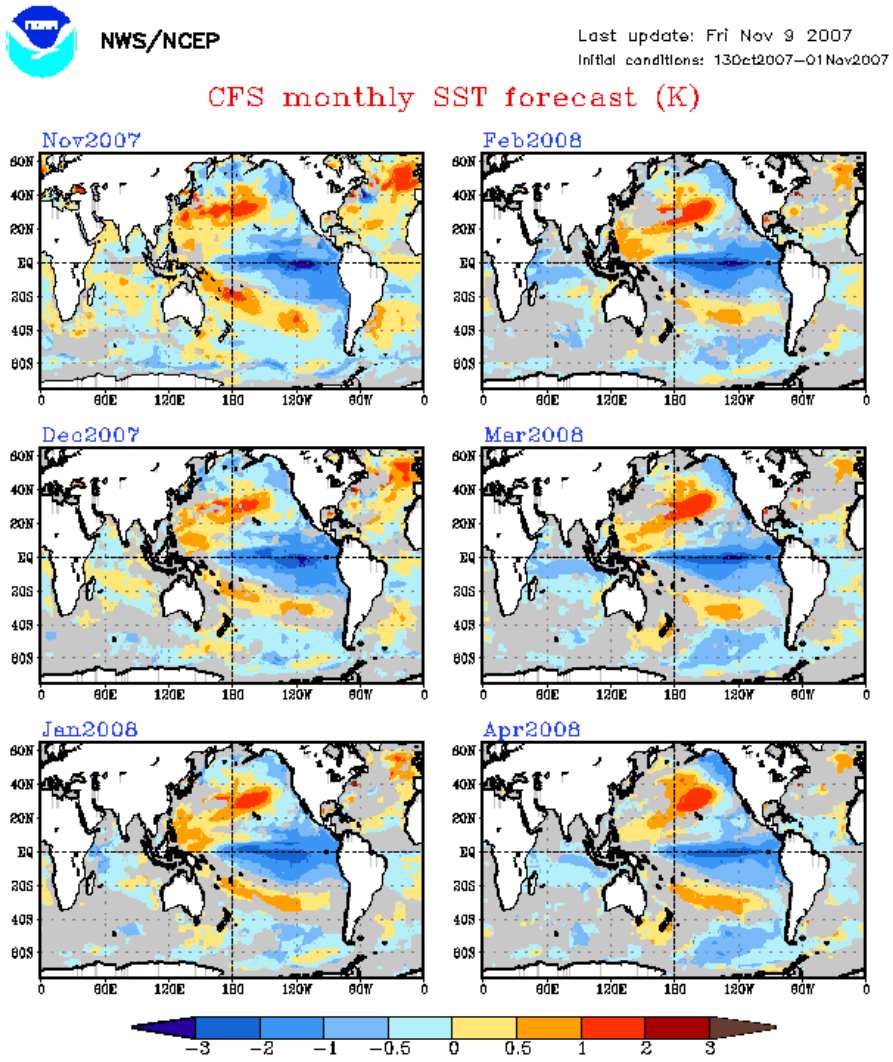
Source: NOAA - National Geophysical Data Center

PACIFIC DECADAL OSCILLATION (PDO)



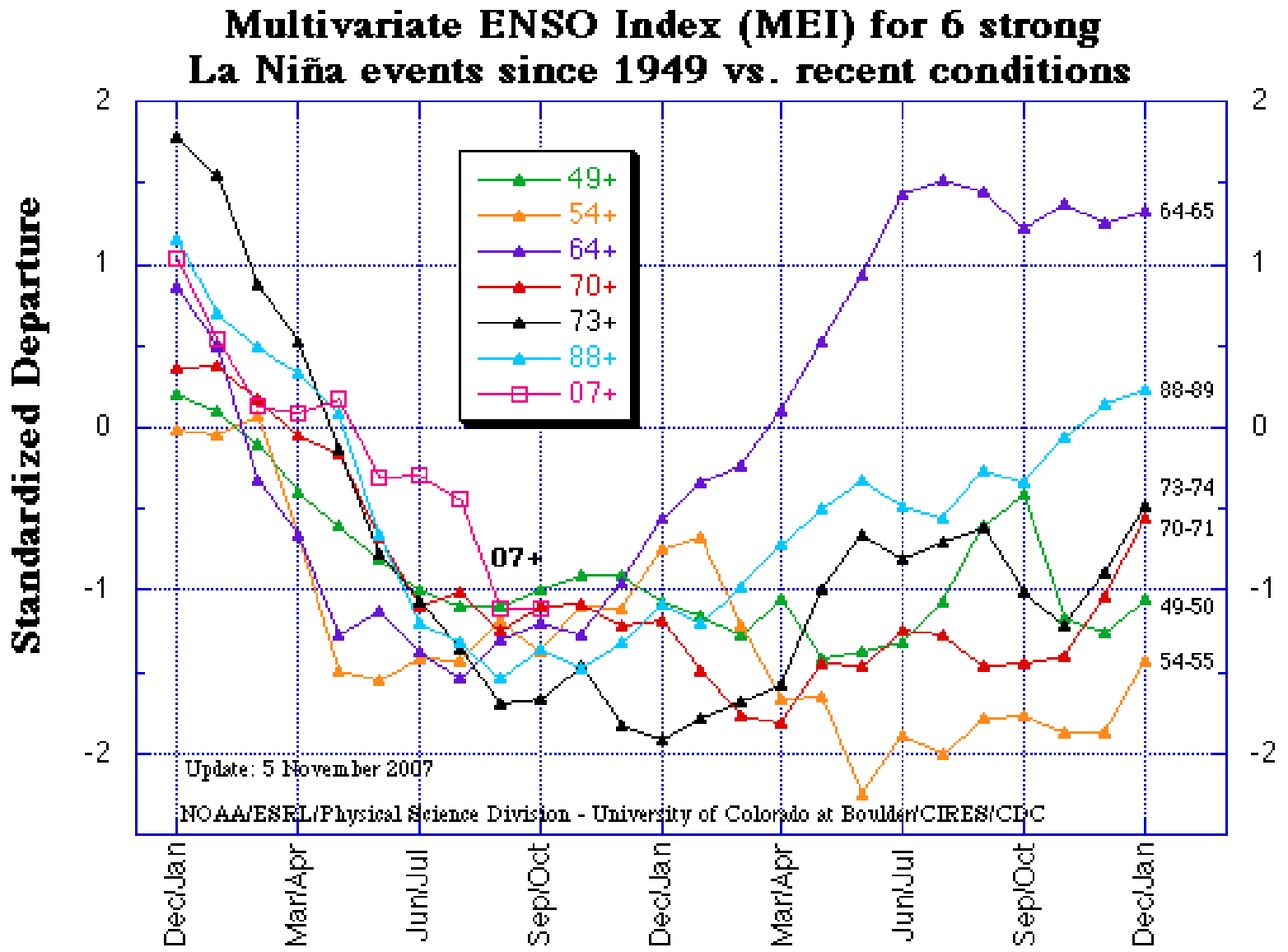
Source: UW-Climate Impacts Group

SEA SURFACE TEMPERATURE DEPARTURE FORECAST

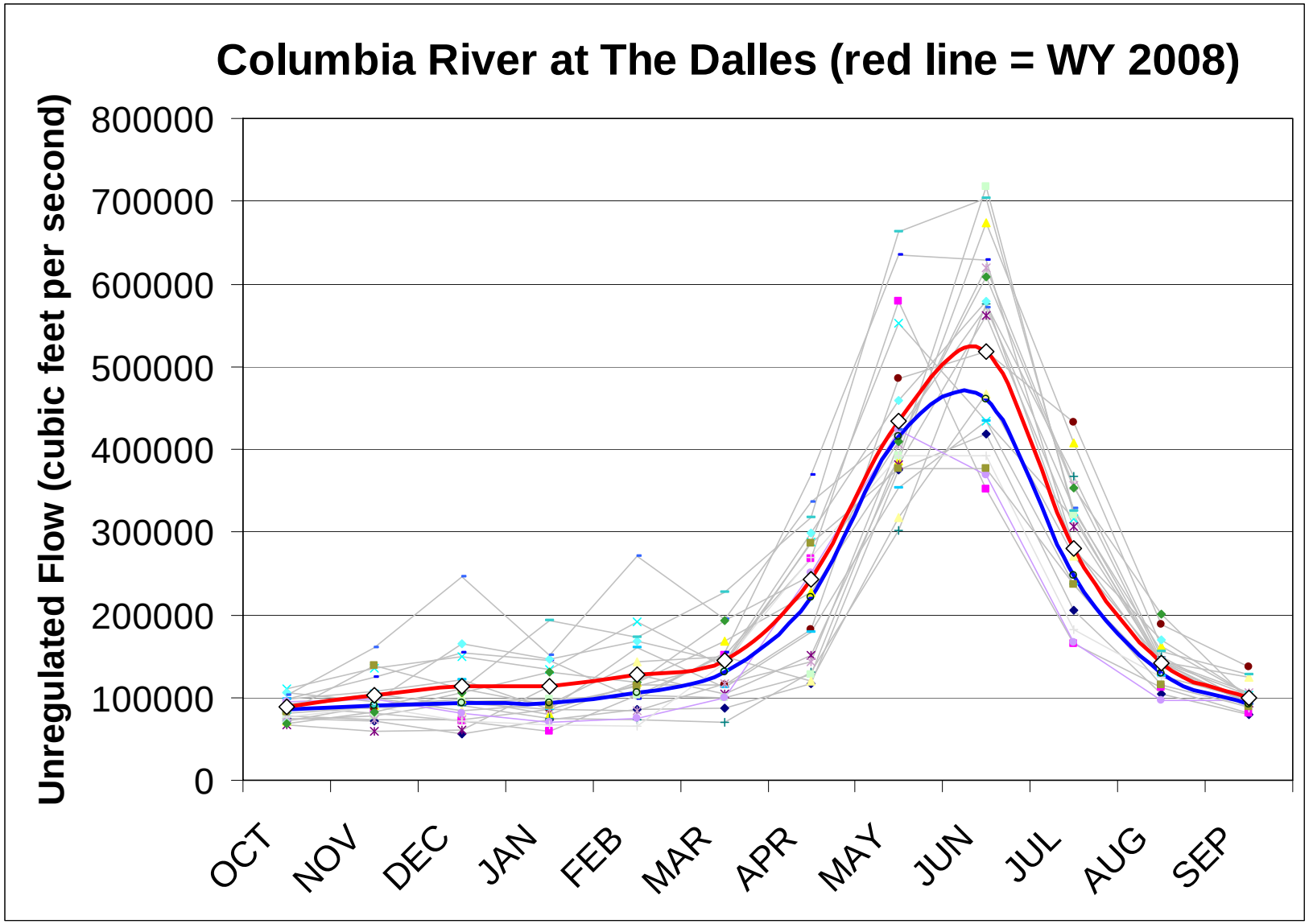


Ensemble average of 40 members from initial conditions of 13Oct2007 to 01Nov2007.
Base period for climatology is 1982–2003. Base period for bias correction is 1982–2003.
Forecast skill in grey areas is less than 0.3.

MEI-- MULTI-VARIABLE EL NINO INDEX



ENSEMBLE STREAMFLOW FORECAST



Blue line = long-term average (WY 1929-2007)

Summary: The Forecast

Month:	Temperature (mean monthly):	"Hedge"	Precipitation (% normal):	"Hedge"
November	Near Normal (-1.8 to + 1.8 degF)	0.1	Above Normal (110 - 130%)	128%
December	Near Normal (-1.8 to + 1.8 degF)	-0.1	Near Normal (90 - 110%)	90%
January	Near Normal (-1.8 to + 1.8 degF)	0.6	Near Normal (90 - 110%)	109%
February	Near Normal (-1.8 to + 1.8 degF)	-0.8	Near Normal (90 - 110%)	106%
March	Near Normal (-1.8 to + 1.8 degF)	-1.2	Near Normal (90 - 110%)	103%

...but what about snow events?!

Expect three events...with one significant event to “shut down Portland”

COLUMBIA RIVER REGIONAL FORUM

TECHNICAL MANAGEMENT TEAM

November 28, 2007 TMT Conference Call

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS

Facilitator: Donna Silverberg
Notes: Robin Gumpert

The following notes are a summary of issues that 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.

Snake River Zero Generation

With steelhead still passing the dam, there was no proposal to allow zero nighttime generation in the Snake River at this point. It was noted that posting survey results in a timely manner will be most helpful as the fish near the end of their migration. If numbers drop to a significant low, TMT members will have a check-in prior to the scheduled 12/12 TMT meeting.

Chum Operations

Paul Wagner, NOAA, reiterated the salmon managers' preference stated at the 11/21 TMT meeting for managing water during chum spawning at Bonneville: In the event surplus inflows at Bonneville Dam result in an inability to maintain the 11.5' target range, excess waters will be shaped during nighttime hours (1800-0600 hrs.) These flows will be shaped in time blocks of four hours and may be extended to eight hours, if necessary to maintain tailwater elevations of no higher than 13'. In the event of excess water *beyond* that, increase the nighttime range to 8 hours and no more than 15'. TMT members will revisit this issue at the 12/12 TMT meeting.

Next TMT Meeting, December 12, 9am-noon

Agenda items include:

- Zero Nighttime Generation in the Snake River
- Chum Operations
- Operations Review

COLUMBIA RIVER REGIONAL FORUM
TECHNICAL MANAGEMENT TEAM
2007 Year End Review
November 28, 2007

FACILITATOR'S SUMMARY NOTES ON FUTURE ACTIONS
Facilitator: Donna Silverberg
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The following notes are a summary of issues that 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. Most presentations were accompanied by Power Point or other electronic information. Please go to the agenda on the TMT web page to see more detailed information.

2007 TMT YEAR END REVIEW

Please note that all power point presentations shared during the Year End Review can be found attached as links to the agenda on the COE's TMT web page: http://www.nwd-wc.usace.army.mil/tmt/agendas/2007/1128.html

Conditions Review

- *Weather*: Kyle Dittmer, CRITFC, provided an overview of 2007 weather. He noted that the past year's weather was highly variable, with hard rains in November 2006 matching those of the floods of 1996, and a hot dry July similar to the drought of 2001. Looking ahead, he reported that the oscillation index indicated the region will experience a La Nina winter which suggests more water than usual this year, and he anticipates a large snow event in the Lower Columbia basin sometime this winter. Kyle handed out a more detailed forecast to attendees.
    - **LESSON LEARNED**: There is value to using a combined approach to forecasting, utilizing the CRITFC, CIG and NOAA forecasts since no single technology has been proven to be the best for long term forecasting.

- *Water and Runoff Patterns:* Cathy Hlebechuk, COE, shared 2004-2006 runoffs compared with 2007. The Libby basin showed the highest runoff for 2007. Cathy also shared flow objectives vs. actual flows: Lower Granite spring objective was 85 kcfs, vs. 61 kcfs actual flow. The Lower Granite summer objective was 50 kcfs and actual flows were 29 kcfs. The McNary spring flow objective was 237 kcfs, actual flows were 240 kcfs. The summer objective was 200 kcfs, actual flows were 163 kcfs. The Priest Rapids spring flow objective was 135 kcfs, and actual flows were 169 kcfs. Cathy also gave a quick overview of project operations for Libby and Dworshak, both of which were discussed in detail during the afternoon 'Reservoir Operations' portion of the agenda.
    - **Questions:** It was noted that the Dworshak operation went well this year – how was the project operated differently than in the past? Cathy offered to look into the specifics and follow up with TMT.

