

NMFS Survival Studies 1993-2002



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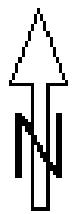
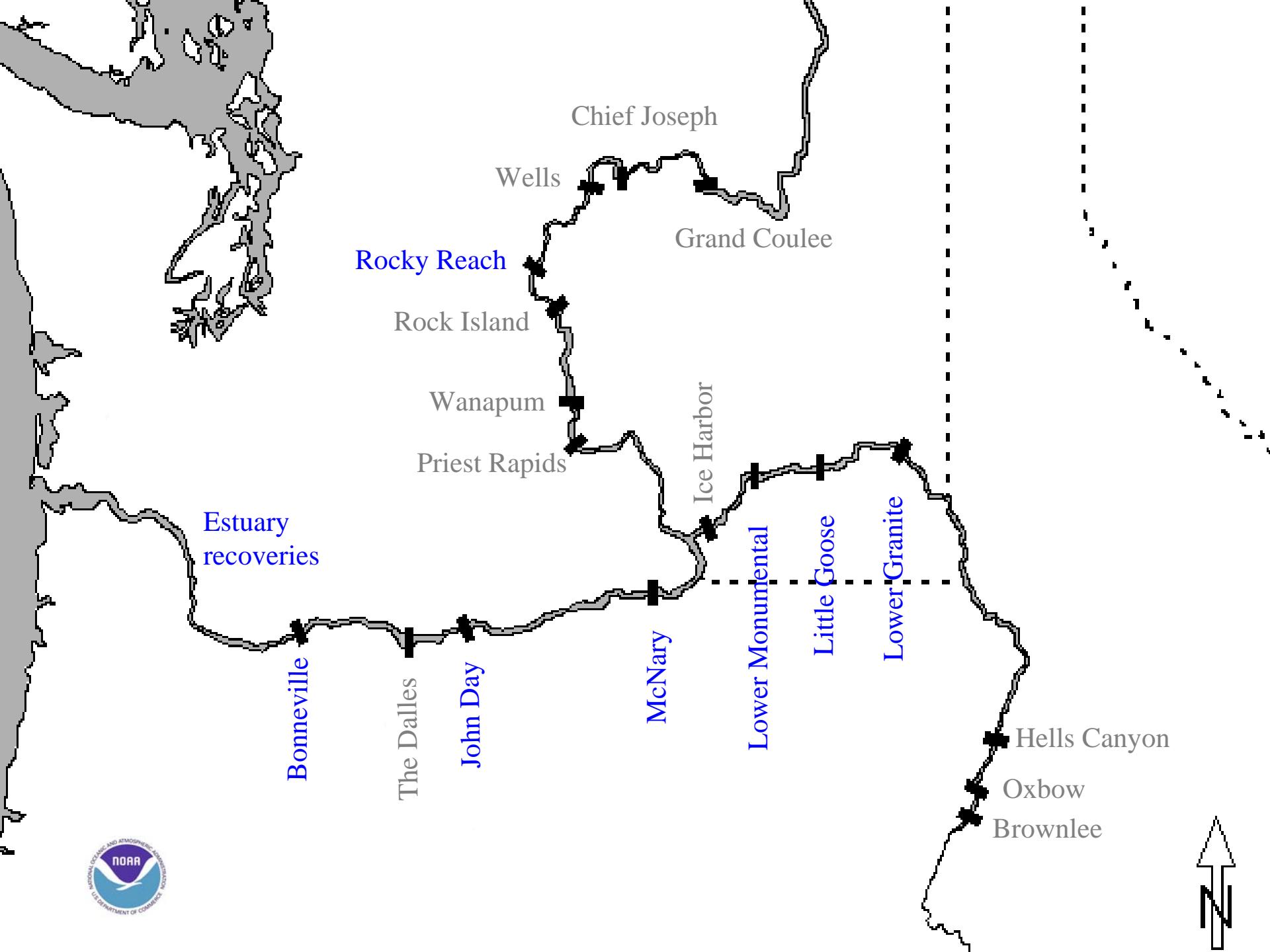


Results for

- Yearling chinook salmon survival from Snake River Basin hatcheries to LGR
- Yearling chinook salmon and steelhead survival through individual reaches
- Their survival through the entire hydropower system
- Survival for subyearling fall chinook in the Snake River and from McN to JD



