

# Invasive Crayfish in Maine: Potential Impacts on Fish, Plants and Benthic Invertebrates

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# Rusty crayfish

*Orconectes rusticus*

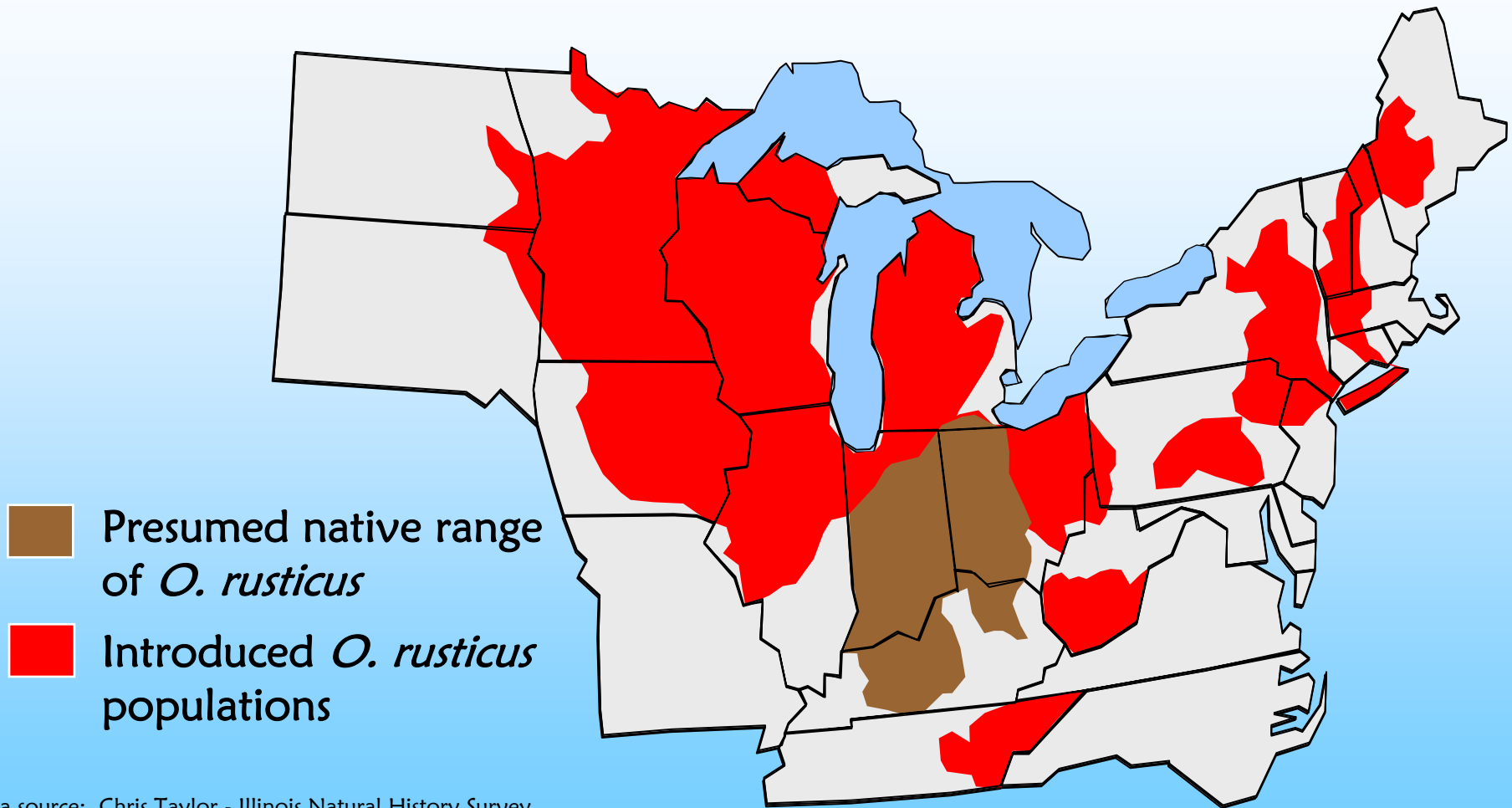


Presumed  
native range  
of *Orconectes  
rusticus*

Data source: Chris Taylor - Illinois Natural History Survey  
Map produced by: Nonindigenous Aquatic Species Program  
USGS, Gainesville, FL March 1999

# Introduced populations of rusty crayfish

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# Mechanisms of introduction

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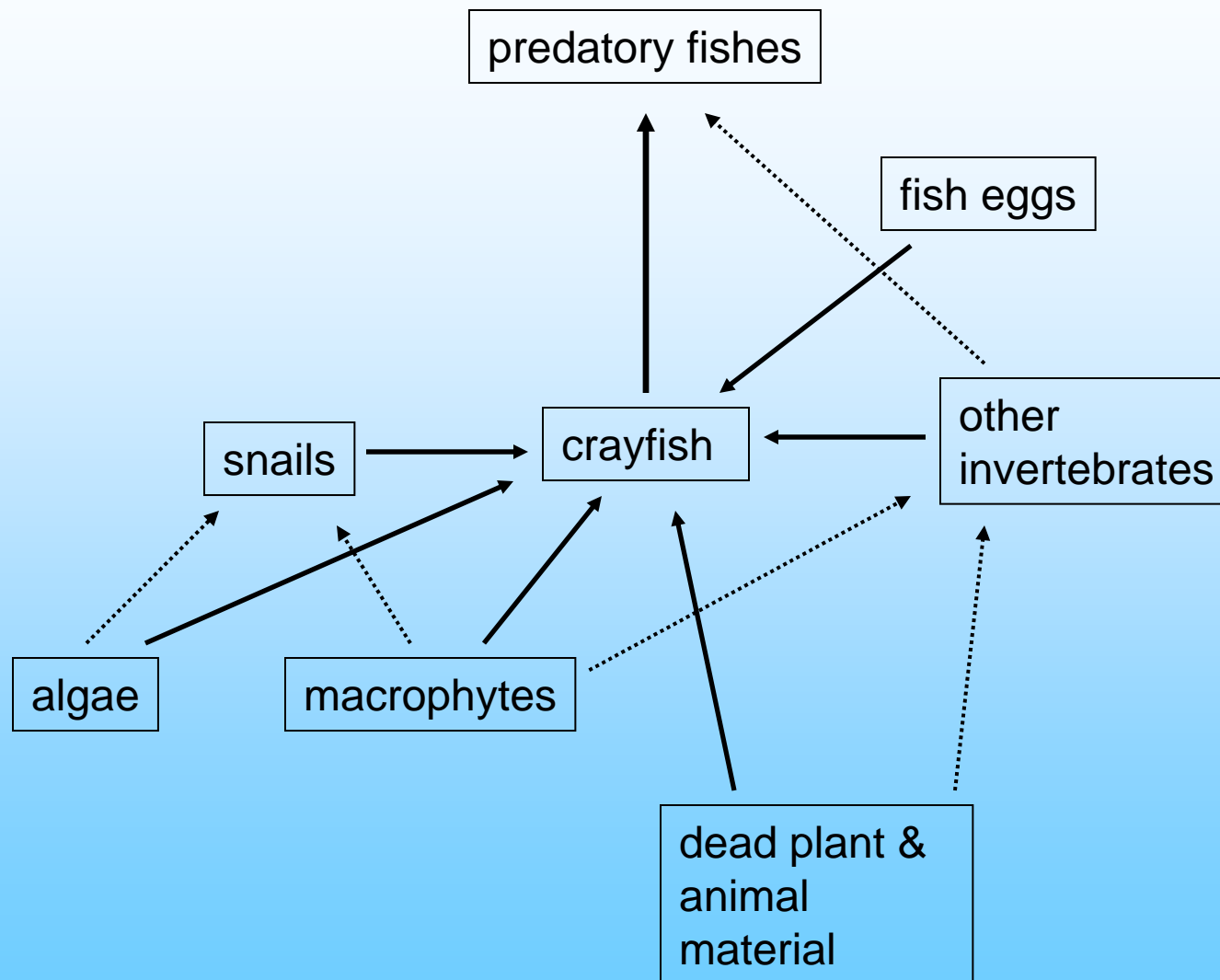
- Natural range expansions
- Bait-bucket & classroom liberations
- Aquaculture escapes



