

MUSSEL DENSITY AT INTERSTATE PARK, ST. CROIX RIVER, MN AND WI: A NEW EQUILIBRIUM?

Daniel J. Hornbach, Mark C. Hove and Kelly MacGregor.

Departments of Biology, Environmental Studies and
Geology, Macalester College. St. Paul, MN

The St. Croix River contains a diverse and dense community of mussels

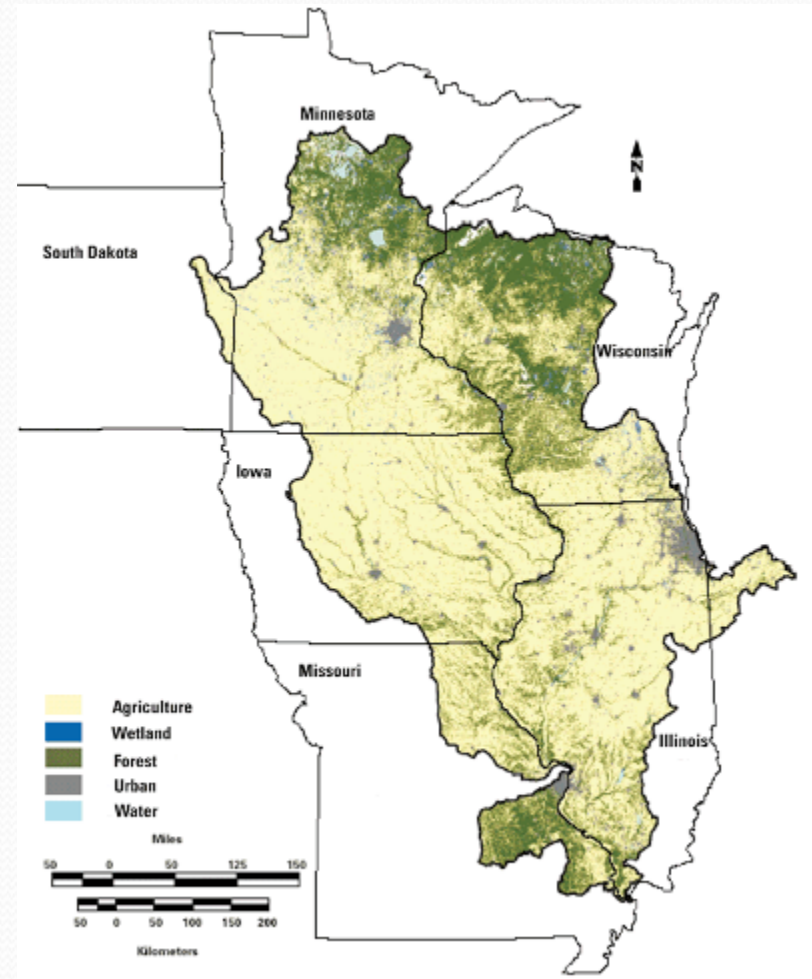


Juvenile Winged Mapleleaf
Collected in 2008



The vast majority of
Minnesota's mussel species are
represented in the St. Croix
River

The mussel fauna of the upper Mississippi River is fairly homogeneous and thus the St. Croix is a refuge for an entire biogeographic region

