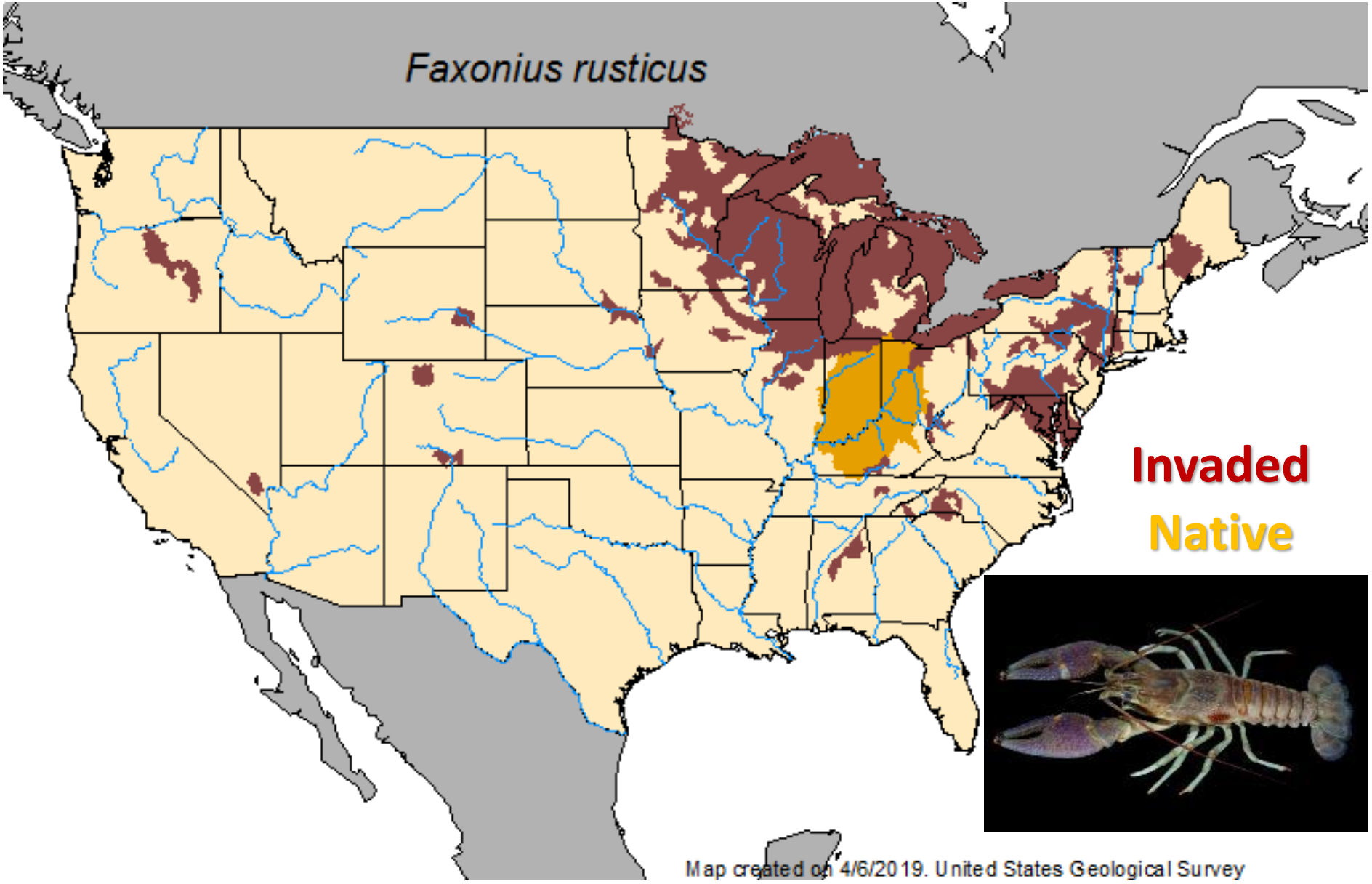
# Rusty Crayfish in Sparkling Lake 18 Years After a Removal Experiment

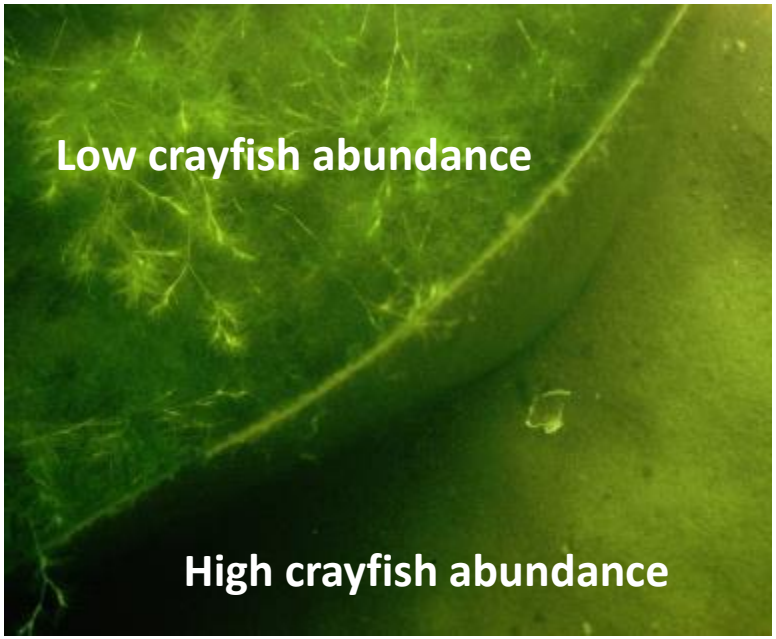
Katie Hein

# Rusty Crayfish Distribution



# Impacts of rusty crayfish

- Extirpation of native crayfish species
- Negative effects on:
  - macrophytes
  - macroinvertebrates
  - recreational fish




