

Invasive crayfishes and taxonomy



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Number of crayfish species

- 640 + species of freshwater crayfishes worldwide
- About 400 species of crayfishes in North America, most in the United States and highest diversity in southeastern U.S.
- About 40 species known in South Carolina (includes 1 non-native species)

How many people study crayfishes?

- Likely there are hundreds of people studying various aspects of biology and ecology that involves crayfishes to some degree
- Only a small number of people study taxonomy of crayfishes as their main area
- Horton Hobbs, Jr. did most of the taxonomic work in the 1900s

What's happening now?

- Still discovering new species and reanalyzing past work, resulting in recognition of more species (resurrecting old names)
- Need to be able to identify both native and non-native species due to introductions
- Requires looking at large samples of specimens over larger areas than just within a single state, province, etc.

Problems caused by invasives

- Burrowing damage to dams and levees
- Competition / hybridization with native species
- Introduction of diseases and parasites
- Altering food webs and ecosystems
- Potential loss of native species
- Costs of control and damage (est. \$120 billion / yr for the ~ 50,000 U.S. invasives)

How do invasives travel?

- Tag along in shipments of other aquatic species such as pond fish and plants
- Aquaculture importations (& tag alongs)
- Pet trade - pet stores
- Pet trade - private / trade by individuals
- Bait industry
- Fishermen discarding bait

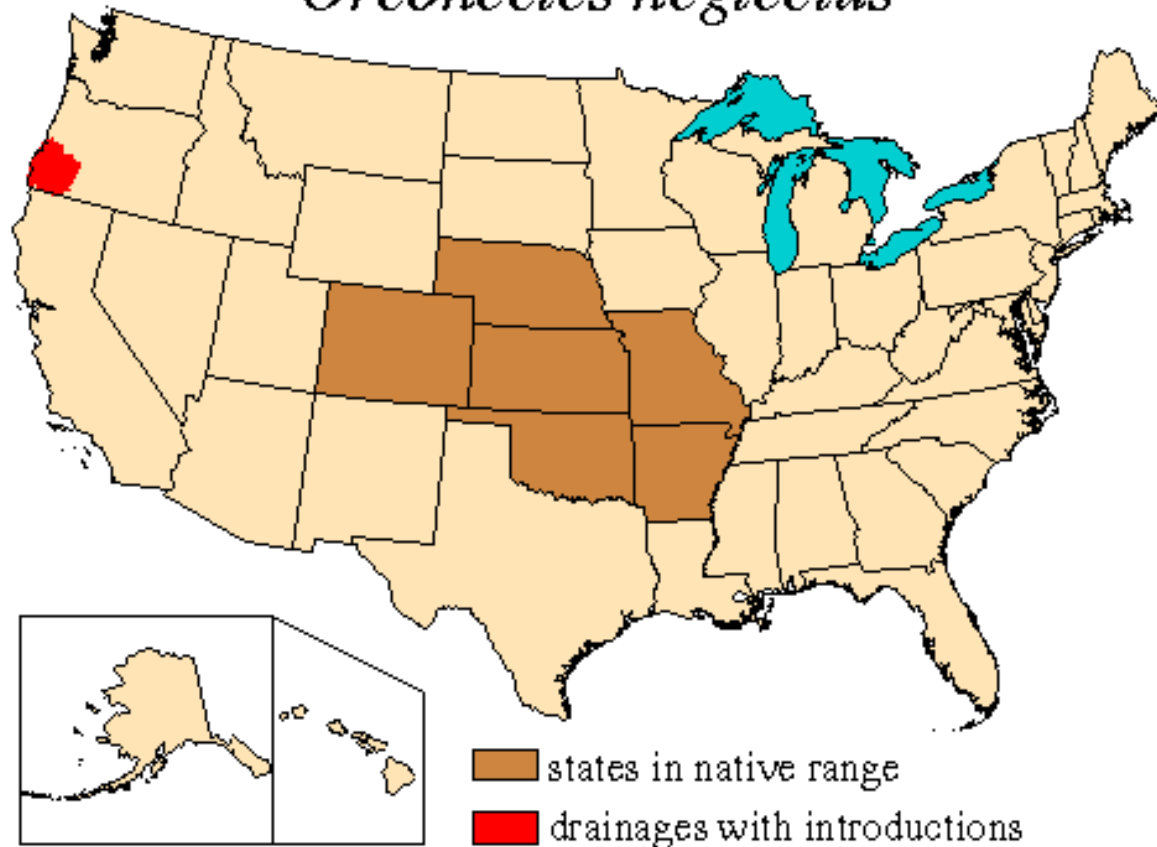
Why does taxonomy matter for invasive species?

