NET ENVIRONMENTAL BENEFITS ANALYSIS SPECIES FACT SHEET:

AMERICAN BEAVER (*Castor Canadensis)*

I. Species Description

Beavers are the largest rodents in North America. They are primarily aquatic animals. They average 3 to 4 feet in length and range from 30 to 75 pounds in weight. They have a waterproof, rich, glossy, reddish brown or blackish brown coat. The ears are short, round, and dark brown. The hind legs are longer than the front legs, making the rear end higher than the front end while walking. A beaver's incisors are long, massive and sharp and are used chiefly for gnawing. They have a spilt nail on the second hind toe used for grooming. Beavers are easily identified by their large paddle-shaped tails.

Beavers are found throughout all of North America except for the northern regions of Canada, the deserts of the southern United States, Mexico, and Florida. They live in lodges, of which there are three types: those built on islands, those built on the banks of ponds, and those built on the shores of lakes. The island lodge consists of a central chamber, with its floor slightly above the water level, and with two entrances. One entrance opens up into the center of the hut floor, while the other is a more abrupt descent into the water.

Beavers confine their activities to within one-half mile of their lodge or den. They are most active at night, dusk, and dawn. Daytime activity is rare except during the breeding season, when the ice melts in springtime, and in areas with little human disturbance.

Beavers eat bark and cambium (the softer growing tissue under the bark of trees). Their favorites include willow, maple, poplar, beech, birch, alder, and aspen trees. They store woody vegetation near shore for winter food. They also eat water vegetation, buds, and roots in warm weather.

II. Sensitivity to Oil and Other Spills

Beavers spend large amounts of time in the water and rely on their fur for insulation. If externally oiled, they could suffer eye damage or become hypothermic and die. Beavers groom frequently, placing them at risk of ingesting oil. Consumption of contaminated plants could also result in oil ingestion. Ingestion of oil can result in digestive tract bleeding and in liver and kidney damage. Breathing hydrocarbon vapors can result in nerve damage and behavioral abnormalities to all mammals. Spills may also indirectly affect habitats and food resources.

III. Sensitivity to Response Methods

Methods Causing Least Adverse Impacts

Boom Deployment
- Control the movement of floating oil to prevent or reduce contamination of species.

Skimming
- Recover floating oil from surface to prevent or reduce contamination of species.

Physical Herding
- Free oil trapped in vegetation or debris to move away from sensitive areas.

Vacuum
- Minimal effects if foot and vehicular traffic is controlled and minimal substrate is removed.

Manual Cleaning/Removal
- Oiled debris should be removed to prevent scavenging and the ingestion of oil.

Methods Causing Some Adverse Impact

In-Situ Burning
- If used, include either wildlife hazing in burn area or capture of oiled wildlife.

Shoreline Cleaning Agents
- Wildlife may contact cleaning agents and/or bioremediation substances used for shoreline treatment.

Sorbents
- Likely disturbance of habitat during deployment and retrieval. Use should be monitored to prevent overuse and generating large volumes of waste.

Scare Tactics
- Increased stressing of wildlife may lead to shock and fatalities.

Methods Causing Probable Adverse Impact

Natural Recovery
- This method may be inappropriate for areas where high numbers of mobile animals (birds, terrestrial mammals) or endangered species use the body of water or shoreline.

Vegetation Removal
- Will destroy habitat for many animals. Cut areas will have reduced plant growth. Trampled areas will recover much more slowly.