Karen Wilson

Brian Roth

# Rusty Crayfish Removal Experiment

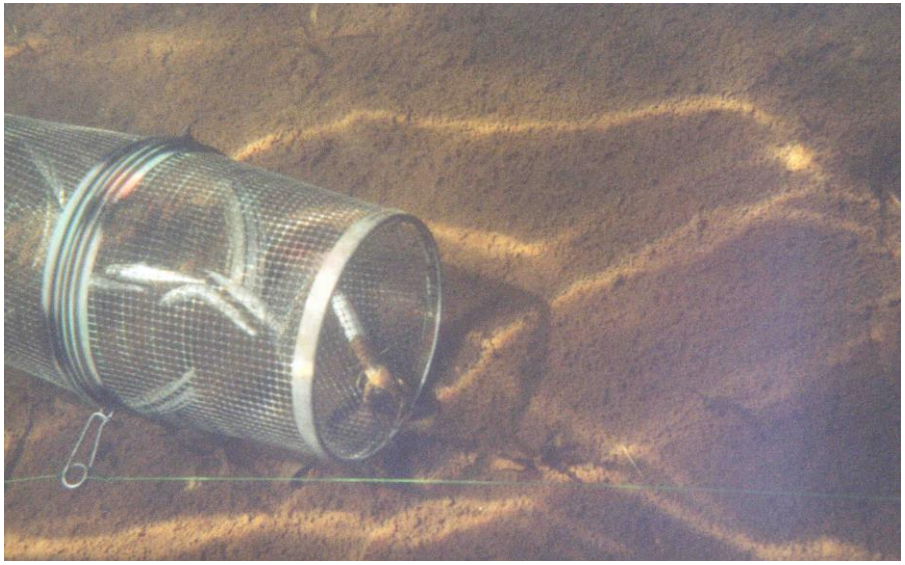
- Is it possible to reduce/extirpate rusty crayfish?
- Are negative effects of rusty crayfish reversible?
- Can fish control rusty crayfish once trapping has reduced their population to low levels?

# Sparkling Lake

- Small (64 ha)
- No surface inlets or outlets
- Rusty crayfish present since the 1970's
- Long-term records available (1981 – present)

