

Small Diesel Spills (500-5,000 gallons)

Definition

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

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 contains about 0.5% BTEX and 10-23% low-molecular-weight aromatic compounds.

Environmental Behavior

- When spilled in **open water and is unconfined**, most diesel will evaporate or naturally disperse within a few days or less (see ADIOS® oil weathering plots*). Under these conditions, there is seldom any surface oil for responders to recover. This is particularly true for typical spills from a fishing vessel (500-5,000 gallons), even in cold water.
- When spilled on water, diesel oil spreads very quickly to a thin film. Oil described as a heavy sheen is only 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.
- Diesel has a very low viscosity, and surface sheens are readily dispersed into the water column when winds exceed 7 knots or sea conditions are >1 foot.
- 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. 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. It is not likely to result in measurable sediment contamination for small spills.
- 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 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.

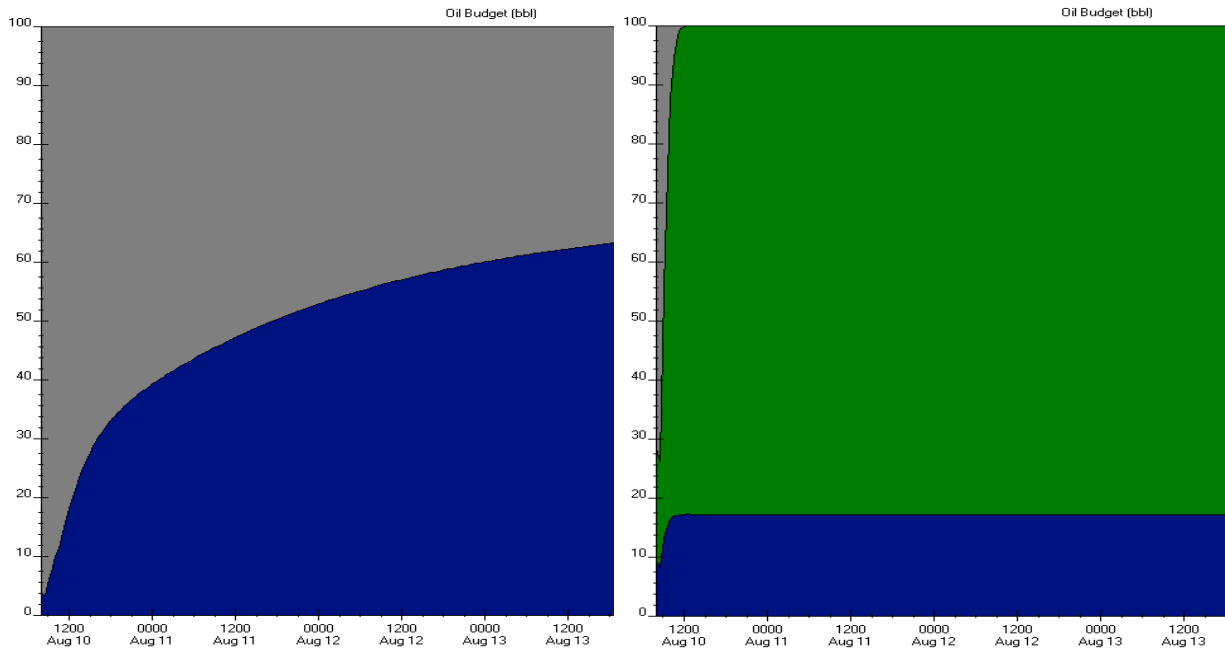
Environmental Effects

- 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. Fish and invertebrates in small streams can be affected for miles downstream of a diesel release.
- Where larger amounts of diesel soak into wetland soils, expect high mortality of animals and plants.
- Marine birds are affected by direct contact. Mortality is caused by ingestion during preening or 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

* ADIOS is a tool specifically developed for open water conditions and assumes the spill is not confined or restricted (i.e., the oil spreads according to its physical properties).

impacts to birds under the "wrong" conditions, such as a spill adjacent to a nesting colony or transport of sheens into a bird concentration area.

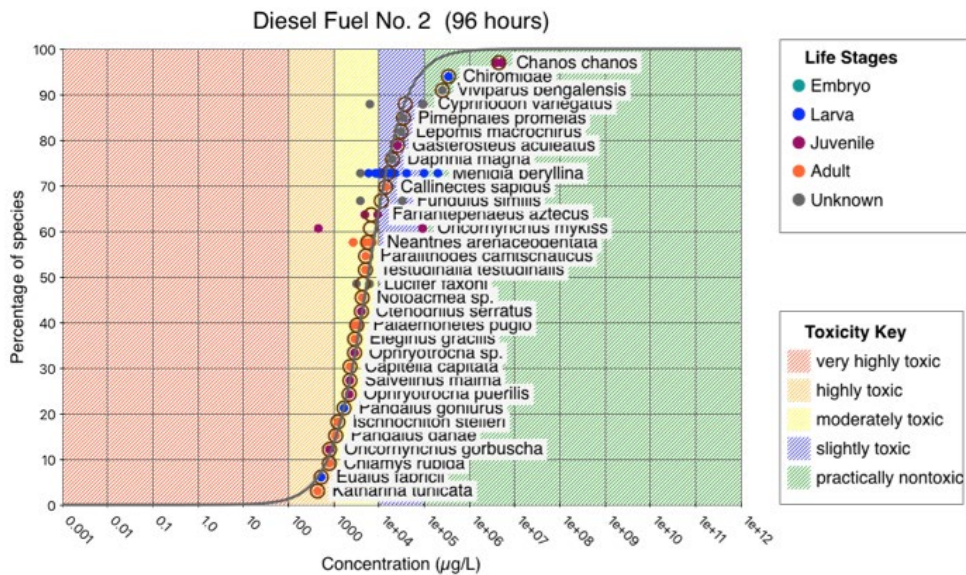
- Shellfish can be tainted from diesel spills in shallow, nearshore areas. These organisms bioaccumulate the oil, but will also deplete the oil, usually over a period of several weeks after exposure ends.



ADIOS model output for a diesel spill of 100 bbl; winds of 5 knots (left) and 20 knots (right). There is very little natural dispersion at low wind speeds, but very high dispersion at higher wind speeds. **Blue = evaporated; green = dispersed; grey = remaining.**

ADIOS (Automated Data Inquiry for Oil Spills) web link: <https://response.restoration.noaa.gov/adios>

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://response.restoration.noaa.gov/cafe>