- *Temperature/TDG*: Jim Adams, COE, provided an overview of spill operations with special note of those projects that were operated differently than last year: Lower Monumental spilled to the spill cap in the spring, Bonneville summer spill was 85 kcfs day time from June 21-July 15, and 75 kcfs day time starting July 16. There were 99 total TDG exceedances for the year, which was much lower than 2006 but close to 2004 and 2005. Most exceedances occurred at the Lower Monumental forebay, Ice Harbor forebay, and Camas/Washougal gauges. It was noted that the COE uses highest 12 hours *in a 24-hour period* to determine exceedances, rather than the highest *consecutive* 12 hours per language in the Washington water quality standard. All exceedances were due to uncertainties using best professional judgment at Snake River projects, and most exceedances on the Columbia were for the same, with one due to a unit outage and a few due to high TDG coming from McNary. Jim reported on the summer Dworshak flow augmentation operations to meet temperature criteria at Lower Granite and said there was a minimal exceedance at Lower Granite that was quickly corrected. Jim also shared the contributing temperatures from Anatone and Orofino.
    - **Observations**: With an eye toward combined, collaborative forecasting and modeling, a suggestion was made to look back at how well the predictions from CEQUAL and RBM-10 temperature models matched with actual temperatures.
    - Overall, the hatchery fish and recreational users were not negatively impacted by the Dworshak operation this year.
    - The thermocline has been much cooler for the last three years as compared to 2004.

- *Fish Conditions*:
  In-river – Steve Smith, NOAA, shared a power point overview of preliminary results of PIT tag survival studies on spring/summer migrants on the Snake River – updates will be made and 2007 results will be finalized in an annual report in the next few months.

  This was the 15th year of collected PIT tag data, and 2007 was unique as a 'low flow, high spill' year which likely will provide useful data for future analysis. Initial results included: Average survival for hatchery chinook was 65.2% in 2007 compared to 61.8% long term average. Travel time for hatchery chinook from release to Lower Granite Dam was shorter in 2007 than the long term average. Steelhead experienced longer travel times in 2007 than 2006, but faster than 2004. Stream-type (yearling) chinook experienced above average reach survival throughout the reach, while steelhead survival was not as consistent throughout the reach in terms of 2007 comparisons to long term. The Lower Monumental to McNary reach showed higher survival estimates for steelhead in 2007 than in past, low flow years. It was suggested that increased caspian tern populations and predation may have contributed to lower survival of steelhead from 2001 to the present. PIT tag detection at Ice Harbor was new this year. The overall survival estimate for spring chinook from Lower Granite Dam to Bonneville Dam was 55.5%, and for steelhead was 39% (this number was much lower in 2004).

Transported – In prior years, it was estimated that 70-90% of the fish were taken out of the river and transported. Estimates are more difficult to do now given PIT-tag and non-tagged fish distribution, and varying transportation dates in the middle of the migration season. Steve shared that the COMPASS model had been used to estimate the transport percentage that was presented at the NWPCC Science/Policy exchange meeting. Steve recalculated those percentages using a different methodology and reported his current estimate for 2007 based on pit-tagged data, for non-tagged fish, were: 24% non-tagged chinook and 33% non-tagged steelhead. The reason for the low numbers was likely due to a later start in transportation so many of the fish had already passed; and, unexpectedly, a low proportion of the fish went through the bypass systems at Little Goose and Lower Monumental (e.g., it was estimated that only 50% of the spring chinook went into the bypass system).

- **Questions**: Will information gathered this year be taken into account during finalization of the 2007 FCRPS BiOp? NOAA: Given that this is a unique low flow, high spill year, it is difficult to draw too many definitive conclusions. AND the data does need to be considered.
- Need to look at transportation/spill very carefully – are we doing a good job spreading the risk?

- *Adult Fish Runs*: Cindy LeFleur, Washington, reported on preliminary results for salmon and steelhead adult passage numbers. Upper Spring Chinook counts were slightly above the forecast, at 86,000, while Summer Chinook numbers were below at 37,000. Sockeye continue to experience low return numbers, this year totaling 24,000 (well below escapement goals). Summer steelhead totaled around 318,000, and both wild and total numbers remained stable. Upriver Fall Chinook numbers were lower than previous years and, at 150,000, were below what was predicted. Within this group, Spring Creek hatchery numbers were particularly low, at 17,000, and Upriver Bright Fall Chinook (Hanford Reach and Priest Rapids hatchery fish) were low, at 122,000. However, Lower Granite counts of Upriver Fall Chinook numbers showed the 5th highest return since 1975. Chum numbers at Ives Island are low this year. Bonneville count Spring Chinook jacks are high at 20,000, indicating that adult returns will likely be high given past correlations between jack and adult counts. Of the jacks, Tule Fall Chinook counts were particularly high.

- *Spring/Summer/Fall Passage*: Margaret Filardo, Fish Passage Center, shared information on hatchery subyearling Fall Chinook survival for the Lower Granite to McNary reach, and timing estimates. The fish passed earlier this year compared to historical dates; most passed by the end of July. Actively migrating chinook survival was estimated at 55-60%. Margaret reiterated the conditions this year: low spring and summer flows (similar to 2001), higher spill proportions and warmer temperatures. The FPC shared graphs of: survival and spill percentage relationship; flow to water transit time conversion, water transit time relative to survival; survival relative to average temperature and all components in relation to each other.
    - **Observations**: Increased spill and reduced water travel time show strong correlations to higher survival. Even though this was a low flow year, in

river migration rates and survival were relatively high because of the spill provided.
  - *Spill proportion* (not just flow) and travel time are important – this should be considered when making management decisions.
  - Some management actions were not implemented consistent with fish protection goals – so, for example, spill occurred this year during lower flow conditions while transportation might have been the more beneficial action.
  - This year provided a unique opportunity to 'think outside the box' and try different management options.
  - Adult survival data should be reviewed as a management tool and indicator of in-river management success, not just juvenile survival. It was noted that data is now emerging that allows the region to begin teasing out the resulting impact on adults from management scenarios and other conditions.
  - Temperature effects on spring migration should be considered.
  - Information on Fall Chinook holdovers should be gathered to help aid in management decisions. Migration timing and size information is also important.
  - Need to build time into TMT discussions to integrate new information.

Overall Lessons Learned: 2007 was a roller coaster of a year with a winter like 1996 (very wet) and a summer/fall similar to 2001 (drought). In spite of this, water temperatures and gas levels were generally well managed—and the fish story, once the data is complete and analyzed, will likely provide useful information for future management strategies in unusual weather years.

Specific Operations Review

- *Vernita Bar Operations*: Russell Langshaw, Grant County PUD, provided an overview of 2007 Hanford Reach Fall Chinook Protection Program operations as compared to previous years, and shared current data from the 2007 spawning season: No redds were observed above 65 kcfs during the 2007 spawning period. 55 kcfs was the critical elevation. Conclusions were drawn based on comparisons with previous years' experimental operations.
  - **LESSONS LEARNED**: Peaking operations have potential.
  - Pre- and post-hatching periods continue to see a high level of protection.
  - Dramatic improvements have been observed during emergence and rearing; protection criteria was met 94% of the time in 2007, and the maximum exceedance was 2.9 kcfs.
  - Hourly coordination and the new management philosophy led to success this year.
  - Observations of redds this year showed few stranding. This may be correlated to low escapement numbers.

- *Transportation Operations*: Paul Wagner, NOAA, added to the previous presentation by Steve Smith by supporting the belief that the information gathered this year will provide good information to the region in 2009 operations.

- *TDG Management – Lower Monumental Spill Operations*: On behalf of FPAC, Paul Wagner reported concerns about how spill was managed at Lower Monumental during a period when TDG levels had exceeded the states' criteria. The COE lowered spill to a level and for a period long enough to drop TDG levels well below 115%. From the salmon managers' perspective, the extent of this action was too drastic.

    - **Observations**: Lower Monumental TDG is very sensitive both in modeling and real time monitoring. The COE and the salmon managers need enhanced communication and collaboration regarding setting spill caps and choosing modeling scenarios to improve overall management.
    - In the future, from the salmon manager perspective, TDG management should be more flexible and time travel delays of up-stream operations and changing conditions in the river should be considered.
    - The COE will pursue improvements to the weather component of SYSTDG as a long term solution to better TDG management.

- *Lower Monumental Emergency Spill*: The salmon managers noted that increasing spill from 13.5 kcfs to 31.5 kcfs for a short, 4-hour period of time, had a positive impact on passing juveniles, particularly steelhead.
    - **Observation**: With the installation of an RSW at Lower Monumental next spring, operations might change and will need to be reviewed.

- *MOP Operations*: Jim Adams, COE, reported two deviations from normal MOP operations this year, one in April which was documented through the BiOp court process, and the other to accommodate safe towboat navigation (see next bullet for more discussion).

- *Navigation Issues*: Rob Wall, COE, and John Pigott, Towboaters Association, reported on operations implemented this year to provide safe passage for towboats at McNary, Little Goose and Lower Monumental dams. A flat spill pattern was utilized at McNary and Lower Granite this year as opposed to stopping spill – it worked well at McNary and had mixed results at Lower Granite. At Little Goose, a flow discrepancy occurred that led to the COE implementing a soft constraint pool limit in the upper 6 inches of MOP.
    - **Observations**: Better communication, including more notice with special operations, tests, etc. at the projects has proven effective at helping aid safe navigation. Improvements in operations could be made at Lower Granite.
    - Constraining one pool impacts all projects, so operating within 6 inches is a challenge – and while it was a soft constraint for the COE, BPA considered it the operation to manage to.

- New RSW's and other structural changes will need to be considered in context in the coming year, and will require early and frequent communication to make the best management choices around navigation safety.

- *Mechanical Issues/Scheduled Outages*: Paul Wagner, NOAA, noted mechanical issues that have occurred over the past three years that have caused a change in fish operations: McNary spill gate hoists (2007), John Day line outage/turbines (2006), The Dalles wire ropes (2005), and Bonneville tie cranes (2007). The Bonneville tie cranes will not be a barrier next year. Drum gate maintenance should pose no outages this year, and doble testing occurs every year on a staggered schedule.
    - **Observations**: Mechanical issues and scheduled outages that will impact fish measures should be communicated to TMT ahead of time, to the extent possible.
    - The salmon managers need to identify for the action agencies which units are important so proper notice and communication can occur; and so they can be folded into the Fish Passage Plan.
    - Given the aging system, everyone supported the need to secure budgets for inspection, maintenance and repair. Questions remain about how to do that.
    - Also, given the aging system, a *need to create contingency plans* was identified by the group for future action.

Reservoir Operations Review

- *Libby Spring/Summer Operations*: Cathy Hlebechuk, COE, and Brian Marotz, Montana, re-capped the 2007 Libby VARQ operation. Brian Marotz shared two alternatives to implementing VARQ, and suggested an alternative to get the freshet moved real time and to help fish migration.
    - **Observations**: It was useful to see how the COE's new SOI technology tracked this year.
    - Setting April 10 flood control targets in the spring causes fluctuations and a less than optimal operation for the fish. A stable flow through the spring migration would be better.
    - Use flexibility of VARQ at the appropriate time – at the end of the period when the threat of flooding has passed and during refill.
    - **FOR FUTURE CONSIDERATION:**
        - Set guiding criteria January-April similar to Albeni Falls decision tree.
        - Set flat flow targets in the summer based on ending elevation, forecasted flows and available volume. Make weekly adjustments.

- *Hungry Horse Spring/Summer Operations*: John Roache, BOR, reported on the Hungry Horse VARQ operation. He noted that 2007 had very high March inflows which would have resulted in higher March discharges if Hungry Horse was operating under Standard Flood Control. However since Hungry Horse was operating under VARQ Flood Control, discharges were shaped into the May/June time frame.

- In response to a question about Columbia Falls minimums, it was noted that the 2000 USFWS BiOp specifically addresses this operation.

- *Dworshak Spring/Summer Operations*: Greg Haller, Nez Perce Tribe, reported that from the Dworshak Board perspective, operations were successful in meeting temperature and flows given the condition constraints in 2007. Dworshak was responsible for 41% of the total flow that cooled Lower Granite. 20 kaf of the 200 kaf reserved water pool was used at the end of August and 180 kaf was used in September for flow augmentation per the Dworshak Board agreement.
    - **Observations**: More guidance to the COE would provide for a better coordinated strategy for developing and modeling alternative scenarios for Dworshak operations. This is challenging given varying perspectives around flow/temperature approaches and Idaho Power decisions. Another suggestion was that the COE offer operation recommendations for TMT to discuss.
    - Are there other management targets that could be considered besides the temperature criteria at Lower Granite?
    - A control structure is needed for Hell's Canyon/Brownlee as they cause significant temperature impacts on the system.

- *Upper Snake Flow Augmentation*: John Roache summarized that a total of 428,425 acre-feet was provided for flow augmentation, just above the former 427,000 but below the current 487,000 SRBA target. Much of the water was provided from the 'power head', which was a challenge for the BOR.
    - **LOOKING AHEAD**: Carry over storage water is down so much that it will require an average or above average water year to fill the reservoirs.
    - The Biological Assessment for the 2008 Upper Snake proposes to shift releases (likely out of the Upper Snake and Boise) from June/July/August to May/June/July. While an agreement has not been set with Idaho Power, the FERC process may require conditions that would aid this shift.

- *Hell's Canyon*: Paul Wagner reviewed the 2004 Interim Agreement that states that Brownlee will refill on or around June 20, and provide 237 kaf of stored water. This agreement is similar to the FERC DEIS operation.

- *Grand Coulee Operations*: John Roache continued with a review of Grand Coulee operations with more detail on the January-May timeframe. Targets recommended in SOR 2007-1 were met, and from the BOR's perspective, the same operation would have been implemented even without the SOR, to meet several objectives – and all were met this year.
    - **Questions:** What if the April 10 refill target cannot be met while meeting target flows for chum? NOAA gives preference priority to refill. A retrospective look shows that the action agencies have been successful in operating to meet the upper rule curve.

- *Bonneville Operations – Spring Creek*: Dave Wills, USFWS, reviewed the 2007 Spring Creek hatchery operations. About 6.5 million fish were released in early March, and a sudden decline in numbers was observed on March 9. Mortality numbers were higher than usual so a request was made to spill, which was not granted. Investigation resulted in verification that the fish were healthy leaving the hatchery. Spikes in mortality occurred again during the April release, and the COE responded by lowering the turbines to the lower end of 1% -- and passage improved. For the final release in May, the COE again operated to the lower end of 1% and this proved effective.
    - **Observations:** The cause of Spring Creek hatchery Fall Chinook mortalities is unknown, and continues to be a concern. A research proposal to further study this issue will be led by NOAA and PFMFC, and will test travel time, descaling rates, and mortality rates. This study will be discussed with TMT. Also a transportation test is being proposed for March and April that will require discussion at TMT.

- *Bonneville – Chum Operations*: Paul Wagner, NOAA, reported that a TDG study on chum will continue again this year.
    - **Observations**: Preliminary results indicate that chum may not be as susceptible to negative effects of total dissolved gas in the fry stage compared to other salmonid species that have been studied.

