


US EPA ARCHIVE DOCUMENT



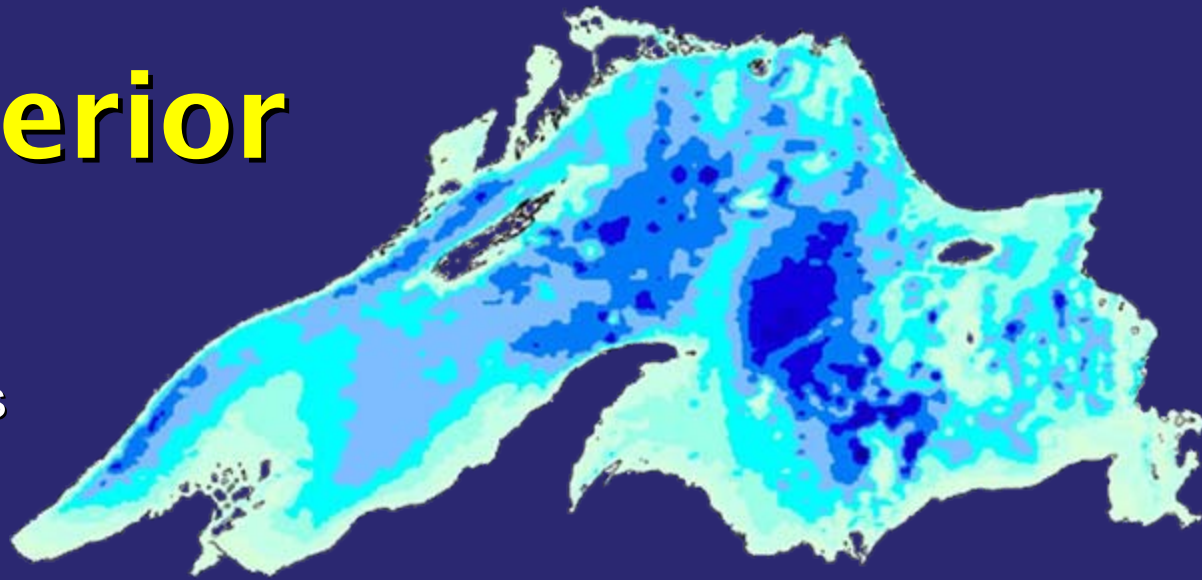
Lake Superior

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Michigan Department of Environmental Quality





Lake Superior



Average Depth 483 feet
147 meters

Maximum Depth 1,332 feet
406 meters

Volume 2,900 cu. mi.
12,100 cu. km.

Water Area 31,700 sq. mi.
82,100 sq. km.

Land Drainage Area 49,300 sq. mi.
127,700 sq. km.

Shoreline Length 2,726 miles
4,385 km

Population 842,262
(U.S.2000; Canada 2001)

