Fishery Management Issues

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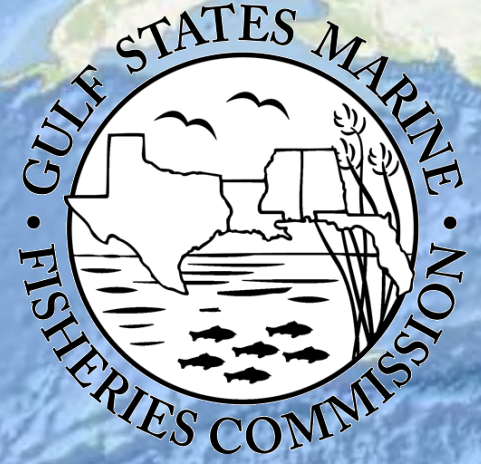


Fisheries

The northern Gulf of Mexico supports commercial and recreational fisheries which generate over $2 billion annually. These fisheries are directly and indirectly impacted by freshwater diversions. How will freshwater diversions along with an associated increase in nutrients impact marine fish populations?

Salinity Impacts

In fish and shrimp, changes in salinity affect the metabolic cost of osmoregulation and food conversion efficiencies. In oysters, changes in salinity affect filtration and respiration rates.

In examining brown and white shrimp, Rozas and Minello (2011) found that reduced growth in low salinity environments is likely due to the combined effects of increased metabolic costs and less food in these areas.

River diversions that reduce estuarine salinities over a large portion of available habitat during peak recruitment periods may reduce overall growth rates and shrimp productivity in the affected areas.

Salinity Impacts

The impact on shrimp productivity would depend on the magnitude, duration, and timing of freshwater input.

Other crustaceans would be similarly impacted. Blue crabs have higher growth rates at salinities of 15 or 30 ppt than at 3ppt.