- Some areas have not been surveyed well for crayfishes even in the U.S.
- Even in the surveyed areas, the taxonomy has not been studied in enough detail
- Species are getting introduced at greater rates so it might be difficult to know if a species is native or non-native

Why does taxonomy matter for invasive species (cont.)?

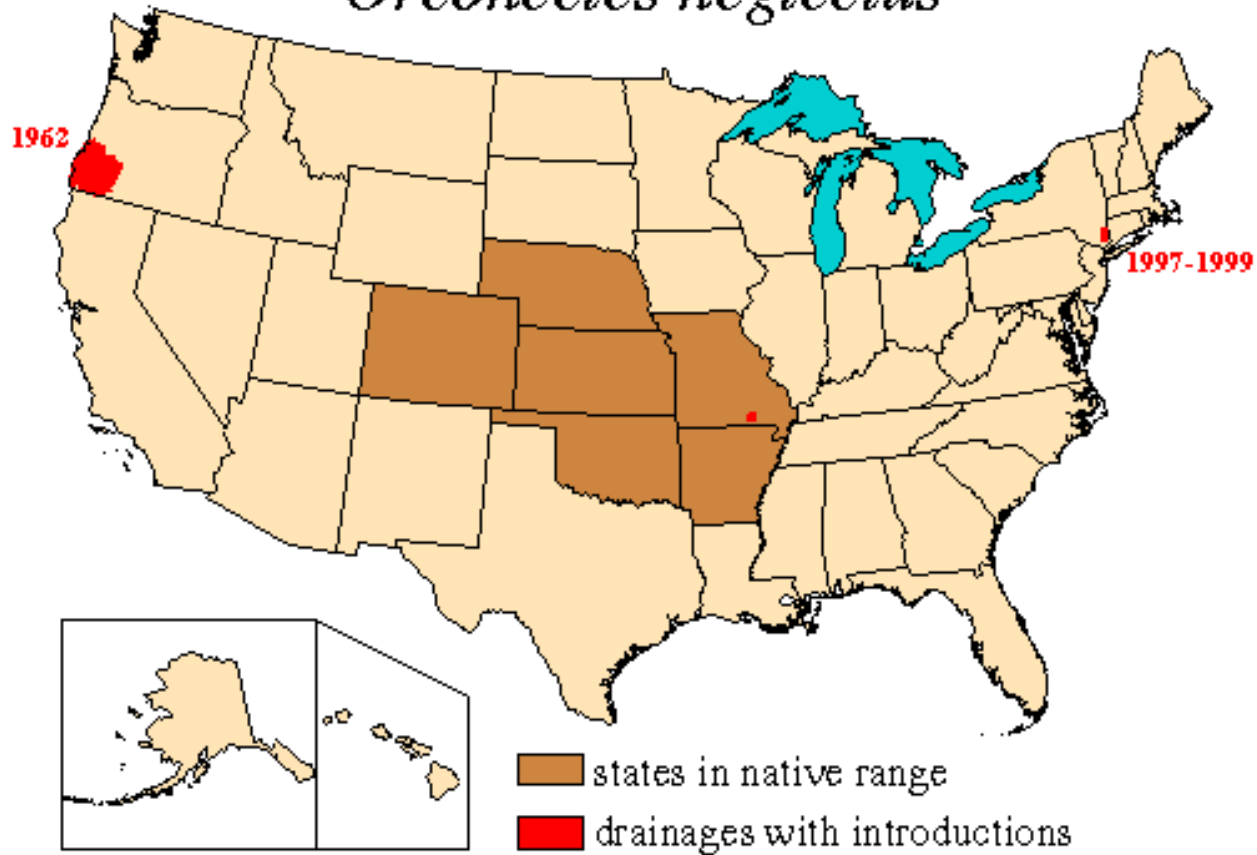
- Must be able to recognize the non-native species
- Example: Fitzpatrick (1966) described a new species from Rogue River in Oregon, then Bouchard (1977) concluded that the new species was a junior synonym of *Orconectes neglectus* Faxon, 1884, which is native to the midwestern U.S.