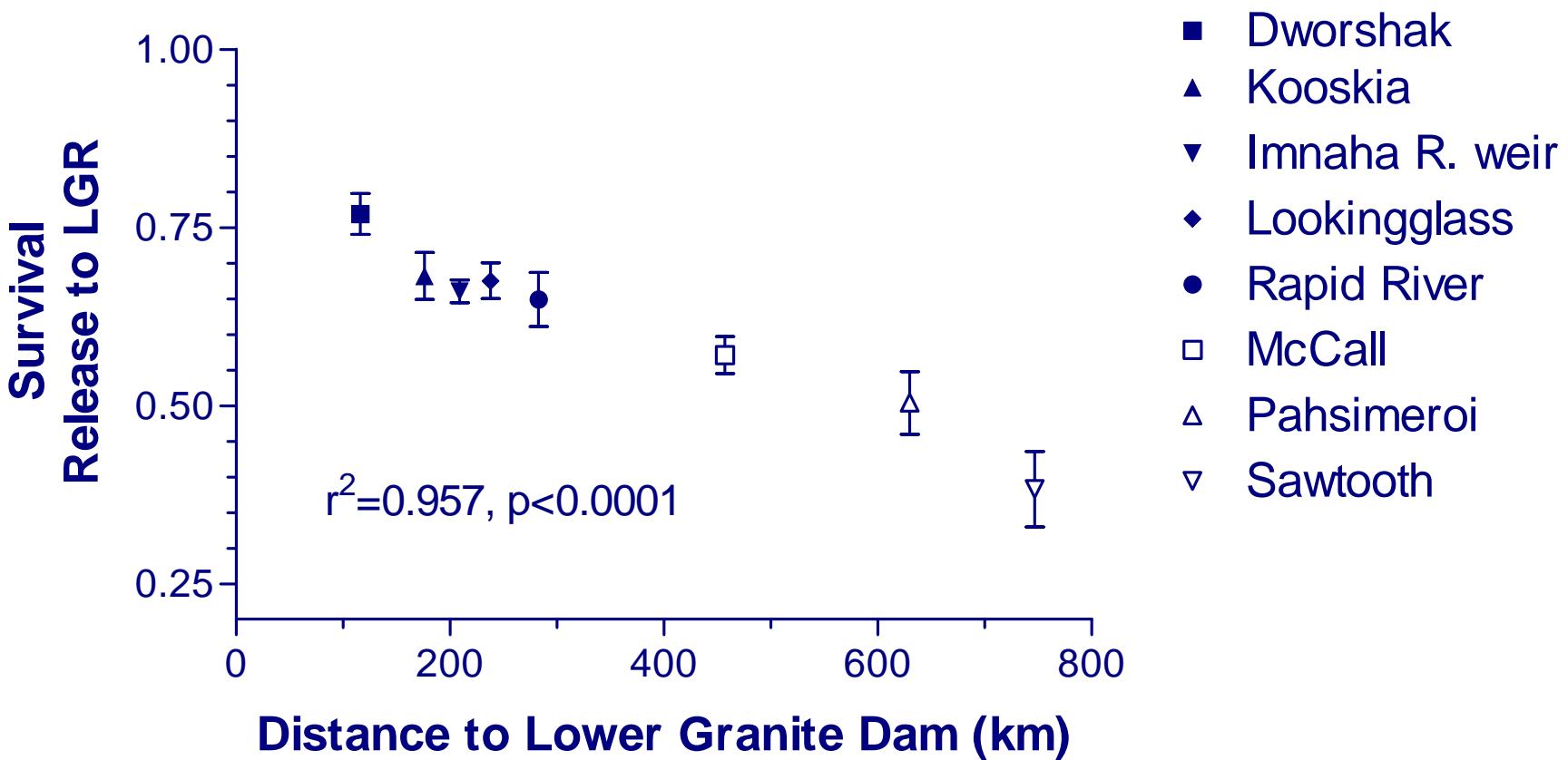




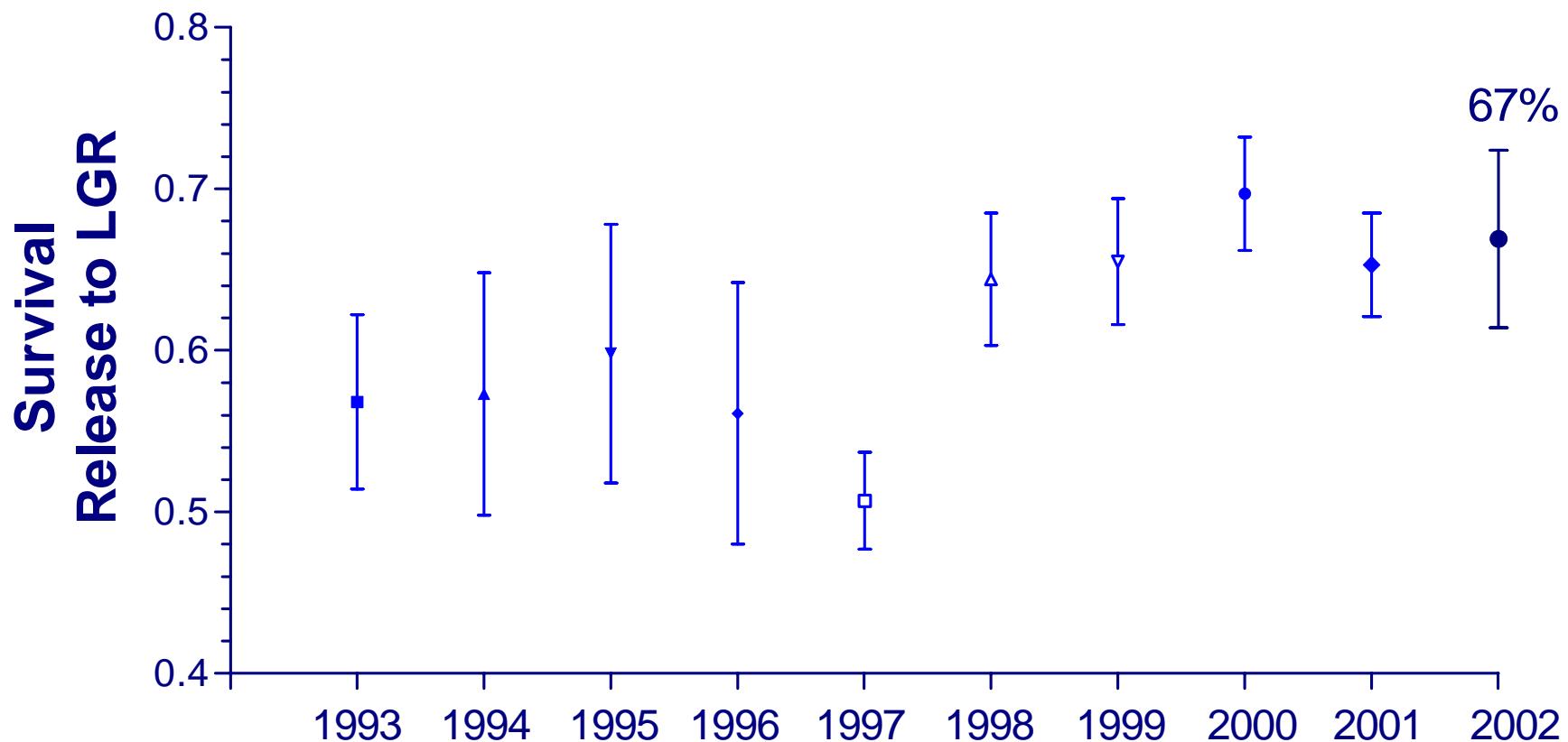


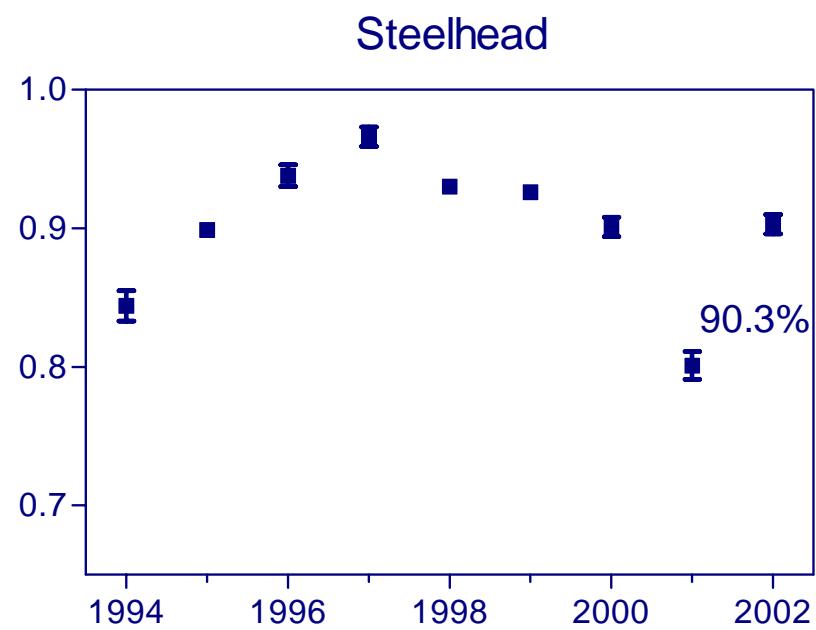
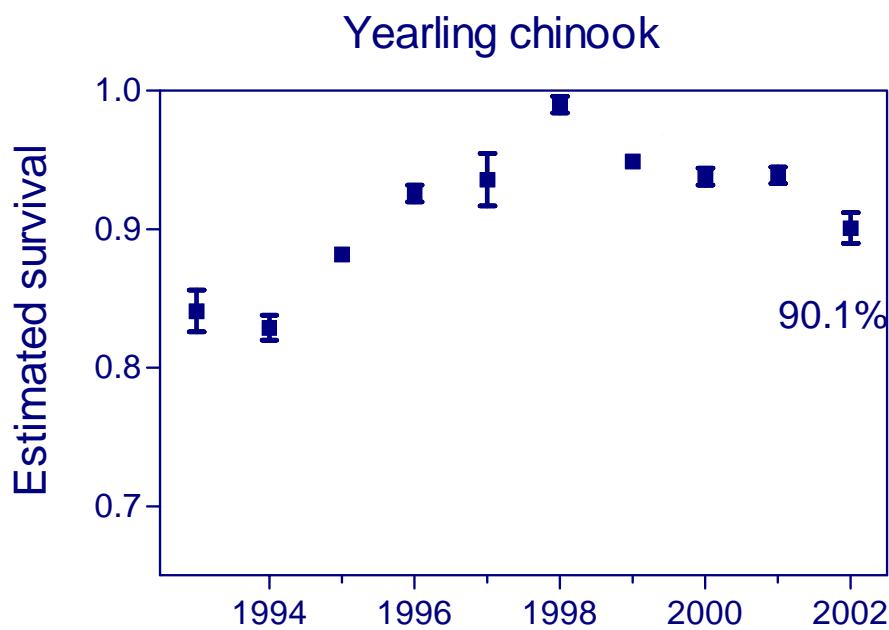
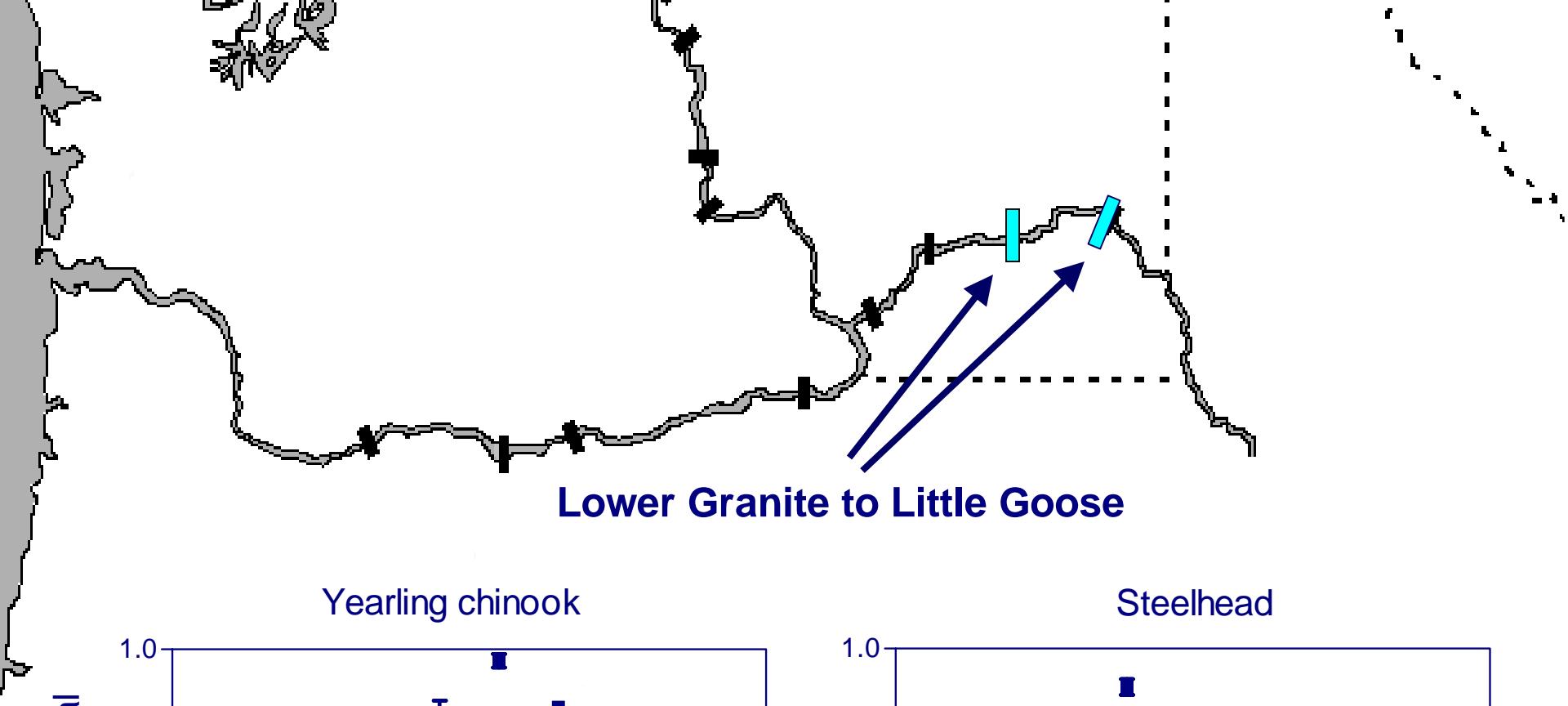


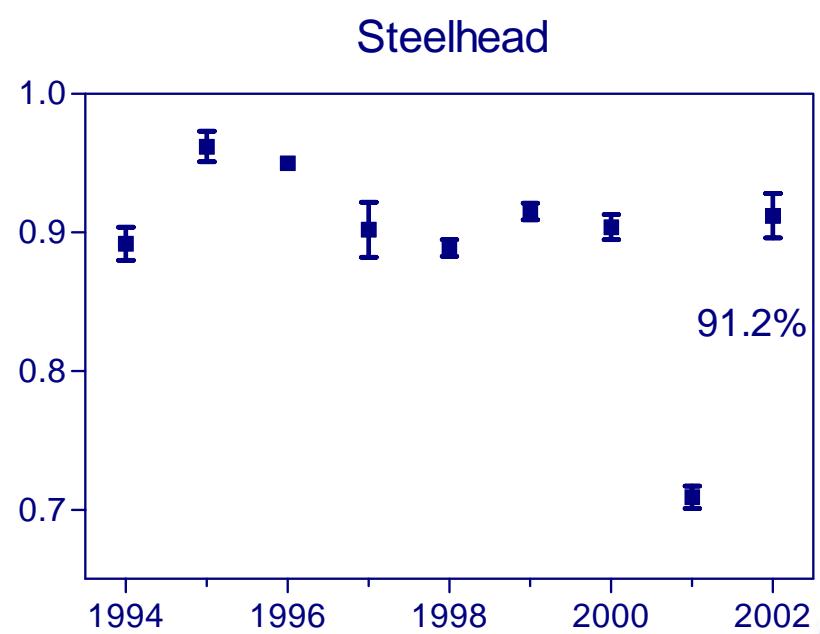
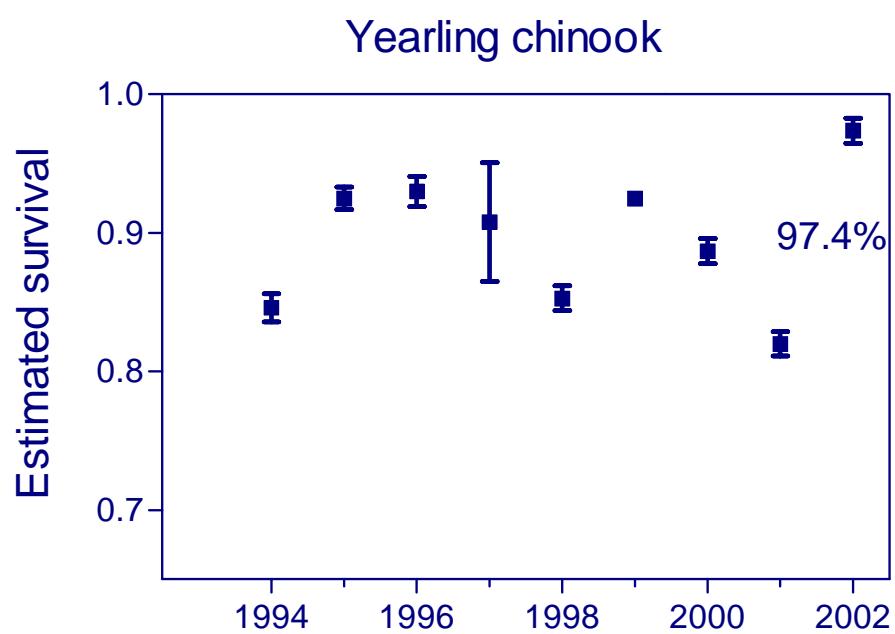
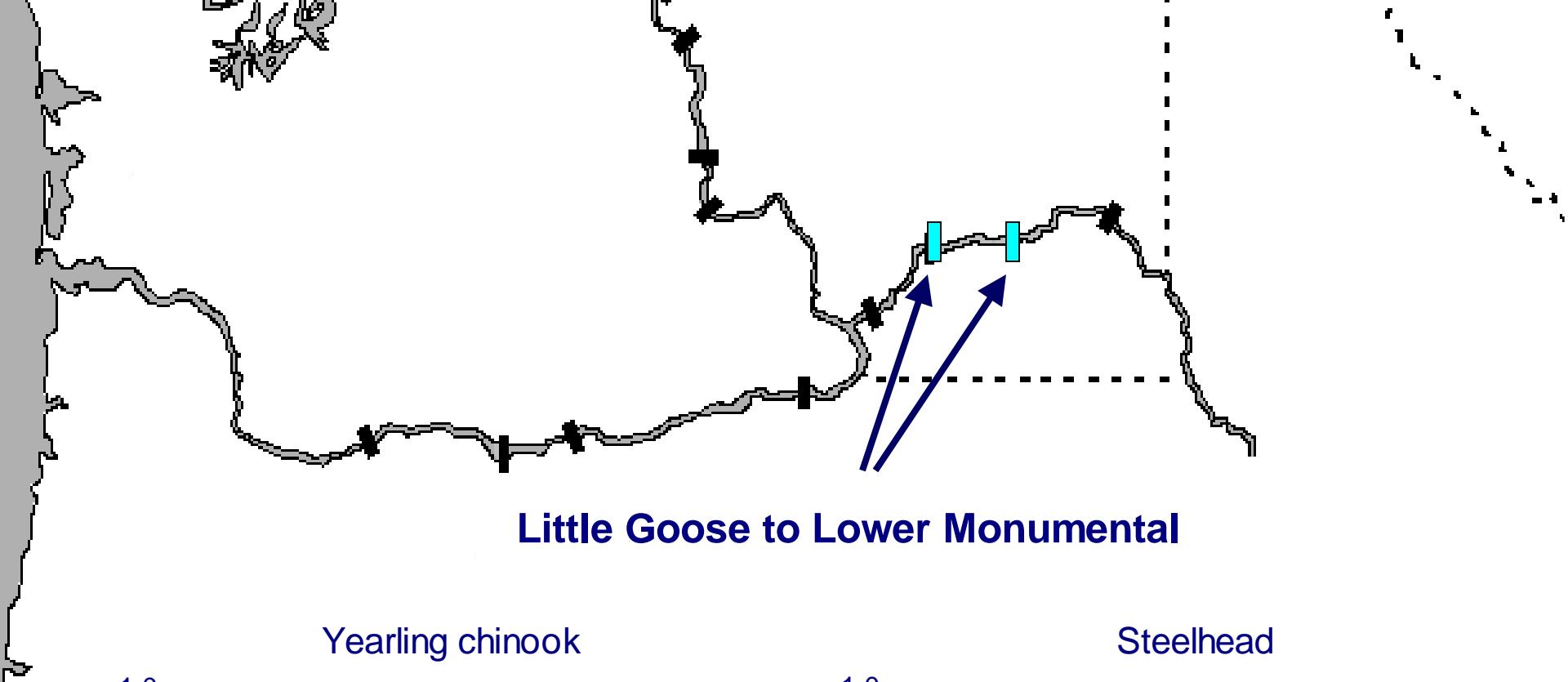
Hatchery yearling chinook salmon (1993-2002)

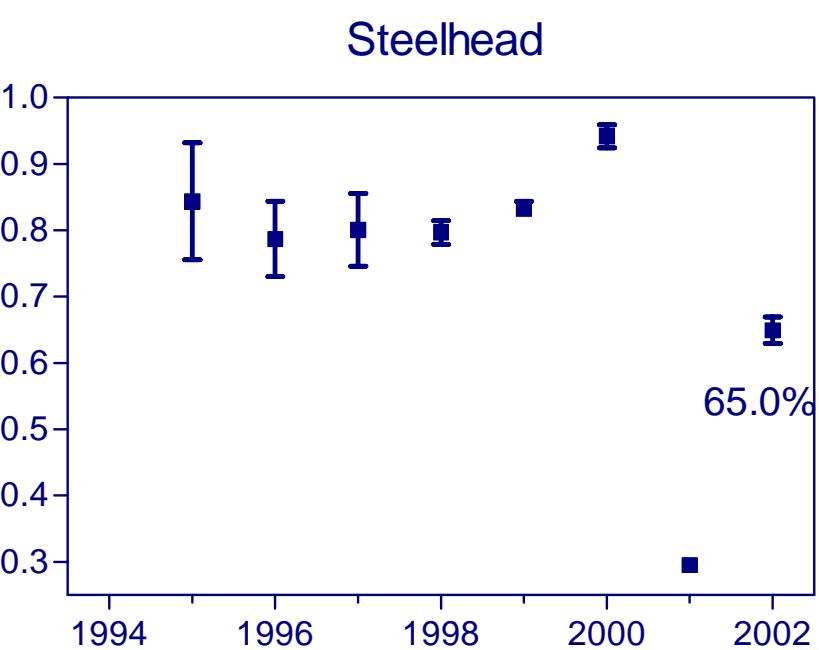
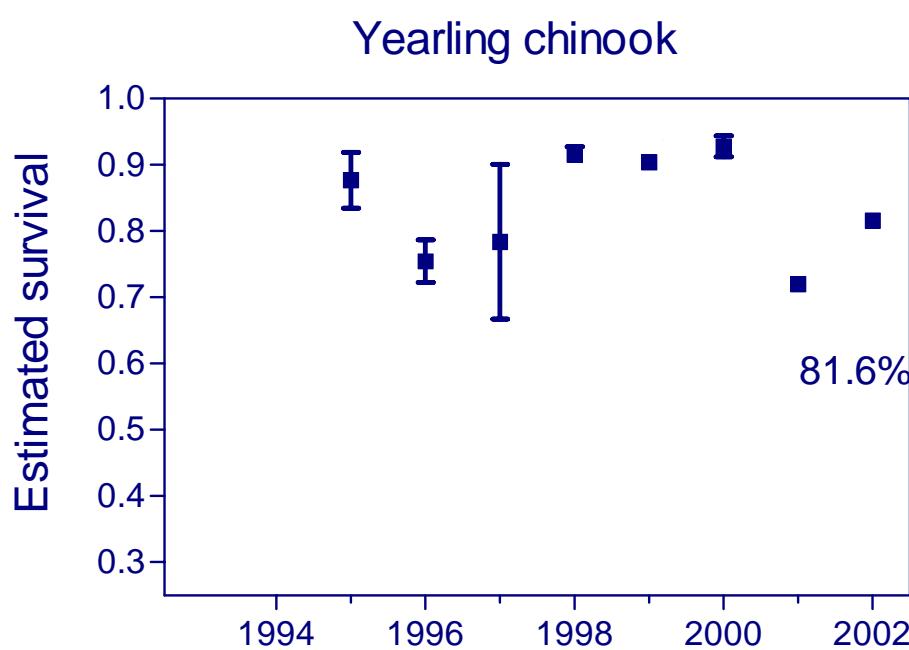
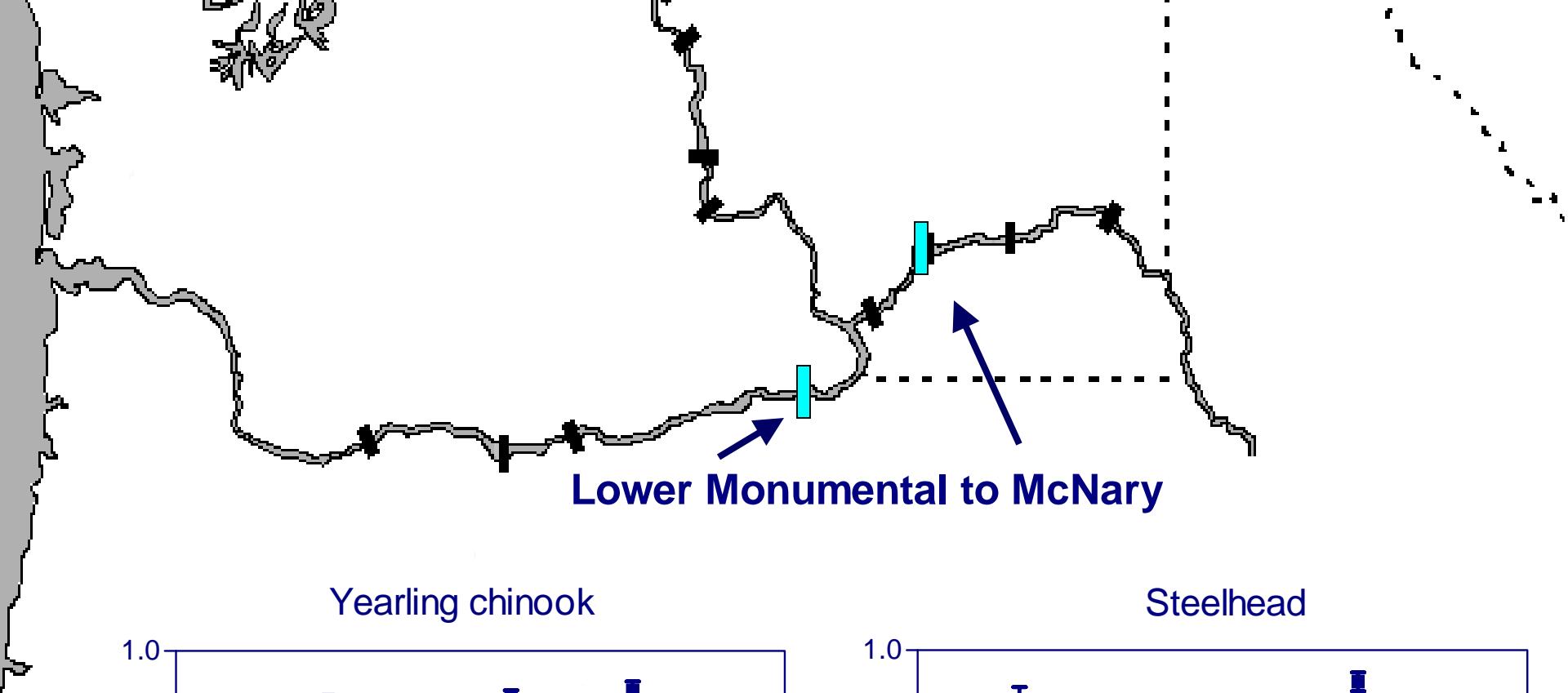