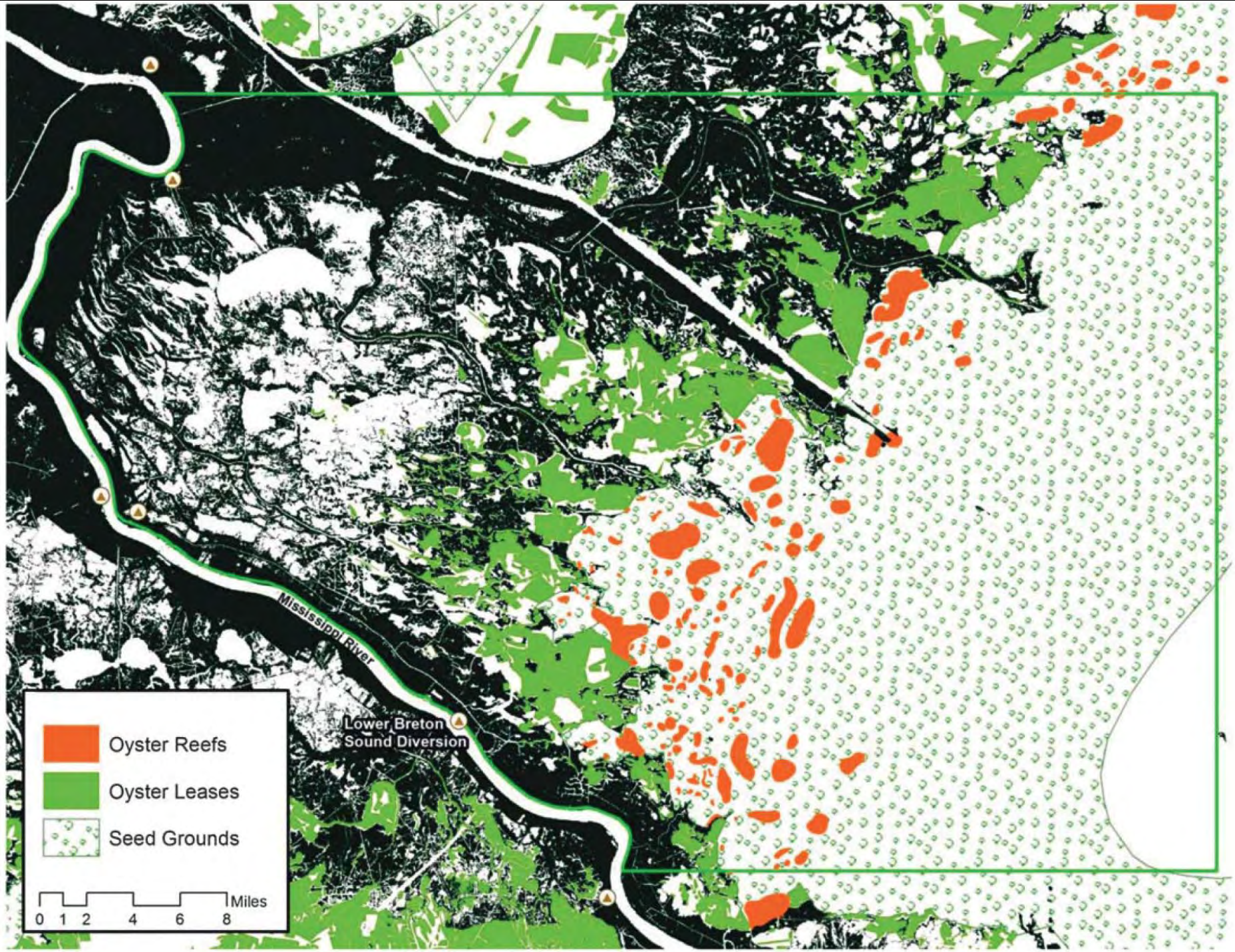
Timing

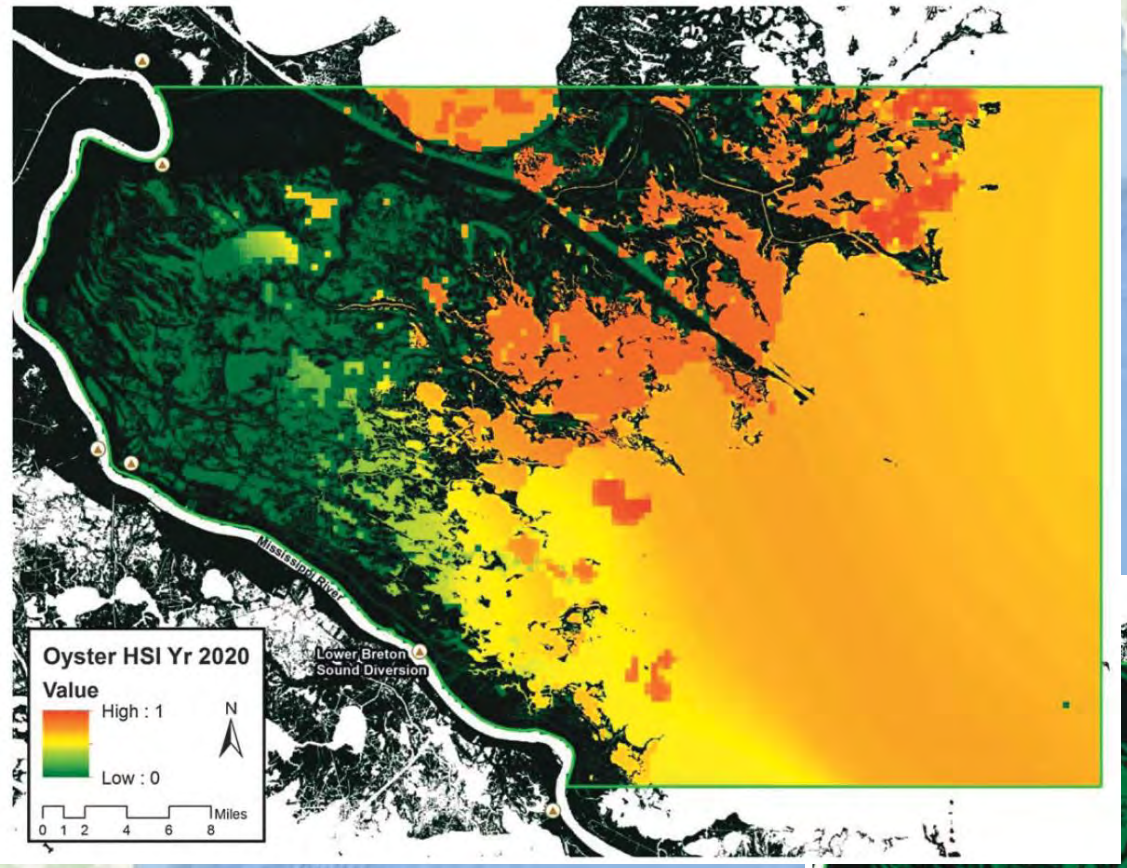
Adamack et al. (2012) found that diversions during February and March had little effect on brown shrimp, but 30 and 60 day diversions starting in April and May often had large, negative impacts on brown shrimp production. April and May diversions that dropped water temperature by 5°C or more could decrease juvenile brown shrimp production by 40 to 60% compared with no diversion scenarios.