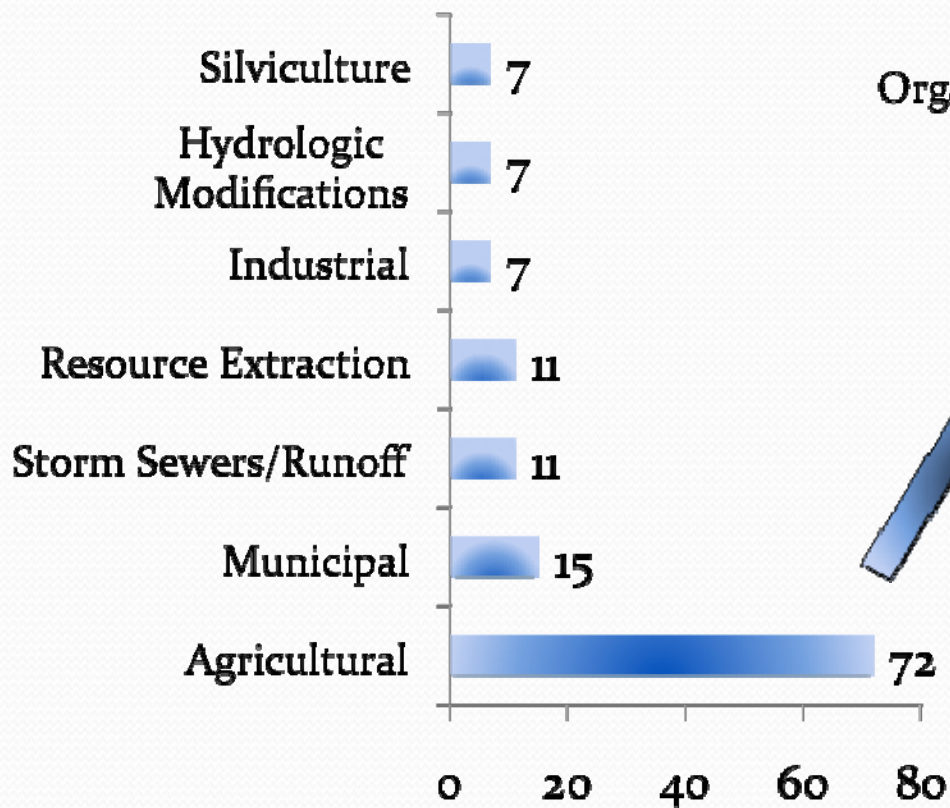


Lampsilis higginsii

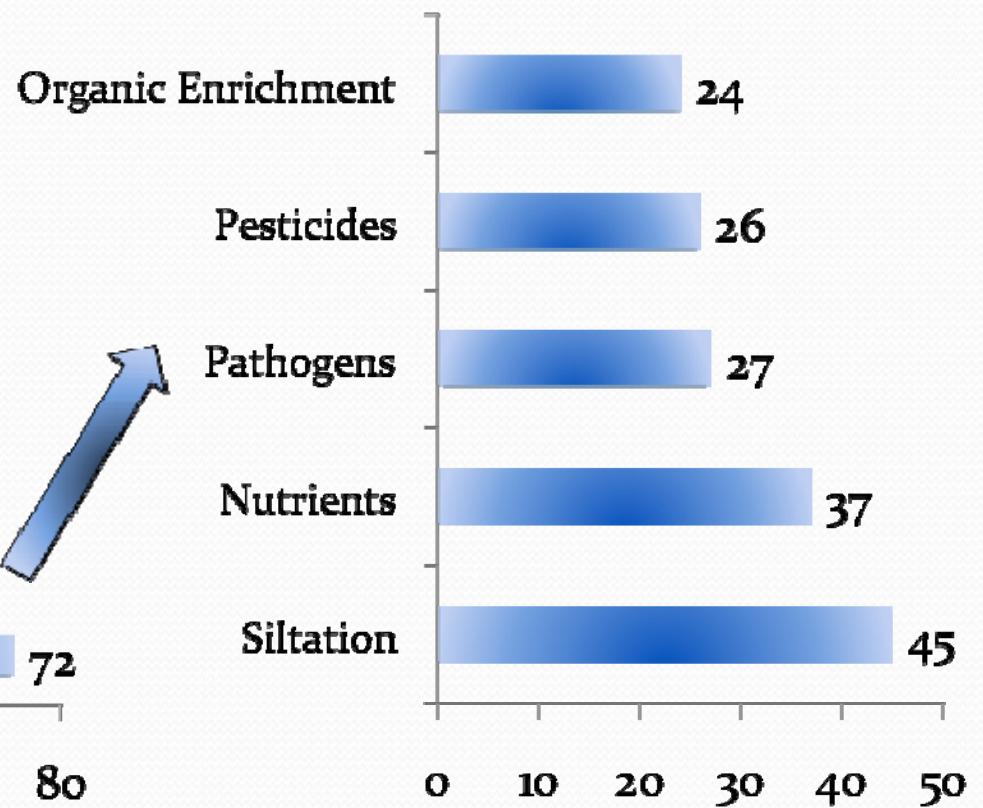


Rivers are impaired most by agriculture, especially siltation

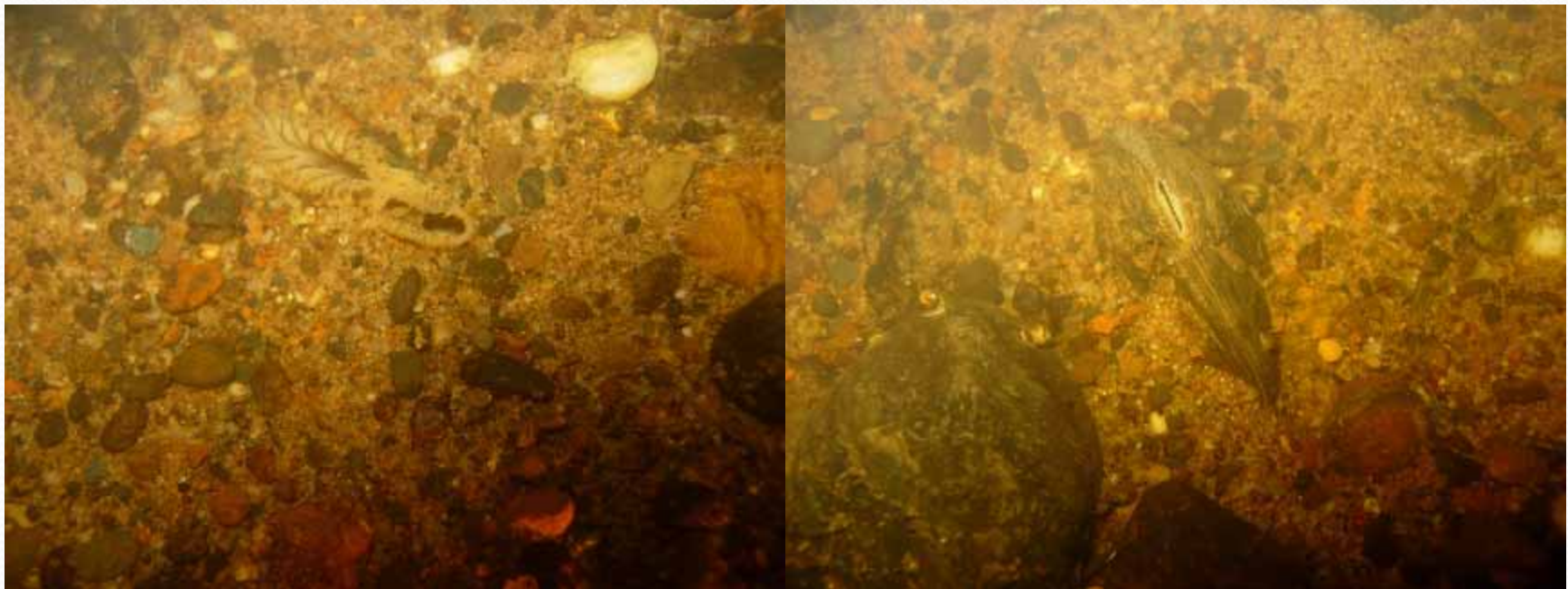
Impaired kilometers Affected (Percent)



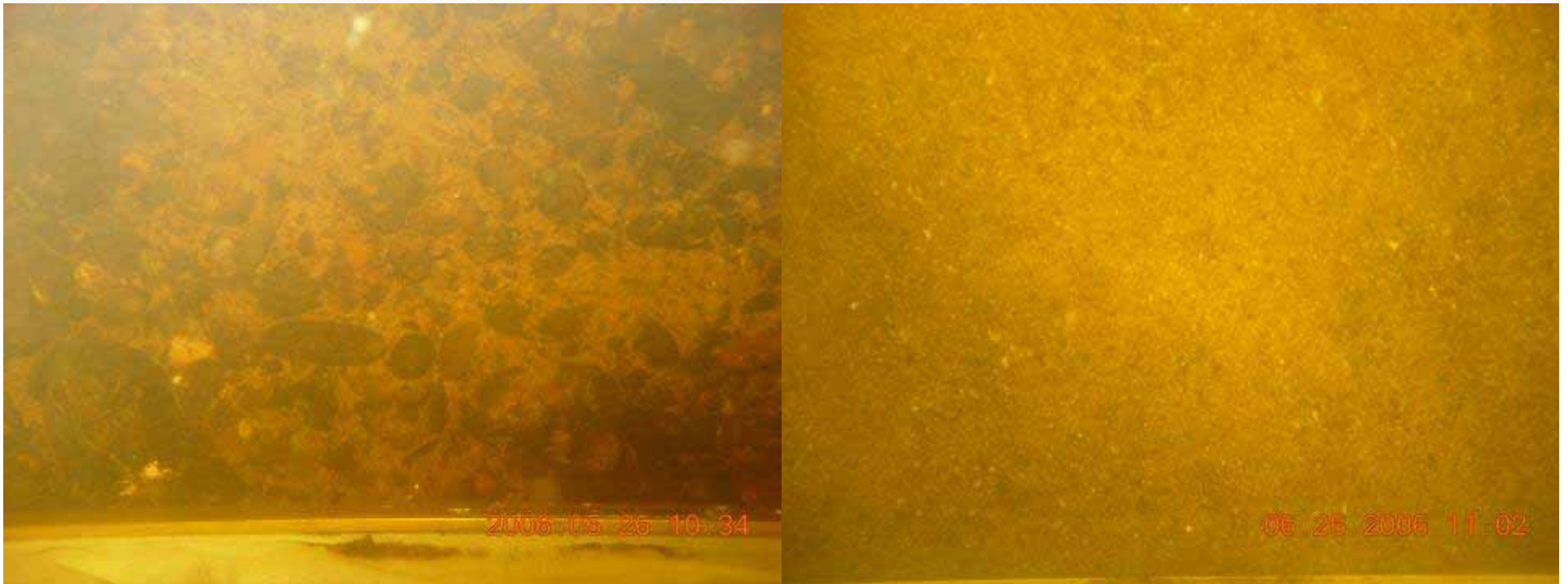
Impaired Kilometers Affected (Percent)



Siltation can influence mussels in a number of ways – mussels are filter-feeders



Mussels tend to be found in non-depositional, stable substrates



Interstate Park – Mean Density
54.7 mussels/m²

Interstate Park – Mean Density
0 mussels/m²

Because of the unique life-cycle of freshwater mussels, sediment size and stability is important for fish hosts and juvenile mussels



ENDANGERED MUSSELS



The Carolina heelsplitter has disappeared from all but a few streams in the Carolinas. In North Carolina, it is found mainly in Union County.



The endangered Tar spiny mussel is one of only three freshwater mussels with spines and lives in rivers and streams only in Eastern North Carolina.



FRESHWATER MUSSELS' LIFE CYCLE

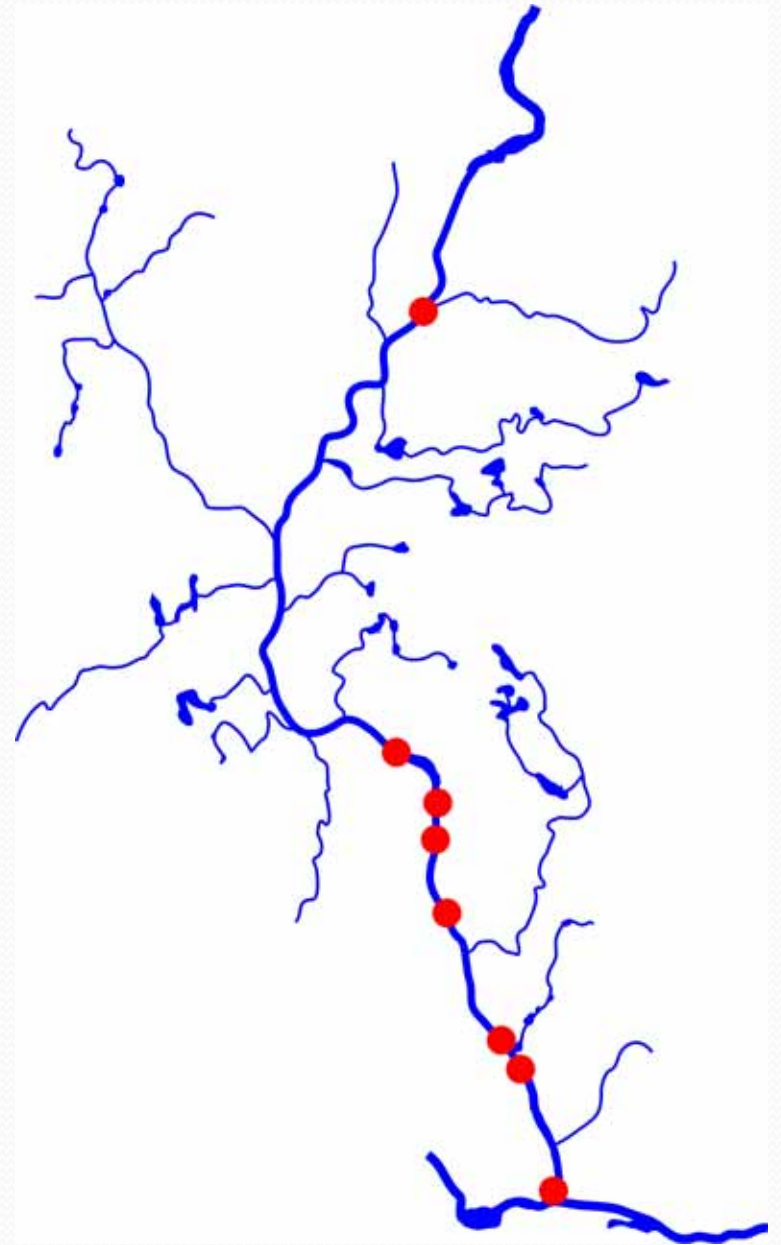
More than 60 species of freshwater mussels live in the rivers and streams of North Carolina, but more than half are in trouble. Researchers at N.C. State University are trying to restore some species by raising them in the laboratory and reintroducing them into the wild.