Yearling chinook salmon All Snake River Basin hatcheries combined

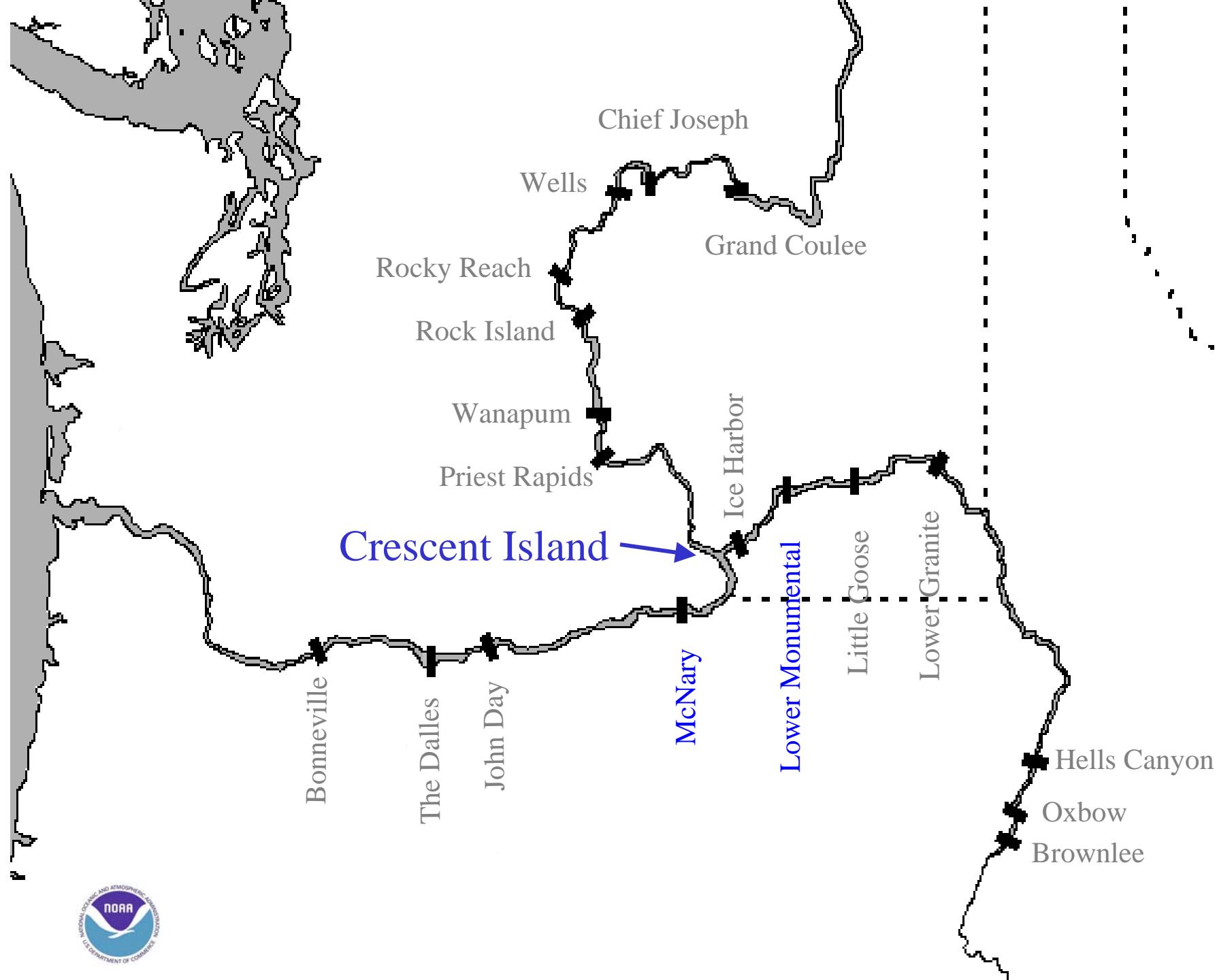






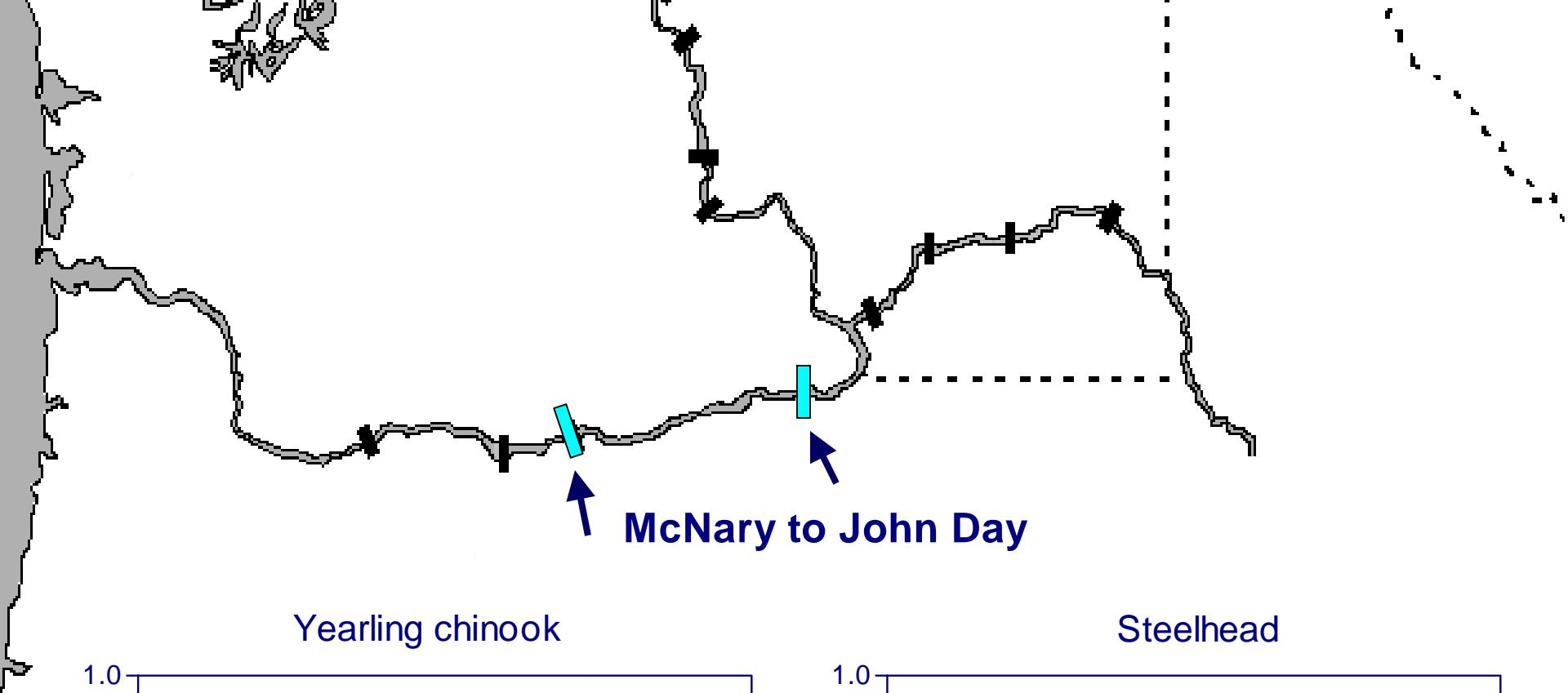




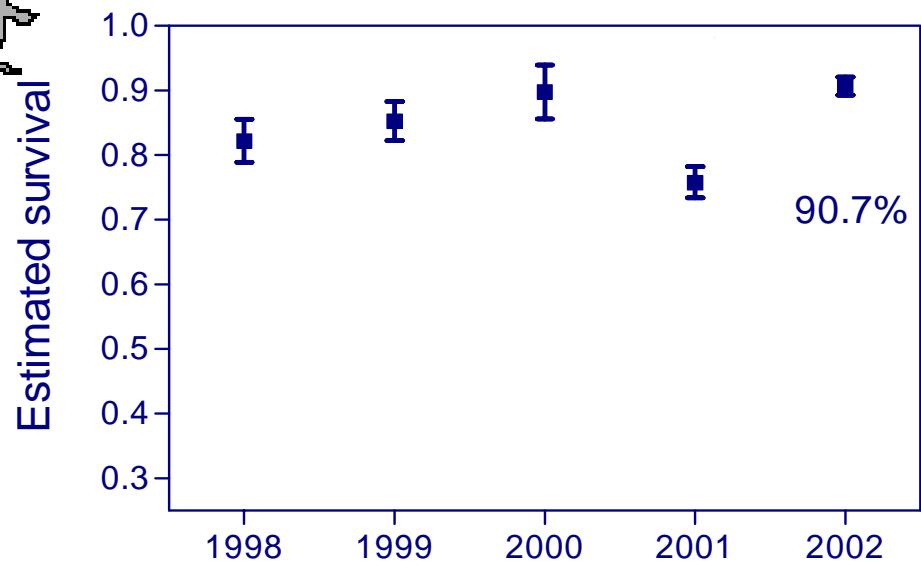


- > 12,000 PIT tags found in 2002
- 9.7% of steelhead leaving Lower Monumental Dam
- 1.5% of yearling chinook salmon leaving Lower Monumental Dam
- Not all tags are recovered

