Northwest Power and Conservation Council

February 4, 2014

MEMORANDUM

TO: Council Members

FROM: Jim Ruff – Mainstem Passage and River Operations

SUBJECT: Briefing on NOAA Fisheries' 2013 Mainstem Reach Survivals

At the February11, 2014, Council meeting, Dr. Steven Smith from NOAA's Northwest Fisheries Science Center will present results from his agency's 2013 reach survivals and travel times for spring migrants in the mainstem Snake and Columbia River reaches. For over two decades, NOAA Fisheries has used data from migrating juvenile salmonids tagged with passively detected electronic tags (called "PIT tags") to estimate survival probabilities, travel times and migration rates.

In the Snake River in 2013, river discharge volumes were below average during the spring outmigration, except for a brief peak in mid-May. Water temperatures were cooler than average in April and warmer than average during May. A higher-than average proportion of discharge was spilled over dams in the Snake River, especially in April.

As in other recent years, travel times for migrating smolts were shorter in 2013 (smolts entered the ocean earlier), attributable to increased spill and installation of new surface-passage structures at dams. Survival for spring/summer Chinook salmon in 2013 was above average in all segments of the impounded river, except for the reach from the head of Lower Granite reservoir to the tailrace of that dam on the Snake River. Overall, estimated survival from the head of Lower Granite reservoir to Bonneville Dam tailrace (federal hydrosystem survival) was 52.5%, essentially equal to the long-term average survival for spring/summer Chinook salmon.

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For steelhead, estimated hydrosystem survival was 50.1%, which was the lowest of the last five years, though higher than the long-term average. NOAA Fisheries estimates that a little over one-third (34% of Chinook, 38% of steelhead) of smolts arriving at Lower Granite Dam were collected at a dam on the Snake River and transported by barge to below Bonneville Dam.

Throughout the years of NOAA's PIT-tag research, estimated adult return rates have generally been higher for transported fish than for in-river fish throughout most of the migration season (the exception is for the earliest migrating Chinook salmon). Differences in adult return rates between transported and in-river migrants have generally been smaller in recent years; the adult return rate of in-river fish has increased relative to that of transported fish. In-river fish of both species benefit from earlier ocean entry, and steelhead have also benefited from increased in-river hydrosystem survival.

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Survival and Travel Time of Migrating Salmonid Smolts in the Snake and Lower Columbia Rivers

Update with Preliminary 2013 Data

Northwest Power and Conservation Council
February 11, 2014

Steve Smith steven.g.smith@noaa.gov
Jim Faulkner, Dan Widener, Tiffani Marsh, Rich Zabel
Northwest Fisheries Science Center
NOAA Fisheries

Outline

- Summary of migration conditions, travel time and survival of PIT-tagged smolts through the hydropower system
  - Final report submitted to BPA January 14

- Information from return of PIT-tagged adults – transported from and bypassed at Lower Granite
  - Spring migrants: Final report (returns through 2010) to USACE March 2013 (updated with returns through 2013 here)
  - Fall chinook: Draft report to be submitted to COE February

2013 Spring Survival Summary

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

2013 Spring Survival Summary

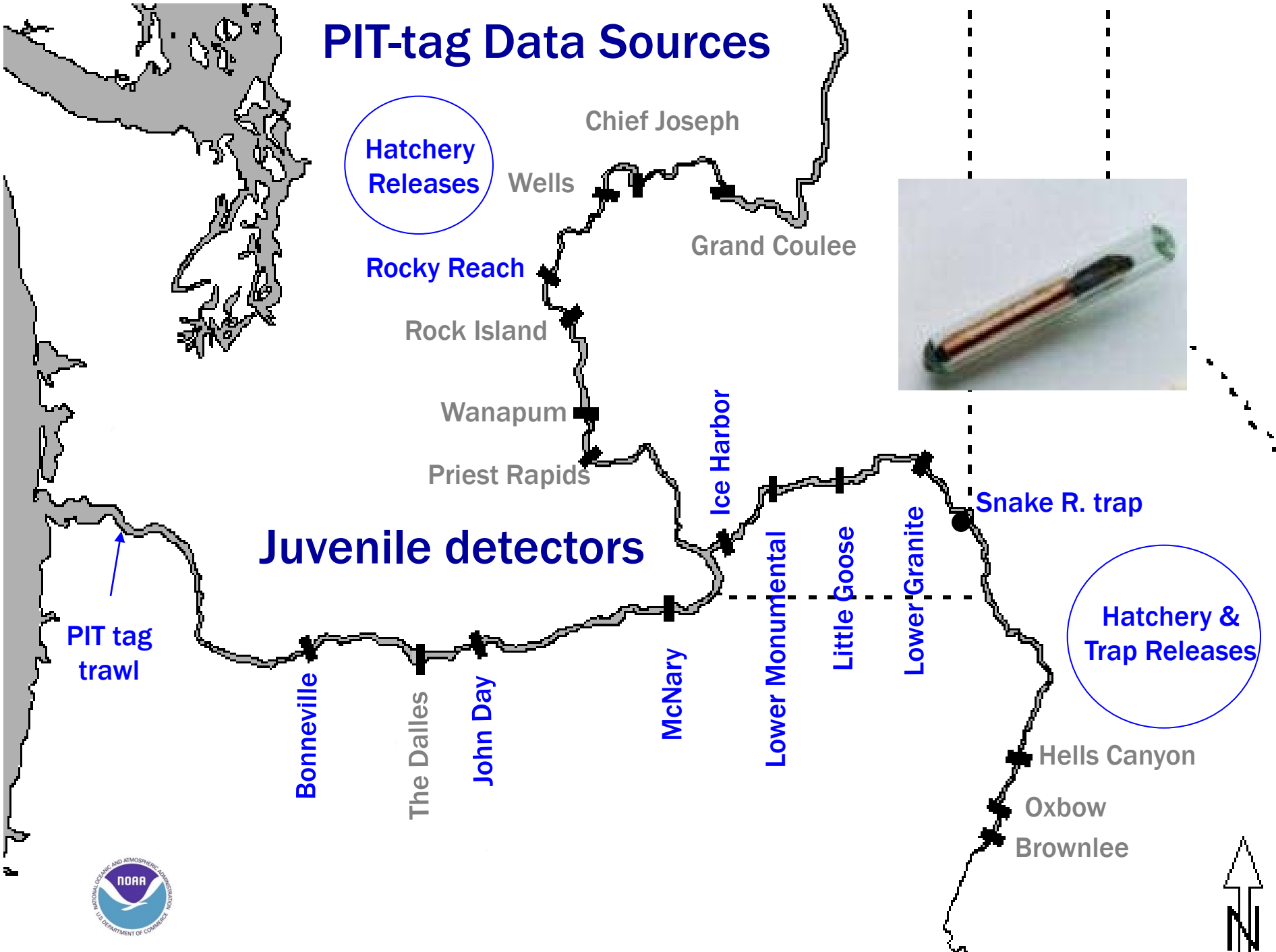
- Surface passage and spill continue to promote shorter travel times
- Above-average survival for yearling Chinook except for Lower Granite pool
- Hydrosystem survival for a bit above 50% for both yearling Chinook and steelhead

2013 Spring Survival Summary

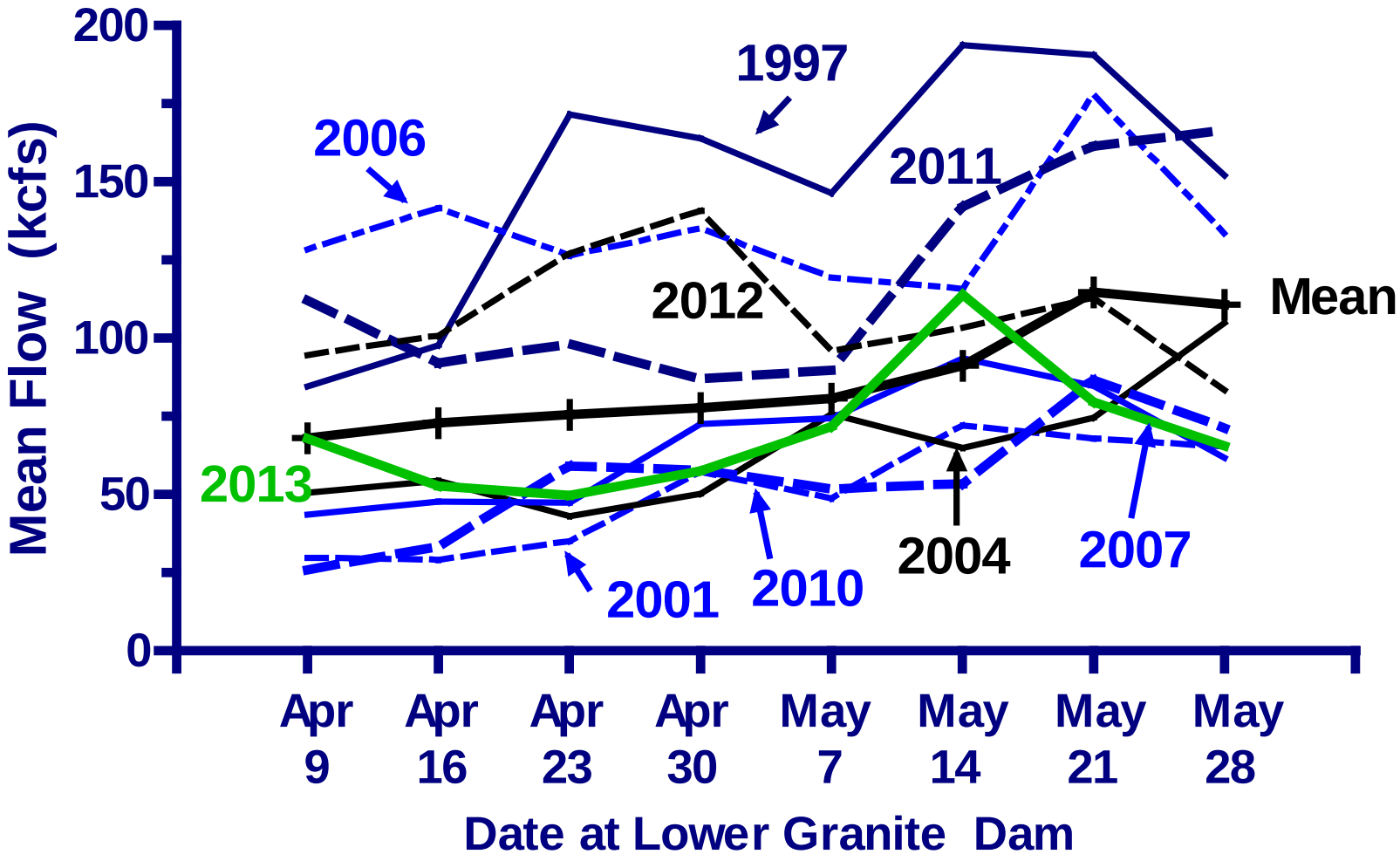
- Usual reminders:
- **Only those fish left to migrate in-river**
- **Only juvenile data, not survival to adult**

  (but a bit of adult return info today)