Sources: N.C. State University; Illustrations by Emma Skarck

DALE THORNTON / The News & Observer

We have been
conducting long-term
monitoring at 8 sites
beginning in 1991



Sampling Methodology



Mussels Collected



Sample Sieved



Sediment weighed

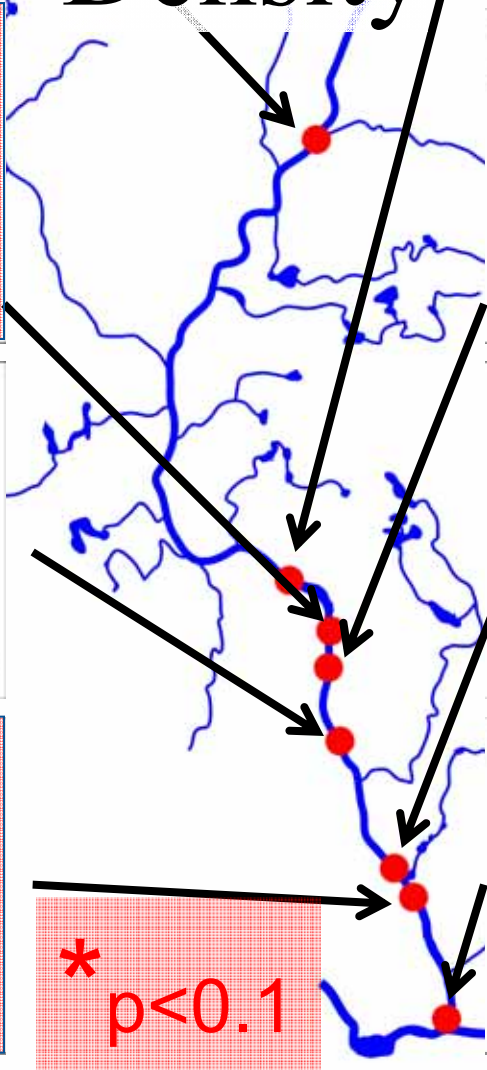
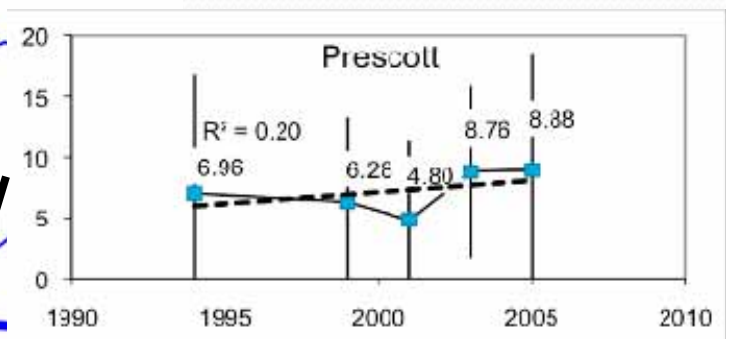
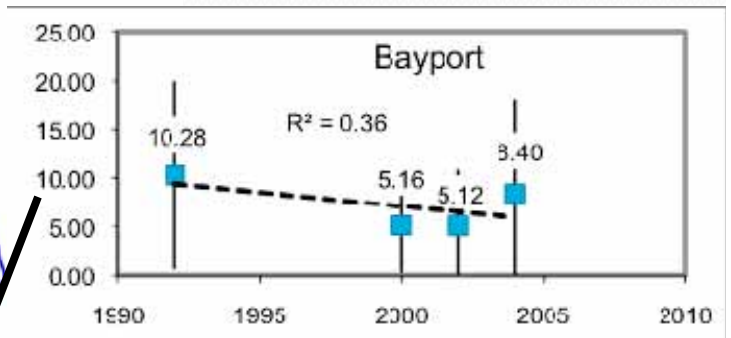
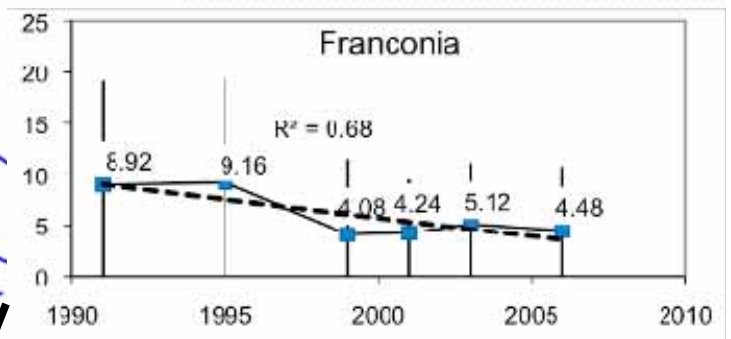
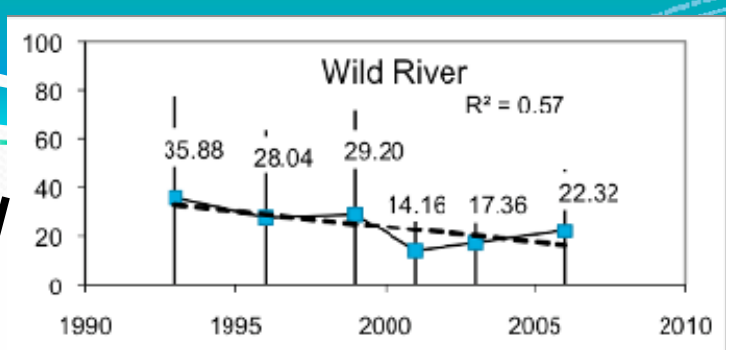
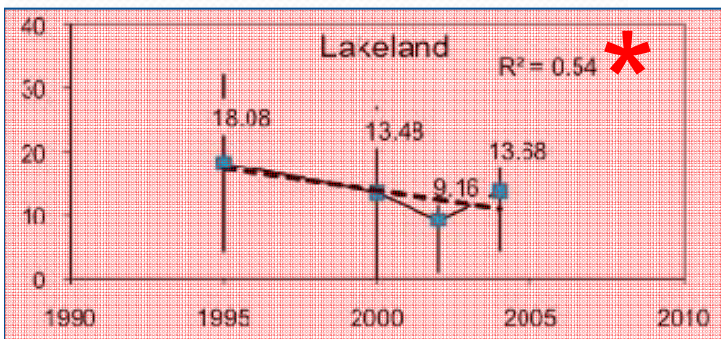
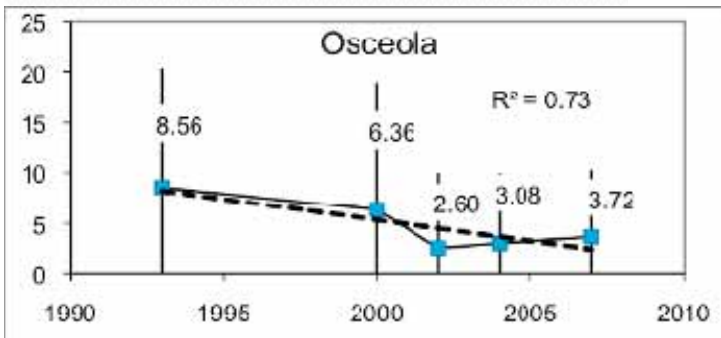
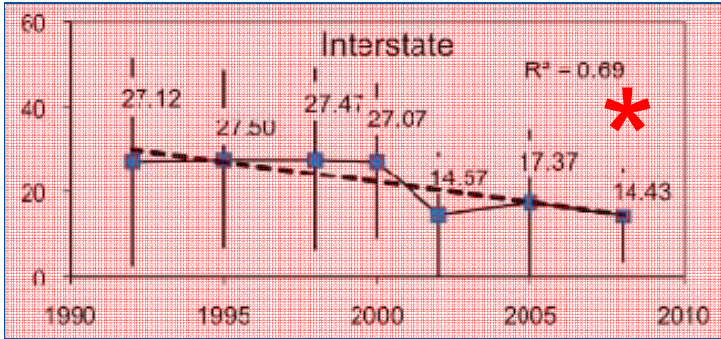
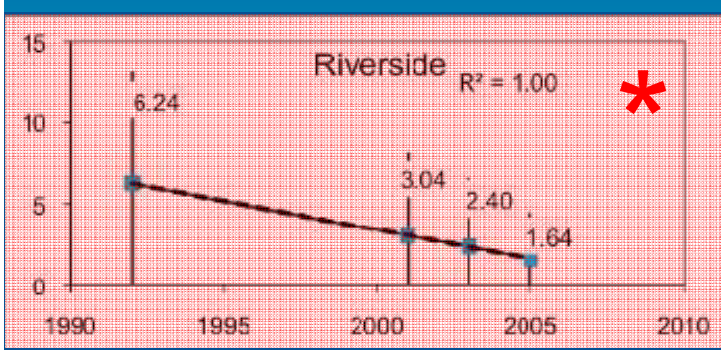