Concluding Observations:

Given the highly changing nature of the 2007 water and weather year—combined with changes to projects and other external impacts, this year's management and monitoring of the FCRPS was surprisingly good. While there will always be room to improve, TMT did a good job getting ahead of most problems and did a good job working through problems as they arose. Areas that have been problems in the past have seen marked improvements. This 'year-in-review' session provided a good set of information from which TMT members, and the public, can continue to learn and improve the overall management of the Columbia River Power System and the fish that live and migrate in its waters. TMT will look at the list of 'needs more improvement' at a meeting in the New Year and set a course for making those improvements.

Thank you to all the presenters who took the time to put together very good presentations from which everyone could learn and benefit.

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NOTE: All power point presentations from the TMT Year End Review can be found linked to the agenda on the TMT web page. Thank you all for your participation!

Columbia River Regional Forum
Technical Management Team Year-End Review
November 28, 2007

1. Introduction

TMT's annual review of in season management decisions and lessons learned from 2007 operations was chaired by Jim Adams (COE) and facilitated by Donna Silverberg (D.S. Consulting). Representatives from NOAA, COE, FPC, BPA, BOR, USFWS, CRITFC, NPCC, Washington, Oregon, Idaho, Montana and others attended in person or by phone. The following is a summary (not a verbatim transcript) of the topics discussed and decisions made at the meeting. Anyone with questions or comments about these notes should provide them to the TMT chair or bring them to the next meeting.

2. Conditions Review

a. Weather. Kyle Dittmer (CRITFC) presented a summary of water year 2007, a winter 2007-08 climate forecast, and a forecast summary. He characterized this past year as screwball, with several abrupt changes. Precipitation started out normal in October 2006, then heavy rains the first week of November broke records in relation to the 1996 flood. A major windstorm in December was followed by an El Nino winter that transitioned from a wet, cold start to a drier, warmer winter than normal.

Spring was relatively uneventful, then summer went abruptly from wet to bone dry. The Snake basin suffered disproportionately with only 79% of normal precipitation, while The Dalles received 94% of normal and Grand Coulee, 98% of normal. A 12-day heat wave in July 2007 peaked at 116 degrees Fahrenheit, breaking records again. Then a powerful storm at the end of September brought another sudden change from bone dry to very wet, from summer to winter with very little autumn transition. The year's water supply ended up a bit below normal when peaks and valleys were averaged out.

There are several good signs regarding weather and ocean conditions for this winter, Dittmer said. Sunspot counts are low, meaning we might have a La Nina winter, snowy and wet which is good for fish. There are other indications this winter will be a La Nina one. Furthermore, NOAA researchers say the PDO index of ocean conditions predicts cool weather in the Northwest for the next six months, also a good sign.

Dittmer distributed copies of CRITFC's forecast for winter 2007-08, which calls for about 116 maf or 108% of the normal water supply. The SIG (??) forecast calls for a 98 maf water year in 2008, 92% of normal. The RFC forecast calls for 106 maf, 99% of normal.

Each year, Dittmer said he compares the CRITFC and RFC forecasts after the fact. He found the CRITFC forecast for last year close to being on target. In response to questions, Dittmer couldn't say overall which of the three agencies provides the best forecasts. There's value in considering all three forecasts, he emphasized – a consensus approach to weather forecasting.

Dittmer's presentations are available on the CRITFC website at www.ametsoc.org/chapters/oregon/index.html.

b. 2007 Water and Runoff Patterns. Cathy Hlebechuk (COE) and Greg Haller (Nez Perce) addressed this topic together.

Hlebechuk focused on runoff and Dworshak/Libby operations. Runoff at The Dalles for January to July was 89% of normal, and for April to August, 85% of normal. The highest runoff was at Libby, which was 115% and 109% for the January to July and April to August periods, respectively. Runoff in the Snake vastly differed from Libby, with only 63% of normal for the April to August period and 59% of normal for the April t August period at Lower Granite Dam. With springtime average flows of only 61 kcfs, Lower Granite failed to achieve its springtime (April 3-June 20) objective of 85 kcfs. (For a short period flows exceeded the objective; overall they didn't.) The Lower Granite summer (June 21 – August 31) objective was 50 kcfs and the actual was 29 kcfs. The McNary spring (April 10 – June 31) objective was 237 kcfs and the actual average flow was 240 kcfs. The MCN summer (July 1 – August 31) objective was 200 kcfs; the actual was 163 kcfs.

The Priest Rapids operation was very successful in meeting its spring April 10 – June 30 objective of 135 kcfs flows, with169 kcfs.

For Libby operations, in early April the COE had to reduce flows because the IJC rule curve was exceeded; inflows were passed for the first half of April. Then the operation went to full powerhouse for flood control purposes. Lake Kookanusa filled to 5 feet from full, then provided fairly stable flows throughout the summer.

Hlebechuk provided more detail on Dworshak operations. The project operated for flood control from January-April, then began refilling. At the end of March the COE shifted 78 kaf from Dworshak to Grand Coulee. The project was within 1 foot from full from June 14 to July 2, 2007, then drafted 67.5 feet and reached elevation s 1,533.5 feet at the end of August. That left 180 kaf of water for September. The project reached elevation 1,520 on September 15.

Jim Ruff asked how much was shifted, and what the effect was on Grand Coulee and Dworshak? Dworshak was 78 kaf above its end of March flood control elevation, Hlebechuk said. The end of March elevation at Grand Coulee reflects 11 feet difference between the shifted and unshifted flood control

elevations, John Roache (BOR) said. The April 15 elevation reflected 3.5-3.7 feet difference between the shifted and nonshifted elevations.

Often, Dworshak reservoir can't reach the end of month flood control elevations if the forecast is drier than expected, even if the project is on minimum flow. This year, Wagner said, he was impressed – because the later forecasts were drier than earlier forecasts yet the project was able to still shift flood control to Grand Coulee this year.

c. Temperature/TDG Level Variations. Jim Adams (COE) gave a brief summary of TDG levels, spill quantities and temperature operations at Dworshak and resulting temperatures in the lower Snake River.

Spill operations at Lower Granite were 20 kcfs in spring, 18 kcfs in summer, the same as last year, Adams said. Little Goose spill operations were the same as last year, but operations at Lower Monumental changed. Instead of going up to 27 kcfs and stopping, the COE spilled to the TDG spill cap continually throughout spring. Spill in summer went up to 17 kcfs which isn't supposed to be exceeded voluntarily. As part of RSW-related research, Ice Harbor fluctuated between 30% total outflow for 24 hours a day, and 45 kcfs in the daytime and to the spill cap at night.

Spill operations along the Columbia River were pretty much the same as previous years, except for Bonneville Dam, which spilled up to 100 kcfs during the springtime 24 hours a day. Summer spill started earlier than normal, with flows at 85 kcfs during daytime and to the spill cap at night. This was a change from previous years. From July 16 onward, Bonneville went back to spilling 75 kcfs during daytime and to the spill cap at night.

This year, TDG exceedances were significantly down compared to last year, Adams said. There were only 99 daily exceedances of TDG water quality criteria this year based on the average of the highest nonconsecutive 12 hours in a day. Of these systemwide exceedances, 49 were on the Snake River. A frequent cause of exceedances is flows exceeding what the system can handle. Another is uncertainties in setting spill caps while using best professional judgment, which means that reasonable steps were taken but there was an exceedance anyway. All 49 exceedances on the Snake were attributed to uncertainties in setting spill caps. Of 50 exceedances on the Columbia, 44 were attributed to uncertainties in setting spill caps. Less frequent causes of exceedance are unit outages during repairs/maintenance, and high TDG levels in water moving downstream.

Adams summarized Dworshak summer operations during flow augmentation/temperature management season. Beginning July 2, outflows ramped up to 7.6 kcfs, with outflow temperatures in the 44-45 degrees F range and two units in undershot mode. On July 5, flows were increased to 9.5 kcfs and

up to 12 kcfs, then slowly ramped down to 10-11 kcfs by July 14. Minimum flows occurred on September 16. Both units were on undershot mode by September 11, producing 45-47 degree water. Water temperatures at the Orofino gage peaked at 82-83 degrees F in August.

In the summer of 2007, Dworshak water had a strong cooling influence on Lower Granite and the rest of the Snake River. Deciding when to start the cooling process with Dworshak outflows was more acute in 2007 than in other years. The need usually competes with recreational needs on the Fourth of July weekend. This year, Dworshak outflows began on July 2. Kyle Dittmer advocated using the consensus forecast approach mentioned earlier today to help identify this critical turning point.

Temperature exceedances were significantly lower than in previous years. There were 31 hours of temperature exceedance at Lower Granite tailwater, meaning temperatures during these hours were a tiny fraction over the 68 degrees F criteria. Compared to that, there were 223 hours of exceedances in 2006 and 1,184 hours of exceedances in 1998.

Wagner asked how temperatures in the basin this year compared with other years. Summer was hotter than usual, with 12 consecutive days of temperatures in the 100s, Dittmer said. Adams explained an anomalous 6 hour spike of 62 degree Dworshak outflow temperatures that occurred during a maintenance operation.

d. Fish Conditions for Spring/Summer Migrants. Steve Smith (NOAA) gave a presentation on preliminary 2007 results regarding juvenile survival rates, travel times through the hydrosystem, and percentages of fish transported. Smith shared data from 1997, 2001, 2004, 2006 and 2007. The volumes of water spilled were similar in 2006 and 2007, but flows were lower in 2007 especially early in the year. That translates to a higher percentage of water spilled, which affects PIT tag data. This year is essentially the only year on record that could be classified as a low flow, high spill year, Smith said.

Researchers found a strong relationship between the distances hatchery Chinook traveled to the dam and their survival rates. Travel times in 2007 were shorter than average, but longer than in 2006. Survival rates for stream type Chinook were a bit above the long term average despite the fact this was a low flow year. PIT tag detection has only been possible at Ice Harbor in the past few years, which means that separate PIT tag data are available for Lower Monumental and McNary dams. There is no PIT tag detection between Bonneville and John Day, so the project average was used for that span.

In recent years, mortality has been higher in the lower Columbia than in the Snake per kilometer traveled, Smith said. Jim Ruff asked whether there was

much change in survival averages from the beginning to the end of migration season. It's too early to be that specific about 2007 data, Smith said.

Steelhead reach survival was 94.7%, from McNary to John Day, 61%, from John Day to Bonneville, 95%.from Ice Harbor to McNary. It is unknown whether assumed mortalities were in fact due to tag loss or migration through the B2 corner collector.

Chinook survival in 2007 was a little higher than the long-term average, while steelhead survival rates have been quite a bit lower since 2001. One of the reasons for the steelhead losses is Caspian tern predation at McNary pool. Another is that an estimated 95% of steelhead were transported that year, so the only fish left in the river had been PIT tagged and purposely put back in the river.

Estimated Chinook survival rates were higher than average (55%) in 2007. Extrapolated data for 2004 show a slightly lower survival rate (51%) that year. For steelhead, the estimated survival rate was 39%, only slightly less than 2006 which was a similar spill year in terms of volume. The extrapolated survival rate for Chinook in 2004 was only 8%.

Typically 70-90% of fish are transported out of the Snake, Smith said. Changes in transportation levels in recent years have made survival estimates difficult. Recently Smith discovered the COMPASS model is overestimating the number of fish in the bypass systems at Little Goose and Lower Monumental.

In 2007, 24% of Chinook and 33% of steelhead were transported, according to preliminary estimates based on PIT tag data, Smith said. Margaret Filardo (FPC) said FPC transportation estimates were somewhat higher: 45% of steelhead, 29% of hatchery Chinook, and 56% of subyearlings.

NOAA's estimates are low for two reasons, Smith explained. First, transportation started 10 days to 2 weeks late in 2007; NOAA estimated that 57% of non-tagged wild Chinook and 24% of steelhead had already passed Lower Granite by May 1. Also, an extremely low proportion of fish were found in the bypass systems at Little Goose and particularly Lower Monumental. Detection probabilities suggest that only 50% of Chinook got into these bypass systems at the time transportation was happening there. The Chinook numbers include two types, Smith explained: the stream type that spawn, spend a year in freshwater and migrate as yearlings in springtime, and the ocean type that spend less than a year in freshwater before out-migrating in June or July.

Jim Litchfield (Montana) asked whether this analysis will be taken into account when the draft 2007 BiOp is revised. It's hard to say what decision-makers will do because the low flow/high spill conditions of 2007 are so unusual, Smith said. This year brought probably the lowest flows ever to Lower Monumental Dam.

e. Adult Fish Runs/Fisheries Review. Cindy LeFleur (Washington) summarized adult fish runs and gave a fisheries review. Upriver spring Chinook returns were 86,000, more than the predicted 78,000. Spring Chinook fisheries on the mainstem Columbia below Bonneville included 6,500 Chinook below Bonneville and 600 Chinook above.

Summer Chinook returns above Priest Rapids Dam were 37,000, less than the 45,000 predicted. Sockeye had another year of poor returns at only 24,000 for 2007. Summer steelhead returns were 318,000 hatchery fish; wild runs also remained steady.

Upriver fall Chinook fell short of the predicted 236,000 with returns of 150,000. Spring Creek Hatchery returns were dismal in 2007 at 17,000 fish (by comparison, returns were 180,000 in 2003). Upriver bright fall Chinook runs declined to 122,000 this year; 185,000 were predicted, and this is where 65,000 of the shortfall in predictions for the year occurred. Fisheries fall Chinook were very constrained in the lower Columbia. Chum numbers are very preliminary, but staff are reporting very few chum at Ives Island this year, LeFleur said.

On the positive side, spring Chinook jack counts at Bonneville dam were very high this year; LeFleur invited TMT members to draw their own conclusions about what next year's spring Chinook run will look like, based on the returns shown in today's presentation (linked to the agenda, as all of today's presentations are). Bright fall Chinook jacks in the Hanford reach and Snake River were 40,000 while Spring Creek jack returns were huge, over 120,000. The upriver bright run was 122,000, including fisheries and escapement. The escapement goal for Hanford reach is around 40,000, LeFleur said. Tule jack numbers were around 9,000, Margaret Filardo (FPC) said.

f. Spring/Summer/Fall Fish Passage. The timing of runs in 2007 as compared to historic timing was somewhat earlier this year, with about 90% of the migration past Lower Granite and in the Snake by end July, Filardo said. Survival estimates for 2007 fell between 55-60% for yearling Chinook that were actively migrating (not holdovers). Because the likelihood of holding over increases as summer passes, FPC limits their analysis to early migrating fish to eliminate the question of holdovers. The biggest question, Filardo said, will be: How has the court-ordered spill program affected holdovers?

Filardo presented information on average spill percentages for all projects, water transit time, the relationship between average flow and water transit time, transit time vs. survival at Lower Granite and McNary dams, and water temperatures. She ended the presentation with a 3-D graph depicting all these multi-varied relationships together.

Litchfield asked, aren't water travel times and spill proportions directly related to flow? Not totally, Filardo said, because if you spill 30% of a river, the proportion will remain directly related when flows increase, but increasing water volumes won't necessarily yield the same spill proportion. Each dot on the FPC charts represents 2 weeks, and the graphs represent returns from 1998-2007.

A major finding is that subyearling Chinook have very low survival rates when there is no spill and travel times are slow, Filardo concluded. As water travel speeds up and spill proportion increases, so does survival.

g. Lessons Learned from the 2007 Conditions Review. Several TMT members asked questions and made observations. Analysis of not just flow and travel times, but proportions of spill and travel times would be helpful, Russ Kiefer said. He expressed concern that when flows are low, a higher percentage of fish tend to get spilled, while we tend to transport fish when flows are high and survival might be better in the river. Jim Litchfield agreed with that assessment.