- Subsequent spread through river drainages



# Omnivores



# Impacts of rusty crayfish

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= large proportion of benthic invertebrate biomass

- reach high densities:

native crayfish

7 indiv./trap

0.6 indiv./m<sup>2</sup>

versus

versus

rusty crayfish

60 indiv./trap

5 indiv./m<sup>2</sup>

- individuals > 35mm carapace length have a size refuge from most fish predators

**DUE TO** high density **CRAYFISH**  
Please Release  
All Smallmouth Bass  
Boulder Lake Adv. Assoc.  
**APPROVED BY THE D.N.R.**

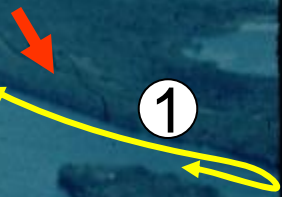
Photo: K. Wilson

# Trout Lake, Wisconsin

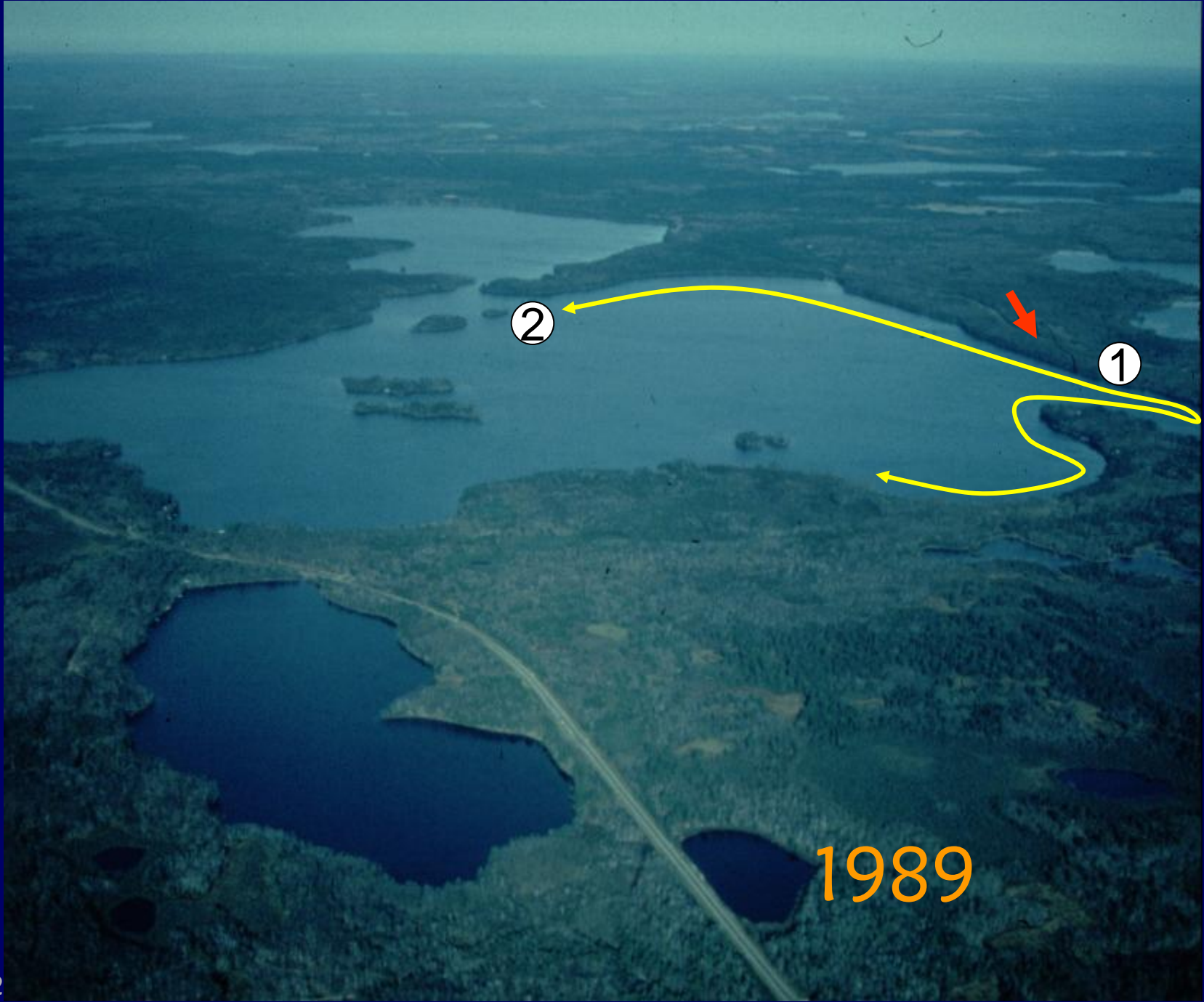
- Since 1981, one of the focal lakes of the North Temperate Long-Term Ecological Research program
- Since 1982, yearly sampling of crayfish, aquatic plants, benthic invertebrates, fish & environmental variables at permanent locations
- Sampling sites chosen in part to monitor potential invasion of rusty crayfish