Mussels identified

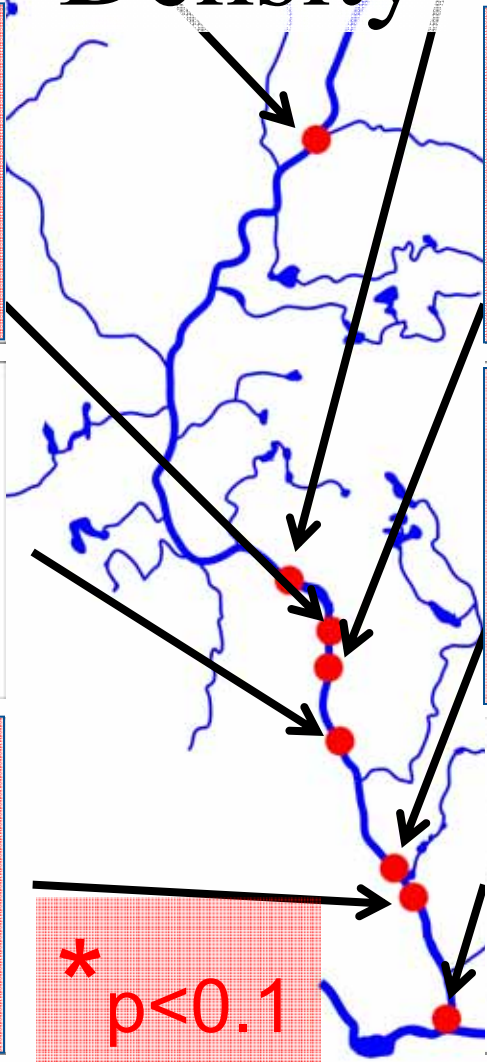
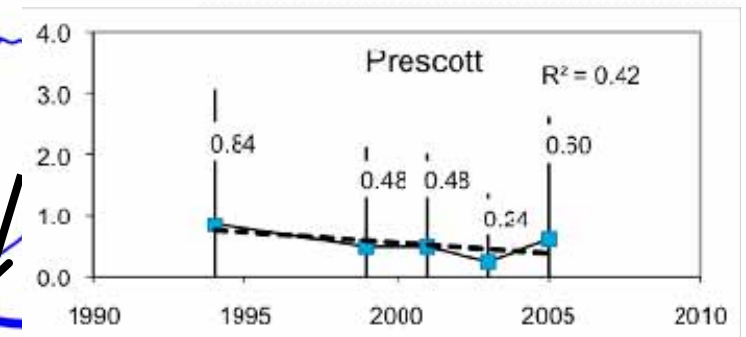
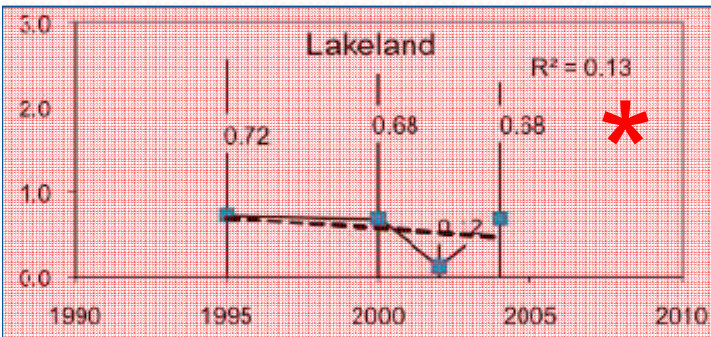
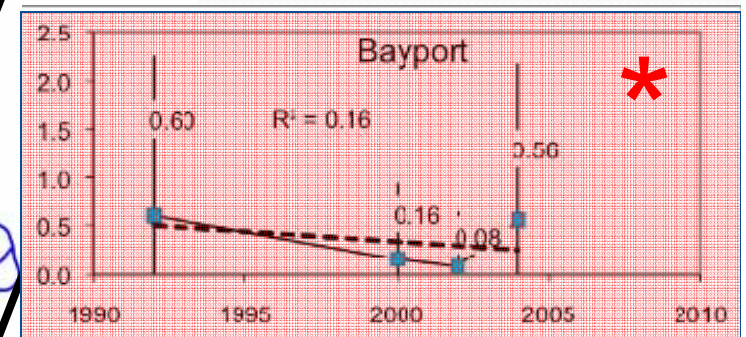
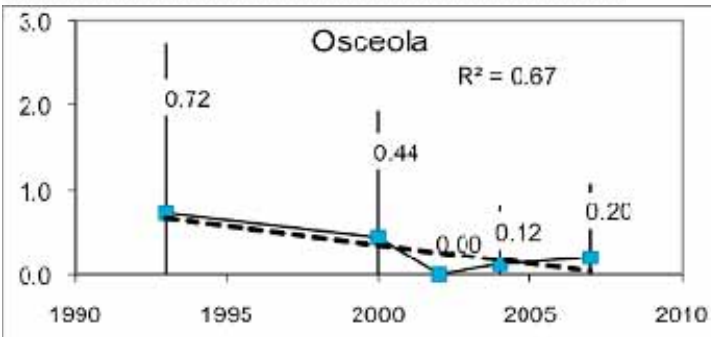
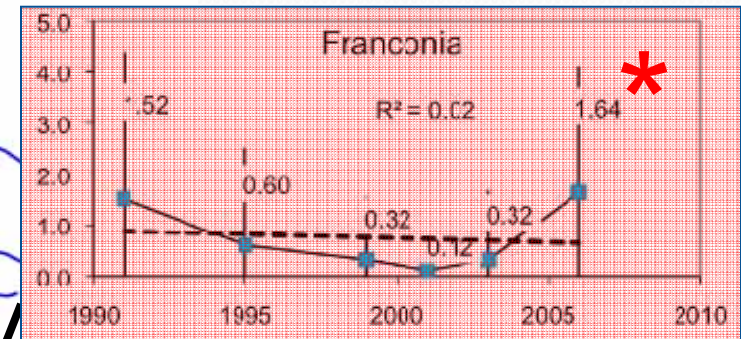
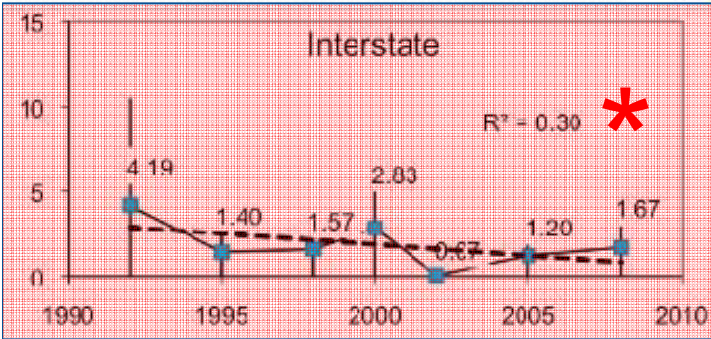
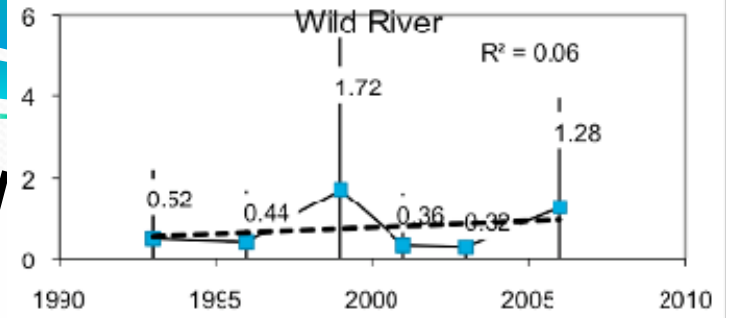
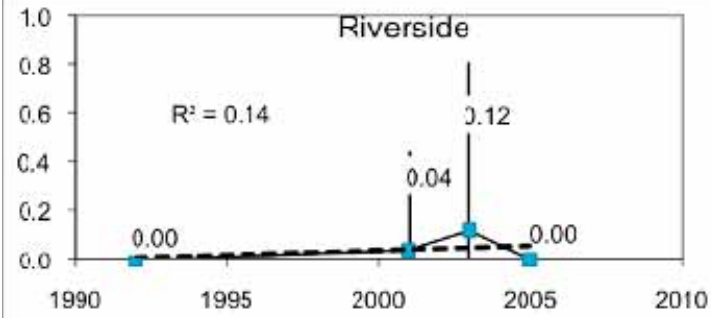