# Rusty Crayfish Removal

## Trap adults



## Fish predation on small crayfish

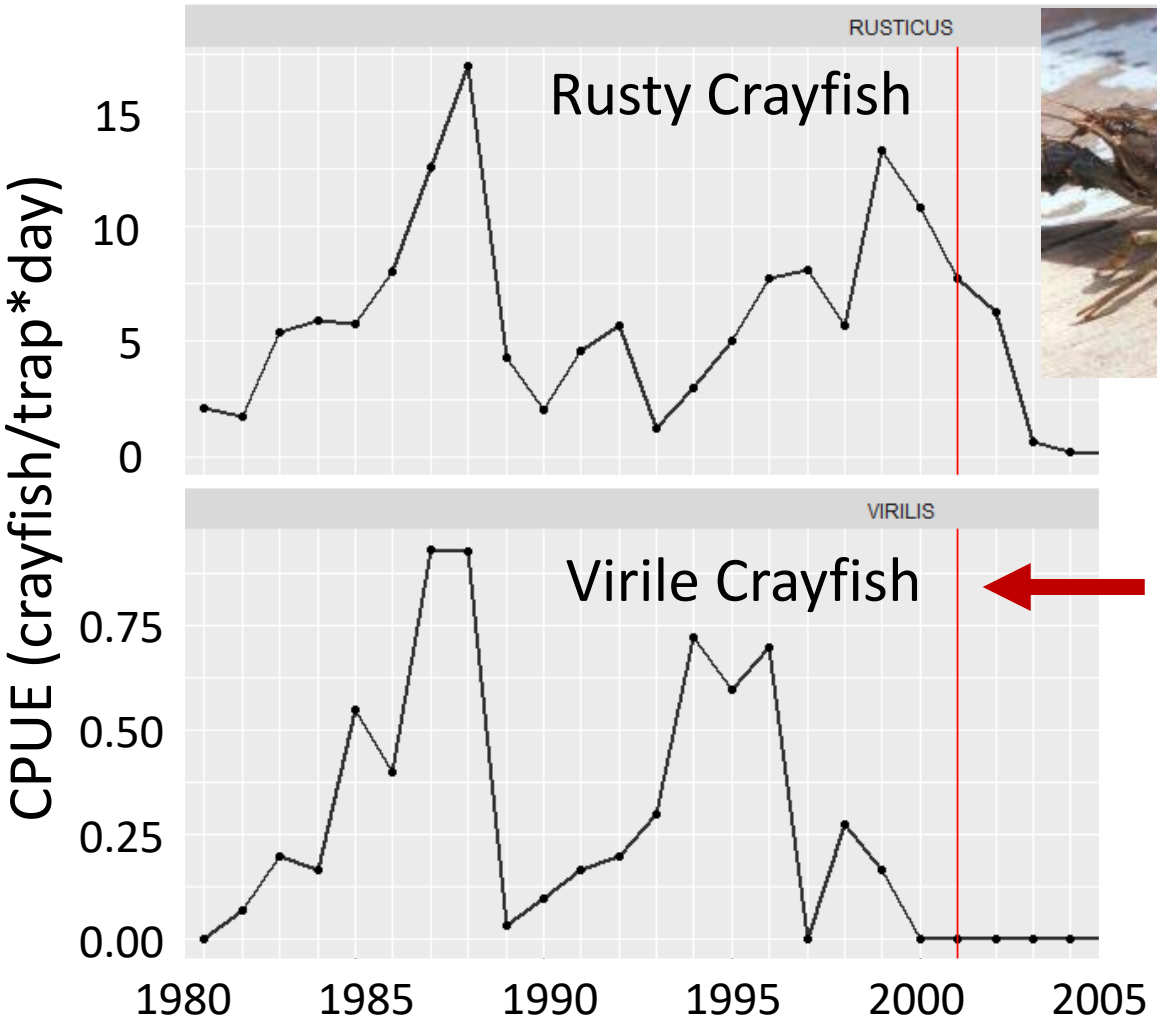
Smallmouth Bass

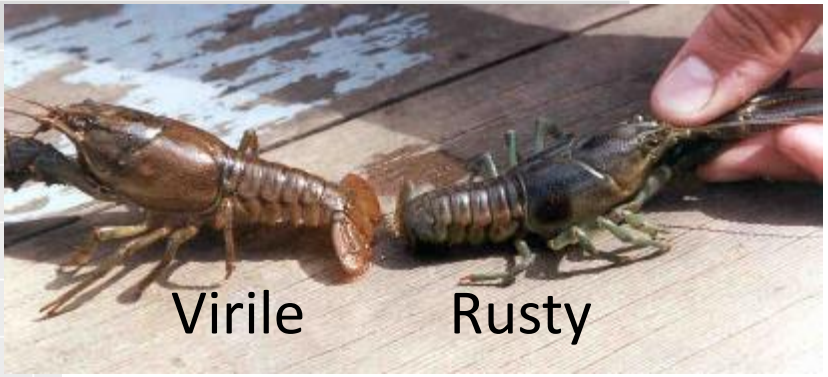
- Size limit from 14” to 18”
- Bag limit: 1 fish/person/day

# Trapping effort was high

- June-August 2001-2008
- 100-300 traps per day
- 1,300-15,000 “trap days” per year
- 91,930 crayfish removed

# Rusty crayfish declined by 99%




Removal Begins

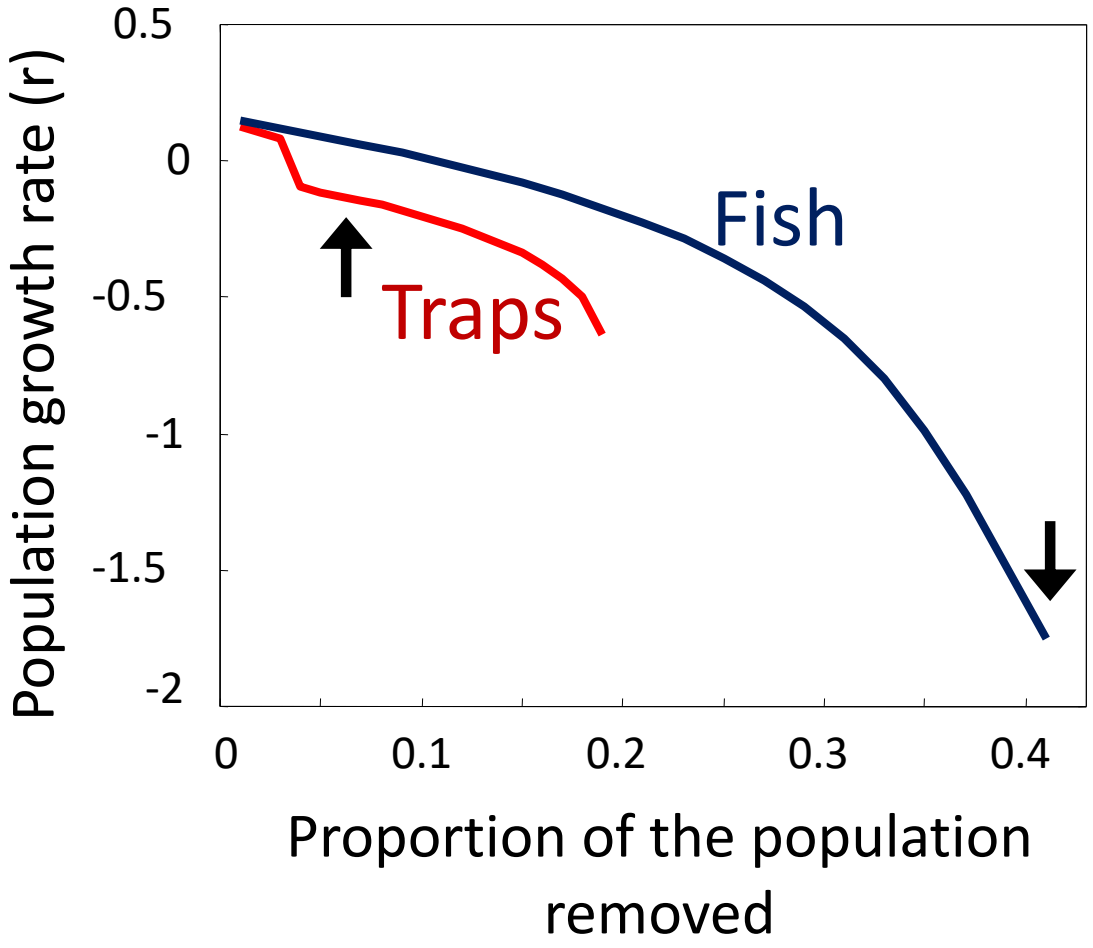
Hein et al. 2006 Can J Fish Aquatic Sci
Hein et al. 2007 Freshwater Biology

