

Reach Survival Estimates, 2008

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Bill Muir, Steve Smith, Doug Marsh,
John Williams, and Jim Faulkner



Outline

- **Juvenile travel time and survival through the hydropower system**

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- **Data problem in lower river in 2008?**

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- **Percentage transported**

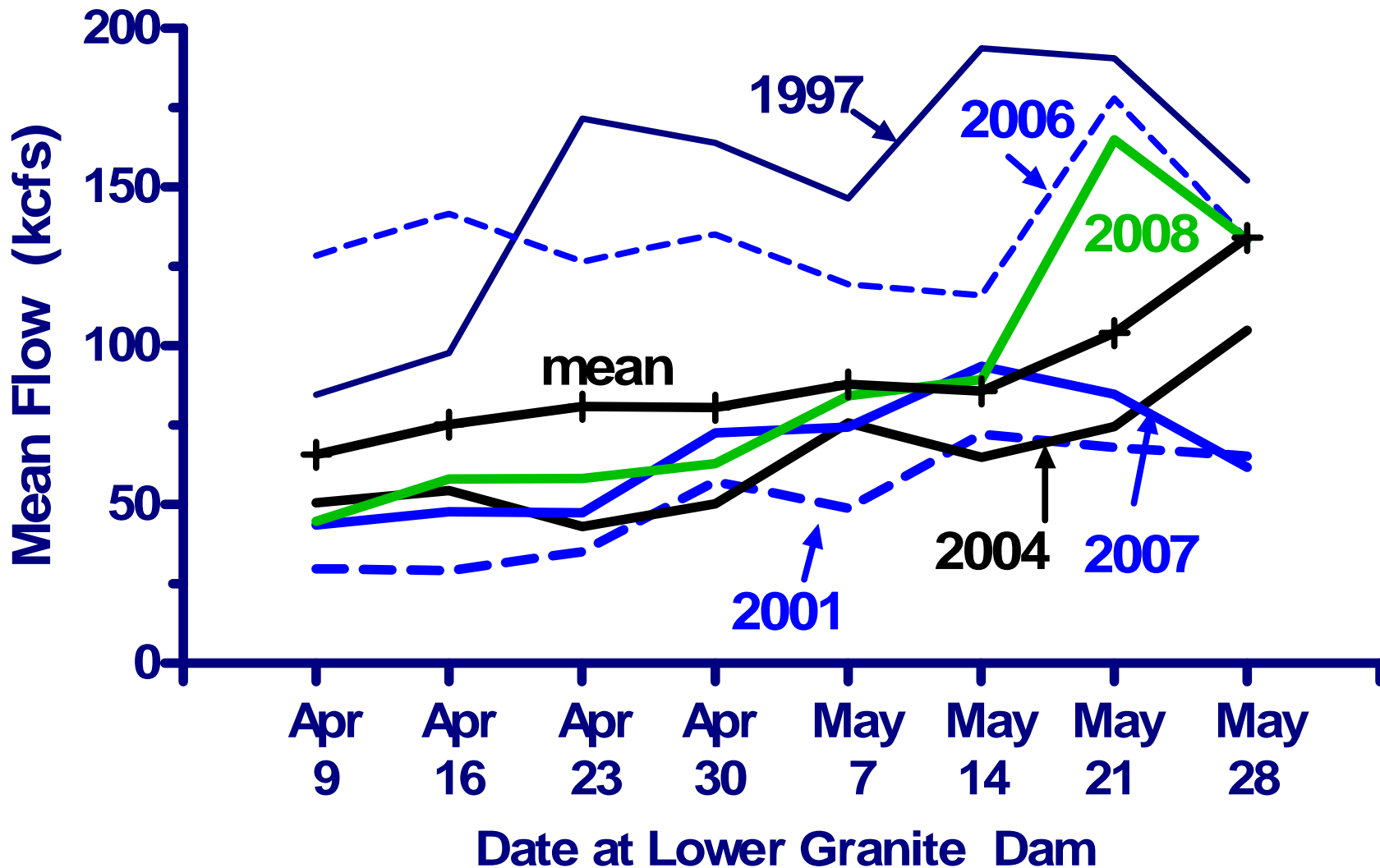
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- Juvenile travel time and survival through the hydropower system
- Data problem in lower river in 2008?
- Percentage transported
- **Spill, transport, size of in-river population, and survival**

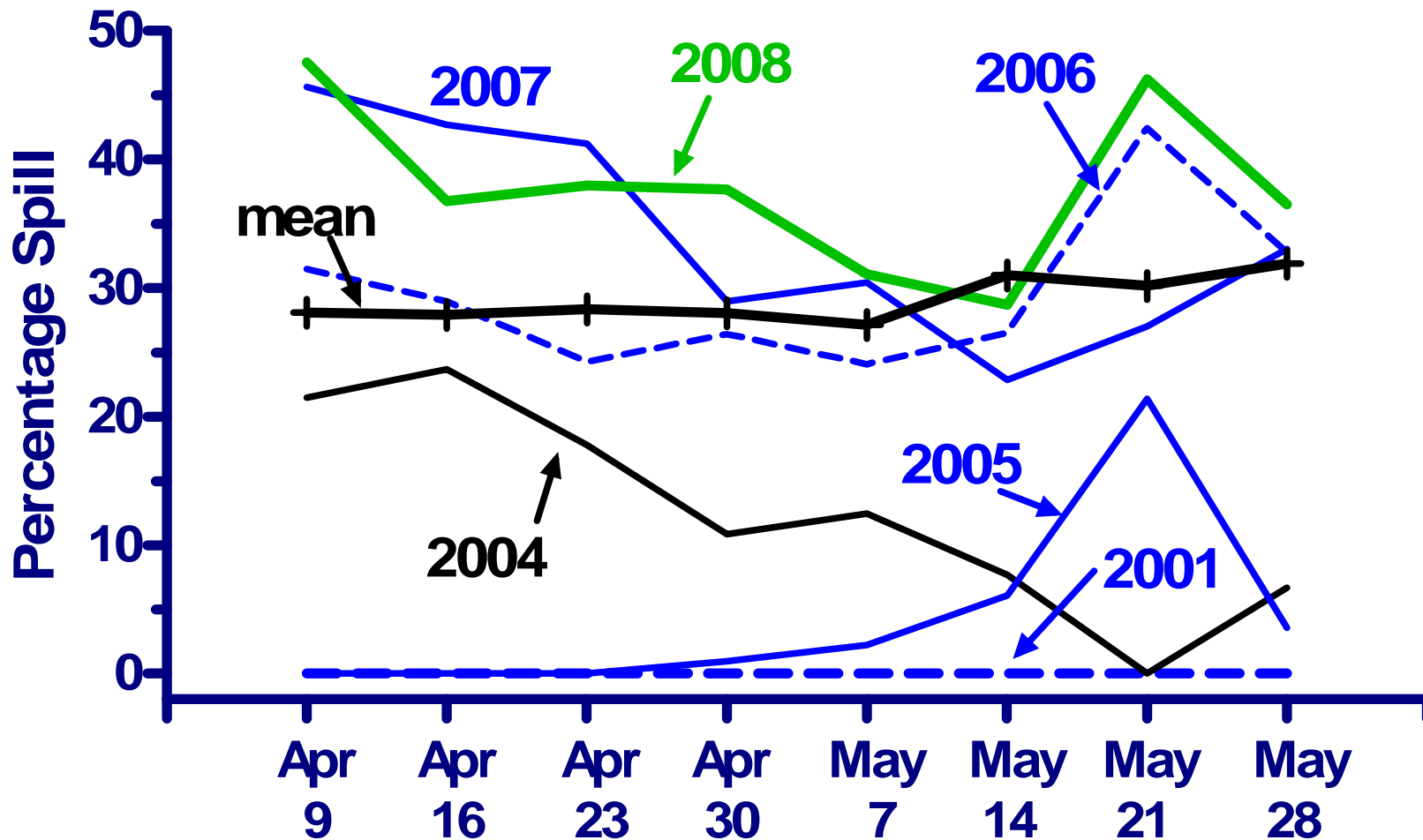
Survival and Travel Time for PIT-tagged Spring Migrants



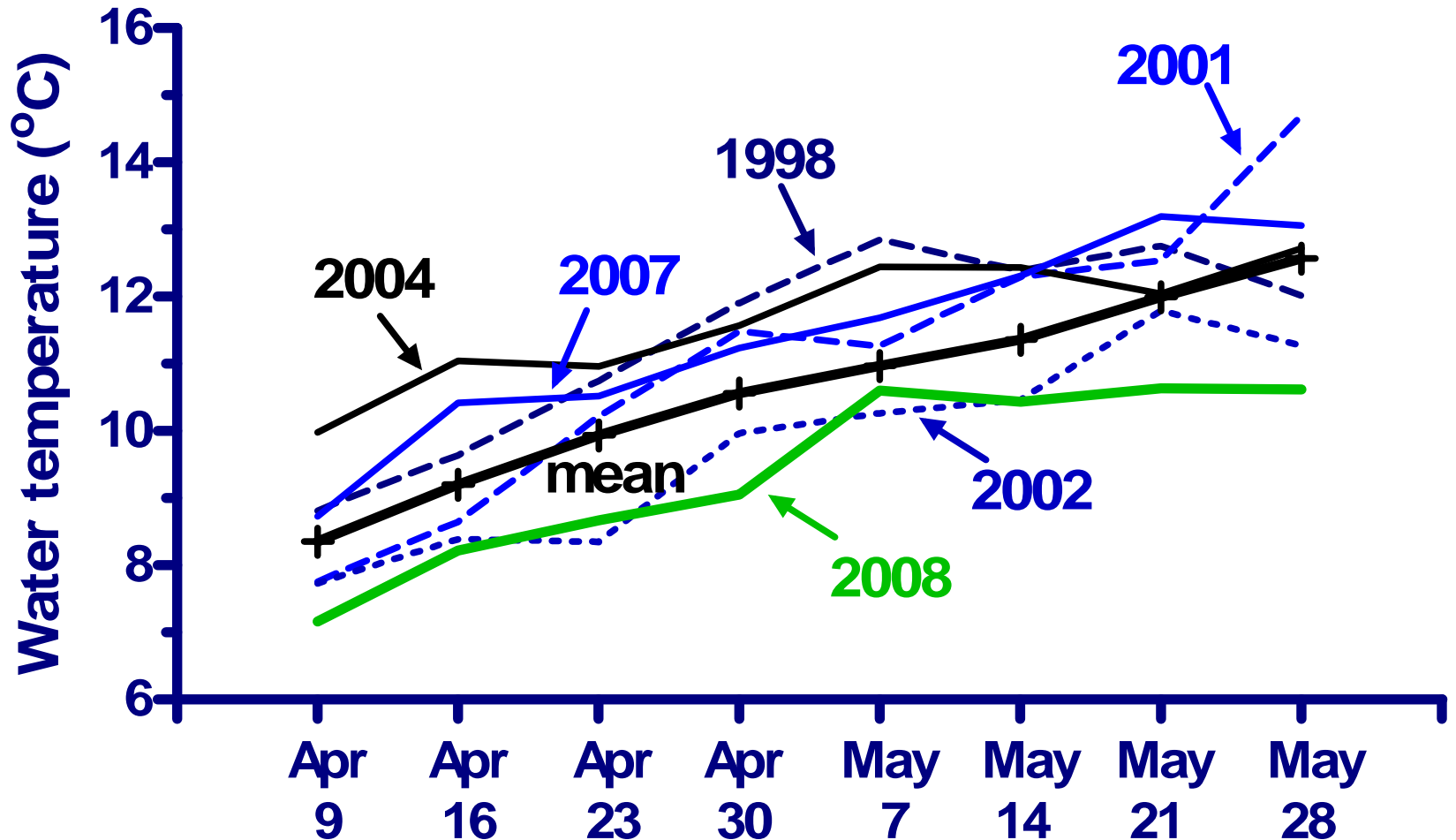
Weekly Mean Flow (kcfs) Lower Granite Dam 1997-2008