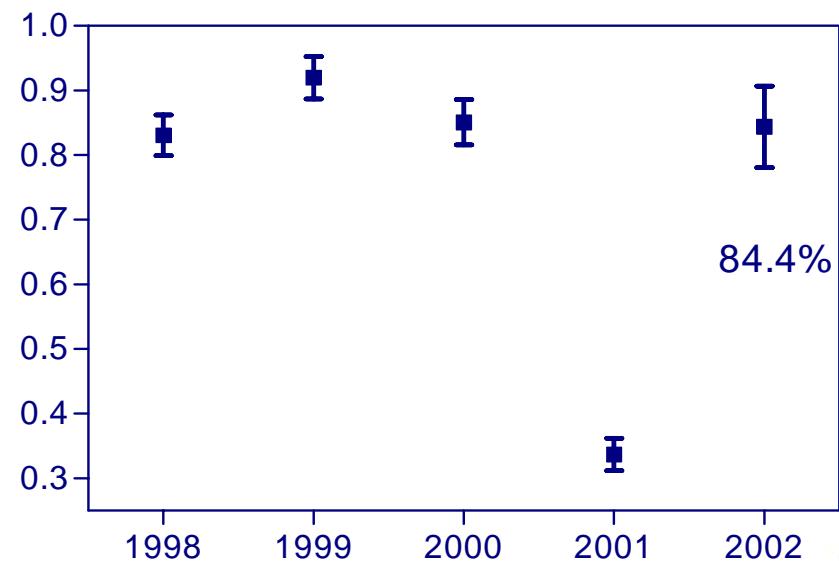


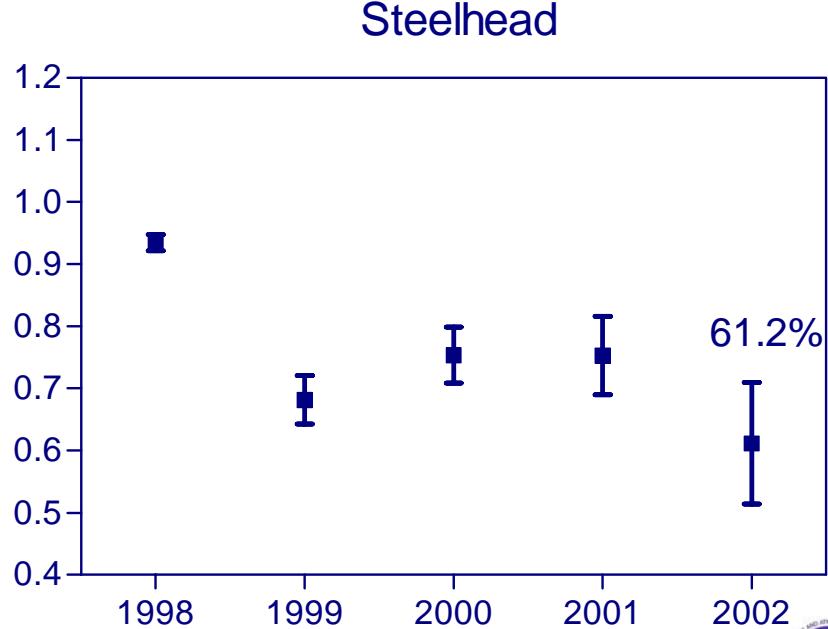
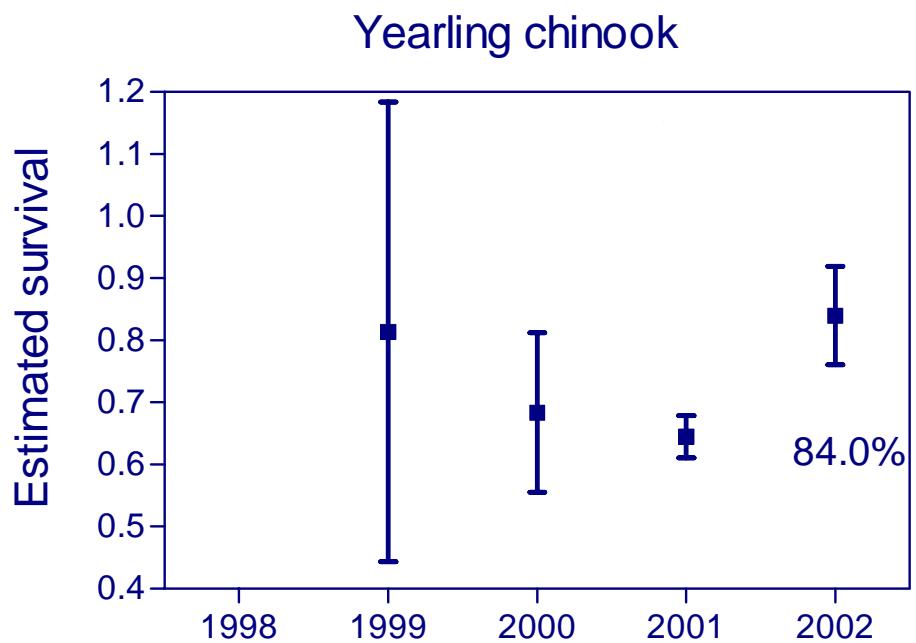
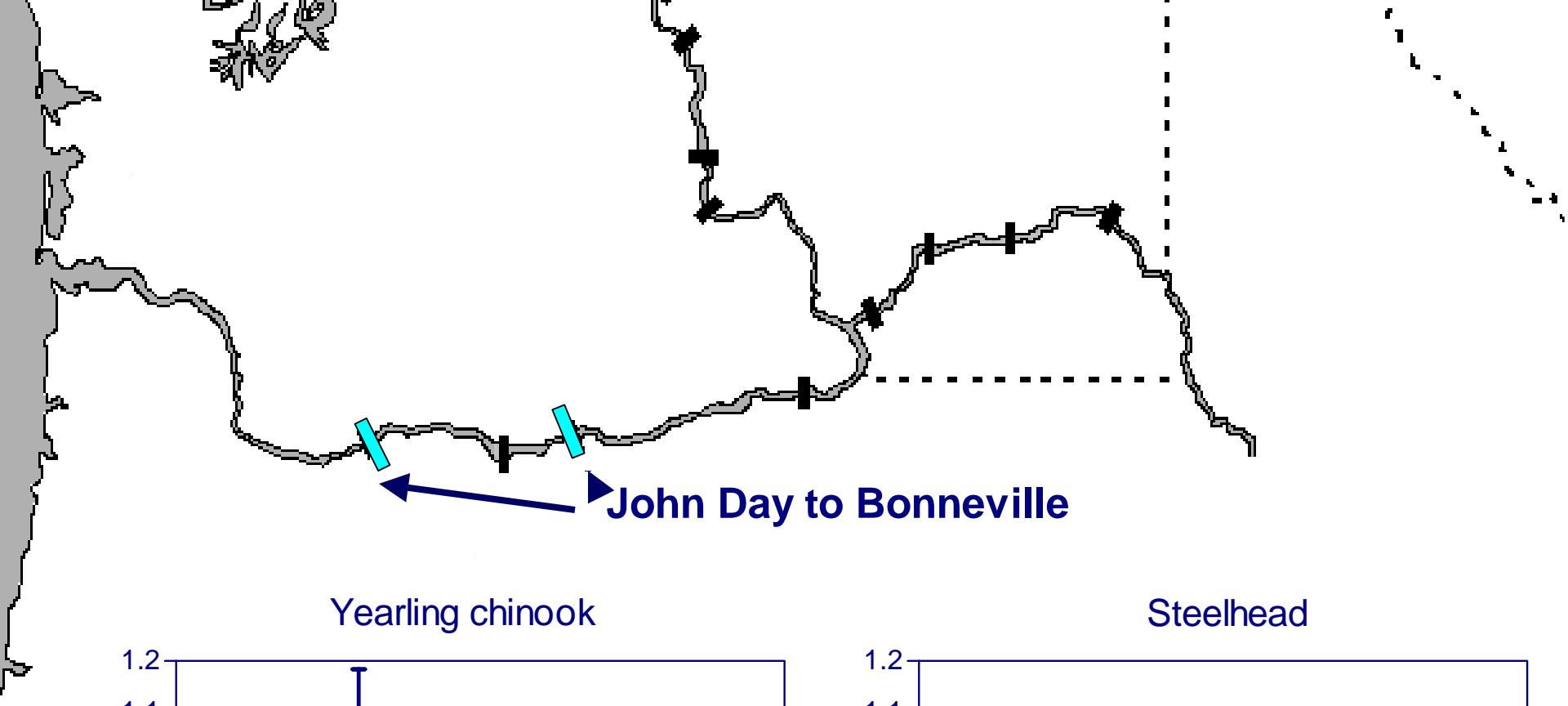


