

## Great Lakes Fishes




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## Geology

- About 10,000 years since last glacial retreat – **very young ecologically**
- **Largest surface freshwater system on earth**
  - 21% of world's supply
  - 84% of North America's supply
- Five unique lakes

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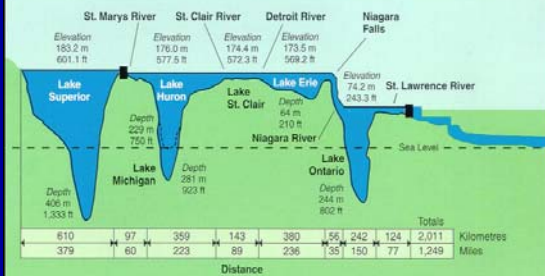
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## Great Lakes Profile




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## Key Factors

- Overfishing
- Habitat destruction
- Eutrophication
- Toxic pollutants
- Invasive species

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## Overfishing

- Peak harvests in late 1800's were nearly 150 million pounds; only 63 million today
- Lack of management, improved fishing gear, other stressors
- **Key species:** lake trout, sturgeon, Atlantic salmon, blue pike, whitefish, walleye, yellow perch

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## Historical Fishing



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## Habitat Destruction

- European settlement and urbanization
  - **Deforestation**: loss of cover, sedimentation, increased stream temperatures
  - **Drainage of wetlands**: loss of nursery habitat
  - **Dams**: block migration routes
- Loss of habitat greatly impacted
  - Lake sturgeon in Lake Erie
  - Atlantic salmon in Lake Ontario

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## Eutrophication

- **Cultural eutrophication**: accelerated input of nutrients (esp. phosphates) into waterways, decreased dissolved oxygen
  - Fertilizers
  - Detergents
  - Water treatment plants
- Lake Erie very susceptible
  - Shallow and warm
  - Extensive agricultural development in watershed
- **"Lake Erie is dead"** in the 1960's
  - Canada and US: Great Lakes Water Quality Agreement in 1972
  - Phosphorus reductions very successful

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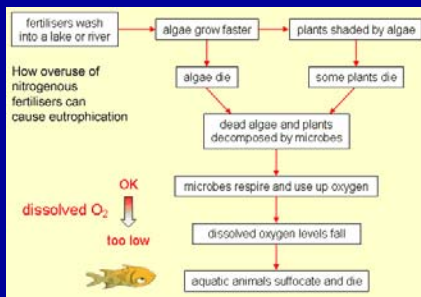
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## Accelerated Eutrophication



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## Toxic Pollutants

- Increased use of **synthetic organic chemicals** since 1940's – persistent in the environment
- Dangers first evident with pesticide DDT
- Increased risk of cancer, birth defects, genetic mutation
- **Fish consumption advisories**

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## Toxic Pollutants



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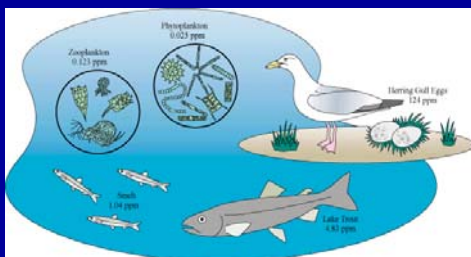
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## Bioaccumulation of PCB's



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## Invasive Species

- Canals (Welland, Erie) and ballast water
- **Notable invaders:** sea lamprey, carp, smelt, alewives, Pacific salmon, round gobies, zebra mussels
- Significant effects possible
  - Displace native species
  - Reduce biodiversity
  - Alter established ecosystems

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## Great Lakes Invasive Species



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## Case Studies Important Great Lakes Fishes



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## Atlantic Salmon



- Once very abundant in Lake Ontario
  - 1 fisherman in 1800's caught 400 in one night averaging 15 lbs each!
  - Reports of salmon so numerous people were "fishing" with pitchforks
- Extinct by 1930's