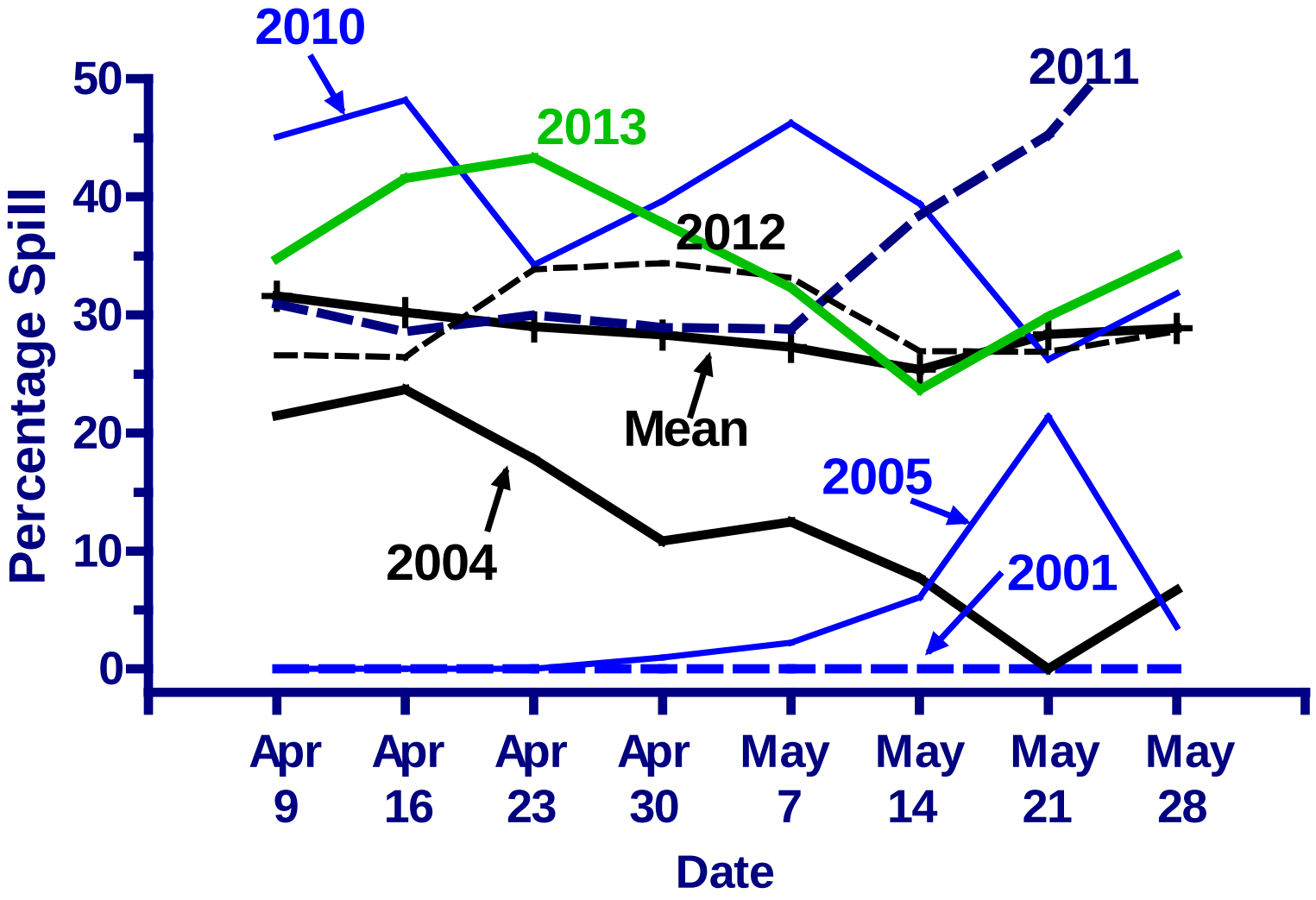
PIT-tag Data Sources



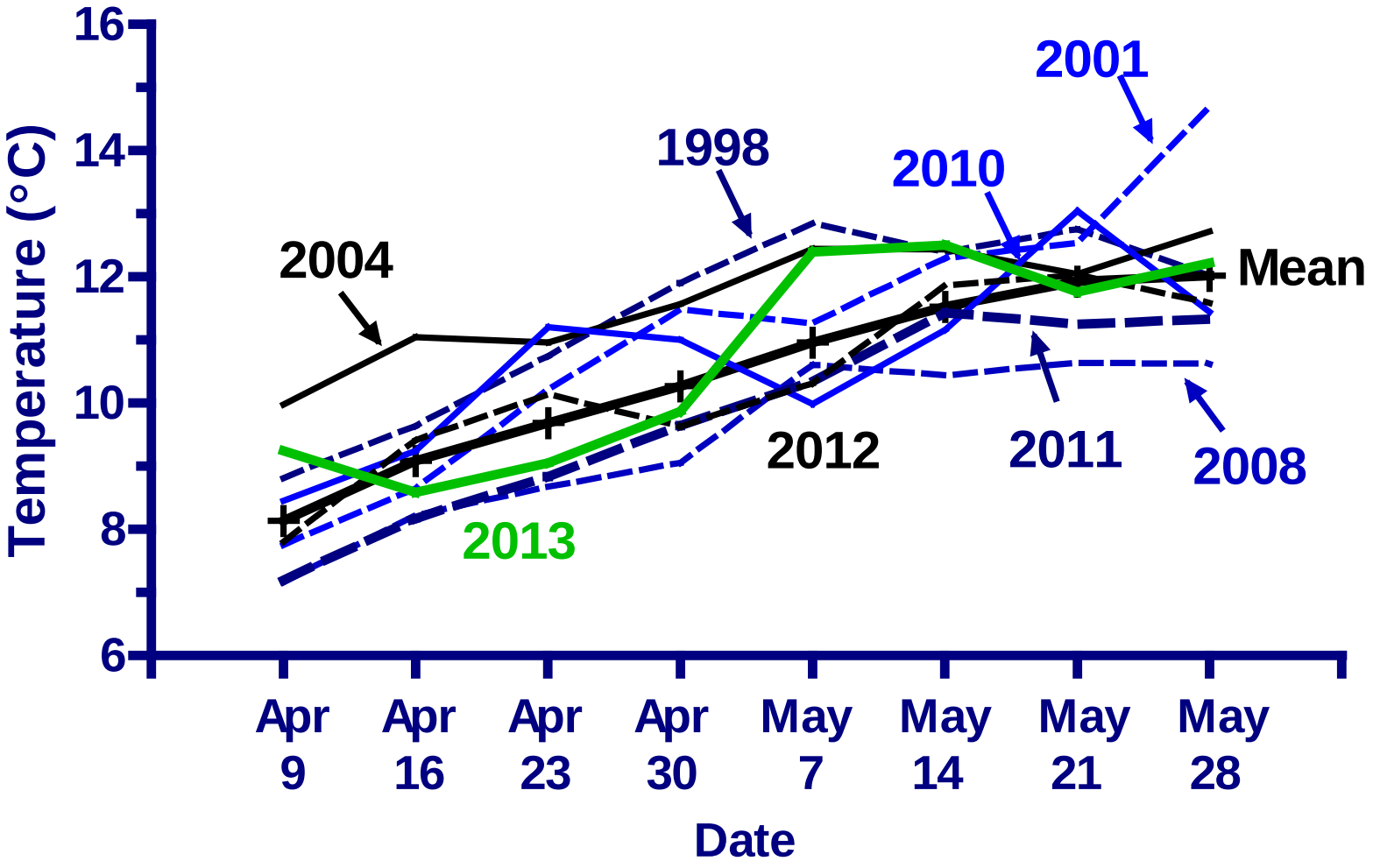
Weekly Mean Flow (kcfs)
Lower Granite Dam