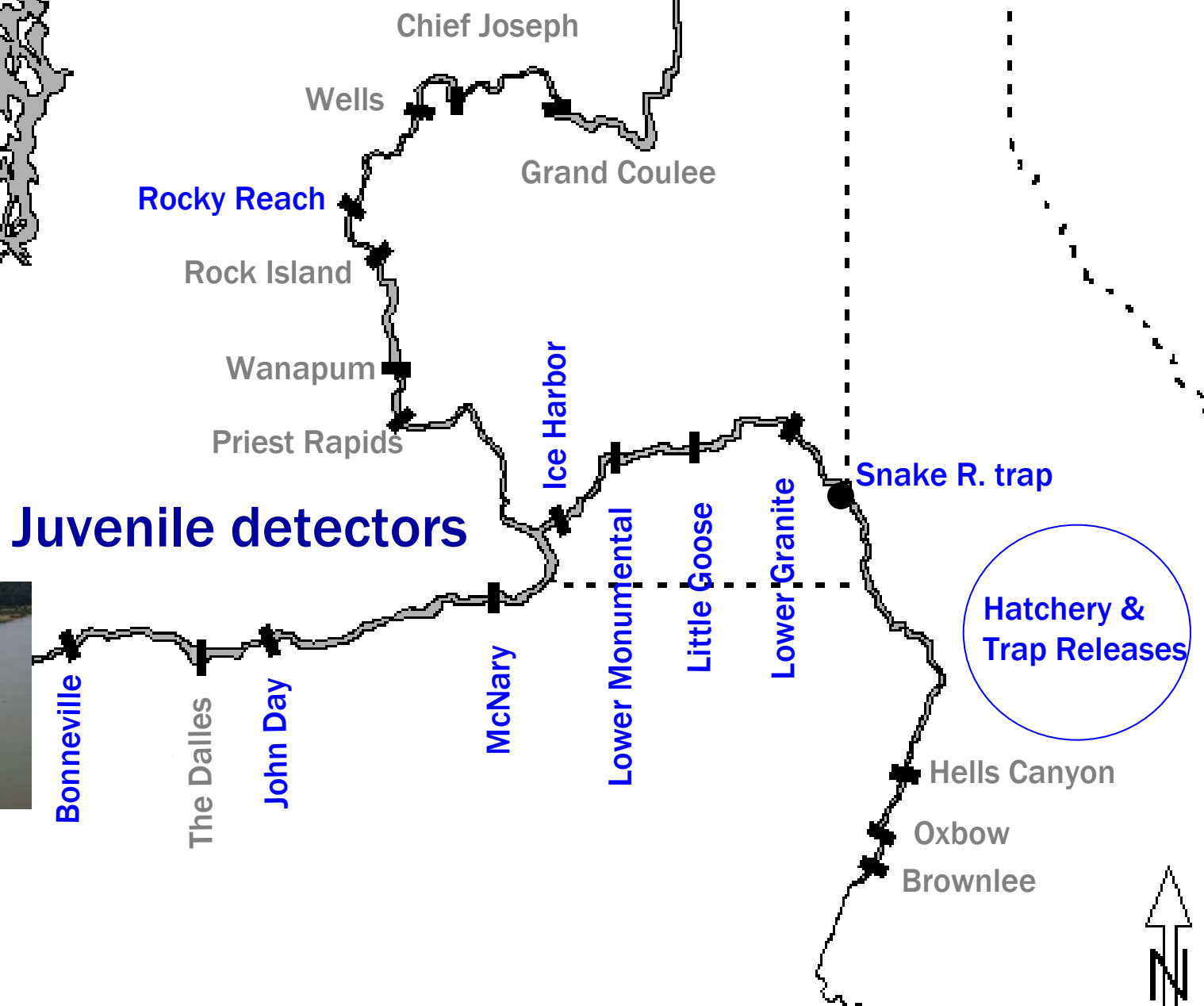
Weekly Mean %Spilled LGR, LGS, LMN 1997-2008



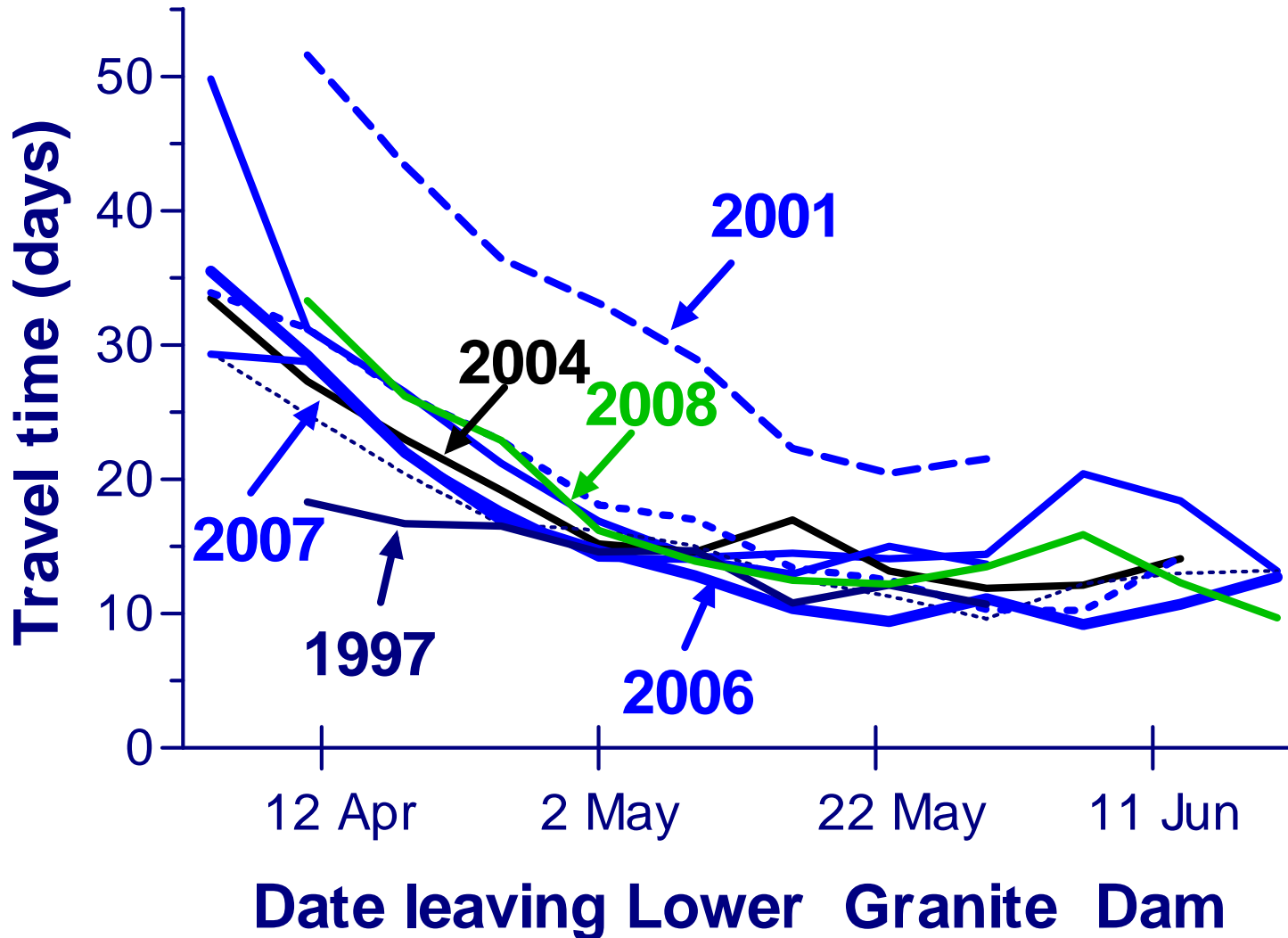
Weekly Mean Temperature Little Goose Dam 1997-2008