Sources

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State of Illinois, Illinois Department of Natural Resources, Illinois Furbearer Guide: Beaver, Accessed February 8, 2006 at, http://www.dnr.state.il.us/orc/wildlife/furbearers/beaver.htm

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NET ENVIRONMENTAL BENEFITS ANALYSIS SPECIES FACT SHEET:

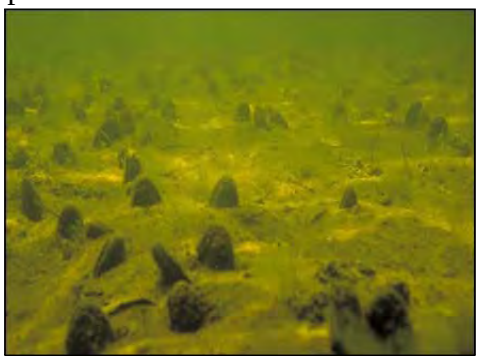
FRESHWATER MUSSELS

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
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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

NET ENVIRONMENTAL BENEFITS ANALYSIS SPECIES FACT SHEET:

FROGS *(Order Anura)*

I. Species Description

There is no scientific distinction between "frogs" and "toads," although most of the species are usually referred to as one or the other. They are found throughout most of the world, except in polar regions, some oceanic islands, and extremely dry deserts. They are found from tropical rainforests to dry mountaintops, from deserts to swamps. Adults may be arboreal, terrestrial, or aquatic. The continental United States is home to at least 90 frog species.

Physical features shared by most frogs include powerful hind legs for hopping and leaping, bulging eyes, and squat bodies. However, because of the large number of species, there are many characteristics that are not shared. There is a wide range in size, and many different types of skin textures, colors, and markings.

Being cold blooded, temperature is critical to frogs. In the winter months, frogs in temperate zones cannot remain active and must enter into a state of extremely reduced activity. In summer months, frogs can avoid the extreme heat by remaining underground in daylight, and being active at night.

Frogs are also susceptible to the loss of body water due to extremely hot or dry conditions. Those in temperate climates maintain moist skin to aid in evaporative cooling. Permeable skin allows the frog the ability to absorb water simply by jumping into a pond or sitting in a puddle. Frogs in arid regions, on the other hand, have different ways of regulating body water. Their skin is often impermeable to water to prevent rapid evaporation and dehydration. Instead, they may cover their bodies with a thick mucus, or burrow to avoid the heat altogether.

Frogs are carnivorous. They mostly feed on insects, other small arthropods, or worms. Some of the larger species eat vertebrates such as other frogs, and small rodents, snakes, and turtles.

II. Sensitivity to Oil and Other Spills

Frogs are in constant danger from toxic spills from egg to adult. As eggs and larval tadpoles they are particularly exposed to contaminants in the water. Most adult frogs have thin, permeable skin which externally absorbs pollution from the air, water, and soil. They are also likely to ingest spilled chemicals via consumption of contaminated food, soil, or sediment in their habitats. Research suggests that toxic spills in aquatic environments are linked to global outbreaks of frog deformities and population declines.

III. Sensitivity to Response Methods

Methods Causing Least Adverse Impacts

Boom Deployment
- Control the movement of floating oil to prevent or reduce contamination of species.

Skimming
- Recover floating oil from surface to prevent or reduce contamination of species.

Physical Herding
- Free oil trapped in vegetation or debris to move away from sensitive areas.

Vacuum
- Minimal effects to wildlife if foot and vehicular traffic is controlled and minimal substrate is removed.

Manual Cleaning/Removal
- Oiled debris should be removed to minimize the ingestion of oil.

Methods Causing Some Adverse Impact

In-Situ Burning
- If used, include either wildlife hazing in burn area or capture of oiled wildlife.

Shoreline Cleaning Agents
- Wildlife may contact cleaning agents and/or bioremediation substances used for shoreline treatment.

Sorbents
- Likely disturbance of habitat during deployment and retrieval. Use should be monitored to prevent overuse and generating large volumes of waste.

Methods Causing Probable Adverse Impact

Natural Recovery
- This method may be inappropriate for areas where dense species populations or endangered species use the body of water or shoreline.

Vegetation Removal
- Will destroy habitat for many animals. Cut areas will have reduced plant growth. Trampled areas will recover much more slowly.

Sources

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Heying, H. 2003. "Anura" (On-line), Animal Diversity Web. Accessed February 24, 2006 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Anura.html.