Mussels measured

Adult Mussel Density

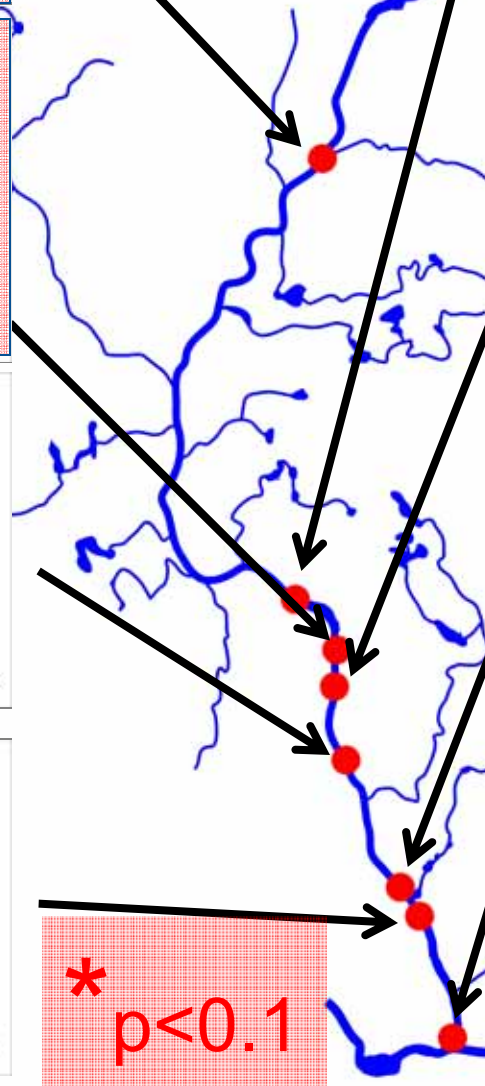
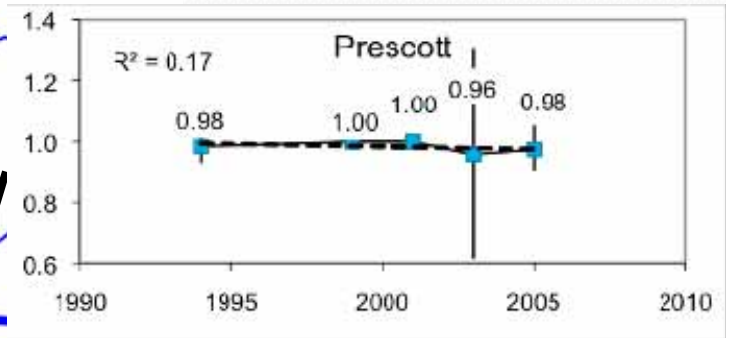
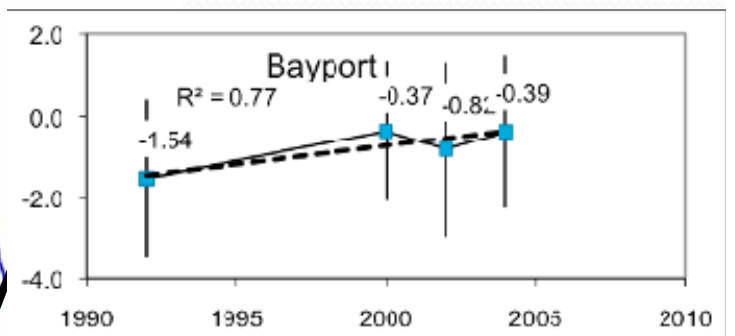
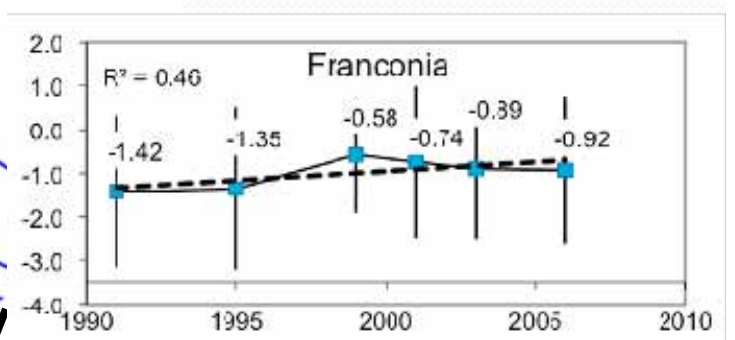
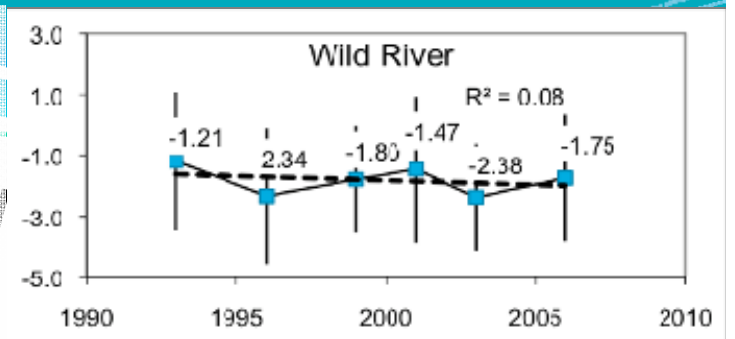
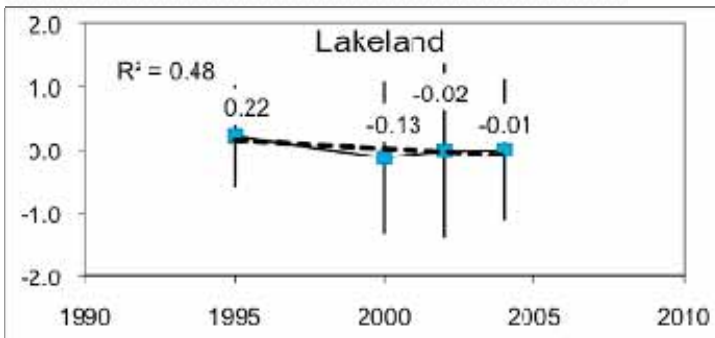
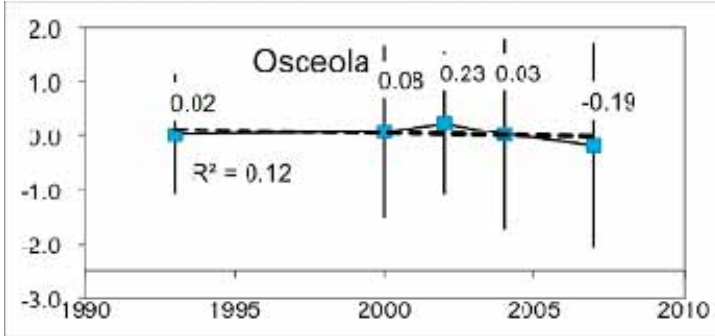
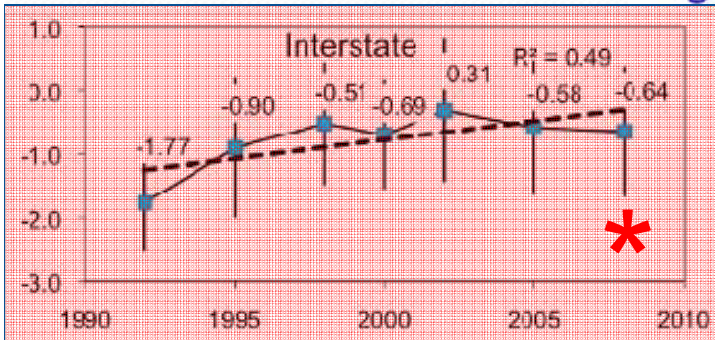
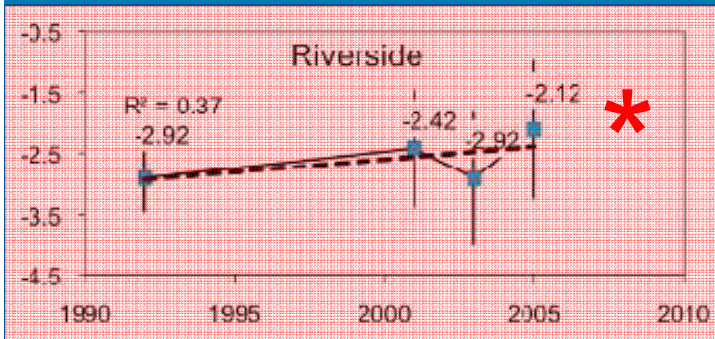