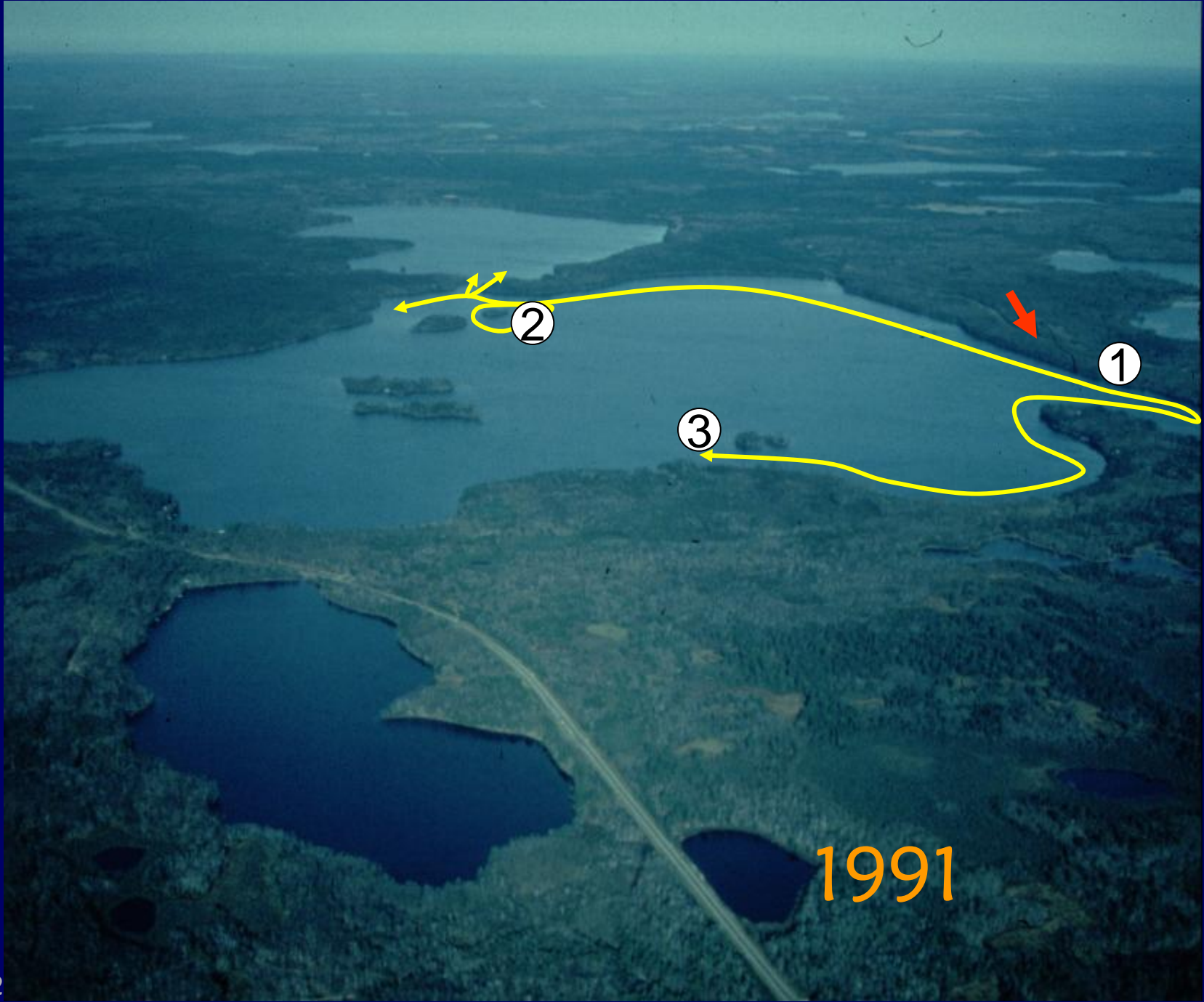
Photo: NTL-LTER

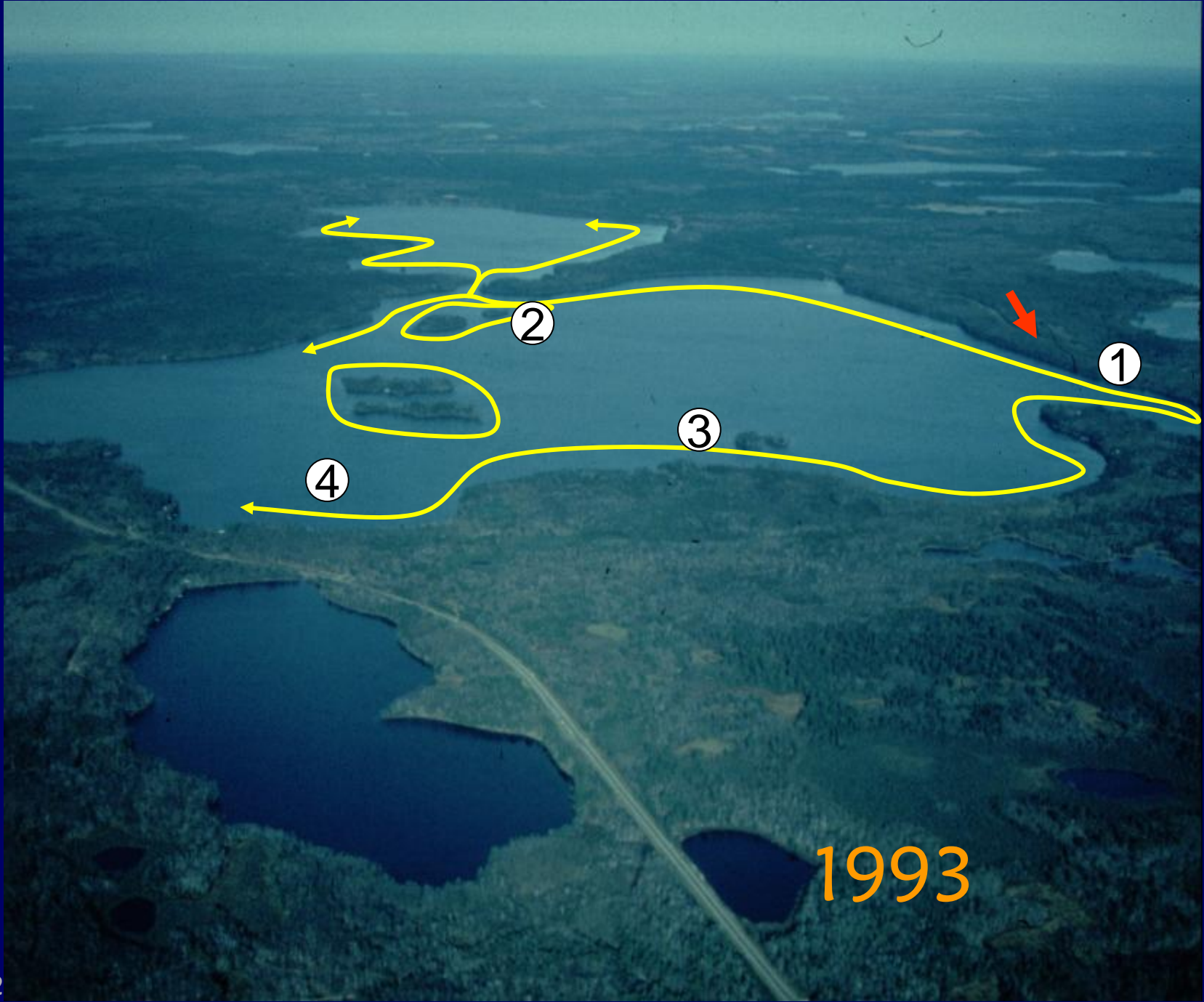
Rusty crayfish  
first detected  
in 1979



