

Assessing Natural Resource Impacts from the Enbridge Pipeline Spill into the Kalamazoo River

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Presentation Outline

- ⦿ Natural Resource Damage Assessment overview
- ⦿ Enbridge oil spill incident description
- ⦿ Trustees' data collection efforts

Oil Pollution Act Authorizes Natural Resource Damage Assessment

OPA (33 U.S.C. §§ 2701, *et seq.*) and NRD Regulations: 15 C.F.R. Part 990

“The goal of OPA is to make the environment and the public whole for injuries to natural resources and services resulting from an oil spill into navigable waters and adjoining shorelines.”

-15 C.F.R. 990.10

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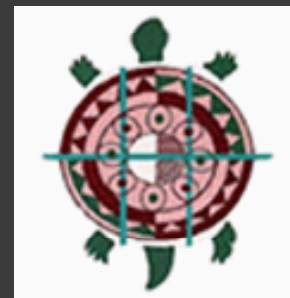
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Trustees assess natural resource injuries on behalf of the public

There are eight trustees for the Kalamazoo River Oil Spill



How NRDA Restores and Protects Trust Resources

Trustees work with Response Agencies and Responsible Parties to:

- Ensure protection of trust resources during response;
- Identify and quantify lost resources/services;
- Implement projects to restore injured resources and their associated services to their baseline condition (primary restoration); and
- Implement additional projects to compensate the public for interim losses (compensatory restoration).



NRDA seeks to determine:

- ⦿ What natural resources are/have been injured?
- ⦿ What was the extent of the injury?
 - Spatial extent
 - Duration
 - Severity
- ⦿ How long will the injury take to recover?
- ⦿ What types of restoration projects can address the injuries?
- ⦿ How much restoration is needed to compensate for the injuries over time?

The Incident

- 30" underground pipeline ruptured on July 25, 2010
- Approximately 1 million gallons of tar sands crude oil released
- Oil seeped through wetland soils into a creek tributary to the Kalamazoo River



The Material

- ① 2 products in pipeline at the time of the rupture:
 - Starting a batch of Cold Lake Blend (77%)
 - 70% bitumen
 - 30% diluent (natural gas condensate)
 - End of a batch of Western Canadian Select (23%)

The Setting



Ceresco Dam

Morrow Dam



Morrow Lake

Battle Creek

Marshall

Source



Assessment Tasks

- ⦿ Identify probable injuries
- ⦿ What data are response agencies collecting that can be used for injury characterization?
 - Coordinate with response agencies to share the data
 - Identify data gaps, develop sampling plans
- ⦿ What baseline data are available and how informative are they?
 - Is it possible to conduct similar surveys post-spill?

Overview of NRDA Data Collected

- Extent of oiling in floodplain habitats
- Vegetation
- Erosion
- Fish
- Aquatic macroinvertebrates
- Mussels
- Chemistry (source oil, water, sediment, and biota)
- Wildlife
- Impacts to human uses

Floodplain Oiling Survey

◎ Objectives

- Identify and characterize extent and degree of oiling in the floodplains
- Characterize the general floodplain habitat types in the areas of the spilled oil

◎ Methods and Results

- Transects at 50m intervals
- 744 transects surveyed representing 23 river miles and associated floodplains
- 66% of transects were oiled to some extent
- Field observations provided to Response and data later used by Response

Rapid Vegetation Survey

- ⦿ Identify types of vegetation present
- ⦿ Identify rates of invasive plant species in order to compare over time

Erosion

- ⦿ Proactively raised concerns to Response Agencies based on field observations.
- ⦿ Reviewing erosion control plans and evaluating monitoring results.

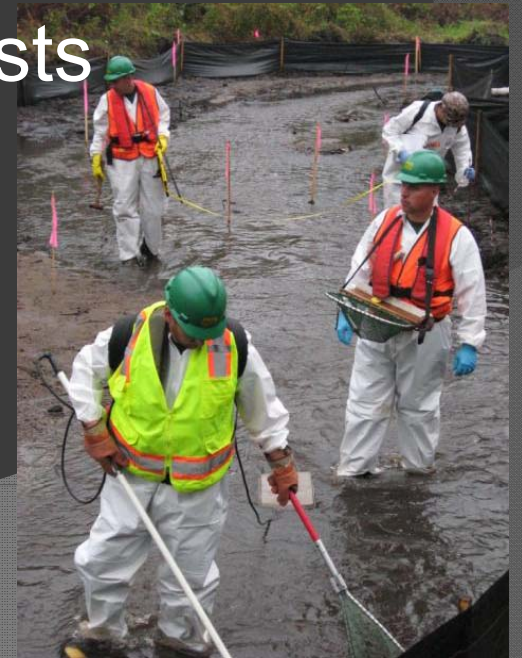


Fish Kill Surveys

- Conducted by state fishery biologists
- Followed previously published standard protocols
- No fish kills observed in spill area

