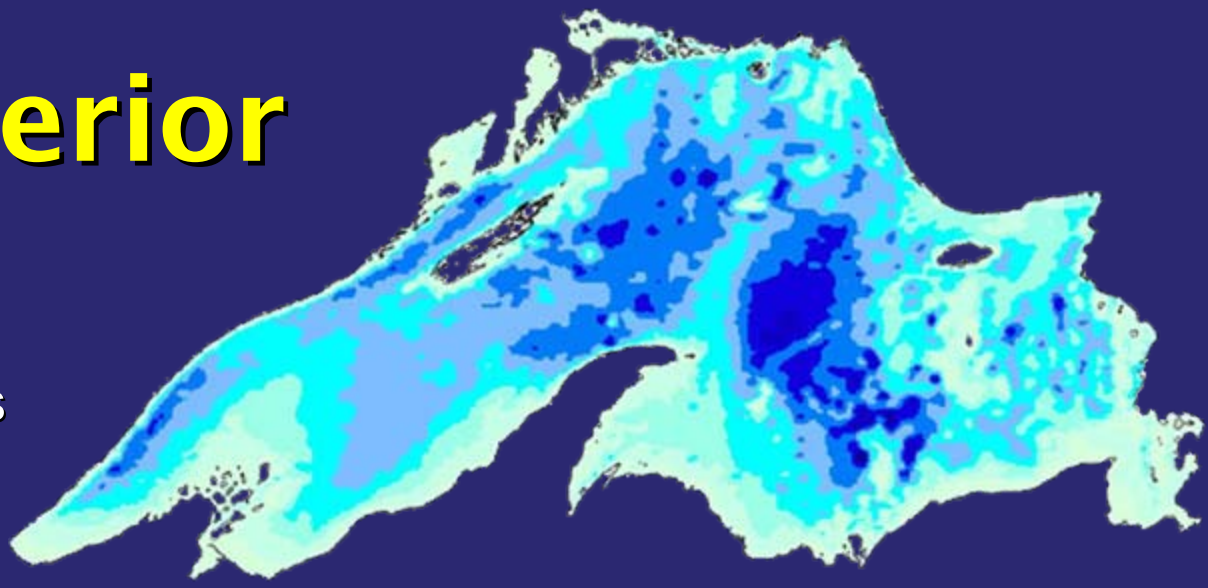
Lake Superior

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

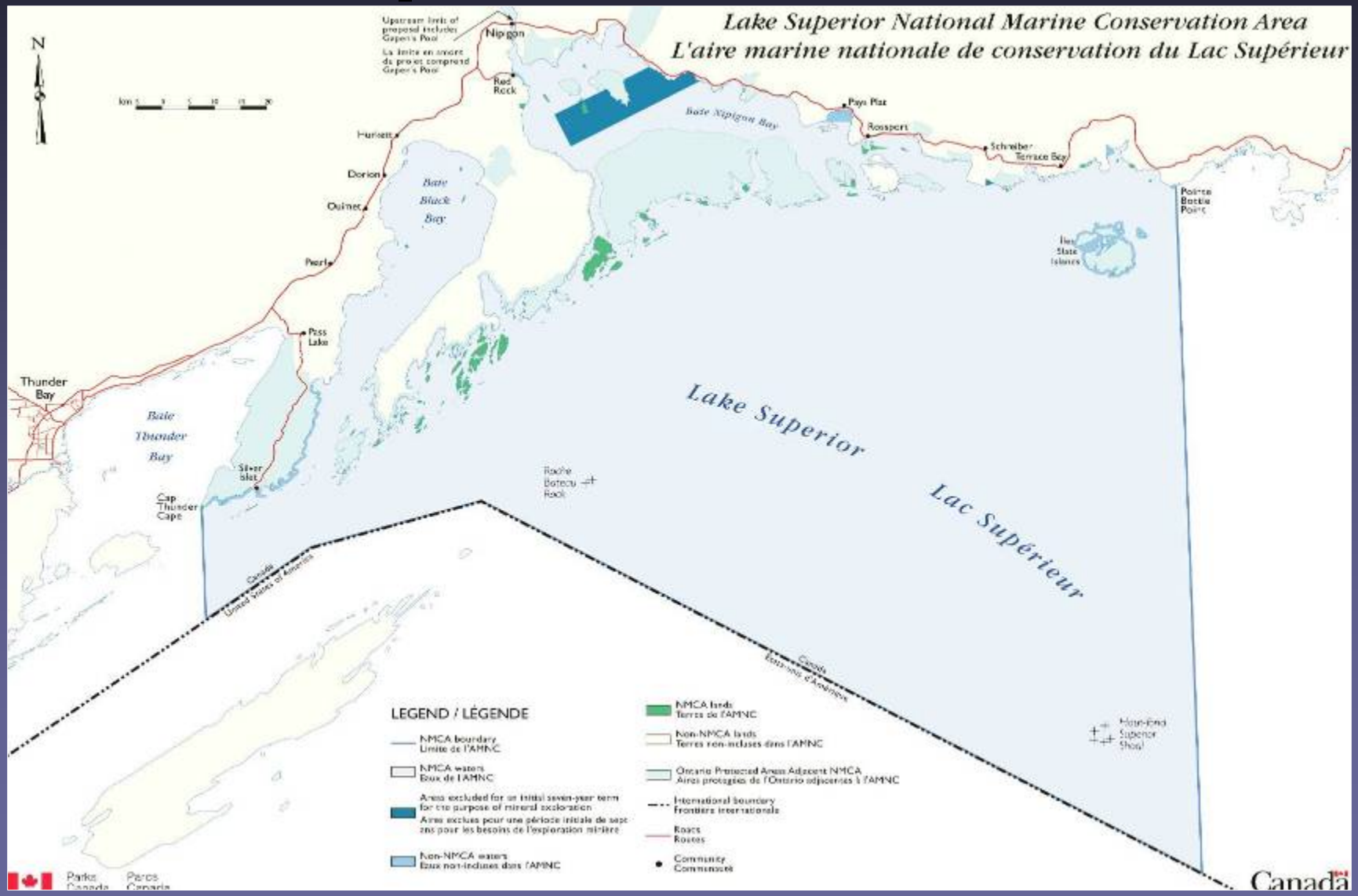