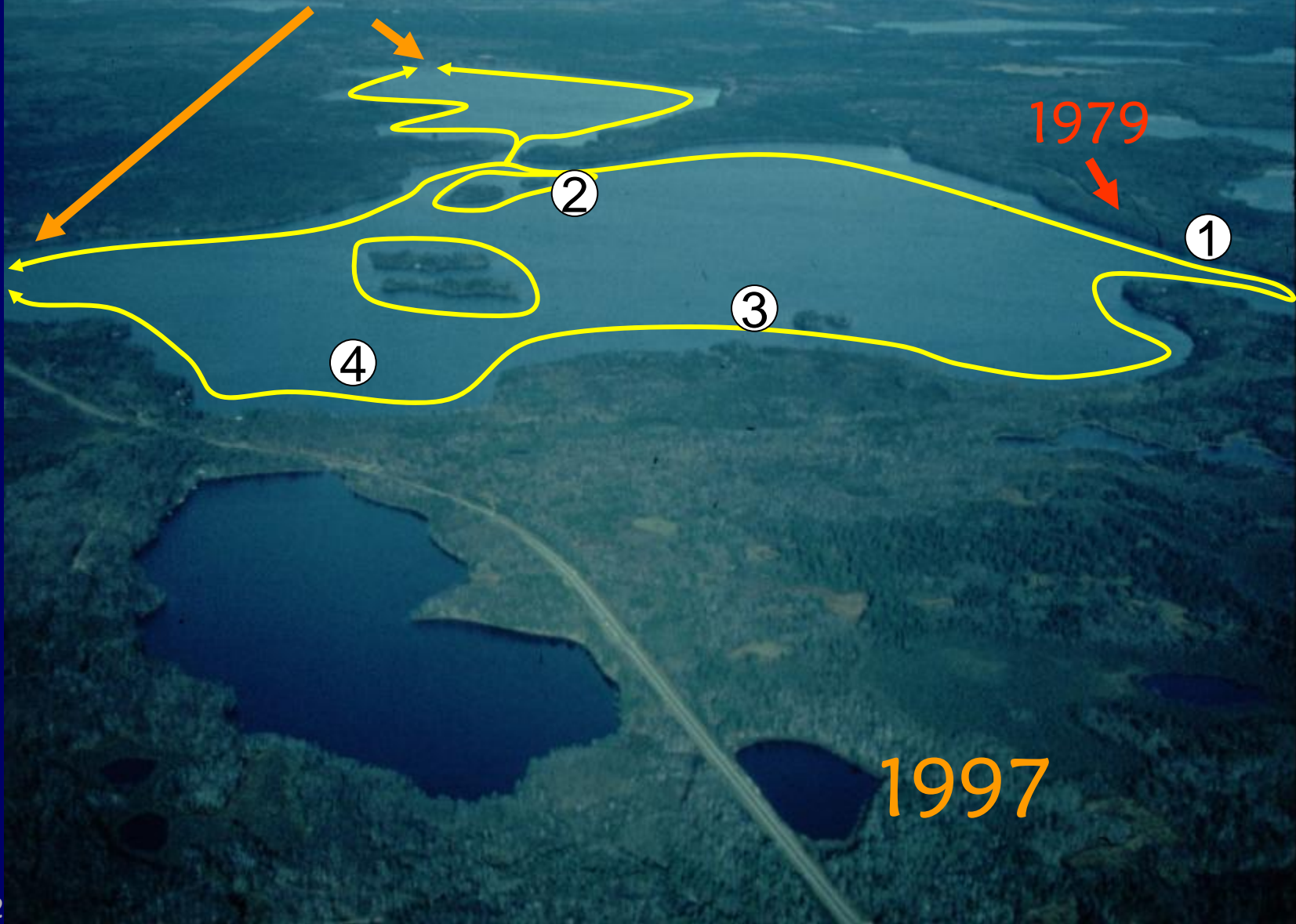
1983



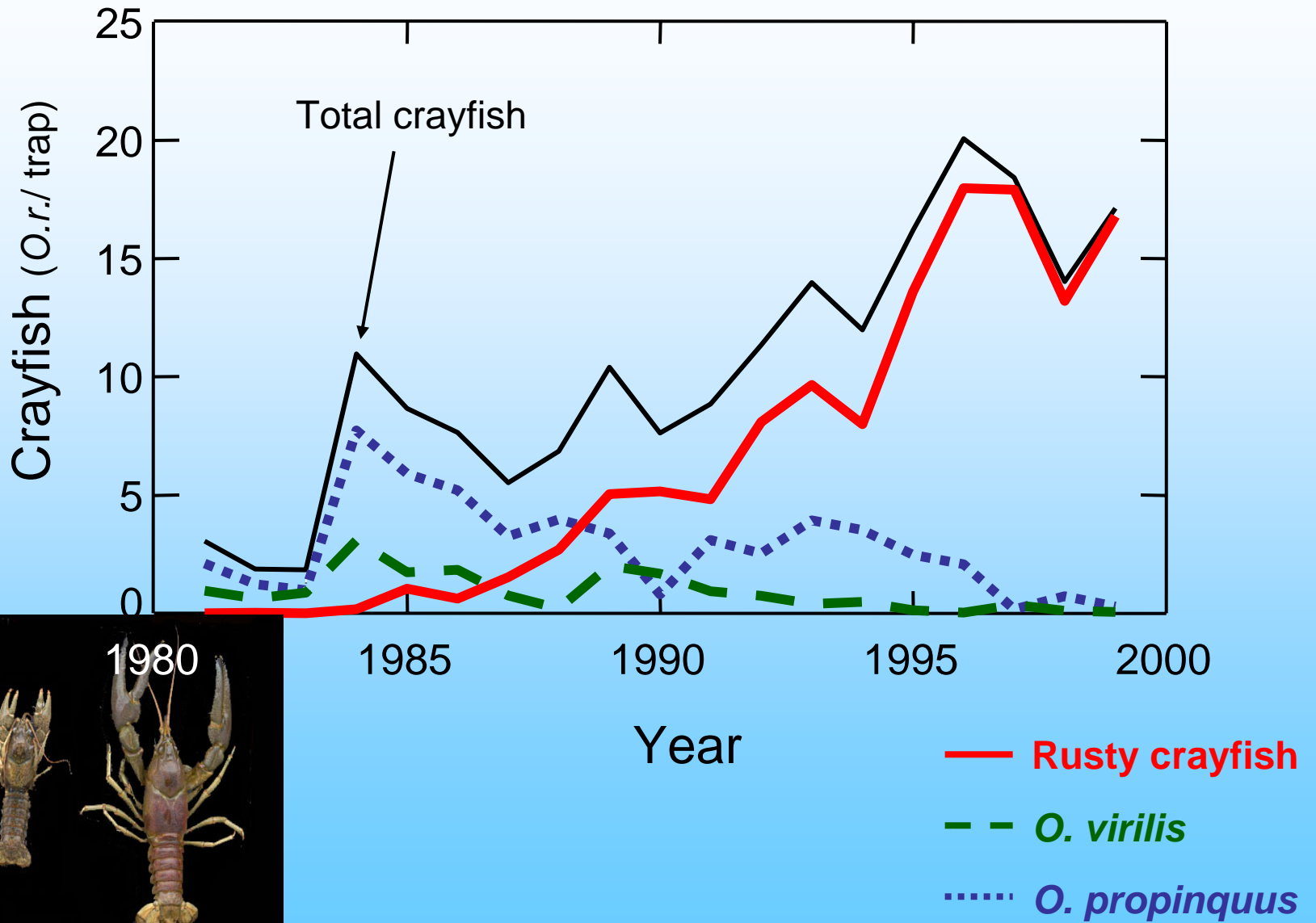




Rusty crayfish encircled lake by 1997

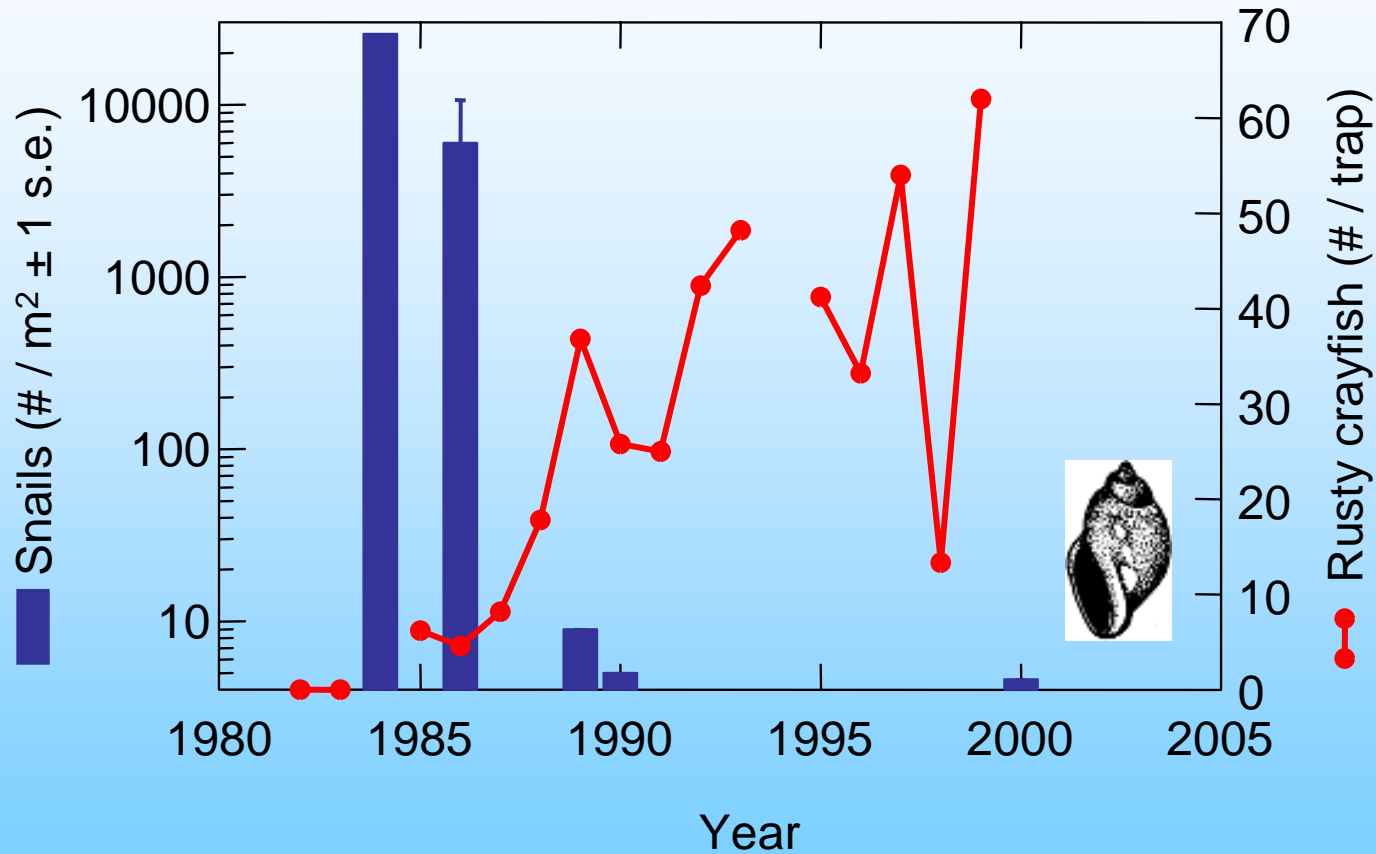