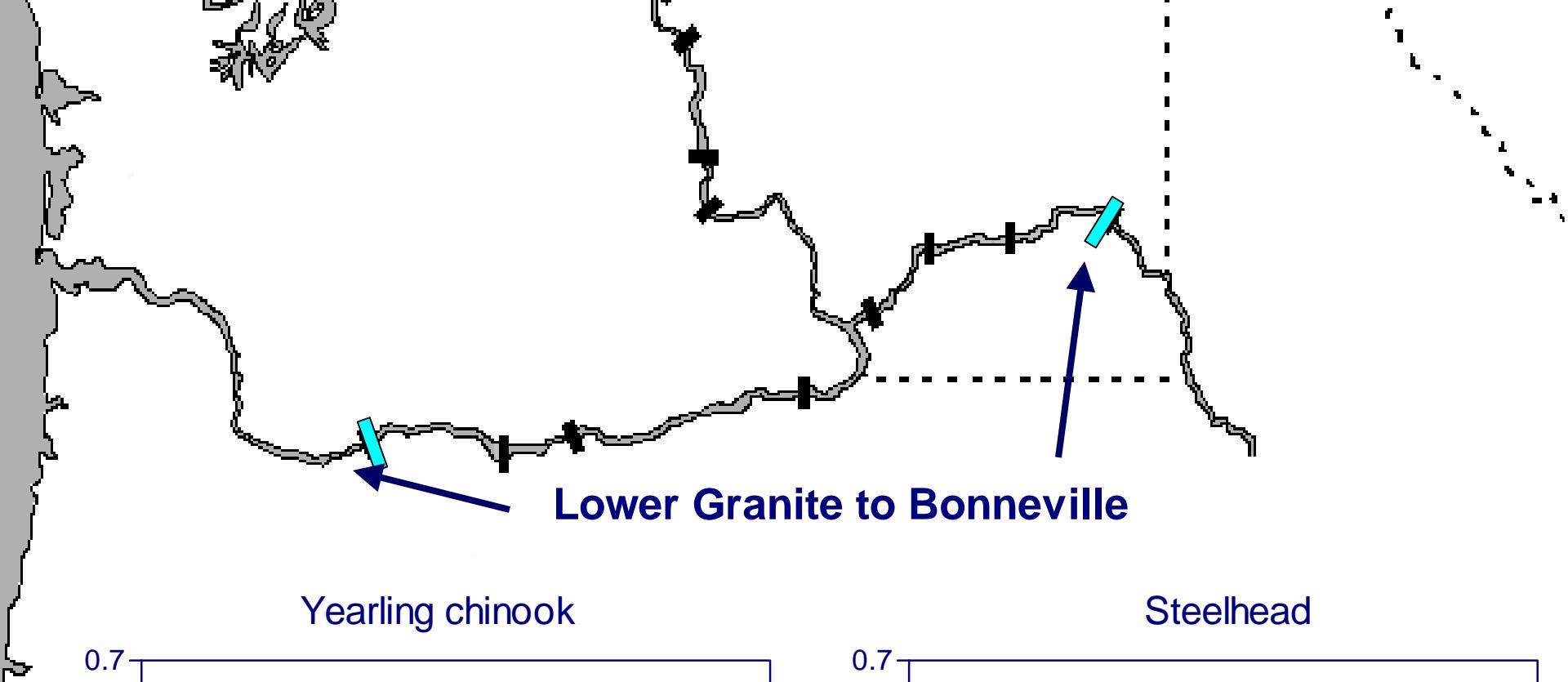
Yearling chinook



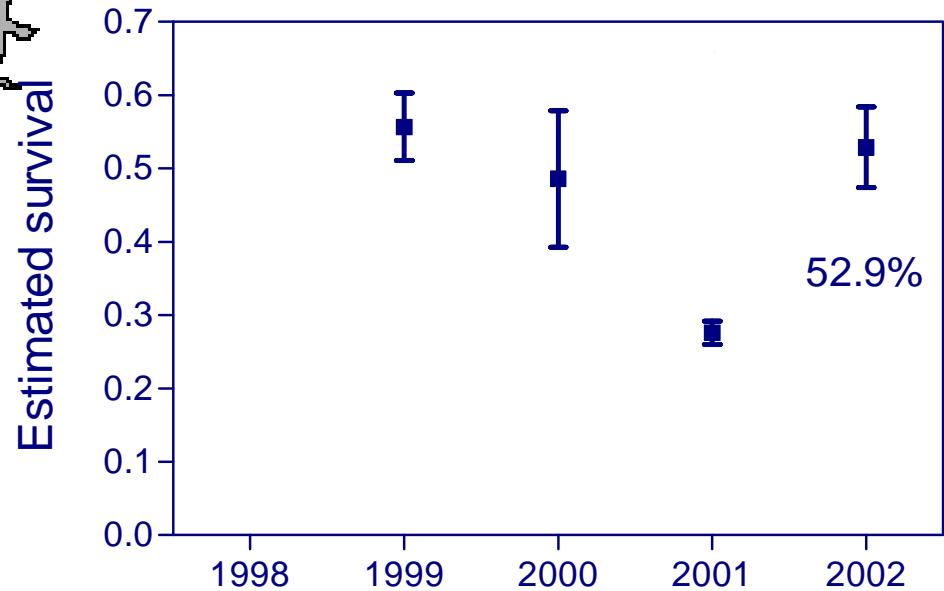
Steelhead



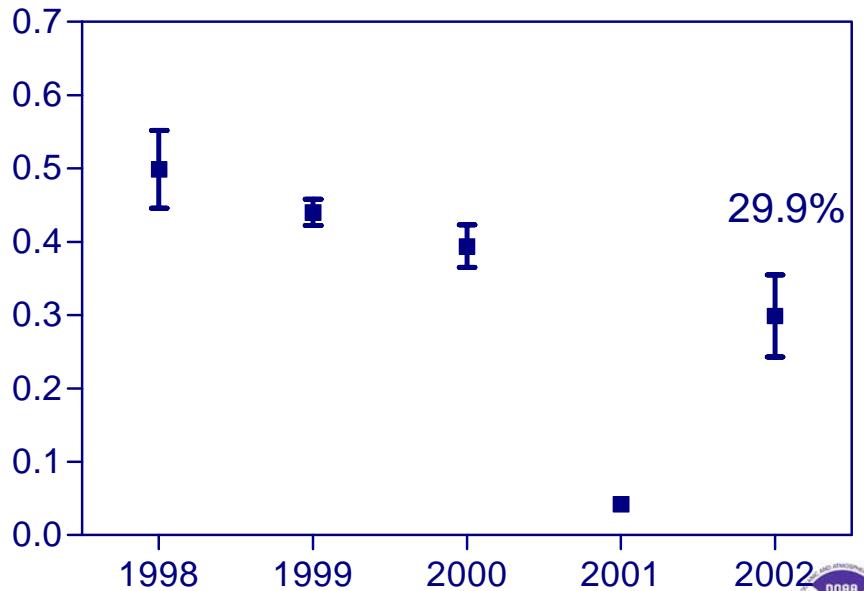


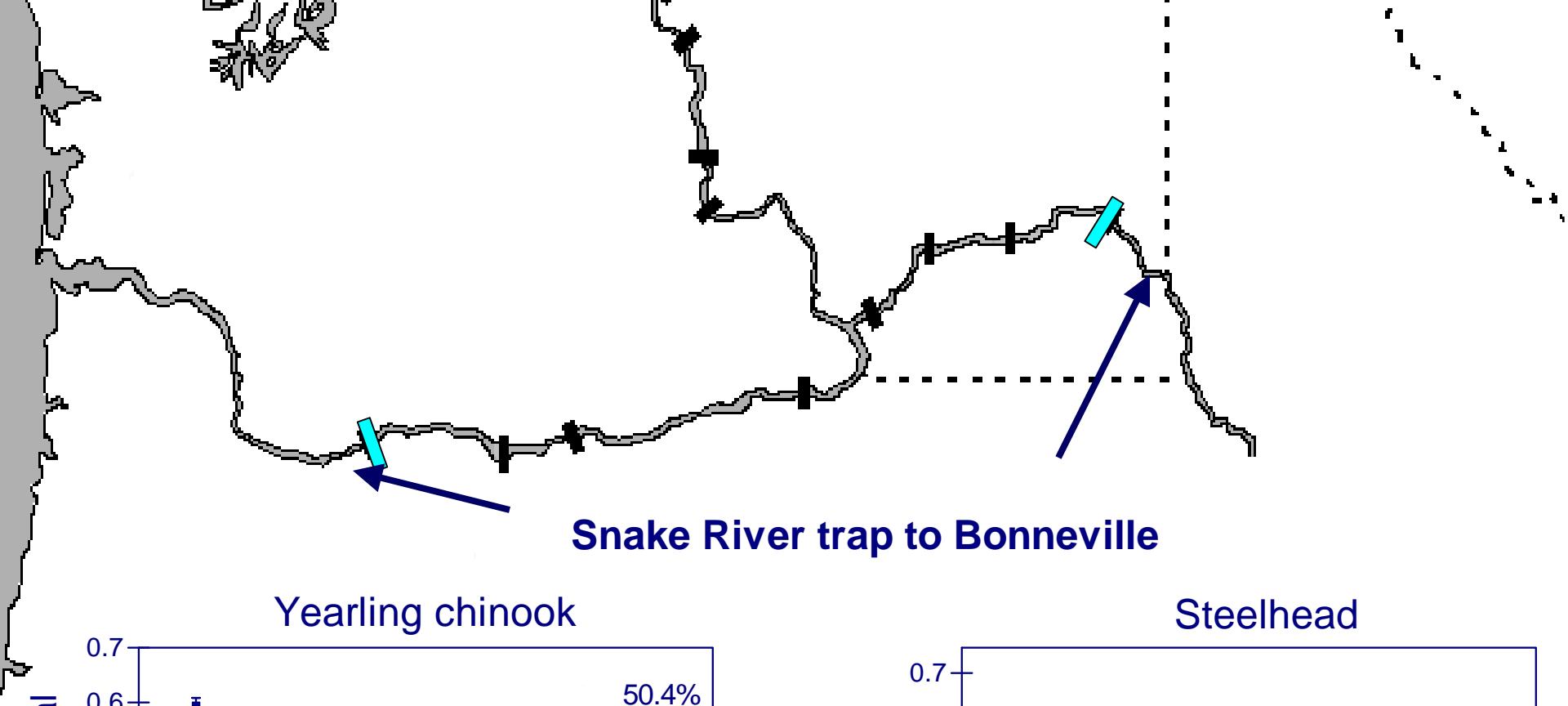


Yearling chinook

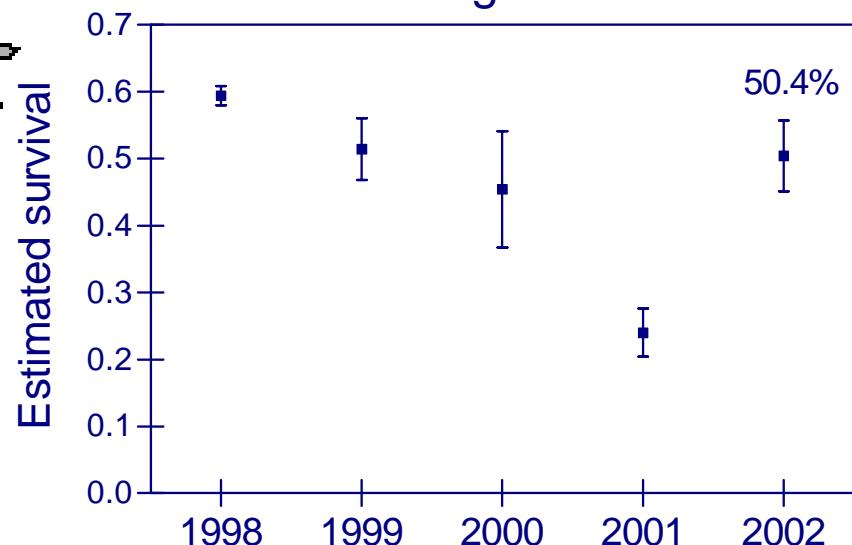


Steelhead

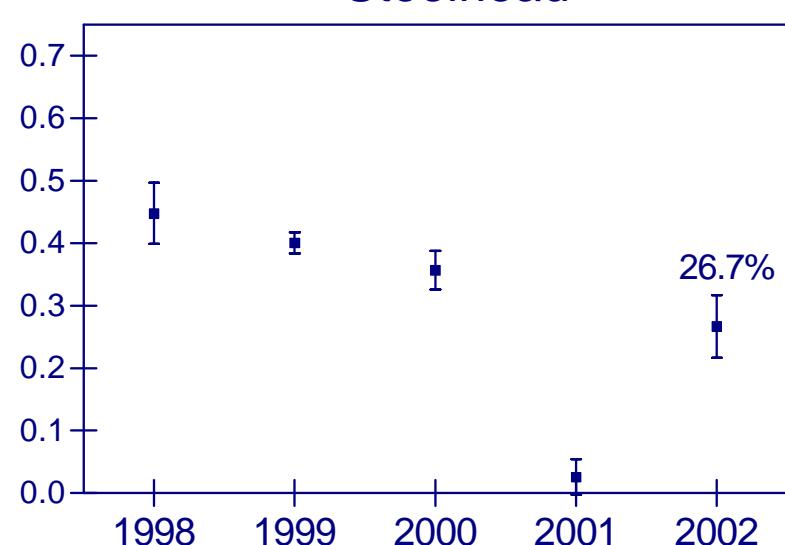




Yearling chinook



Steelhead



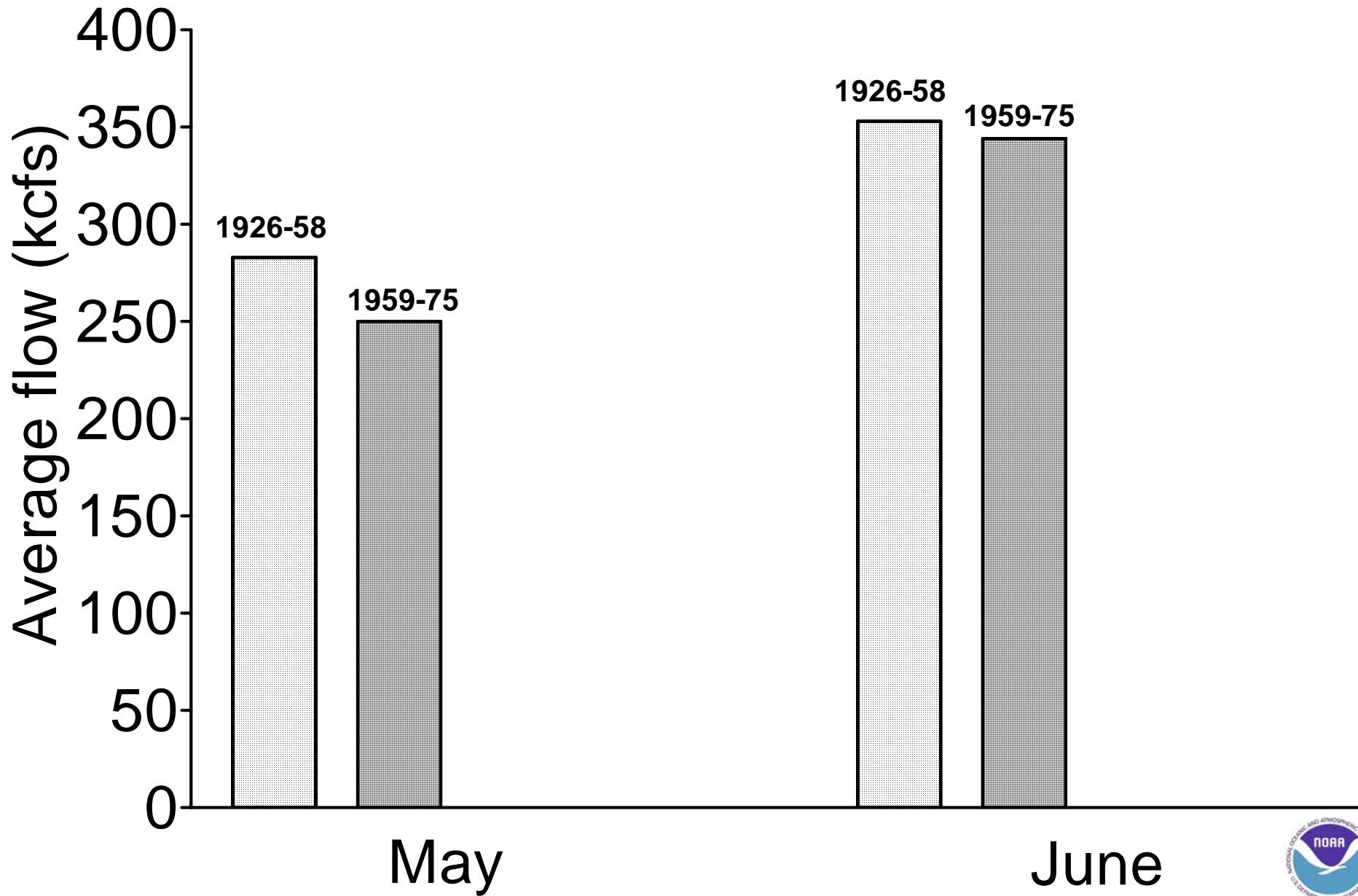
Historic conditions



Salmonids evolved to migrate under flow conditions with a natural hydrograph. Due to the small size of smolts, the limited ability to store energy reserves, and the long distance they must travel, fish rely tremendously on flow (water velocity) to move them to the ocean.