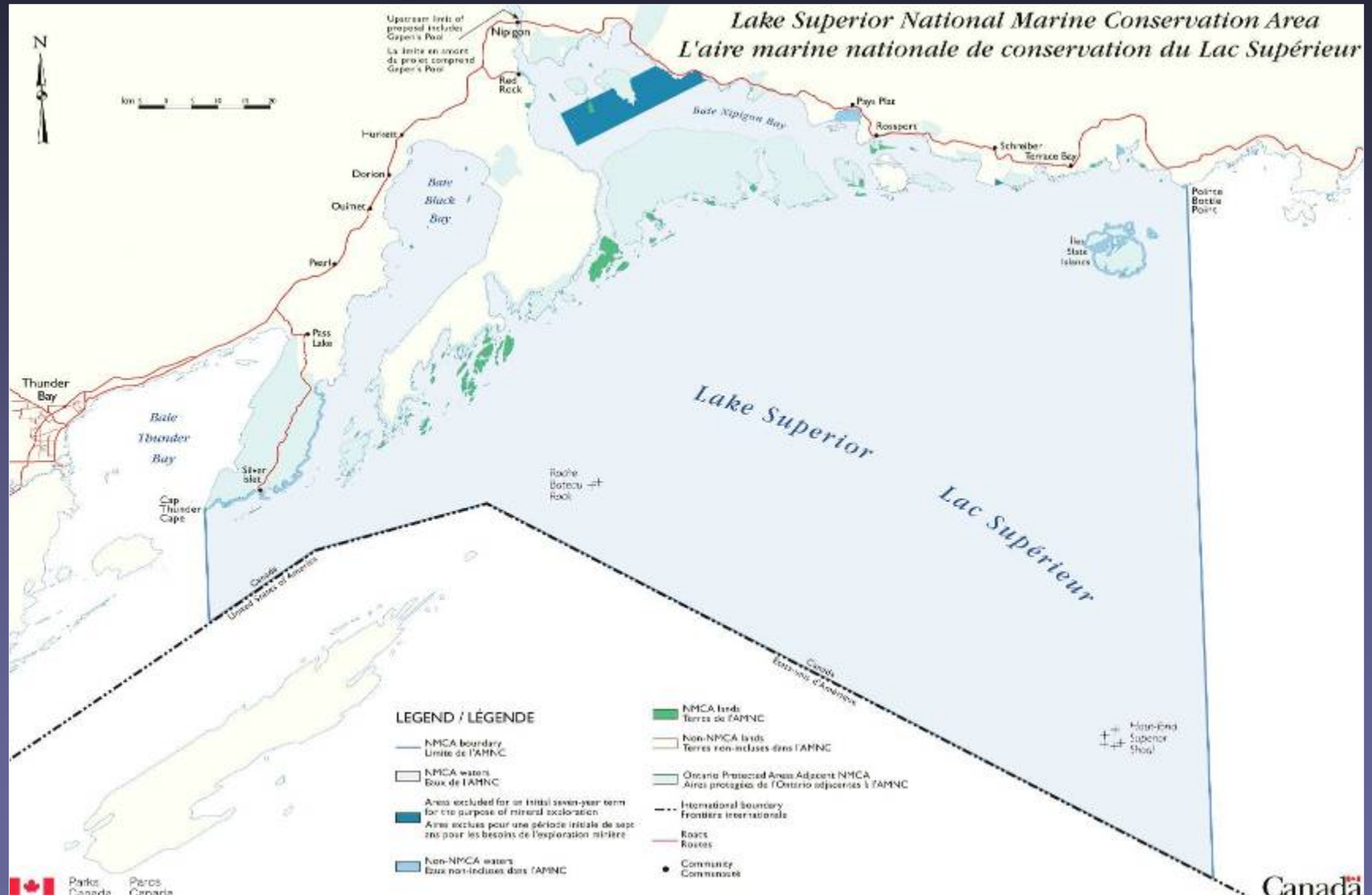
Retention Time 173 years

Ecosystem: Generally Good

- Bald eagle, gray wolf and peregrine recovering
- Fisheries in good to excellent condition
- Lower food web robust and stable
- Forest cover increasing
- Contaminant levels are declining or remaining constant
- Important habitat and land acquisitions, including the National Marine Conservation Area



Map of the NMCA



Lake Superior Ecosystem Faces Challenges



- Non-native species
- Shoreline development and hardening
- Habitat loss
- Aquatics species threatened
- Land use change
- Critical pollutants
- Substances of emerging concern
- Mining
- Climate change effects
- Protection

