

Estimates of the Economic Damages of an Oil Spill in the Straits of Mackinac in Michigan

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APRIL 17, 2019

Objectives

- Estimate the potential economic damages of an oil spill from Line 5 at or near its crossing of the Straits of Mackinac
- Natural resource damages
- Economic impacts
 - Tourism
 - Commercial fishing
 - Municipalities
 - Coastal property
 - Commercial shipping

Qualifications

- Does not consider the possibility of a rupture of Line 5 during the winter season
 - Economic impacts would be difficult to estimate when possibility of containment is uncertain
- Does not consider a rupture of Line 5 in the context of a spill of natural gas liquids
 - There are few studies of the impacts of such an event
 - Vulnerable to ignition and explosion
- High levels of uncertainty
 - Scope of an oil spill in an open freshwater environment
 - Location and extent of its impacts

Hypothetical Scenario

- Study scenario involves a technological failure of the automatic response valves and a delay in human response of up to two hours
 - Release of approximately 2,500,000 gallons (about 59,500 barrels)
 - 900 miles of shoreline across **five Tier I counties** (Charlevoix, Cheboygan, Emmet, Mackinac, and Presque Isle), along with **twelve Tier II counties** (Alcona, Alpena, Antrim, Benzie, Chippewa, Delta, Grand Traverse, Iosco, Leelanau, and Schoolcraft)
- A true “worst-case” scenario could involve a prolonged spill of greater magnitude and broader geographic range
 - i.e., Georgian Bay, Saginaw Bay, Lake St. Clair, Lake Erie, Lake Ontario, etc.
 - would likely lead to shutdowns of the Soo Locks and the Straits shipping lanes, delaying vessel traffic for extended periods

Methods

1. Primary data: Key informant interviews
 - Approximately 30 interviews with key informants
 - Civil engineers, conservationists, fisheries biologists, hydrologists, legal experts, administrators of municipal water systems, real estate professionals, tourism professionals, and other experts
2. Secondary data: Document review
 - More than 50 published reports and websites on Line 5, Line 6B, federal agency reports, and other related information
 - More than 15 peer-reviewed journal articles on the impacts of previous oil spills

Natural Resources

Region is endowed with an abundance of natural resources that are of **vast social, ecological, and economic value**

- Fresh water
- Fish
- Wildlife
- Beaches
- Limestone cobble shorelines
- Sand dunes
- Coastal wetlands and marshes
- Aquatic and terrestrial plants



Source: <http://www.Michigan.org>

Natural Resources

- Natural Resource Damage Assessment is the legal process that federal agencies use to evaluate the impacts of oil spills on natural resources
- Natural Resource Damage Assessment and Restoration from the oil spill from Line 6B in the Kalamazoo River near Marshall
 - Approximately \$775,000 per mile of affected shoreline
- Study scenario (900 miles): \$697.5 million



Tourism

- 119 million person-trips
- Direct visitor spending = \$23.7 million
 - Generated **\$40.7 billion in total business sales** (indirect and induced)
- Supports over 220,000 jobs
- 7th consecutive year of growth