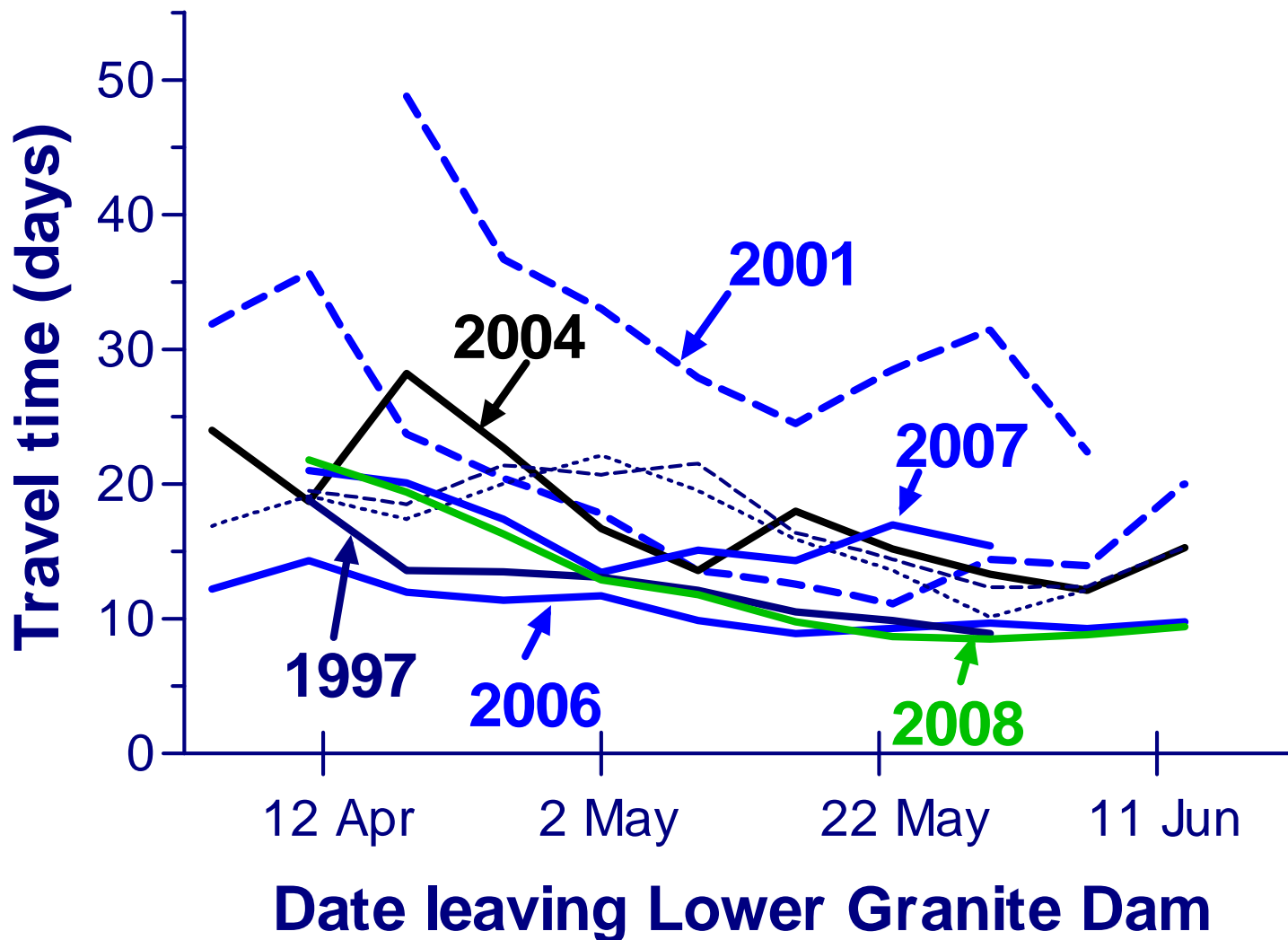
PIT-tag Data Sources



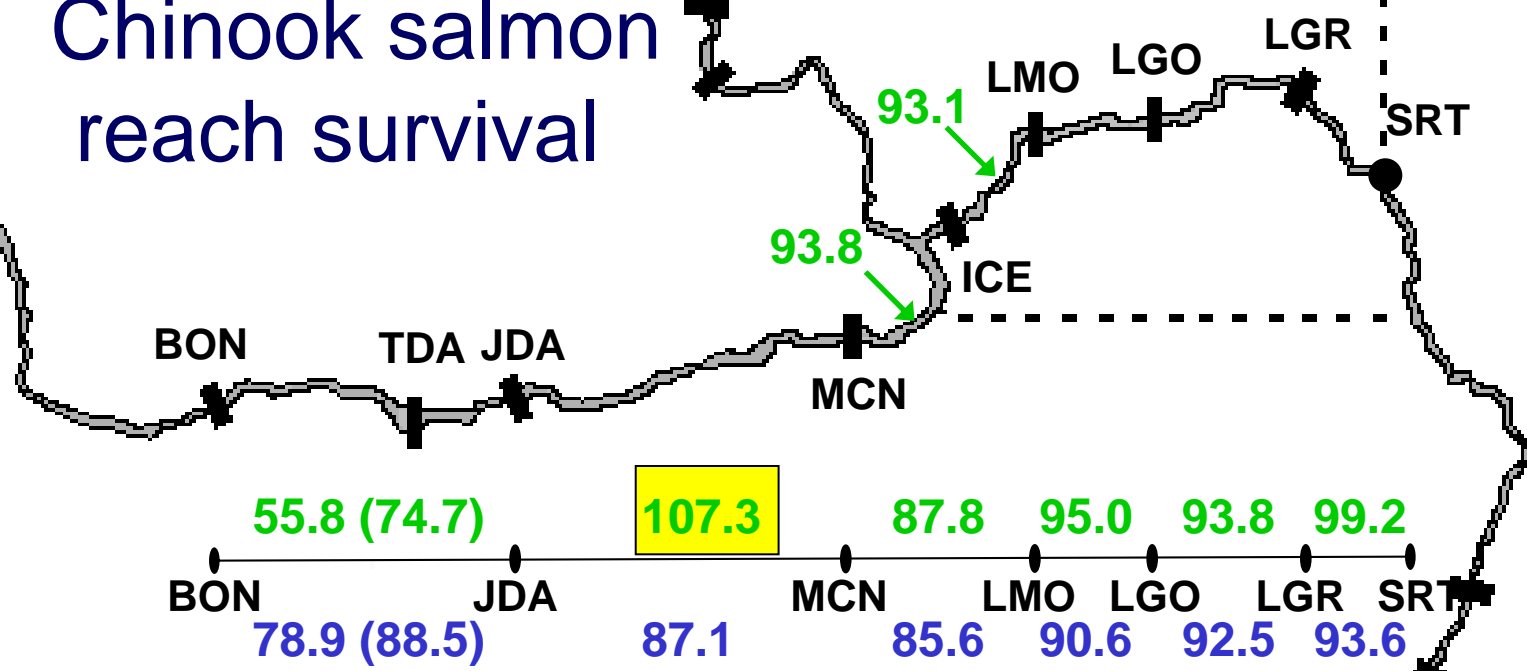
Stream-type Chinook median travel time Lower Granite to Bonneville (461 km)



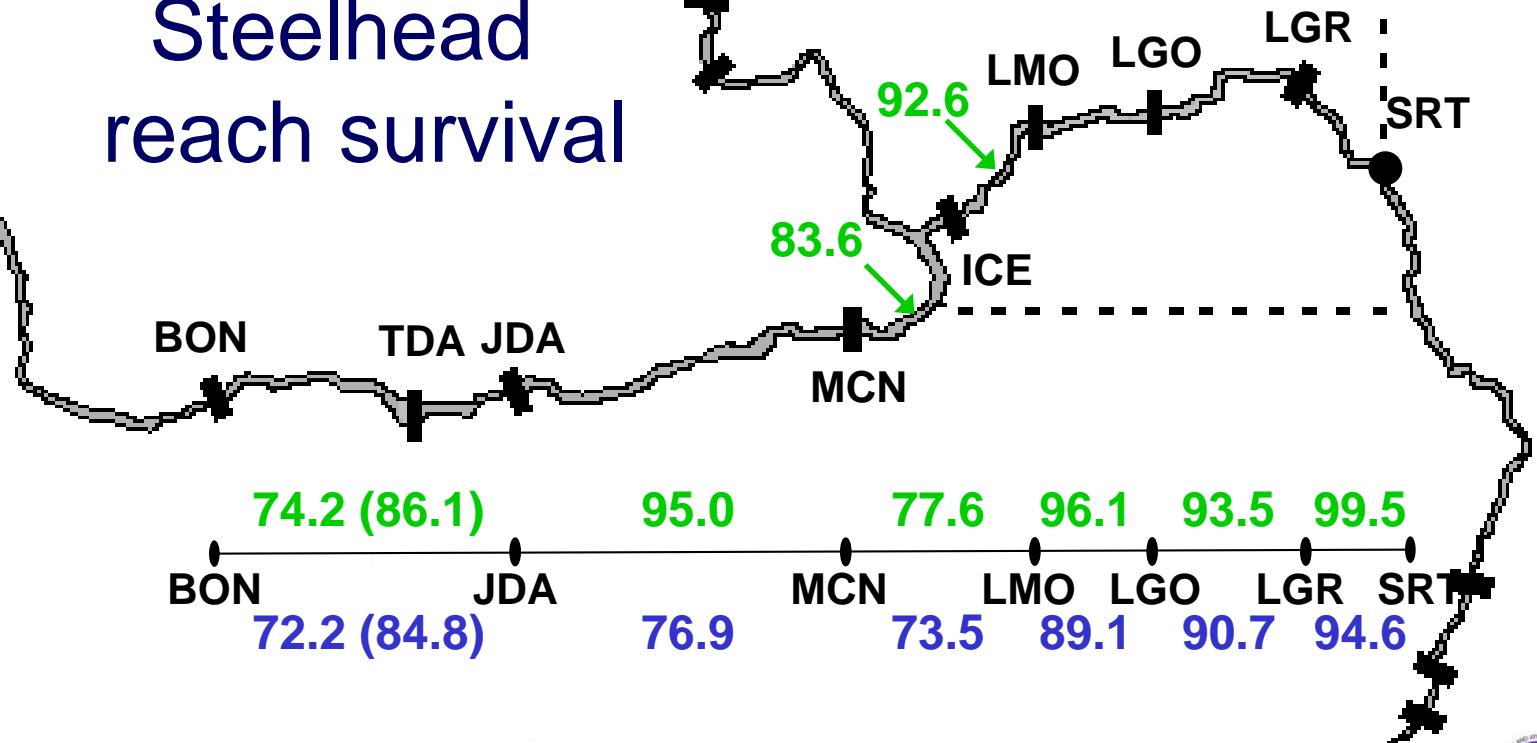
Steelhead median travel time Lower Granite to Bonneville (461 km)

