



The Enbridge Oil Spill

Calhoun County, MI

On July 26, 2010, an accident on the Line 6B oil pipeline owned by Enbridge Energy Partners in Calhoun County, Michigan released over 800,000 gallons of crude oil into a tributary of the Kalamazoo River.¹ As of August 5, the spill had affected Talmadge Creek and at least 30 miles of the Kalamazoo River downstream of Marshall, and the cause of the leak was still unknown. The spill has led to evacuations as well as drinking water, fish consumption and swimming advisories, and containment and cleanup response by the company and a number of agencies.

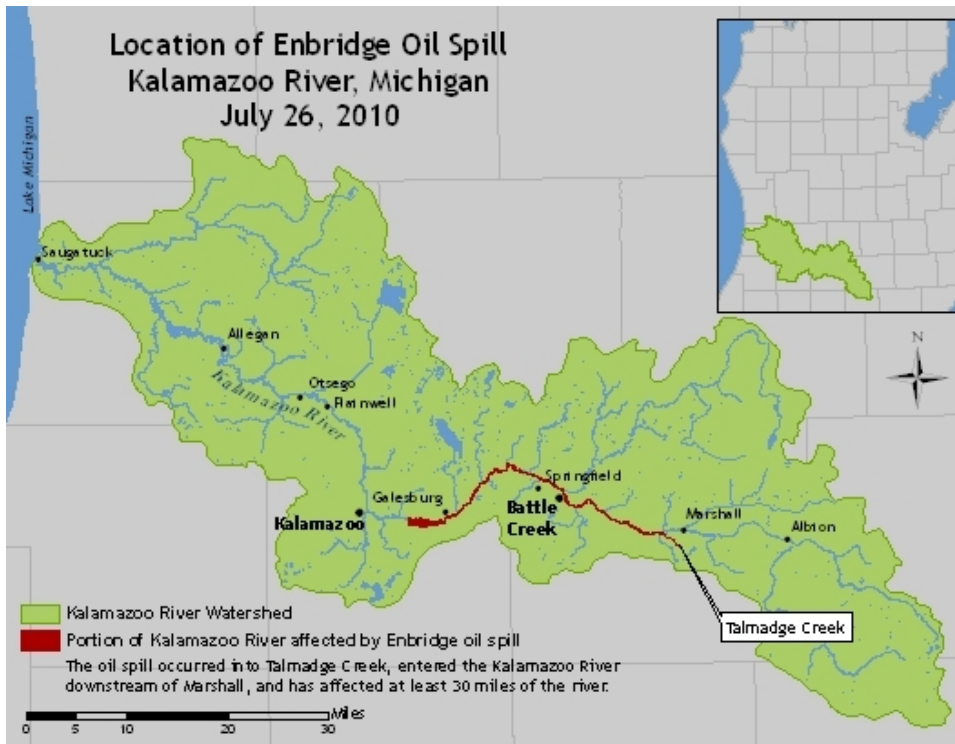
Oil Spill Fate and Impacts on Human Health and Environment

Following an oil spill on water, the oil goes through a process termed “weathering”, involving processes such as evaporation of the more volatile chemicals (e.g. benzene), natural dispersion, emulsification, dissolution of certain chemicals into water, sedimentation, and biodegradation.² Health concerns with oil spills include prolonged inhalation exposure to crude oil components, which can cause respiratory irritation and headaches, nausea, and other symptoms. In addition to the carcinogen benzene, other chemicals of concern in crude oil include toluene, n-hexane, and hydrogen sulfide.³ Following the spill, recommendations for evacuations had been issued for 30-50 residences near the spill site, due to elevated levels of benzene monitored in the air.⁴ In addition, the Michigan Department of Community Health issued a precautionary advisory for the

Kalamazoo River and vicinity, which includes avoiding (until further notice) consumption of fish of any kind if oiled or smelling of oil, from both Talmadge Creek and the Kalamazoo River down to the west end of Morrow Lake. In addition, the Department recommended against swimming in or touching the water of the river, from I-69 downstream to the west end of Morrow Lake.⁵