Lake Superior State of the Fisheries



Brook trout



Shortjaw cisco



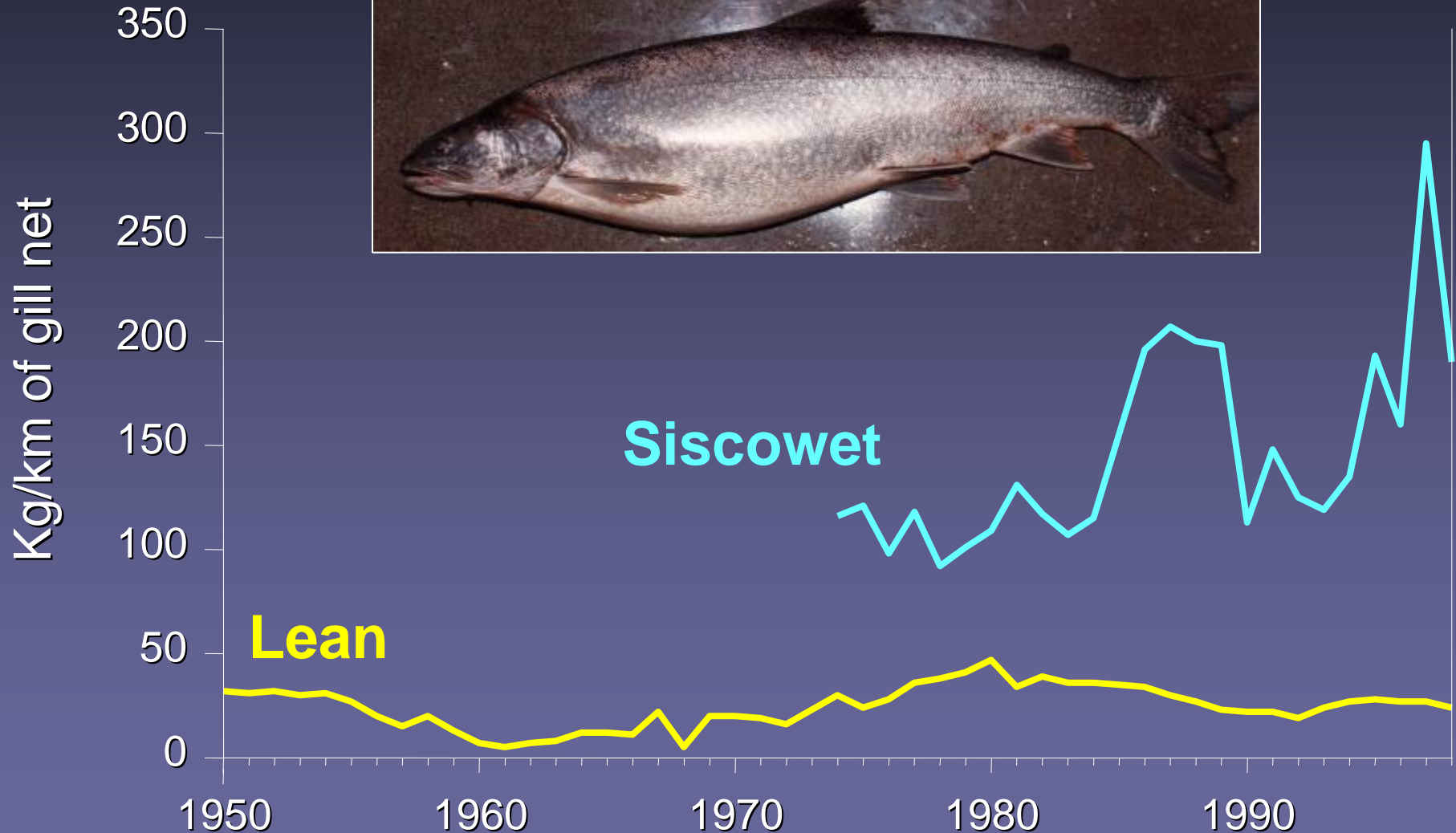
Lake trout

Lake Whitefish, Cisco and Lake Sturgeon

- Lake whitefish and cisco abundant and increasing
- Walleye, lake sturgeon and coaster brook trout populations being rehabilitated



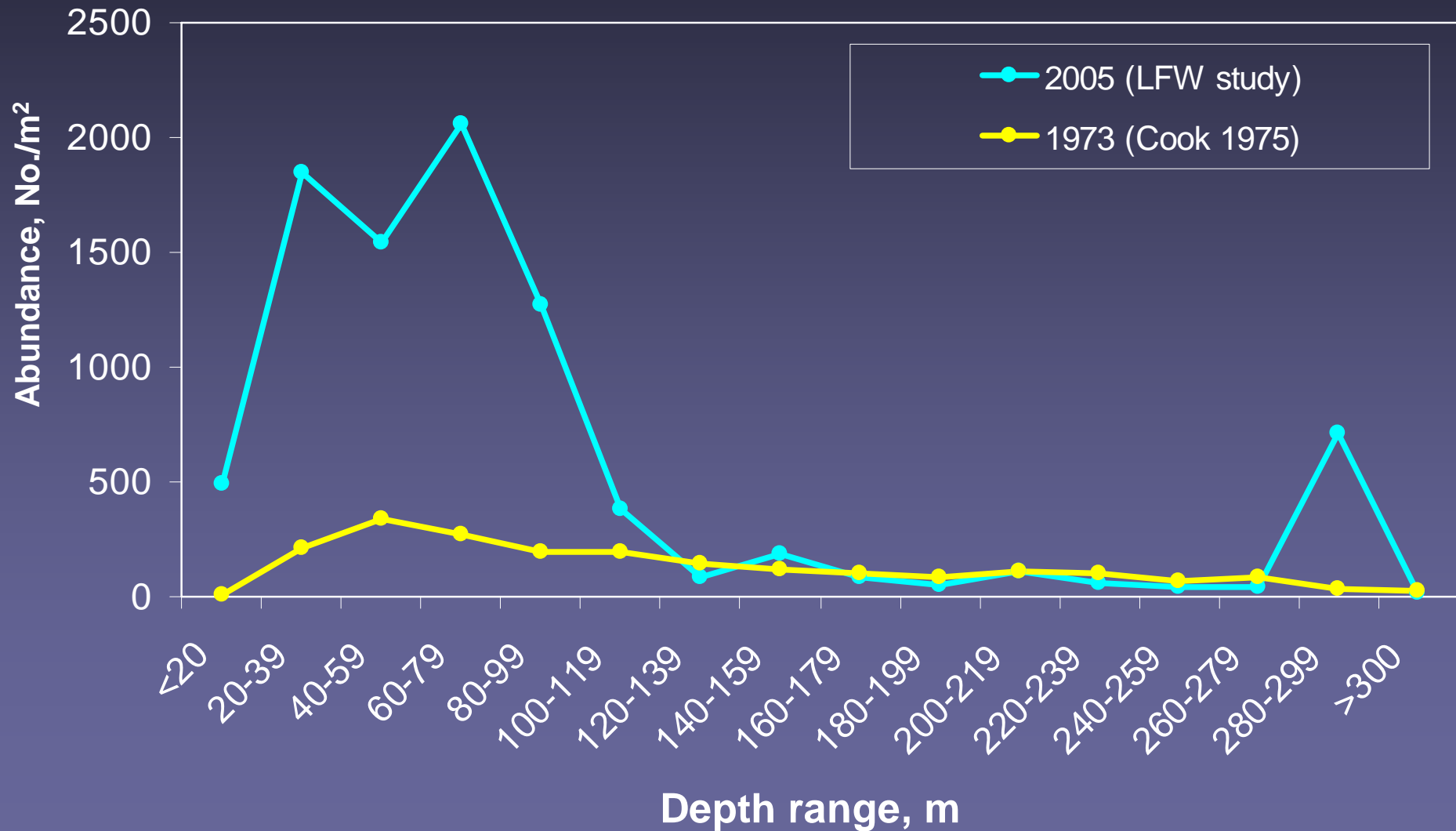
Lake Trout Abundance: A Success Story for Lake Superior



