

PUBLIC PERCEPTIONS ON THE USE OF OIL SPILL RESPONSE METHODS IN ALASKAN WATERS AND THE LEVEL OF TRUST IN ORGANIZATIONS TO PREVENT OIL SPILLS

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ABSTRACT: All of the cleanup methods available for responding to a marine oil spill in Alaska have operational limitations. In Prince William Sound and Cook Inlet, non-mechanical response methods such as the use of chemical dispersants or in situ burning can be requested as secondary cleanup options. This study identifies citizens' concern and determines the preference of response methods and perceived effectiveness of each method. Environmental risks, values, and the level of trust residents in communities of Prince William Sound and Cook Inlet are also examined.

A correlational research design was used to answer research questions with survey data collected by randomly sampling 1657 residents in fifteen communities of Prince William Sound and Cook Inlet. Of the 1657 surveys mailed a response rate of 41% was obtained. Descriptive and inferential statistical analyses were used to analyze the survey information. General descriptive statistical analysis was used to examine responses to each statement in the survey. Inferential statistical analysis was used to quantify the direction and strength of a relationship between variables.

In general, 92% of the respondents support the use of mechanical recovery methods, 61% support the use of in situ burning and 45% chemical dispersants. The population recognizes burning as a means of removing large quantities of oil from the sea surface and the environmental risk of displacing pollutants into the atmosphere. Environmental concerns associated with the use of chemical dispersants are tied to seasonal abundance of and impact to marine organisms, amount of area and subsistence use and dependency on marine resources.

The survey population's ecological priorities are commercial fishing, sea mammals and sea birds. The U.S. Coast Guard and Commercial Fishing Associations are held to the highest level of trust while the Alaska State Legislature and U.S. Congress received the lowest level of trust for ensuring Alaska waters remain oil free.

Introduction

Major oil spills in Alaska have captured news headlines around the world. These incidents have created a global awareness of oil spills and the potential damage they can cause to the environment. The efficiency of cleanup equipment and

techniques vary as weather conditions change and the character of spilled oil alters. Spills can be physically contained using containment boom and oil recovery by skimming devices. Chemical dispersants can be requested for use on an oil spill in Prince William Sound and Cook Inlet. In addition, burning oil on the sea surface is a response option available statewide.

Policy makers tend to agree that citizen participation is key to developing acceptable, sustainable environmental policy decisions. Research studies over the past two decades have focused on the use of non-mechanical response techniques. Traditional research and communication efforts have been unable to successfully resolve public concerns on the ecological effects and effectiveness of these nontraditional methods (Pond et al. 1997). The primary reasons that many of the attempts have been unsuccessful are that they either failed to focus on the true issues of concern or they failed to effectively communicate information to the participants in the decision process (Aurand 1995).

Discussion

Response Methods. Coastal residents who have experienced the devastation from oil spills provide valuable insight on spill response decisions and capabilities. An overwhelming majority of the residents in Prince William Sound and Cook Inlet support the use of mechanical recovery as the primary response method which is consistent with federal and state laws. In general, most residents prefer containment and physical removal of spilled oil from the environment. Only under poor weather conditions and the likelihood of oil impacting marine biota or the shoreline will residents consider the use of non-mechanical response methods. If a non-mechanical response method is to be used during a spill response, the preferred option is in situ burning rather than chemical dispersants. Respondents did not rule out the use of chemical dispersants but less than half supported this option. Individuals that support the application of chemical dispersants on an oil spill also support the use of in situ burning.

Respondents appear to recognize the environmental trade-off for each non-mechanical response method while the displacement of contaminants into the atmosphere appears to be more acceptable than displacement with chemicals into the water column. This acceptability may be because they can visually

evaluate the risk from a smoke plume where they can't evaluate the risk of dispersing oil into the water column.

The opportunity for using chemical dispersants and in situ burning on an oil spill is short. The argument in favor of both countermeasures include the fact that wildlife and intertidal species will be adversely affected by untreated spills and there is a need to remove the oil from the sea surface in order to protect these groups. Dispersants offer advantages at higher sea states and, in some cases, higher wind speeds, when booms and skimmers or in situ burning do not operate effectively or safely.

Ecological Priorities. Oil spills form slicks that pose risks to organisms at the sea surface and intertidal areas. Also at risk are vegetated shorelines such as coastal marshes that provide the shallow sub-tidal habitat for species such as herring spawn. Mechanical recovery of spilled oil, in addition to the use of chemical dispersants and/or in situ burning, can reduce the risk to these resources by removing the spilled oil from the sea surface. The appropriateness of the use of non-mechanical response methods depends on whether the environmental gain achieved by their use outweighs the environmental losses.

