SANTA ROSA COUNTY HABITATS, OIL SPILL AFFECTS & CLEANUP

Introduction

Oil on coastal waters, shorelines, or subtidal habitats can harm the environment, intrude on recreational activities, cause economic hardship, disrupt commercial activities, and be expensive to clean up. Decisions about if, where, when, and how to remove oil from coastal habitats affect each of these potential spill consequences. Sound cleanup decisions depend on accurate information about the types of habitats that the oil affects, the degree and the location of oiling. When choosing effective response options, including natural recovery, you must consider trade-offs affecting the option's potential environmental impact, its appropriateness for the habitat, and timing of its application. Remember that the benefits and impacts of response options depend upon incident-specific conditions and affect the options' suitability for use in a habitat during any spill. Following is a descriptive list of habitats in Santa Rosa County. This information was derived from NOAA. A detailed booklet can be downloaded at: http://response.restoration.noaa.gov/book_shelf/911_coastal.pdf.

SAND BEACHES

Description

- These beaches are flat to moderately sloping and relatively hard-packed.
- There can be heavy accumulations of wrack.
- They are used by birds and turtles.
- Upper beach fauna include ghost crabs and amphipods; lower beach fauna can be moderate, but highly variable.

Predicted Oil Behavior

- Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone.
- Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide.
- Maximum penetration of oil into fine-to medium-grained sand is about 10-15 cm, up to 25 cm in coarse-grained sand. Maximum penetration of oil into fine to medium-grained sand is about 10-15 cm, and about 25 cm into coarse-grained sand.
- Burial of oiled layers by clean sand can be rapid (within one day), and burial to depths as much as one meter is possible if the oil comes ashore at the beginning of a depositional period.
- Organisms living in the beach sediment may be killed by smothering or lethal oil concentrations in the interstitial water.
- Biological impacts include temporary declines in infauna, which can affect important shorebird foraging areas.

Response Considerations

- These beaches are among the easiest shoreline types to clean.
- Cleanup should concentrate on removing oil and oily debris from the upper swash zone once most of the oil has come ashore.

- Manual cleanup, rather than road graders and front-end loaders, is advised to minimize the volume of sand removed from the shore and requiring disposal.
- All efforts should focus on preventing vehicular and foot traffic from mixing oil deeper into the sediments.
- Mechanical reworking of lightly oiled sediments from the high-tide line to the upper intertidal zone can be effective along exposed beaches.

RIPRAP

Description

- Riprap structures are composed of cobble- to boulder-sized blocks of granite, limestone, concrete, or other materials.
- Riprap structures are used as revetment and groins for shoreline protection, and as breakwaters and jetties around inlets and marinas.
- Attached biota are generally sparse on exposed riprap.
- They are common in highly developed waterfront areas.
- **Predicted Oil Behavior**
- Deep penetration of oil between the blocks is likely.
- Oil adheres readily to the rough surfaces of the blocks.
- Uncleaned oil can cause chronic leaching until the oil harden.

Response Considerations

- When the oil is fresh and liquid, high pressure spraying and/or water flooding may be effective if all liberated oil is recovered.
- Heavy and weathered oils are more difficult to remove, requiring scraping and high-pressure, hot-water flushing.

EXPOSED TIDAL FLATS

Description

- Exposed tidal flats are broad intertidal areas composed primarily of sand and minor amounts of gravel.
- The presence of sand indicates that tidal currents and waves are strong enough to mobilize the sediments.
- They are usually associated with another shoreline type on the landward side of the flat, though they can occur as separate shoals; they are commonly associated with tidal inlets.
- Biological use can be very high, with large numbers of infauna, heavy use by birds for roosting and foraging, and use by fish for foraging.

Predicted Oil Behavior

- Oil does not usually adhere to the surface of exposed tidal flats, but rather moves across the flat and accumulates at the high-tide line.
- Deposition of oil on the flat may occur on a falling tide if concentrations are heavy.
- Oil does not penetrate water-saturated sediments, but may penetrate coarse-grained sand and coat gravel.
- Biological damage may be severe, primarily to infauna, thereby reducing food sources for birds and other predators.

Response Considerations

- Currents and waves can be very effective in natural removal of the oil.
- The use of heavy machinery should be restricted to prevent oil mixing into the sediments.

SHELTERED, SOLID MAN-MADE STRUCTURES

Description

- These are structures such as seawalls, groins, revetments, piers, and port facilities constructed of concrete, wood, or metal.
- Most structures are designed to protect a single lot, thus their composition, design, and condition are highly variable.
- Often there is no exposed beach at low tide, but multiple habitats may be present.
- There can be dense attachments of animal and plant life.
- They are common in developed waterfront areas.

Predicted Oil Behavior

- Oil will adhere readily to the rough surface, particularly along the high-tide line, forming a distinct oil band.
- The lower intertidal zone usually stays wet (particularly if algae-covered), preventing oil from adhering to the surface.