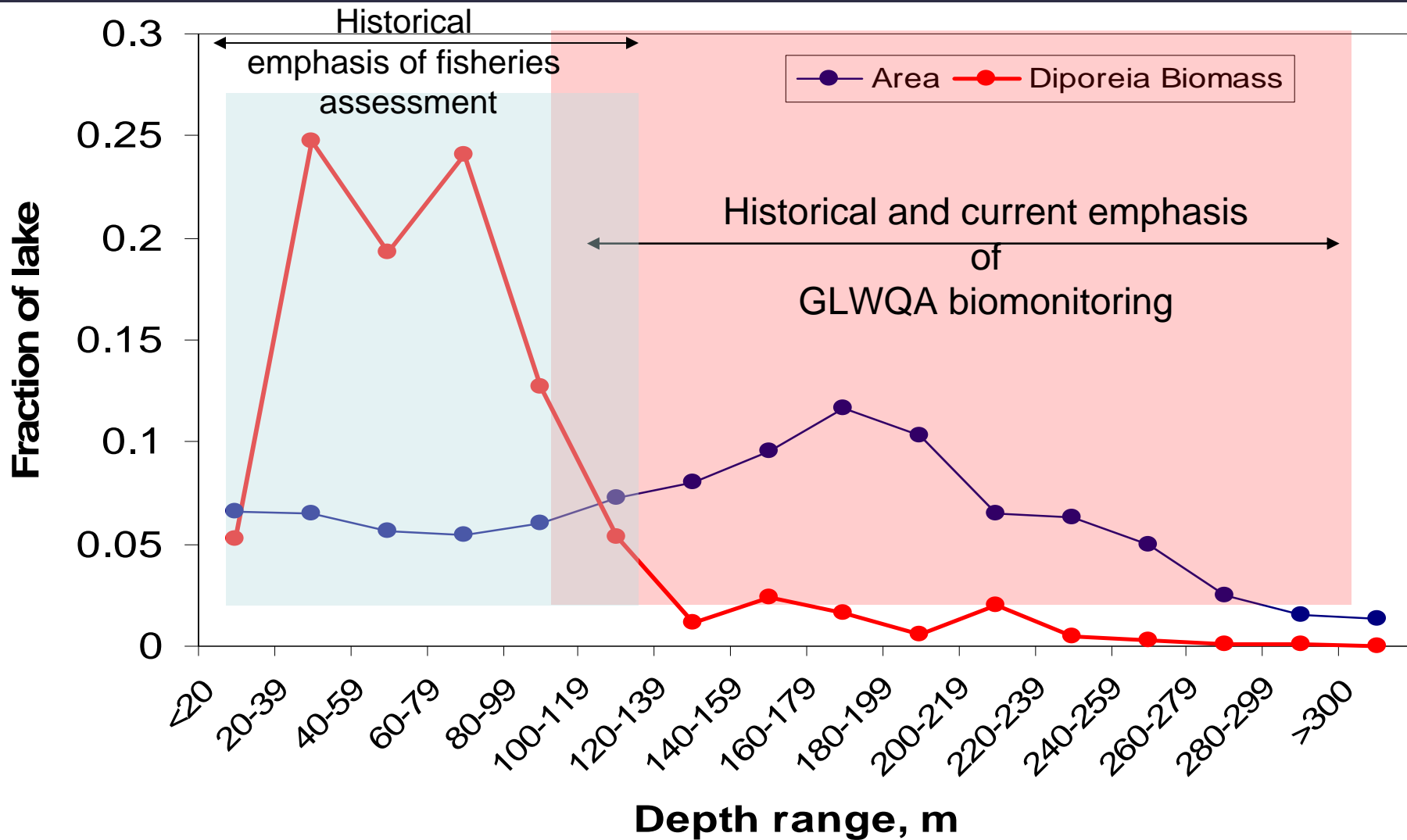
Lake Superior Lower Food Web



Diporeia 2005 and 1973 (aka Pontoporeia) in Lake Superior



Nearshore (0-100 m) has ~30% of lake area but ~80% of lake *Diporeia* biomass