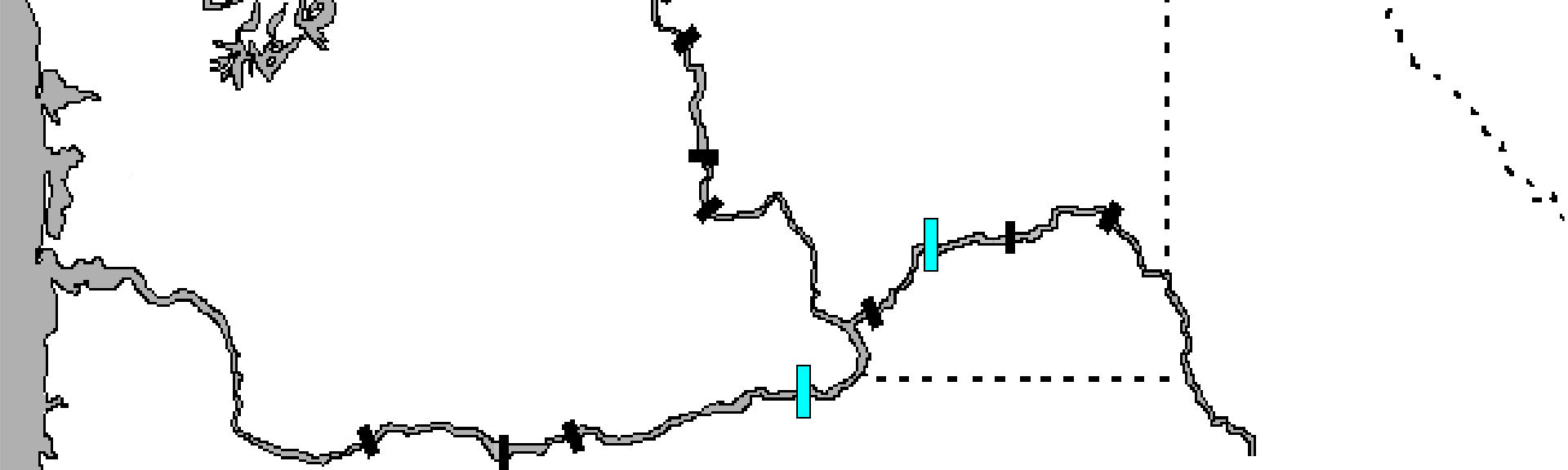


Stream-type Chinook salmon reach survival



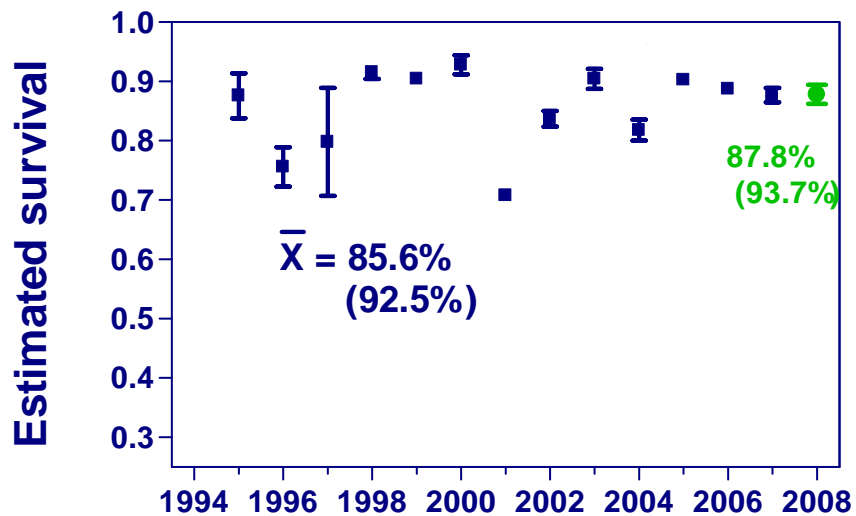
Steelhead reach survival



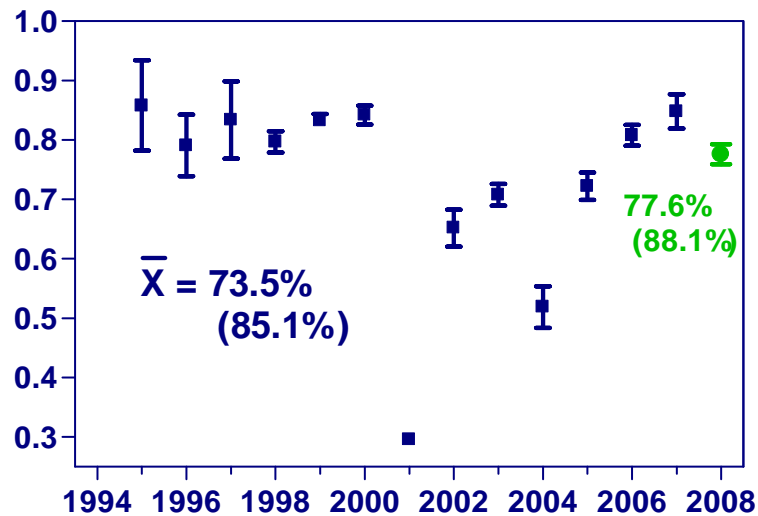


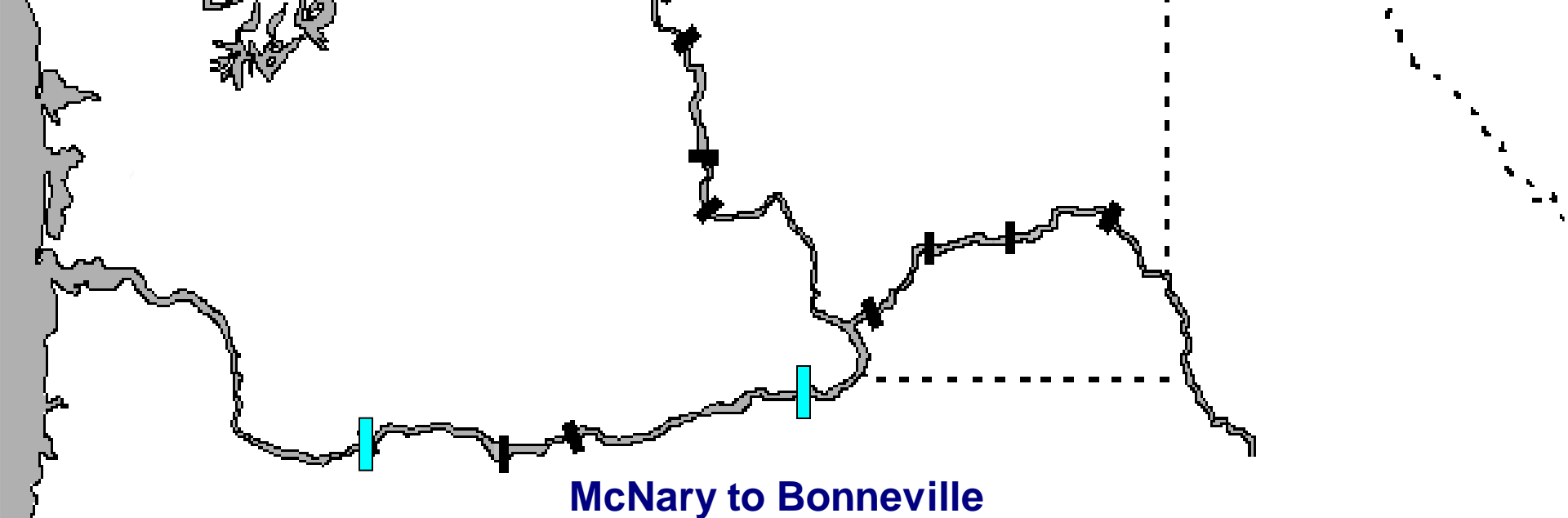
Lower Monumental to McNary

Stream type Chinook

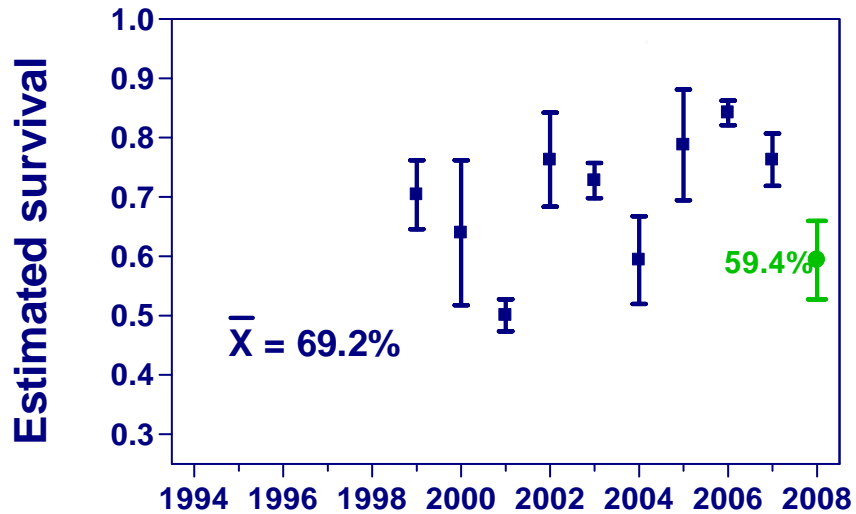


Steelhead

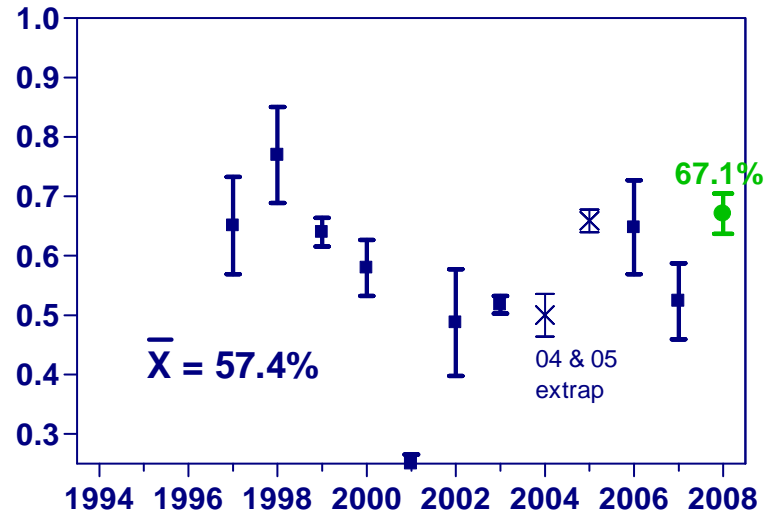


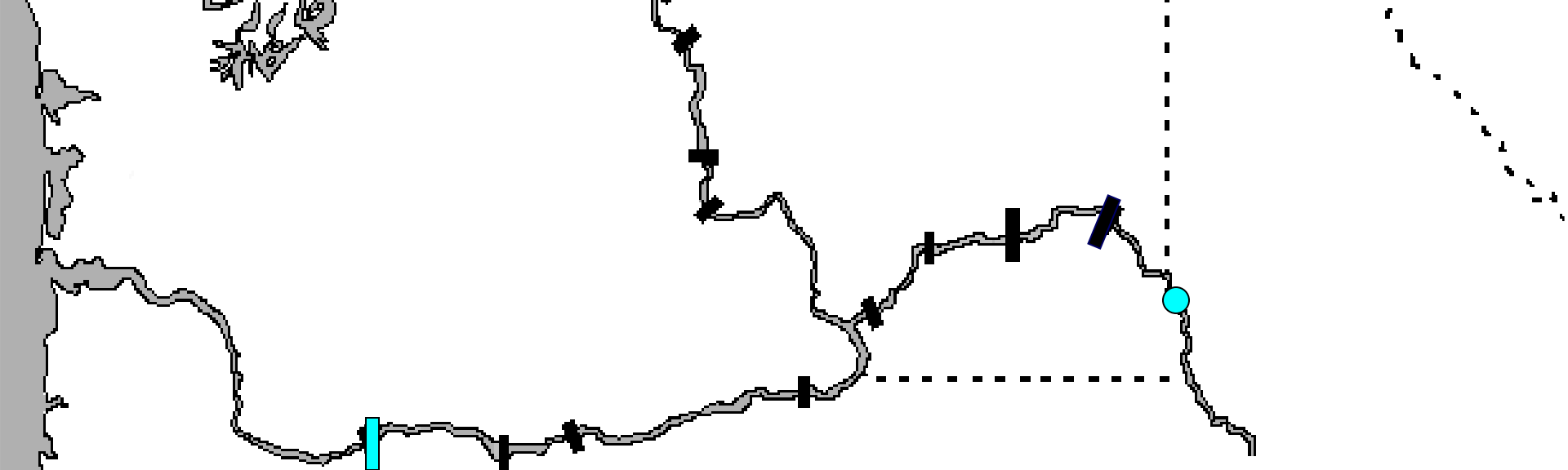


Stream type Chinook



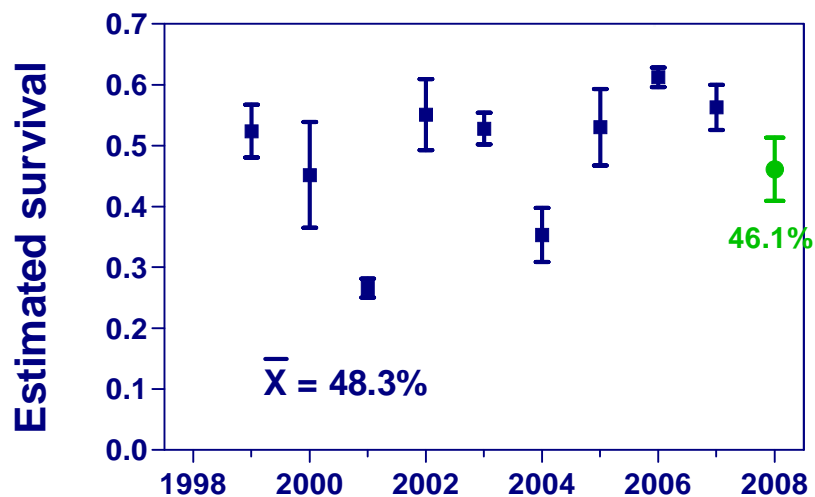