Orconectes neglectus



**USGS Nonindigenous Aquatic Species map for
Orconectes neglectus (from <http://nas.er.usgs.gov/>)**

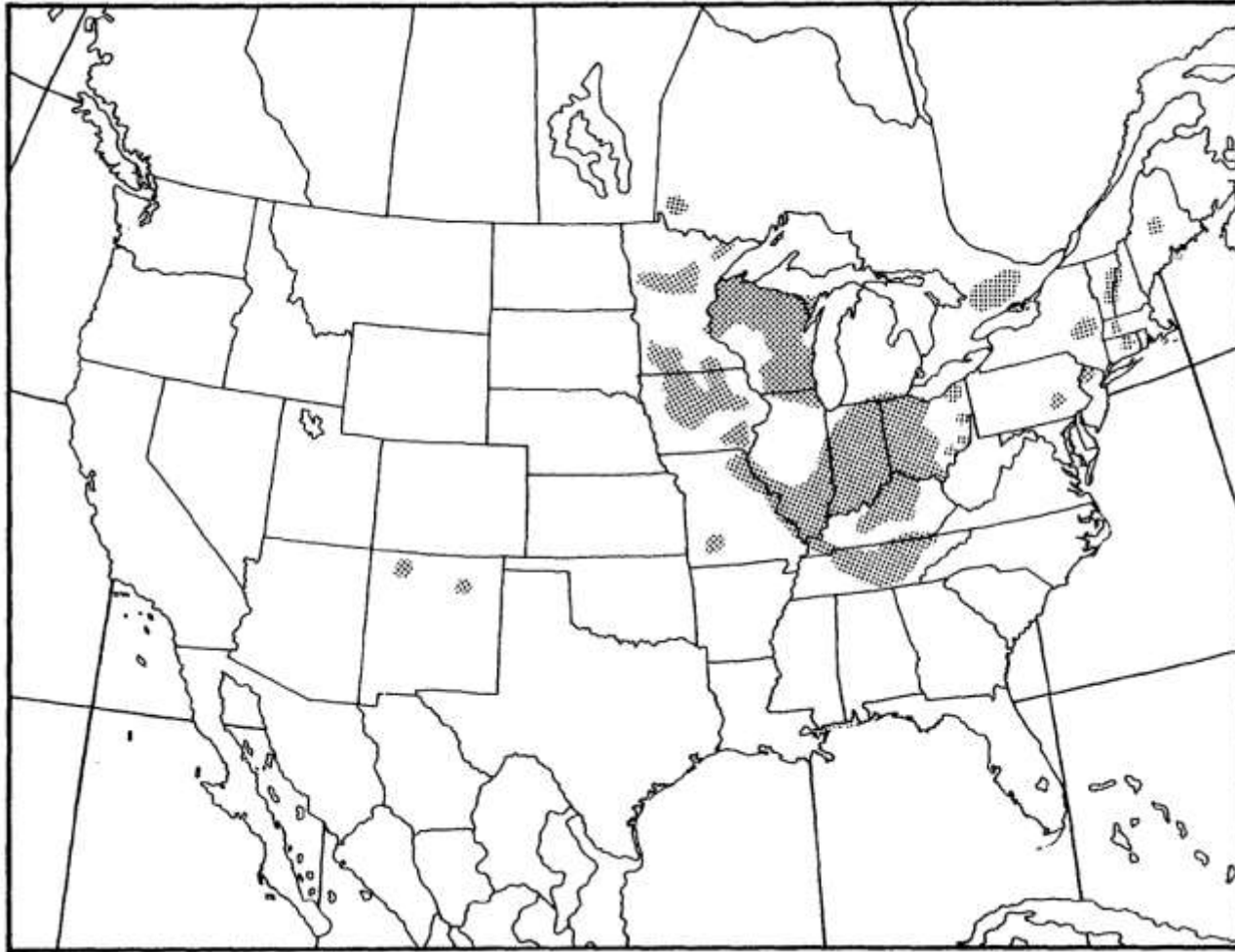
Orconectes neglectus