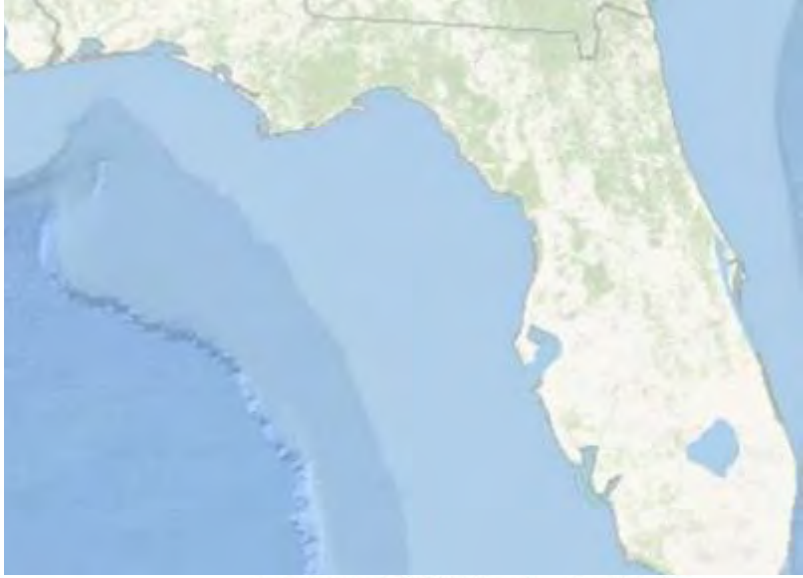
The same magnitude of temperature and salinity change in February or March caused much weaker responses with reductions of less than 11% in February, regardless of diversion length, and by up to 11% for short diversions and 31% for long diversions in March.

