

negative impacts on marine mammals because as additional offshore oil exploration and production occurs, the potential for large spills increases. Northstar transports crude oil from a gravel island in the Beaufort Sea to shore via a 5.96-mile buried sub-sea pipeline. The pipeline is buried in a trench in the sea floor deep enough to reduce the risk of damage from ice gouging and strudel scour. Production of Northstar began in 2001, and currently 70,000 barrels of oil pass through the pipeline daily.

Due to the concern of a potential offshore oil spill, a risk assessment was performed to investigate the probability of mortality in polar bears due to an oil spill and the likelihood of occurrence in various ice conditions. Pacific walrus were not included in the risk assessment due to a lack of data regarding walrus abundance and distribution in the Beaufort Sea because of small numbers present seasonally in the Beaufort Sea.

The quantitative rationale for a negligible impact determination was based on a risk assessment that considered oil spill probability estimates for the Northstar Project, an oil spill trajectory model, and a polar bear distribution model. The Northstar FEIS provided estimates of the probability that one or more spills greater than 1,000 barrels of oil will occur over the project's life of 15 years. We considered only spill probabilities for the drilling platform and sub-sea pipeline, as these are the spill locations that would affect polar bears.

Methodology

Initially, Applied Sciences Associates, Inc., was contracted by BP Exploration Alaska Inc. to run the OILMAP oil spill trajectory model. The size of the modeled spills was set at 3,600 barrels, simulating rupture and drainage of the entire sub-sea pipeline. Each spill was modeled by tracking the location of 100 "spillets," each representing 36 barrels. In the model, spillets were driven by wind, and their movements were stopped by the presence of sea ice. Open water and broken ice scenarios were each modeled with 250 simulations. A solid ice scenario was also modeled, in which oil was trapped beneath the ice and did not spread. In this event, we found it unlikely that polar bears will contact oil, and therefore removed this scenario from further analysis. Each simulation was run to cover a period of 4 days, with no cleanup or containment efforts simulated. At the end of each simulation, the size and location of each spill was represented in a geographic information system (GIS).

The trajectory model was dependent on numerous assumptions, some of which underestimate, while others overestimate, the potential risk to polar bears. These assumptions relate to, and include: variation in spill probabilities during the year; the length of time that oil was in the environment and was subject to the spill trajectory model; whether or not containment occurred in various runs of the trajectory model; types of efforts and effects of efforts to deter wildlife during spills; contact by bears with a modeled spillet resulting in mortality; and the presence and size of bear groups. We assumed that the annual probability of a spill was equal during any season of the year. Any differences in seasonal spill probabilities would have a corresponding increase or decrease in risk. The model assumed oil would remain in the environment for 4 days; increasing that period of time would increase the risk to polar bears, while decreasing the period would decrease the risk. We assumed that containment of oil in broken-ice conditions would not be effective; however, any successful containment of oil under other water conditions would correspondingly reduce the risk of oiling to wildlife. We assumed that deterrent hazing of wildlife did not take place. If instituted, hazing could reduce the likelihood of polar bears encountering oil. We assumed that polar bear distribution was not affected by sights, smells, or sounds associated with a spill and that polar bears were neither attracted to nor displaced by these factors.

Similarly, the risk assessment model accounted for average movements and likelihood of polar bears being present in any given location based on a history of movements from satellite-collared females. The model did not consider aggregations of polar bears that may be present seasonally in the study area, nor did it consider whether other sex and age classes of polar bears have movements similar to adult females. If aggregations were to occur, then the risk to polar bears could increase. If the distribution of other sex/age classes differs from adult females, then risk may correspondingly increase or decrease for these sex/age classes.

Lastly, we assumed that polar bears located within the distribution grid that intersected with oil spillets modeled in the trajectory model were oiled and that mortality occurred, although this may not occur naturally. In evaluating the impacts of all these assumptions, we determined that the assumptions that overestimate and underestimate mortalities were generally in balance.

Impacts to polar bears from the oil spill trajectory model were derived using telemetry data from the U.S. Geological Survey, Biological Resources Division (USGS). Telemetry data suggest that polar bears are widely distributed in low numbers across the Beaufort Sea with a density of about one bear per 30–50 square miles. Movement and distribution information was derived from radio and satellite relocations of collared adult females. The USGS developed a polar bear distribution model based on an extensive telemetry data set of over 10,000 relocations. Using a technique called "kernel smoothing," they created a grid system centered over Northstar and estimated the number of bears expected to occur within each 0.25-km² grid cell. Each of the simulated oil spills was overlaid with the polar bear distribution grid. In the simulation, if a spillet passed through a grid cell, the bears in that cell were considered killed by the spill. In the open water scenario, the estimated number of bears killed ranged from less than 1 to 78 bears, with a median of 8 bears. In the broken ice scenario, results ranged from less than 1 to 108, with a median of 21. These results are based on an "average" distribution of polar bears and do not include potential aggregation of bears, such as on Cross Island in the fall.

The Service then analyzed the spill trajectory and polar bear distribution to estimate the probability of an oil spill during the proposed 16-month regulation period and the likelihood of occurrence of oil spills causing mortality for various numbers of bears. Assuming this probability was uniform throughout the year, the probability during any particular set of ice conditions was proportional to the length of those conditions. The probability of polar bear mortality in the event of an oil spill was calculated from mortality levels in excess of 5, 10, and 20 bears. Likelihood of occurrence is the product of the probabilities of spill and mortality. Hence, the overall likelihood is the sum of likelihoods over all ice conditions.

Results

The results of the analysis suggested that there is a 0.72% probability of an oil spill occurring during the period of the proposed rule. Furthermore, there was a 0.13–0.21 percent chance of a spill occurring that results in greater than five polar bears killed. As the threshold number of bears is increased, the likelihood of that event decreases; the likelihood of taking more bears becomes less. Thus, the probability of a spill that will cause a mortality of 10 or