Steelhead



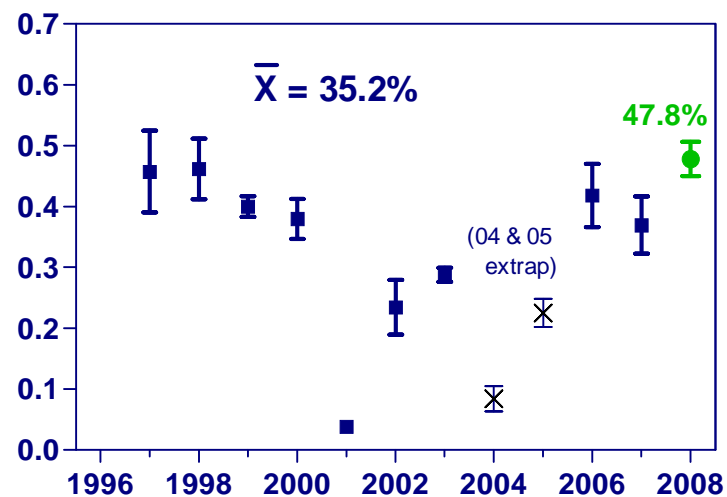


Snake River Trap to Bonneville

Stream type Chinook



Steelhead

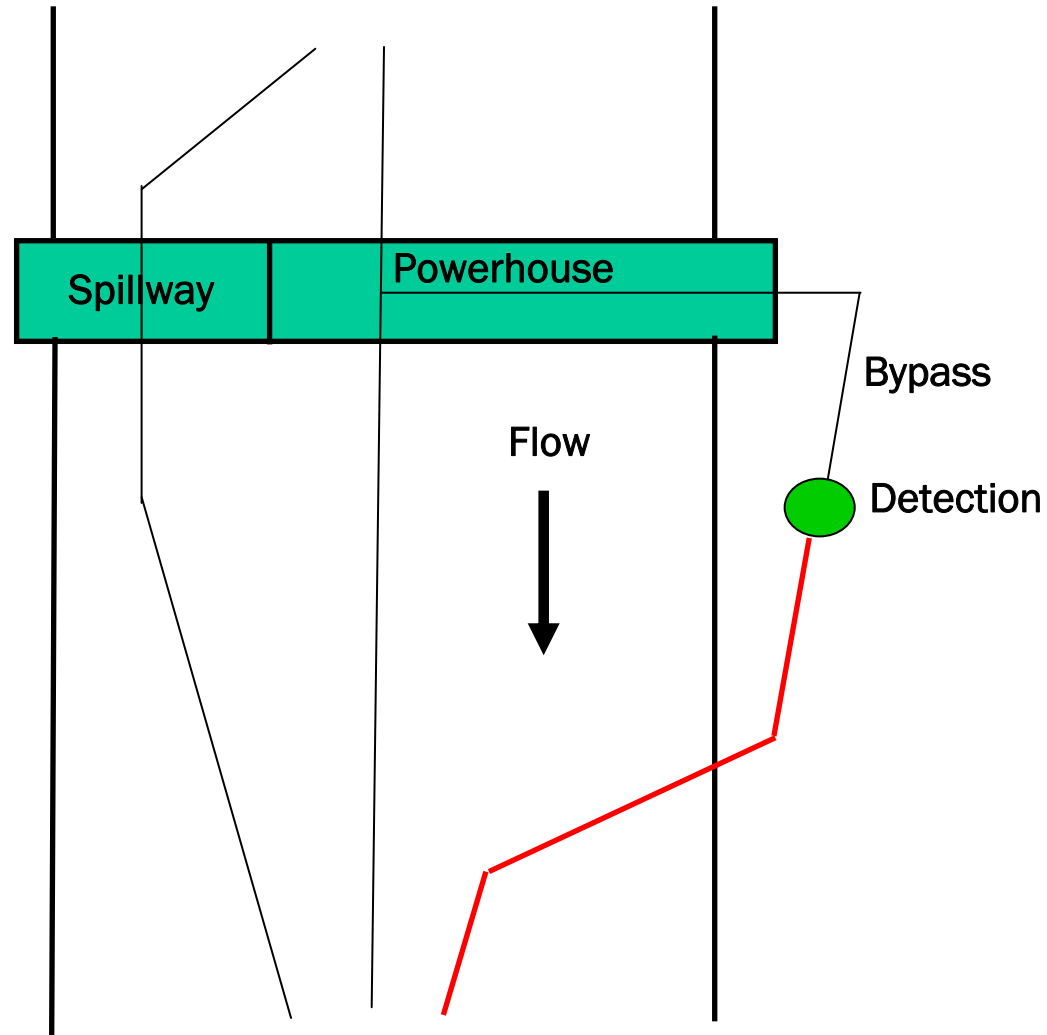


Data problem in lower river in 2008?

Table 2. Estimated survival probabilities for Snake River yearling Chinook salmon (hatchery and wild combined) detected and released to the tailrace at McNary Dam in 2008. Daily groups pooled weekly. Estimates based on the single-release model. Standard errors in parentheses. .

