

# Alaska Oil Spill Risk Analysis



## Analyzing Risk to Improve Oil Spill Planning and Response

Alaska's waters are rich in biological resources that are sensitive to spilled oil. These waters are also host to oil exploration and production activities, heavy vessel traffic, and are bordered by land-based facilities that transfer, store, and handle oil. This combination of sensitive resources and potential oil spill sources increases the risk of a damaging spill.

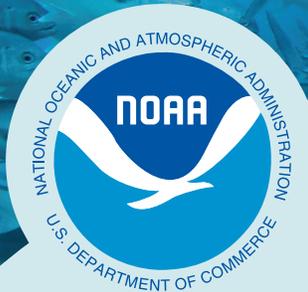
The Restoration Center conducted a screening-level analysis of the relative risk of oil spills to the marine waters of the state of Alaska. To do this, we worked with experts in oil spill impacts and risks, including Louis Berger, RPS ASA, Environmental Research Consulting, and Research Planning Inc. We also consulted with the United States Coast Guard (USCG), NOAA Fisheries Alaska Region, and NOAA Ocean Service Assessment and Restoration Division and Emergency Response Division.

In any risk analysis,

$$\text{Risk} = \text{Probability} \times \text{Consequence}$$

In the Alaska Oil Spill Risk Analysis, the "probability" of an oil spill is determined using over 10,985 data points representing vessel and facility spills that occurred from 1995-2012. The "consequence" to the environment is a function of both environmental vulnerability (potentially impacted habitat and species) and potential spill volumes. These factors are assessed on a regional and seasonal basis, and different oil types are considered. The analysis also includes an assessment of future risk for the year 2025.

The Restoration Center undertook this task to ensure that our Natural Resource Damage Assessment (NRDA) and restoration planning efforts are strategic and effective. The report and query tool can be used by oil spill planners from USCG and Alaska Department of Environmental Conservation, NRDA planners, and restoration planners.



## NOAA FISHERIES

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## Modeling the Probability and Impact of a Large Oil Spill

The Alaska Oil Spill Risk Analysis involved the development of a detailed model to enhance our understanding of when and where a highly damaging oil spill might occur.

The model looks at 14 broad geographic zones which are based on the Alaska Department of Environmental Conservation and the Alaska Regional Response Team Contingency Planning Regions. Six, 2-month seasonal periods are included in the model. To capture the varying effects of different oil types on the environment, the model considers: crude oils, heavy oils, light oils, and distillates.

The environmental vulnerability portion of the risk model is based on the vulnerability of both habitat and species. The three habitat types considered are shoreline, bottom marine, and sea ice. The relative abundance, impact, and recovery of 36 species are also considered, including marine mammals, birds, fish, and invertebrates.

The output of the model is dependent on the questions asked. For example, the areas of high risk will change by oil type, season, spill scenario, and current or projected time frames. Therefore it is difficult to give a straight forward answer to the question “Where is oil spill risk highest?” We have developed a query tool so that individuals can ask specific questions and explore their own scenarios.

Across 4 different model scenarios that the Restoration Center ran, the Southeast Alaska region occurs 4 times in the top 3 highest relative risk ranking, followed by the Aleutians region with 3 occurrences, the Beaufort Sea and Kodiak/Shelikof Strait regions with 2 occurrences each, and the Cook Inlet region with 1 occurrence. These regions are recommended for further study to investigate various aspects of the factors constituting risk – particularly spill volume and location, location of species and habitats within a region, and fate and transport of spilled oil.