Retention Time 173 years

Source: NRRI, UMD; State of the Great Lakes 2005

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

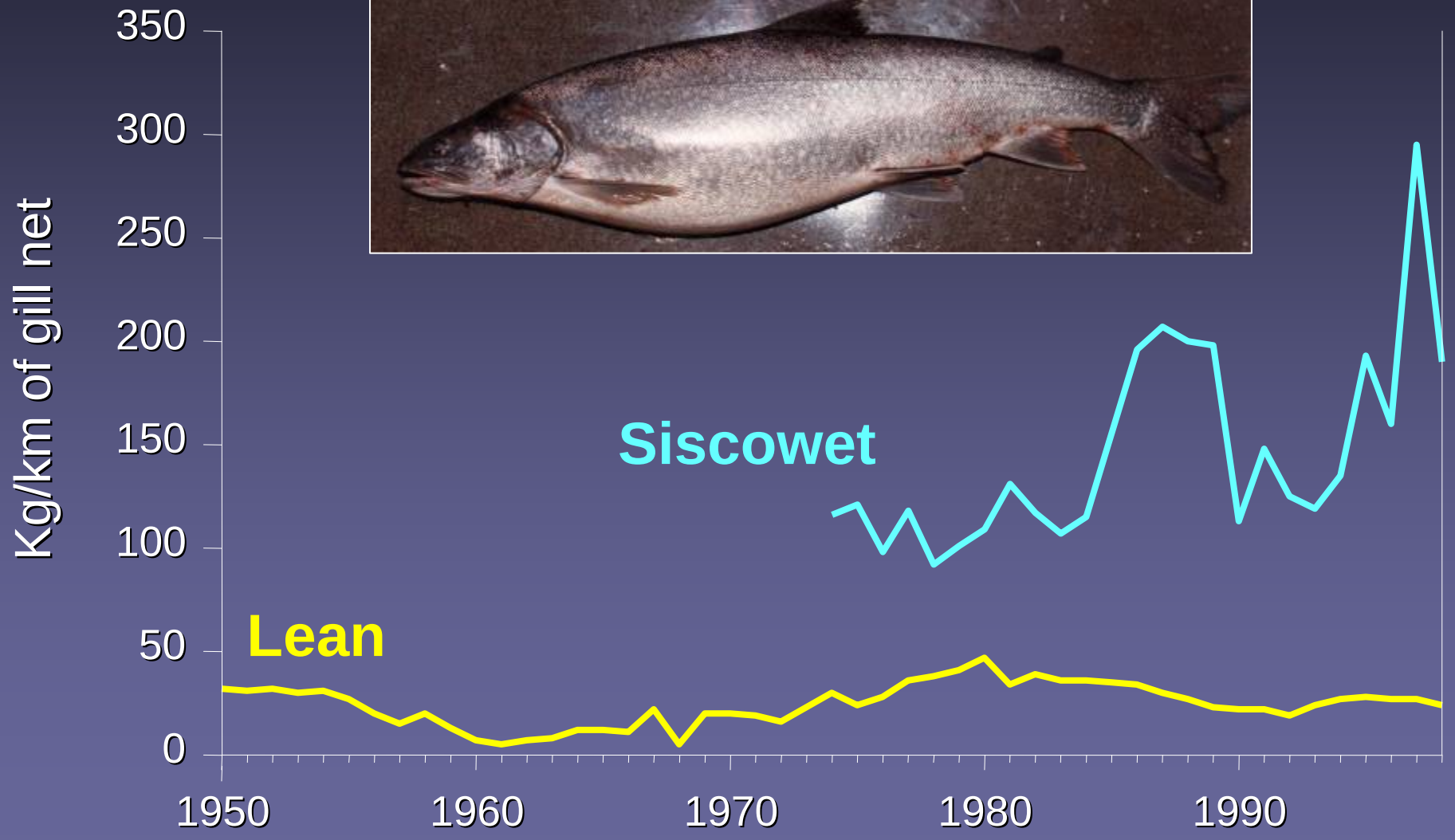