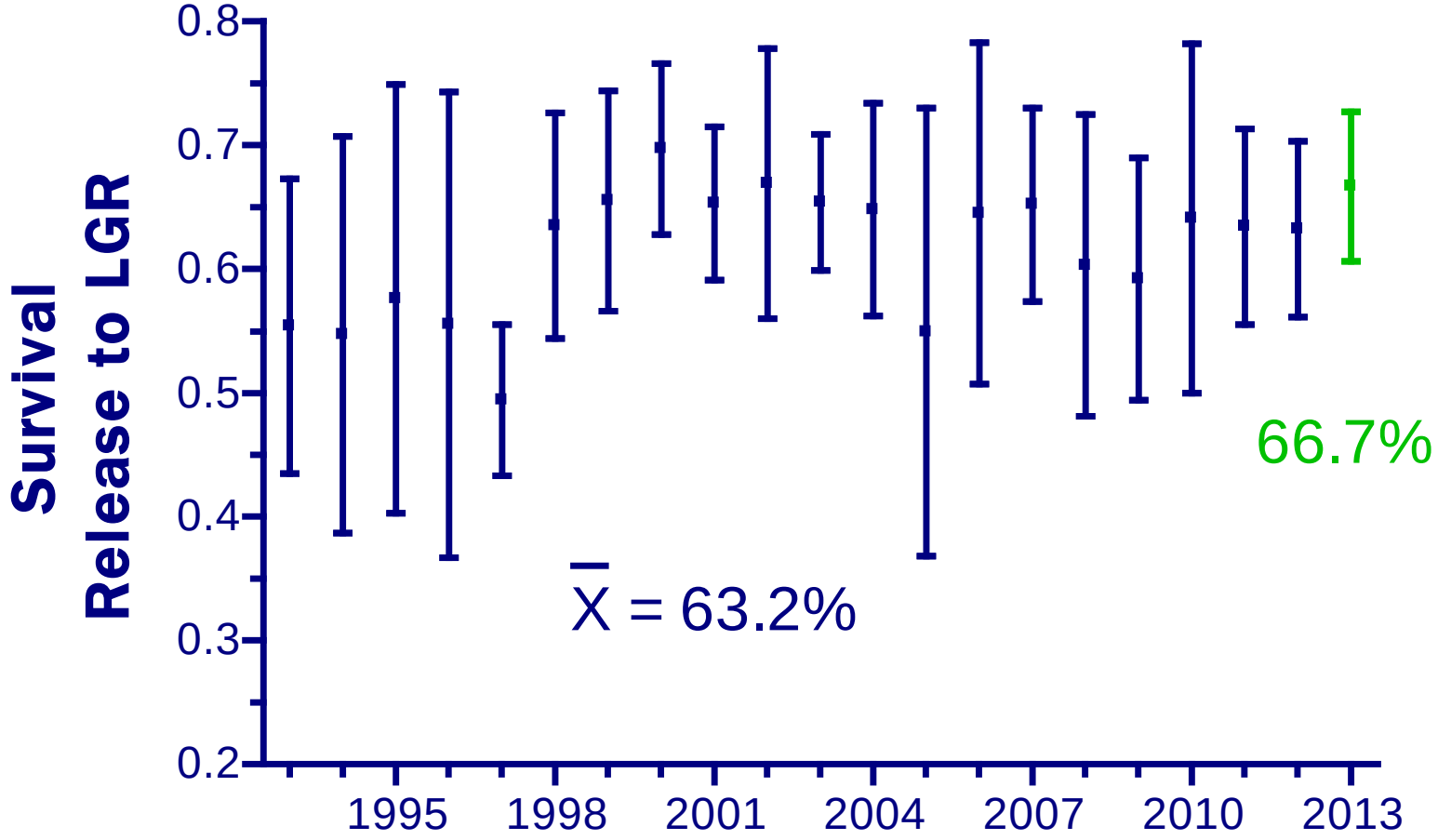
Weekly Mean %Spilled
LGR, LGS, LMN



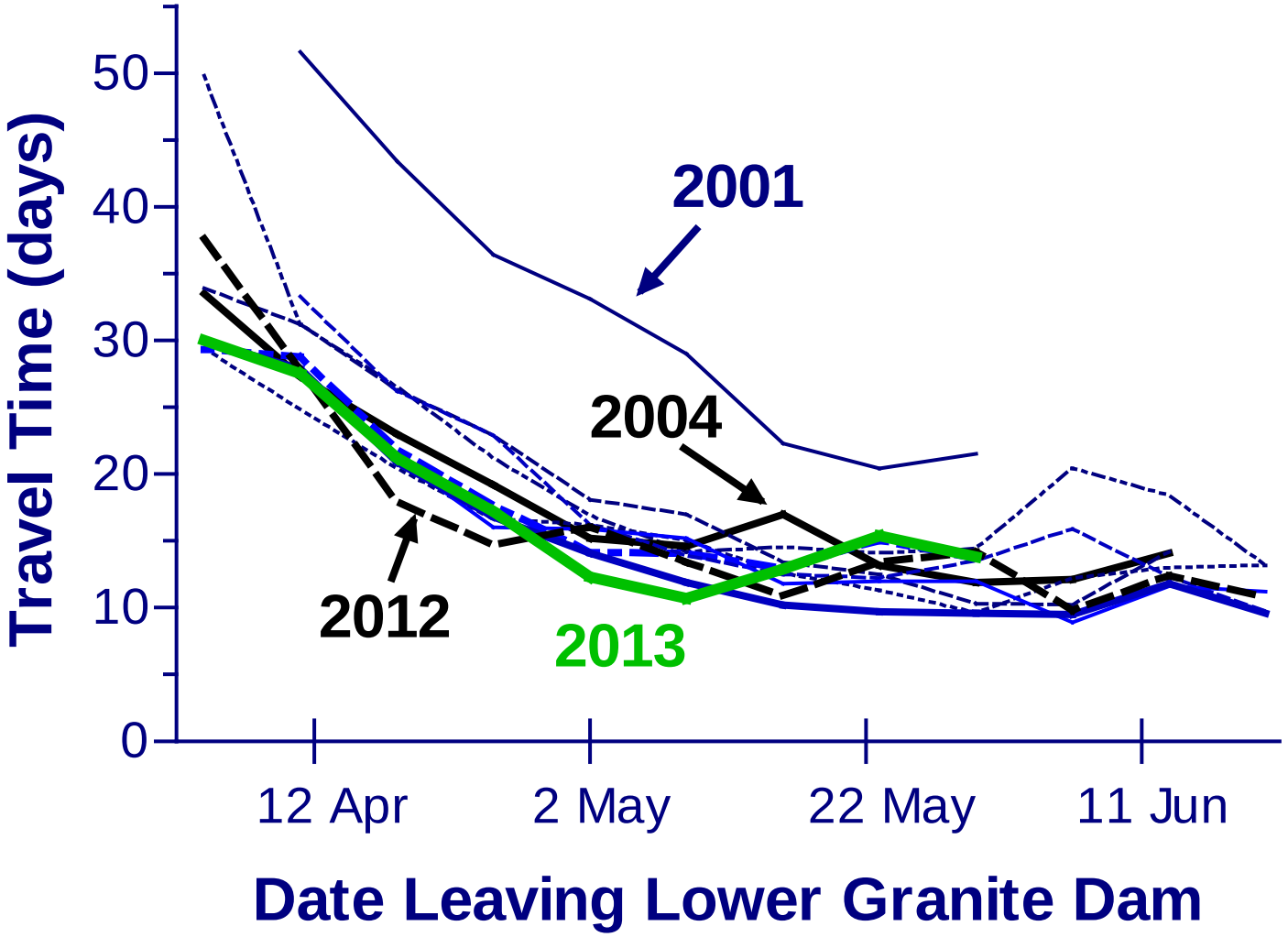
Weekly Mean Temperature
Little Goose Dam



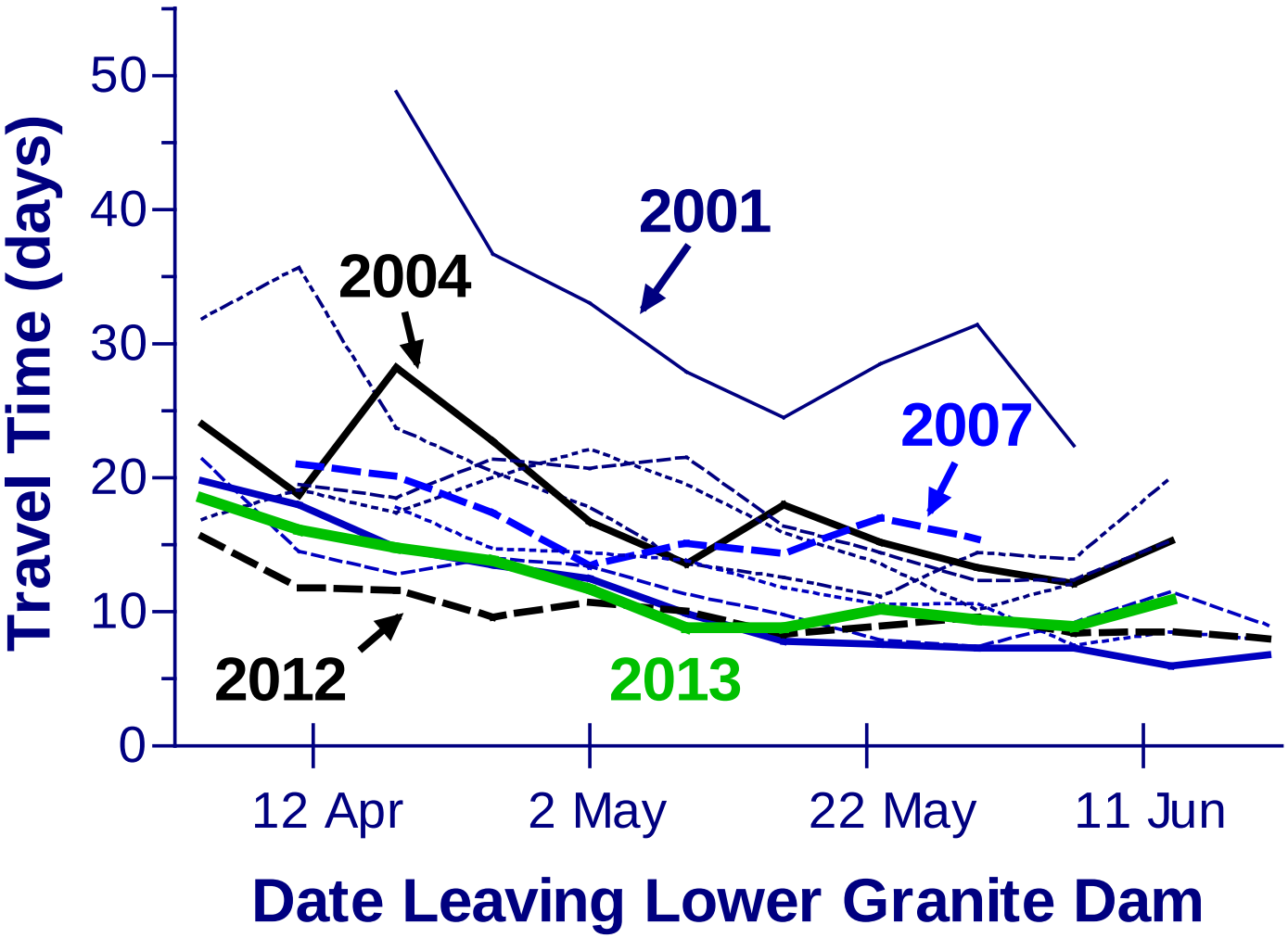
Yearling Chinook
Snake River Basin Hatcheries
Mean of Index Groups



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

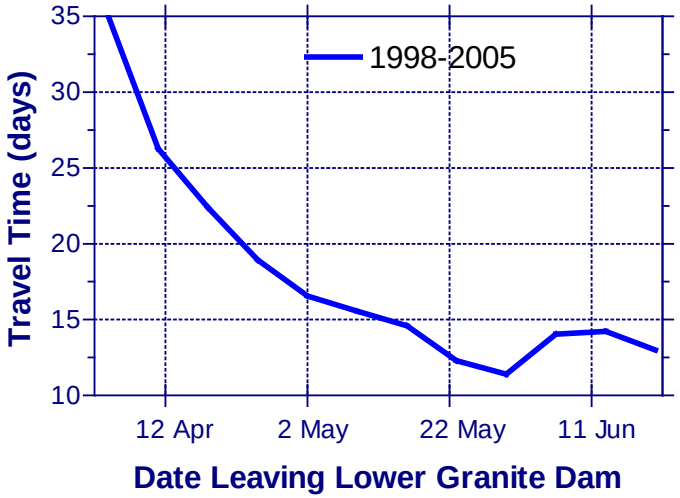


Steelhead Median Travel Time
Lower Granite to Bonneville (461 km)

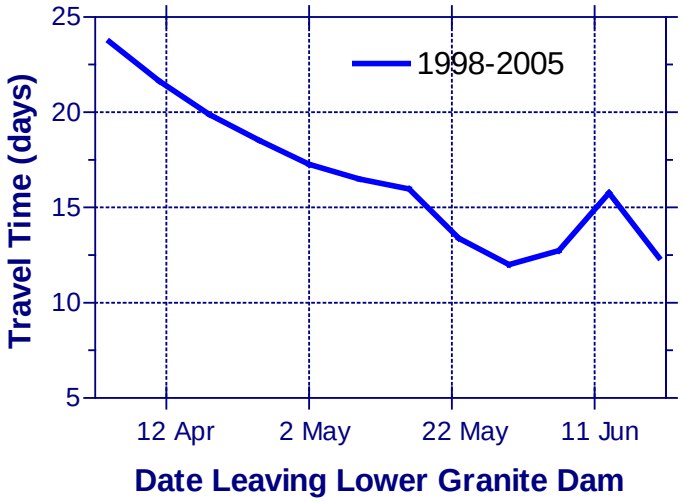


1998-2005

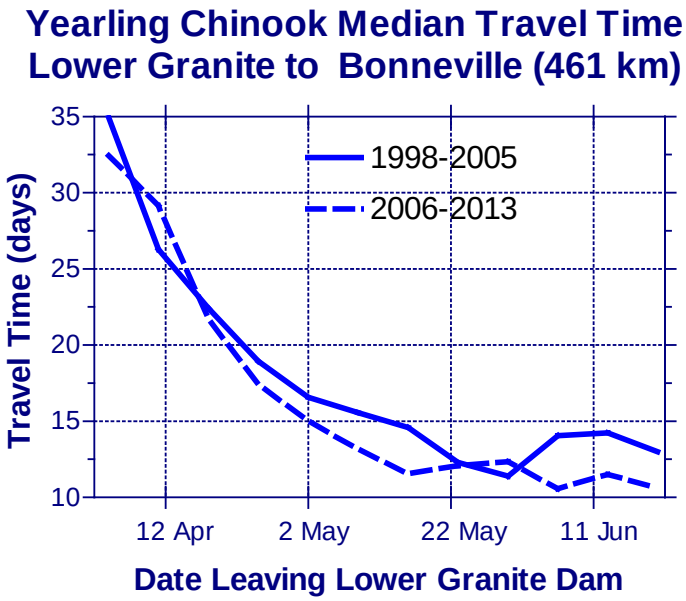
Yearling Chinook Median Travel Time
Lower Granite to Bonneville (461 km)