**Updated USGS Nonindigenous Aquatic Species
map for *Orconectes neglectus* (modified from
<http://nas.er.usgs.gov/>)**

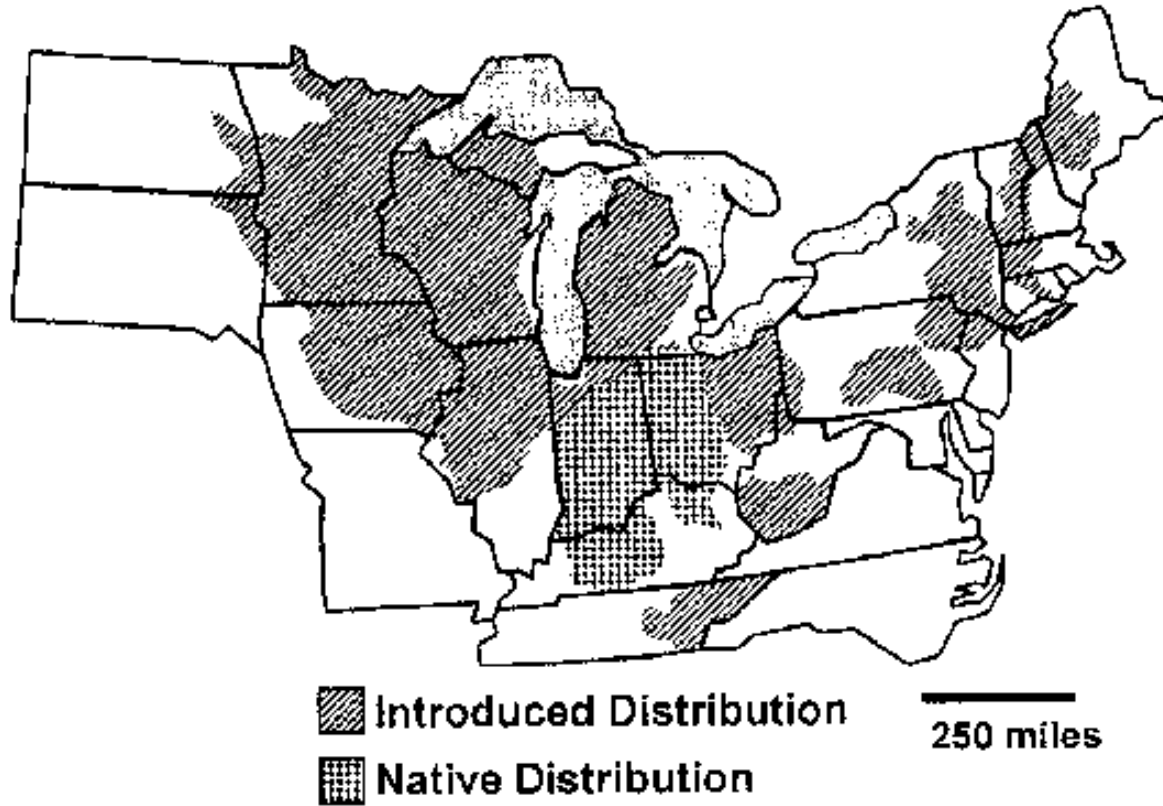
What about the rusty crayfish?