Kiefer sought a clearer correlation of the PIT tag survival data Smith presented today with the information on fish returns LeFleur presented. Data are finally beginning to emerge that support a relationship between juvenile survival and adult returns as expressed in SARs, Filardo said. The clearer that relationship becomes, the easier it will be for TMT to make good adaptive management decisions, Silverberg said. Jim Ruff suggested TMT consider travel time and temperatures, in addition to spill proportions, when making decisions.

More information on fall Chinook that overwinter and migrate out in the spring as yearlings would be useful, Rudd Turner (COE) said. That information might help with both spring and summer operational decisions. There was discussion of how TMT will integrate new information presented today into their decisionmaking schedule. Scott Bettin (BPA) asked, what could TMT do differently? Should changes start being made now? Filardo said it's too early. The critical balance is between timing and survival, Bill Muir (NOAA) said.

3. Review of Specific Operations

a. Vernita Bar Operations. Russell Langshaw (Grant County PUD) gave an overview of the Hanford reach fall Chinook protection program for 2006-07. This year's operation had a 94% success rate which was a big improvement over past years.

Spawning in 2006 was differet than in the past. For 1984-2004, Grant Count PUD did reverse load factoring, which involves reducing flows during day and increasing them at night. As part of the Hanford reach fall Chinook protection agreement, Grant County PUD did experimental flows for two years and reverted to RLF operations on November 7, 2005. The end of spawning followed on November 20, when 98 redds were counted, plus an additional 67 redds above

the 65 kcfs elevation. That's one of the highest redd counts above that elevation observed since the Vernita Bar operation began, Langshaw said. Grant PUD's position is that the experimental flows were not effective at limiting high elevation spawning. It appears the minimum flow needed out of Priest Rapids is 70 kcfs.

On November 19, 2006, there were 43 redds counted above the 65 kcfs elevation. The signatories to the fall Chinook agreement decided to continue the operation for another week, and the end of spawning occurred November 26. The resulting critical elevation was 70 kcfs. Escapement in 2006 was 47,000.

In 2006-07, the hatching range occurred from December 9-February 23 based on accumulated temperature units at Vernita Bar. Emergence was from April 4-May 20, 2007, and weekend rearing protections were in place from May 1-June 20, 2007. Weekend protections occur when 800 temperature units have accumulated from the end of spawning, Langshaw explained. During weekend protections, the average discharge from Monday-Thursday becomes the weekend minimum flow. This evens out flows when weekend discharges tend to drop. The mean discharge at Priest Raipds was 171.7 kcfs, and the mean daily delta (difference between the daily maximum and minimum discharge) was 38.2 kcfs. There were 4 exceedances of these flow guidelines, with a maximum exceedance of 2.9 kcfs which is low.

Conclusions based on 2006-07 program operations are:

- Peaking operations have potential, as well as investigating redds that are at risk above critical elevation. Daytime peaks were extended during peak spawning week, but it didn't accomplish the intended goal due to higher elevation spawning.

- Overall, the operation was a dramatic improvement compared to previous years, when protection criteria were met 94% of the time (as compared to 88% of the time in 2002 and below 74% of the time in 2003). The maximum exceedance in 2006-07 was 2.9 kcfs; in 2005-06 it was 38 kcfs.

- RLF operations started October 24 and continued through November 18, 2007, the end of spawning. There were no redds above the 65 kcfs elevation. Escapement this year was 20-25,000 fish, with low daytime flows of 6 kcfs which helped keep spawning elevations low.

Tony Norris (BPA) asked, did operators use the hourly coordination simulator that was developed? Yes and it was a major reason the program met criteria so well this season, Langshaw said. Paul Wagner asked, how did aerial counts compare with prior years? They've been around 6,000 fish which is low but within the typical range of 4-10,000. This year, it was striking via helicopter survey that redds didn't approach the higher elevations, which is interesting when

escapement was low, Scott Bettin said. High elevation spawning is correlated more with spawning escapement than actual aerial redd counts, Langshaw said.

b. Transportation Operations. Paul Wagner (NOAA) gave a presentation. This will be a good year to study due to unusual conditions. Information on adult returns that resulted from 2007 transportation operations will be available in 2009. There will be data from tagged fish going both directions in the river vs. being transported to provide a basis for clear comparisons.

Jim Litchfield mentioned the impact of ocean conditions on survival. Ocean conditions this year are believed to be excellent, Wagner said; large returns are expected. This year will also provide information on the effects of limited transportation during a low flow year.

c. TDG Management and Impacts on Fish Passage. Controlled spill to aid fish passage was the name of the game in 2007, Paul Wagner said. There was a lot of TMT angst over Lower Monumental in 2007, the result of conflict between spilling for fish passage and exceeding TDG criteria at Ice Harbor downstream. TDG levels exceeded criteria in the ICR forebay, causing the COE to decrease spill. Wagner wondered whether so much reduction in spill was a necessary response to exceedances at Ice Harbor, given the 5-day lag time between the two projects during low flows. Could TMT implement a future process that takes into account travel time delays?

Russ Kiefer expressed concern that spill caps were set to drop TDG in the Lower Monumental tailrace to 115% when weather forecasts suggested there would be no TDG increases. Because wind can strip gas out of the reach, the COE couldn't raise spill levels enough at Lower Monumental to get the gas levels in the reach to rise suddenly, Adams said. So there were low TDG levels in the Ice Harbor forebay for several days after raising spill caps due to the lag time of 3-5 days between the two projects. It will be difficult to manage spill until it's possible to better predict wind events.

Wagner said it's clear in retrospect that 2007 spill levels were set too low. The SYSTDG model the COE runs daily calculates gas production and estimates new spill caps, Adams said. Predictions past 2 days are generally not trustworthy enough to base decisions on, Laura Hamilton (COE) said. In modeling the forebay gage issue, she found the Lower Monumental TDG production equation in SYSTDG excruciatingly sensitive to spill cap changes. At around 40 kcfs, an increase of as little as 1 kcfs can produce 10-20 exceedances over the previous level. This is highly unusual compared to other projects.

Adams asked the Fish Managers to give COE scenarios to run on SYSTDG to help manage this problem. He also suggested the Fish Managers communicate daily with the COE to improve the process for managing TDG levels at Ice Harbor.

d. Emergency Spill Operations at Lower Monumental. Wagner summarized this successful operation in response to a new phenomenon. Around May 2, 2007, large numbers of fish congregated in the LoMo forebay, a pattern not seen in past migrations. Spill was increased from 13.5 kcfs to 31.5 kcfs for four hours – and the results were dramatic. Forebay passage times for spring Chinook decreased from 2.5 hours to 0.8 hours, and for steelhead, from 16.5 hours to 1.3 hours. Fish already moving downriver benefited most from the increased spill and gained momentum to pass the forebay. Nevertheless those already stalled had increased passage rates out of the forebay.

Adams wondered whether staggered spill periods might help; the general response was no. Wagner recalled that the pre-season spill estimate for LoMo was 27 kcfs. The real question, Jim Ruff said, is what passage conditions and forebay delay times will be like when the Lower Monumental RSW is installed.

Russ Kiefer and Paul Wagner thanked the COE for providing that 4-hour pulse in response to the pileup of fish, even though Ice Harbor was outside TDG criteria at the time. Limiting the spill to 4 hours prevented an exceedance of TDG levels because exceedances are triggered by an average of the 12 highest nonconsecutive hours, Adams said. A spill period of more than 4 hours would have violated water quality criteria.

e. Summary of MOP Operations and Impact. The COE documented in its April report the only MOP operations glitch that occurred all season, Adams said. John Piggot (Tidewater) gave the Towboaters Association perspective on MOP operations at Little Goose during the navigation problems in August.

The problems at Little Goose arose out of a gage calibration discrepancy of around 4-5 inches. The COE proceeded assuming that a soft constraint within the top 6 inches of MOP would work, as opposed to MOP+1 foot. In response to the calibration problems, COE modified the operation of Little Goose pool to run in the upper half foot of the MOP criteria throughout August.

f. Navigation Issues. Rob Wall (COE) provided context for this problem. Spill at McNary was approximately 40% of total flow on August 1, when the navigation problem was brought to TMT. After discussion on August 8, TMT altered the spill pattern to accommodate towboat captains that requested the spill pattern change for around 30 minutes per lockage. Altered patterns during the weekend of August 11-12 worked well at McNary, but not at Lower Granite, where it was unclear whether a flat flow pattern provided any benefit.

John Piggot (Tidewater/Towboaters Association) gave the navigation stakeholders' point of view. Over the past few years, tow boaters have encountered experimental spill patterns, sometimes with very little or no notice.

Tow boaters are happy with how things worked out at Lower Monumental in 2007, less so at Lower Granite and McNary.

Adams suggested looking at Lower Monumental more closely as a RSW will soon be installed there.

Scott Bettin asked, would MOP+`1/2 a foot work, given the calibration discrepancy at Little Goose gage? There was discussion of the calibration issue. Tow boaters are prepared to operate at MOP itself, not MOP plus anything Piggot said –the real question is, what is MOP?

Constraining one project to MOP+6 inches impacts them all, Robyn MacKay (BPA) said. MOP at Goose is elevation 633 feet, Adams said, but is that the true MOP or is it 633.5 feet? The agreed upon goal was to find a required depth for navigation purposes and not dip below that.

g. Mechanical Issues and Scheduled Outages. Paul Wagner presented some recent history on equipment challenges at FCRPS mainstem projects – McNary spill gate hoists in 2007, the John Day outages of turbines 1-4 in 2006, problems with The Dalles wire ropes in 2005. This year's issue was the broken Bonneville TIE crane, which came up during the Spring Creek spill operation. A TIE or turbine intake extension is a large structure that fits into the front of the turbine during fish migration season, Bettin explained. Of 8 units at Bonneville, 4 no longer have TIEs because of the corner collector. The TIEs for the other 4 units can't be installed for fish season because the TIE crane, which weighs 260 tons, is broken.

FFDRWG has discussed monitoring the situation to see if the TIEs are really needed now the BGS is in place. Given that the system is aging, we need increased communication on maintenance status, Wagner said. TMT doesn't have a clear procedure for dealing such problems like it does for dealing with electrical emergencies. If fish protection measures are lost during an electrical emergency, there is an immediate compensatory response, and the same is needed for mechanical problems.

Not being able to shut off the TSWs at McNary was another challenge in 2007, Bettin said. Problems with water pumps at the fish ladders are also in this category, Kiefer said. The operation of turbine 1 at Little Goose is critical for ladder entrance conditions.

Kiefer recommended three steps TMT can take to prevent maintenance issues from impacting fish passage:

- Better inspection of repairs.
- More communication about the causes of fish problems.

- A process for adjusting operations to provide the level of fish protection measures called for in the BiOp and the Fish Passage Plan.

Scott Bettin asked the Salmon Managers to compile a ticker list of sensitive equipment and maintenance issues of which the Action Agencies should notify TMT. For example, notifying TMT that Little Goose unit 1 is out of service isn't part of the Fish Passage Plan, and it should be.

Litchfield asked about the status of drum gate maintenance at Grand Coulee. It could come up this year, but we won't have to deal with it if we don't get down to flood control elevations, John Roache said. There was general discussion of the ongoing schedule for doble testing.

4. TMT Business Meeting: Chum Operations and Snake River Zero Flow

During the lunch break, TMT met briefly to discuss these two items.

a. Zero Nighttime Flow. The cutoff established in 2005 for steelhead migrating past Lower Granite was 10 wild fish, Paul Wagner said. At last count, 30 wild fish passed the project, which means it's too early to start zero nighttime flows. He asked, is that a crisis? No, but we'd like to start soon, Bettin said. TMT will check in on this in approximately two weeks. Tony Norris asked Wagner to email him the video counts when they're available.

Russ Kiefer expressed hope the new BiOp will give clearer direction on this relatively small issue so TMT doesn't have to spend lots of time on it. Zero nighttime flows should start when there are few if any fish and no later than December 14, Bettin recalled. The BiOps don't address this issue because it came out of a tentative agreement between the fish agencies and the COE, Wagner said. TMT will discuss it again at its next meeting December 12.

At the recent IT meeting to introduce the new BiOp, Mark Bagdovitz (USFWS) asked IT to address the question Kiefer raised again today regarding decisions TMT is expected to make under the new BiOp.

b. Chum Operations. The current protection level for chum is to maintain 11.3 – 11.7 foot tailwater below Bonneville during the day, releasing any excess water up to 13 feet elevation between 6 pm-6 am, Wagner said. FPAC has already decided this nighttime operation would be fine. TMT will reconsider if flows exceed what can be passed in an 8-hour, 13-foot block at night.

Jim Adams asked, if there are any spikes, how would the Fish Managers want them shaped? Between 10 pm and 4 am, and no more than 4 hours per spike during the darkest period possible, Wagner said. Flows as high as 20 feet for an hour that drop to no more than 15 feet elevation would be acceptable as a soft constraint. TMT will discuss chum operations again on December 12.

5. Reservoir Operations Review

a. Libby and Hungry Horse Spring/Summer Operations. Cathy Hlebechuk (COE), Brian Marotz (Montana) and John Roache (BOR) addressed this topic.

At Libby, VARQ flows started on May 2, with full powerhouse for 14 days, Hlebechuk said. VARQ analysis doesn't include the sturgeon pulse, so it has a tendency to not refill the reservoir as full as TMT would like. The ESP analysis in early June showed an average maximum elevation of 12 feet from full, but in reality high runoff refilled the reservoir within 5 feet from full July 18. After refill, Libby went to flat flows. Flow augmentation and the Montana operation were elevated to IT and finally on July 17, regional executives. Flows were 17 kcfs through the end of August with the reservoir coincidentally meeting its end of August target elevation of 2,439 feet.

Kyle Dittmer asked how the December preseason forecast tracked with the January 1 official forecast; David Wills agreed that would be interesting. Hlebechuk will check and get back to them. *{Editors comment: The December and January forecasts for the April through August period were 122% and 110% of normal, respectively.}*

Meeting April flood control targets can result in operations that are not the best for fish, Litchfield said. This year it would have been better for Montana fish to have stable flows through March. Libby passed inflows during the first half of April when Kootenay Lake was exceeding it's International Joint Commission level, then inflows increased in the last half of April to draft down to it's end of month flood control elevation. VARQ flows started May 3, Hlebechuk said. The object of being at the April 10 flood control target is to move the freshet into the river as soon as possible, recognizing the need for flood control, Wagner said.

The BOR has been implementing VARQ flows since 2001 flawlessly, Brian Marotz said. Before VARQ was instituted, he recalled, Libby was drafted down enough to contain the entire spring runoff, store and release enough water to meet winter power needs, and ensure that flows are kept to a minimum during the runoff period.

Typically, Libby discharges are limited until the freshet is declared, which happened this year on April 18 – and should have happened earlier in order to reach the April flood control limit, Marotz said. In retrospect it would have been better for fish in 2007 if the freshet had not been declared.

As it was, the VARQ discharge formula triggered large outflows, first for flood control, then for the sturgeon pulse, which resulted in a double peak operation that damages the ecology of Montana's reservoirs. To demonstrate

what following strict VARQ does to Montana's reservoirs, Marotz showed TMT plots of Libby inflows and elevations throughout the year.