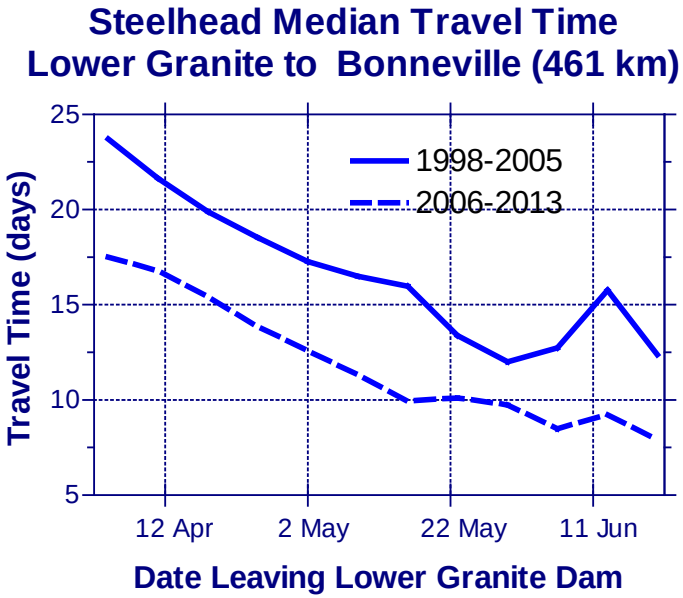


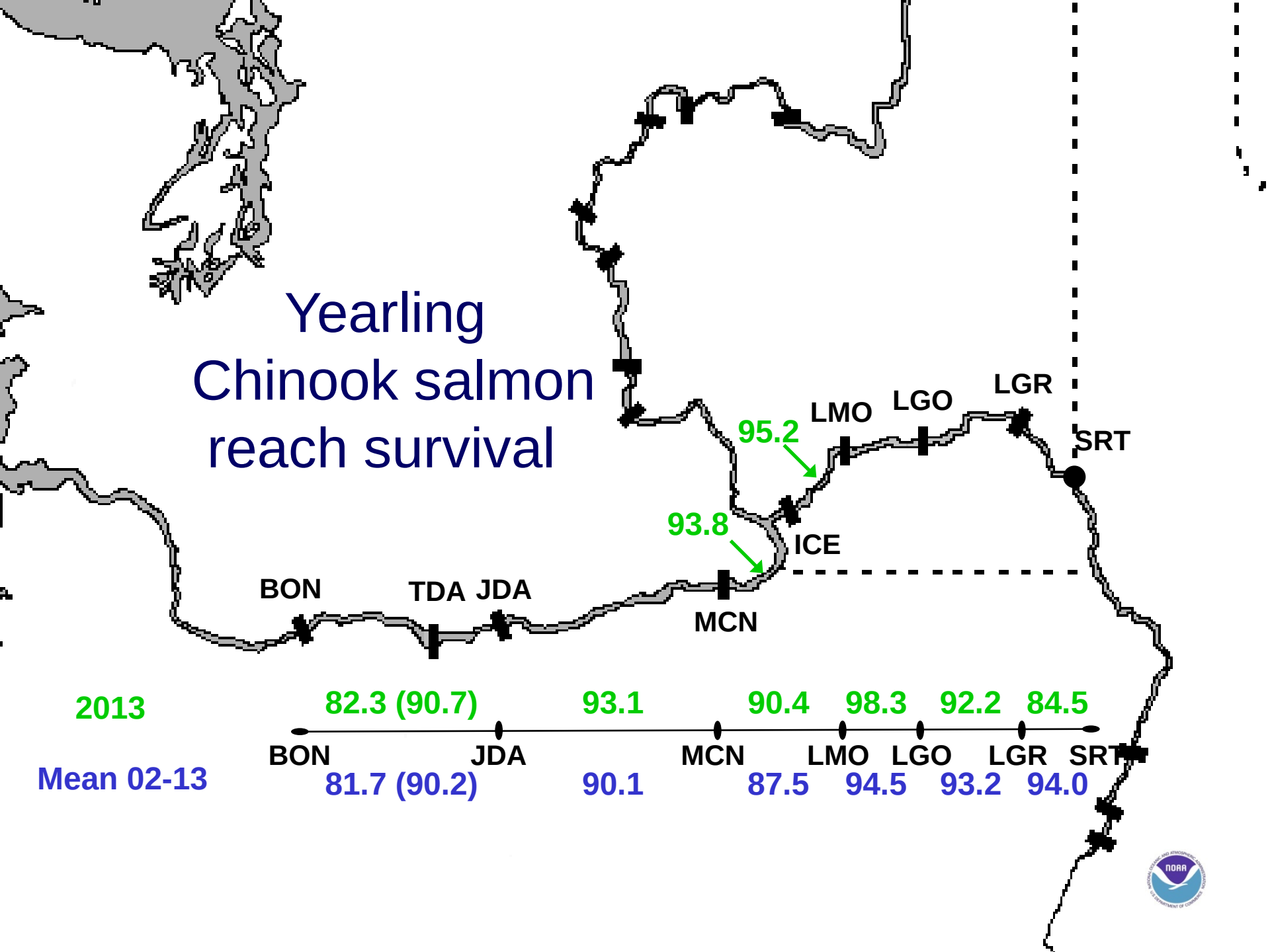
Steelhead Median Travel Time
Lower Granite to Bonneville (461 km)

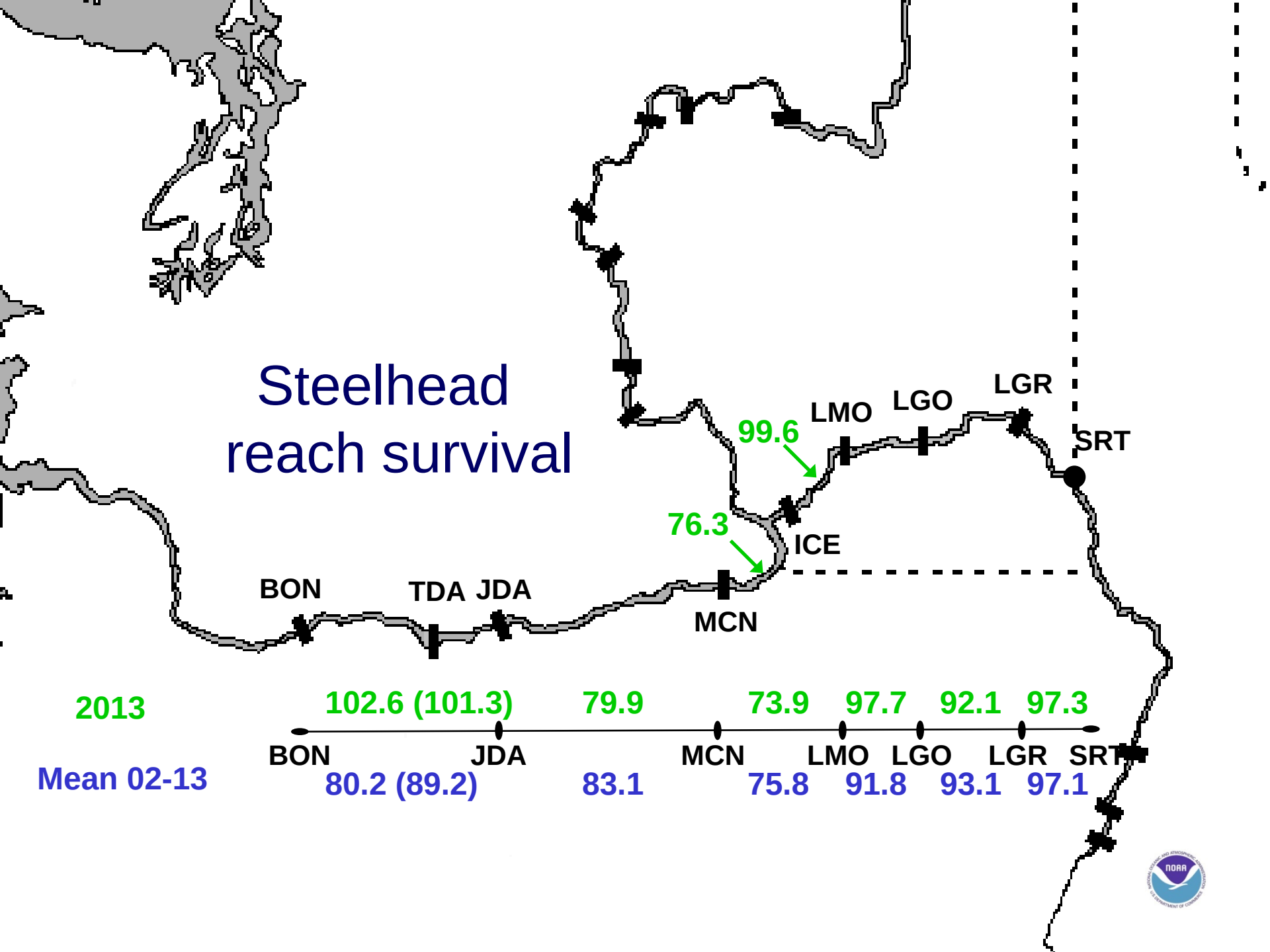


2006-2013 vs 1998-2005



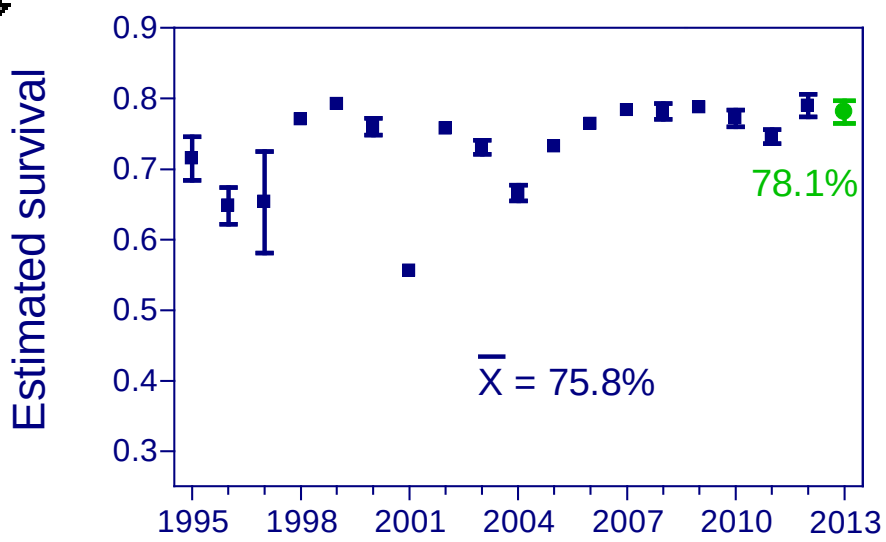



Yearling
Chinook salmon
reach survival
95.2
93.8
LMO
LGO
LGR
SRT
ICE
BON
TDA
JDA
MCN
2013
82.3 (90.7)
93.1
90.4
98.3
92.2
84.5
BON
JDA
MCN
LMO
LGO
LGR
SRT
Mean 02-13
81.7 (90.2)
90.1
87.5
94.5
93.2
94.0

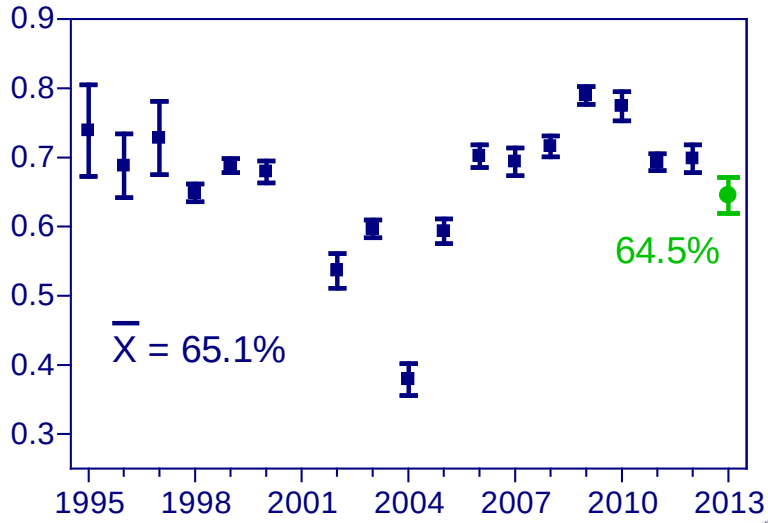

Steelhead
reach survival
LGR
LGO
LMO
99.6
SRT
76.3
ICE
BON
TDA
JDA
MCN
2013
102.6 (101.3)
79.9
73.9
97.7
92.1
97.3
BON
JDA
MCN
LMO
LGO
LGR
SRT
Mean 02-13
80.2 (89.2)
83.1
75.8
91.8
93.1
97.1