# Lake-wide crayfish abundance



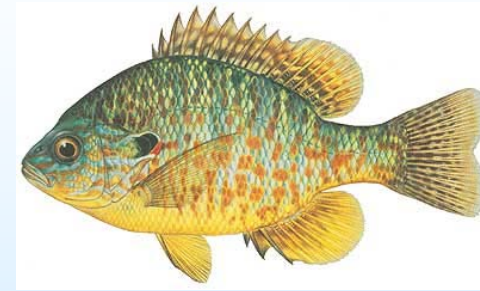
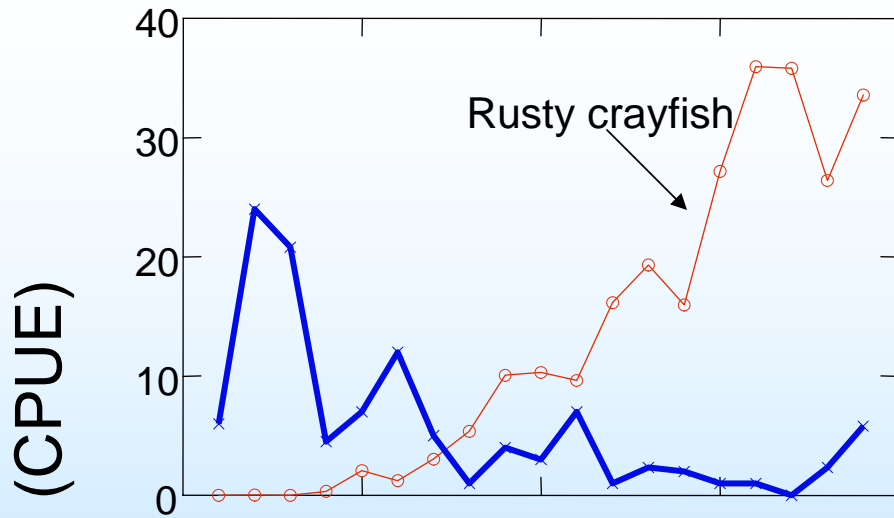
# Other benthic invertebrates