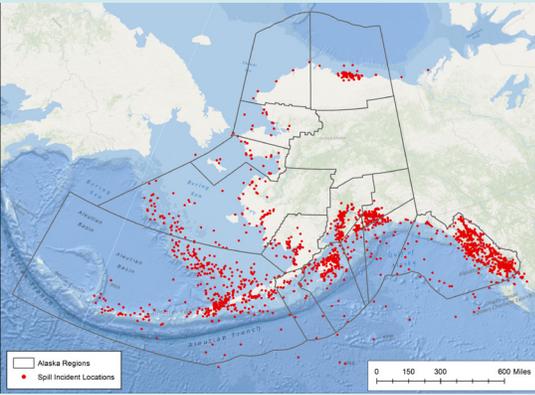


Figure 1: Geographic distribution of incidents from 1995-2012.

## Learning from the Past to Plan for the Future

To determine incident rates for each region, season, and oil type, historic vessel and facility incidents were analyzed for the years 1995-2012. During this timeframe spill volumes were very small, and many incidents did not involve any spillage.

- 85% of the spills involved less than 1 barrel
- Over 99% of the spills involved less than 50 barrels
- Only .1% involved more than 500 barrels

In order to assess the relative risk and prioritize areas for future study, the Restoration Center’s risk analysis uses the Maximum Most Probable Discharge (MMPD) and Worst Case Discharge (WCD) volumes that could potentially result from a future incident.

The worst case discharge is a low probability but high consequence planning scenario.

Although spills with MMPD and WCD volumes have a very low likelihood of occurring, they must be considered for contingency planning and risk mitigation efforts.

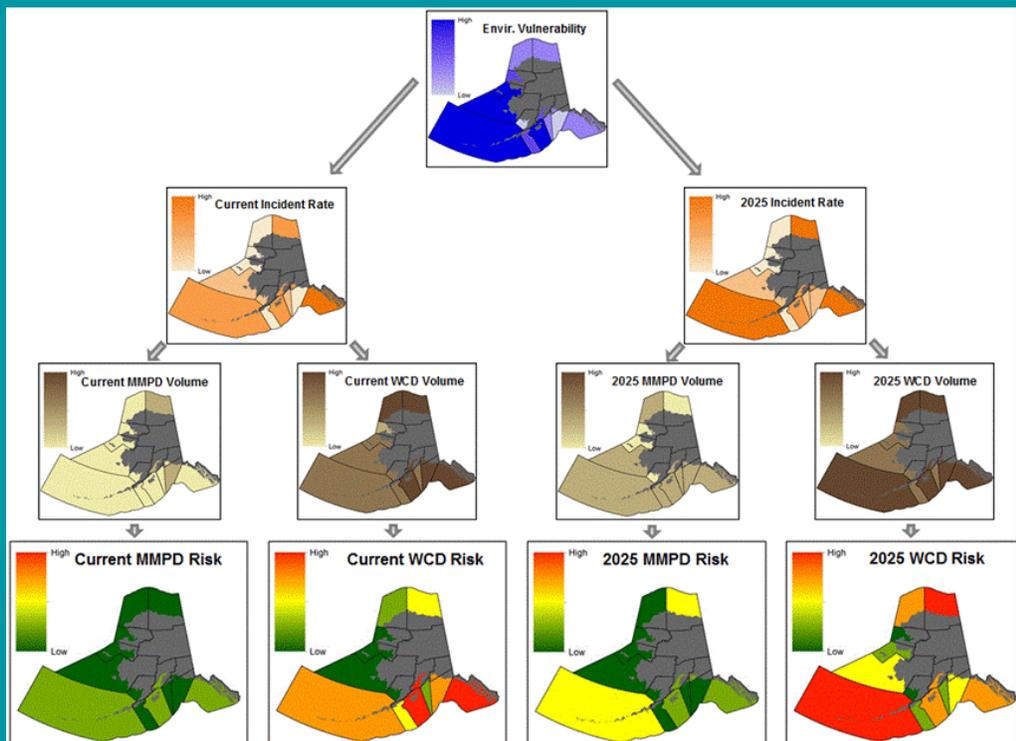


Figure 2: Sample model output. This flow diagram shows yearly mean relative risk model results (for all oil types). Maps of the same type are shown on the same color scale and are directly comparable.