Juvenile Mussel Density



* $p < 0.1$

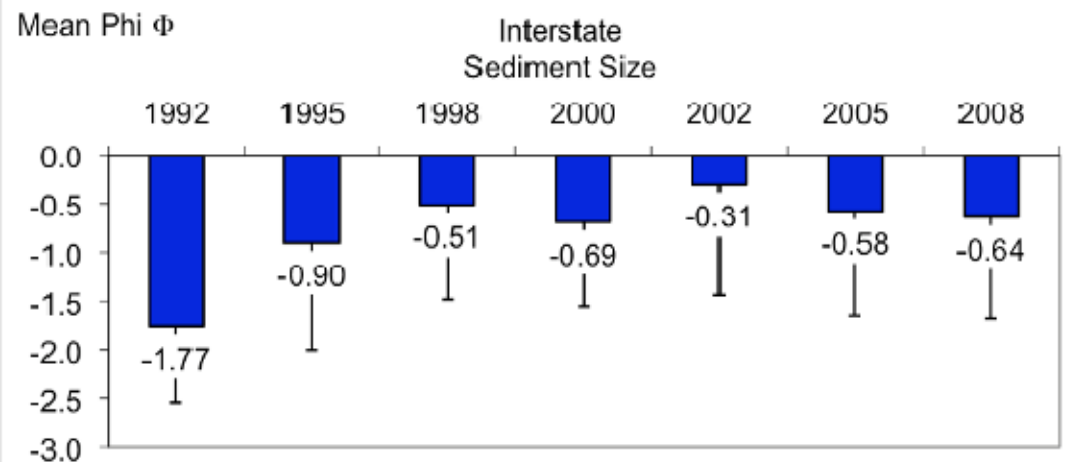
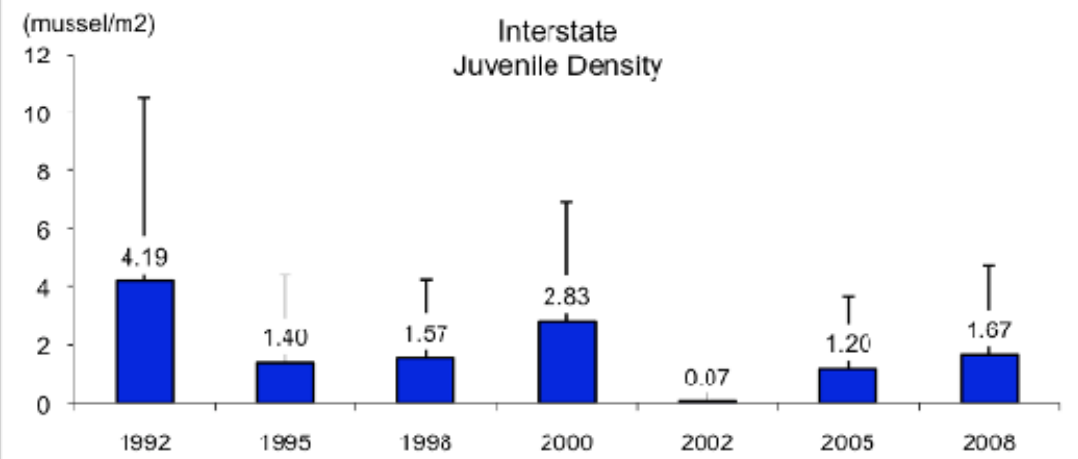
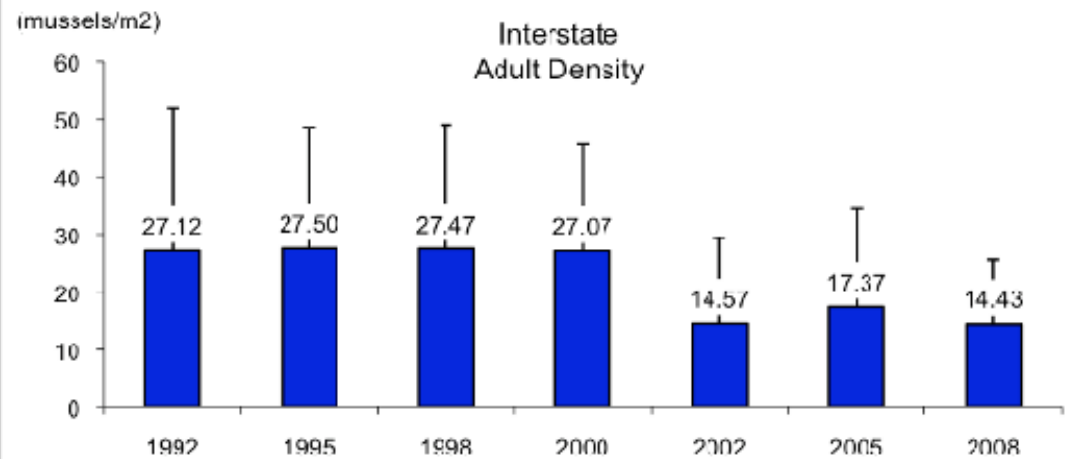
Sediment size (Φ)



* $p < 0.1$

Interstate has had significant changes in

- Adult Density
- Juvenile Density
- Sediment size



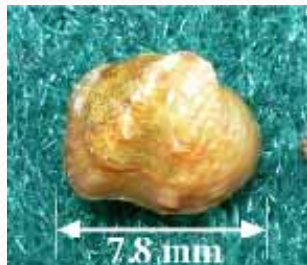
Winged Mapleleaf

Federally
Endangered
Mussels at
Interstate Park



Higgins Eye

Since adult mussels live for decades, changes in population density may occur only slowly. Changes in juvenile density may be more responsive to acute environmental changes.



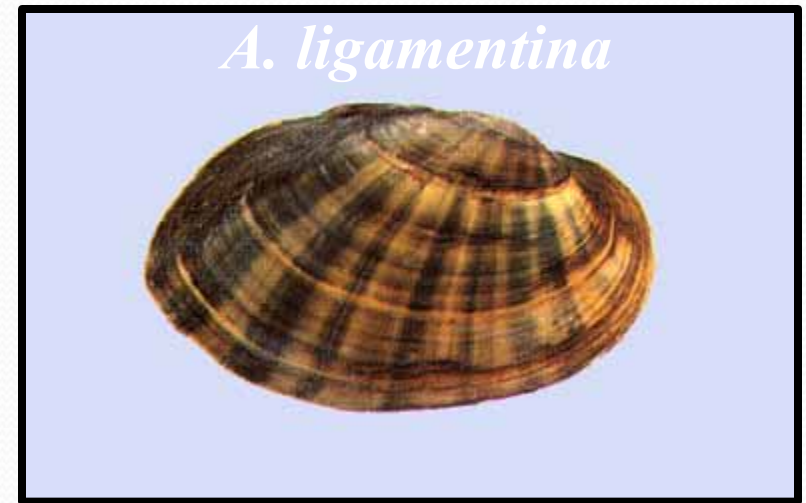
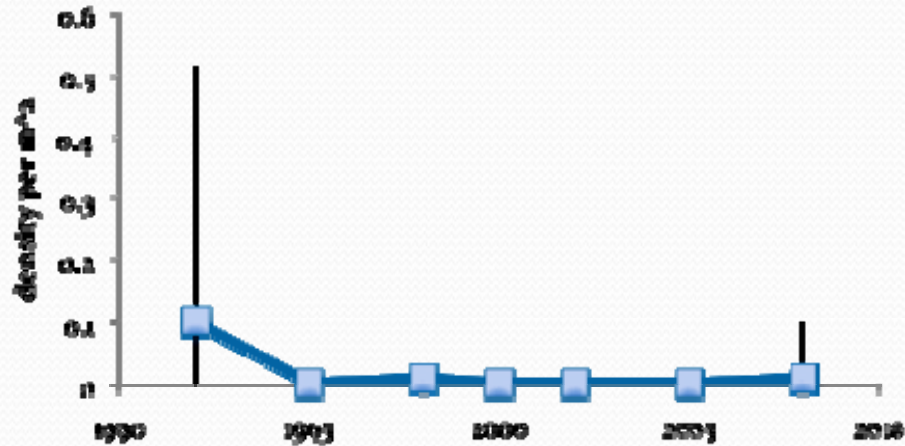
Juveniles are difficult to collect but our sampling technique allows us to collect them