Tourism

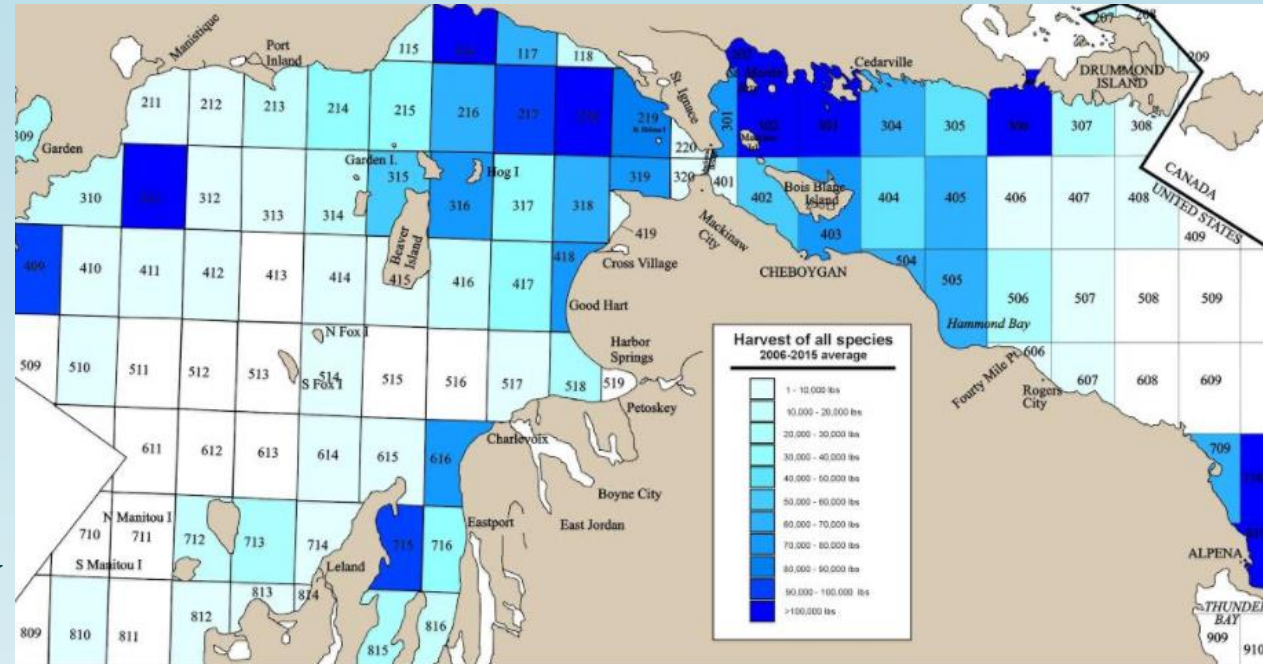
- Previous studies: duration of the impacts of oil spills on tourism has been found to extend well beyond the spill event
- Region: Tier I + Tier II counties
 - Annual economic impact of tourism: \$3 billion
- Sector scenario:
 - Tier I counties: Loss of visitor spending of 60% in Year 1, 50% in Year 2, 40% in Year 3, 20% in Year 4, and 10% in Year 5
 - Tier II counties: Loss of visitor spending of 40% in Year 1, 35% in Year 2, 25% in Year 3, 15% in Year 4, and 10% in Year 5

Estimates of Economic Damages to Tourism Sector

Affected Area	Economic impact
Tier I counties	\$ 3,156,228,245
Tier II counties	\$ 1,666,854,681
Total economic impact	\$ 4,823,082,926

Commercial Fishing

- Whitefish and other commercial species
- Average dockside value of commercial catch—approximately \$10 to \$12 million per year
- Average indirect effects from commercial fishing—four to five times the dockside value
 - Tribes would be disproportionately affected by losses to fishery
- Present value of estimate of economic impacts: \$61.1 million