Snail abundance - Site 1

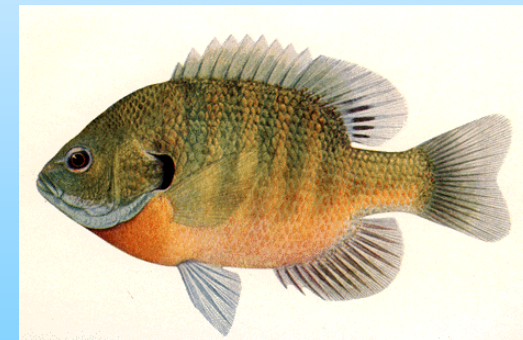
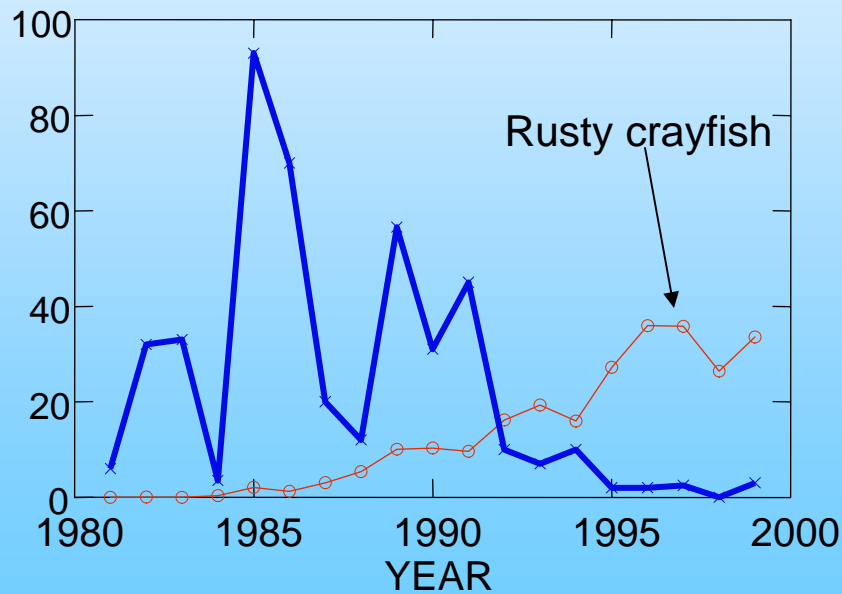


Lake wide, odonates, trichopterans & amphipods also decreased significantly.

# Fish



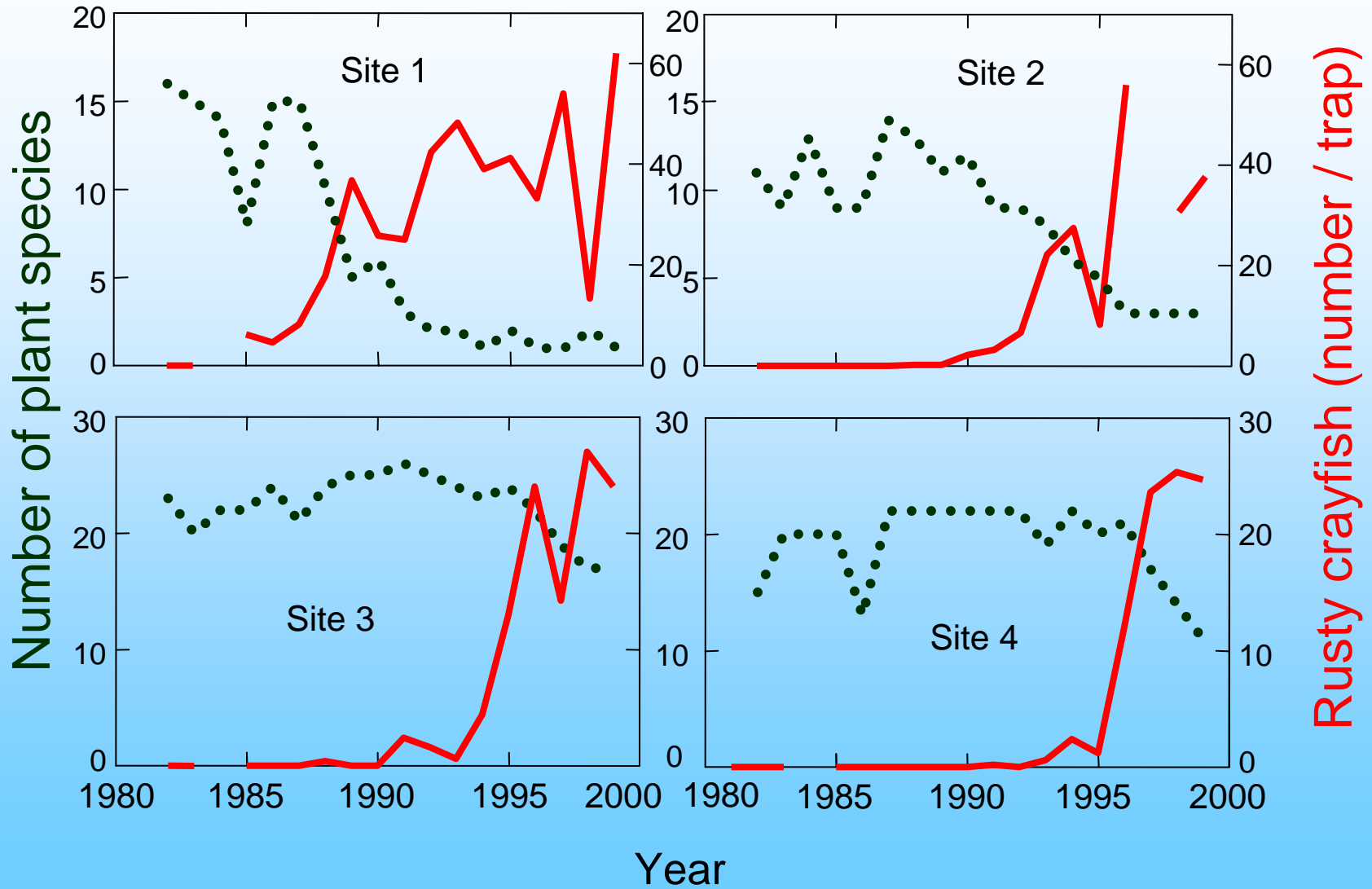
Pumpkinseed



Bluegill

No significant change in smallmouth bass or rock bass abundance.