Juvenile Density for various species

no significant change

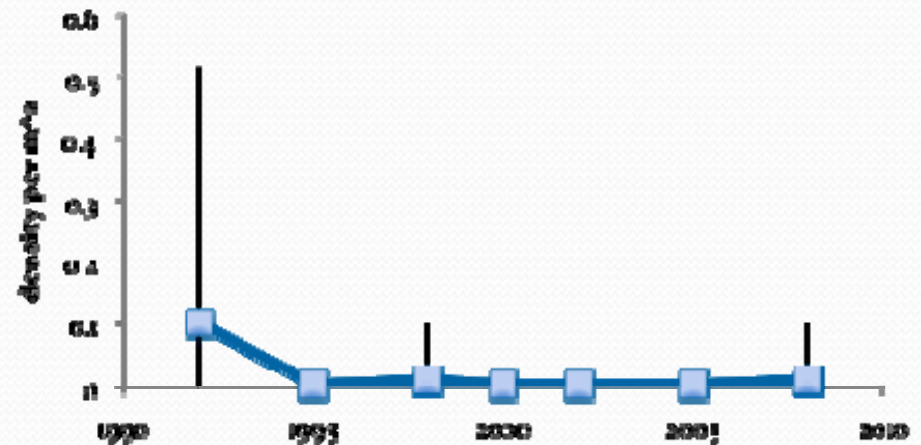
A. ligamentina - juvenile



Q. pustulosa



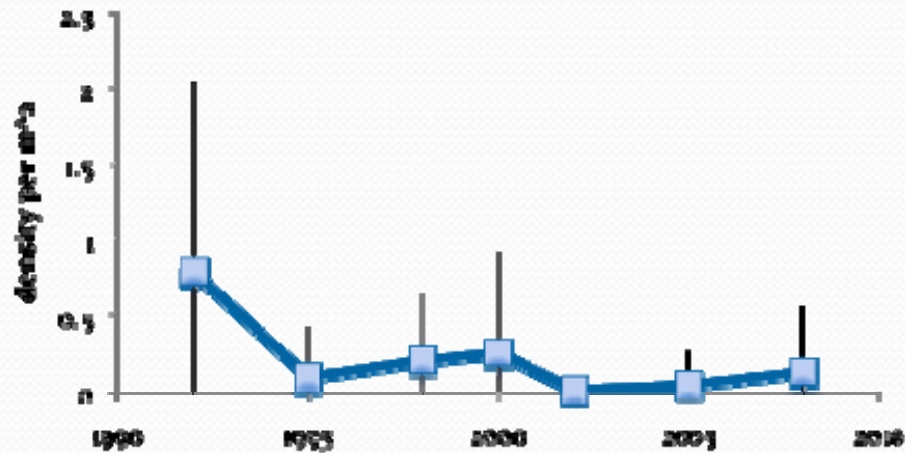
Q. pustulosa - juvenile



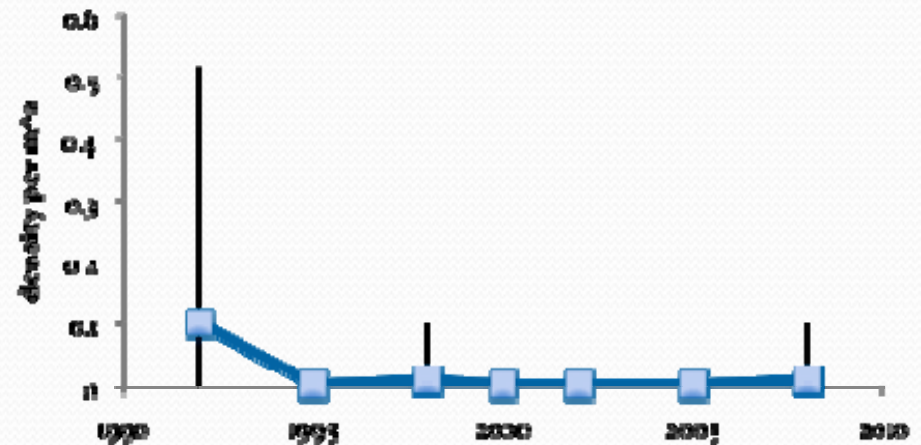
Juvenile Density for various species

significant change

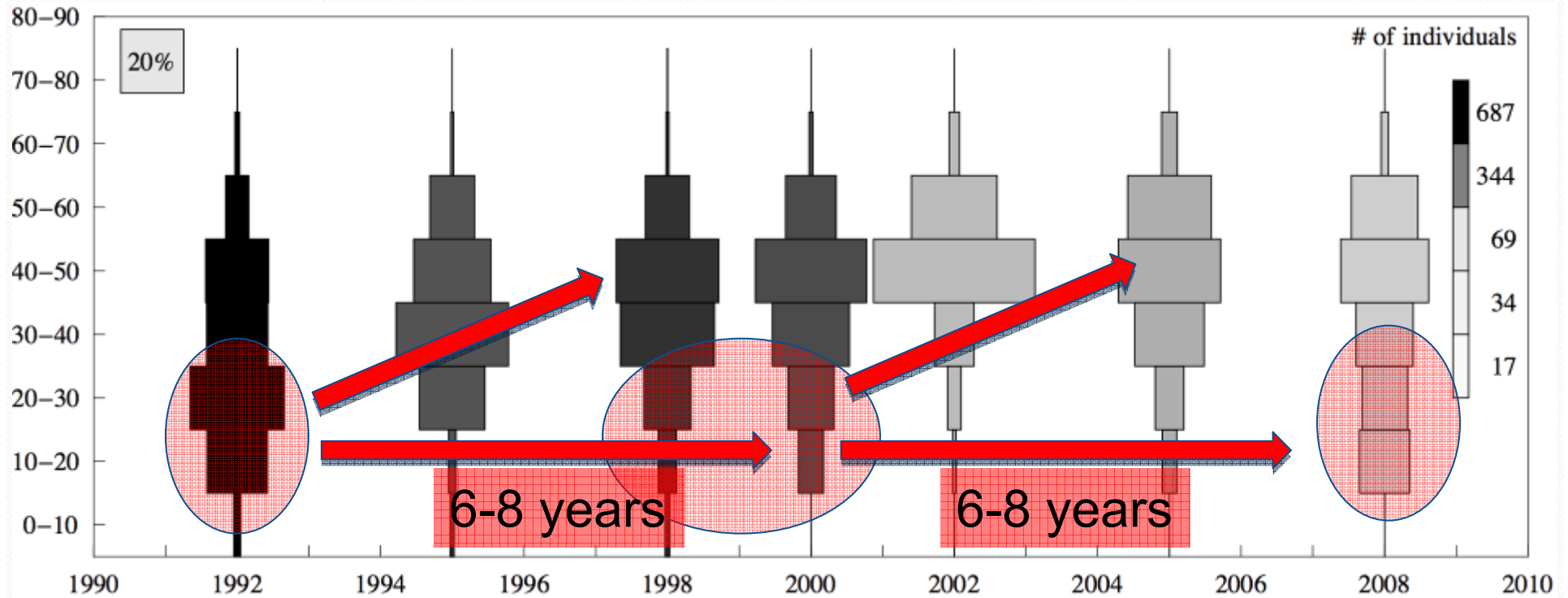
T. truncata - juvenile



F. flava - juvenile

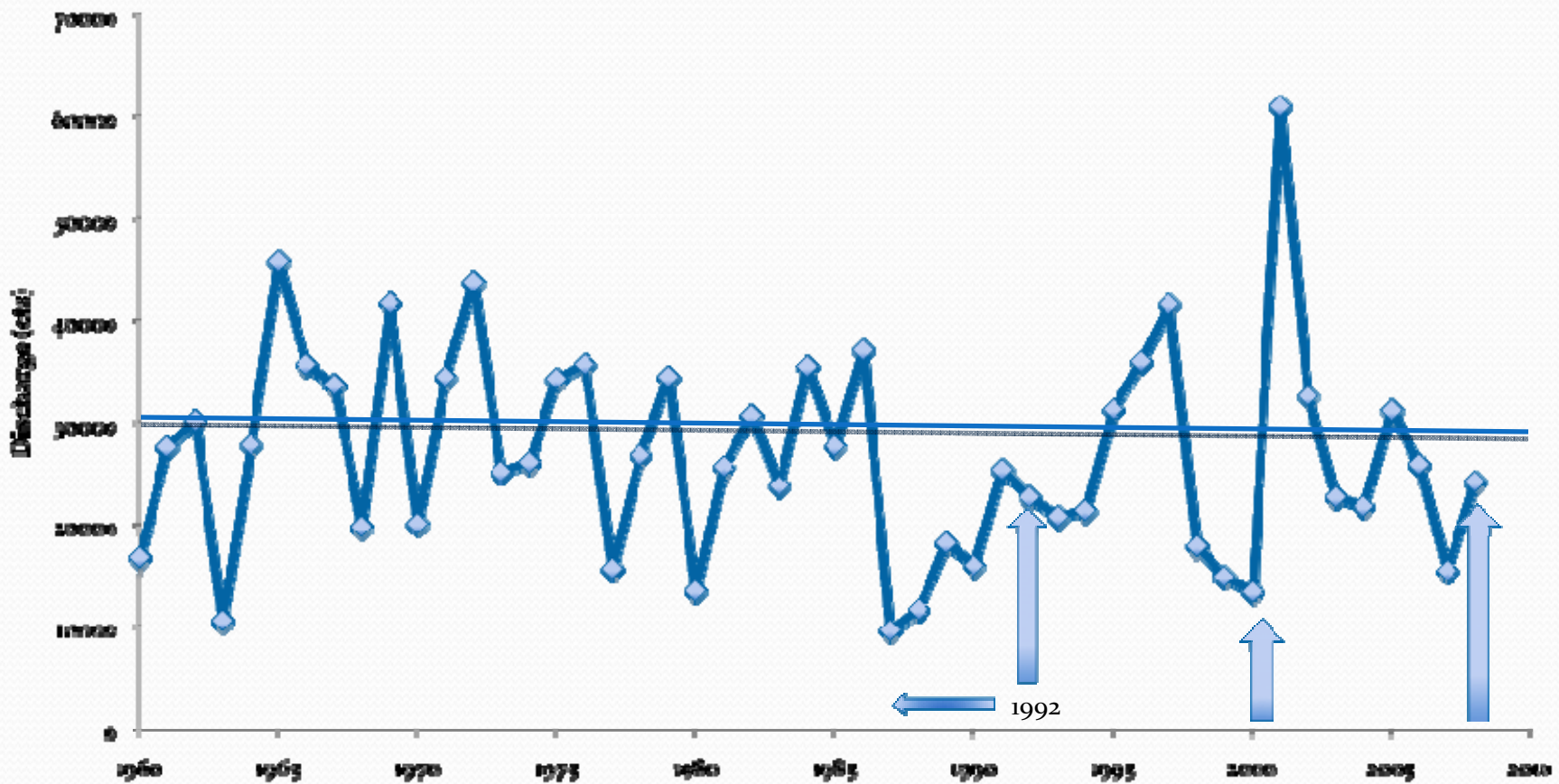