Inflows at Hungry Horse were the 2nd highest on record for March 2007, John Roache said. VARQ flood control allowed BOR to shift approximately 365 kaf of outflows from March to May/June, as compared to what standard flood control would have done. The reservoir refilled in the third week of June, and outflows tapered to 4.4 kcfs as decided at the meetings of IT then the regional executives in July. Hungry Horse flows ramped down to around 2.4 kcfs starting September 1. There was discussion of the Columbia Falls minimum flow target, which is based on the wetted perimeter technique Montana uses to maintain productivity in the river channel.

b. Dworshak Summer Operations. Greg Haller (Nez Perce) and Jim Adams addressed this topic. Flows in the Snake basin were dismal this year, but Dowrshak ended up contributing 41% of the total flow at Lower Granite, which helped to cool the Snake. As a result, there was only one temperature exceedance at the beginning of the season. The Dworshak board began the 200 kaf Nez Perce operation August 30, allowing for some of the 200 kaf to be used at the end of August. The operation successfully provided the cooling needed as well as flows.

Jim Adams asked the Fish Managers to pose specific questions regarding Dworshak operations so the COE can model answers to those questions. Idaho Power's operation of Hells Canyon and Brownlee dams is a huge complicating factor in planning Dworshak operations, Haller said. There was general agreement that more information on Idaho Power's operations would do a lot to help keep water temperatures on the Snake within criteria for fall Chinook spawning.

There's value in running both the EPA-RBM 10 model and the COE's in house model to predict temperatures at Dworshak, Kyle Dittmer said; Haller agreed. The CEQUAL modeling Mike Schneider (COE) did this year was helpful, Litchfield said. Adams asked, are there behavior targets that should be looked at below 68 degrees F? When managing flows to keep temperatures below 68 in the Lower Granite tailrace, we're actually providing flows of around 74 degrees F for juveniles, Kiefer said. Lowering water temperatures further at Ice Harbor tends to cause problems on the Clearwater, Adams said.

c. Upper Snake/Hells Canyon Operations. John Roache (BOR) and Paul Wagner (NOAA) addressed this. Flow augmentation delivered a total of 428,425 acre feet from the upper Snake River in 2007. It was a low water year in the Snake system, so BOR delivered some of that from powerhead, Roache said. There was some discussion of the possibility of shifting flow augmentation volume to May-July instead of releasing it between June-August. Part of the Nez

Perce settlement allows BOR to utilize into powerhead space in order to provide up to 427 kaf of flow augmentation.

Paul Wagner discussed the Hells Canyon interim agreement of December 2004, which will be in force until a BiOp is completed on this project. Provisions call for Brownlee to refill around June 20 each year, then draft from June 21-August 7, providing 237 kaf of stored water for Snake River flow augmentation during that period. There was discussion of Idaho Power's working relationship with the BOR regarding water rights.

d. Grand Coulee Operations. John Roache (BOR) presented end of month elevations. Grand Coulee reservoir refilled on July 9 when it reached the 1,290 foot elevation target. Litchfield asked if the April 10 elevation target is an interpolation. Yes, it's based on the March Final, end of March and April 15 flood control elevations, Roache said.

Drafting of Grand Coulee this year was right on target, SOR or no, to provide chum flows while meeting the April 10 elevation and generating power, Wagner said. When the SOR for chum flows was presented, BOR and BPA had already taken steps to turn the system in that direction, Roache said. There was discussion of variable draft limits for power generation in relation to chum flows, and of the lead times involved in setting flood control elevation targets.

e. Bonneville Operations. Dave Wills (USFWS) discussed Spring Creek Hatchery and Paul Wagner, chum operations. On March 5, 2007, USFWS released 6.5 million juveniles from Spring Creek Hatchery. Almost immediately, there was a spike in mortalities at Bonneville Dam 20 miles downstream, with rates increasing from 4%-8% when the normal background mortality rate is around 1.5%. There was no obvious explanation for the deaths, and the April release followed the same pattern, with mortalities as high as 10% within the first few hours of fish passage.

This time, the COE responded by lowering the intakes on the gatewells in all but two of the turbines to the lower end of the 1% efficiency range, and the mortality problem disappeared. For the May release of the final 3.5 million smolts, USFWS asked the COE to operate these units at the lower end of the 1% efficiency range, and there were no more mortalities. Subsequent investigation proved the fish were not ill.

The cause of the Spring Creek mortalities in March and April 2007 is still unknown. To try to make sense of it, NOAA and the FPC have since put together a research proposal with two test periods in March and April 2008. Increased turbulence in gatewalls caused by gap closure devices could have caused fish to be slammed against the bypass system, Will said; they're small fish. Temperature is another possibility that will be investigated during the course of

the study. NOAA will be on the lookout to ensure that this research doesn't affect other listed fish.

The main project underway for chum operations is a Battelle study of the depth compensation needed for chum redds to incubate. Chum appear to be less susceptible to TDG exposure than other species, showing no GBT symptoms and only slightly higher mortality rates after exposure to TDG levels of 113%.

f. Lessons Learned from the 2007 Reservoir Operations Review. This year's presentations were more useful than previous years' because they focused on what happened rather than on general study reviews, Wills said. Future trends may be toward more extreme weathr patterns like those experienced in 2007, Kyle Dittmer said. Silverberg was impressed by how effectively the system was managed despite the wide variations in weather.

7. Next Meeting

The next TMT meeting will be in person on December 12 in the COE's Pearl District office. This summary prepared by consultant and writer Pat Vivian.

Name	***Affiliation***
Gary Fredricks	NOAA
Margaret Filardo	FPC
David Benner	FPC
Kyle Dittmer	CRITFC
Rick Kruger	Oregon
Russ Kiefer	Idaho
Robyn MacKay	BPA
Mary Mellema	BOR
John Roache	BOR
Tony Norris	BPA
Cindy LeFleur	Washington
Pamela Justus	COE
Greg Bowers	COE
Tina Lundell	COE
Laura Hamilton	COE
Don Faulkner	COE
Scott Bettin	BPA
Rudd Turner	COE
Steven Wallace	Citizen
Shane Scott	NWRP
Tim Heizenrader	Centaurus
Mark Bagdovitz	USFWS
Barry Espenson	CBB
Jim Litchfield	Montana
Bill Muir	NOAA

Russ George	WMC
Steve Smith	NOAA
Bill Hevlin	NOAA
Paul Wagner	NOAA
Bob Buchholz	COE
Scott Boyd	COE
Ruth Burris	PGE
Brian Marotz	Montana
Richelle Beck	DRA
Jim Adams	COE
Cathy Hlebechuk	COE
Rudd Turner	COE
John Piggot	Tidewater/Towboaters Association
Jim Ruff	NPCC

Phone

Greg Haller	Nez Perce
Mike Butcho	Powerex
Glenn Trager	Shell Energy
Tracy Horton	Washington Council staff
Tom Le	Puget Sound Energy

Direct Survival of Migrating Salmonid Smolts in the Snake and Lower Columbia Rivers: Update with 2007 Results

Technical Management Team
Lessons Learned 2007 **November 28, 2007**

Steve Smith steven.g.smith@noaa.gov
Bill Muir bill.muir@noaa.gov
John Williams john.g.williams@noaa.gov

Outline

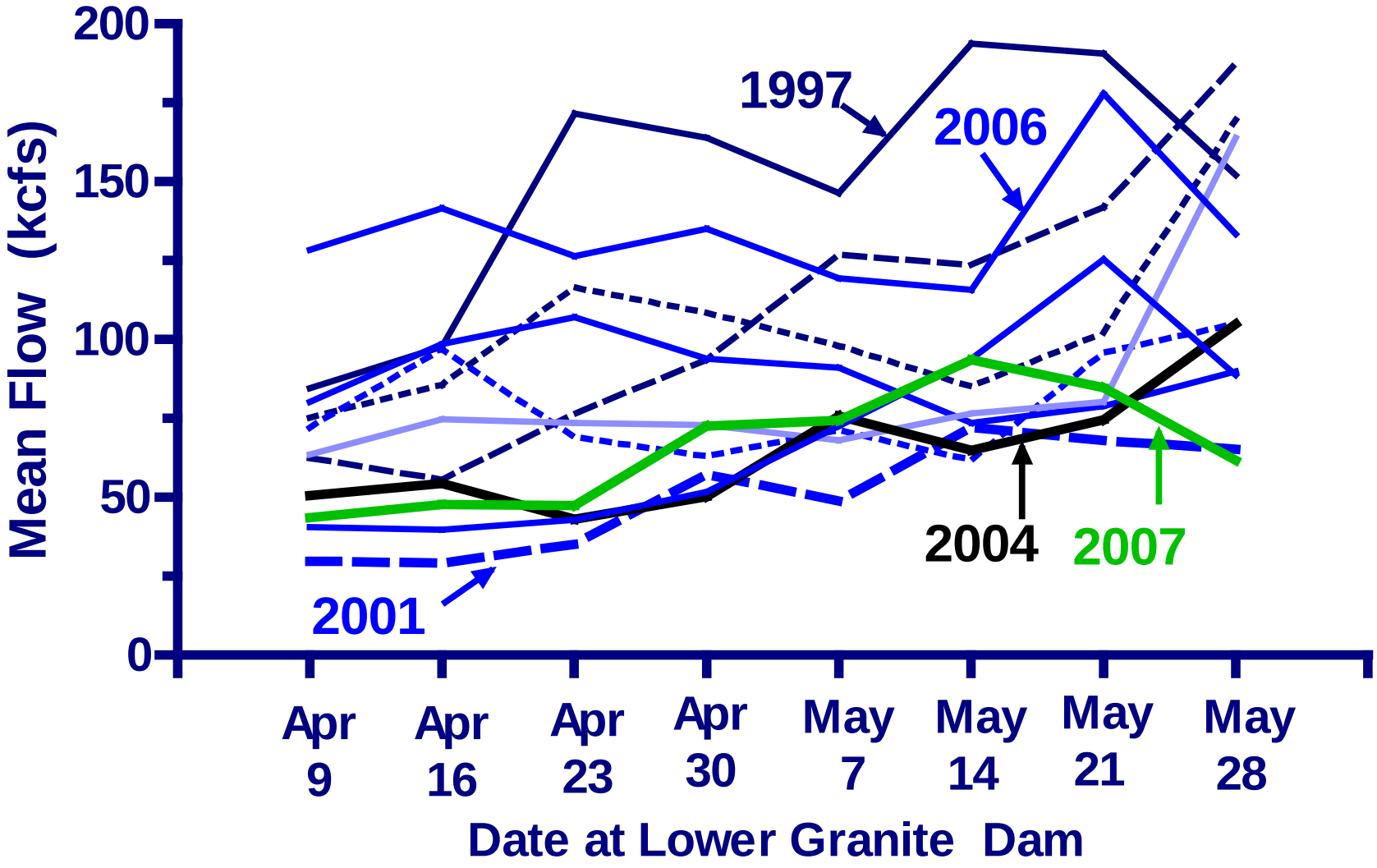
- Juvenile survival and travel time through the hydropower system
- Percentage transported

  – Update with preliminary 2007 results

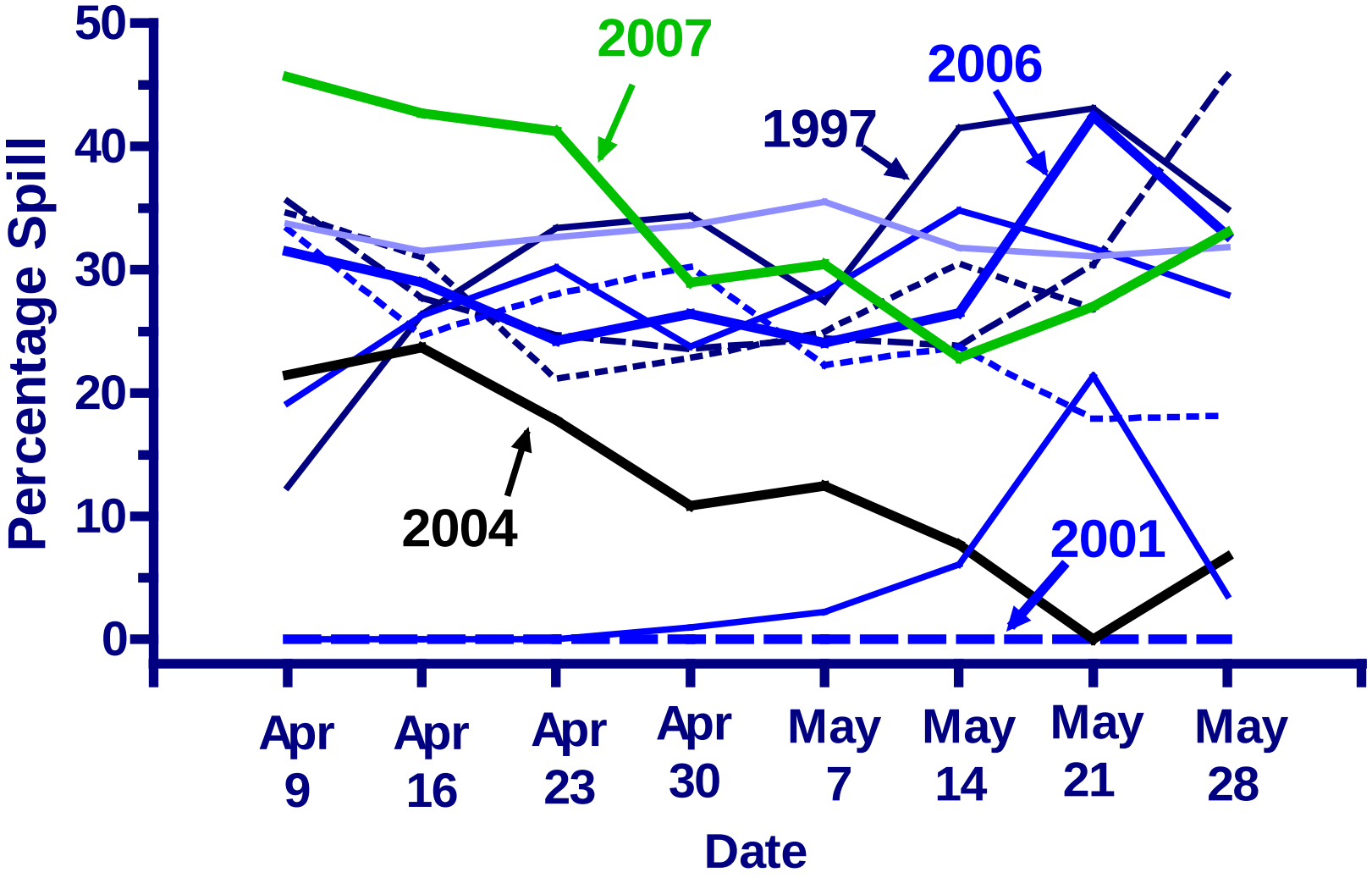
    - Annual summer “survival memo” released 31 August 2007
    - Presentation at NWPCC Science Policy Exchange 12 September 2007