# Submersed aquatic plants



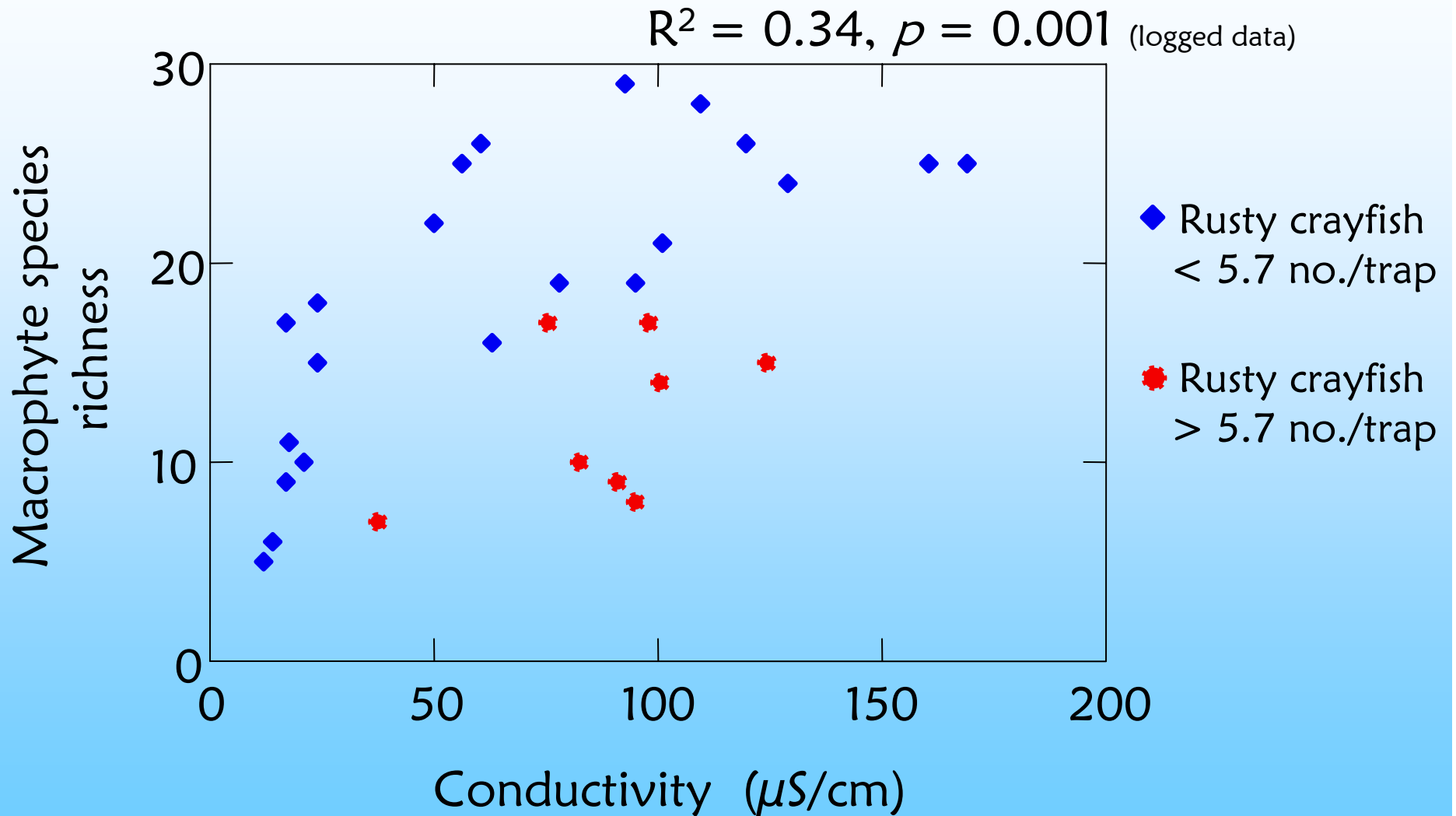


Low rusty crayfish abundance

High rusty crayfish abundance

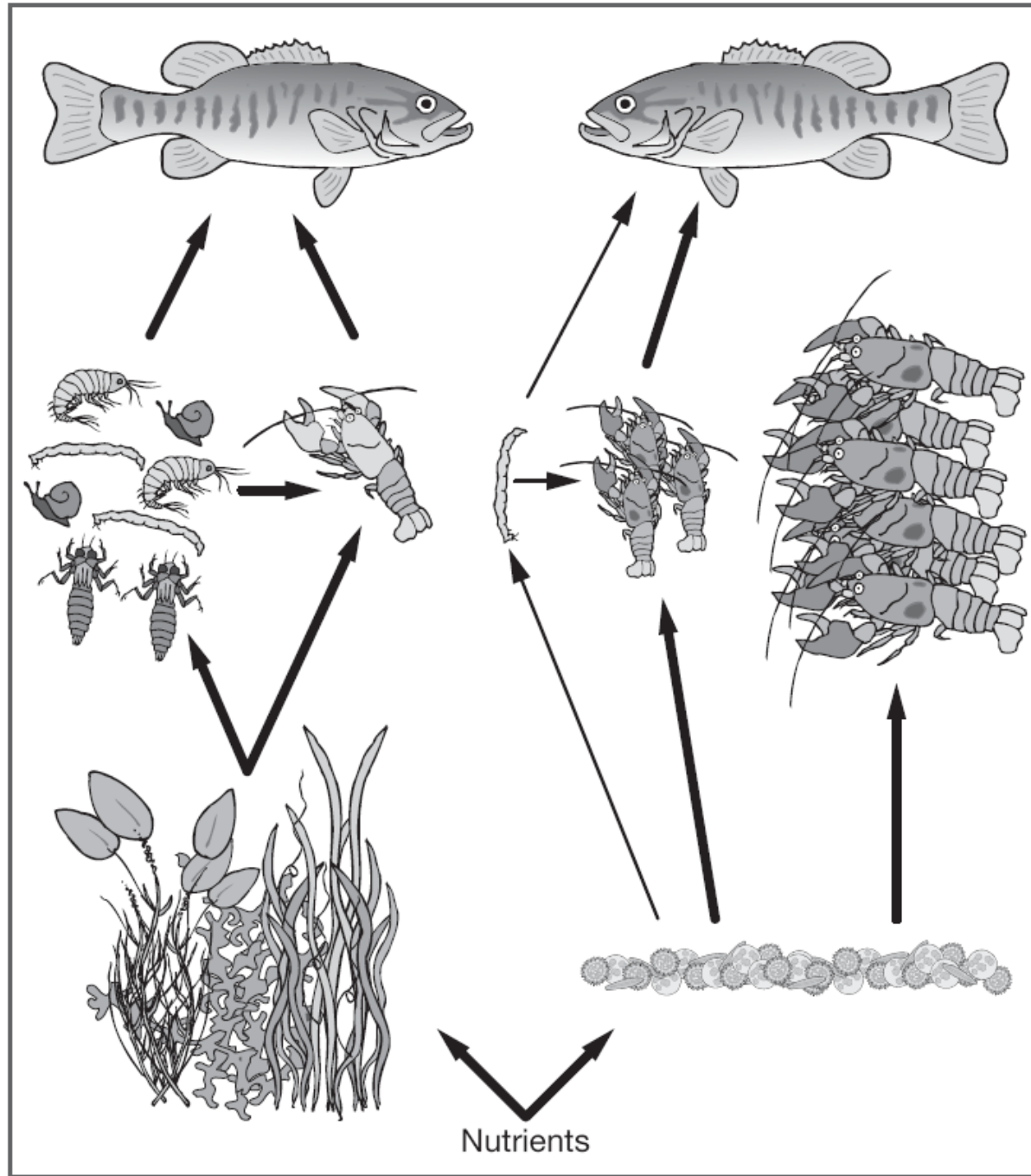
Photo: K. Wilson

# Landscape-level impacts – northern Wisconsin lakes



Before Rusty Crayfish

After Rusty Crayfish



Diverse  
benthic  
biomass.