Truncilla truncata - Deertoe

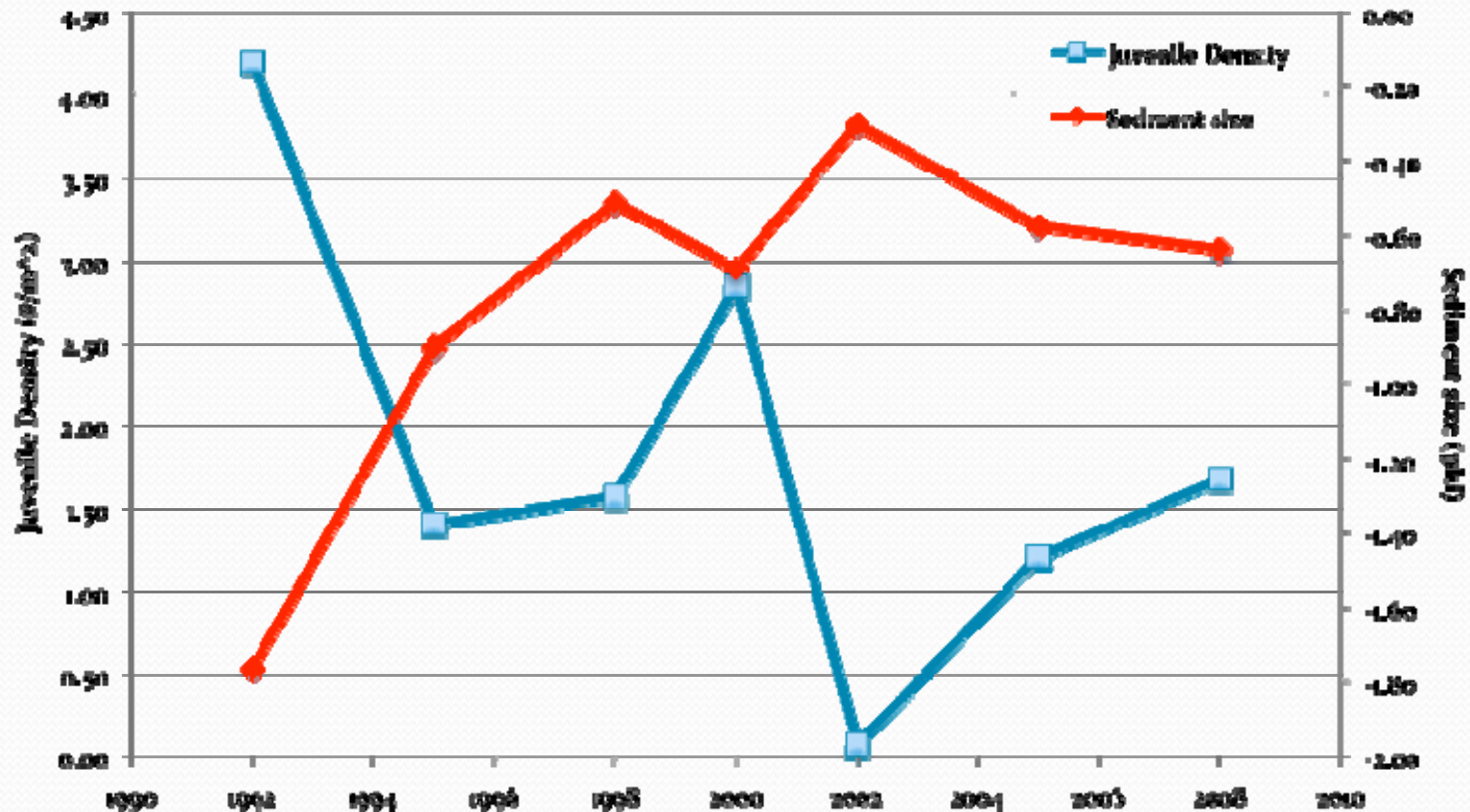


Do periods of low discharge correlate with higher reproductive output?

Peak Discharge

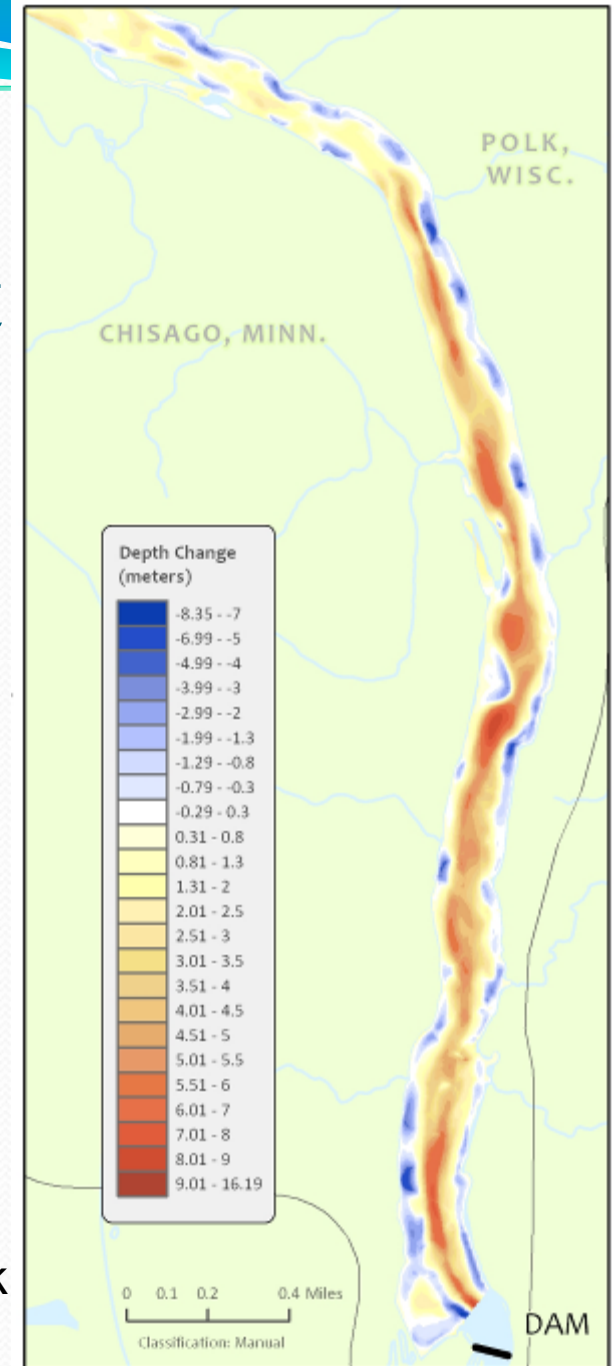


Sediment Size and Juvenile Density are Inversely Related at Interstate



Sediment is accumulating in the reservoir above the dam at St. Croix Falls

Change, 1968-2008



Normal Summer Flow
Interstate Park



Flood of 2001 – Interstate Park
and St. Croix Falls Dam