Survival and Travel Time for PIT-tagged Spring Migrants

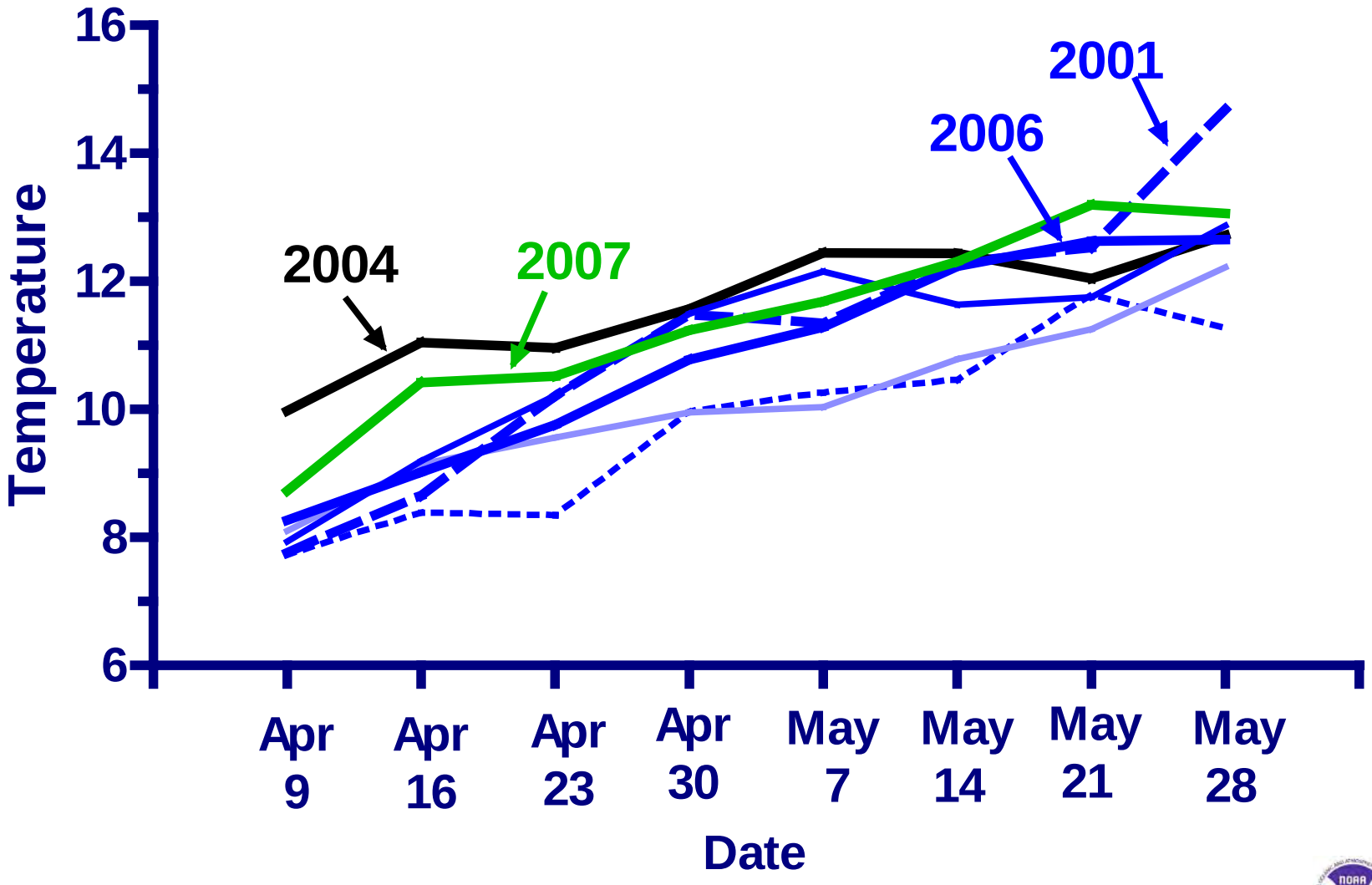
Weekly Mean Flow (kcfs)
Lower Granite Dam



Mean Percentage Spilled
LGR, LGS, LMN



Weekly Mean Temperature
Little Goose Dam



PIT-tag Data Sources

Chief Joseph

Wells

Grand Coulee

Rocky Reach

Rock Island

Wanapum

Priest Rapids

Ice Harbor

Snake R. trap

Juvenile detectors

Lower Monumental

Little Goose

Lower Granite

Hatchery &
Trap Releases

Bonneville

The Dalles

John Day

McNary

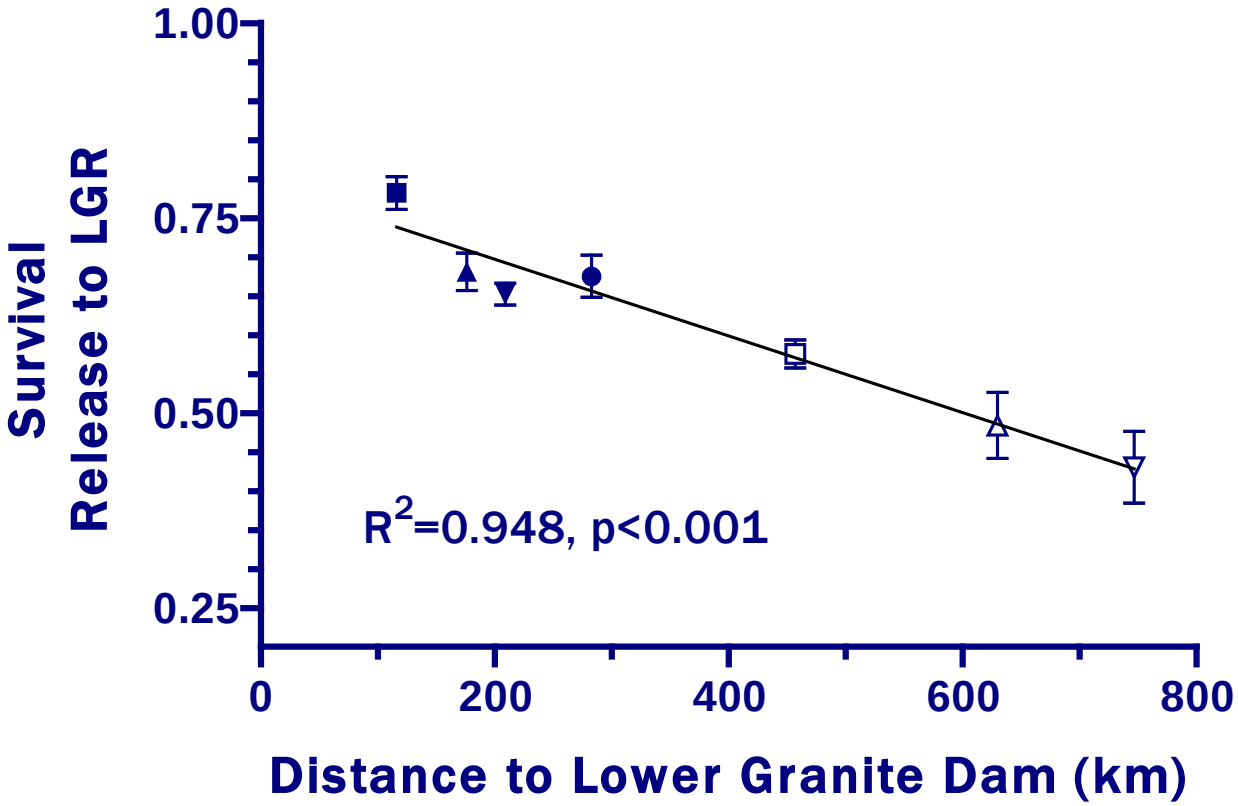
Hells Canyon

Oxbow

Brownlee

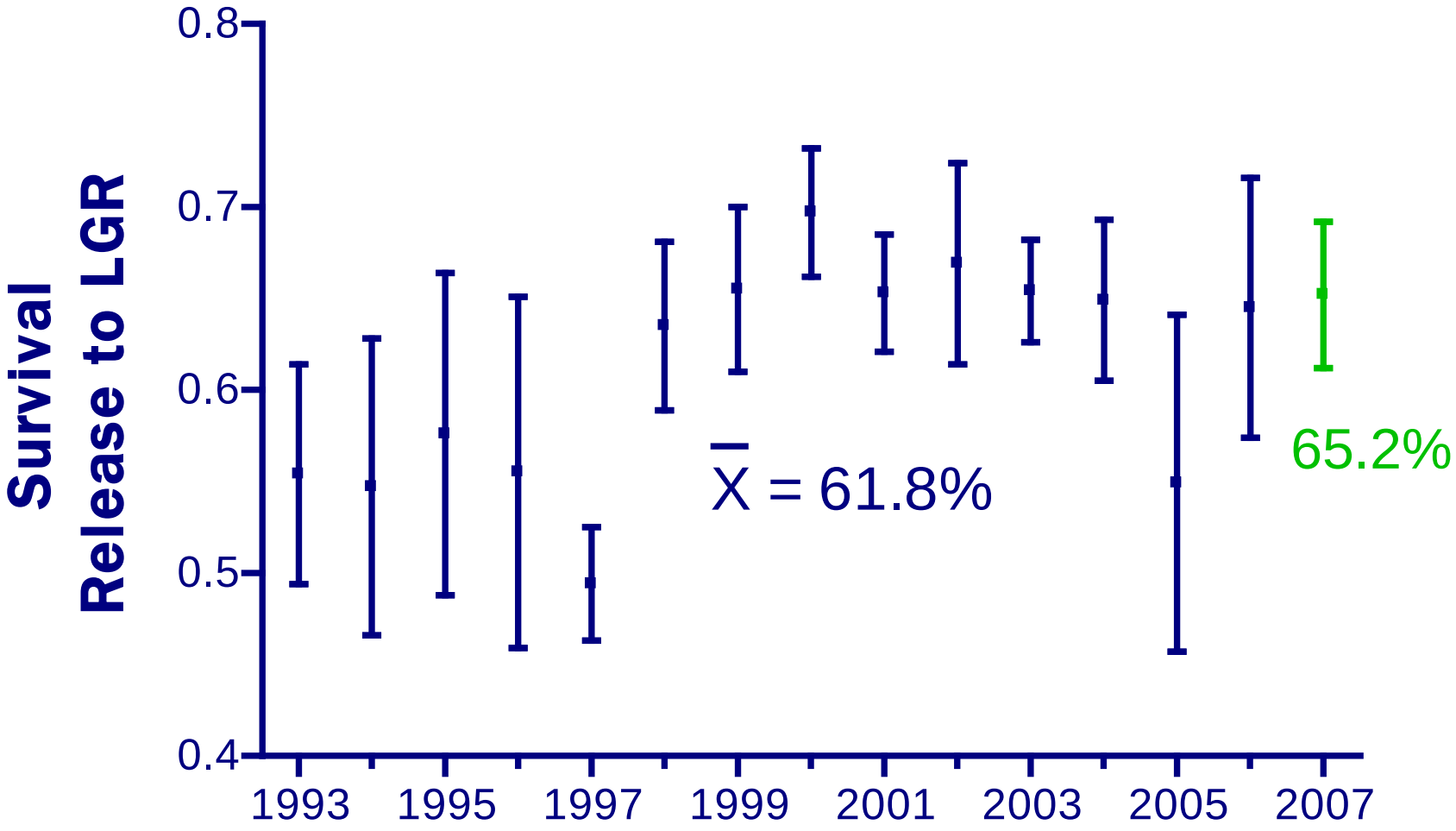
N

Hatchery stream type Chinook (1993-2007)

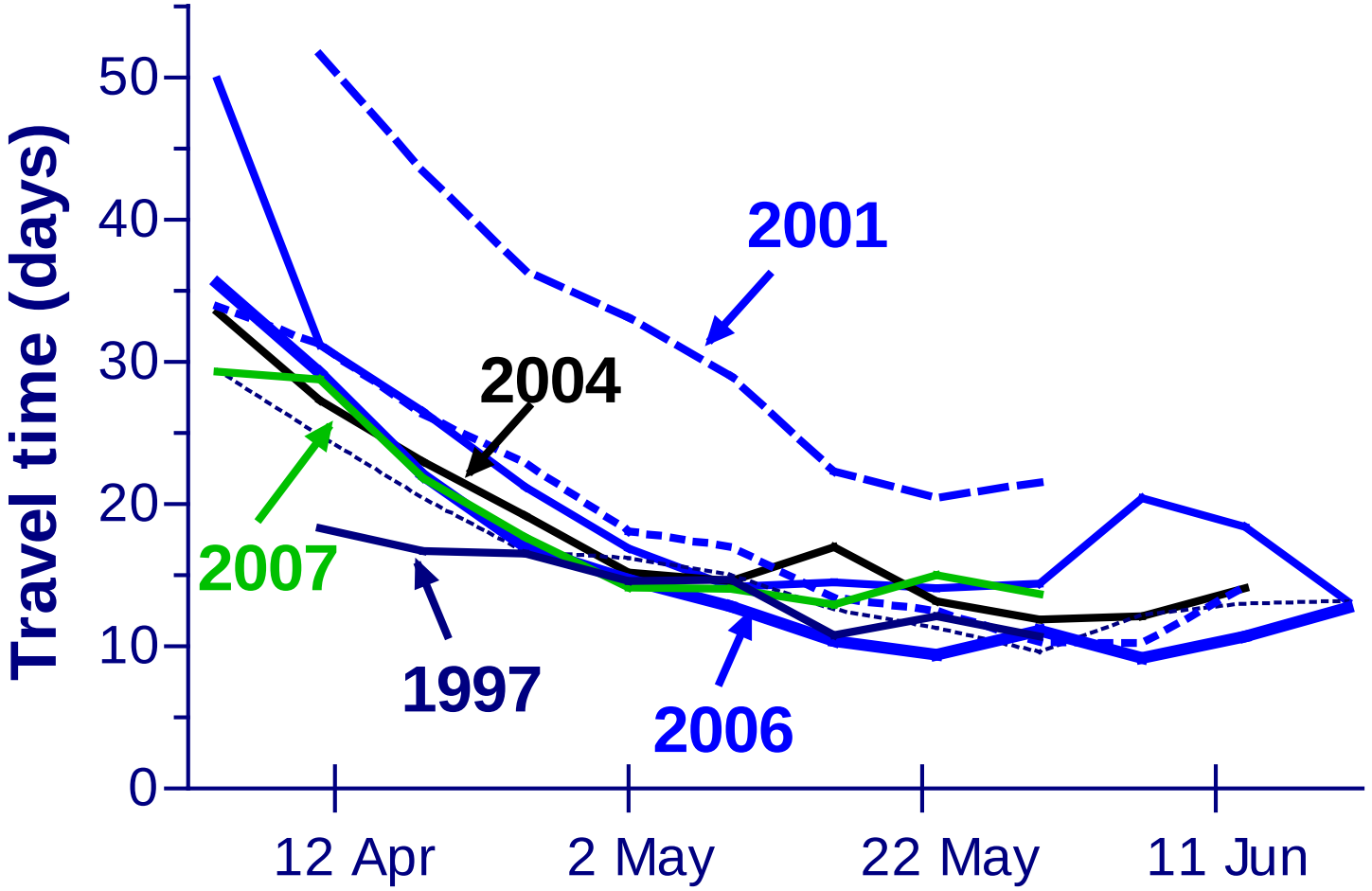


- Dworshak
- Kooskia
- Imnaha R. weir
- Rapid River
- McCall
- Pahsimeroi
- Sawtooth