Shortjaw cisco

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

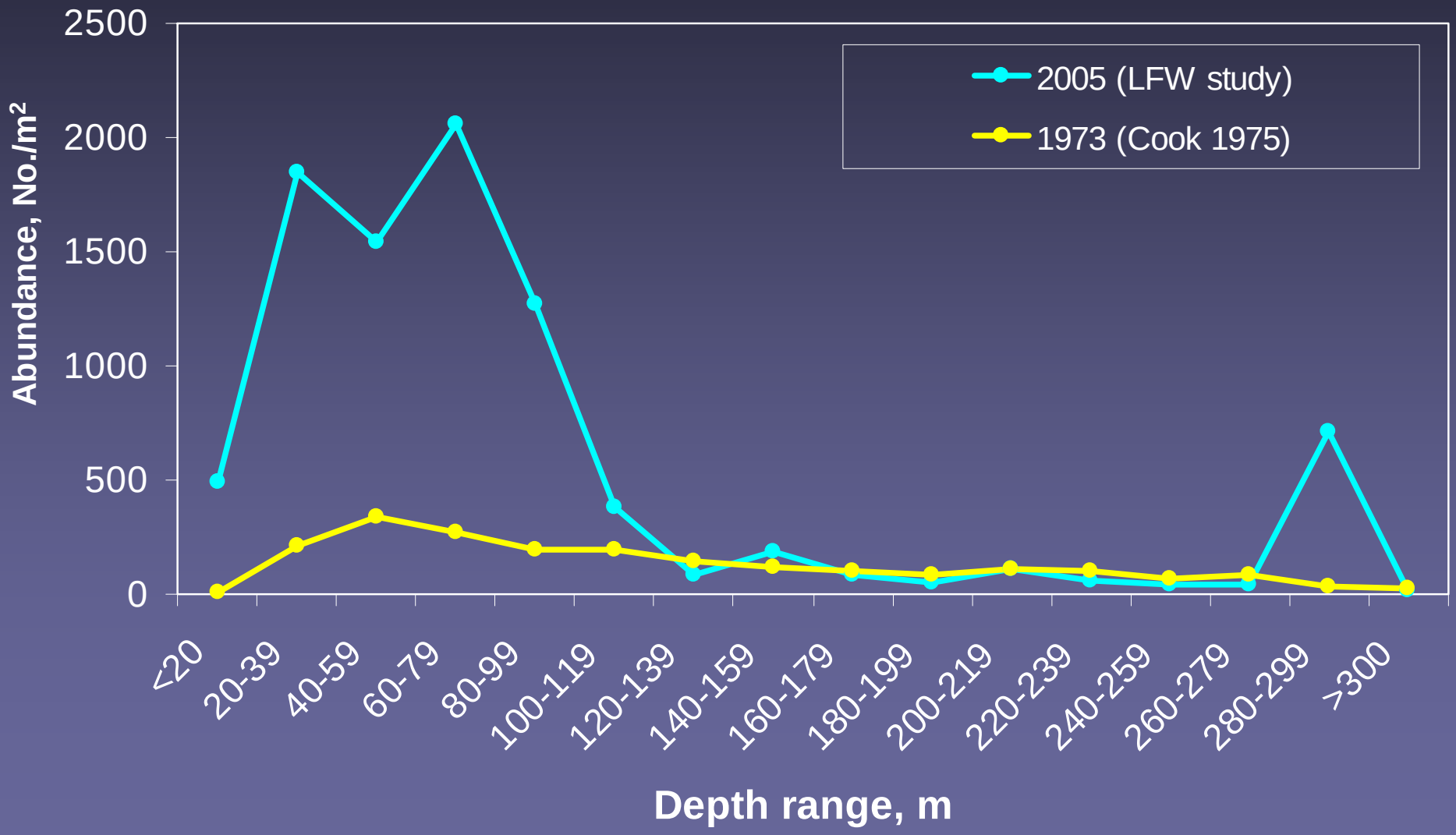
Lake Trout Abundance: A Success Story for Lake Superior