# Short Term Success!

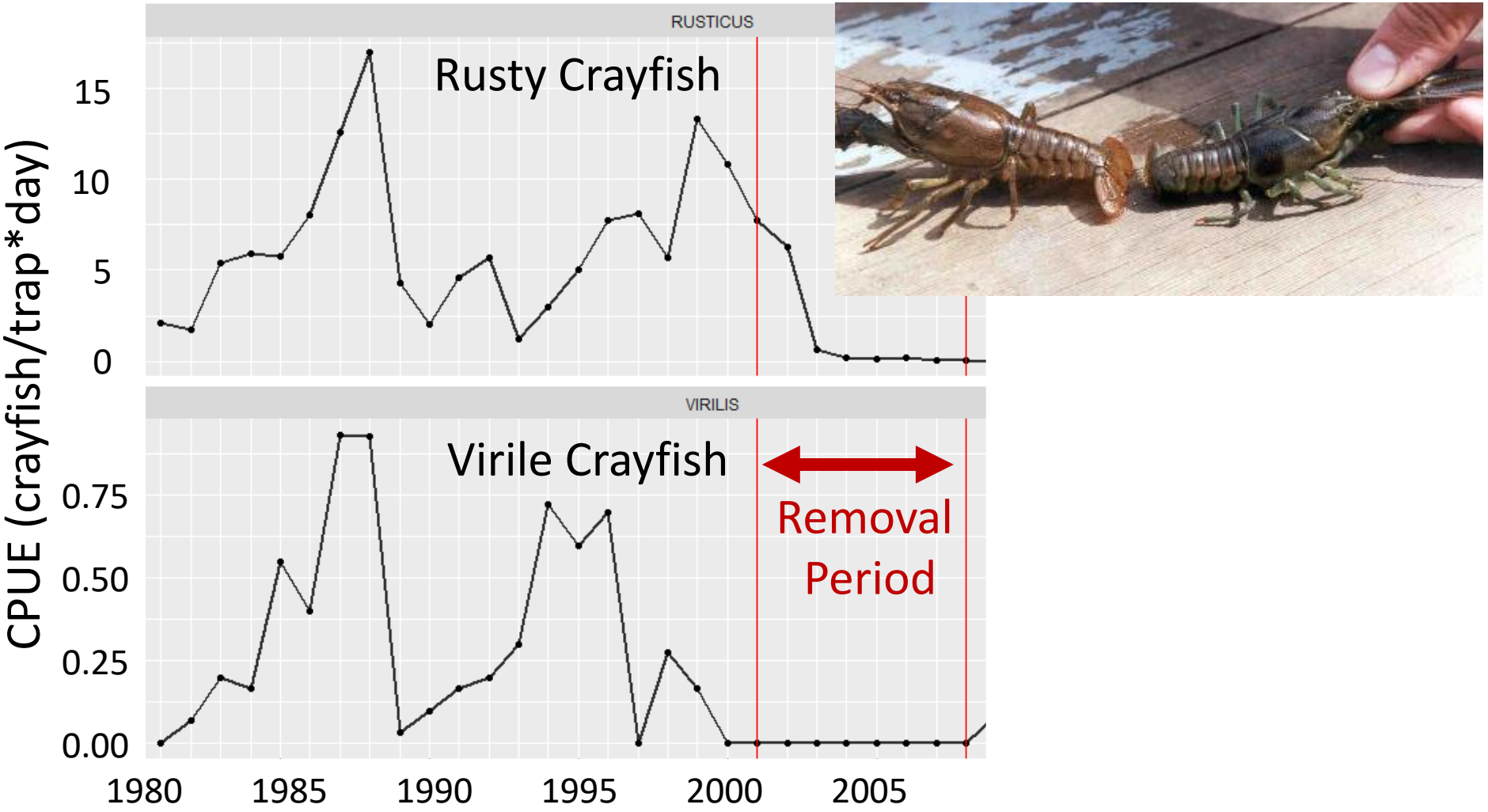

## What will be the long-term success of removal?

1. Extirpate rusty crayfish
2. Fish predation maintains low densities
3. Rusty crayfish rebound when removal stops

# Population model suggested long-term possibility of success



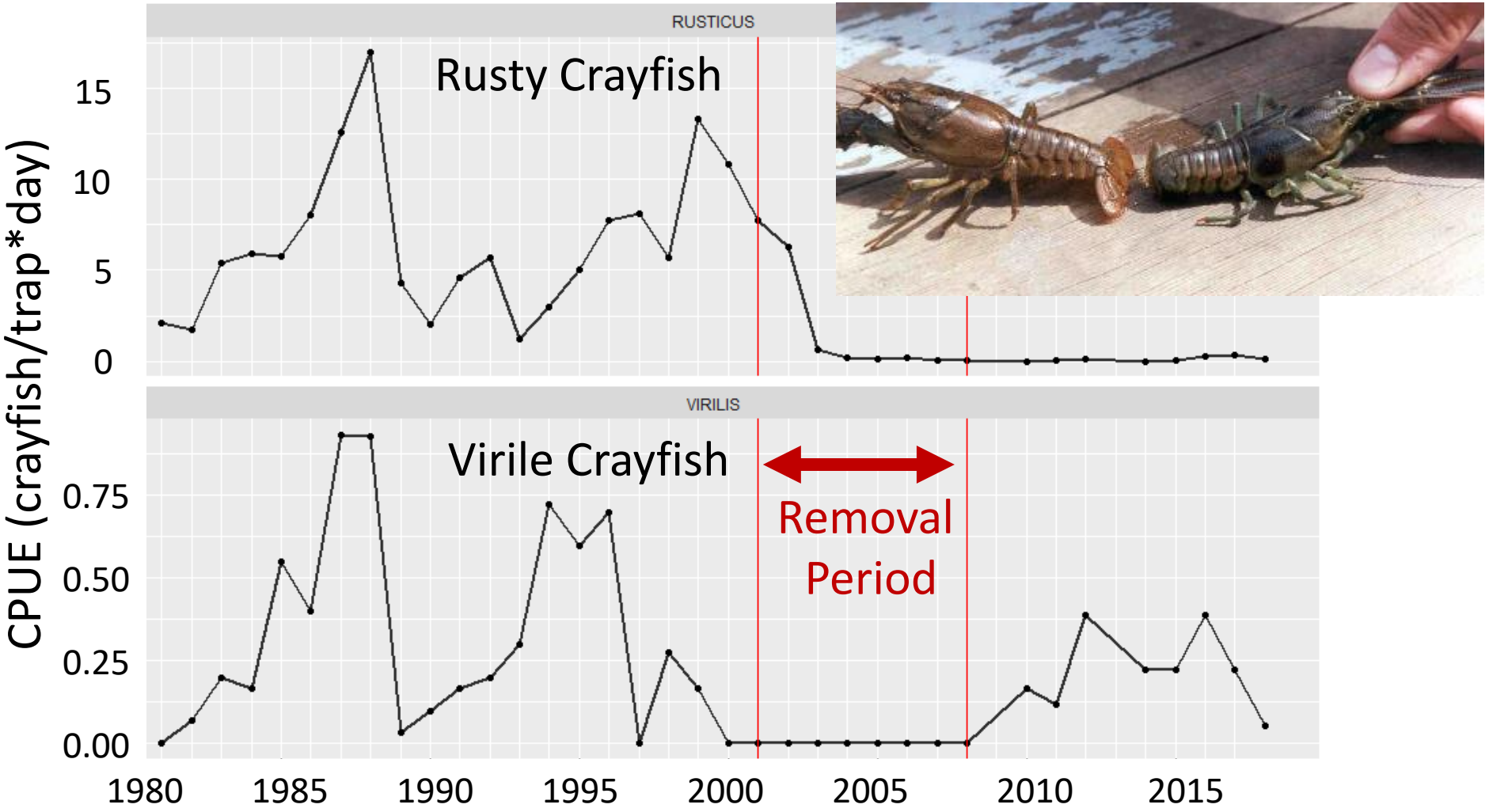
# Rusty crayfish declined by 99% and stayed low




Hansen et al. 2013 Ecology