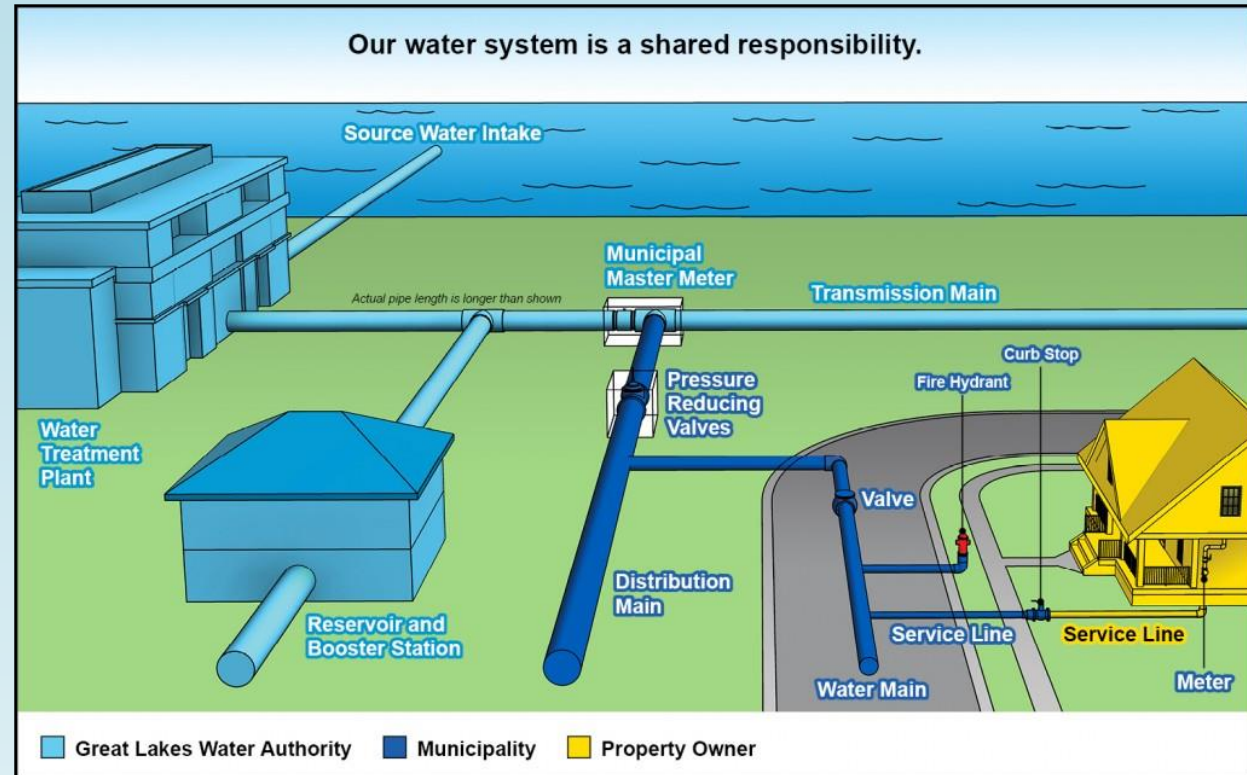


Fish harvest by Chippewa Ottawa Resource Authority commercial fishers, by grid, 2006 – 2015 average (Ebner, 2016)

Gonia, 2014; Michigan DNR, 2016

Municipalities

- Wastewater treatment facilities draw in surface water or groundwater to treat wastewater
- If volatile organic compounds (VOCs) found in oil were to enter municipal water and wastewater treatment plants, there would be significant costs for **repair** and **replacement** of important equipment
- Estimate of economic damages: \$233.1 million



Source: Great Lakes Water Authority, 2016

Coastal Property

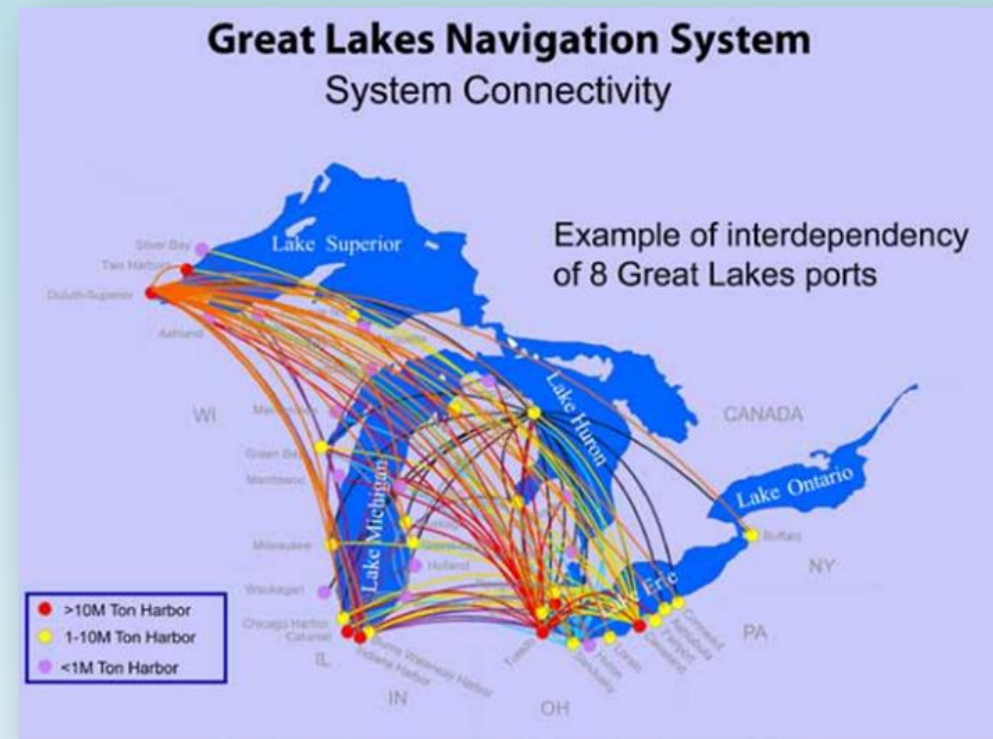
- Previous studies have estimated the impact on property values from previous oil spills
 - Deepwater Horizon: 14-42%, 16% persisted long after event
- Breach of Line 5 could require evacuation of homes and businesses
- Property values assumed to be negatively affected
 - Tier I counties: loss of annualized benefits of coastal property of 80% in Year 1, 60% in Year 2, 40% in Year 3, 30% in Year 4, and 20% in Year 5
 - Tier II counties: loss of annualized benefits of coastal property of 50% in Year 1, 30% in Year 2, 15% in Year 3, 10% in Year 4, and 5% in Year 5



	Economic impact
Tier I counties	\$ 235,774,960
Tier II counties	\$ 336,907,200
Total	\$ 485,811,163

Great Lakes Shipping Industry

- Interdependent system locks, ports, harbors, navigation channels
- About 50 percent of iron ore used by North American steel mills is shipped through the Poe Lock at the Soo Locks
- Rupture of Line 5 would likely lead to the closure of shipping traffic across the Straits of Mackinac, as well as a closure of the Soo Locks
 - Studies suggest a two-week closure of the Soo Locks during the early shipping season would halt U.S. steel production
 - Severe consequences for steel supply chain, including automobile manufacturing