Attempting to rank and prioritize the ecological resources was a difficult task for the survey population. For the residents of Nanwalek, all of the resources were considered to have the same value and need equal protection when an oil spill occurs. Commercial fishing was the top ecological priority for protection during an oil spill, followed by marine mammals and sea birds. The selection of commercial fishing as the first ecological priority confirms the economic importance placed on common resources in the regions. Those with occupations dependent on the harvest of marine resources weighed in heavily towards making this the primary priority. The impact of fisheries closures, during and after the T/V Exxon Valdez oil spill, resulted in the loss of lifestyle, livelihood and quality of life for many residents. Although marine mammals were selected as the second ecological priority, the Prince William Sound community of Chenega chose the protection of shoreline and intertidal areas as their second priority. This priority difference may be due to the impact on subsistence areas located in intertidal areas resulting from the T/V Exxon Valdez oil spill. Many of the primary subsistence use areas for residents of Chenega were heavily contaminated with oil. Efforts were made to cleanup these subsistence areas but oil residue remains buried in the some of the shoreline substrate.

Ecological concerns for the survey populations are consistent with the ecological priorities. Commercial fishing is the primary ecological concern, followed by the protection of marine life and aesthetics. The communities of Chenega, Nanwalek and Port Graham chose aesthetic value as their second concern. The concern to protect and prevent spoiling of subsistence use, cultural and recreational areas reflects the Native American populations' intrinsic and inherent values for this portion of the ecosystem.

Fate and Transport of Spilled Oil and the Effectiveness of Response Methods. Alaska crude oil, when spilled on unconfined marine water, rapidly spreads into a slick. A majority of the survey population understands the general fate and transport principles for spilled oil. The community of Nanwalek's perception about fate and transport differed from all others. Residents of Nanwalek that visit the area more than 10 times in a year are less certain that spilled oil floats and spreads

The emulsification of oil has the most significant affect on response options and the window of opportunity for using chemical dispersants or in situ burning is narrow. Individuals that visit Prince William Sound and the Cook Inlet area 6 to 10 times

during a year believe that crude oils are more difficult to disperse or burn 48 hours after a spill than those that never visit the area. Individuals that visit the area frequently are more skeptical of the effectiveness of chemical dispersants and in situ burning on weathered oil. As area and subsistence use increases the acceptability of using each method decreases. This skepticism may be based on the individuals personal experience with poor weather and sea conditions when visiting the Prince William Sound and Cook Inlet area. Individuals that never visit the area don't have these experiences to draw from and are more optimistic.

Individuals with occupations dependent on marine resources are uncertain whether burning can rapidly remove oil from the sea surface, especially individuals from the communities of Homer and Nanwalek. Residents of the communities of Valdez and Tatitlek are more certain than other communities that chemical dispersants are effective on Alaskan crude oil. The level of certainty may be due to the amount of oil spill response training and individual experience. Individuals that gather between 26-50% and 76-100% of their food by subsistence methods believe that dispersants pose a greater threat to the marine environment than spilled oil. Those that gather 76-100% of their food by subsistence methods find the use of chemical dispersants unacceptable. In general, subsistence users' view the chemicals formulated by the oil and chemical industry more harmful or toxic than oil alone.

Chemical Dispersant Impacts. Uncertainties associated with exposure tolerances of marine species to potentially acute, sublethal and chronic toxicity levels from the dispersant and dispersed oil is a significant issue with the use of chemical dispersants. Most Alaskan species only produce young once a year. This usually takes place during the spring bloom, the period of increasing sunlight in mid-spring. The exact timing and duration of the spring bloom varies from year to year. A large portion of the survey population believes marine organisms will be harmed by short-term exposure to dispersed oil and that time of year should be considered in the decision to allow for the use of dispersants.

The non-Native American population is more certain than the Native American population that the time of year should be considered in the decision to allow for the use of dispersants. This sector of the population, specifically residents of Anchorage, Kenai and Seward are more likely to accept the use of dispersants during those times of the year when marine organisms are less abundant. A high degree of uncertainty exists with the Native American and commercial fishing population, specifically residents of Tatitlek, Nanwalek and Cordova are less inclined to allow for the use of dispersant.

In general, Alaska Native communities and individuals that rely heavily on harvests of subsistence and commercial resources are less supportive or oppose the use of chemical dispersants as a response option. Household interviews conducted after the T/V Exxon Valdez oil spill showed that subsistence harvests in most of the communities in Prince William Sound and Cook Inlet declined substantially. This decline was due to reduced availability of fish and wildlife, concern about possible health effects and disruption of the traditional lifestyle (<http://www.oilspill.state.ak.us/people/subsist.htm>). These same ecological and lifestyle concerns appear to be perceived when considering the use of chemical dispersants on an oil spill.