Date at McNary	Number released	McNary to John Day Dam	John Day to Bonneville Dam	McNary to Bonneville Dam
27 Apr–03 May	588	1.103 (0.190)	0.507 (0.167)	0.559 (0.156)
04 May–10 May	7,576	0.983 (0.054)	0.761 (0.080)	0.748 (0.067)
11 May–17 May	24,299	1.195 (0.060)	0.379 (0.036)	0.453 (0.036)
18 May–24 May	13,541	1.175 (0.099)	0.682 (0.189)	0.802 (0.212)
25 May–31 May	3,244	0.731 (0.084)	NA	NA
01 Jun–07 Jun	1,239	0.962 (0.164)	0.795 (0.544)	0.764 (0.507)
08 Jun–14 Jun	716	0.747 (0.202)	0.640 (0.606)	0.478 (0.434)
Weighted mean*		1.073 (0.058)	0.558 (0.082)	0.594 (0.066)

Post-detection bypass (PDB) mortality



Data Effects of PDB Mortality

- Detected at dam 1 = Counted alive in tailrace, but actually dead
- Too few detected fish show up at dam 2
- Dam 1 detection probability underestimated
- Reach 1 Survival probability overestimated



Data Effects of PDB Mortality

- Effect on Reach 2 survival estimate depends on Dam 2:
 - If no PDB mortality at Dam 2, Reach 2 survival is underestimated, *but combined Reach 1 & 2 survival is unbiased*
 - If PDB mortality at Dam 2, effect is uncertain

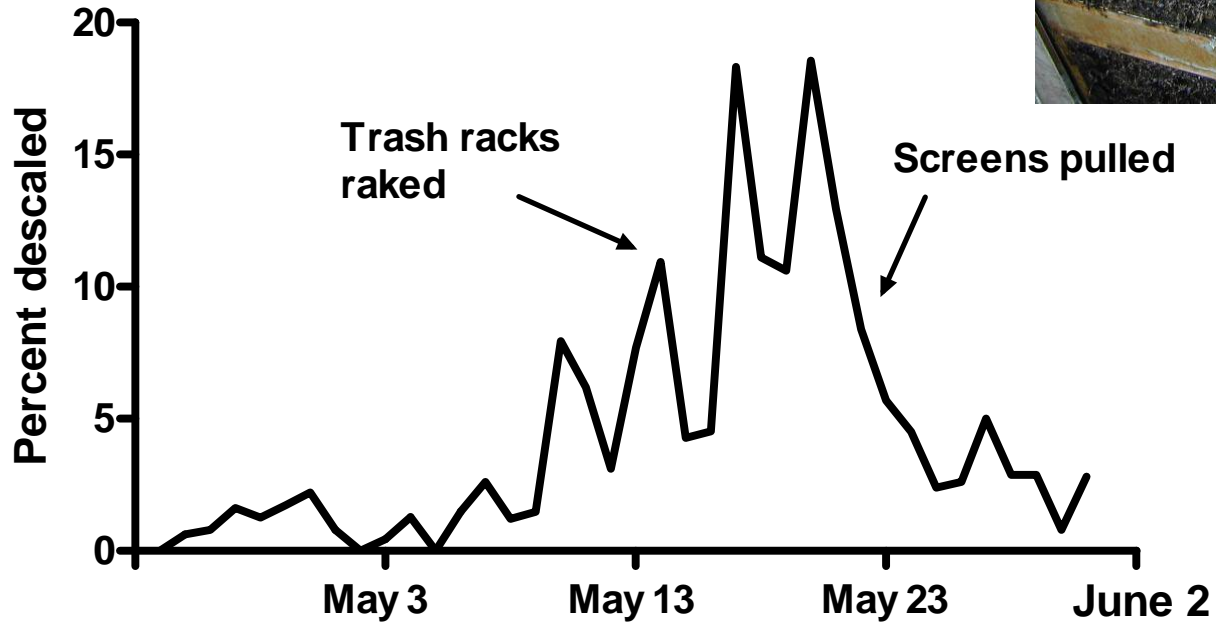
Lower River Conditions

- MCN-JDA and JDA-BON estimates affected by PDB mortality, but MCN-BON ok?
 - MCN-BON estimate lower than average for Chinook

Increased Avian Predation?



Bonneville Dam Yearling Chinook salmon





Spill, Transport, In-River Population Size, and Survival



Preliminary estimates of transport % for 2008 based on PIT-tag data:

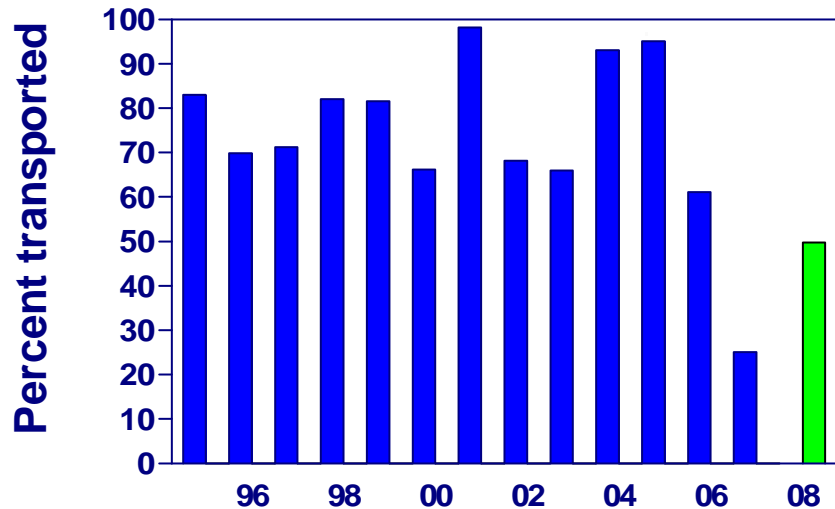


- 54.3% wild Chinook
- 45.3% hatchery Chinook
- 50.5% wild steelhead
- 46.6% hatchery steelhead