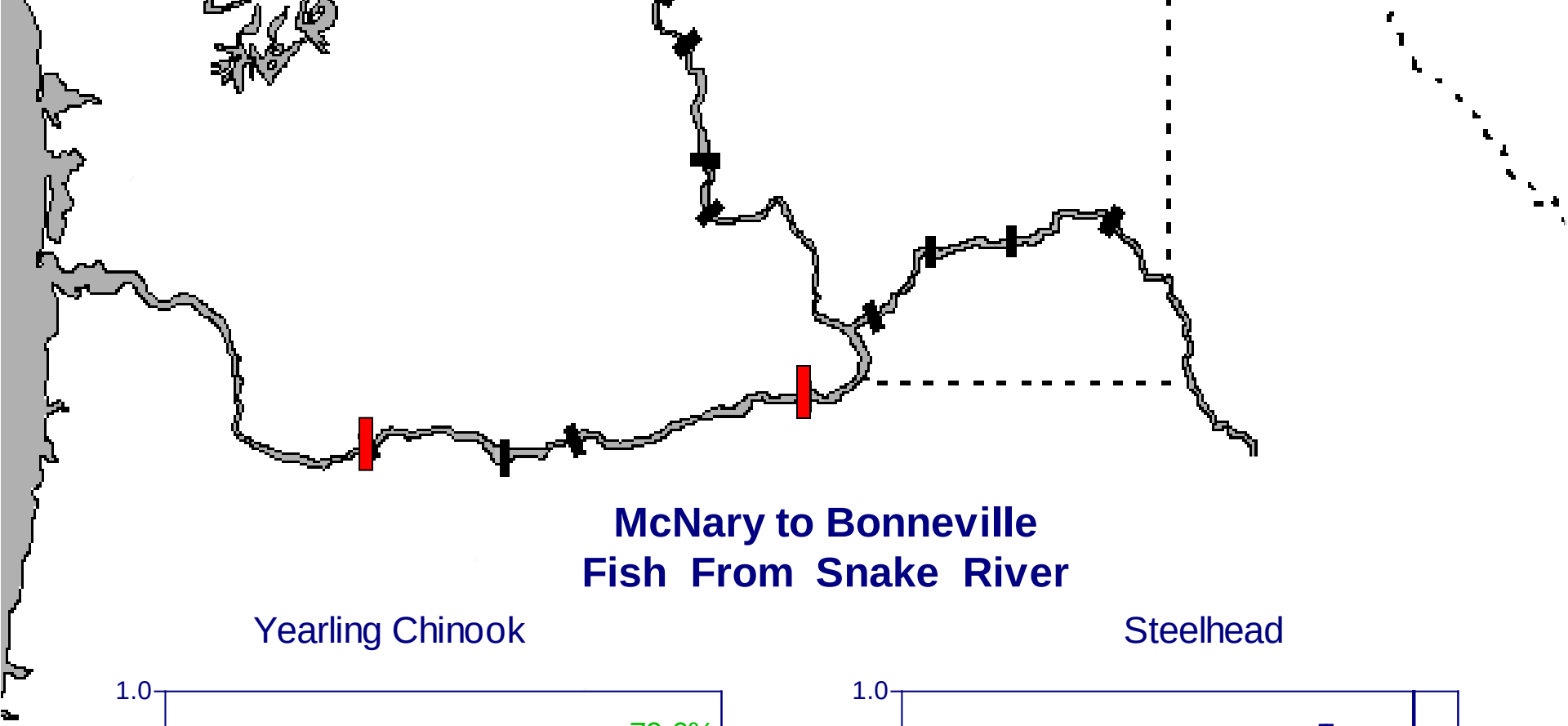
Lower Granite to McNary

Yearling Chinook



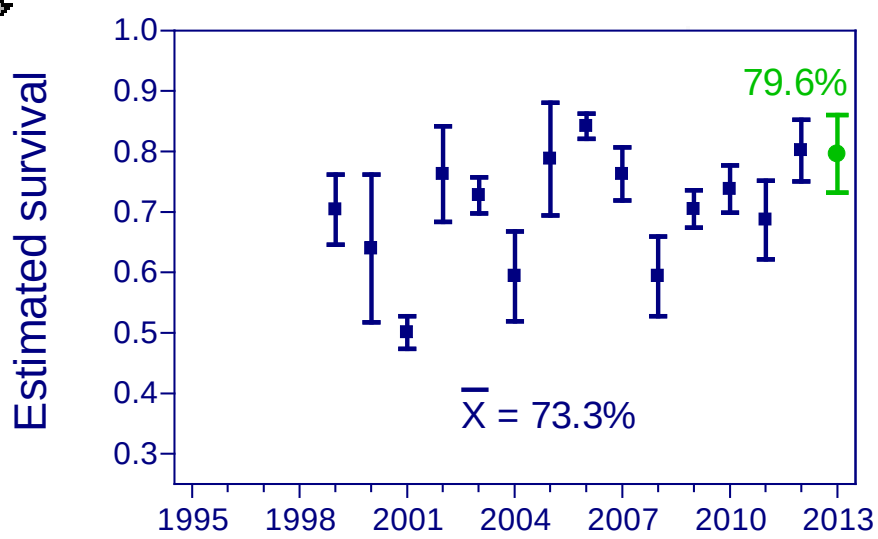
Steelhead



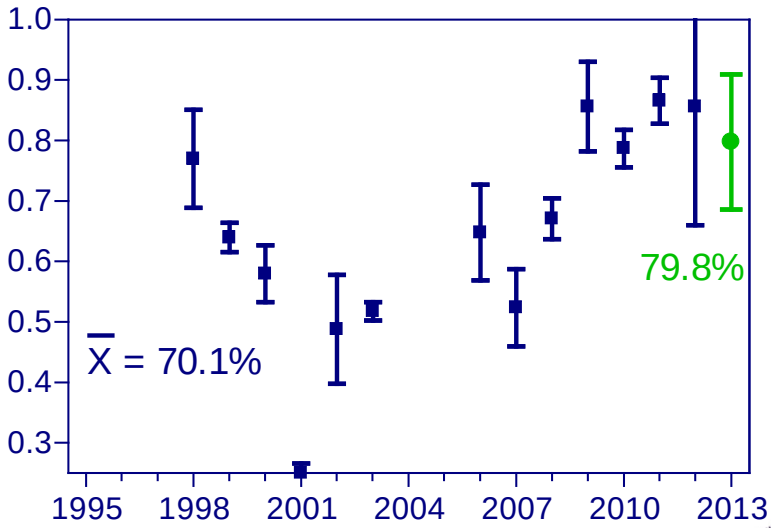


McNary to Bonneville
Fish From Snake River

Yearling Chinook

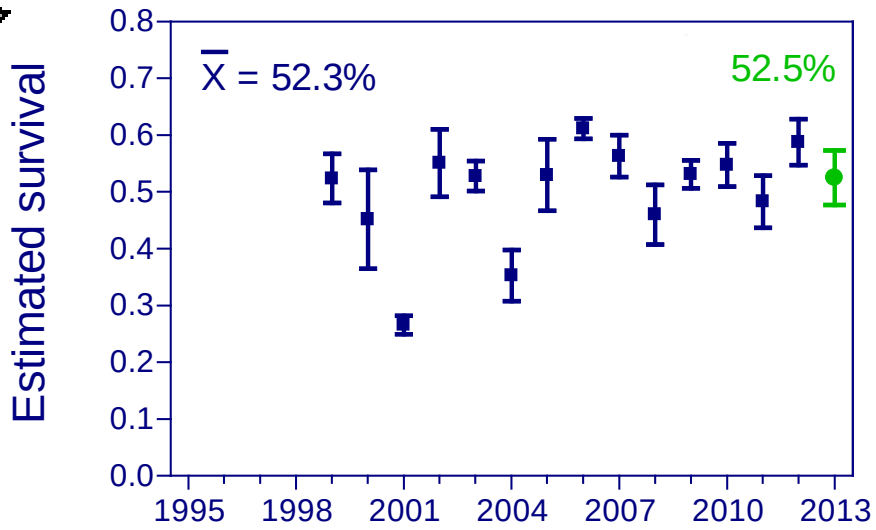


Steelhead

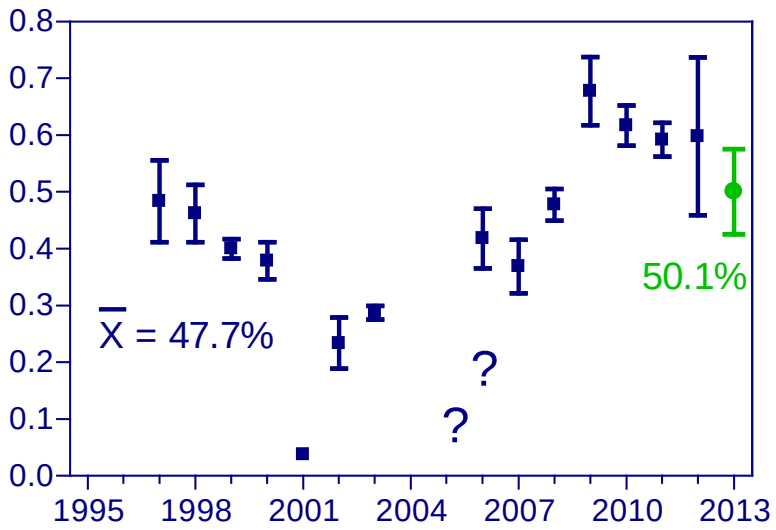


Snake River Trap to Bonneville

Yearling Chinook



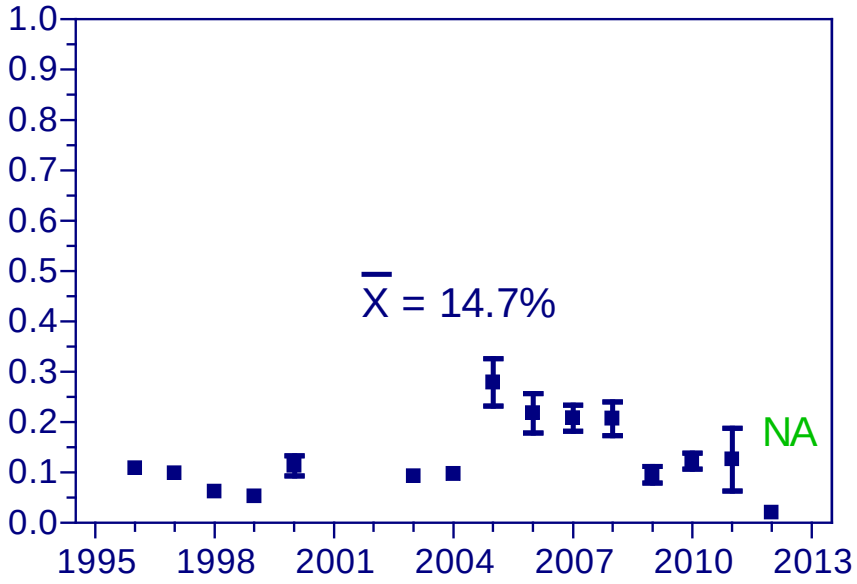
Steelhead



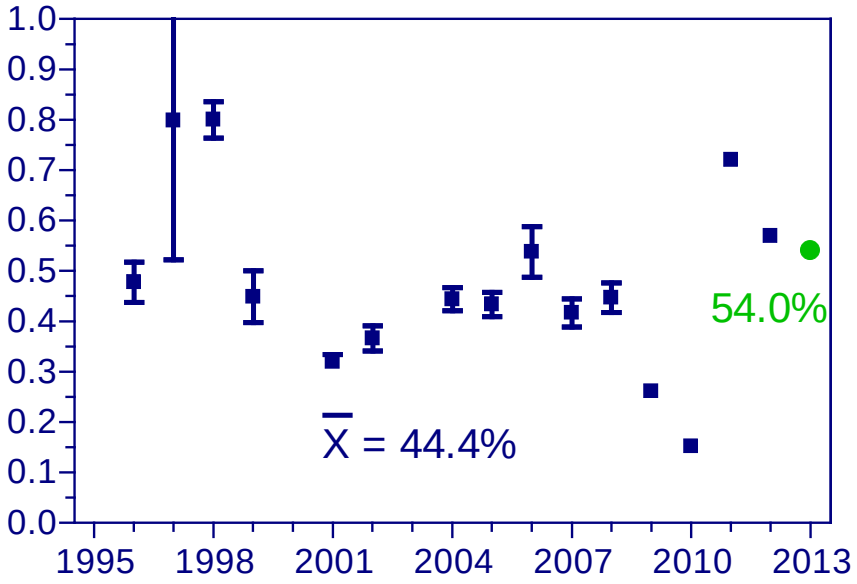
Sockeye Survival

Snake River Sockeye
Redfish Lake to Lower Granite

Released as parr in fall

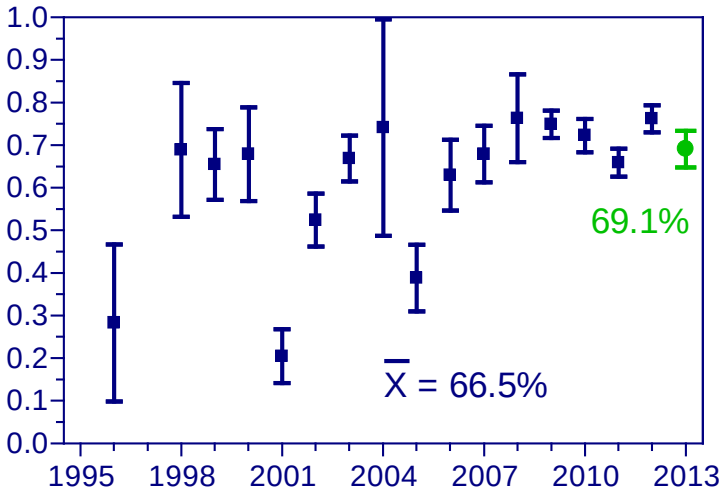


Released as smolts in spring

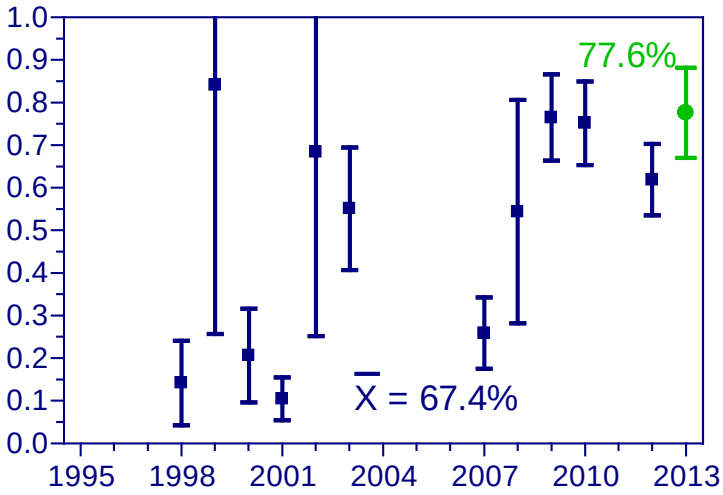


Snake River Sockeye
Smolts Migrating in Spring

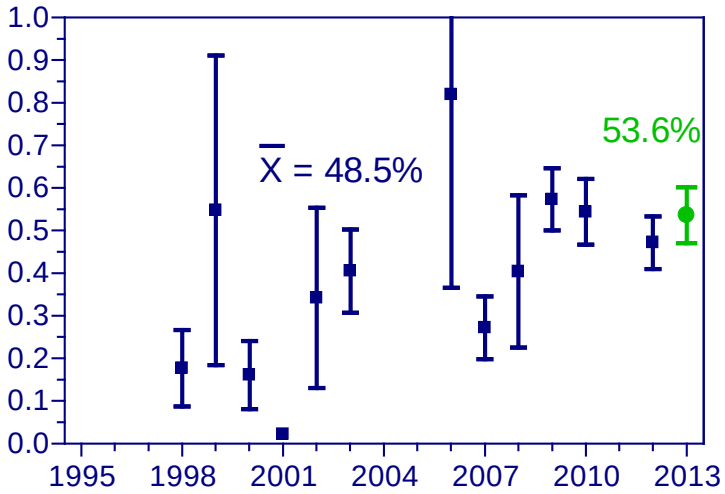
Lower Granite to McNary



McNary to Bonneville