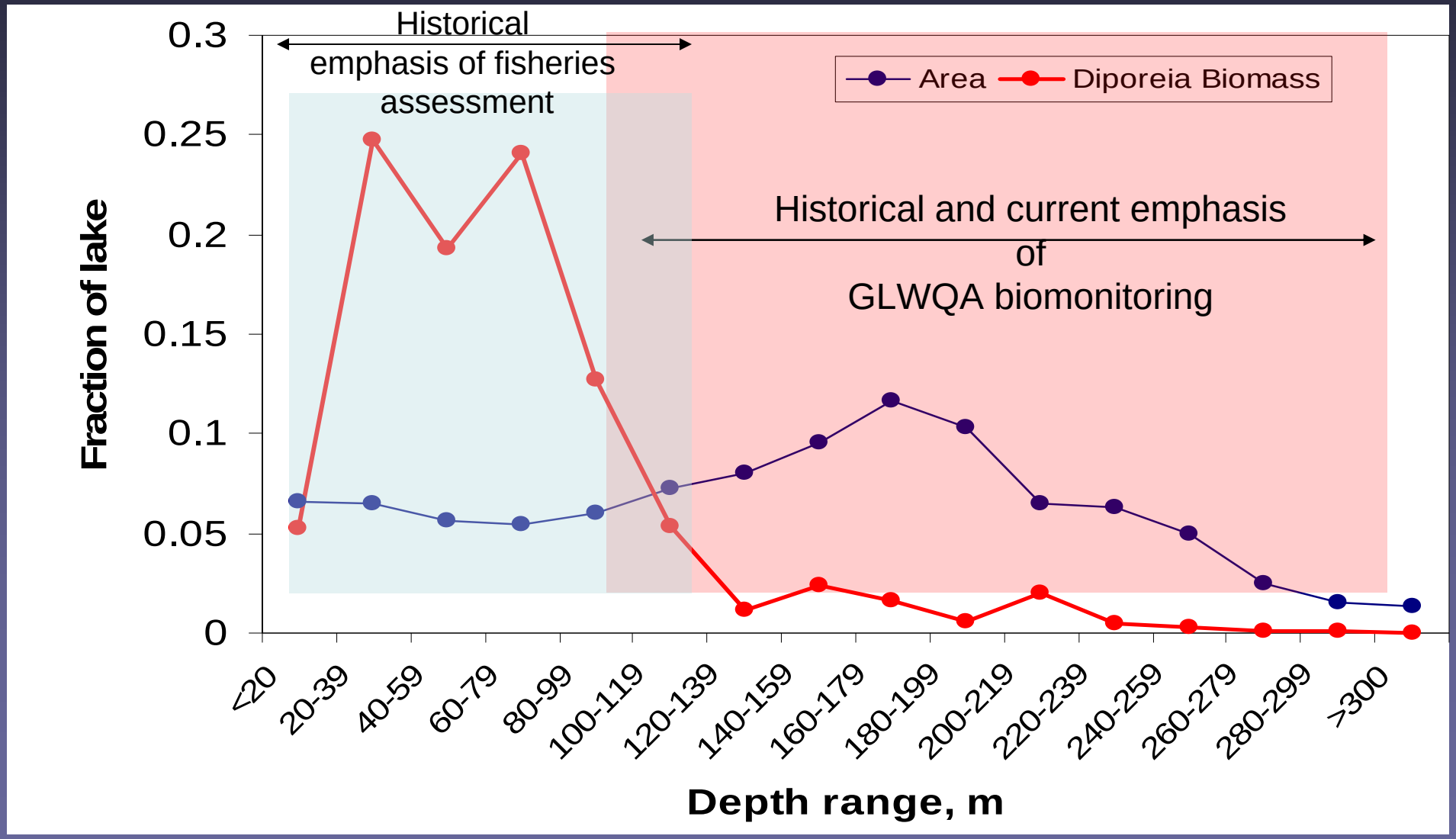
Lake Superior Lower Food Web

Diporeia

Diporeia 2005 and 1973 (aka Pontoporeia) in Lake Superior