- Species was described in 1852 (Ohio R.)
- Has been introduced to many places in U.S.
- Species that is most studied in U.S.
- As of 2002 it was still confused with a native species in Iowa and Minnesota
- Distribution maps from various sources not accurate

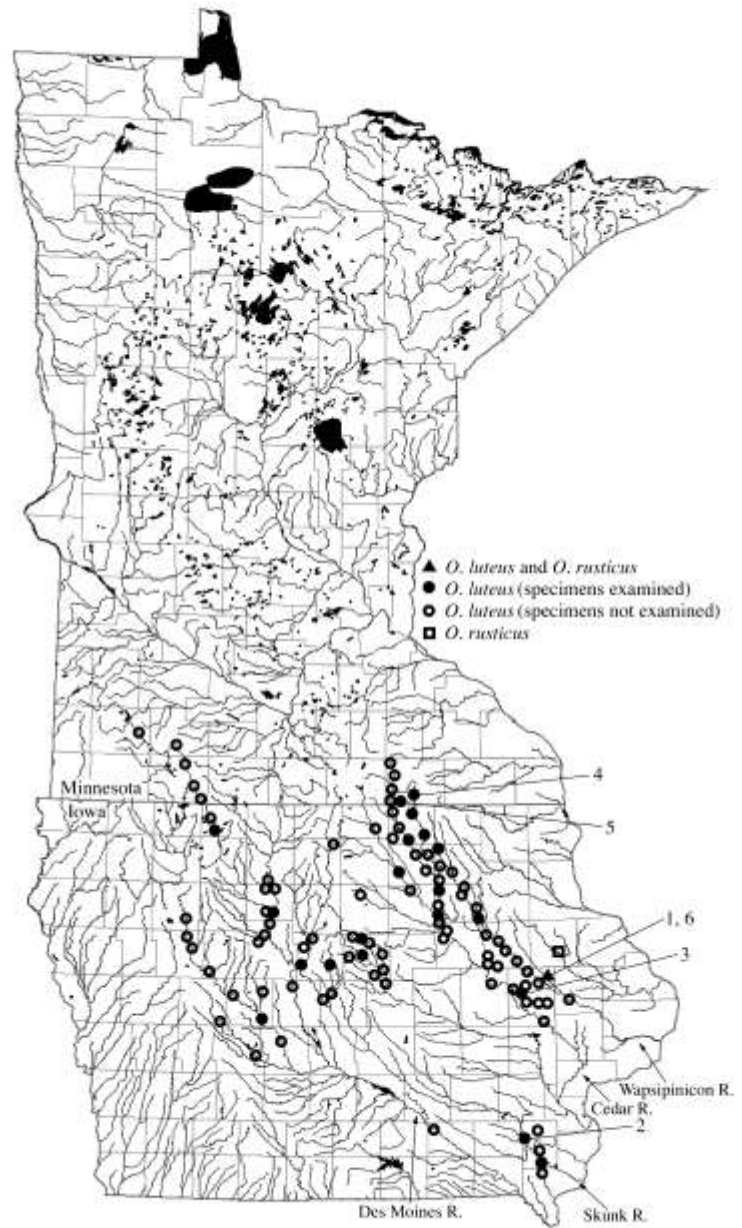


Distribution of rusty crayfish from Hobbs and Jass (1988).

Orconectes rusticus



Distribution of rusty crayfish from Perry et al. (2001).