The Enbridge spill occurred into Talmadge Creek, a coldwater stream which feeds into the Upper Kalamazoo River just downstream of Marshall. Common fish in the creek include mottled sculpin, blacknose dace, and blackside darter.⁶ The mainstem of the Kalamazoo River from Marshall to Morrow Dam just upstream of the city of Kalamazoo has been classified as “top quality warmwater” fish habitat by the Michigan Department of Natural Resources (now the Michigan Department of Natural Resources and Environment, MDNRE).⁷ A number of fish species utilize all or part of the affected portion of the Kalamazoo River, including smallmouth and

largemouth bass, northern pike, and various suckers, shiners, and other species. Even if fish can swim away from a spill, exposure to some bulk oil can lead to reduced growth rates, and then to increased mortality.⁸ In addition, fish and other organisms can be exposed to dissolved components of oil (such as polycyclic aromatic hydrocarbons (PAHs)), leading to acute or chronic effects; for example, increased deformities in lake whitefish were associated with increased PAH exposure associated with an oil spill in Wabamun Lake in Canada.⁹ Some fish species that may be at particular risk from the Enbridge spill include black crappie, bluegill, greater redhorse, pugnose shiner, walleye, and western blacknose dace.¹⁰ Several turtle species have been reported in the upper or middle segments of the Kalamazoo River, including the threatened spotted turtle, and Blanding’s and eastern box turtle, both of which are identified as special concern species by the state.¹¹ Adult turtles can be harmed by exposure to oil, and eggs and hatchlings are also at risk.



A number of other animal species are present in the Kalamazoo River watershed as a whole, including a number of waterfowl that use the Mississippi Flyway (including Canada geese and numerous duck species). In addition, several threatened or endangered water-dependent birds use the watershed, including the common loon, trumpeter swan, osprey, bald eagle, king rail, and Caspian and common terns.¹² In addition to potentially suffering acute poisoning from oil ingestion or severe oiling which leads to death, birds are also susceptible to more chronic effects from oil, such as laying of fewer eggs, reduced hatching success, or decreased growth rate in the young. Mammals present in the watershed that may be at risk from the oil spill include beavers, muskrats and mink.¹³ Wetlands and other habitat adjacent to the river are also at risk from the oil spill; segments immediately upstream and downstream of Battle Creek in particular have a high abundance of wetlands.¹⁴

Tar sands and Oil Pipelines

The Line 6B oil pipeline, where the leak occurred, runs from Griffith, Indiana to Sarnia, Ontario, and transports up to 190,000 barrels per day of light synthetics, heavy, and medium crude oil. The pipeline is part of the Enbridge partnerships' Lakehead System; according to the company, 68% of Western Canadian crude exports to the U.S. in 2009 were shipped via the Lakehead System, which provides oil for refining in the Midwest and Ontario, and has increasing access to refineries in the Mid-Continent and Gulf Coast.¹⁵

An increasing amount of the crude oil shipped to and through the Midwest is being produced from tar sands (or oil sands), in Western Canada. Tar sands are a mixture of organic matter, bitumen (a viscous hydrocarbon mixture), sand and water that are either mined and processed, or extracted *in*

situ, producing crude oil.¹⁶ Starting in 2006, production of crude oil from tar sands in Canada surpassed conventional production, and tar sands production is projected to make up an increasingly larger fraction of Canadian production in the coming decades.¹⁷ A number of concerns have been raised about the production of oil from tar sands, including regarding forest destruction and degradation, water quality impacts, human health concerns (including incidences of rare cancers), and increased greenhouse gas emissions compared to conventional oil production.¹⁸ Parallel with increased tar sands production has been growth of pipelines in the U.S., including the Keystone XL project proposed by the company TransCanada. Two recent NWF reports have highlighted the ecological threats and harm to people that can come with these developments, including the risks from pipeline accidents. For example, from 2000-2009, there were 2,554 significant pipeline incidences in the U.S. and 161 fatalities; Michigan ranked ninth nationally in the number of significant incidences, and three other Great Lakes states were also in the top 10.¹⁹ Pipeline corrosion (and the risk of spills) is an increasing concern with aging pipelines; Enbridge had notified the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) on July 15, 2010 concerning an alternative remediation plan to address metal loss anomalies in the pipeline identified in a June 2009 survey.²⁰ NWF has recommended a number of policy changes (including more aggressive efforts to promote renewable energy) to lessen the environmental and other risks from our heavy reliance on petroleum (see note 19).

