

Small Diesel Spills (500-5,000 gallons)

Definition

Diesel fuel is a light, refined petroleum product with a relatively narrow boiling range.

Physical Properties

- Diesel is much lighter than water (specific gravity is 0.82-0.88, vs. 1.00 for fresh water and 1.03 for seawater). It is not possible for diesel to sink and accumulate on the bottom as free oil.
- Diesel has a very low viscosity, and surface sheens are readily dispersed into the water column when winds exceed 7 knots. However, diesel slicks will be more persistent under low winds and relatively sheltered waterbodies.

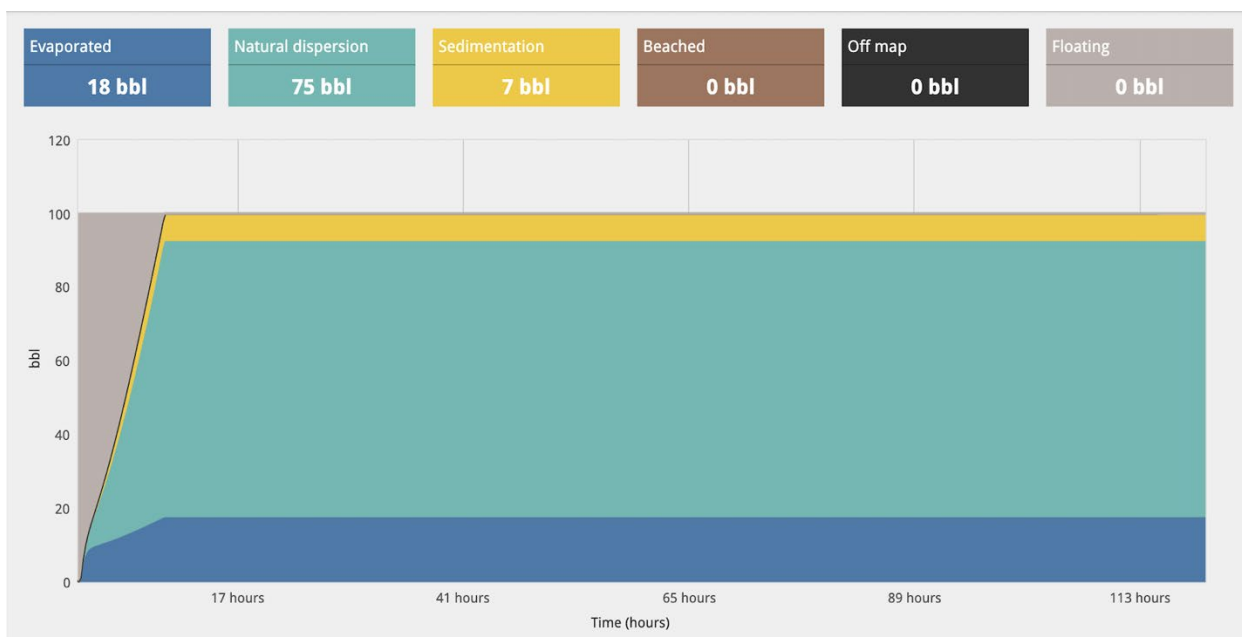
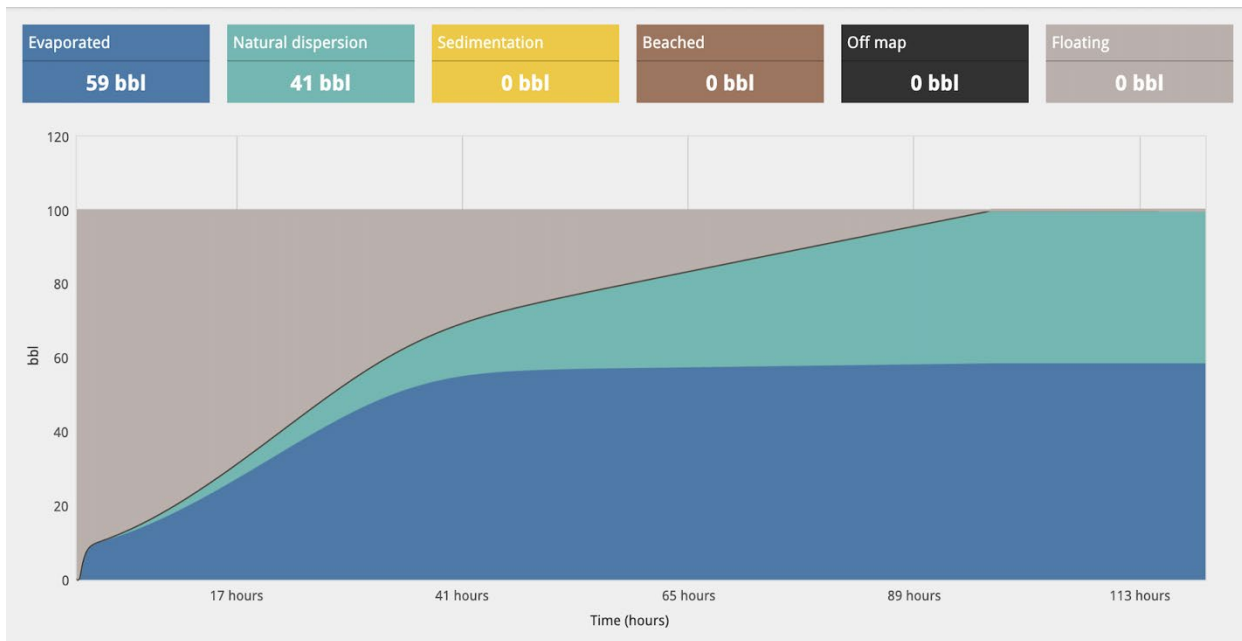
Environmental Behavior