Dept of Homeland Security, 2014; U.S. Army Corps of Engineers, 2010

Great Lakes Shipping Industry (*continued*)

- Closure of the Straits and Soo Locks would lead to bottlenecks and cascading delays at ports and locks
- We used system dynamics modeling to estimate the effects of delays on shipping and manufacturing value chain
- We estimate lost economic output resulting from a 15-day closure to be \$45.8 billion
 - Estimates from the Department of Homeland Security and U.S. Army Corps of Engineers: over \$1.1 trillion for a 180-day closure

Flow of Iron Ore through GLNS

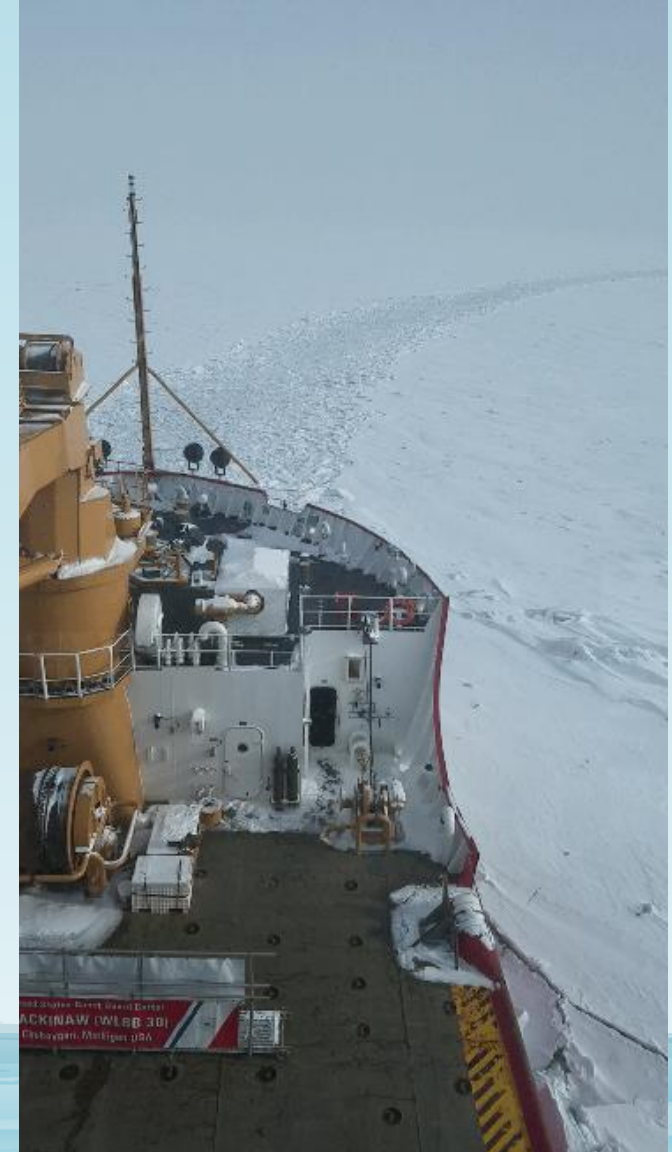


Meadows et al., 2018; U.S. Army Corps of Engineers, 2018; Dept of Homeland Security, 2014

“A disruption of the Poe Lock likely will cause an almost complete shutdown of Great Lakes steel production...North American economies would likely enter a severe recession” (DHS, 2015)

Shipping: Implications of Ice Cover

- Straits are a critical shipping lane in ice covered season
 - \$500 million of commercial traffic
 - 85.7 million tons of cargo transported
 - 46 million tons of iron ore steel
- US Coast Guard maintains shipping lanes



Conclusions

- Freshwater oil spills are more frequent and often more destructive to the environment
 - important to human health and the environment
 - highly sensitive to contamination
- Estimates of economic damages from a breach of Line 5 near the Straits of Mackinac
 - Natural resource damages: \$697.5 million
 - Economic impacts: \$51.3 billion
- Uncertainty
 - Impacts dependent on scale and magnitude of spill

Category	Economic damage estimates
Natural resource damages	\$ 697,500,000
Economic impacts	
Tourism	\$ 4,823,083,000
Commercial fishing	\$ 61,050,000
Municipalities	\$ 233,090,000
Coastal property	\$ 485,811,000
Commercial shipping	\$ 45,800,000,000
Total economic impacts	\$ 51,403,034,000

EPA, 2016

Thank you



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Source: <http://www.Michigan.org>