In Situ Burn Impacts. Many of the concerns associated with the use of in situ burning stem from the generation of a large smoke plume. The airborne components of burn by-products have been the subject of intense study in both small-scale and large-

scale experimental burns. Regional differences exist for whether toxic materials are found in the smoke plume created by burning oil on the sea. Residents in Prince William Sound, specifically the communities of Whittier and Tatitlek are more certain the smoke plume contains toxic material than residents in Cook Inlet. Individuals with occupations dependent on marine resources are also certain that the smoke plume created by burning oil contains toxic material.

The communities of Nanwalek, Port Graham, and Tatitlek believe in situ burning poses a greater threat than the spilled oil. Specifically, Native American respondents and individuals with an elementary school education are more apt to believe that burning poses a greater threat to the marine environment than the spilled oil. This concern also includes individuals that obtain 76-100% of their household food by subsistence methods. This uncertainty towards in situ burning reflects the unknown risk to marine resources and lifestyle impact. Essentially, the concerns about the use of chemical dispersants are similar to those for in situ burning.

Preferred Response Method Prior to Shoreline Impact. The hundreds of miles of oiled shoreline that occurred during the T/V Exxon Valdez spill convinced Alaskans that this was something they never wanted to see happen again. During the development of the in situ burn guidelines, members of the Alaska Regional Response Team (ARRT) recognized that any mortality to floating larvae and plankton species would be an acceptable trade-off if the oil could be kept off the shoreline. In a choice between using chemical dispersants or in situ burning when shoreline damage is likely, the preferred alternative is in situ burning. Cook Inlet residents are more likely to support the use of in situ burning to prevent shoreline damage than those in Prince William Sound. The high resource users in Prince William Sound whether their use is subsistence or commercial and the Native American population are less likely to support in situ burning or a dispersant application if shoreline damage is likely. Although there are a lot of unanswered ecosystem impact questions associated with the use of chemical dispersants, studies exist documenting the long-term persistent impact to habitat from spilled oil, specifically pink salmon spawning beds in Prince William Sound. Examining the potential risk to an entire habitat structure from persistent contamination particularly in a nearshore environment raises the question of whether one would be doing more harm than good by allowing oil to impact the shoreline. Oil allowed to sequester in the sediments of streams, mussel beds, and estuaries of Prince William Sound have provided a persistent source of contamination in natal and nursery fish habitat over several years (Moles, 2001).

Individuals distant from the biologically rich ecosystem of Prince William Sound and Cook Inlet are supportive of the use of non-mechanical response methods if shoreline impact from spilled oil is anticipated. The risk perceived by using dispersants or in situ burning appears to be worth taking rather than allowing long-term contamination of shorelines. Spill response decisions should be geared toward preventing oil from reaching streams, fine sediment beaches and estuaries that serve as critical habitats.

Level of Trust. The public holds the U.S. Coast Guard with the highest level of trust when compared to all other organizations in the study. This high level of trust is also supported by surveys conducted on a national level. A logical reason for this high level of trust may be due to the diverse mission of the Coast Guard in Alaska. In addition to their oil pollution and prevention mandate, the Coast Guard is responsible for enforcing high-seas fisheries laws, conducting search and rescues, and medical evacuations, and providing safety training to

the fishing industry. Specific to the region studied, a lower level of trust toward the Coast Guard was measured among Native Americans, primarily residents of the Prince William Sound community of Chenega. In general, individuals that obtain 76-100% of their household food by subsistence and traditional methods, and those that visit the Prince William Sound and Cook Inlet area more than 10-times a year have a lower level of trust toward the regulatory agencies (EPA, USCG and ADEC). In contrast, individuals that only visit the regions 1-2 times a year have a higher level of trust toward the regulatory agencies and environmental groups. The race/ethnicity for this population is typically non-Native American and they reside in the larger communities away from the 'heart' of Prince William Sound.

The regulatory agencies need to reach out and improve the level of trust with the predominately Native American communities. Residents should be included in the government's oil spill prevention and response planning and preparedness process. The process needs to extend beyond the standard public review process by including local citizens in the process prior to, and during the development of prevention and response strategies or plans. Vital to insuring a successful and healthy relationship is listening, recognizing and including the local knowledge, concerns and values of those linked to the resources of the sea and land when developing oil spill prevention and response strategies.

