GREAT LAKES FISHERIES HERITAGE Trail

EDUCATION ALIGNMENTS

# Lake Huron Fisheries: A Story of Change, Science, and Resilience

## Story Summary

*Lake Huron Fisheries: Change, Science, and Resilience* traces the evolution of a fishery shaped by both tradition and transformation, from Indigenous stewardship and a thriving commercial fishery to ecosystem disruption caused by invasive species and food web collapse. Through the lived experiences of Tuffy Cross and the scientific research of Jim Johnson, the story shows how understanding of Lake Huron evolved over time, leading to science-based fisheries management, ecosystem restoration, and continued adaptation in a changing Great Lakes environment.

*(Indigenous fisheries → commercial expansion → invasive species and food web disruption → fisheries collapses and change → science-based understanding → adaptation, recovery, and resilience → balancing human and conservation values)*

## Overarching Relevance to Education Standards

- Ecological interdependence within food webs
- Human-environment interactions
- Invasive species and unintended consequences
- Scientific observation, monitoring, and evidence-based decision-making
- Adaptive management and stewardship over time
- Resilience of both ecosystems and communities

## Education Alignments - Michigan Science (MSS) / Social Studies (MSSS)

### Elementary (Grades 3–5)

#### Science (MSS)

- **3-LS4-3:** Construct an argument that some organisms survive well, some survive less well, and some cannot survive at all when environmental conditions change.
- **5-ESS3-1:** Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment..

#### Social Studies (MSSS)

- **Grade 3 – History:** Identify change and continuity over time in Michigan communities.
- **Grade 3 – Geography G5:** Describe positive and negative consequences of human interaction with the environment.

**Story linkage:** The Lake Huron story shows how fish and communities changed over time, while the broader fishery narrative reinforces the idea that environmental conditions influence both ecosystems and people.

### Middle School (Grades 6–8)

#### Science (MSS)

- **MS-LS2-4:** Construct an argument supported by evidence that changes (e.g., food web disruptions) to physical or biological components of an ecosystem affect populations.

- **MS-ESS3-3:** Apply scientific principles to design methods for monitoring and minimizing human impacts on the environment.

### Social Studies (MSSS — history-forward)

- **Grade 8 – USHG Era 8:** Analyze environmental, economic, and technological change in modern America.
- **P3/P4:** Analyze public issues, evaluate evidence, and propose solutions.

**Story linkage:** The story provides a real-world example of how invasive species such as sea lamprey, alewife, zebra mussels, and quagga mussels altered Lake Huron's food web and affected fish populations. Students can examine how scientists collected evidence aboard the R/V Chinook, how fisheries managers responded to changing conditions, and how public agencies adapted management strategies over time.

## High School (Grades 9–12)

### Science (MSS)

- **HS-LS2-7:** Design, evaluate, and refine solutions for reducing impacts of human activities on biodiversity and ecosystem health.
- **HS-ESS3-4:** Evaluate or refine technological solutions that reduce impacts of human activities on natural systems.
- **HS-LS2-6 (additional strong alignment):** Evaluate claims, evidence, and reasoning that complex ecosystem interactions maintain relatively consistent populations under changing conditions.

### Social Studies (MSSS — history-forward)

- **HS USHG (Modern Era):** Evaluate governmental and institutional responses to environmental and economic change.
- **HS Civics P3/P4:** Evaluate policy tradeoffs, stakeholder perspectives, and evidence-based solutions to public issues.

**Story linkage**: Students analyze a complex case study of ecosystem change, invasive species, fisheries management, and resource sustainability. The story demonstrates how long-term scientific monitoring informed restoration efforts, how management decisions often involve tradeoffs among ecological, economic, cultural, and recreational interests, and how resilience can emerge through adaptive management and collaboration.

## Anchor Facts / Story Linkages

- Lake Huron fisheries evolved from Indigenous stewardship and diverse native fisheries to commercial expansion, ecosystem disruption, and modern science-based management.
- Native fish populations, including lake trout, whitefish, cisco, and lake sturgeon, historically supported both ecosystems and communities throughout the Great Lakes region.
- Declines in native fish populations resulted from interacting pressures including overharvest, habitat alteration, sea lamprey predation, and food web changes associated with invasive species.
- The careers of Tuffy Cross and Jim Johnson illustrate the intersection of traditional ecological knowledge, commercial fishing experience, and scientific research.
- The research vessel R/V Chinook symbolizes the growing role of scientific monitoring, data collection, and ecosystem research in fisheries management.
- Stocking of Chinook salmon helped reduce invasive alewife abundance and created a major recreational fishery, while also introducing new ecological dependencies into the system.
- Zebra and quagga mussels fundamentally altered nutrient pathways and food web dynamics, contributing to the collapse of alewife populations and changes throughout the Lake Huron ecosystem.

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- Long-term scientific research improved understanding of food webs, population dynamics, invasive species impacts, and fisheries restoration.
- Recent decades demonstrate resilience through:
- Lake trout recovery
- Walleye restoration and growth in Saginaw Bay
- Greater reliance on native fish populations
- Continued adaptation by Tribal, commercial, and recreational fisheries
- Modern fisheries management seeks to balance ecological sustainability, economic opportunities, cultural traditions, treaty rights, recreation, and conservation goals using long-term scientific evidence.