Remediation and Restoration

Response to the oil spill has included involvement of Enbridge, county, state and federal agencies, and U.S.

Environmental Protection Agency (USEPA) as the Federal On-Scene Coordinator. Response activities as of August 5 included deployment of over 99,000 feet of containment booms, establishment of 37 containment locations, collection of 53,061 barrels of oil/water mixture in storage, and removal of over 19,028 barrels of oil/water from the site.²¹ As of August 5, the U.S. Fish and Wildlife Service had reported that 138 animals had been collected and brought to the wildlife rehabilitation center, including 64 Canada geese and 52 turtles.²²

Concerning the ruptured pipeline, the U.S. PHMSA issued a Corrective Action Order on July 28 calling on Enbridge Energy Partners to develop and submit to the agency a restart plan prior to resuming operation of the pipeline, and following approval to restart, operate at reduced pressure. In addition, the order called for

submission of an integrity verification and remedial work plan, which would include an evaluation of the remaining portions of the pipeline for any integrity threatening conditions.²³

In response to the Removal Administrative Order from USEPA (requesting an oil recovery and containment plan among others), Enbridge provided to USEPA a work plan on July 29. On July 31, USEPA announced an order of disapproval, including disapproval of the eight component plans. The disapproval order included a number of comments concerning the plan for downstream impacted areas, including the need to reference USEPA Shoreline Contamination Assessment Team recommendations, and Enbridge was to have submitted a revised plan by August 2.²⁴

The Kalamazoo River more broadly has been heavily impacted by other activities. Historic paper production operations downstream of the Morrow Dam resulted in the release of significant quantities of polychlorinated

biphenyls (PCBs), and the contaminated sites, a segment of Portage Creek, and the 80-mile stretch of the Kalamazoo River from Morrow Dam to Lake Michigan had been placed on the National Priorities List in 1990 as a Superfund site.²⁵ The same river segment is also designated an Area of Concern under the Great Lakes Water Quality Agreement,²⁶ and a number of fish consumption advisories for several fish species (in particular for PCBs) remain in place in the river.²⁷ Previous restoration objectives had been identified for the Kalamazoo River Superfund site; in addition to eliminating fish consumption advisories and PCB loadings to Lake Michigan, objectives include restoring natural river flow, in-stream movement of fish, and diverse habitats to support various species, including mussels, turtles, mink, otter, and bald eagles.²⁸

Though the new oil spill appears to have been essentially contained above Morrow Dam, the damage from the spill will need to be considered as part of broader restoration objectives for the river. Addressing some damages in the spill area will be particularly challenging, given the potential for some response methods (such as manual oil removal and mechanical removal) to cause high impact in a number of shoreline habitats, including wetlands.²⁹ Following removal and restoration work, monitoring of diverse biota and habitats will be essential; a similarly sized crude oil spill in the Gasconade River in Missouri was associated with decreased biodiversity of macroinvertebrates in backwater sediment habitats, including 18 months after the spill.³⁰ Successful recovery of the river will require both well-planned restoration work, protection from new stresses, and comprehensive and long-term monitoring.