Response Considerations

- Seawalls are usually cleaned for aesthetic reasons or to prevent leaching of oil.
- Low-to high-pressure spraying at ambient water temperatures is most effective when the oil is fresh.

PEAT SHORES

Description

- This shoreline type includes exposed peat scarps, eroded peat, and peat slurries.
- Exposed peat scarps occur where the peat is frozen.
- They are highly erosional (greater than 1 meter/year), resulting from wave action, ice scour, and melting of the frozen peat.
- The intertidal zone is often very complex, with slumped peat blocks and a thin (and temporary) sand layer on the peat.
- Eroded peat occurs as a peat mat or veneer in a dewatered state, deposited on a sand or gravel beach; it is usually less than 20 cm thick and considered to be relatively transient.
- Peat slurries (which have the appearance of coffee grounds) are up to 50 cm thick and 10 meters wide.
- Peat slurries are found at the foot of eroding peat scarps and in depositional areas; they are relatively permanent features that move along the shore with the currents.
- Peat shorelines comprise about 70 percent of the Beaufort Sea coast of Alaska.
- The intertidal zone of this shoreline type is not particularly important as biological habitat.

Predicted Oil Behavior

- Oil could be stranded onshore only during the ice-free summer season.
- Oil penetration and persistence are expected to be very low in frozen peat scarps.
- Light oil can penetrate peat slurries, especially when the peat is dry.
- Peat resists penetration by heavy oils, even when dry.
- Peat slurry reacts with oil like loose granular sorbent and will partially contain and prevent the oil from spreading.

Response Considerations

- The peat substrate is soft, thus cleanup will be difficult; trampling is less of a concern where peat is frozen or work is conducted from boats.
- Substrate disruption is of limited concern because of high erosion rates so long as adjacent tundra is not disturbed.
- Peat slurry may be used as a natural sorbent; sorption will be more effective with liquid and fresh oils.
- With high erosion rates, stranded oil will have a short residence time.
- Tundra cliffs are commonly undercut and naturally unstable, so safety is a primary concern during response operations.
- Hot-water washing or even low-pressure flushing activities are not appropriate because large quantities of peat could be eroded from the treatment area.

SHELTERED TIDAL FLATS

Description

- Sheltered tidal flats are composed primarily of mud with minor amounts of sand and shell.
- They are usually present in calm-water habitats, sheltered from major wave activity, and backed by marshes.
- The sediments are very soft and cannot support even light foot traffic in many areas.
- There can be large concentrations of bivalves, worms, and other invertebrates in the sediments.
- They are heavily used by birds for feeding.

Predicted Oil Behavior

- Oil does not usually adhere to the surface of sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line.
- Deposition of oil on the flat may occur on a falling tide if concentrations are heavy.
- Oil will not penetrate the water-saturated sediments, but could penetrate burrows and desiccation cracks or other crevices in muddy sediments.
- In areas of high suspended sediment concentrations, the oil and sediments could mix, resulting in the deposition of contaminated sediments on the flats.
- Biological impacts may be severe.

Response Considerations

- These are high-priority areas for protection since cleanup options are limited.
- Cleanup of the flat surface is very difficult because of the soft substrate; many methods may be restricted.
- Low-pressure flushing and deployment of sorbents from shallow-draft boats may be attempted.

SALT TO BRACKISH MARSHES

Description

- Intertidal wetlands contain emergent, herbaceous vegetation, including both tidal and muted tidal marshes. Depending on location and interannual variations in rainfall and runoff, associated vegetation may include species tolerant or adapted to salt, brackish, or even tidal freshwater conditions.
- The marsh width may vary from a narrow fringe to extensive areas.
- Sediments are composed of organic muds except where sand is abundant on the margins of exposed areas.
- Exposed areas are located along bays with wide fetches and along heavily trafficked waterways.
- Sheltered areas are not exposed to significant wave or boat wake activity.
- Abundant resident flora and fauna with numerous species and high use by birds, fish, and shellfish.

Predicted Oil Behavior

- Oil adheres readily to intertidal vegetation.
- The band of coating will vary widely, depending upon the water level at the time of oiling.
- Large slicks will persist through multiple tidal cycles and will coat the entire stem from the high-tide line to the base.
- Heavy oil coating will be restricted to the outer fringe of thick vegetation, although lighter oils can penetrate deeper, to the limit of tidal influence.
- Medium to heavy oils do not readily adhere to or penetrate the fine sediments, but can pool on the surface or in animal burrows and root cavities.
- Light oils can penetrate the top few centimeters of sediment; under some circumstances oil can penetrate burrows and cracks up to one meter.