Since the T/V Exxon Valdez oil spill, the oil industry has dedicated a considerable amount of time and money to improve their perceived level of trust with Alaska residents. A moderately low degree of trust exists between the oil industry and residents of Prince William Sound and Cook Inlet. Specifically, residents in the communities of Cordova and Homer don't trust the oil industry. These two communities do have a high level of trust in environmental groups. A large number of respondents from Cordova and Homer have occupations that are dependent on marine resources, especially commercial fishing. In addition, a significant percentage of these residents have unresolved third party claims against Exxon Corporation. One possible way for the oil industry to increase their level of trust with residents in Prince William Sound and Cook Inlet is to resolve or pay all of the Exxon Valdez oil spill third party claimants. The healing and trust development process will, however, take more than money from resolved claims. Alaskans recognize the inherent ecological and economic risk of transporting oil to market. A dedicated commitment by the oil industry towards preventing another catastrophic oil spill in Alaska is essential. Industry, for example, may want to consider redirecting monies being spent on public relations campaigns toward meeting or exceeding the federally required deadline for the construction of double-hulled tankers transiting through Alaska waters.

A higher level of trust toward the oil industry was noted from the communities of Anchorage, Kenai and Tatitlek. This result makes sense because Anchorage is the location of industry headquarters where employment and economic links contribute to trust. This same relationship exists with the community of Kenai for the Cook Inlet region and oil industry. The relationship between the high level of trust toward the oil industry and Tatitlek is interesting. Residents of Tatitlek did not differentiate between the industry groups (oil shipping companies, Alyeska Pipeline Service Company and Alyeska/SERV's) where other communities did. Tatitlek is a predominately Native American community located on the coastal mainland of Alaska but lies in close proximity to Bligh Reef where the T/V Exxon Valdez went aground. The community's economic, social, and subsistence lifestyle was severely impacted as a result of the spill. Tatitlek is

also the closest community to Valdez, an oil industry town. Forty-three percent of the Tatitlek's respondents engage in commercial fishing as an occupation. The communities of Chenega and Tatitlek have a high degree of trust in Alyeska/SERV's, which is the primary oil spill response organization in Prince William Sound. Alyeska/SERV's is required under the Oil Pollution Act of 1990 to provide routine oil spill response training to these communities and the fishing vessel fleets, that provides an opportunity to develop a positive relationship.

The Prince William Sound communities of Chenega, Tatitlek and Cordova highly trust the PWSRCAC. A reason for this trust is because each community has a representative on the Council. The membership allows residents to have a voice in the process of promoting environmentally safe operations for the crude oil industry in Prince William Sound. The communities of Cordova, Tatitlek and Port Graham perceived a high level of trust in the commercial fishing associations. Residents in these communities have a high percentage of occupations dependent on marine resources such as commercial fishing and land-based canneries. The organization, Cordova Fisherman's United also has a representative on the PWSRCAC, which allows for fishing interests to be represented in the oil spill prevention and response process helping to build a stronger relationship with industry that might otherwise not be present.

Residents of the Cook Inlet community of Nanwalek have a low level of trust in all of the organizations. Nanwalek is a predominately Native American community where residents have occupations that depend on marine resources. They also have a high subsistence and area usage rate which helps to explain the low level of trust in industry and regulatory groups. Additional research or conversations with residents in this community would be necessary to understand their lack of trust in the oil spill response organizations, citizen advisory councils and environmental groups.

Conclusions

Private, governmental and non-profit entities have contributed millions of dollars in the past decade to advance the science associated with complex risk parameters regarding the decisions to use or minimizing impacts from the use of oil spill response methods in Alaska. Yet, the major findings from this research

suggest patterns that cluster into identifiable themes. These themes are associated with the amount of area use, percentage of household food obtained by subsistence methods, occupational dependency on marine resources and race/ethnicity. In general, the non-Alaska Native population has a higher level of trust in the use of non-mechanical response technologies while people who depend on subsistence and commercial resources are more skeptical about the effectiveness of chemical dispersants and in situ burning. This latter group perceives a higher economic, environmental, public health and lifestyle risk associated with the use of these countermeasures. In order to expand the public's knowledge and understanding of oil spill cleanup methods a dedicated risk communication effort by academia, private and governmental entities will be required and must include public involvement. The dialogue must be open and honest. Alaskans have lived through a worst case oil spill due to the *T/V Exxon Valdez* grounding and there's overwhelming evidence that the use of alternative response methods such as chemical dispersants and in situ burning could minimize the environmental impact on subsistence and commercial resources. The net environmental benefit must be weighed and all response methods considered when the next significant oil spill occurs in Alaskan waters. Industry and agencies need to recognize that communities need to participate in the decision process. If communities or the public are involved they are able to trust, and verify progress towards its stated environmental goals.

References

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