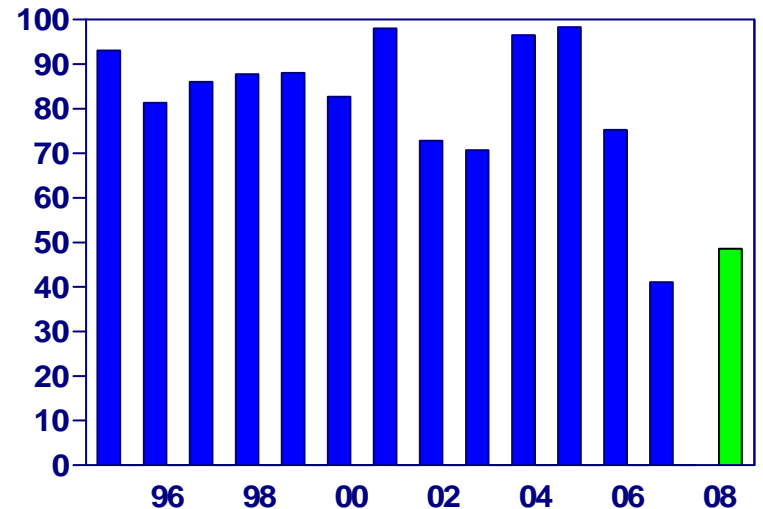


Percent Transported to Below Bonneville

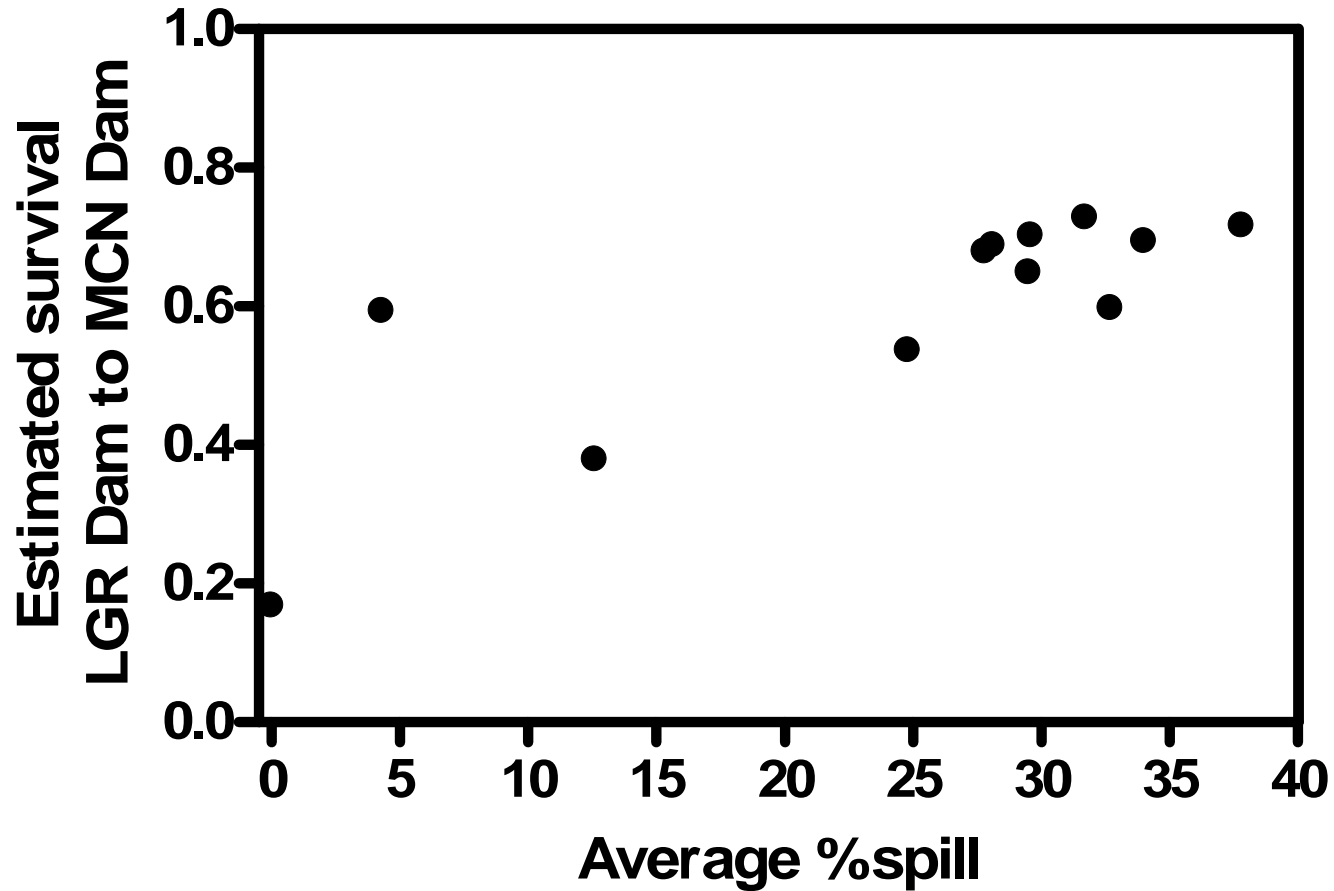
Stream type Chinook



Steelhead

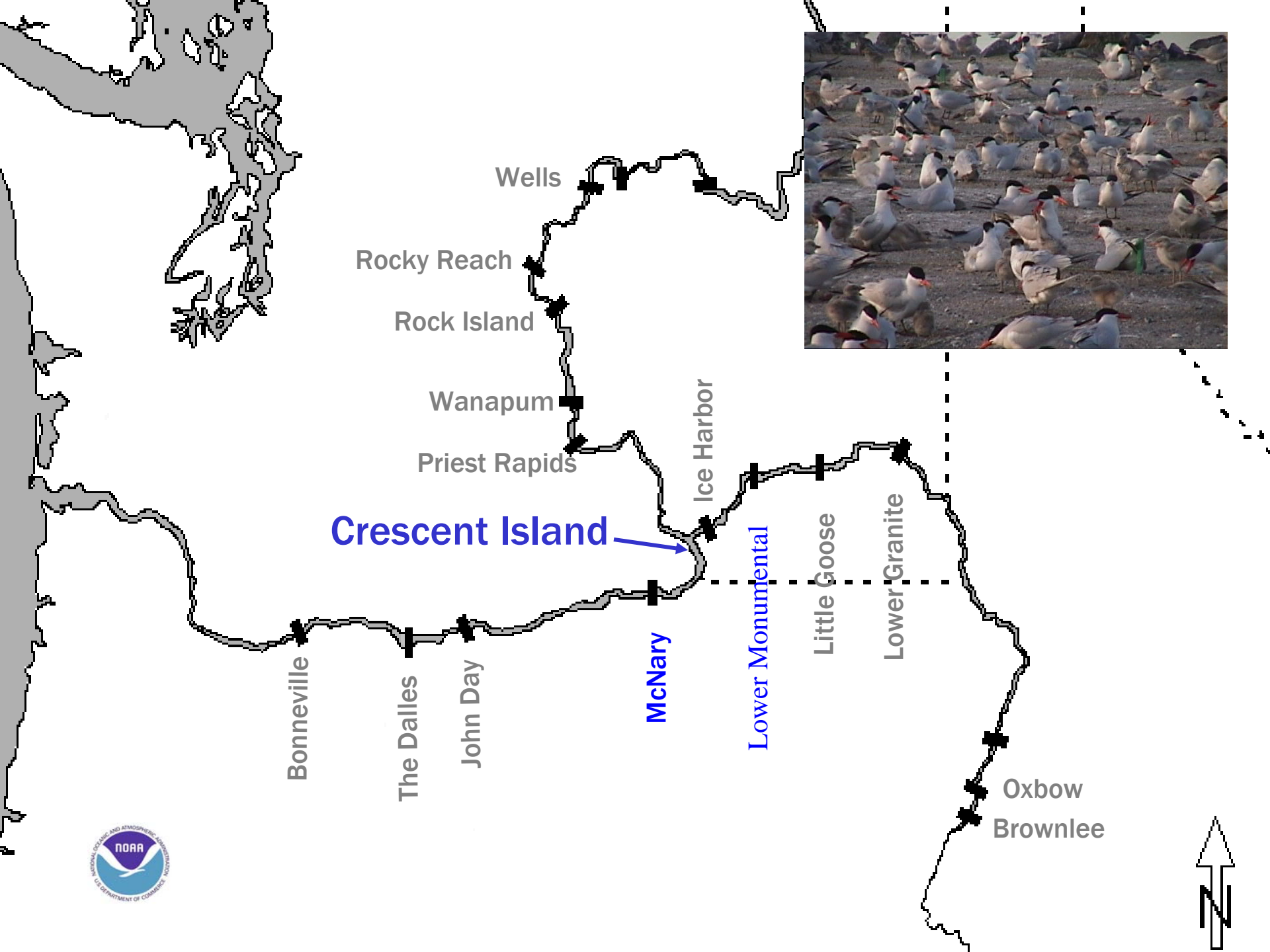


Steelhead Survival & Spill%



Passage-Route Survival Spill vs. Bypass

- Recent radio telemetry studies
 - Little Goose 2005-2007
 - spill & bypass both > 95-96%
 - Lower Monumental 2007
 - spill 93.9%, bypass 98.6%
 - Ice Harbor
 - spill 96-97%, bypass 97-98%

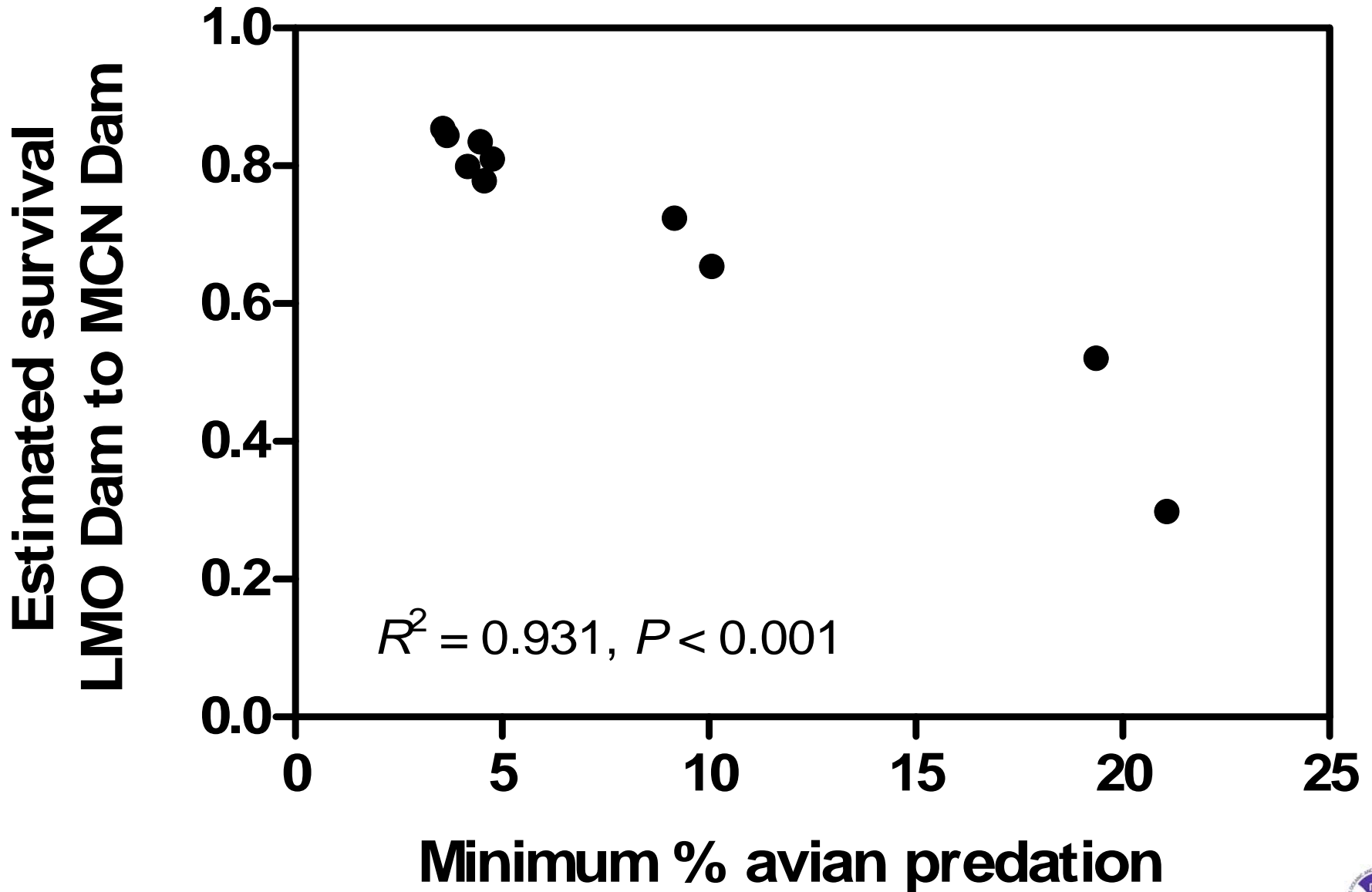


Minimum Estimate of Mortality from Avian Predation

- Percentage of PIT-tagged steelhead detected at LMN eventually recovered on nesting colonies

1998	4%	2004	19%
1999	5%	2005	9%
2000	4%	2006	5%
2001	21%	2007	4%
2002	10%	2008	5%
2003	4%		