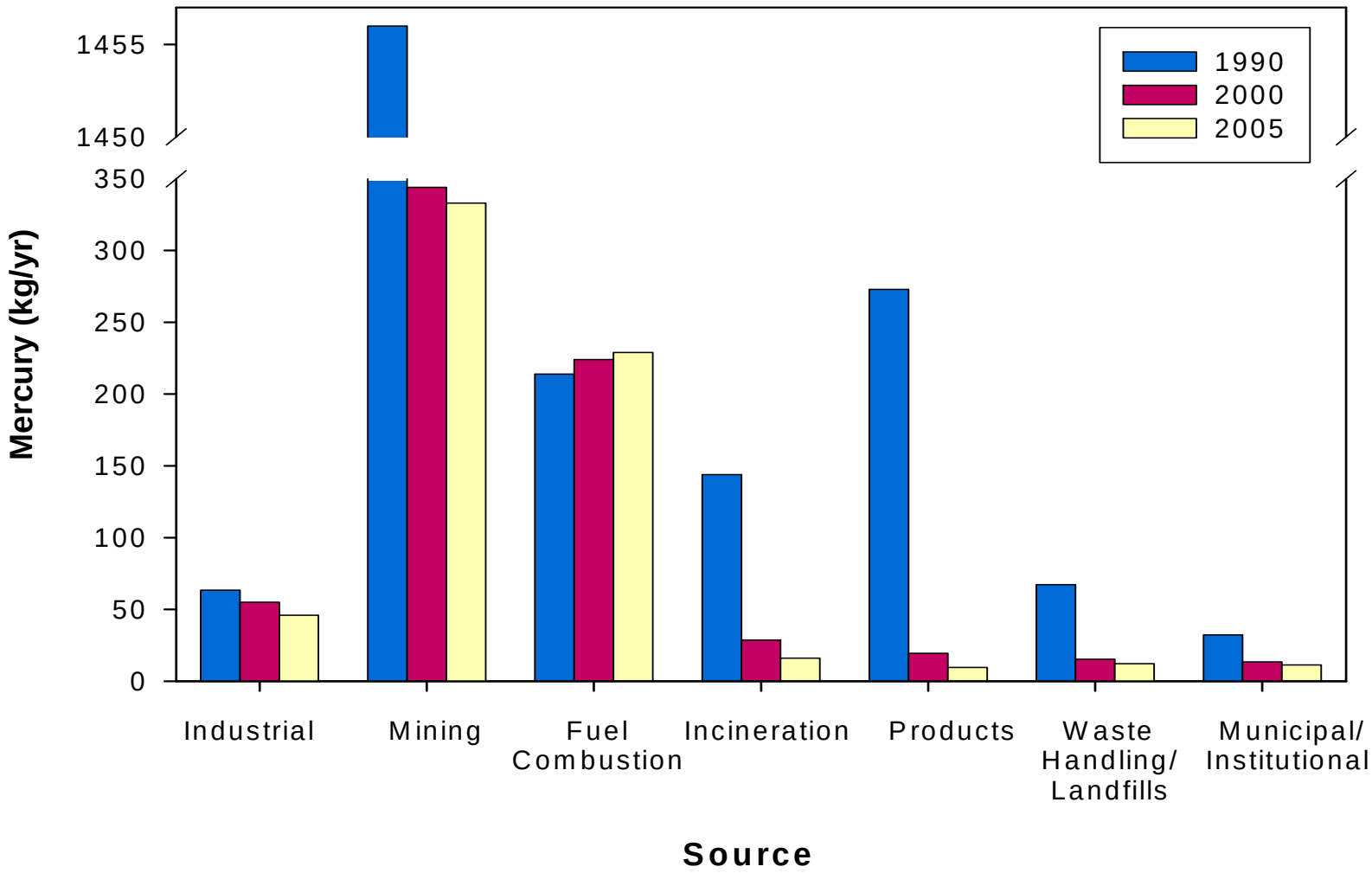
Nearshore (0-100 m) has ~30% of lake area but ~80% of lake *Diporeia* biomass