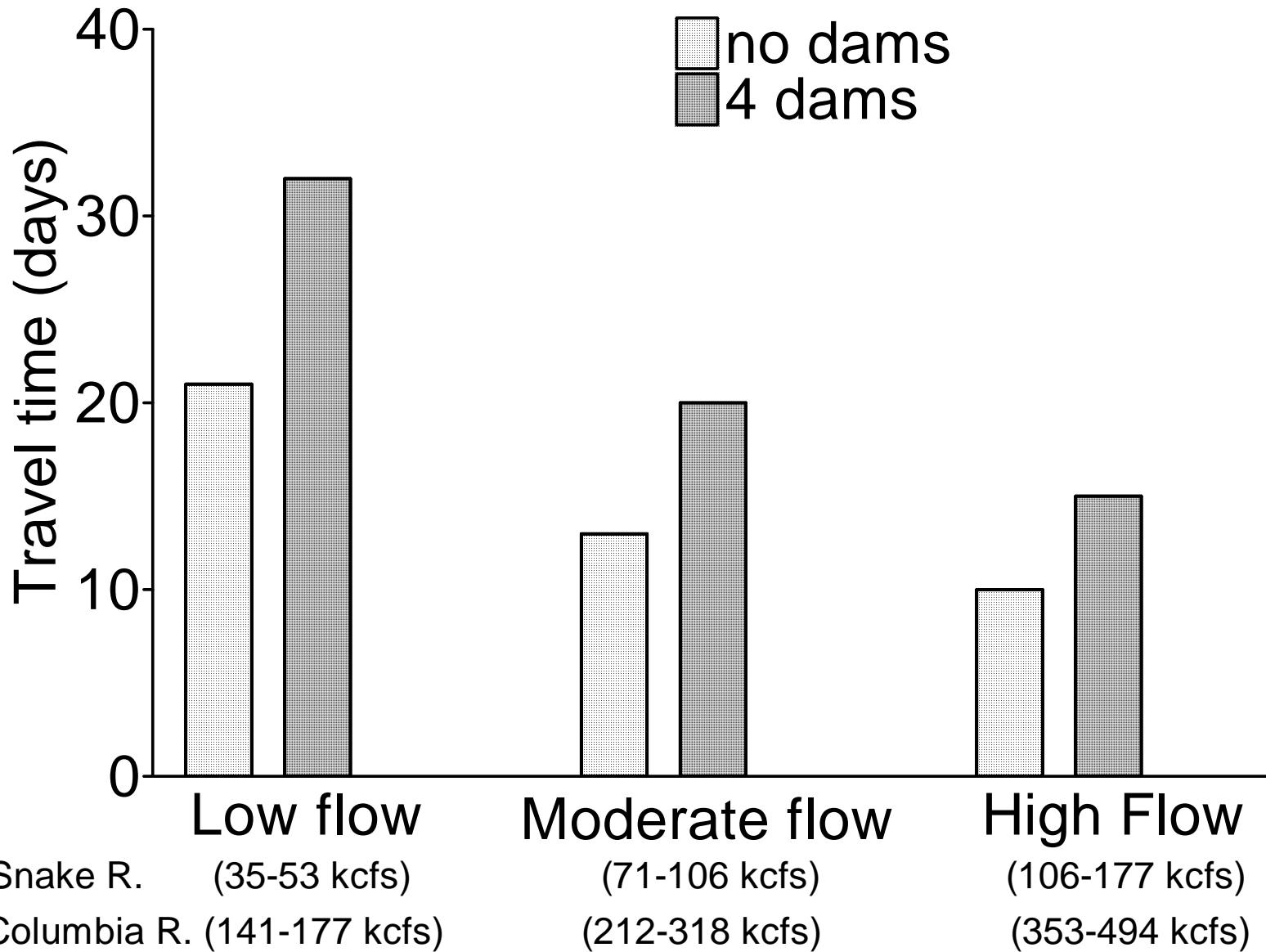


The Dalles Dam

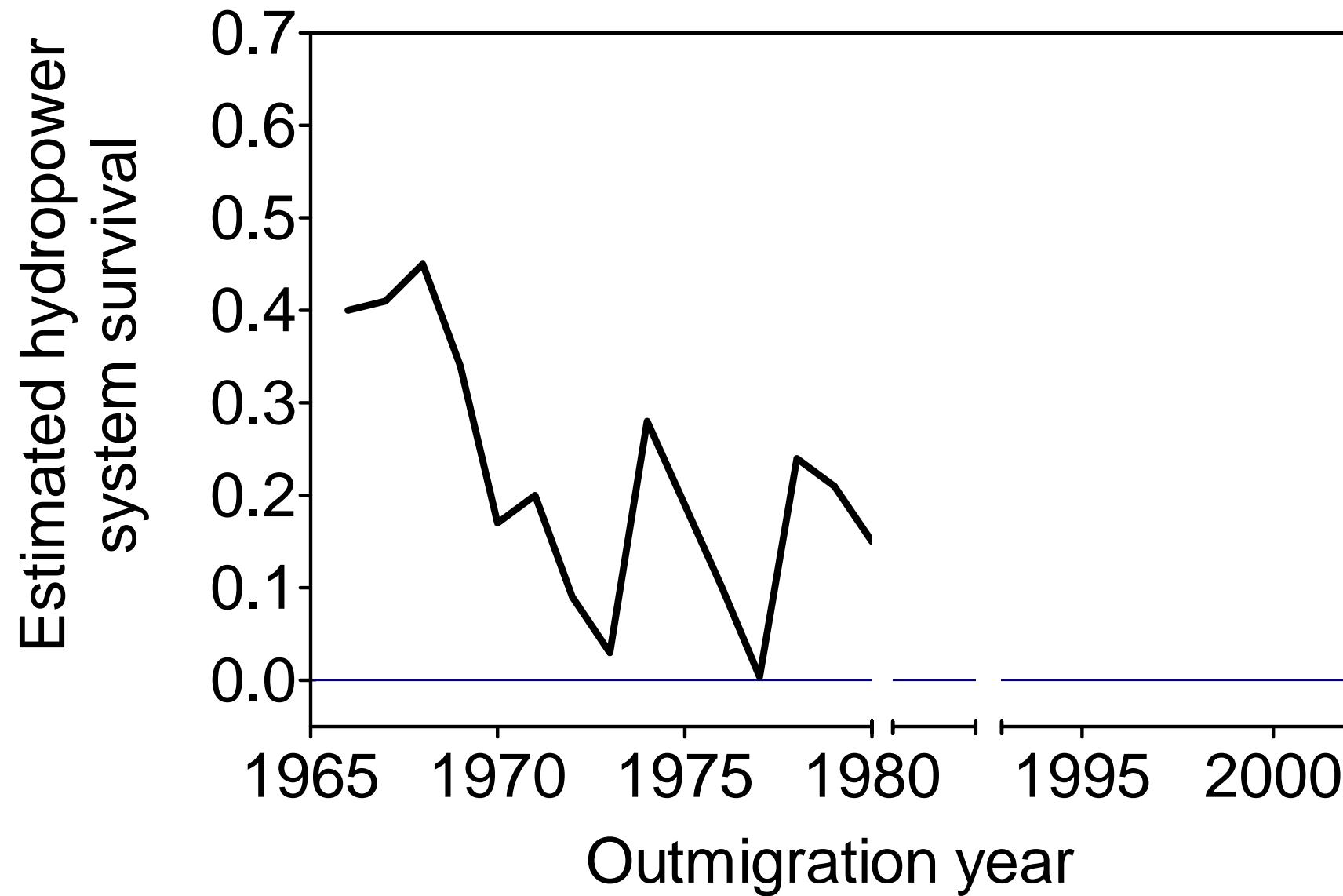


Historic estimated juvenile chinook travel time from Lewiston to Bonneville Dam

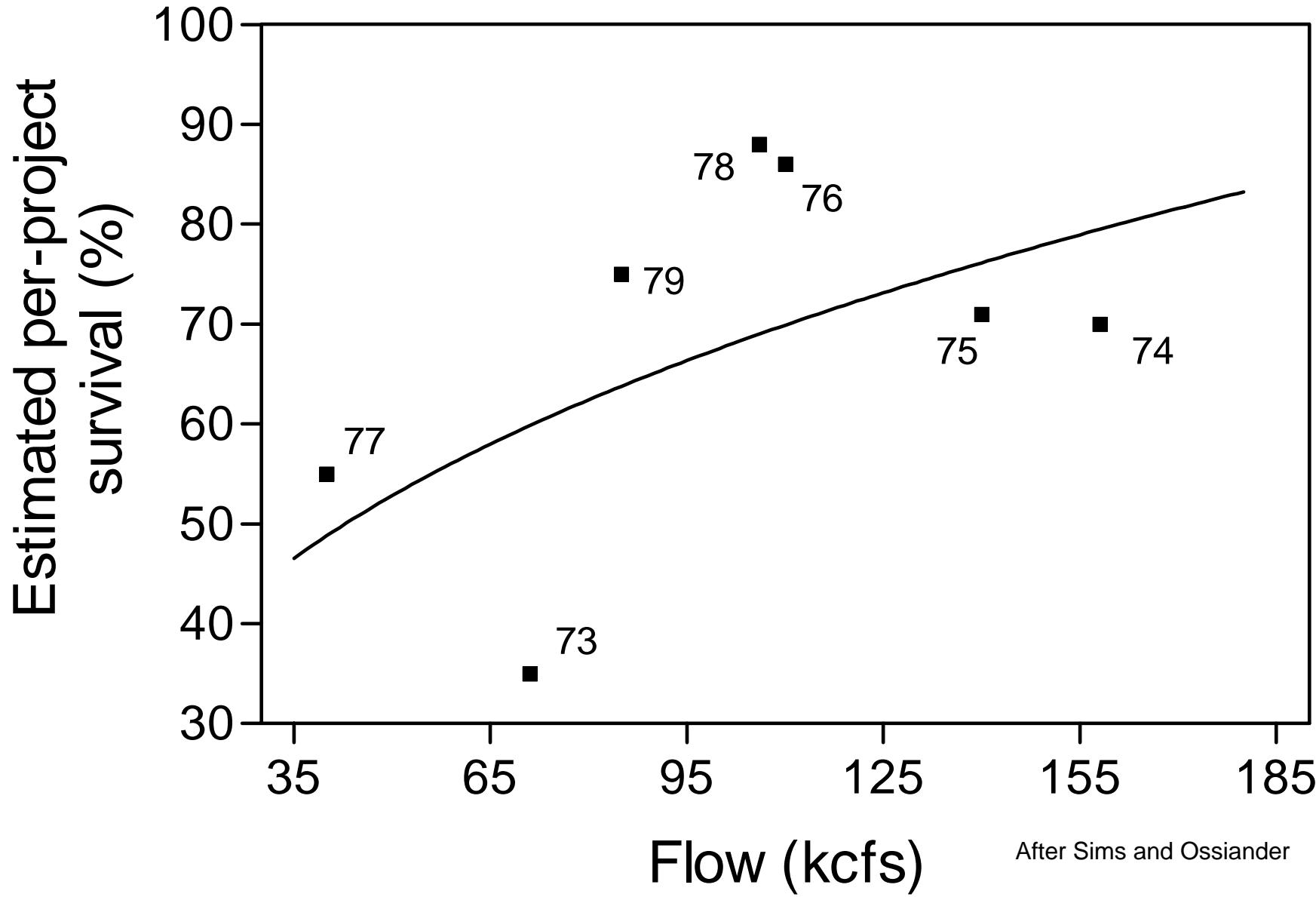
(after Raymond 1979)



