Types of Oil & Effects on the Environment

When oil heats our homes and powers our vehicles, it is a necessity. But when oil spills into our waters and coats our shores, it becomes a big problem. Oil spills along coasts affect many parts of the environment, both non-living and living. Major oil spills most commonly involve oils shipped in large quantities at sea, such as crude petroleum, No. 1 and No. 2 fuel oils, diesel oil, Bunker C oil, kerosene, and jet fuel. Oils are compound, complex mixtures that vary widely in composition. All oil products can affect wildlife. (See Effects of Oil on Wildlife fact sheet)

Oils can be described as belonging to one of five groups:

Group One –Very light oils such as jet fuel and gasoline are highly volatile, which means they evaporate quickly, usually completely within one to two days after a spill. These oils are also flammable and contain high concentrations of soluble toxic compounds. Very light oils can mix with water and kill aquatic life that lives in the upper layers. Cleanup is difficult and may not be necessary, with spills of very light oil.

Group Two - Light oils such as diesel, No. 2 fuel oil, light crude and home heating oil are moderately volatile, but can leave a residue of up to one-third of the amount spilled after a few days. These oils contain moderate concentrations of soluble toxic compounds. Light oils leave a film or layer on intertidal resources causing long-term contamination. Cleanup can be very effective on spills of light oil.

Group Three - Medium oils, mostly crude oils, are less volatile, leaving a residue of about two-thirds of the amount spilled after 24 hours. These oils are less likely to mix with water and oil contamination of intertidal areas can be severe and long-term. The impact of medium oils on waterfowl and fur-bearing mammals can also be severe. Cleanup is most effective with spills of medium oil if conducted quickly.

Group Four - Heavy oils such as heavy crude oils, No. 6 fuel oil, Bunker C have far less evaporation or dilution potential, and they weather more slowly. These oils do not readily mix with water. Spills of heavy oils can cause severe contamination of intertidal areas and possible long-term contamination of sediments. Heavy oils have severe impacts on waterfowl and furbearing mammals. Shoreline cleanup in spills of this type is difficult and long term under most conditions.

Group Five - Mostly very heavy oils can float, sink, or hang in the water. These oils can become oil drops and mix in the water, or accumulate on the bottom, or mix with sand and then sink. As a rule, these oils are less toxic than lighter oils; however, they pose significant problems to responders because they are extremely difficult to track or predict.

Factors of Oil in a Spill

The different types of oils behave in different ways during a spill, so the response to a spill varies

depending on the type of oil and quantity released.

Other important factors in a spill are:
- Weather and season (for example bird migration, nesting, or fish spawning);
- Type of shoreline such as sand beach, tidal flat, rocky shore;
- Exposure to wave and tidal energy; and,
- Types, abundance, and sensitivity of living resources.

Oil in Water
Most oil has a density less than water and floats. The natural tendency of oil is to spread in a thin layer on the surface of the water as a sheen or film. Such sheens are extremely difficult to recover and do not remain for long periods but, they represent a continued threat to fish and wildlife, particularly nesting birds. Under turbulent conditions, oil is more likely to disperse into the upper layers of the water.

Oil changes rapidly once it is spilled into water. These changes are enhanced by the processes of evaporation, dilution and emulsification (when water incorporates into the oil, forming a stable mixture). Some changes help dissipate spilled oil, but others can make it linger in the water, on the bottom, or on the shore.

Evaporation tends to remove the more toxic components and reduces the toxicity of spilled oil.

Emulsification can slow degradation of spilled oil.

Weathering describes the physical, chemical, and biological changes that happen to crude oil and refined petroleum products once they begin to interact with the watery environment. Ultimately, the more toxic elements of oil products spilled in the marine, estuarine, or freshwater environment are broken down. Exposure to air, sunlight, wave and tidal action, and certain microscopic organisms degrades and/or disperses oil. The rate of degradation and dispersion depends on many factors like the type of oil, weather, temperature, and the type of shoreline and bottom.

The California Department of Fish and Wildlife's Office of Spill Prevention and Response (OSPR) responds to oil spills and has the responsibility for managing and protecting California's living environment – migratory birds, anadromous fish (fish that begin their lives in fresh water and live part of their lives in the ocean), certain marine mammals (sea otters, polar bears, walrus, and manatees), sea turtles (when they are on shore), and other reptiles, and aquatic and terrestrial habitats.

OSPR responds with teams of federal, state and local agencies, organizations and industry representatives that have prepared contingency plans for oil spill emergencies. The teams swing into action using the plans when a spill occurs. But once cleanup is complete, OSPR continues its work long after a spill event, assessing the damage to habitat and wildlife and finding ways to minimize the long-term effects on new generations of living creatures.