Hansen et al. 2013 Can J Fish Aquatic Sci

# Rusty crayfish declined by 99% and stayed low
# Native (virilis) crayfish increased 100x




Hansen et al. 2013 Ecology

Hansen et al. 2013 Can J Fish Aquatic Sci

# Rusty Crayfish Removal Experiment

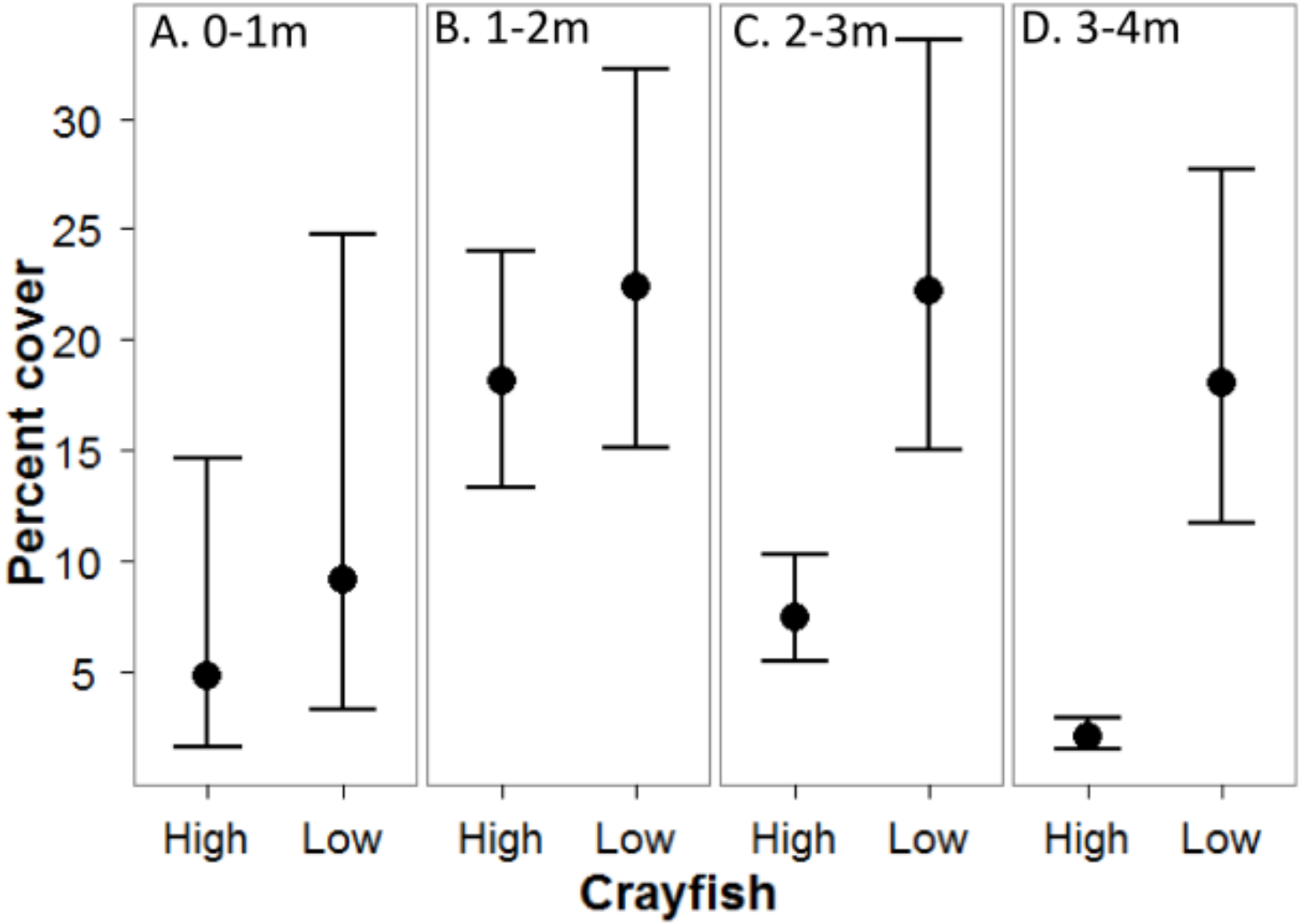
- Is it possible to reduce/extirpate rusty crayfish?