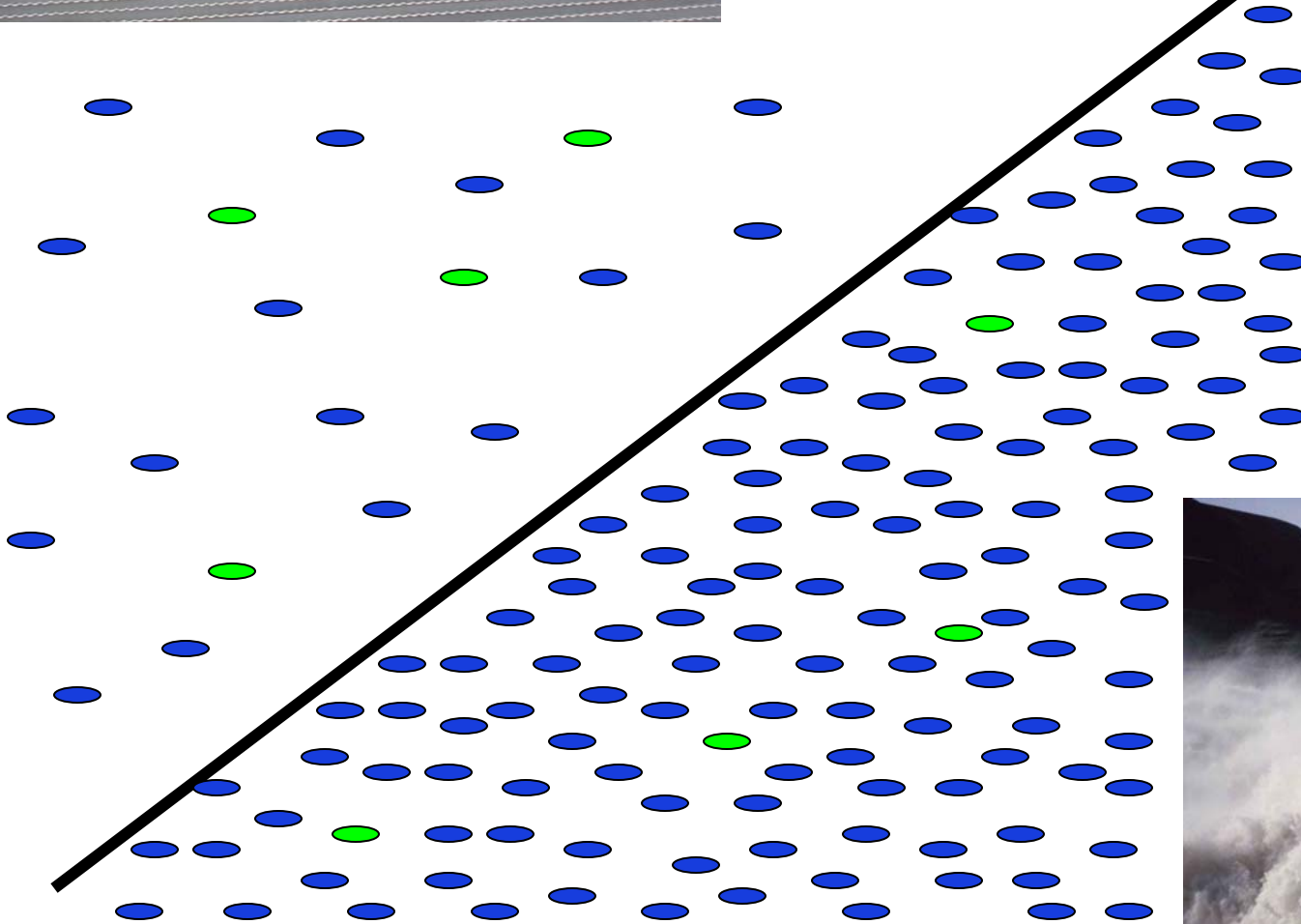
Steelhead



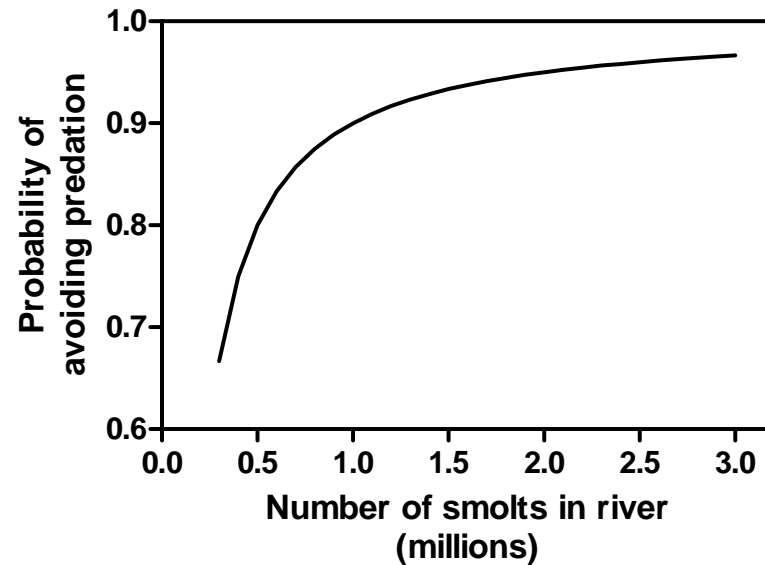
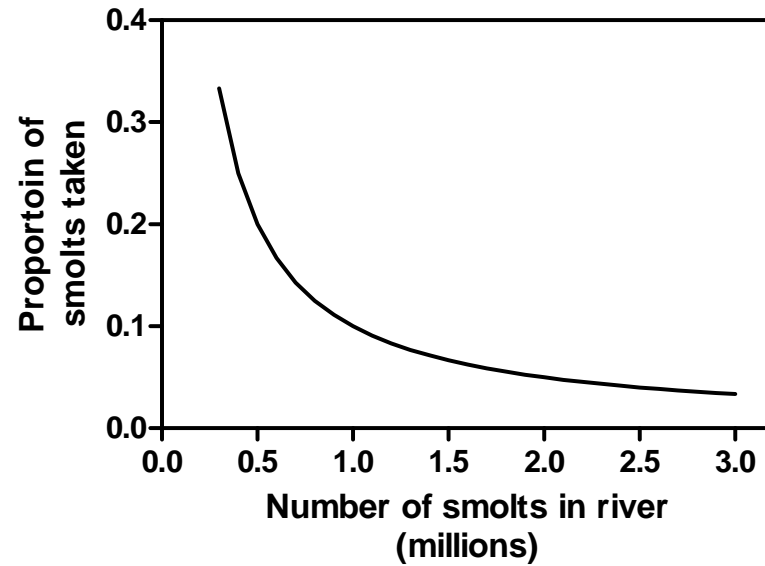


**Maximum
transport**

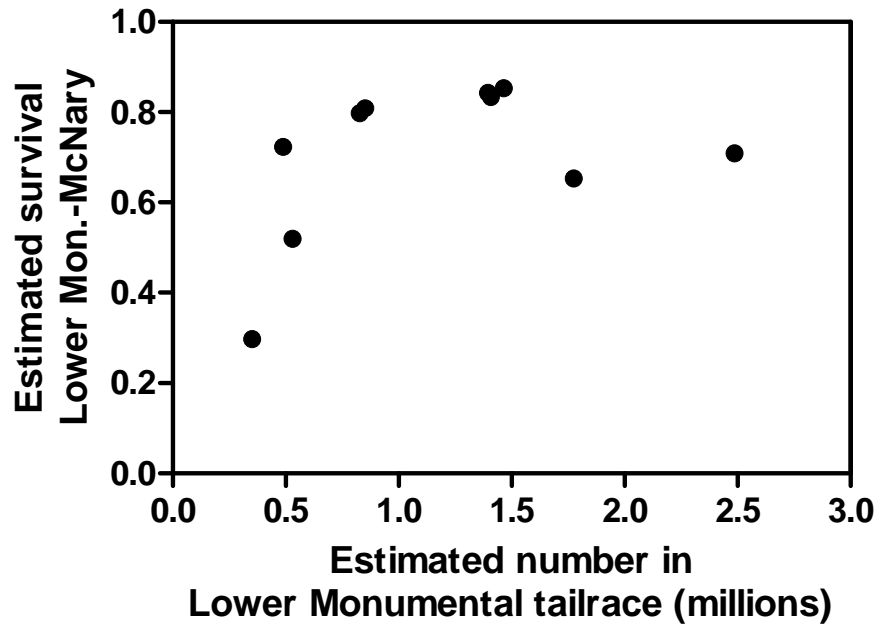
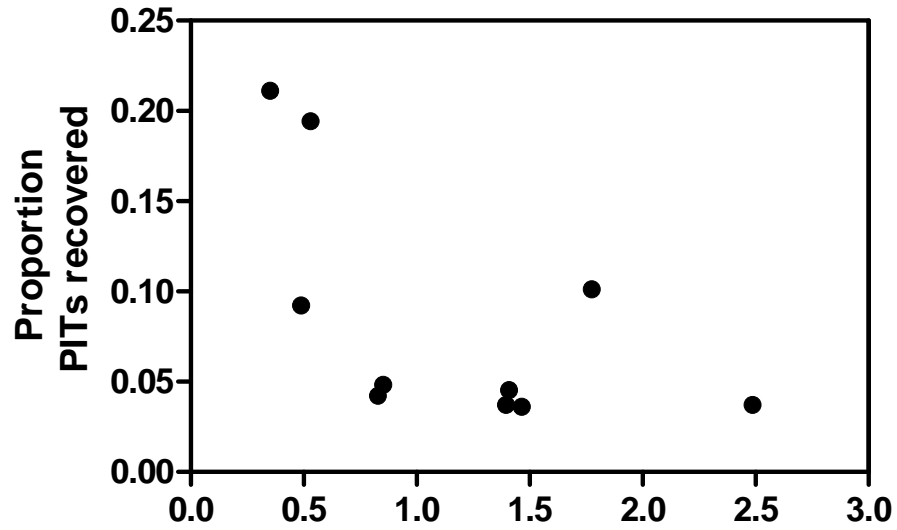
**Transport
with spill**



Idealized Relationships



Steelhead



Conclusions

- In low-spill (high transport) years, lower survival results, in part, simply from fewer fish in the river

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 - In-river survival would have been higher if non-tagged bypass fish had been returned to the river

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- In low-spill (high transport) years, lower survival results, in part, simply from fewer fish in the river
 - In-river survival would have been higher if non-tagged bypass fish had been returned to the river
- Converse is also true: in-river survival increases with increasing spill through indirect effect of reducing individual vulnerability to predation

Conclusions

- Direct or indirect effects of increased spill may not improve smolt-to-adult survival for the population

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- Direct or indirect effects of increased spill may not improve smolt-to-adult survival for the population
 - Cumulative effect must offset effect of transporting fewer steelhead

A wide-angle photograph of a large concrete dam situated on a river. The dam is a long, low structure with a central spillway. The river flows from the background towards the dam. The surrounding landscape consists of rolling hills and mountains, some covered in green grass and others in more sparse, brownish vegetation. In the foreground, a grassy hillside slopes down towards the river. A tall electrical transmission tower stands on the left side of the foreground, with power lines stretching across the scene. The sky is clear and blue. The word "Questions" is overlaid in a large, yellow, serif font in the lower right quadrant of the image.

Questions