Fish Status And Trends

- Conducted by state fishery biologists
- Followed standard protocols
 - 6 locations (2 upstream reference sites)
 - Baseline data at two sites - including a long-term monitoring site



Fish Status and Trends

- Fish data included:
 - Catch per effort and length
 - Species identification
- Habitat data included:
 - Conductivity, temperature, substrate, channel width and depth, velocity, bank and riparian condition, and large woody debris density
- Results
 - Talmadge Creek fish community was reduced and habitat greatly diminished in 2010. Some recovery in 2011.
 - Kalamazoo River: Some declines in fish community diversity and abundance at some sites.
 - Ongoing cleanup activities require continued monitoring.

Fish Exposure and Health

- ◎ Data collected in cooperation with USGS
 - 110 fish from 4 sampling locations
(includes 1 upstream reference)
- ◎ Analyses include:
 - Health assessment index
 - Histopathology of gill, spleen, head kidney tissues
 - Collected and archived bile samples for possible future analysis
 - Differential analysis of blood smears (potential)



Aquatic Macroinvertebrate Survey

- ⦿ State biologists followed pre-existing protocols to assess abundance and diversity
 - 7 locations on Kalamazoo River and Talmadge Creek
 - Included locations with past data
- ⦿ Results
 - In 2010, reduced diversity and abundance.
 - In 2011, scores improved, but abundance was still impacted.
 - Decreased vegetative cover exposed more of the stream channel to sunlight, altering community composition
 - Ongoing cleanup work requires further monitoring.

Mussel Shell Survey

- ⦿ Assessed physical condition of post-mortem mussel shells:
 - Broken vs. crushed
 - Degree of weathering, ranging from “fresh dead” to “heavily worn”
- ⦿ 18 species documented
- ⦿ Crushed and freshly dead shells found within spill area but not in reference area



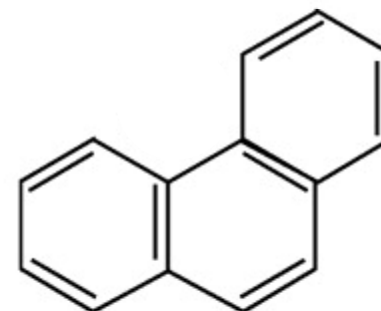
Chemistry Analysis

- ⦿ Water Column
 - 90 samples at 8 locations
- ⦿ Mussel tissue
 - ⦿ 12 composite samples at 4 locations
- ⦿ Sediment
 - ⦿ 12 composite samples at 4 locations
 - Co-located with mussel tissue samples

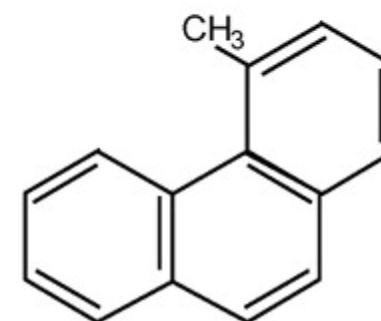
PAH Analytes

- Response generally analyzed for 16 priority PAHs
- Alkylated PAHs are more abundant, persist for a longer time, and are sometimes more toxic than the parent PAHs
- NRDA PAH analyses included alkyl homologues
- Some analyses also included heavy metals that are known to be elevated in the source oil (e.g. vanadium)

A. Phenanthrene



C. 1-Methylphenanthrene



Wildlife Recovery

- Wildlife recovery and rehabilitation center recorded
 - level of effort and geographic coverage of wildlife operations
 - capture, treatment, and release of oiled animals



- Over 3,000 turtles, 170 birds, and 38 mammals were brought to the rehabilitation center, with survival rates to release of 97%, 84%, and 68%, respectively

Human Uses

- River closed to public access for nearly 2 years.



● Trustees are evaluating recreational use of the river to determine when it recovers to baseline conditions and estimate damages.

Key Features of Oil Sands Pipeline Spill for NRDA

- Heavy oil fate and transport
- New cleanup techniques
- Diluted bitumen toxicity

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