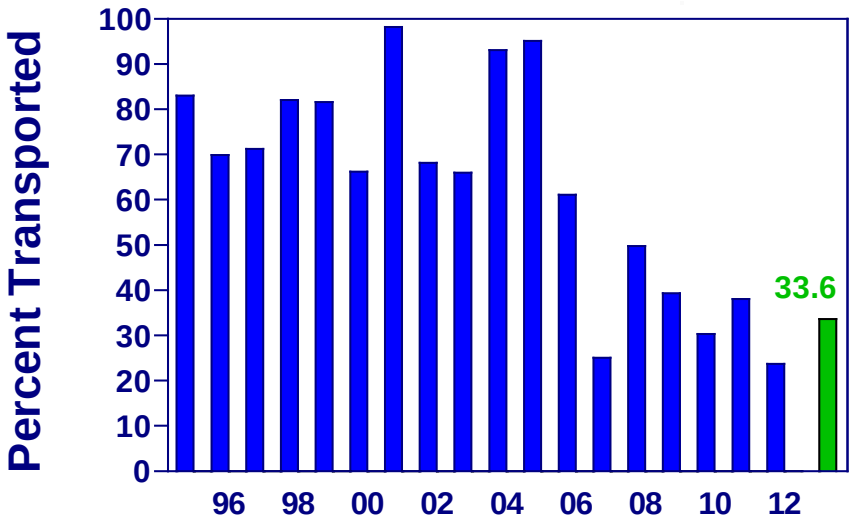


Lower Granite to Bonneville

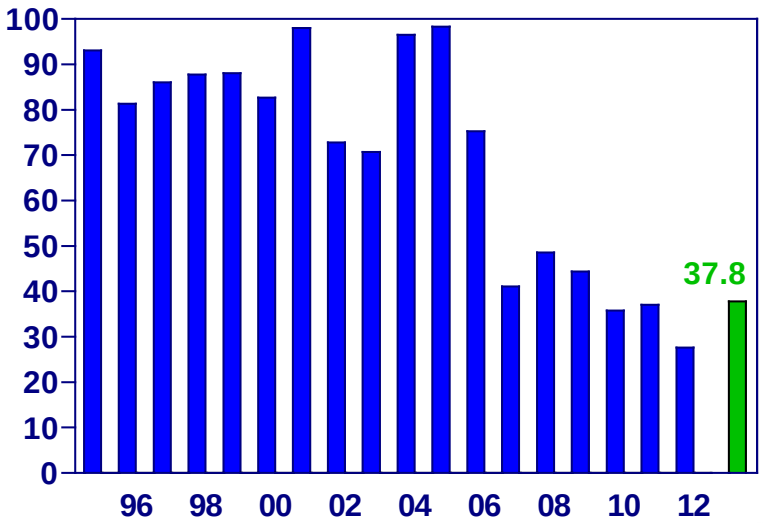


Percent Transported to Below Bonneville

Yearling Chinook



Steelhead



Smolt Transportation Seasonal Analyses

Yearling Chinook & Steelhead Migration Years 1998-2011

Estimating Seasonal SAR Patterns

- Need a “time-stamp”

- We use fish detected at LGR –

  transported or bypassed

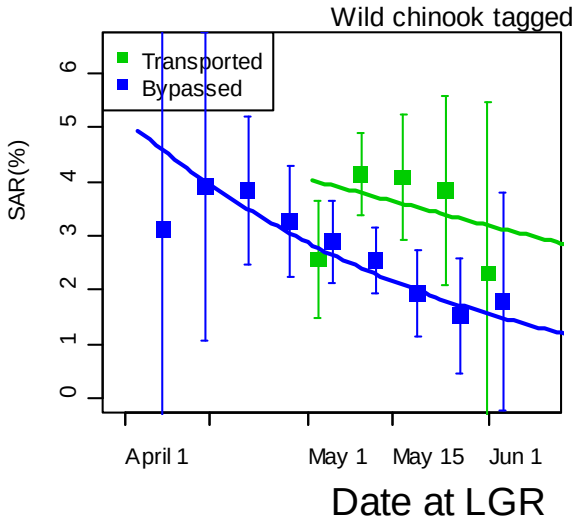
Transportation Summary
Yearling Chinook & Steelhead

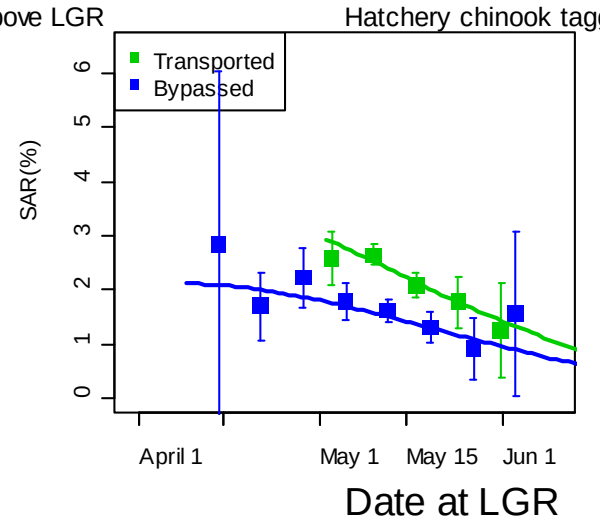
- Benefit of transportation was reduced in 2006-2011 relative to earlier years
  - due to improved survival for in-river migrants

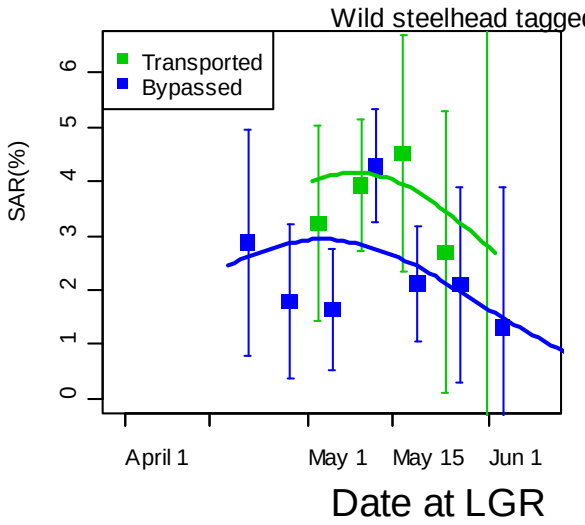
- SAR for transported fish still exceeded that for bypassed fish for most of the season (except incomplete-return 2011?)