B



D



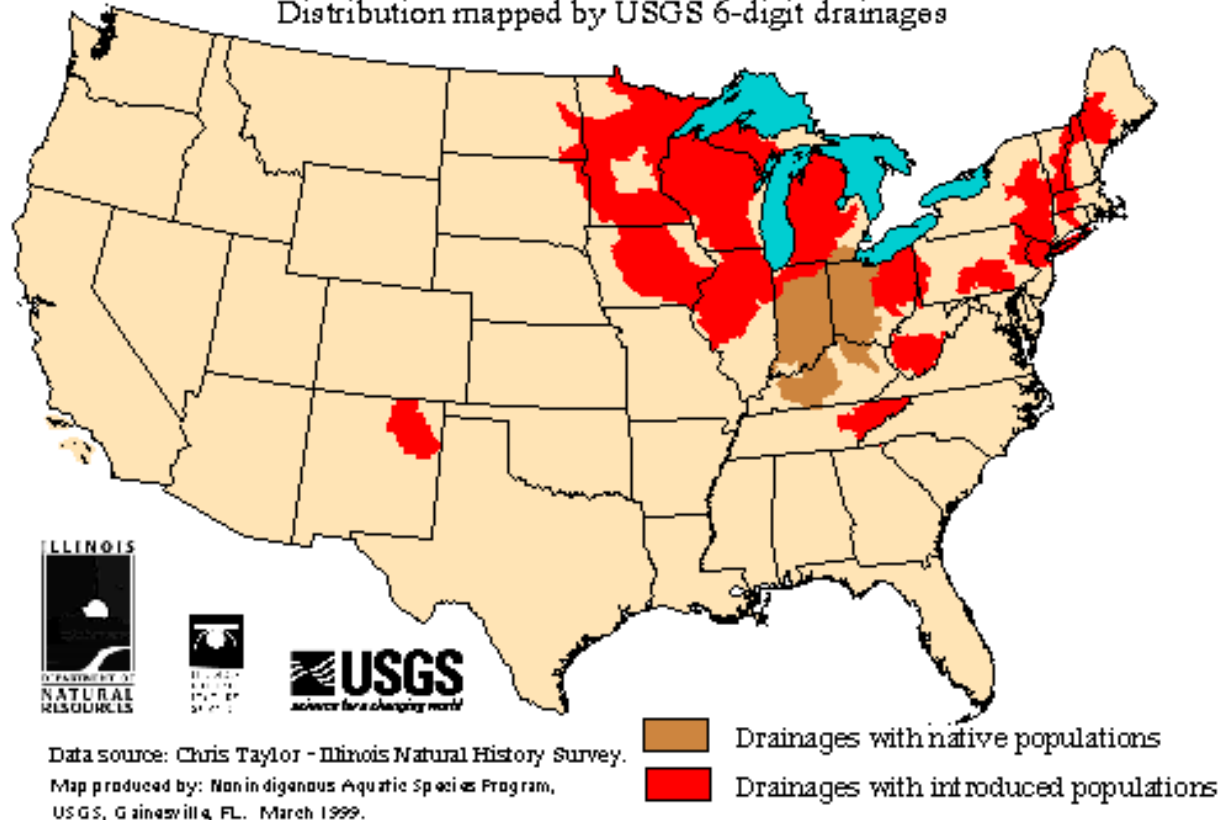
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Rusty crayfish