Contaminant Trends in Lake Superior

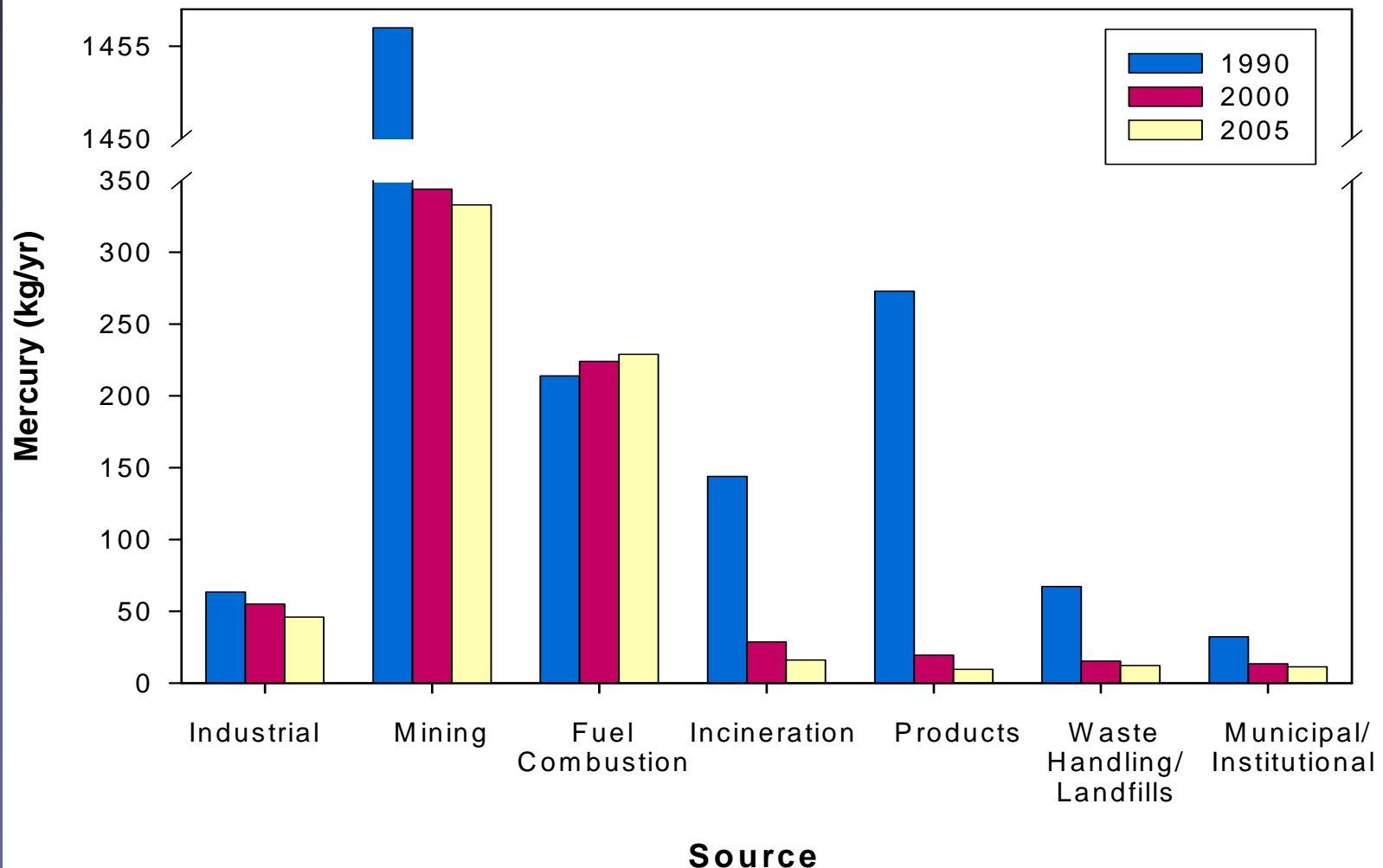




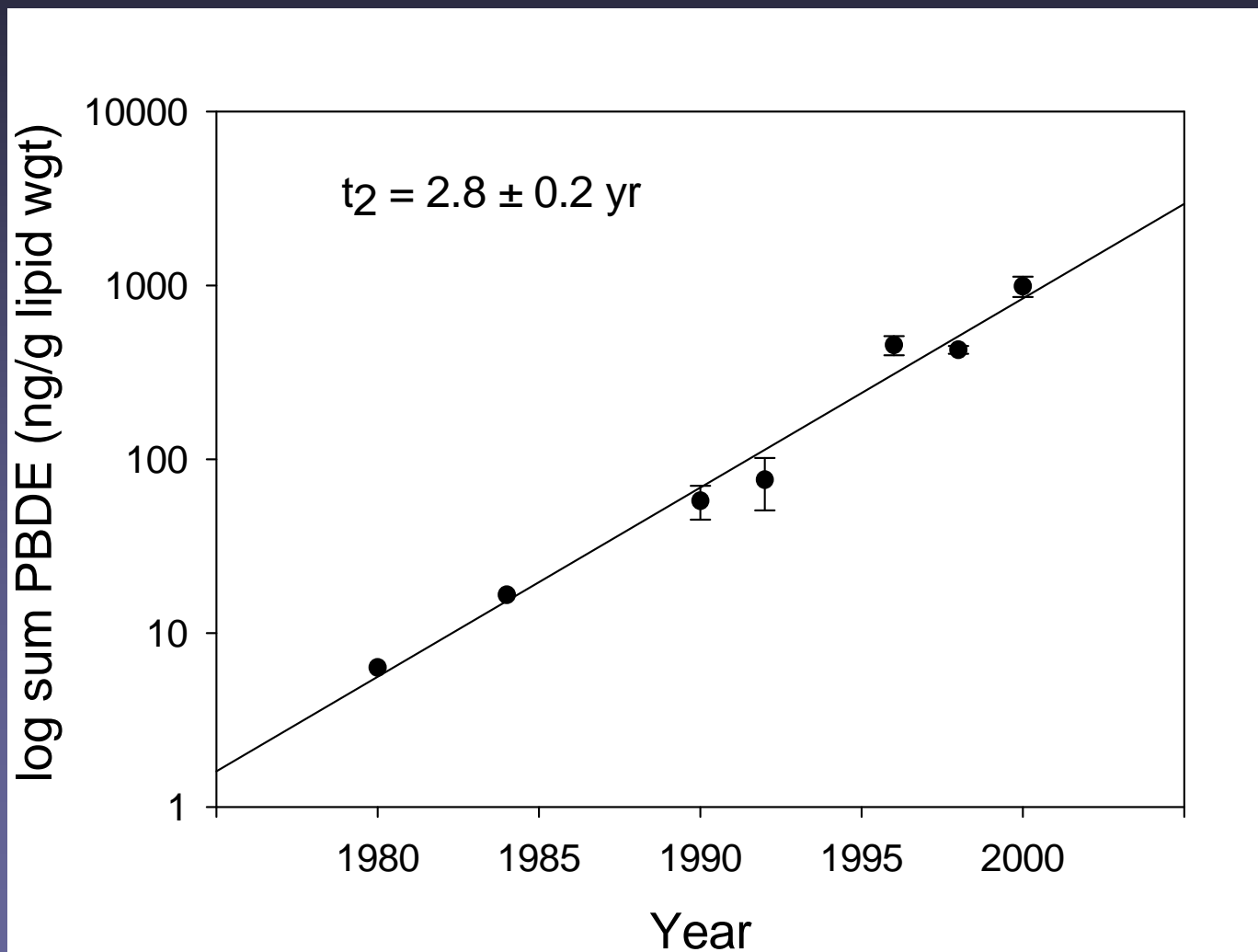
Entering The
**Lake Superior
Watershed**