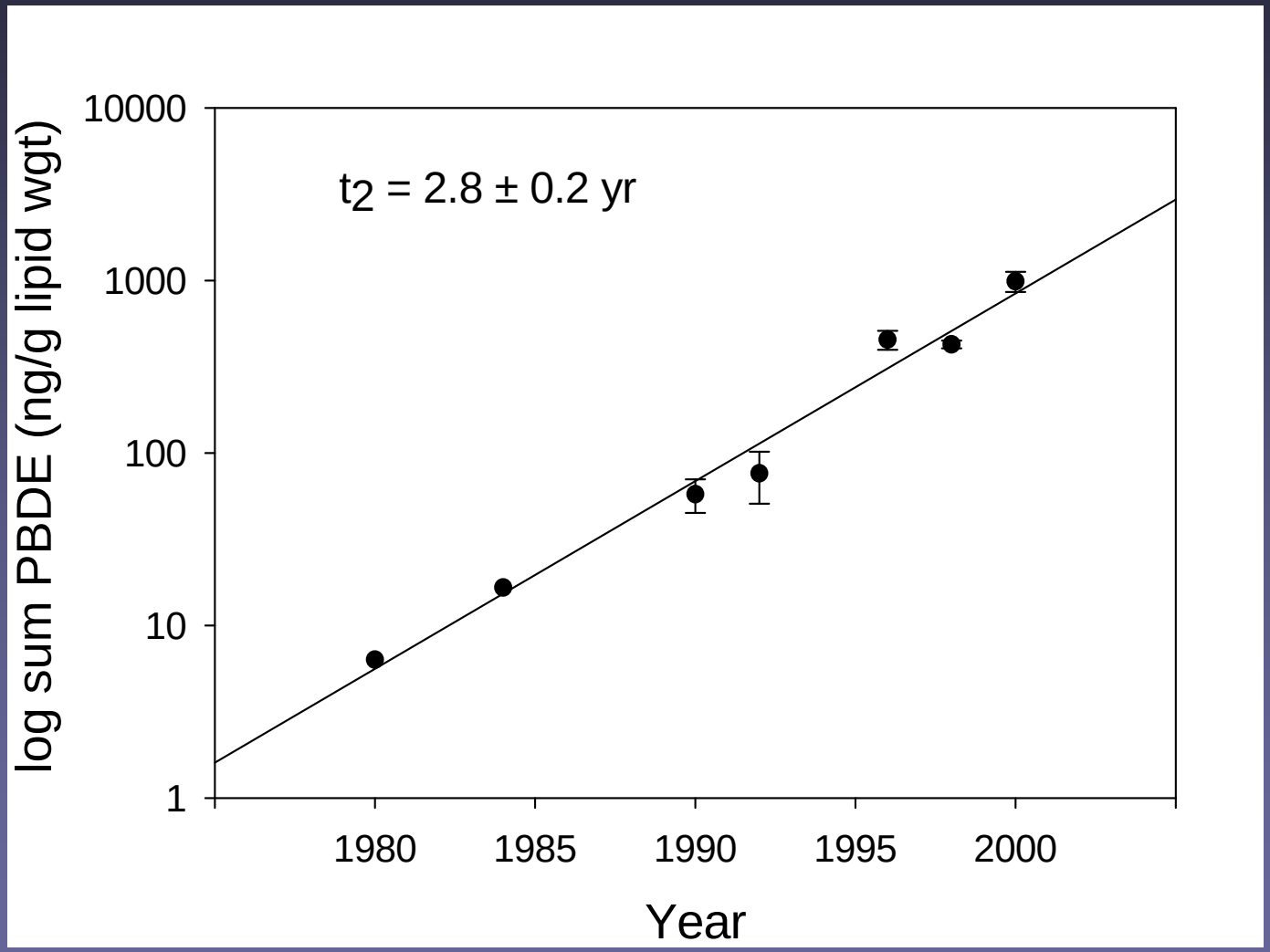
Contaminant Trends in Lake Superior

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

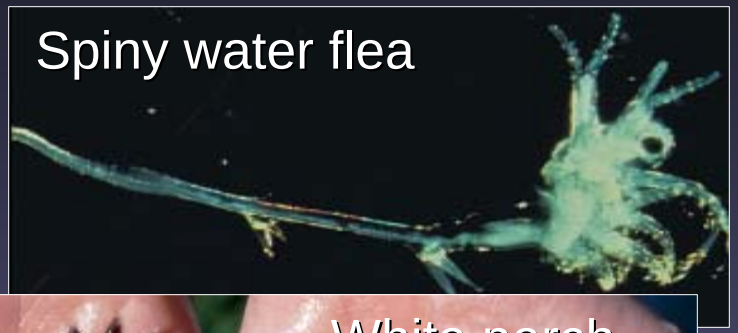
Great Lakes Invasive Species

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



Terrestrial Invasive Species