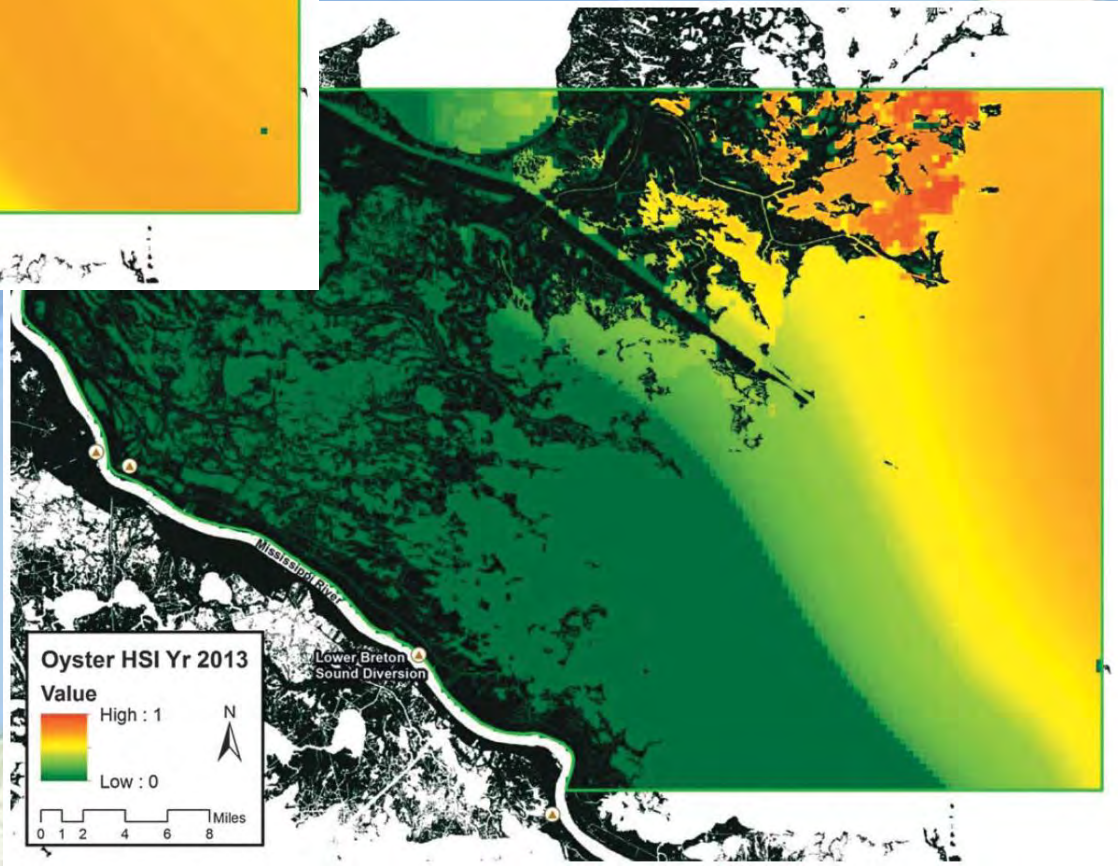
Oysters

Oysters are an important habitat for other organisms. Oysters also support an important commercial fishery that was worth $43.2 million in Louisiana and Mississippi in 2012.


Mississippi River
Lower Breton
Sound Diversion
Oyster Reefs
Oyster Leases
Seed Grounds
0 1 2 4 6 8
Miles







Soniat et al. 2013. Predicting the effects of proposed Mississippi River diversions on oyster habitat quality; application of an oyster HSI model.

Habitat Changes

Evidence suggests that nutrient enrichment from freshwater diversions could cause compositional changes in plant species. Nitrogen additions have been shown to decrease abundance of maidencane (*Panicum hemitomon*), while increasing the abundance of cutgrass (*Leersia hexandra*).

High nutrient concentrations could adversely affect marsh plants by causing faster soil decomposition, lower soil strength and lower accumulation of below ground biomass thereby increasing erosion.

Habitat Changes

Salinity and nutrient conditions also have indirect effects on herbivory. Visser et al. (2006) found salt marshes with higher nitrogen levels generally have higher muskrat populations.

Merino et al. (2008) found that the response of *Spartina patens* growth to nutrient availability varies with salinity such that nutrient availability has more effect on growth at lower salinity levels than at higher salinity levels.