Response Considerations

- Under light oiling, the best practice is to let the area recover naturally.
- Natural removal processes and rates should be evaluated before conducting cleanup.
- Heavily pooled oil can be removed by vacuum, sorbents, or low-pressure flushing. During flushing, care must be taken to prevent transporting oil to sensitive areas down slope or along shore.
- Cleanup activities should be carefully supervised to avoid damaging vegetation.
- Any cleanup activity must not mix the oil deeper into the sediments. Trampling of the plants and disturbance of soft sediments must be minimized.
- Aggressive cleanup methods should only be considered when other resources (migratory birds, endangered species) are at greater risk from oiled vegetation left in place.

SEAGRASSES

Description

- Seagrasses are highly productive habitats that occur on intertidal flats and in shallow coastal waters worldwide from arctic to tropical climates.Water temperature, light penetration, sediment type, salinity, and wave or current energy control seagrass distribution.
- Seagrasses provide a food source for green turtles, manatees, and waterfowl, who graze on seagrasses.
- Seagrasses are used by fish and shellfish as nursery areas.

Predicted Oil Behavior

- Oil will usually pass over subtidal seagrass beds, with no direct contamination.

- Oil that is heavier than seawater can become trapped in the beds, coating the leaves and sediments.
- Oil readily adheres to the vegetation, and the oiled blades are quickly defoliated when intertidal beds are oiled.
- Floating oil stranded on adjacent beaches can pick up sediment and then get eroded and deposited in adjacent beds.

Response Considerations

- Be careful when deploying and anchoring booms to prevent physical damage to seagrass beds.
- Be careful to prevent sediment suspension and mixing with the oil, and disturbance of roots and vegetation by foot traffic and boat activity.
- Do not cut seagrass unless species like sea turtles, manatees, or waterfowl are at significant risk of contacting or ingesting oil.
- Dispersant use directly over subtidal seagrass beds may impact the highly sensitive communities. However, use in offshore areas can reduce impacts to highly sensitive intertidal environments.
- In situ burning can be considered outside the immediate vicinity of seagrass beds to protect sensitive intertidal environments. Burn residues can sink; the potential effects of residues will depend on the composition and amount of the oil to be burned.

SOFT BOTTOM

Description

- Soft-bottom, subtidal habitats consist of various percentages of sand, silt, and clay, and occur in sheltered bays and estuaries, and deeper offshore areas.
- The presence of fine-grained sediments indicates that the substrate is not exposed to significant wave or tidal energy.
- Biological resources associated with this habitat include shrimp, crabs, clams, fish, and the pelagic and benthic communities that support them (e.g., plankton, worms, amphipods, isopods).

Predicted Oil Behavior

- This habitat is not often exposed to spilled oil. The greatest risk of exposure is from the sinking oil or the sorption of dispersed oil on to suspended sediments that are then deposited on the bottom.
- Significant natural dispersion of oil and sediments into the water column occurs only during large storms and nearshore oil spills.
- Shoreline cleanup can suspend oil and fine-grained sediments, causing deposition of oily sediments in nearshore habitats.
- Concerns about seafood contamination from dispersed oil or oiled sediments can become a significant issue. Real, potential, or fear of contamination can close seafood harvesting activities.

Response Considerations

- Removal might be needed where significant amounts of oil have sunk and formed mats or concentrations of tarballs on the sediment surface.
- Special efforts will be needed to control suspended sediments and resuspended oil during recovery operations.
- Dispersants can be used over soft subtidal habitats in order to protect more sensitive intertidal environments. Effects on biota are less for applications in deep water or high dilution rates.

- In situ burning can be used to protect sensitive intertidal environments. When burned, some oils can produce a sinkable residue; the potential effects of these residues will depend on the composition and amount of oil to be burned.

BAYS AND ESTUARIES

Description

- Near coastal waters partially surrounded by land and more sheltered than offshore habitats.
- Limited circulation and flushing, with depths frequently less than 30 feet.
- Suspended sediment concentrations can be high.
- Highly sensitive to oil spills, particularly where flushing rates are low and the probability of contact increases.
- Many species spawn in these habitats during spring, and their sensitive early life stages can persist in shallow waters.
- Large numbers of migratory or wintering waterfowl, wading, and diving birds are often found here. Bays and estuaries are also home to marine mammals and sea turtles.
- Estuaries and bays are used by commercially or recreationally important finfish, shellfish, and other organisms that migrate seasonally.

Predicted Oil Behavior

- Oil can impact bottom habitats (benthic organisms) when water is shallow.
- Stranded oil on nearby shorelines can become a prolonged source for oil re-released to the water column.
- Tides and fresh water can substantially influence spilled oil movement.

Response Considerations

- Reducing impacts to organisms that live on or in the sea surface is often a high priority.
- Reducing the extent of impacts to sensitive nearshore subtidal or intertidal habitats should be considered.
- Spill response is not conducted from a shoreline, but from water-based vessels or aircraft.
- Use of certain response options is seasonally limited to protect sensitive life histories.
- Adverse effects to birds would be greatest during migration and overwintering when the birds form large flocks.