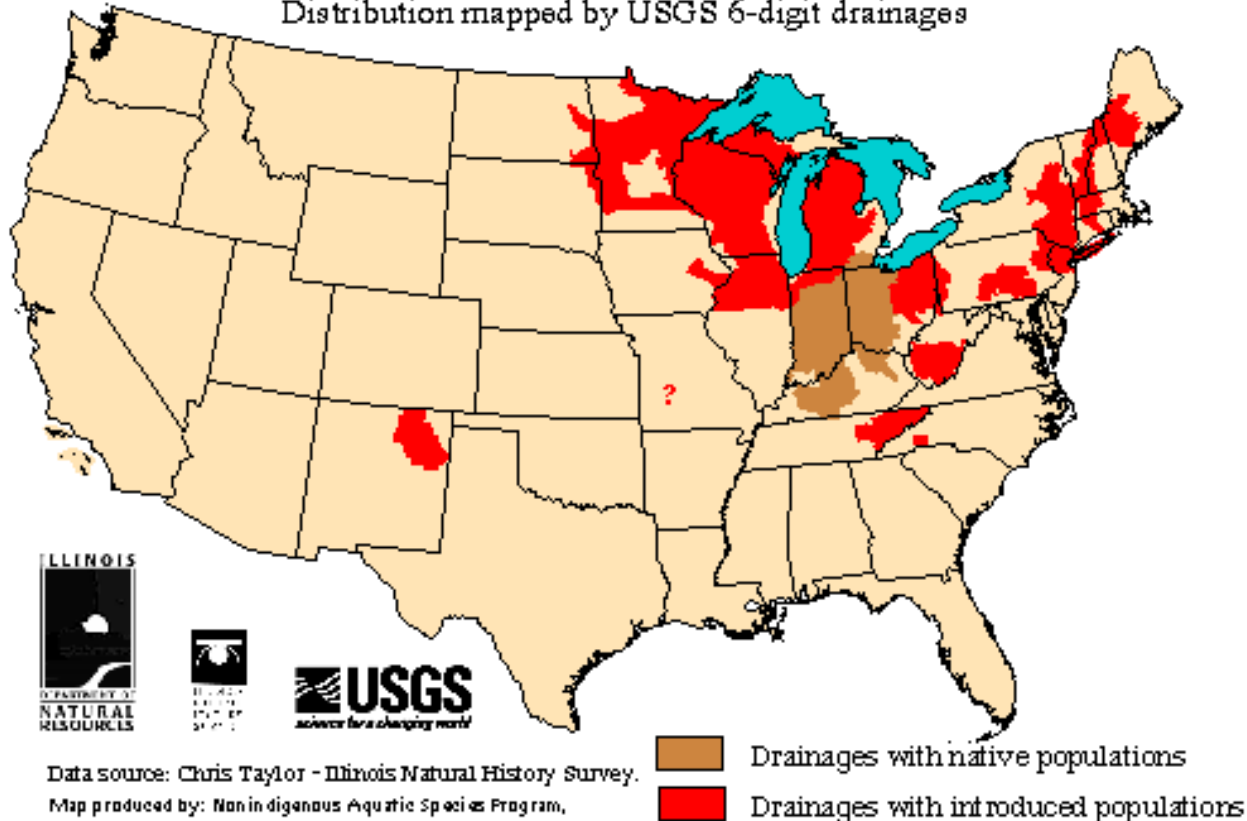
Distribution mapped by USGS 6-digit drainages