- When spilled on water, most of the oil will evaporate or naturally disperse within days or less (see WebGNOME oil weathering plots below for a generic diesel, which is the average of all the diesels in the ADIOS Oil Database). This is particularly true for typical spills from a fishing vessel (500-5,000 gallons), even in cold water. Thus, there is seldom any oil on the surface for responders to recover.
- When spilled on water, diesel oil spreads very quickly to a thin film. Even when the oil is described as a heavy sheen, it is 0.0004 inches thick and contains about 1,000 gallons per square nautical mile of continuous coverage. The volume of oil in areas covered by streamers would be much less. Silver sheen only contains about 75 gallons per square nautical mile.
- However, if the diesel is released on or very close to shore, or concentrates on catchment beaches, there can be heavy loading and penetration into the sediments when the groundwater in the beach falls during low tide, even in beaches and flats with a coarse-grained sediment veneer.
- Diesel is not very sticky or viscous, compared to black oils. When small spills do strand on the shoreline, the oil tends to penetrate porous sediments quickly, but also to be washed off quickly by waves and tidal flushing. Thus, shoreline cleanup may not be needed after small spills.
- Diesel that is dispersed in the water column can adhere to fine-grained suspended sediments, which then settle out and get deposited on the bottom of a water body. This process is more likely to occur in streams and rivers with significant suspended sediment loads. It is less likely to occur in open marine settings. This process is not likely to result in measurable sediment contamination for small spills.
- Diesel is readily and completely degraded by naturally occurring microbes, under time frames of 1-2 months when there is sufficient oxygen. Nutrient addition may speed this process in soils. Diesel that has penetrated into shoreline sediments where conditions are not favorable for natural removal or degradation may persist for months to years.

Environmental Effects

- Diesel is one of the most acutely toxic oil types. Fish and invertebrates that come in direct contact with naturally dispersed and entrained diesel in the water column may be killed. However, small spills in open water are so rapidly diluted that fish kills have never been reported. Fish kills have been reported for small spills in confined, shallow water and in streams, where weathering and mixing are reduced. Animals in small streams can be affected for miles downstream of a diesel release.
- Naturally dispersed diesel in shallow, nearshore environment can impact sensitive benthic habitats, such as seagrass beds and coral reefs.