To report oiled or injured wildlife, please contact:
Fish and Wildlife Service - 800-306-6837

Questions about air quality and human safety:
Calhoun County Public Health Department - 269-969-6371

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Resources

Calhoun County Public Health Department

<http://www.calhouncountymi.org/Departments/HealthDept/EnbridgeOilSpill.htm>

City of Marshall

<http://www.cityofmarshall.com/events/33>

Enbridge, Line 6B Response

<http://response.enbridgeus.com/response/>

Kalamazoo County, Health and Community Services Department

<http://www.kalcounty.com/hsd/>

Kalamazoo River Watershed Council

<http://www.kalamazooriver.org/>

Kalamazoo River Area of Concern

<http://www.epa.gov/glnpo/aoc/kalriv.htm>

Michigan, Oil Spill News and Updates

<http://www.michigan.gov/oilspill>

National Wildlife Federation

<http://www.nwf.org/MichiganOilSpill>

Pembina Institute

<http://www.pembina.org/>

U.S. Environmental Protection Agency

<http://www.epa.gov/enbridgespill/>

U.S. Pipeline and Hazardous Materials Safety Administration

<http://www.phmsa.dot.gov/>

- ¹ Enbridge Energy Partners, Line 6B Response, available from <http://response.enbridgeus.com/response/>; and U.S. Environmental Protection Agency (USEPA), EPA's Response to the Enbridge Oil Spill, available from <http://www.epa.gov/enbridgespill/>. 1,000,000 gallons corresponds to approximately 23,810 barrels of oil.
- ² See for example Fingas, M. 2001. The Basics of Oil Spill Cleanup, 2nd Edition. Lewis Publishers, Boca Raton, FL; and Hibbs, D.E., and J.S. Gulliver, 1999. Processes controlling aqueous concentrations for riverine spills, *Journal of Hazardous Materials B*, 64:57-73.
- ³ Enbridge, Crude oil – heavy, Material Safety Data Sheet, available from http://www.calhouncountymi.org/ReferenceDesk/Forms/CCPHD_MSDS_Heavy_Crude.pdf.
- ⁴ Calhoun County Public Health Department (CCPHD), Health Department Recommends Evacuation of Residents, available from http://www.calhouncountymi.org/ReferenceDesk/Forms/CCPHD_Oil_Spill_Evacuation.pdf. In addition, at least 26 people had been treated in emergency rooms, according to the Detroit Free Press (Neavling, S., and Hall, C., EPA: A lot of work ahead in Michigan oil cleanup, Detroit Free Press, August 2, 2010, available from <http://www.freep.com/apps/pbcs.dll/artikkel?Dato=20100802&Kategori=NEWS05&Lopenr=8020357&Ref=AR&template=fullarticle>).
- ⁵ Michigan Department of Community Health (MDCH), Swimming and Fish Advisory, available from http://www.michigan.gov/som/0,1607,7-192-39745_40885_56784-241538--_00.html.
- ⁶ Wesley, J.K. 2005. Kalamazoo River assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report 35, Ann Arbor. Available from <http://www.dnr.state.mi.us/PUBLICATIONS/PDFS/ifr/ifrlibra/special.htm>.
- ⁷ *Ibid.*
- ⁸ Burger, J. 1997. Oil Spills, Rutgers University Press, New Brunswick, New Jersey.
- ⁹ Debruyne, A. M. H., B.G. Wernick, C. Stefura, B.G. McDonald, B-L. Rudolph, L. Patterson, P.M. Chapman, 2007. In situ experimental assessment of lake whitefish development following a freshwater oil spill. *Environmental Science & Technology* 41(20): 6983-6989. Also see review of PAH impacts on marine fish in Boehm, P.D., J.M. Neff, and D.S. Page. 2007. Assessment of polycyclic aromatic hydrocarbon exposure in the waters of Prince William Sound after the Exxon Valdez oil spill: 1989–2005, *Marine Pollution Bulletin*, 54:339-367.
- ¹⁰ Based on intolerance to turbidity and/or low dissolved oxygen conditions. Species characteristics described in Wesley 2005.
- ¹¹ Wesley 2005.
- ¹² *Ibid.*
- ¹³ *Ibid.*