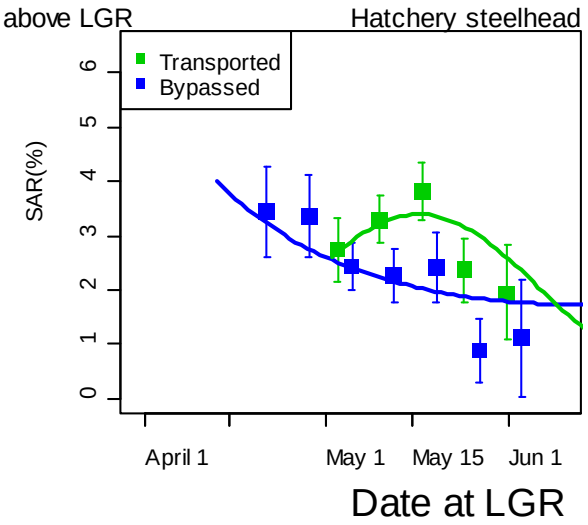
MY 2008

Model-Averaged - Descriptive









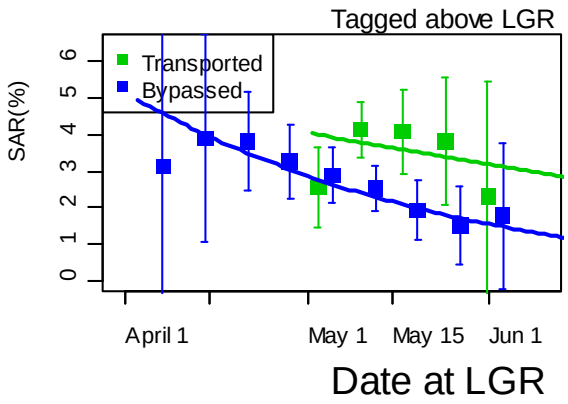
Transportation Evaluation

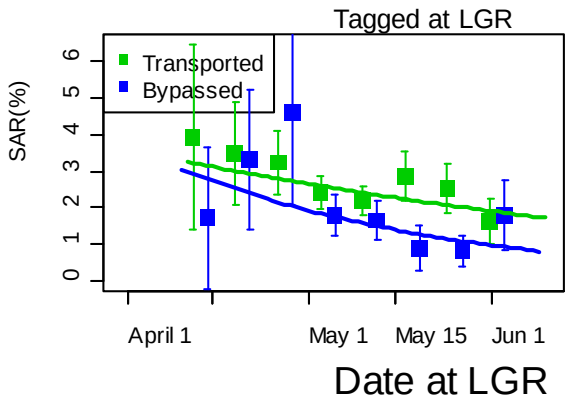
- Relative SAR = “T:B Ratio”
  - T:B > 1 :