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NET ENVIRONMENTAL BENEFITS ANALYSIS SPECIES FACT SHEET:

NORTHERN RIVER OTTER (*Lontra Canadensis)*

I. Species Description

North American river otters are semi-aquatic mammals, with long, streamlined bodies, thick tapered tails, and short legs. They have wide, rounded heads, small ears, and nostrils that can be closed underwater. The whiskers are long and thick. The fur is dark brown to almost black above and a lighter color on the underside. The throat and cheeks are golden brown. The fur is dense and soft, effectively insulating these animals in water. The feet have claws and are completely webbed. Body length ranges from 35 to 51 inches and tail length from 12 to 20 inches. Weight ranges from 11 to 30 lbs. Males average larger than females in all measurements.

River otters are found in Canada, Alaska, the Pacific Northwest, the Great Lakes states and along the Atlantic coast and Gulf of Mexico. Vegetation adjacent to rivers, streams, lakes, and other wetland areas are key habitats. Adult males live along large stretches of river, often up to 40 to 50 miles. Females are not as mobile. Their home ranges are only 3 to 10 miles depending on habitat quality and the time of year. They travel a lot but spend most of their time at activity centers with abundant food and cover. Examples of these centers include logjams, oxbows, pools below dams or spillways, and springs or riffles that stay free of ice all winter.

River otters eat mainly aquatic organisms such as amphibians, fish, turtles, crayfish, crabs, and other invertebrates. Birds, their eggs, small terrestrial mammals, and sometimes aquatic plants are also eaten on occasion. Prey is eaten immediately after capture, usually in the water, although larger prey is eaten on land.

II. Sensitivity to Oil and Other Spills

River otters spend a great deal of time swimming and diving in for food. Their fur can become oiled while in the water, resulting in a loss of insulation and hypothermia. In addition, river otters groom frequently and can ingest oil as a result. While they prefer live prey, they are also opportunistic feeders and potentially will eat oiled carrion, especially during the winter and spring. Ingestion of hydrocarbons during the grooming process or through feeding on contaminated prey items may result in digestive-tract irritation, neurological effects and physiological changes, which in turn, may lead to organ injury, dysfunction, and death. Aromatic hydrocarbons are capable of causing inhalation injury and may cause death before either hypothermia or ingestion injuries affect the animals.

III. Sensitivity to Response Methods

Methods Causing Least Adverse Impacts

Boom Deployment
- Control the movement of floating oil to prevent or reduce contamination of species.

Skimming
- Recover floating oil from surface to prevent or reduce contamination of species.

Physical Herding
- Free oil trapped in vegetation or debris to move away from sensitive areas.

Vacuum
- Minimal effects to wildlife if foot and vehicular traffic is controlled and minimal substrate is removed.

Manual Cleaning/Removal
- Oiled debris should be removed to prevent scavenging and the ingestion of oil.

Methods Causing Some Adverse Impact

In-Situ Burning
- If used, include either wildlife hazing in burn area or capture of oiled wildlife.

Shoreline Cleaning Agents
- Wildlife may contact cleaning agents and/or bioremediation substances used for shoreline treatment.

Sorbents
- Likely disturbance of habitat during deployment and retrieval. Use should be monitored to prevent overuse and generating large volumes of waste.

Scare Tactics
- Increased stressing of wildlife may lead to shock and fatalities.

Methods Causing Probable Adverse Impact

Natural Recovery
- This method may be inappropriate for areas where high numbers of mobile animals (birds, terrestrial mammals) or endangered species use the body of water or shoreline.

Vegetation Removal
- Will destroy habitat for many animals. Cut areas will have reduced plant growth. Trampled areas will recover much more slowly.