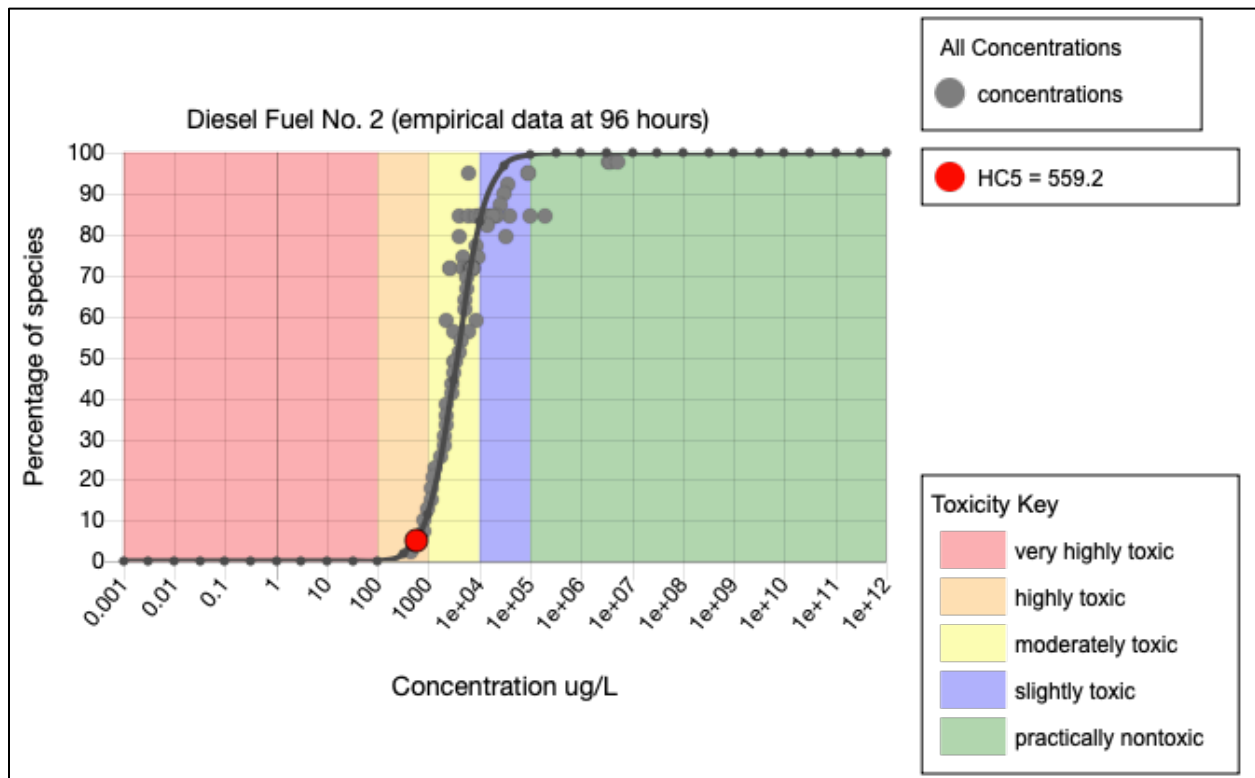
- Where larger amounts of diesel soak into wetland soils, expect high mortality of animals and plants.
- Small diesel spills can affect marine birds by direct contact. Mortality is caused by ingestion during preening, as well as by hypothermia from matted feathers. Experience with small diesel spills is that few birds are directly affected because of the short time the oil is on the water surface. However, small spills could result in serious impacts to birds under the "wrong" conditions, such as a grounding right next to a large nesting colony or transport of sheens into a bird concentration area.
- Shellfish can be tainted from diesel spills in shallow, nearshore areas. These organisms bioaccumulate the oil, but will also deplete the oil, usually over a period of several weeks after exposure ends.
- There can be both acute and chronic exposure/effects in shoreline communities, particularly benthic infauna on beaches with persistent oil.



GNOME model output for a 100-barrel (bbl) diesel spill; wind of 5 knots (top) and 20 knots (bottom). There is little initial natural dispersion at low wind speeds, but very high initial dispersion at high wind speeds.

<https://gnome.orr.noaa.gov>

The following plot shows the toxicity test results for a wide range of species for exposures of 96 hours, indicating that diesel can be slightly to highly toxic to aquatic organisms.



CAFE (Chemical Aquatic Fate and Effects) Database web link: <https://cafe.orr.noaa.gov>