  **YES but it requires a lot of effort**

- Are negative effects of rusty crayfish reversible?

# Sparkling Lake ecosystem response

# Macrophyte percent cover increased, especially in deeper water

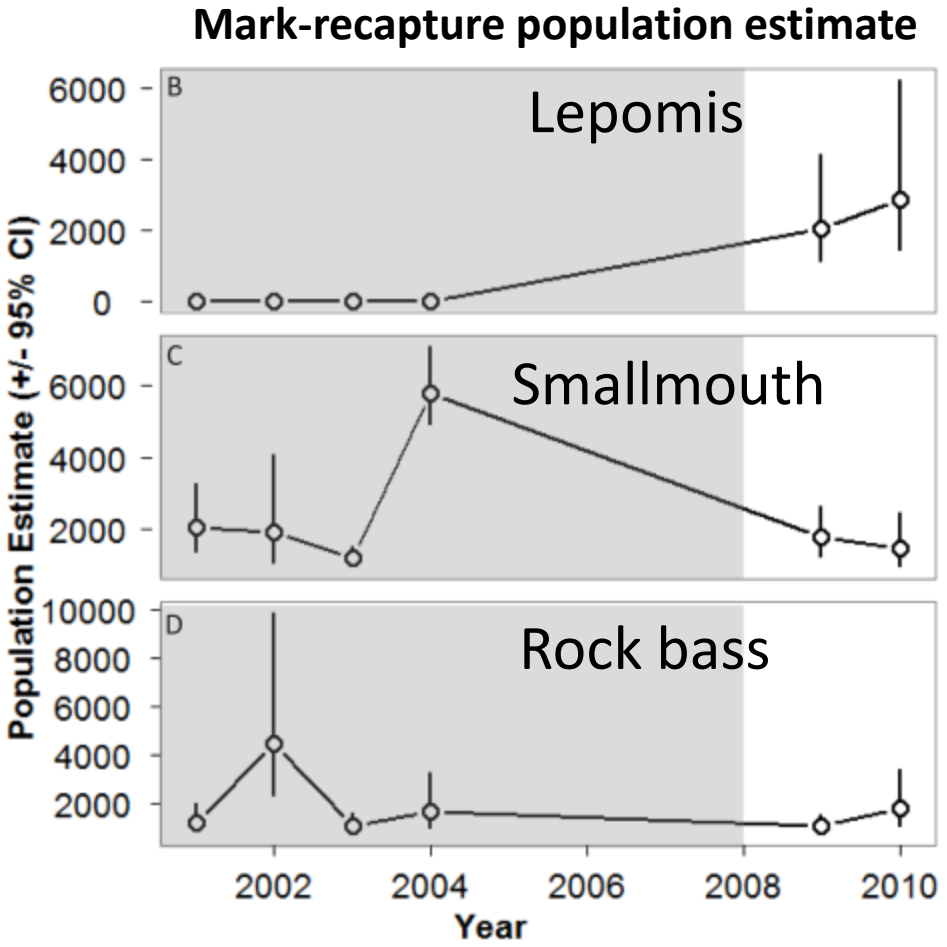


# “High crayfish”

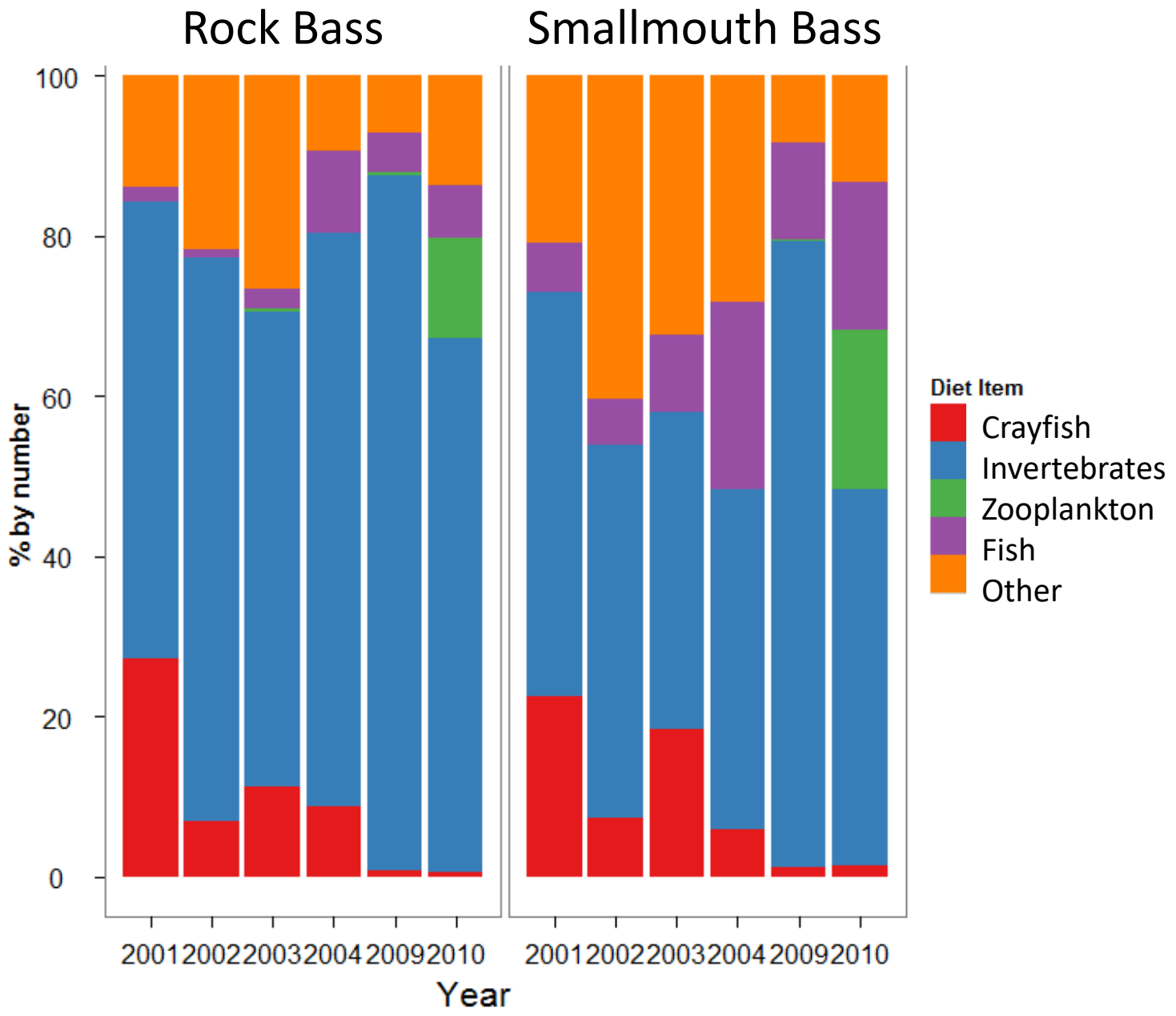
# “Low crayfish”