Sources

State of Illinois, Illinois Department of Natural Resources, Illinois Furbearer Guide: River Otter, Accessed February 8, 2006 at, http://www.dnr.state.il.us/orc/wildlife/furbearers/river_otter.htm

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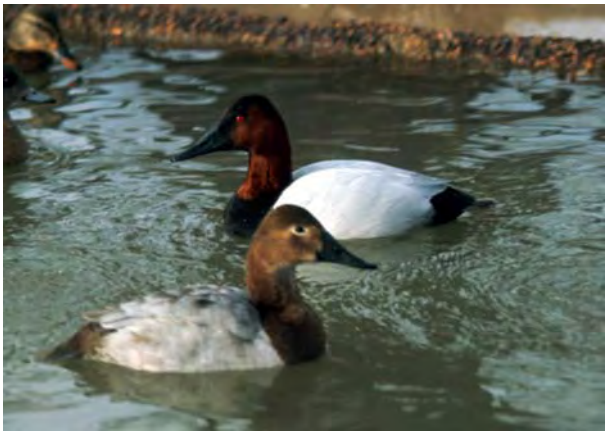
NET ENVIRONMENTAL BENEFITS ANALYSIS SPECIES FACT SHEET:

WATERFOWL (*Family Anatidae*)

I. Species Description



Waterfowl are distributed worldwide, except for the Antarctic region. This family of birds includes ducks, geese, and swans. They inhabit aquatic habitats such as lakes, ponds, streams, rivers, and marshes. Some groups inhabit marine environments outside of the breeding season. Many waterfowl are migratory, although tropical and subtropical species remain close to breeding grounds during non-breeding season.

Waterfowl are medium to large birds (1 to 6 ft; 8 oz to 50 lbs). The bird's necks are relatively long and the heads are small. Wings are short and tails may be short and rounded or longer and narrow. Legs are set far back on the body and the front three toes are webbed. Bills are generally broad. The birds spend much of their time in the water and spend a great deal of time on preening and feather maintenance. They use their bills to condition and waterproof their feathers with oil secreted from a gland in the skin at the base of the tail.

Waterfowl are known for their flock formations, which may serve to provide predator protection or to facilitate locating abundant food sources. Waterfowl may form small flocks or groups of up to several hundred thousand individuals.

Most waterfowl are omnivorous, but some are primarily herbivorous and others are mostly carnivorous. They eat the seeds, roots, stems, leaves and flowers of aquatic vegetation. Some feed on plankton or algae. Other food items taken include mollusks, aquatic insects, crustaceans and small fish.

II. Sensitivity to Oil and Other Spills

The primary direct effect from exposure to oil for waterfowl is getting oil on their feathers and losing their ability to stay insulated, waterproof, and afloat. This can result in death from hypothermia. Waterfowl may ingest oil while trying to clean their feathers or when they try to eat contaminated food. This ingestion can severely damage internal organs, impair the ability to eat, and may cause long-term reproductive effects. A great potential for damage is direct exposure of eggs to water borne contaminants.

III. Sensitivity to Response Methods

Methods Causing Least Adverse Impacts

Boom Deployment
- Control the movement of floating oil to prevent or reduce contamination of species.

Skimming
- Recover floating oil from surface to prevent or reduce contamination of species.

Physical Herding
- Free oil trapped in vegetation or debris to move away from sensitive areas.

Vacuum
- Minimal effects to wildlife if foot and vehicular traffic is controlled and minimal substrate is removed.

Manual Cleaning/Removal
- Oiled debris should be removed to prevent scavenging and the ingestion of oil.

Methods Causing Some Adverse Impact

In-Situ Burning
- If used, include either wildlife hazing in burn area or capture of oiled wildlife.

Dispersants
- Dispersant/detergent contact with birds can reduce insulating value of plumage.

Scare Tactics
- Increased stressing of wildlife may lead to shock and fatalities.

Methods Causing Probable Adverse Impact

Natural Recovery
- This method may be inappropriate for areas where high numbers of mobile animals (birds, terrestrial mammals) or endangered species use the body of water or shoreline.

Vegetation Removal
- Will destroy habitat for many animals. Cut areas will have reduced plant growth. Trampled areas will recover much more slowly.

Sources

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