NET ENVIRONMENTAL BENEFITS ANALYSIS SPECIES FACT SHEET:

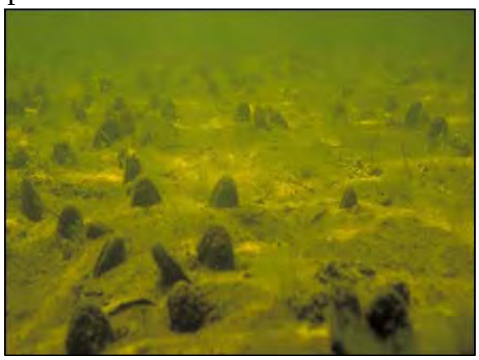
FRESHWATER MUSSELS

I. Species Description

Nearly 300 species of mussels inhabit freshwater rivers, streams, and lakes in North America, it is estimated that 43% of these species are in danger of extinction. Historically, the Midwest boasted the most diverse collection of mussels in the world. But today, the States of Minnesota, Wisconsin, Iowa, Missouri, Illinois, Indiana, and Ohio list more than half of their 78 known mussel species as endangered, threatened, or requiring special concern.

Freshwater mussels belong to a larger group of animals with shells called mollusks. Mollusks are soft-bodied animals enclosed by two hard shells made mostly of calcium and are connected by a ligament or hinge. Because adults are sedentary, long-lived (some live over 100 years), live in sediments, and feed by filtering water, they are excellent indicators of the health of aquatic ecosystems. In addition, mussels are a vital link in the food chain because they are a major food item for wildlife such as raccoon, muskrat, and otter.

Unlike oysters and clams, freshwater mussels need a fish to complete their life cycle. Some mussels require a specific host fish to complete their life cycle; others can use a variety of fish species.



Freshwater mussels are often found in mussel beds, which can be a mile or more long and contain thousands of mussels anchored in mud, sand or gravel. The majority of mussel beds found in large rivers occur in main channel areas, secondary channels, and adjacent backwater habitats.

II. Sensitivity to Oil Spills

Freshwater mussels are highly sensitive to oil spills. Although adult mussels have the ability to "clam up" for a limited time to avoid toxins such as gasoline and oil, young mussels are often killed immediately. Multiple spills or the long-term, chronic leaching of toxins accumulate in the tissues of mussels as they continually filter water for food, and can be passed through the food chain. Eventually the entire mussel population can be killed; directly from a toxin or by killing the fish hosts on which they depend for successful reproduction, ultimately eliminating the mussels.

Freshwater mussels inhabiting navigational river systems have additional sensitivity when responders use the river's lock and dam system to exclude the downstream movement of oil. The resulting changes in water depth, water currents, temperature can negatively affect freshwater mussels. Additionally, closing dams may become barriers to fish and mussel migration, possibly affecting upstream distribution and survival of juvenile mussels in these river systems.

III. Sensitivity to Response Methods

Methods Causing Least Adverse Impacts

Debris Removal
- Degree of oiling that warrants debris removal and disposal depends on human and sensitive resource use of the site

Sorbents
- Overuse generates excess waste
- Physical removal rates of heavy oils will be slow, so less oil will be mobilized for recovery by sorbents

Methods Causing Some Adverse Impact

Natural Recovery
- Oil can stimulate algal production, which covers mussel beds, inhibits feeding, and reduces the supply of oxygen.
- Sheltered mussels may need cleanup because of slow natural removal rates

Flooding and Low-Pressure, Cold-Water Flushing
- Use on heavy oils is likely to leave large amounts of residual oil in the environment
- Use on gasoline spills may transport the oil to more sensitive habitats

Manual Oil Removal/Cleaning
- Mussels are susceptible to trampling

Vacuum
- Not applicable to gasoline spills because of safety concerns

Shoreline Cleaning Agents
- Individual products vary in their toxicity and recoverability of the treated oil

Low Pressure, Hot Water Flushing
- Mussels would be adversely affected by hot water
- Most effective on heavy crudes where heat would make oil more fluid

Methods Causing Probable Adverse Impact

High-Pressure, Hot-Water Flushing
- Will likely kill mussels; use is appropriate in limited areas

Exclusion
- Changes in water depth, water currents, temperature, and restructured fish and algal communities can negatively affect freshwater mussels by exposure, accumulated sedimentation, and affecting upstream distribution and survival of juvenile mussels.

Sources
http://glc.org/irps/irps/nebadec04_bkgd.htm

http://www.fws.gov/midwest/mussel/index.html

http://www.ext.vt.edu/pubs/fisheries/420-523/420-523.html#L5

http://www.great-lakes.net/partners/epa/acp-rcp/app_VI.html#3.0