The Lake Superior Binational Forum
1-888-301-LAKE

Reductions of Mercury Discharges and Emissions from Lake Superior Sectors Between 1990 and 2005, kg/yr



Concentrations of Polybrominated Diphenyl Ethers (PBDEs) in Whole Lake Trout



Zhu and Hites (2004)

Mining Impacts



Taconite mine, MN

Duluth Superior Ore dock



Lake Superior Habitat and Terrestrial Wildlife



Herptile Monitoring in the Lake Superior Basin



Mink frog

Great Lakes Invasive Species



Asian carp

“Invasive species are everywhere. They damage our crops, our industries, the environment and public health. Scientists, academics, leaders of industry and land managers are realizing that invasive species are one of the most serious environmental threats of the 21st century.”

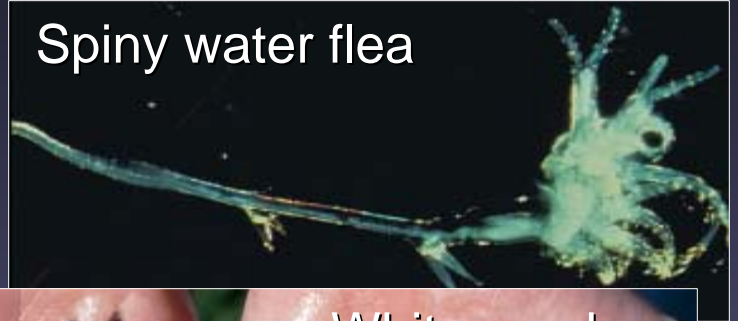
- National Invasive Species
Council (2001)

Aquatic Invasive Species

Ruffe



Spiny water flea



White perch



3-spine Stickleback



Round goby



Zebra mussel



Terrestrial Invasive Species

- Phragmites
- Purple Loosestrife
- Exotic buckthorns
- Asian longhorned beetle
- Emerald ash borer