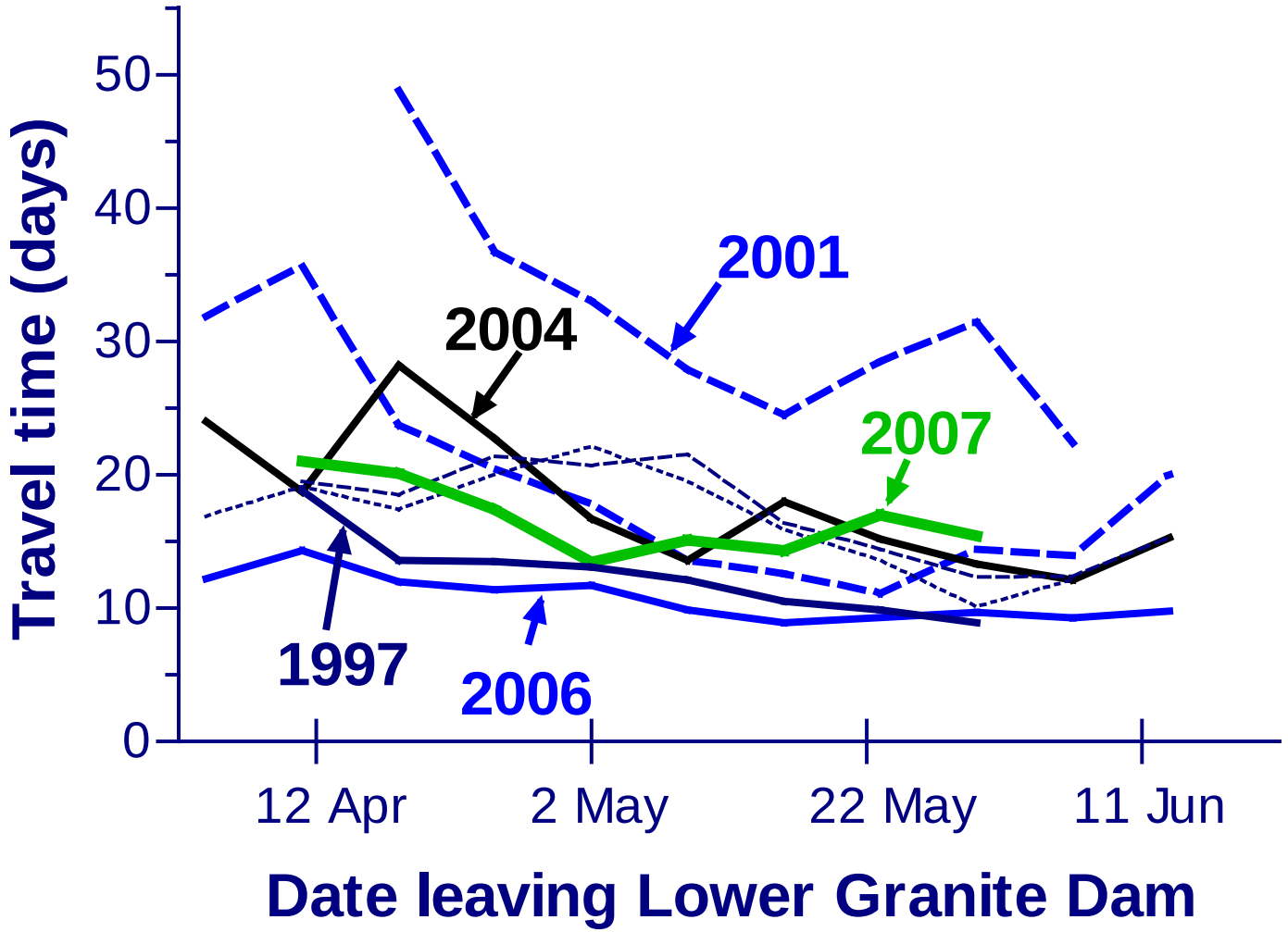
Stream type Chinook
Snake River Basin Hatcheries
Mean of index groups

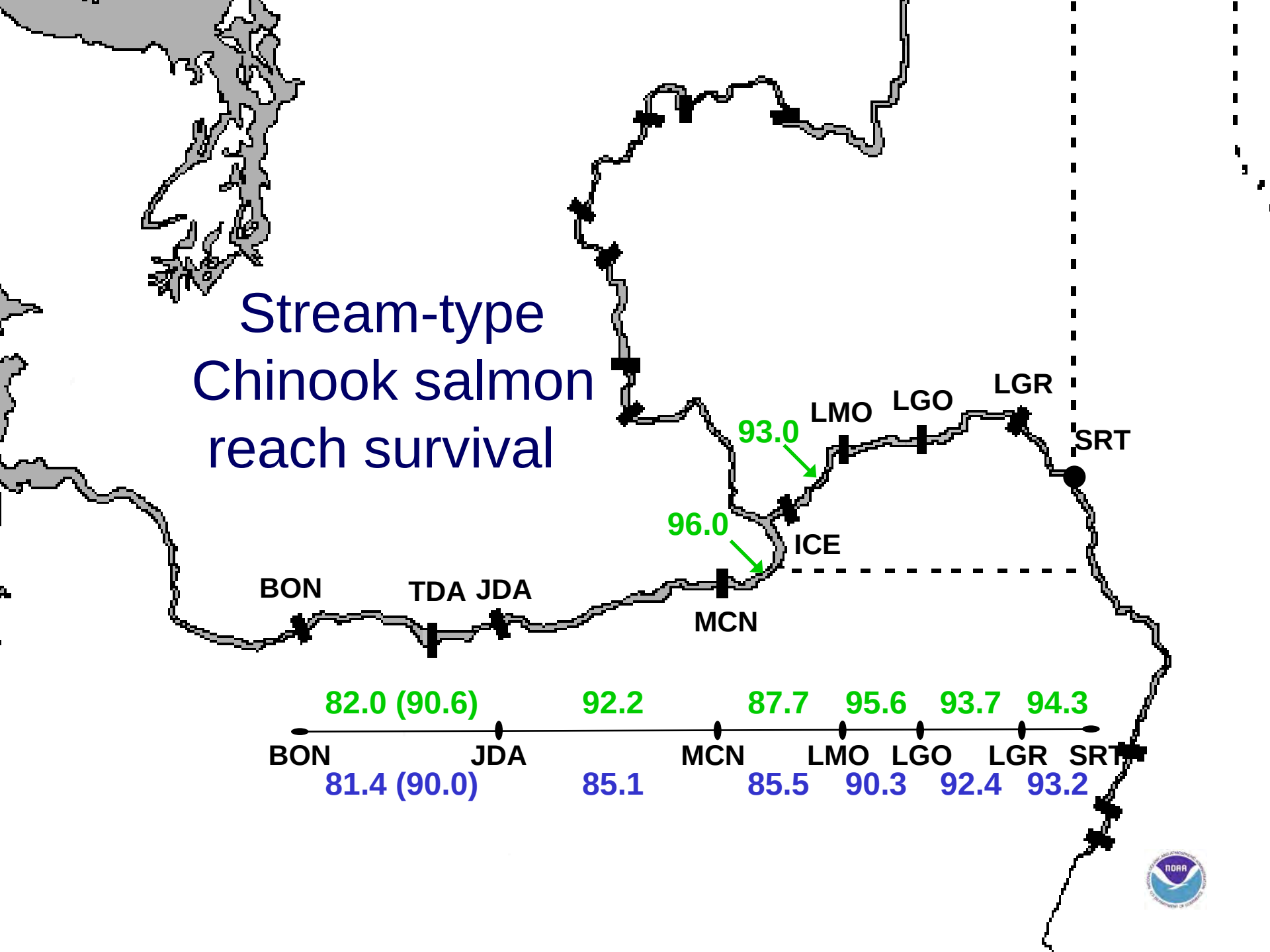


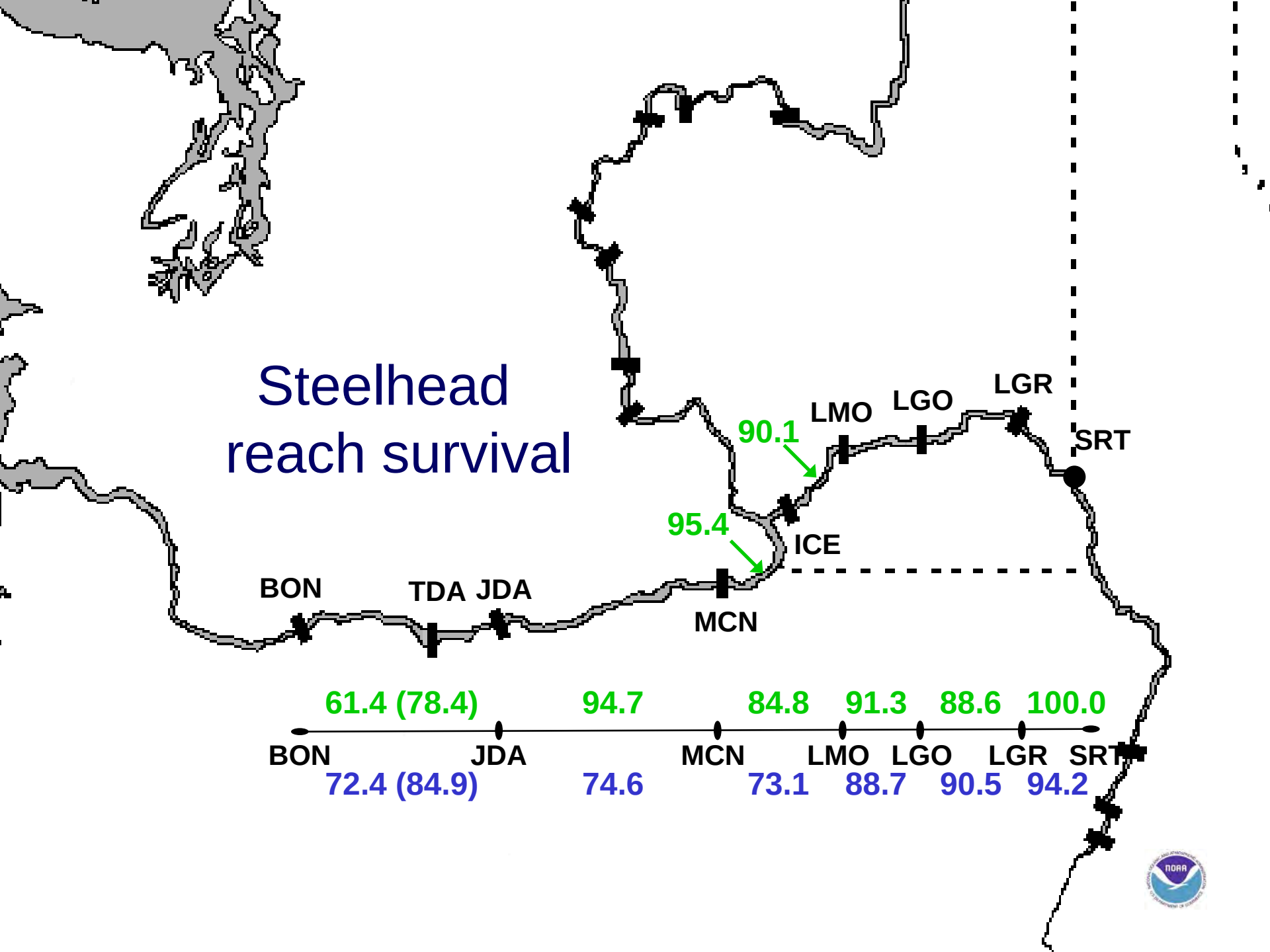
Stream-type Chinook median travel time
Lower Granite to Bonneville (461 km)



Steelhead median travel time
Lower Granite to Bonneville (461 km)

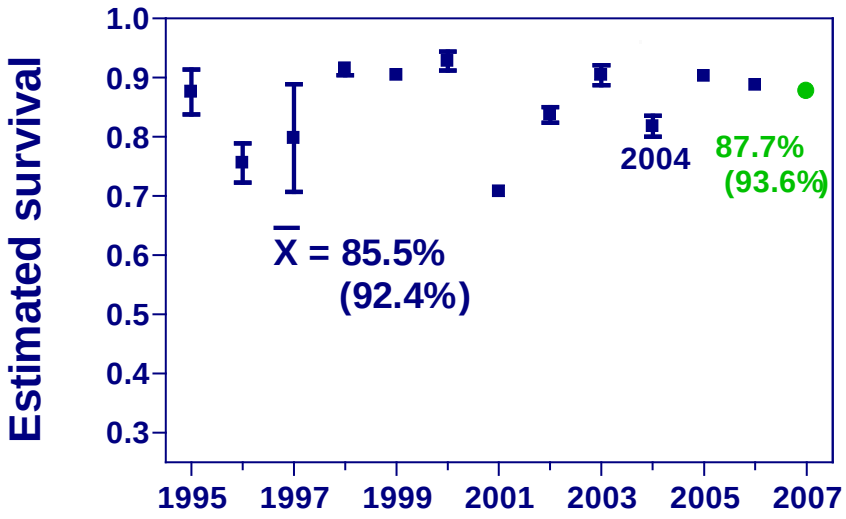



Stream-type
Chinook salmon
reach survival
LGR
LGO
LMO
SRT
93.0
96.0
ICE
BON
TDA
JDA
MCN
82.0 (90.6)
92.2
87.7
95.6
93.7
94.3
BON
JDA
MCN
LMO
LGO
LGR
SRT
81.4 (90.0)
85.1
85.5
90.3
92.4
93.2

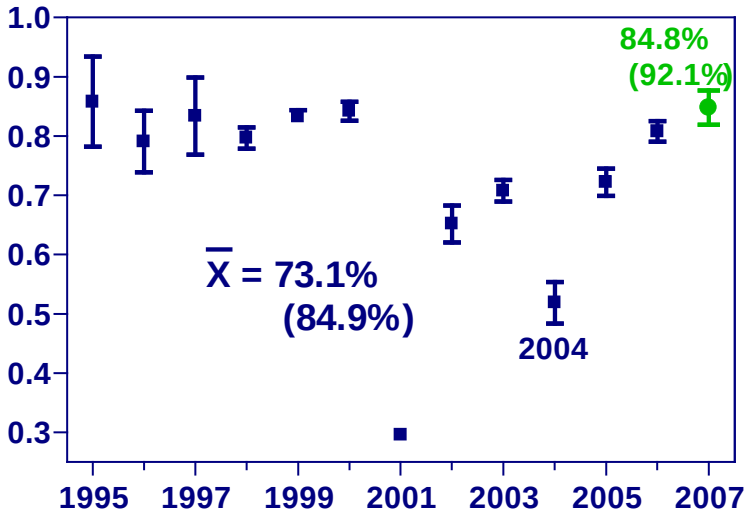

Steelhead
reach survival
BON
TDA
JDA
MCN
ICE
LMO
LGO
LGR
SRT
90.1
95.4
61.4 (78.4)
94.7
84.8
91.3
88.6
100.0
BON
JDA
MCN
LMO
LGO
LGR
SRT
72.4 (84.9)
74.6
73.1
88.7
90.5
94.2