Benthic  
biomass  
dominated  
by large  
crayfish  
with a size  
refuge from  
most fish  
predators

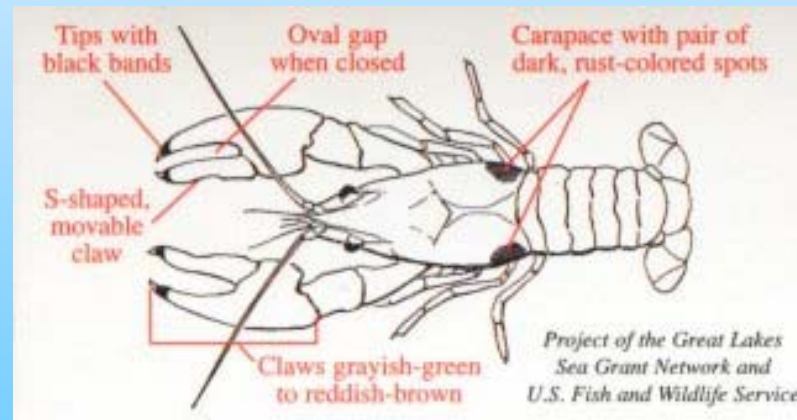
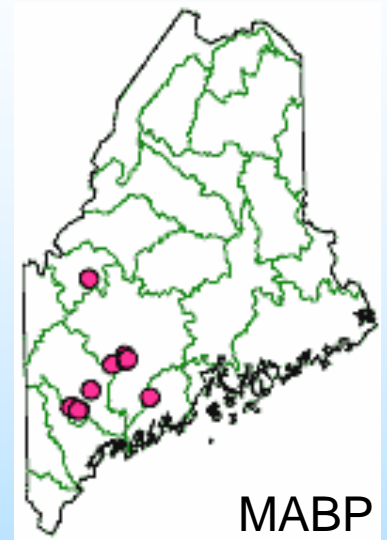
## Management implications of Wisconsin results

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- Loss of native crayfish species
- Reduction in snails and other invertebrates = less fish food
- Fish impacts: reproductive failure (bottom nesters), loss of refuge, loss of forage fish
- Loss of aquatic plant species = change in habitat complexity, resources for waterfowl
- abundance of crayfish is important

# Rusty Crayfish in Maine

Androscoggin Lake (Androscoggin Co., Leeds)	2003 <sup>a</sup>
Gull Pond (Franklin Co., Dallas Plt)	2001 <sup>a</sup>
Haley Pond (Franklin Co., Dallas Plt)	2001 <sup>a</sup>
Great Pond (Kennebec Co., Belgrade)	1968 <sup>b</sup>
Parker Pond (Kennebec Co., Fayette)	1969 <sup>b</sup>
Flagstaff Lake (Somerset Co., Flagstaff Twp)	1998 <sup>b</sup>



<sup>a</sup>BioDiversity Institute, Gorham, Maine

<sup>b</sup>Matt Scott, William Reid, Maine Aquatic Biodiversity Project

# Crayfish species in Maine

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	<u>Scientific name</u>	<u>Common name</u>
native	<i>Cambarus bartonii bartonii</i>	Appalachian brook
	<i>Orconectes limosus</i>	Spinycheek
	<i>Orconectes virilis</i>	Virile
probably native	<i>Orconectes immunis</i>	Calico
introduced	<i>Orconectes obscurus</i>	Obscure
	<i>Orconectes rusticus</i>	Rusty
	<i>Procambarus acutus acutus</i>	White river
	<i>Procambarus clarkii</i>	Red swamp

## What's next for Maine?

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- Continue mapping distribution of native crayfish
- Identify areas with high abundances of crayfish
- Monitor for new arrivals/range expansions
- Discourage bait-bucket liberations
- Post crayfish warnings at boat landings in lakes with introduced crayfish (like invasive aquatic plants program)
- Prevent import of crayfish into the state or movement from lake to lake

# Notice abundant crayfish of any species?

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Let me know:

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## *References:*

- Wilson, K.A.**, Magnuson, J.J., Lodge, D.M., Hill, A.M., Kratz, T.K., Perry, W. L. and T.V. Willis. 2004. Long-term effects of a rusty crayfish (*Orconectes rusticus*) invasion: dispersal patterns and community changes in a North Temperate lake. *Canadian Journal of Fisheries and Aquatic Sciences*. 61(11): 2255-2266.
- Hrabik, T.R., Greenfield, B.K., Lewis, D.B., Pollard, A.I., **Wilson, K.A.** and T.K. Kratz. 2005. Species diversity in four groups of aquatic organisms in north temperate lakes: physical, chemical and biological properties as sources of variability. *Ecosystems*. 8 (3): 301-317
- Wilson, K.A.**, Hrabik, T. R., and J.J. Magnuson. 2006. Chapter 8: Ecological change and exotic invaders: long-term external drivers of lake ecology *in* Magnuson, J.J., Kratz, T.M. and B. Benson, *eds*. Long-Term Dynamics of Lakes in the Landscape. Oxford University Press.

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  - Matt Scott, William Reid
  - BioDiversity Research Institute
  - Maine Aquatic Biodiversity Project / PEARL

# Abstract: Invasive Crayfish in Maine: Potential Impacts on Fish, Plants and Benthic Invertebrates

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There are over 350 crayfish species in North America, most with discreet native distributions and low range overlap between species. More northerly regions have far fewer species, but the activities of humans, and, in some cases, natural range expansions, have resulted in more and more species establishing in northern areas. Most of these crayfish species are introduced through “bait bucket liberations,” and some escape from aquaculture facilities. Crayfish are trophic generalists, eating everything from plant material to benthic insects to fish and their eggs. As a result, when crayfish are abundant, they can have significant effects on aquatic food webs. In this talk I will discuss the long-term negative impacts of one particularly invasive species, the rusty crayfish, on northern Wisconsin Lakes where they became ultra-abundant in the 1980s and 1990s. I will then discuss the known distribution of rusty crayfish and other invasive crayfish in Maine, and the potential for additional spread in the state. I will conclude with reasons why the State of Maine should consider a crayfish control program to prevent the introduction and spread of invasive crayfish species similar to efforts to control invasive aquatic plants.