Snake River chinook salmon



Snake River chinook salmon



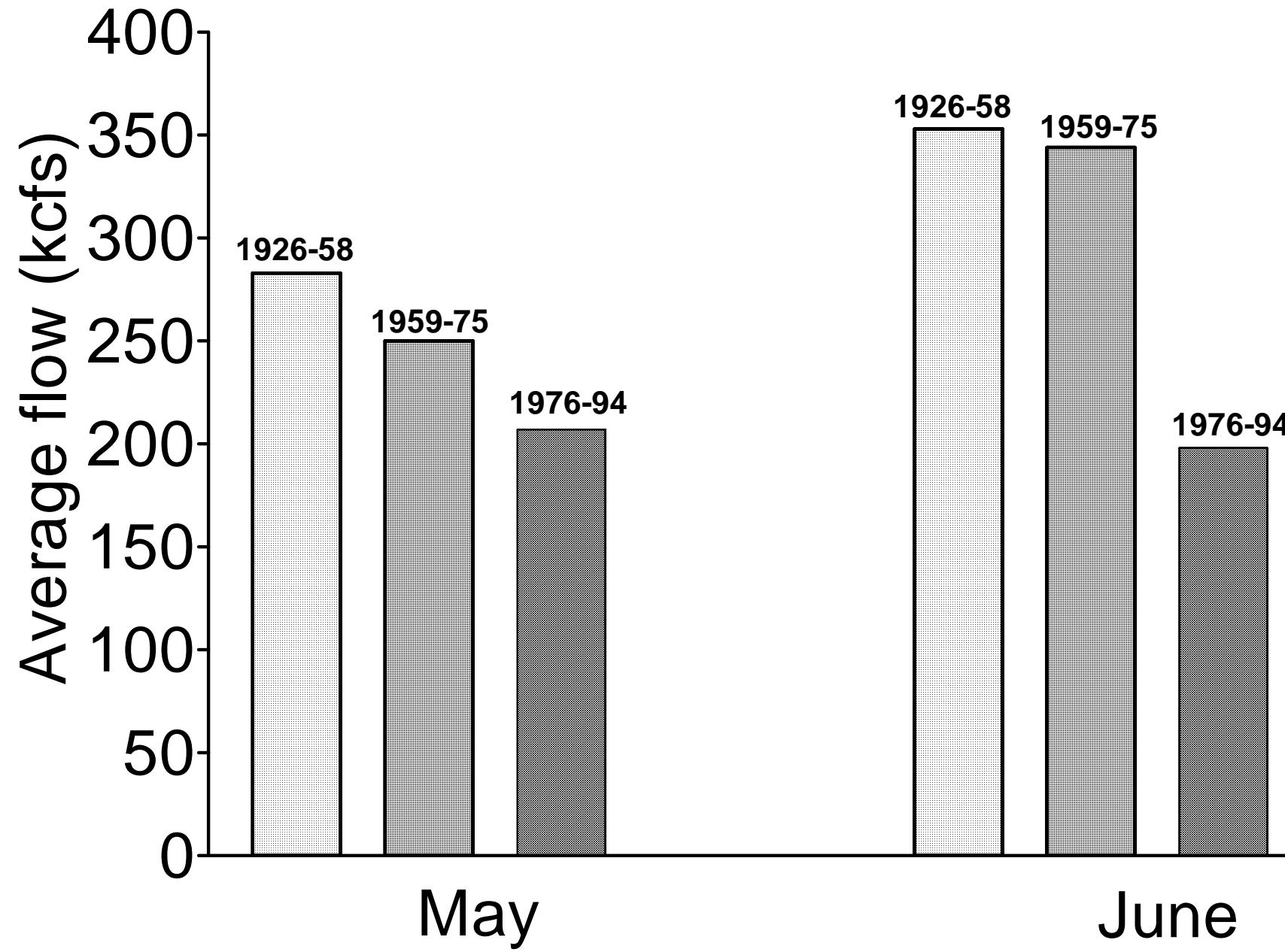
After Sims and Ossiander



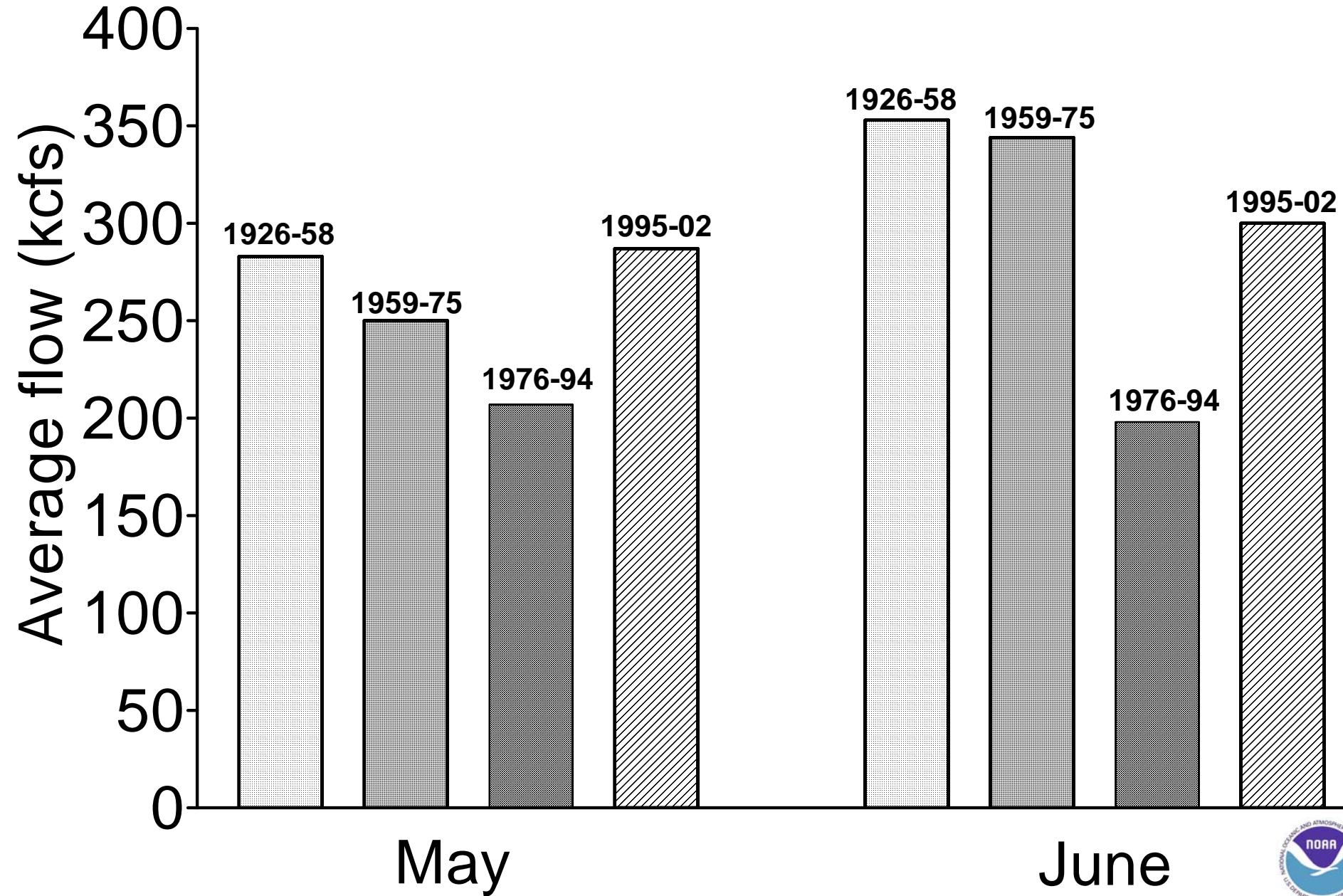
Present conditions



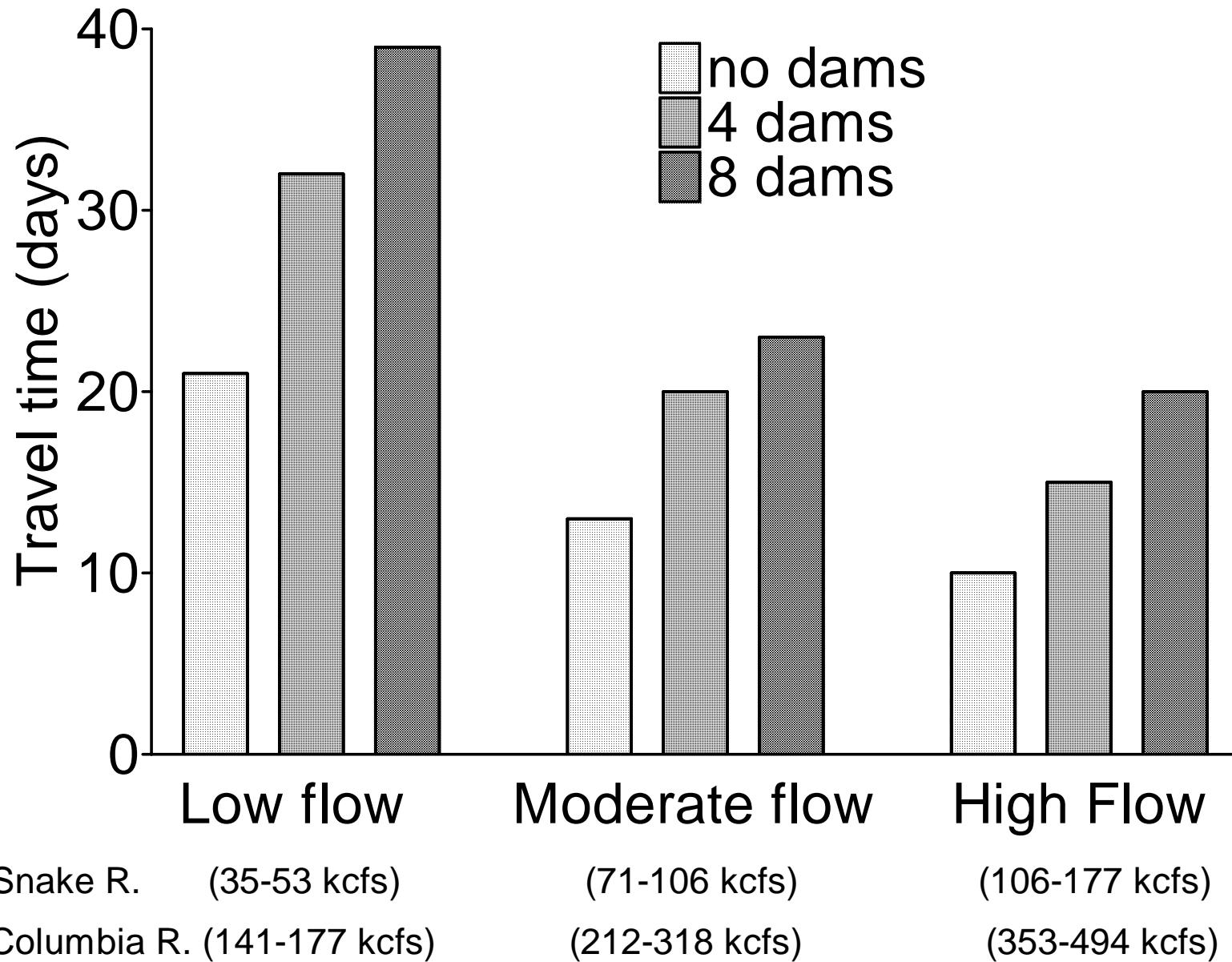
The Dalles Dam



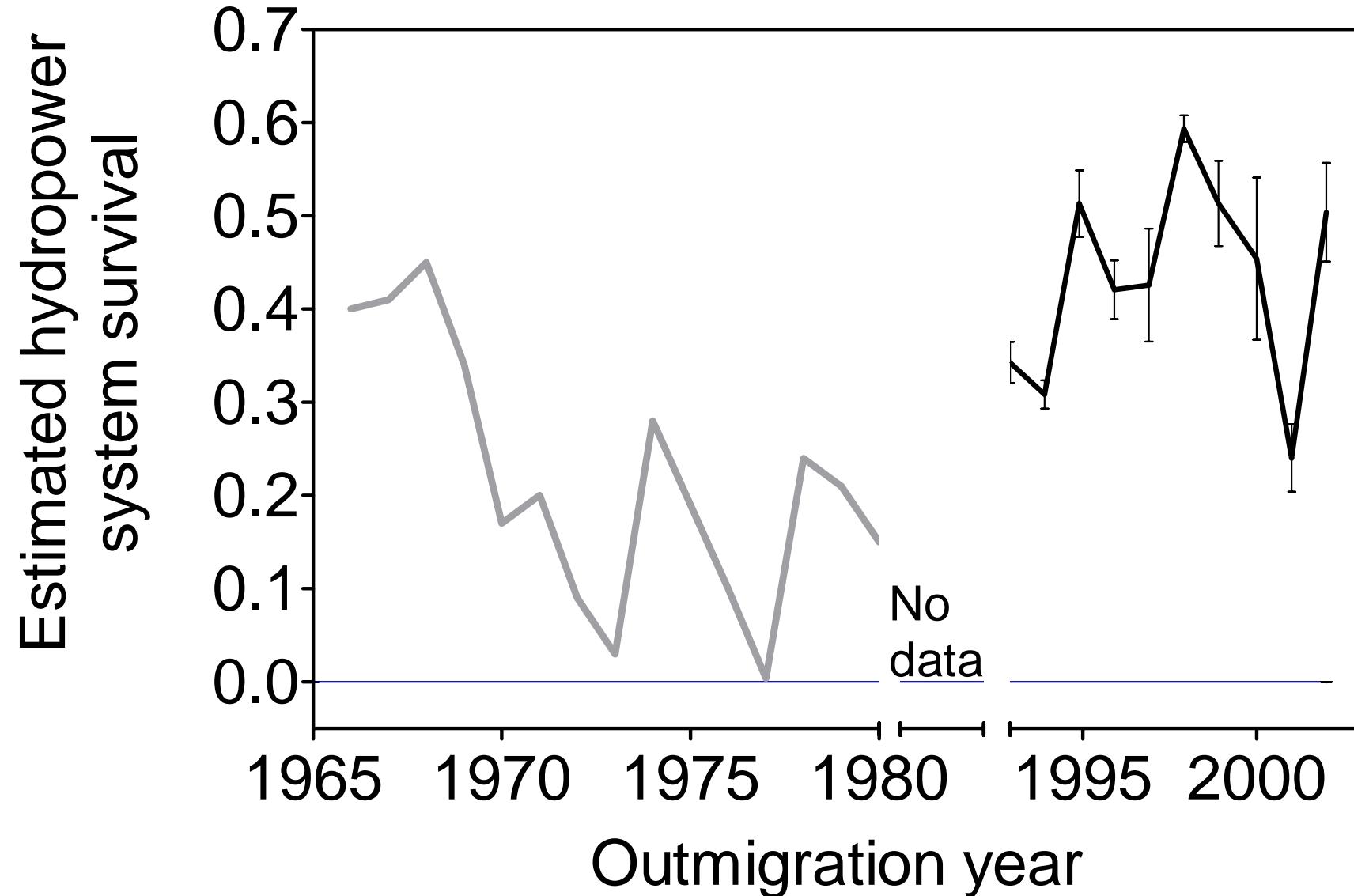
The Dalles Dam



Estimated yearling chinook travel time - Lewiston to Bonneville Dam



Chinook salmon



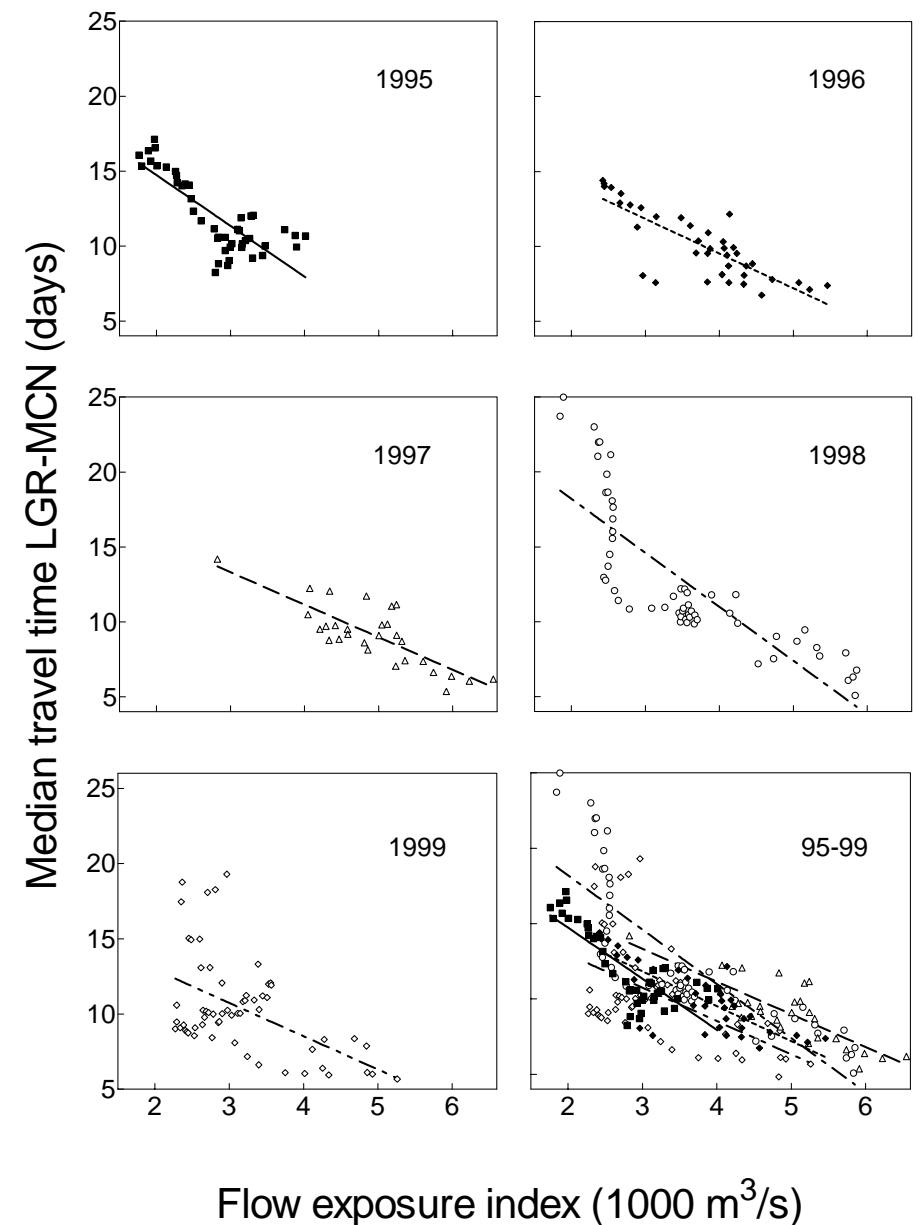
Relations of Travel Time and Survival with Flow



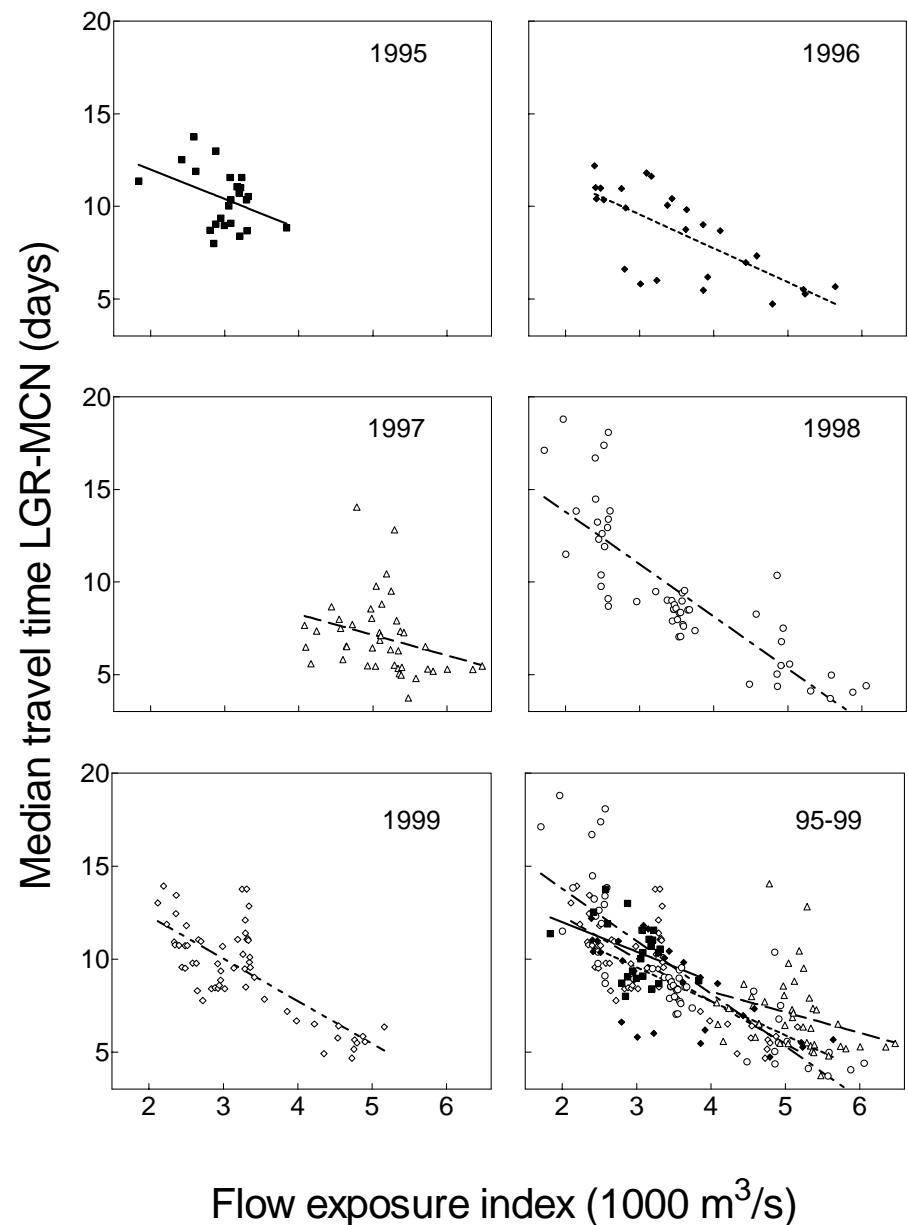
A strong and consistent
relationship
exists between flow
(water velocity) and
travel time



Yearling chinook salmon



Steelhead



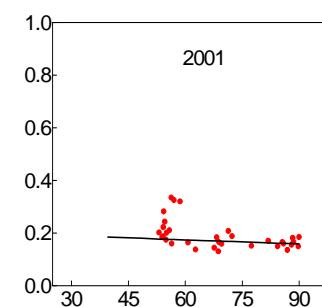
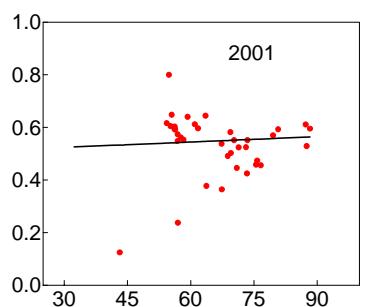
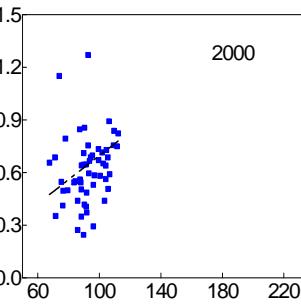
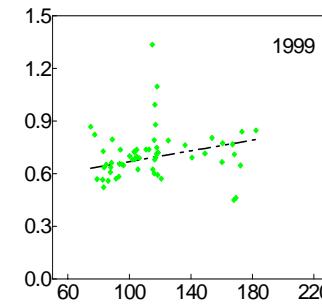
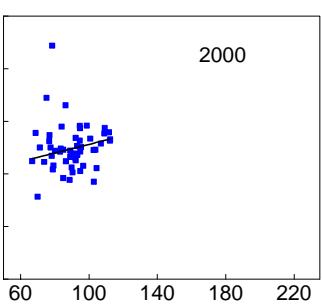
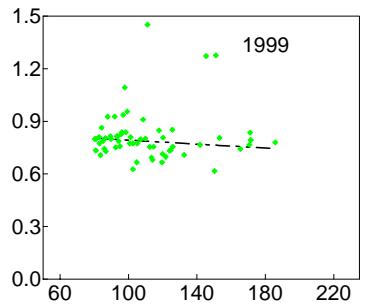
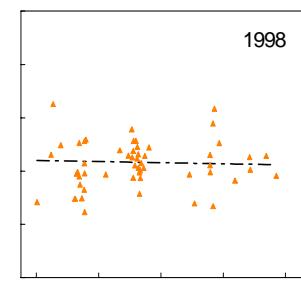
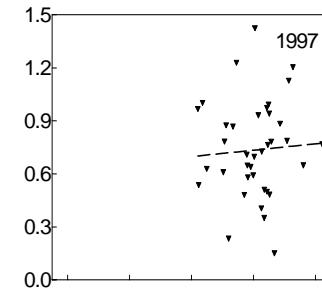
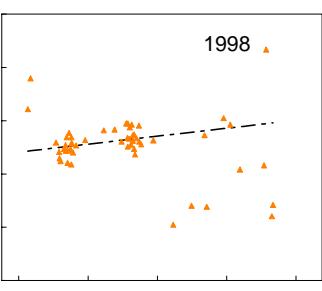
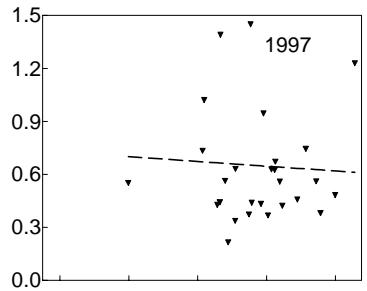
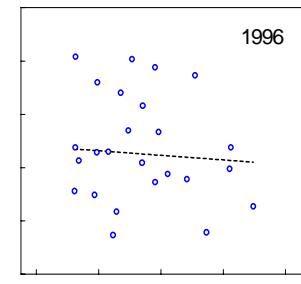
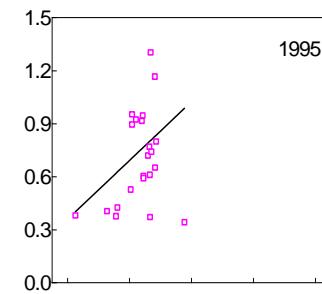
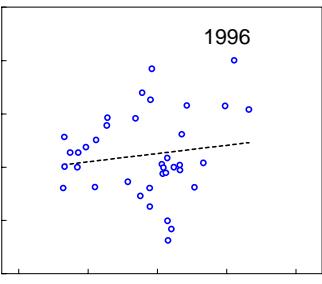
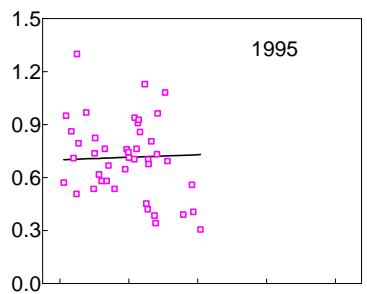
Travel time affects arrival to and through the hydropower system and thus, timing to the estuary and ocean.