Lower Monumental to McNary

Stream type Chinook

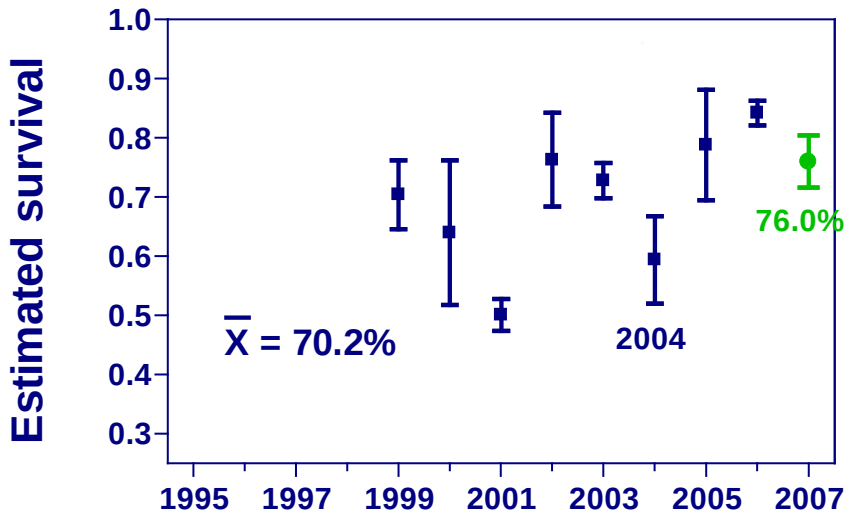


Steelhead

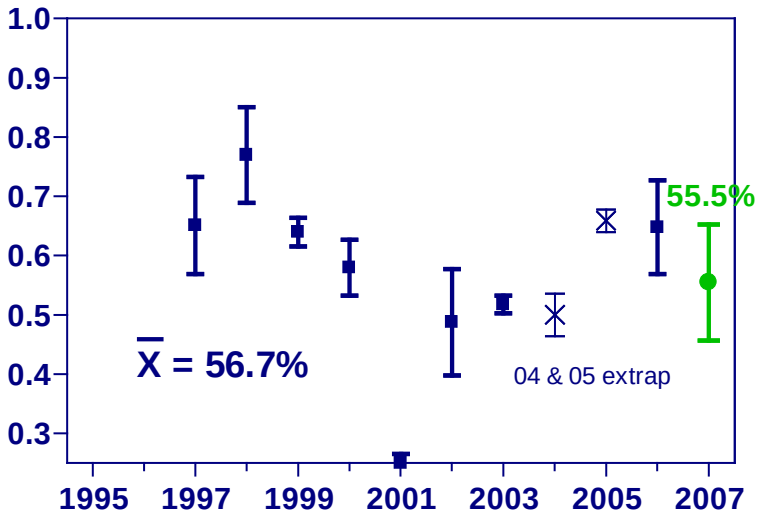


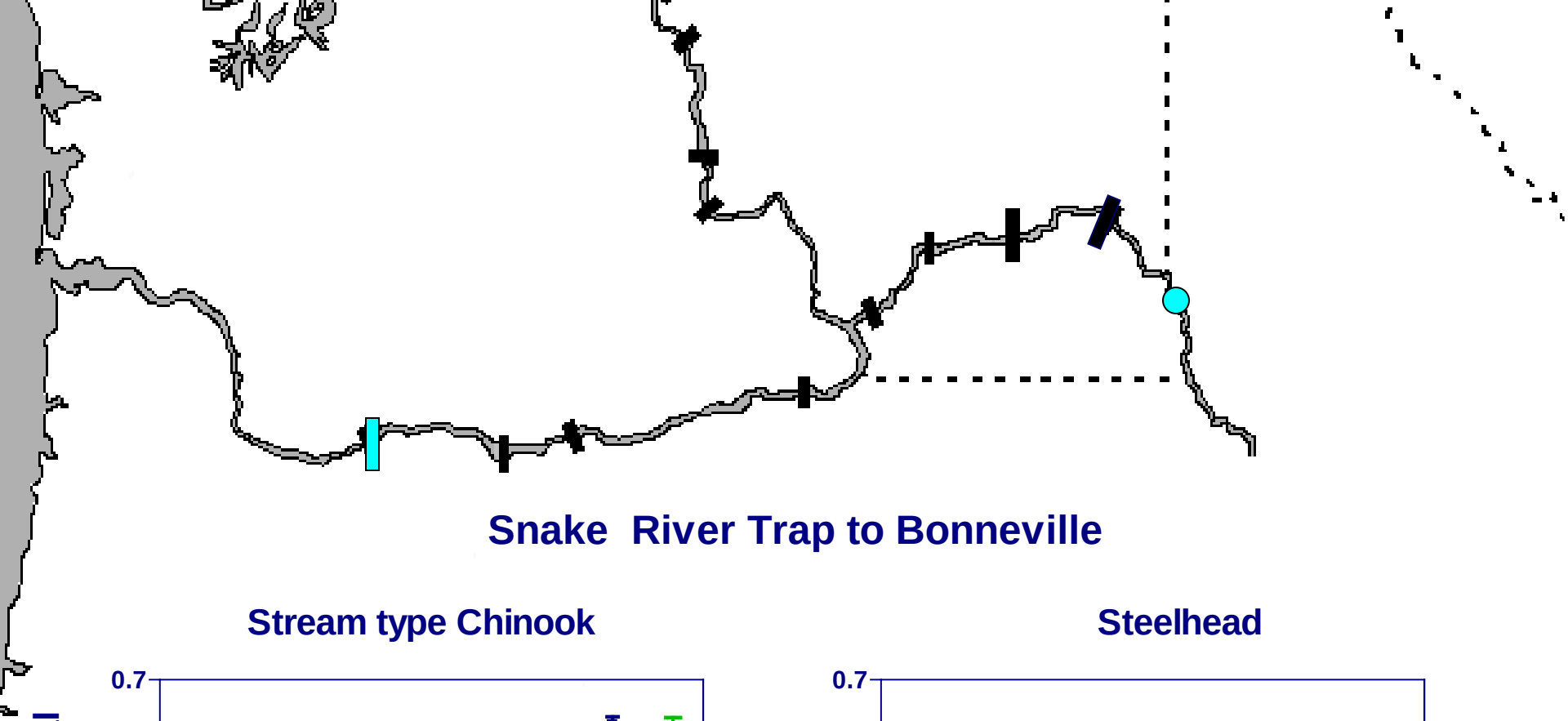
McNary to Bonneville

Stream type Chinook



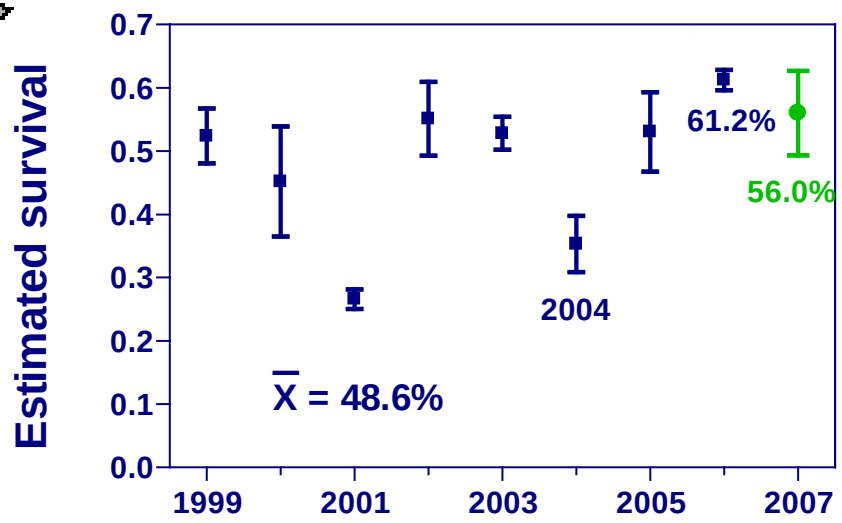
Steelhead



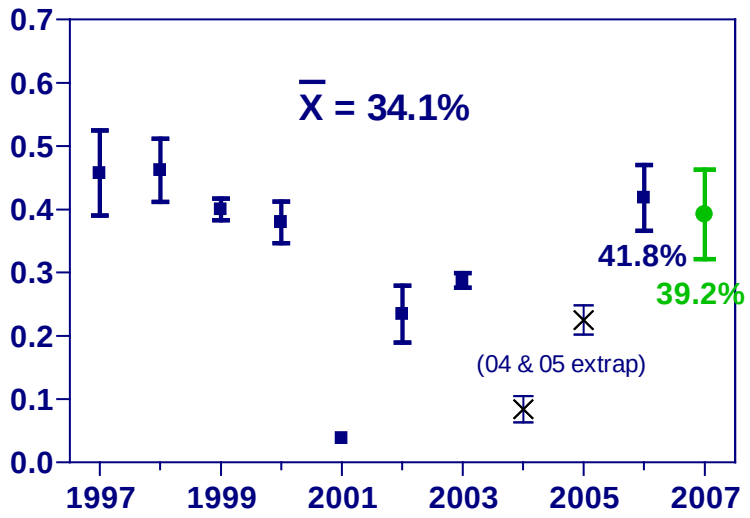


Snake River Trap to Bonneville

Stream type Chinook



Steelhead



Percentage of fish transported

Percentage of fish transported

Estimation of percentage of non-tagged fish is difficult!

- Requires estimate of total number of non-tagged smolts

- Data from PIT-tagged fish, but:
  - groups are treated differently, (almost) none like non-tagged fish
  - distribution of tagged fish not the same as non-tagged

- Transport started in middle of season
  - Proportion transported depends on travel times, etc.

Percentage of fish transported

Preliminary estimates for 2007 based on PIT-tag data:

- 24% of non-tagged stream type Chinook
- 33% of non-tagged steelhead

Percentage of fish transported

Why so low in 2007?

- Transportation started late
  - 57% of wild chinook past LGR before May 1
  - 24% of steelhead
- Low proportion of fish in bypass at Little Goose and Lower Monumental
  - Given percentage of spill more attractive in low flow?


Questions

Hanford Reach Fall Chinook Protection Program
2006-2007

Russell Langshaw
Public Utility District No. 2 of Grant County

Grant County
PUBLIC UTILITY DISTRICT
Excellence in Service and Leadership

Priest Rapids Project Spawning Period operations

- Reverse Load Factor 1984-2004
- Experimental operations under HRFCPPA
  - Load following 2005
  - Peaking 2006
- Reverse Load Factor 2007

2005 Load following operations

- Initiation of spawning – Oct. 19
- 31 redds > 65 kcfs elevation – Nov. 6
- Reverted to RLF – Nov. 7
- End of spawning – Nov. 20
- 98 redds > 65 kcfs elevation – Nov. 20
- 70 kcfs Critical Elevation

2006 Peaking operations

- Initiation of spawning – Oct. 25
- 43 redds > 65 kcfs elevation – Nov. 19
- End of spawning – Nov. 26
- 70 kcfs Critical Elevation

HRFCPP critical dates

- Hatching
  - Begin – Dec. 9
  - End – Feb. 23
- Emergence
  - Begin – April 4
  - End – May 20
- Rearing Period
  - Weekend protections – May 1
  - End – June 20

Emergence and Rearing Period operations - 2007

- Mean PRD discharge = 171.7 kcfs
- Mean Daily Delta = 38.2 kcfs
- Number of exceedances = 4
- Maximum exceedance = 2.9 kcfs
- Criteria distribution
  - 40 kcfs = 5
  - 60 kcfs = 42
  - 150 kcfs min = 21

2006-2007 Conclusions

- Spawning Period
  - Peaking operations have potential
- Pre & Post Hatch Periods
  - Continued high level of protection
- Emergence & Rearing Period
  - Dramatic improvement over previous years
  - Met protection criteria 94% of time
  - Maximum exceedance of 2.9 kcfs

2007 RLF operations

- Initiation of spawning – Oct. 24
- End of spawning – Nov. 18
- 0 redds > 65 kcfs elevation
- 55 kcfs Critical Elevation

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 N.E. Oregon, Suite 200, Portland, Oregon 97232 Telephone (503) 238-0667
Fax (503) 235-4228
www.critfc.org

WINTER WEATHER 2007 - 2008 FORECAST

Oregon Chapter-American Meteorological Society, Winter Weather Meeting; November 9th, 2007

Kyle Dittmer, *Hydrologist- Meteorologist*, CRITFC Hydro Program

Climate prediction tools used:

1. Australian Bureau of Meteorology—ENSO guide (http://www.bom.gov.au/climate/enso).
2. Assume La Nina years (100%) and sunspot minima years (25%).
3. Analog Water Years (October 1 to September 30): 1944, 1945, 1950, 1951, 1955, 1956, 1963, 1965, 1968, 1974, 1975, 1976, 1985, 1986, 1989, 1996, 1997, 1999, 2000, and 2006.
4. Multivariable ENSO Index: (http://www.cdc.noaa.gov/people/klaus.wolter/MEI)
5. Sea Surface Temperature departure forecasts: (http://www.cpc.ncep.noaa.gov/products/people/wwang/cfs_fcst/images/glbSSTMonMask.gif)
6. Sunspot data: (ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SUNSPOT_NUMBERS/MONTHLY). Late Dr. Landscheidt's Solar Model: (http://www.john-daly.com/theodor/new-enso.htm)

Winter 2007 - 2008 Climate Forecast for Portland:

Month:	Temperature (mean monthly):	"Hedge"	Precipitation (% normal):	"Hedge"
November	Near Normal (-1.8 to + 1.8 degF)	0.1	Above Normal (110 - 130%)	128%
December	Near Normal (-1.8 to + 1.8 degF)	-0.1	Near Normal (90 - 110%)	90%
January	Near Normal (-1.8 to + 1.8 degF)	0.6	Near Normal (90 - 110%)	109%
February	Near Normal (-1.8 to + 1.8 degF)	-0.8	Near Normal (90 - 110%)	106%
March	Near Normal (-1.8 to + 1.8 degF)	-1.2	Near Normal (90 - 110%)	102%

Snow (% probability): November 35%, December 70%, January 85%, February 70%, March 75%.
Snow (inch): Nov. 0.7 (+/- 2.1), Dec. 1.4 (+/- 2.8), Jan. 3.6 (+/- 9.7), Feb. 0.8 (+/- 1.7), March 1.1.

****

Water Supply Forecast (Columbia River at The Dalles), January - July 2008, Million-Acre-Feet:

CRITFC (MEI method), updated Nov. 6, 2007: **115.8 MaF** or 108% of normal.
CIG's VIC Hydro model, updated Nov. 6, 2007: **98.2 MaF** or 92% of normal.

NOAA-NWS-NWRFC (ESP method), updated Nov. 6, 2007: **106.3 MaF** or 99% of normal.

VERIFICATION: Winter 2006 – 2007, CRITFC Climate Forecast vs. Observed Data for Portland:

Month:	Temperature (mean monthly):	"Hedge"	**Observed**	Precipitation (% normal):	"Hedge"	**Observed**
November	Near Normal (-1.8 to + 1.8 degF)	0.3	**1.6**	Below Normal (70 - 90%)	86%	**212%**
December	Near Normal (-1.8 to + 1.8 degF)	-0.2	**-0.2**	Near Normal (90 - 110%)	97%	**103%**
January	Near Normal (-1.8 to + 1.8 degF)	1	**-1.8**	Near Normal (90 - 110%)	95%	**54%**
February	Near Normal (-1.8 to + 1.8 degF)	0.2	**1.1**	Below Normal (70 - 90%)	79%	**83%**
March	Near Normal (-1.8 to + 1.8 F)	0.6	**2.9**	Near Normal (90 - 110%)	91%	**87%**
	average:	0.4	**0.7**	average:	90%	**108%**

WY 2007 Water Resources Forecast (Columbia River at The Dalles):

CRITFC (Kyle's) prediction: 96 MaF (90% of normal).
CIG (UW) prediction: 105.5 MaF (98% of normal).
NOAA-NWS-NWRFC prediction: 98.5 MaF (92% of normal).

The observed, unregulated runoff was 95.7 MaF (January – July).
The best preseason 2006-07 forecast goes to CRITFC.