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## Obstacles to Restoration

- **Habitat remediation**
  - Clear, cold water
  - Gravel substrates
- **Passage for migrations**
- **Exotic species**
  - Competition with Pacific salmon, steelhead
  - Predation from sea lampreys

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## Lake Sturgeon

Can achieve length of over 6 ft and a weight of over 200 lbs



- Feeds on soft-bodied benthic invertebrates and fish
- Nearly went extinct in Great Lakes
  - Habitat destruction
  - Overfishing

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## Lake Sturgeon

- Originally viewed as a nuisance species – destroyed fishing gear
- Became valuable
  - Caviar
  - Meat
  - Isinglass from swimbladder (foods, glass)
  - Even burned in steamships!
- Vulnerable due to slow growth, maturation

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## Walleye

Important native piscivore – prefers dim light



- Historically supported commercial fishery throughout the Great Lakes
- Fishery declined after 1950's
- World-class fishery in Lake Erie
  - Concerns about extinction in 1970's
  - Mercury concerns closed fishery, rebound

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## Blue Pike

Subspecies of walleye, now extinct. Smaller size, larger eyes



- Historically one of most harvested fishes
- Declared extinct in 1972, but rumors persist!
- Preferred deeper, cooler water
- Decline due to
  - increased eutrophic conditions
  - larval predation from smelt
  - Overfishing and possible hybridization

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## Lake Whitefish

Salmonid prized for delicious, smoked meat



- Small mouth and large scales
- Feed near bottom in deep, cold water
- Important commercial fishery, not common in recreational fisheries
- Recent decreases in size, condition, lipid content
  - More *Dreissenid* mussels, fewer *Diporeia*

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## Lake Trout

Most valuable fishery in Great Lakes in early 1900's



- Widely distributed in colder regions of North America
- Feed on chubs, sculpin, rainbow smelt, alewife
- Overfishing and lamprey invasion decimated lake trout in 1950's
  - Extinct everywhere except Lake Superior
  - Maintained today by extensive stocking

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## Obstacles to Restoration

- Sea lamprey control still needed
- Competition from Pacific salmon
- Spawning habitats
- Thiamine deficiency
  - Causes early mortality syndrome (EMS)
  - Thiaminase in prey, especially alewives

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## Sea Lamprey

Most destructive  
invasive species in  
Great Lakes history



- Native to Atlantic Ocean and Lake Ontario
- Spread throughout Great Lakes via canals by 1947
- Sea lamprey populations reduced by 90% by control programs – expensive!
- One adult lamprey consumes 20-30 lbs of fish in its lifetime

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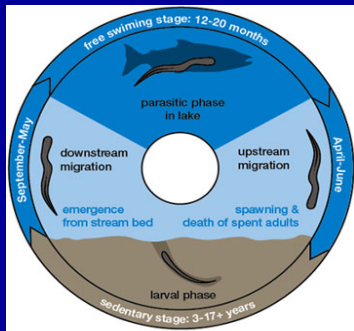
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## Sea Lamprey Life Cycle



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## Control Methods

- Chemical (TFM) – primary control
- Barriers and traps
- Sterile male release
- Pheromones

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## Yellow Perch

Popular sport and commercial fish throughout the Great Lakes



- Feed on small fish and benthic invertebrates
- Rebound in 1990's due to improved water quality, return of mayflies
- Competition with young walleye?
- Common species taken during ice fishing

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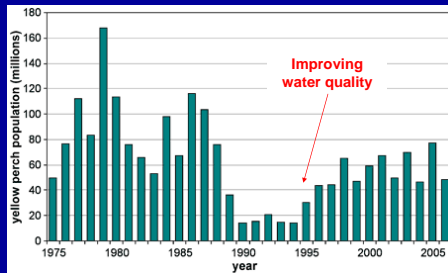
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## Yellow Perch Abundance in Western Lake Erie 1975-2005



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