NCS photo

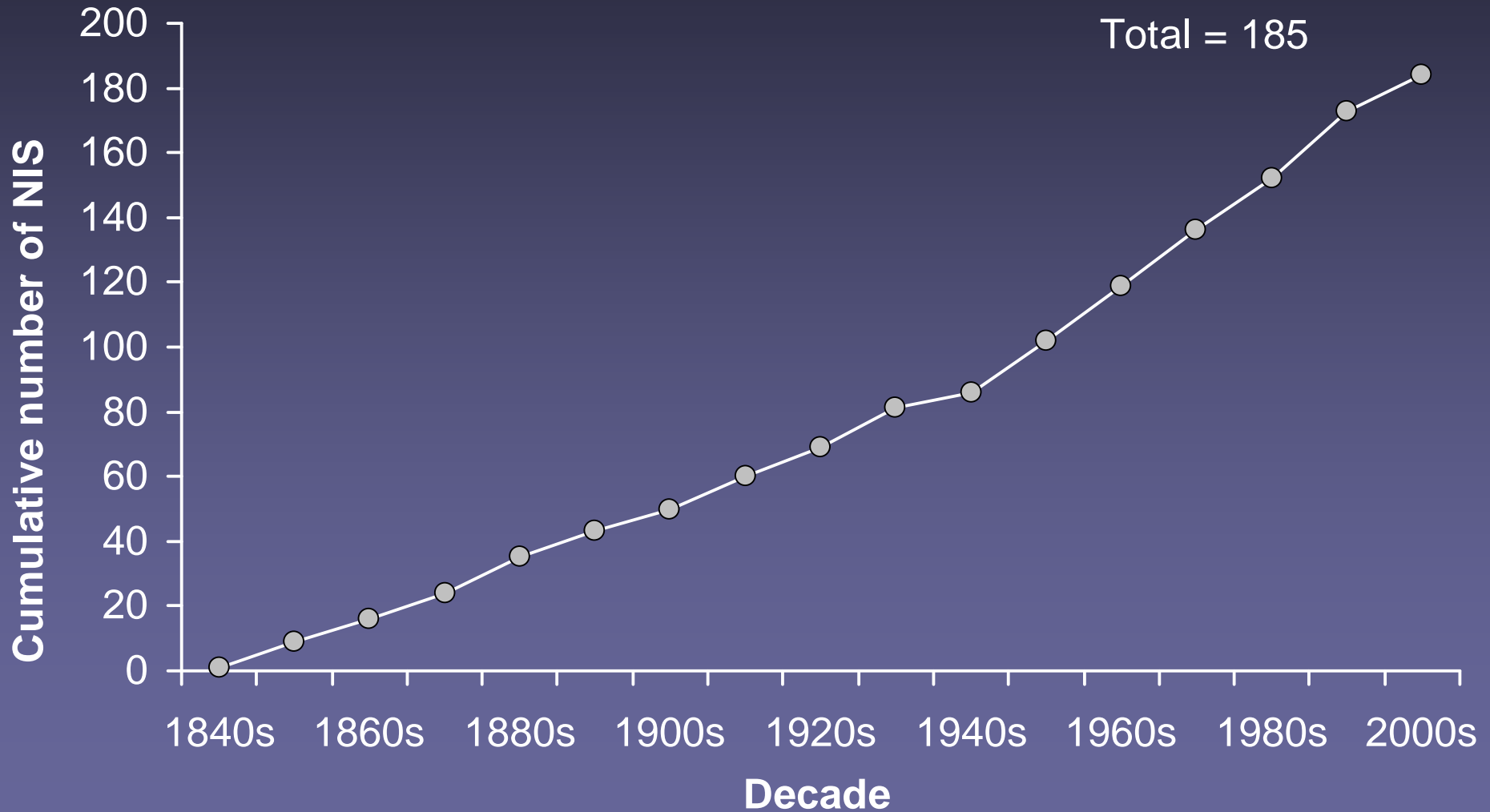
Emerald ash borer

Invasive Free Zone:

To eradicate invasive plants and restore native plant communities on a landscape scale



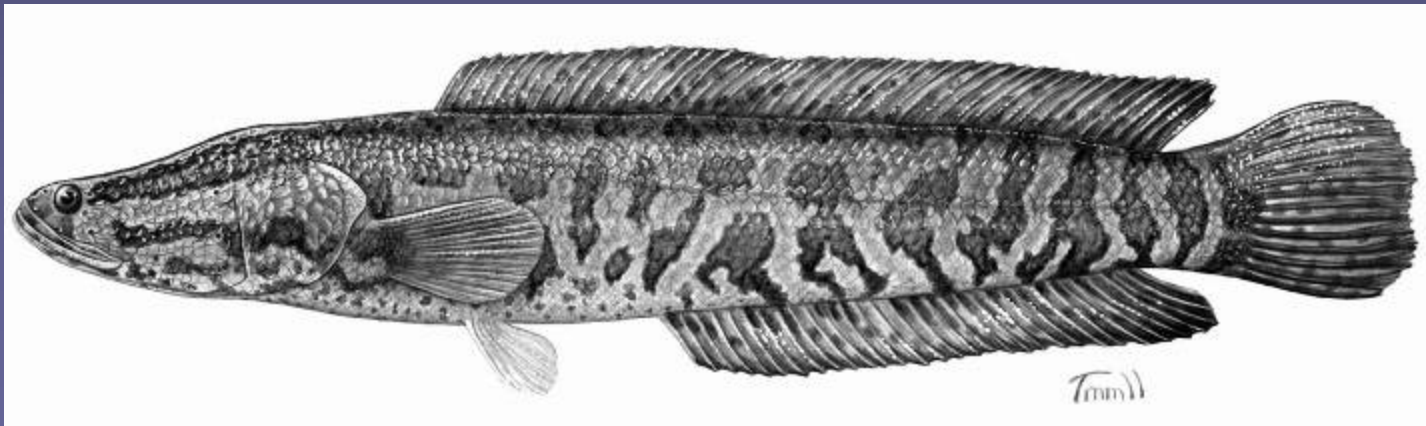
Aquatic Non-Native Species



Imminent Invasives



Killer Shrimp



Snakehead

Emerging Invasive: Didymo



Invasive freshwater alga *Didymosphenia geminata*

Lake Michigan Invasives



- Diporeia declining dramatically: 95% between 1995 and 2005
- Increased clarity of waters has led to increased algae, botulism spread and massive bird die offs
- VHS has caused significant fish mortality events

Lake Michigan Invasives

- Asian Carp within 30 miles of Lake Michigan
- New invasive in Lake Michigan – *Hemimysis*
- *Phragmites* spreading rapidly
- Round goby increasing