# Sunfish (*Lepomis*) Increased

# Bass Abundance Stayed the Same



# Bass ate more invertebrates

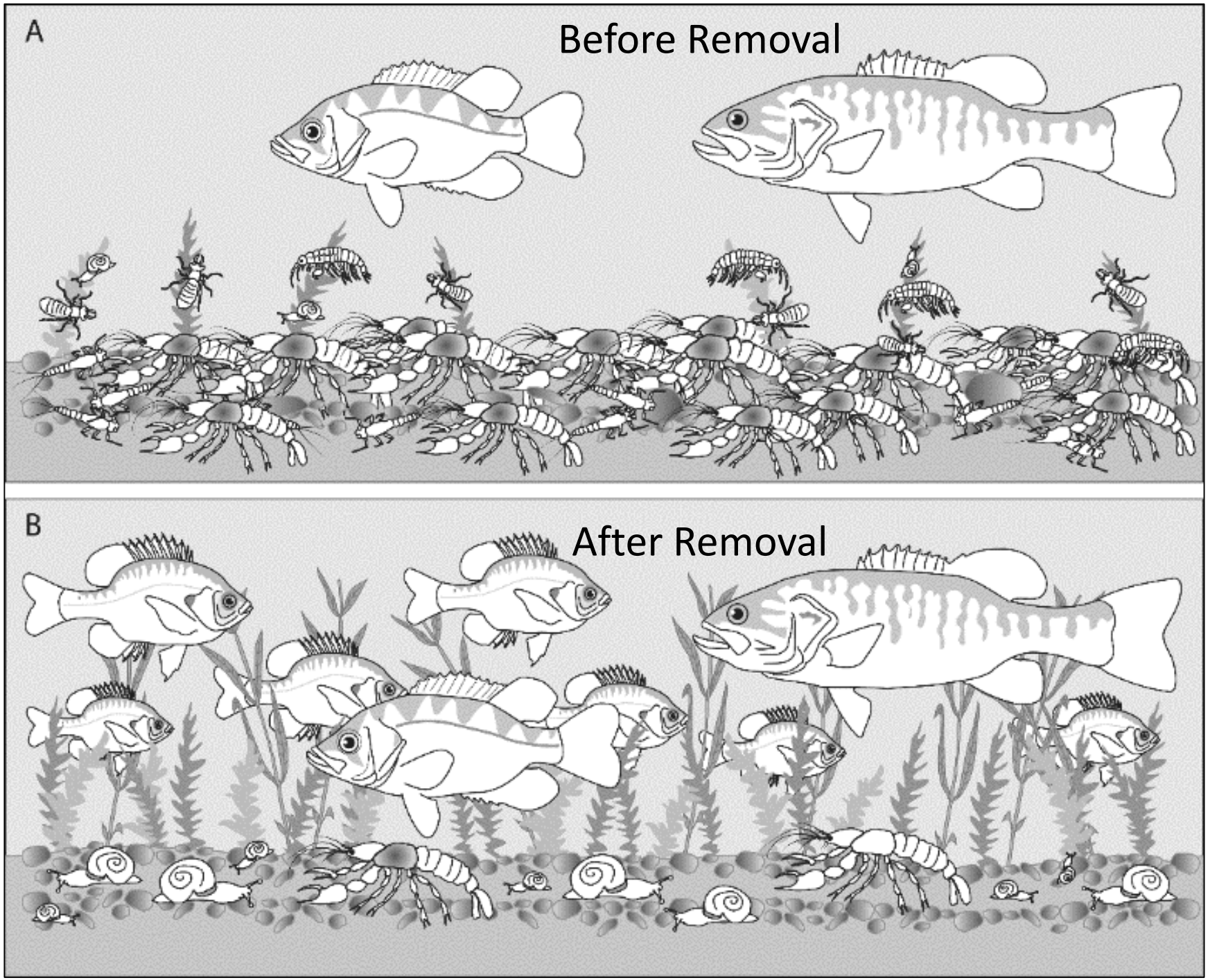


# Variety of Macroinvertebrate Abundance Responses

## Declined




## Increased

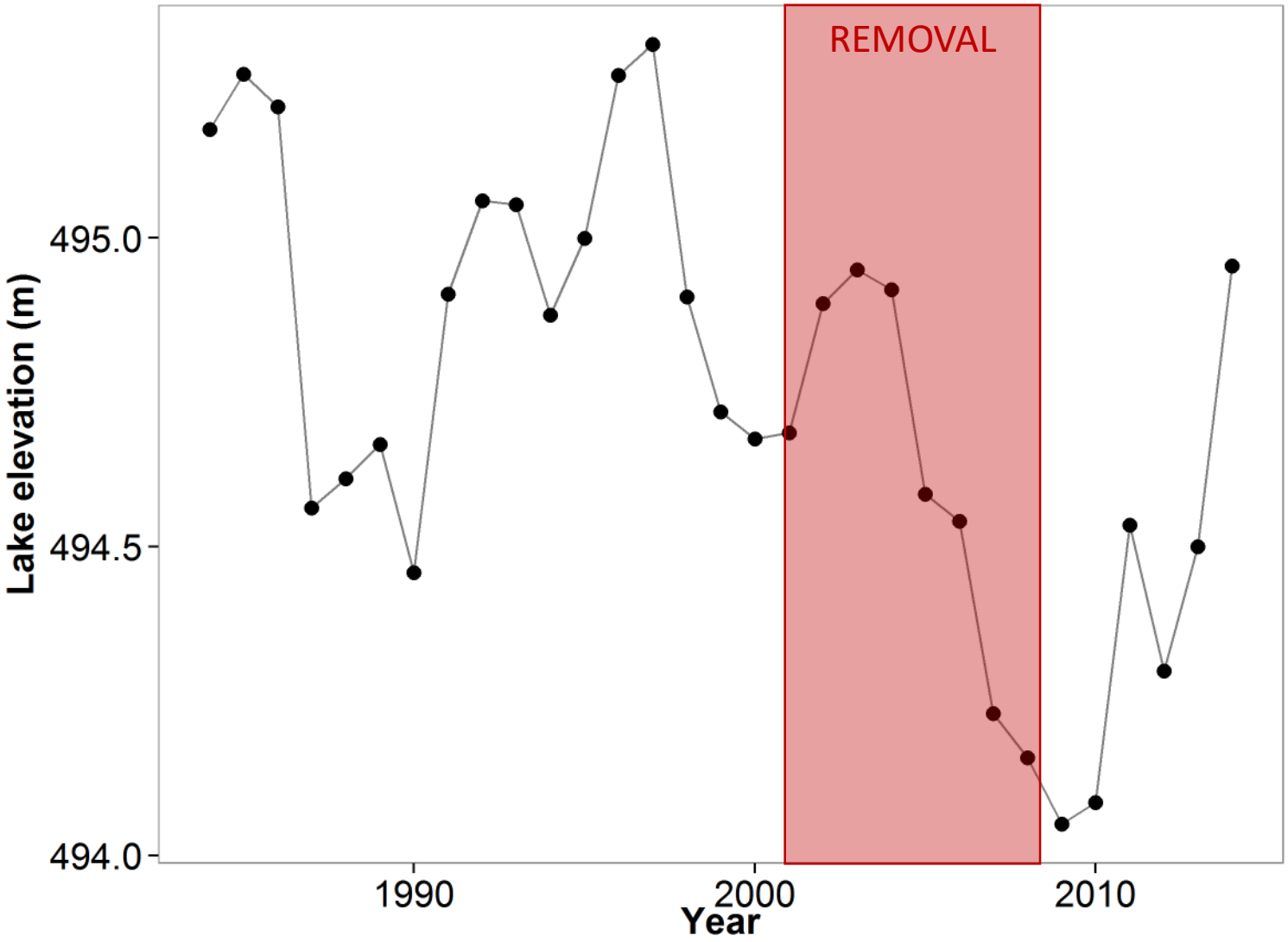

A
Before Removal
B
After Removal

# Rusty Crayfish Removal Experiment

- Is it possible to reduce/extirpate rusty crayfish? **YES**
- Are negative effects of rusty crayfish reversible?

  **YES, with variable effects on macroinvertebrates**
- Can fish control rusty crayfish once trapping has reduced their population to low levels?

# Lake level declined during removal



# Drought reduces cobble rearing habitat for rusty crayfish

# Rusty Crayfish Removal Experiment

- Is it possible to reduce/extirpate rusty crayfish? **YES**
- Are negative effects of rusty crayfish reversible? **YES**
- Can fish control rusty crayfish once trapping has reduced their population to low levels?

**SO FAR. Possible effects of water levels on habitat**

# Acknowledgements


- NSF – REU, Biocomplexity, and LTER grants
- Jake Vander Zanden and lab
- Gretchen Hansen
- Martin Perales
- Brian Roth
- Steve Gilbert
- Dave Balsiger
- Barbara Benson
- Jeff Maxted
- Karen Wilson
- Stacy Lischka
- Adam Ray
- Ellen Feingold
- Patrick Hermann
- Laura Kessler
- Julia McCarthy
- Katie Lord
- Everyone who got “pinched”


Center for Limnology, UW-Madison