- ¹⁴ Michigan Department of Natural Resources and Environment (MDNRE), Wetland Inventory Maps, available from http://www.michigan.gov/deq/0,1607,7-135-3313_3687-11178--_00.html.
- ¹⁵ Enbridge Energy Partners, About Lakehead, available from <http://response.enbridgeus.com/response/main.aspx?id=12780>.
- ¹⁶ Humphries, M. 2008. North American Oil Sands: History of Development, Prospects for the Future, CRS Report for Congress, Updated January 17, 2008, available from <http://fas.org/spp/crs/misc/RL34258.pdf>.
- ¹⁷ Canadian Association of Petroleum Producers. 2010. 2010-2025 Canadian Crude Oil Forecast and Market Outlook, available from <http://www.capp.ca/getdoc.aspx?DocId=173003>.
- ¹⁸ See for example Humphries, 2008; Tenenbaum, D.J. 2009. Oil sands development: A health risk worth taking? *Environmental Health Perspectives*, A150-A156; Charpentier, A. D., J.A. Bergerson, and H.L. MacLean. 2009. Understanding the Canadian oil sands industry's greenhouse gas emissions, *Environmental Research Letters*, 4:1-11; and Droitsch, D., M. Huot, and P.J. Partington. 2010. Canadian Oil Sands and Greenhouse Gas Emissions: The Facts in Perspective, Pembina Institute Briefing Note, available from <http://www.pembina.org/pub/2057>.
- ¹⁹ See Doyle, J., and M. Mejia. 2010. Assault on America: A Decade of Petroleum Company Disaster, Pollution, and Profit, National Wildlife Federation, available from <http://www.nwf.org/News-and-Magazines/Media-Center/News-by-Topic/Global-Warming/2010/07-28-10-Oil-Disasters-Report.aspx>; also see Glick, D. 2010. Staying Hooked on a Dirty Fuel: Why Canadian Tar Sands are a Bad Bet for the United States, National Wildlife Federation, available from <http://www.nwf.org/News-and-Magazines/Media-Center/Reports/Archive/2010/Tar-Sands-Staying-Hooked-on-a-Dirty-Fuel.aspx>.
- ²⁰ U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA). 2010. Corrective Action Order, CFP No. 3-2010-5008H, available from http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Pipeline/CAO_07282010.pdf
- ²¹ USEPA. Available from <http://www.epa.gov/enbridgespill/> (accessed August 5, 2010).
- ²² U.S. Fish and Wildlife Service Michigan Oil Spill Response, available from <http://www.fws.gov/midwest/oilspill/> (accessed August 5, 2010).
- ²³ PHMSA, 2010 (see note 20).
- ²⁴ See Enbridge Energy, Limited Partnership, Work Plan, Enbridge Marshall Pipeline Release, July 29, 2010, http://www.epa.gov/enbridgespill/pdfs/enbridge_workplan_complete_20100729.pdf; and U.S. EPA, Notice of Disapproval of Enbridge Energy Partners' submissions in response to the Removal Administrative Order issued by U.S. EPA on July 27, 2010, pursuant to §311(c) of the Clean Water Act in Docket No. CWA 1321-5-10-001, http://www.epa.gov/enbridgespill/pdfs/enbridge_disapproval_notice_20100731.pdf.
- ²⁵ National Oceanic and Atmospheric Administration (NOAA), Case, Kalamazoo River, MI, available from <http://www.darrp.noaa.gov/greatlakes/kalamazoo/index.html>.
- ²⁶ U.S. EPA, Kalamazoo River Area of Concern, available from <http://www.darrp.noaa.gov/greatlakes/kalamazoo/index.html>.
- ²⁷ MDCH, 2010 Michigan Fish Advisory, available from http://www.michigan.gov/documents/FishAdvisory03_67354_7.pdf.
- ²⁸ NOAA, 2010. Restoration Activities, Case, Kalamazoo River, MI, available from <http://www.darrp.noaa.gov/greatlakes/kalamazoo/restore.html>.
- ²⁹ NOAA. 1994. Options for Minimizing Environmental Impacts of Freshwater Spill Response, available from http://response.restoration.noaa.gov/book_shelf/902_freshwater.pdf.
- ³⁰ Poulton, B.C., S.E. Finger, and S.A. Humphrey. 1997. Effects of a Crude Oil Spill on the Benthic Invertebrate Community in the Gasconade River, Missouri. *Archives of Environmental Contamination and Toxicology* 33, 268–276.