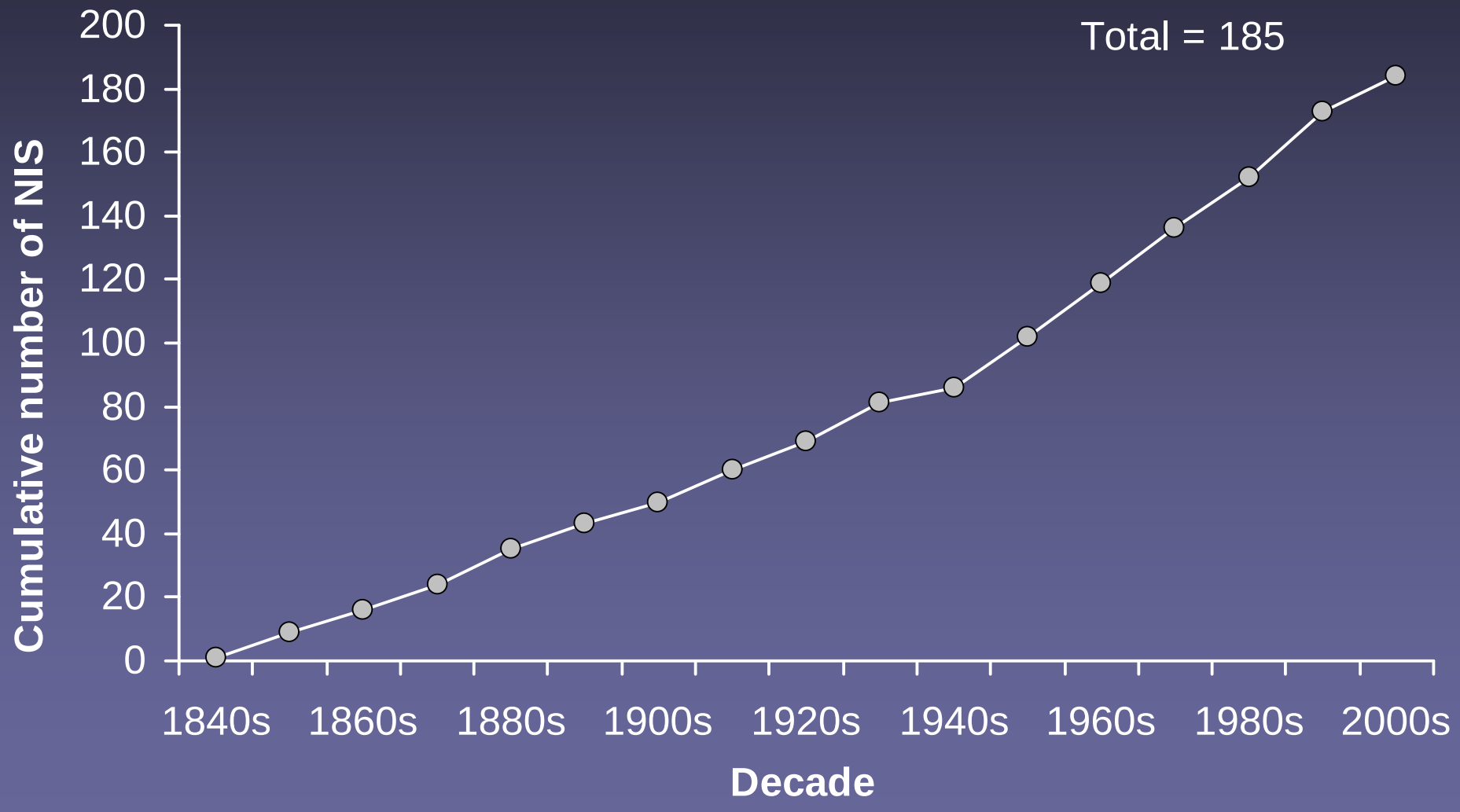
- Phragmites
- Purple Loosestrife
- Exotic buckthorns
- Asian longhorned beetle
- Emerald ash borer

Emerald ash borer

Invasive Free Zone:

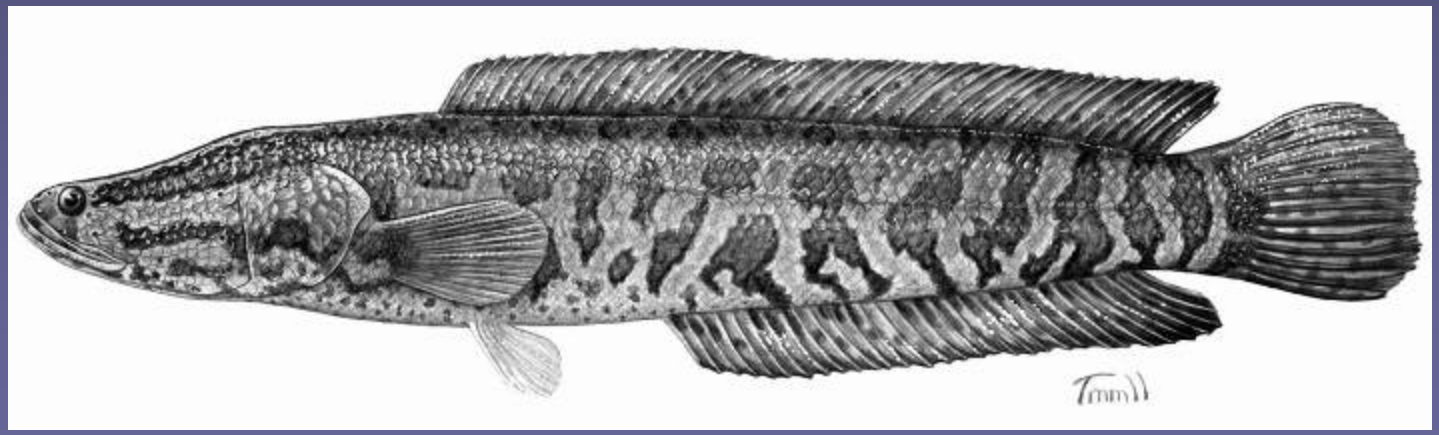
To eradicate invasive plants and restore native plant communities on a landscape scale