Lake Huron Invasives



Phragmites



Sea Lamprey

Lake Erie Invasives



Round goby

Lake Erie Algae Aerial



Lake Ontario Invasives



VHS-Infected Fish

Lake Superior Invasives






Ruffe

Chinese Mitten Crab

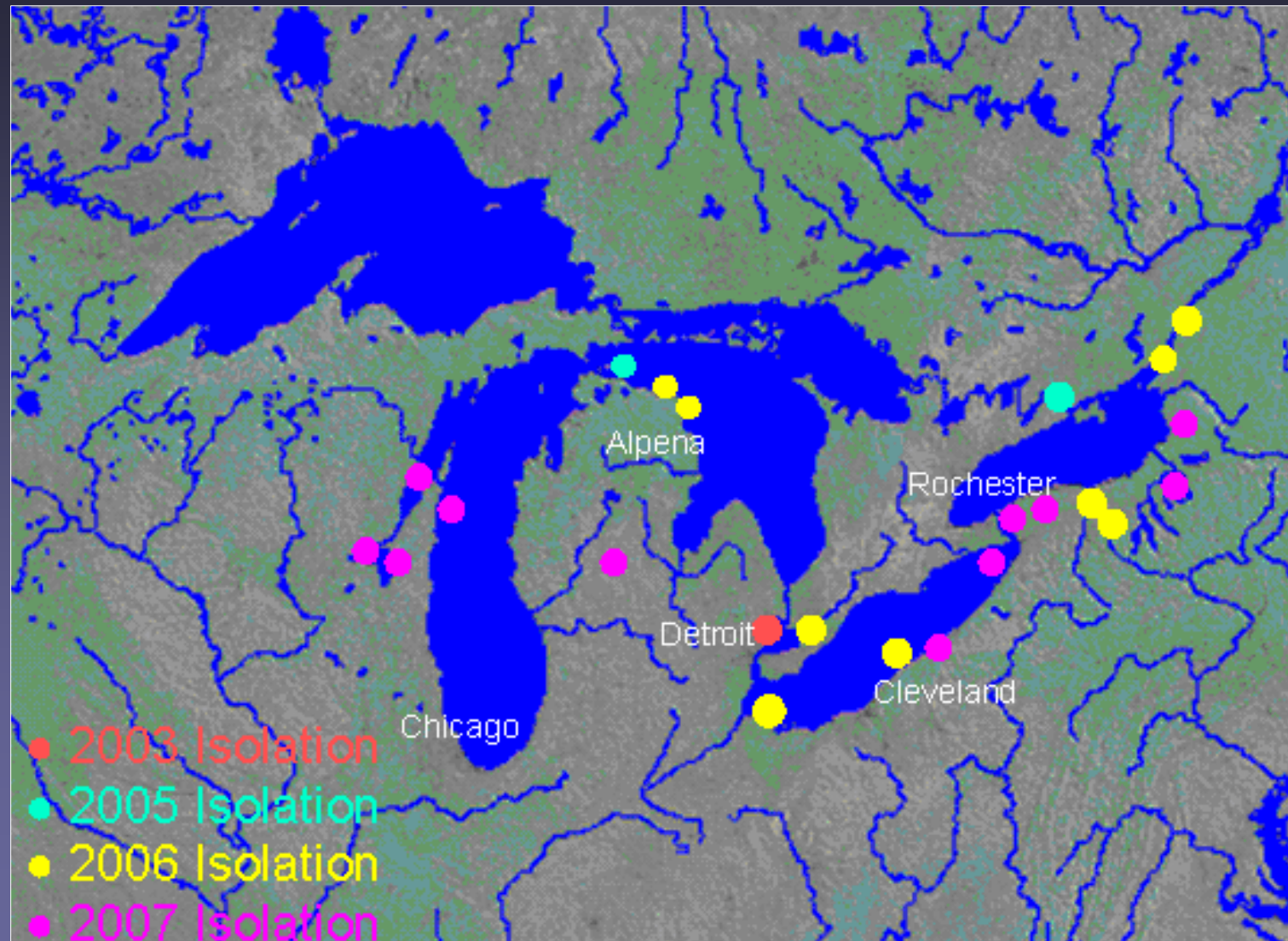


Lake Superior

Status of Introduced Species

Species	Range	Abundance	
ruffe	Increasing	Stable	
threespine stickleback	Increasing	Increasing	
fourspine stickleback	Stable	Stable	
white perch	Increasing	Increasing	
round goby	Increasing	Stable	
New Zealand mud snail	Increasing	Increasing	
Chinese mitten crab	New	Low	

Lake Superior VHS Free



Aquatic Invasive Species Prevention in Lake Superior Pathways Concept Map

**Maritime
Commerce:**
Ballast Water
Hull/Anchor fouling

**Water
Recreation:**
Boating equipment
Livewells
Fishing equipment
Bait

**Agency
Activities:**
Stocking/hatcheries
Assessment
Harbor maintenance
Navigation
Homeland security
Research

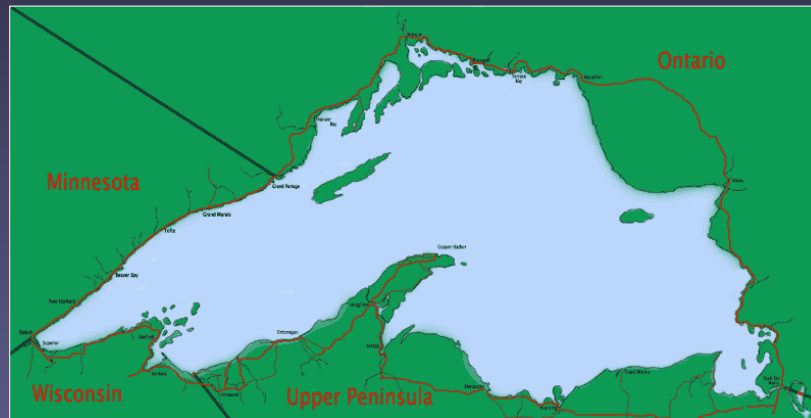
Tourism:
Charter fishing
Ecotours
Float planes
Diving

Organisms in Trade:
Pets/Aquariums
Aquatic plants
Shoreline restoration
Bait
Live food fish
On-line sales

**Canals and
Diversions**
Locks
Power canals
Compensating works
Diversions

**Illegal
Activities:**
Plants
Fish stocking
On-line sales

**Commercial
Fishing:**
Fishing equipment/vessels
Bait
Fish Aquaculture





**LAKE
SUPERIOR**



**BINATIONAL
PROGRAM**