Yearling chinook salmon 1995-2001.

Steelhead 1995-2001.

Estimated survival probability LGR-MCN

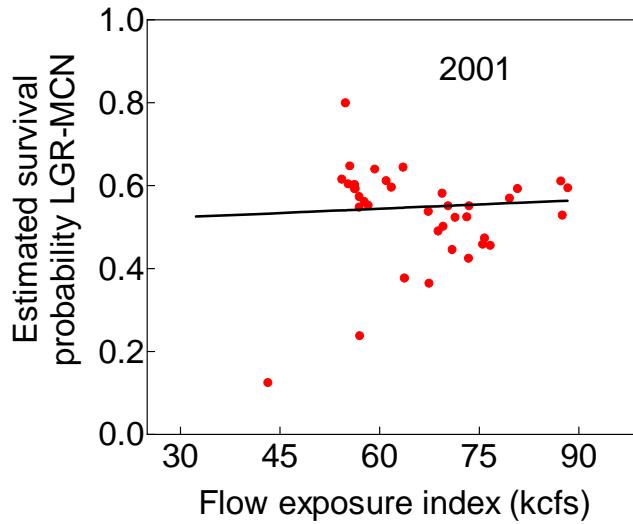


Flow exposure index (kcfs)

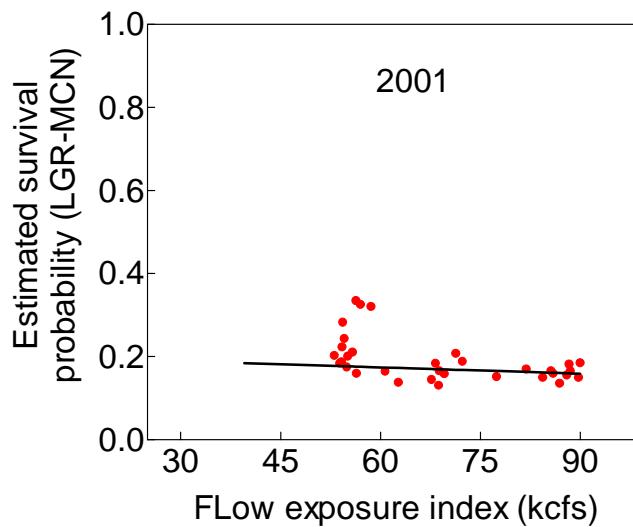
Flow exposure index (kcfs)



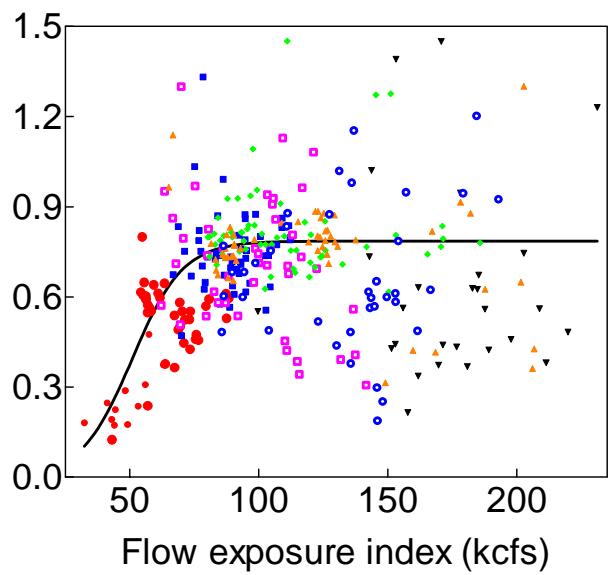
Yearling chinook salmon



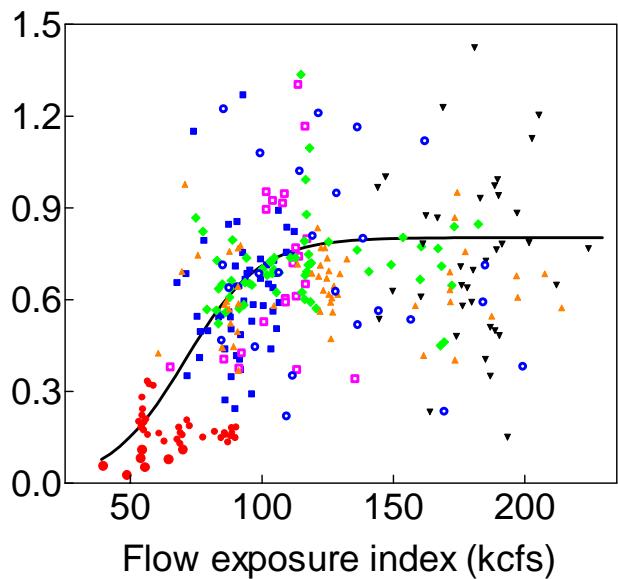
Steelhead



Yearling chinook salmon 1995-2001.

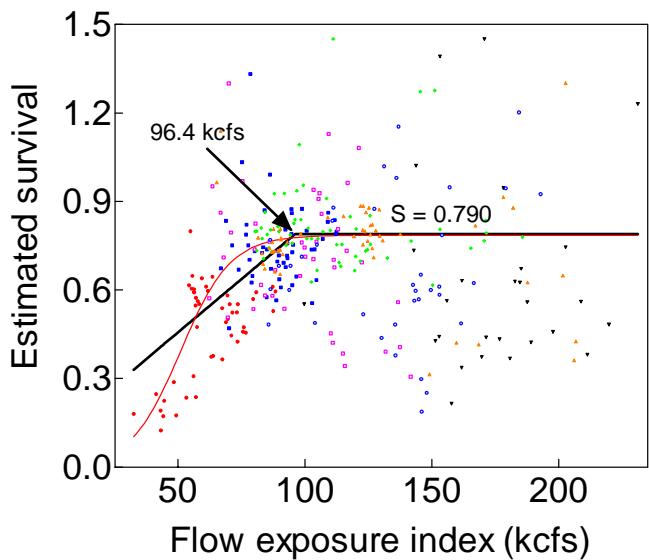


Steelhead 1995-2001.

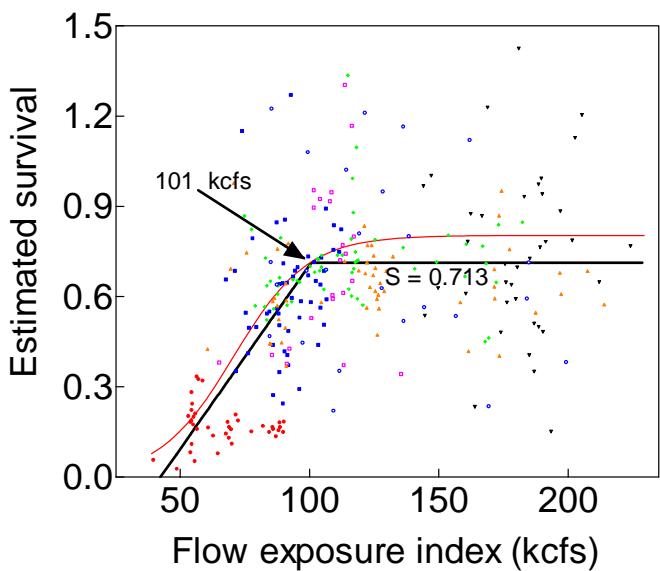


In 2001, little to no spill at all dams. In other years, spill to 2000 BiOp levels or to the gas cap.

Yearling chinook salmon 1995-2001.

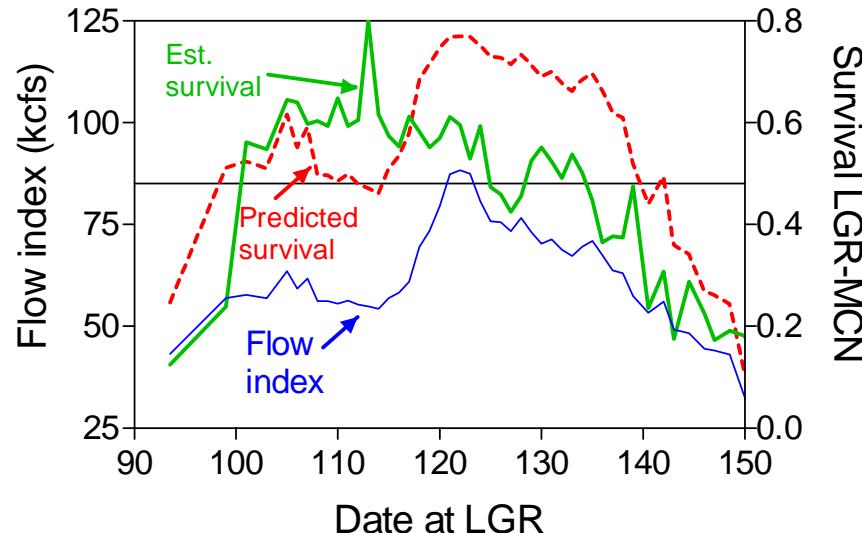


Steelhead 1995-2001.

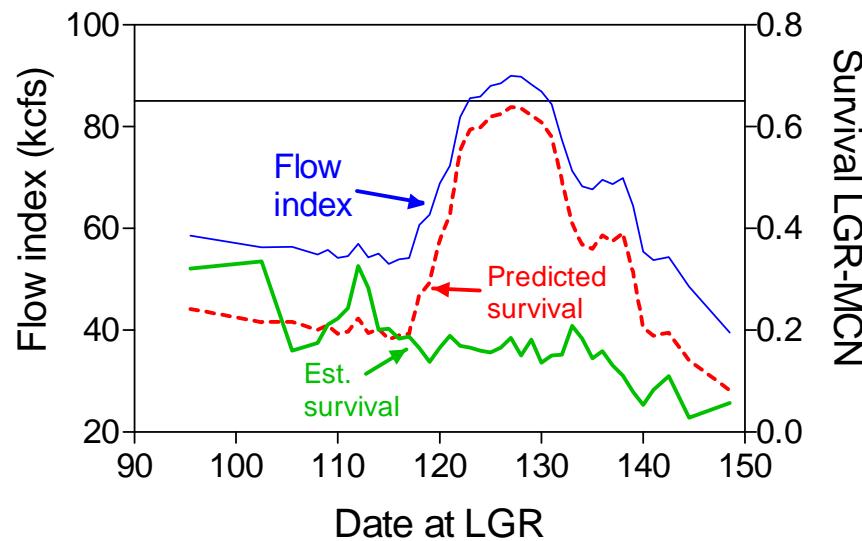


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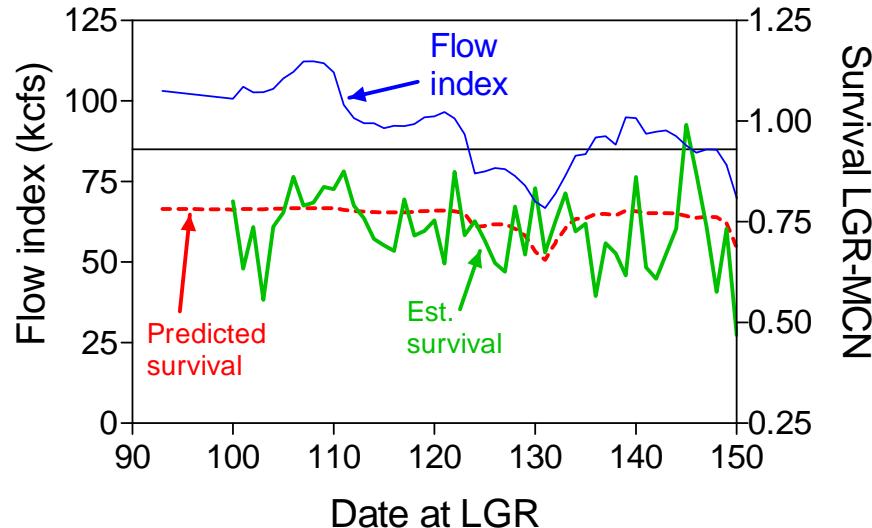
Yearling Chinook 2001



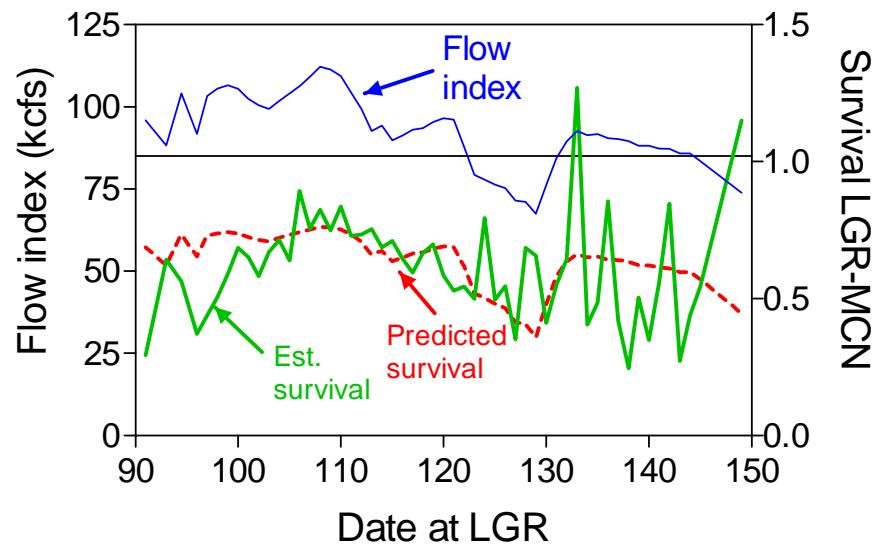
Steelhead 2001



Yearling Chinook 2000



Steelhead 2000



- Above some threshold average survival appears to vary little, is relatively high, and does not correlate with flow.
- Below the threshold, survival is lower.
- Within migration season (2001), relationship between flow and survival did not follow curve fit to multi-year data.



Conclusions – Spring Migrants

- Construction of dams has decreased water velocities and increased juvenile travel time.
- In low-flow years, juvenile survival decreases.



Conclusions – Spring Migrants

- Lack of a strong flow survival relationship from LGR-MCN under generally good flow conditions is not surprising given the high estimated juvenile survival in this reach.
- Most losses from LGR-MCN occur from dam passage, leaving little mortality in the reservoirs where flow would affect survival the most.
- Lack of a strong flow/survival relationship in this short reach does not support an end to flow augmentation.

Conclusions – Spring Migrants

- Adult returns vary widely depending on timing of the juvenile migration through the estuary and into the ocean.
- Presently, we cannot predict when favorable estuary/ocean conditions will exist.