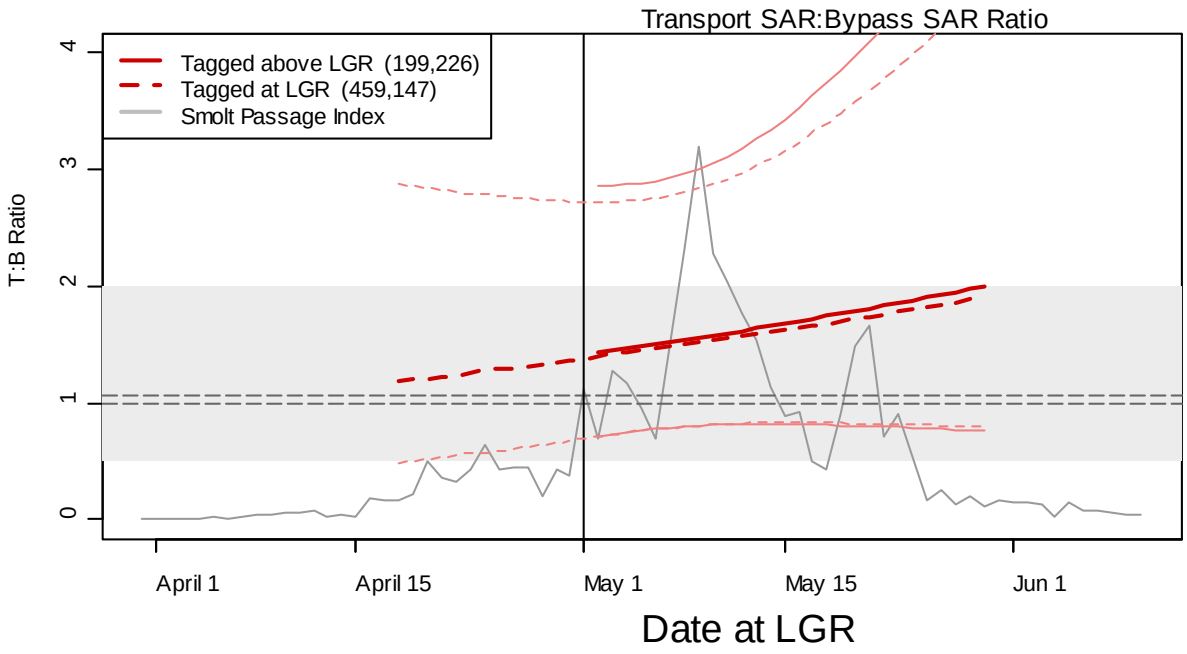
    transported SAR > bypassed SAR

Wild Chinook 2008

Model-Averaged - Descriptive

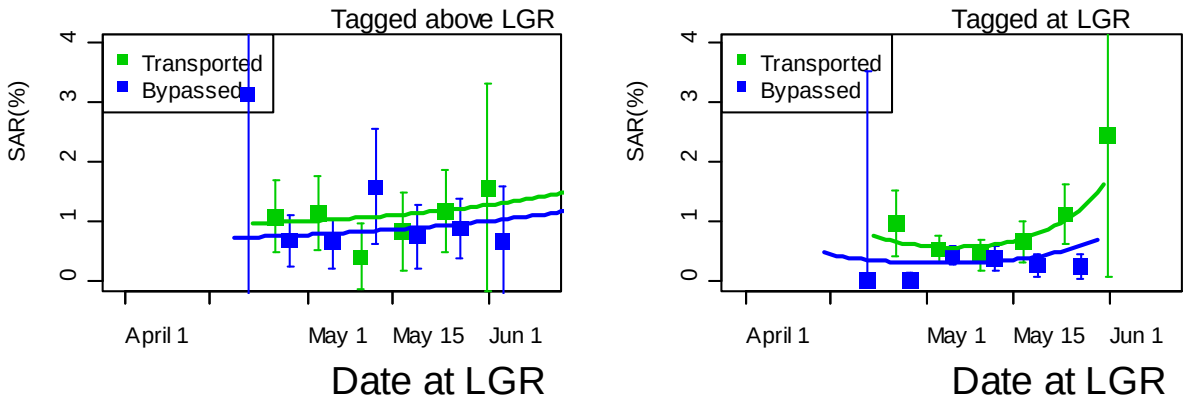


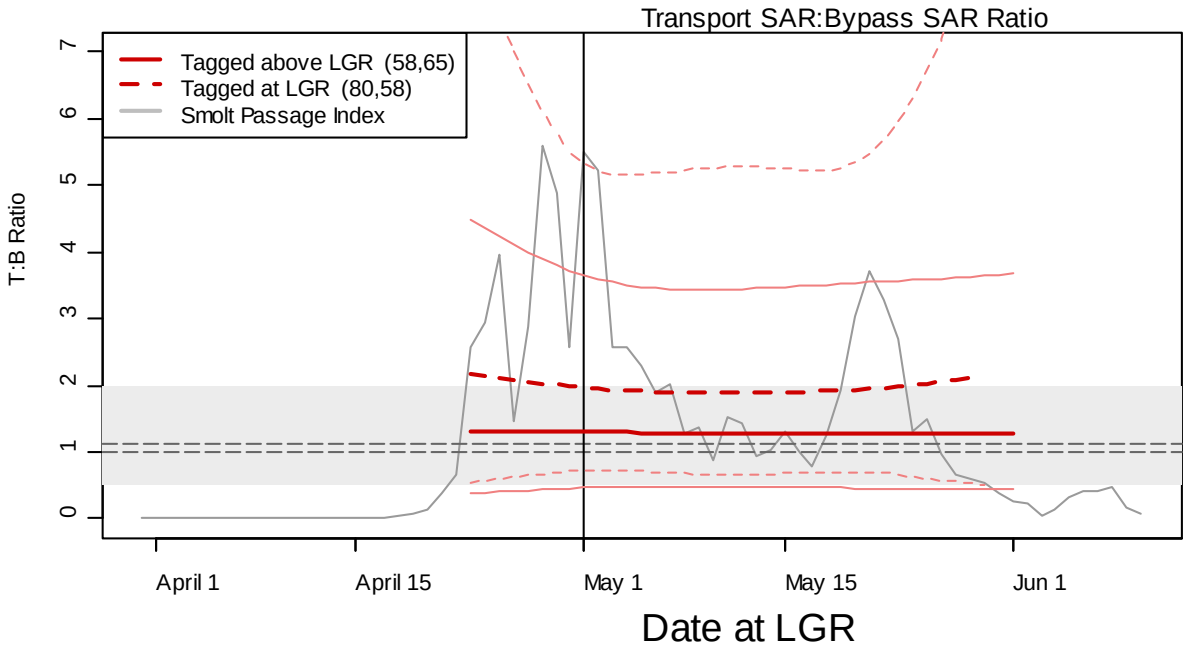


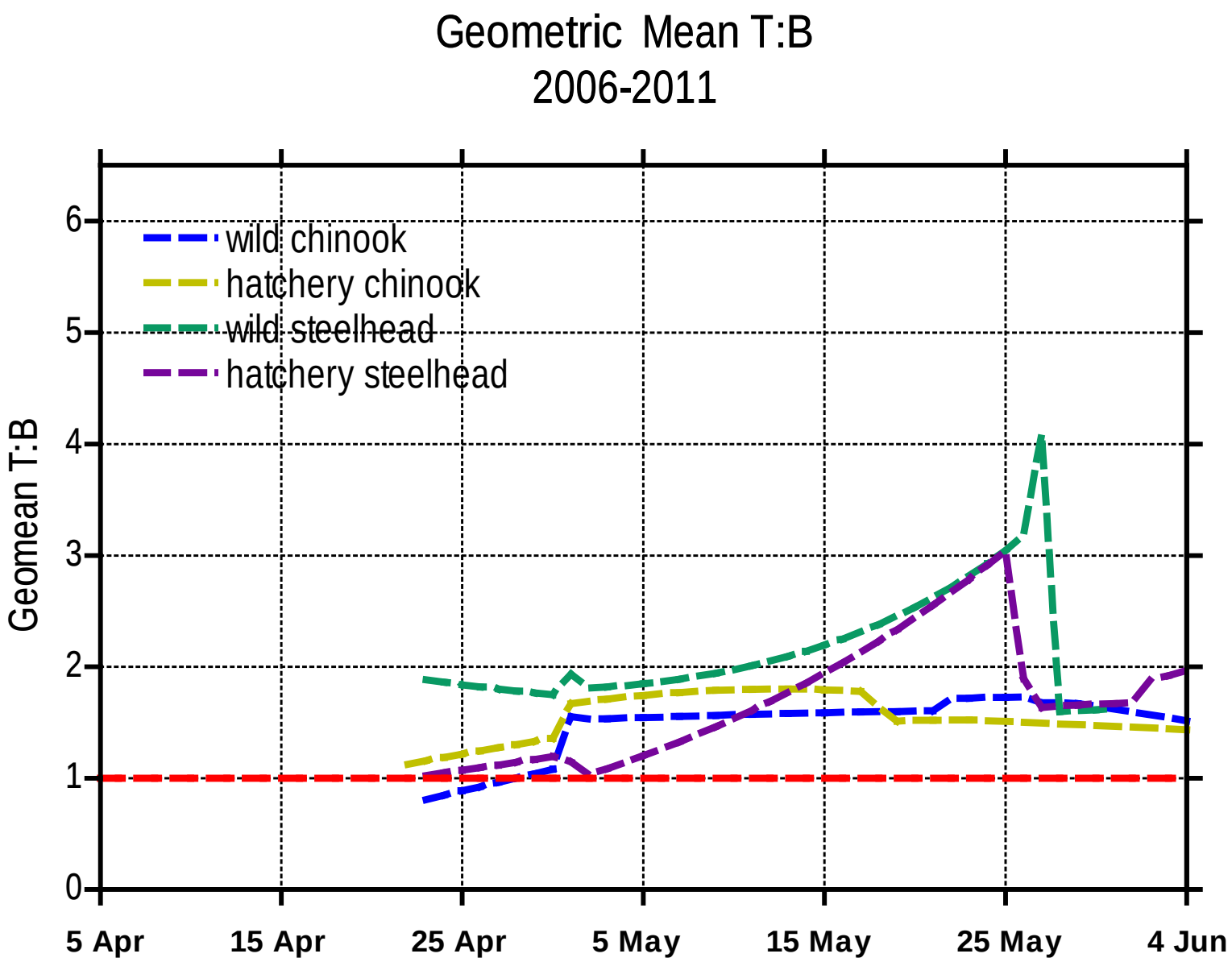


Wild Chinook 2010

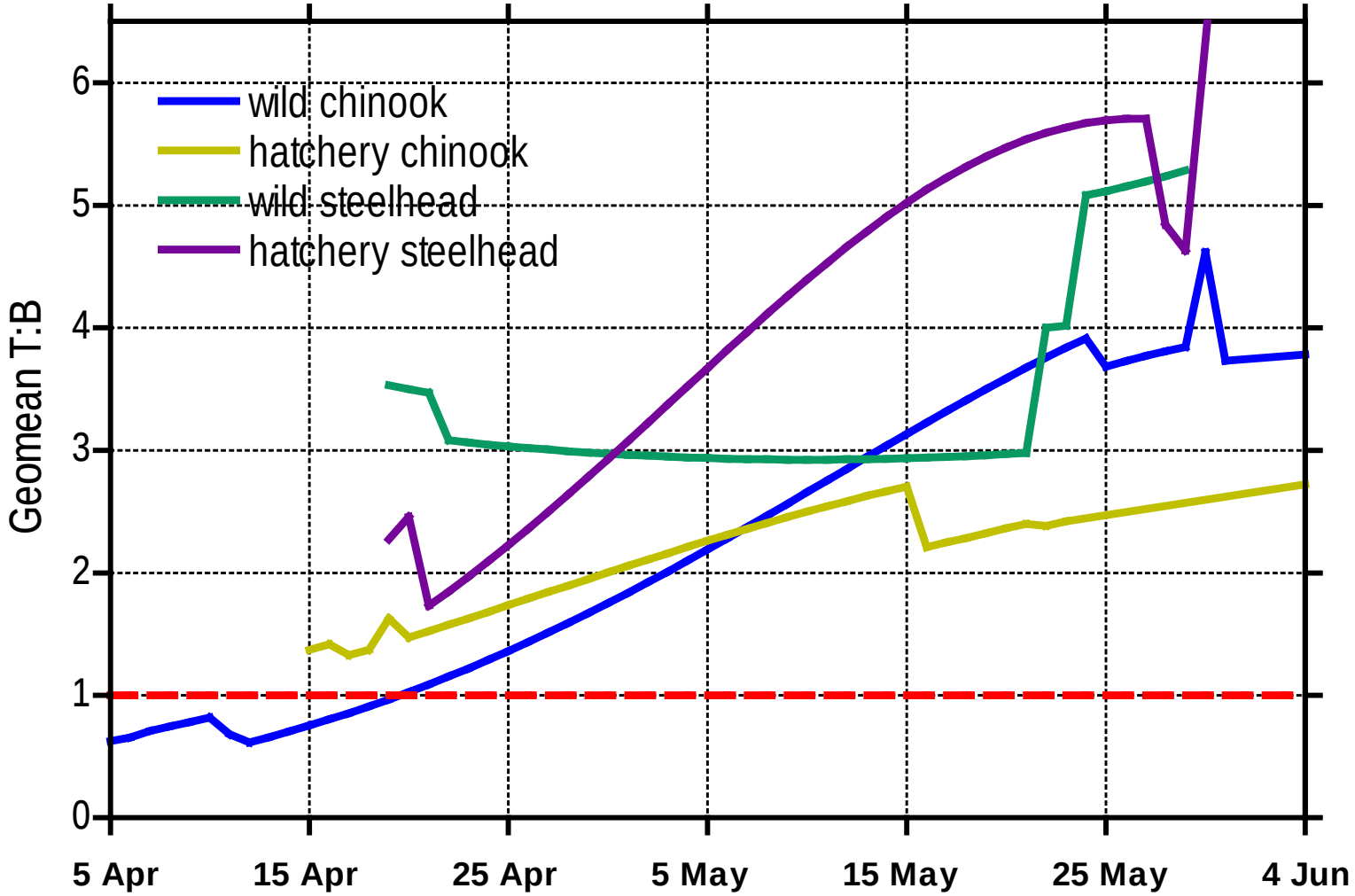
Model-Averaged - Descriptive



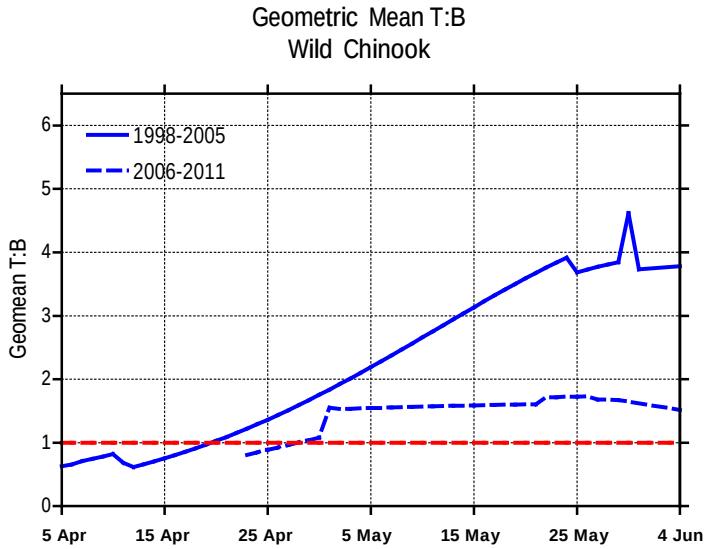


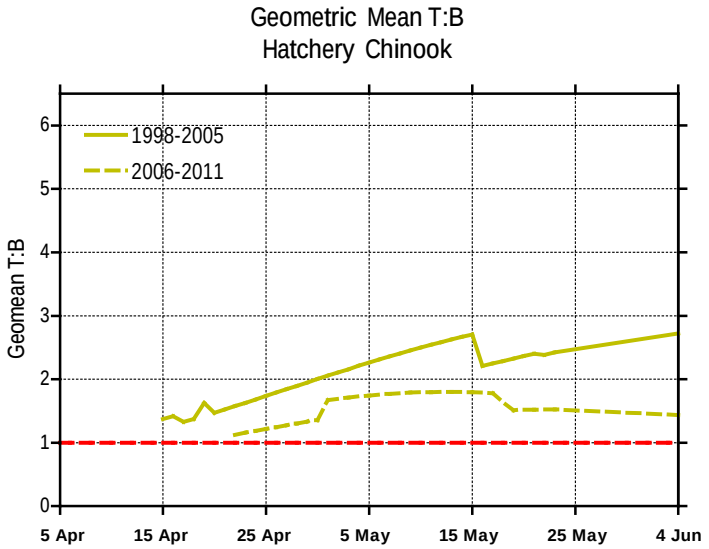

Geometric Mean T:B
2006-2011
Geomean T:B
0
1
2
3
4
5
6
wild chinook
hatchery chinook
wild steelhead
hatchery steelhead
5 Apr
15 Apr
25 Apr
5 May
15 May
25 May
4 Jun

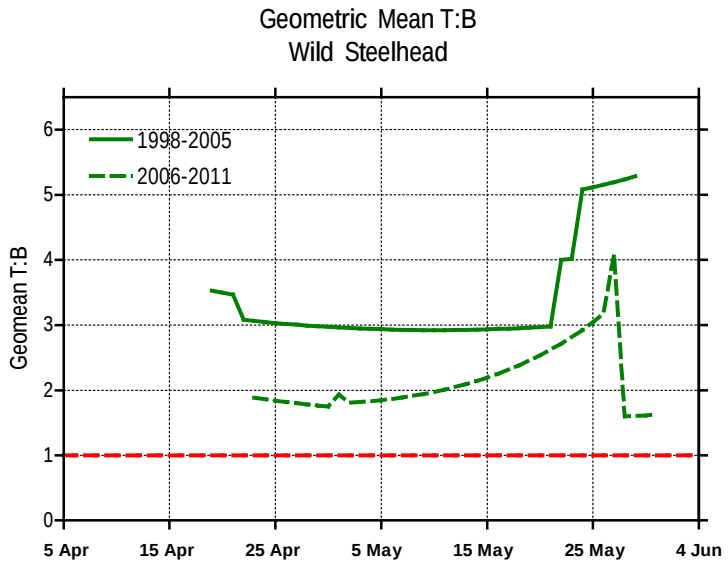
Geometric Mean T:B
1998-2005

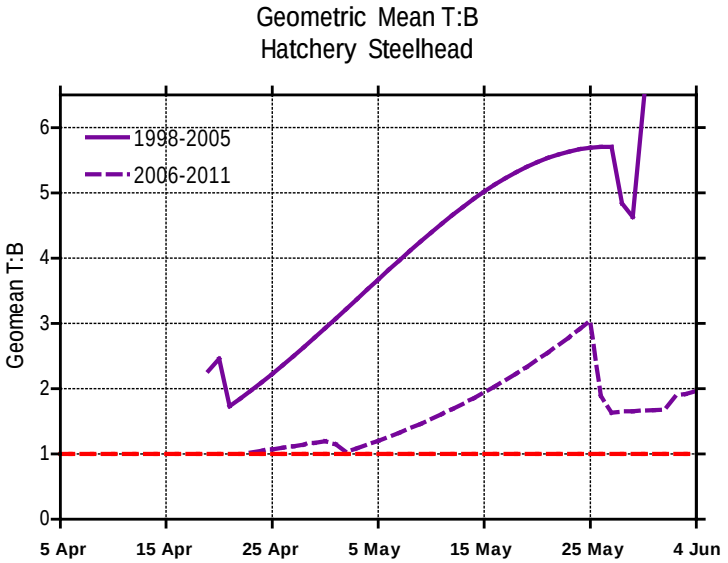


2006-2011 vs. 1998-2005










Questions