**USGS Nonindigenous Aquatic Species map for
Orconectes rusticus (from <http://nas.er.usgs.gov/>)**

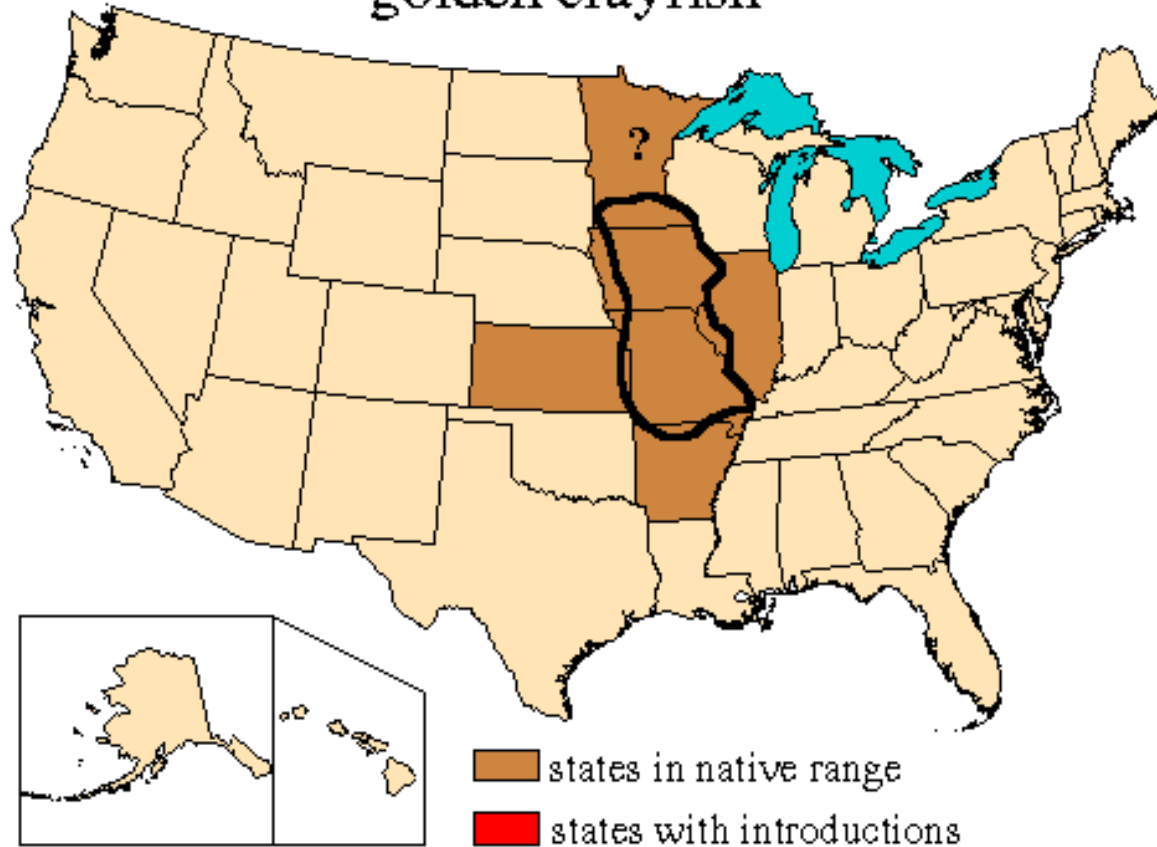
Rusty crayfish

Distribution mapped by USGS 6-digit drainages



**Updated USGS Nonindigenous Aquatic Species
map for *Orconectes rusticus* (modified from
<http://nas.er.usgs.gov/>)**

Orconectes luteus
golden crayfish



**Updated USGS Nonindigenous Aquatic Species
map for *Orconectes luteus* (modified from
<http://nas.er.usgs.gov/>)**

Red swamp crawfish in SC

- Introduced to SC for aquaculture in late 1970s and also around the world
- Distributed around SC in aquaculture ponds
- Species readily travels over land, especially on rainy nights
- Now distributed around SC in streams and rivers
- Impacts?

Impacts of red swamp crawfish?

- Collected with other native species at some sites in SC
- Some locations in SC had only red swamp crawfish present
- Sites in NC that formerly had several native species now have only red swamp crawfish
- Problems in other countries (e.g. Japan)

“Marmokrebs”

- A parthenogenetic species of *Procambarus* that turned up in German aquarium trade ca. 1995
- Origins of stock unknown but apparently is a new species from Florida where the most similar species occur (still not described)
- The species has become established in Madagascar already
- Madagascar?????? Where next?!

“Marmokrebs”



- Will likely continue to be spread through pet trade
- Use as a model organism for research also could contribute to further spread

Conclusions

- Need to do more surveys and monitoring to detect native species, describe new ones, and document non-native species that continue to appear
- Need taxonomists who can distinguish the species not just on a local scale but now must be knowledgeable about species from wider geographic areas

Conclusions

- Find ways to stop further spread of non-native species
- Do not allow non-native species to be imported, especially if being held outdoors