Invasive Species

Rio Grande Cichlids

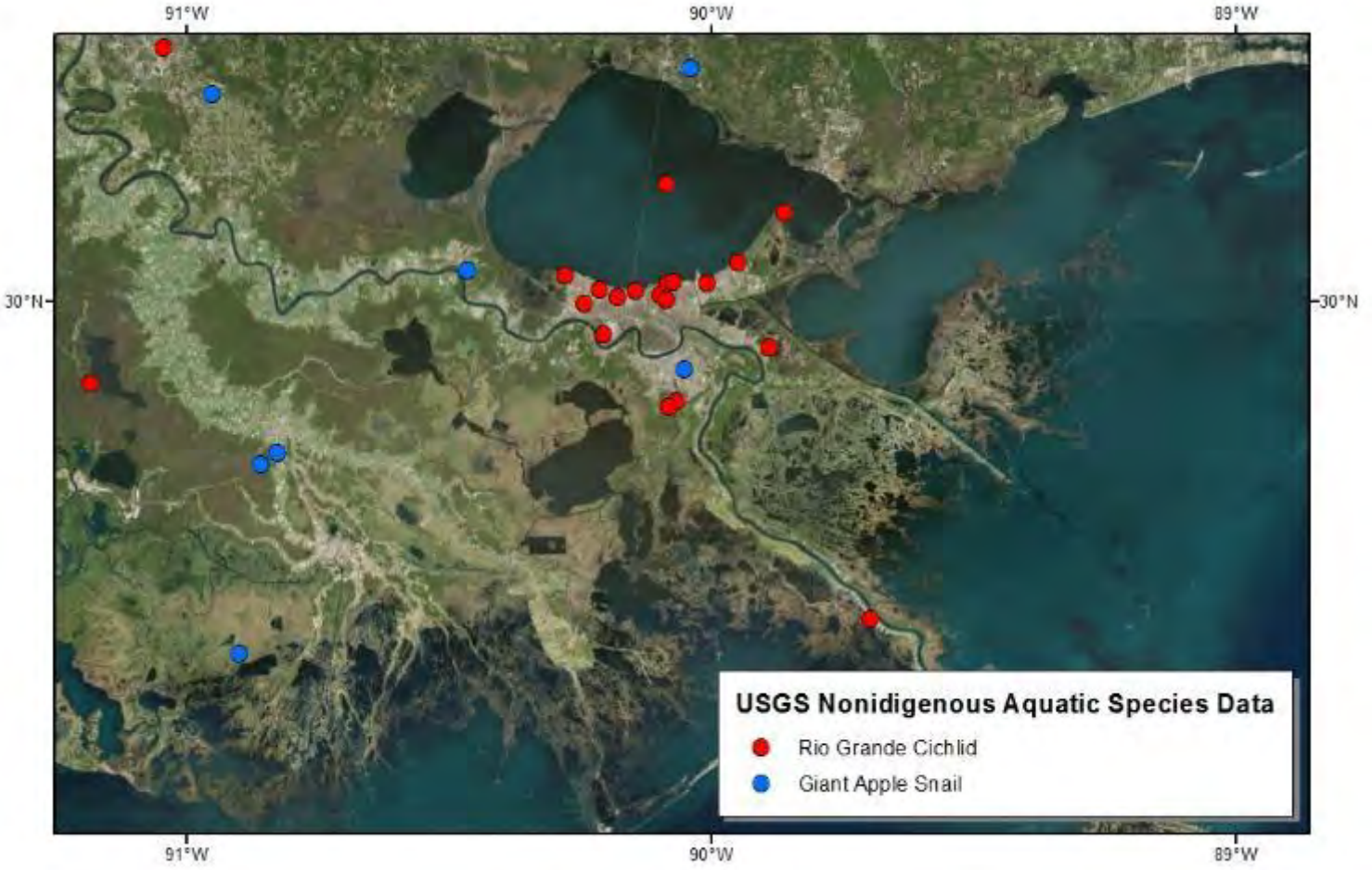
Chinese Tallow

Bullrushes

Phragmites

Nutria

Apple Snails



Conclusions

The challenge of minimizing fisheries impacts while maximizing the restoration potential of large-scale diversions is an example of a classic sustainability conflict between short-run and long-run objectives.

Research done in one area or under some salinity regime will not necessarily be applicable in another area or under other conditions.

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