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

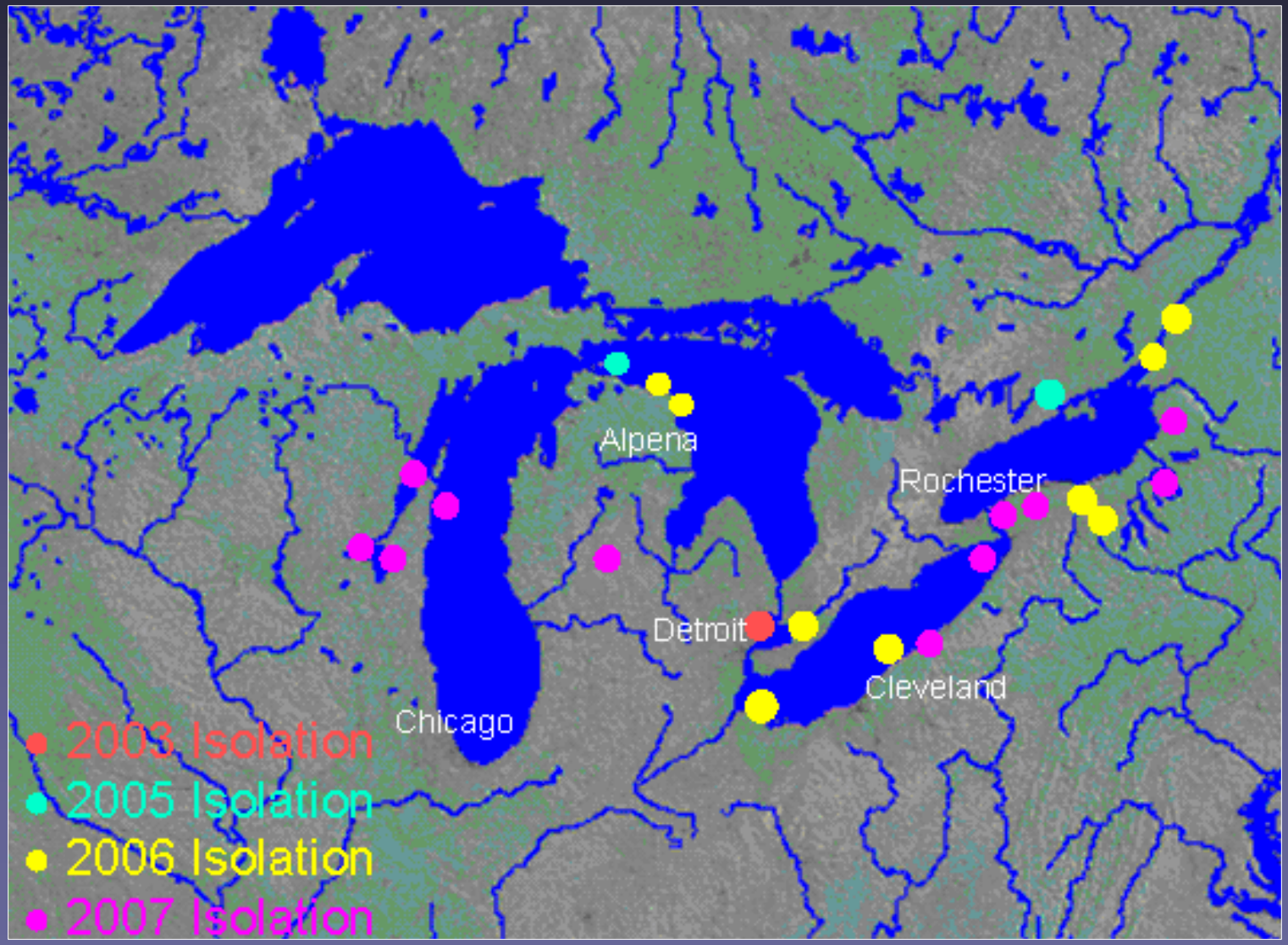
Ruffe

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