Written Testimony of Dr. Jeffrey Short
Committee on Natural Resources, Joint Subcommittee on Energy and Mineral Resources and Subcommittee on Insular Affairs, Oceans and Wildlife
"Energy Development on the Outer Continental Shelf and the Future of our Oceans"
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Good morning. I am the Pacific Science Director for Oceana, an international marine conservation organization dedicated to using science, law, and policy to protect the world's oceans. Oceana's headquarters are in Washington, DC, we have offices in five states as well as Brussels, Spain, and Chile. Currently, we have offices in Juneau and Kotzebue, Alaska, and bring more than 250 years of experience working and living in the state. Oceana has 300,000 members and supporters from all 50 states and from countries around the globe.

Today marks the 20th anniversary of the *Exxon Valdez* oil spill, the largest spill in our nation's history and one of the most environmentally damaging spills in the world. Within a week of the incident, that spill and its effects were the focus of my research. Prior to joining Oceana, I spent more than 30 years as an environmental chemist studying oil pollution fate and effects as an employee of the National Oceanic and Atmospheric Administration (NOAA). In that role, I led numerous studies on the *Exxon Valdez* oil spill beginning a week after the incident through my retirement from NOAA last November (2008). I have a Master of Science degree in chemistry, and I wrote the doctoral dissertation for my PhD in fisheries on data generated by the spill. With more than 50 professional papers on the *Exxon Valdez* oil spill and related topics, I have advised governments in Canada, China, Korea, Norway and Russia on oil pollution issues, making me an internationally recognized authority on oil pollution.

I have dedicated most of my professional life to understanding the *Exxon Valdez* oil spill, and now to helping ensure that we do not repeat the mistakes of the past. We are coming dangerously close to heading down that path. More than 70 million acres offshore in Alaska either have been made available for oil and gas leasing, exploration, and development or are slated to be offered in the next few years. These areas are crucial for the lives of local residents, are among the most pristine ecosystems in the world, and are increasingly threatened by climate change and ocean acidification. They are also remote places in which no technology currently exists to respond to or clean up an oil spill effectively. Concurrently, there has been a push to allow oil drilling in offshore areas of the contiguous United States that have been closed to these activities for more than 25 years. Just last year, Congress and the president let lapse moratoria that protected these areas.

My testimony will focus on the Alaskan Arctic and, in particular, the Beaufort and Chukchi seas. I will summarize some of the scientific lessons we have learned from the *Exxon Valdez* spill, and their implications for future development of offshore oil and gas resources around Alaska. Together, these facts make a compelling case for a comprehensive, science-based, precautionary approach to oil and gas activities in the Arctic and for reinstating and extending the moratoria on offshore development in the United States.

I. Introduction

The stage was set for the *Exxon Valdez* oil spill nearly two decades before it happened with the decision in 1973 to authorize the trans-Alaska pipeline to the Valdez marine terminal. That decision was strongly opposed by the fishermen of Prince William Sound, who were skeptical of the assurances from the oil industry regarding all the modern safeguards that would be put into place. These fishermen feared, correctly it turned out, that a large spill could ruin their livelihoods. At the time, commercial fishing was the leading industry in the State of Alaska, employing more people and generating more revenue than any other private sector employer. Fisheries in Prince William Sound were especially well developed, harvesting enormous runs of pink, sockeye and other salmon, supplemented by halibut, herring and rockfish.

Prince William Sound is one of the great sheltered coastal embayments of North America, comparable in size to the Chesapeake Bay, Albemarle Sound, San Francisco Bay or Puget Sound, and comparable as well in its magnificent natural bounty. There is one big difference: Prince William Sound is not seriously impacted by sustained coastal population growth and industrialization. As such, it supports very high populations of local and migratory birds and marine mammals, from puffins to peregrine falcons, and sea otters to killer whales. It is a major stop on the Pacific flyway, where birds land after long flights across the Gulf of Alaska to re-provision themselves and either reproduce in the immediate area or move on to the vast breeding grounds of the western and northern Alaskan coastal plains. Their timing coincides with the spring phytoplankton bloom in the ocean, when increasingly long days and calmer waters turn the sea green with algal plant growth. Nearly half the annual nutritional requirements of the entire food web in this area are produced over the course of just a few ensuing weeks. The bloom starts in the protected waters of Prince William Sound and radiates out to the Gulf of Alaska, so the Sound acts as a magnet attracting fish, birds, and marine mammals hungry after the long winter. This magnet lured many of these animals to their deaths soon after the T/V *Exxon Valdez* hit Bligh Reef on March 24, 1989, just before the beginning of the spring bloom.

II. Lessons from the *Exxon Valdez* Oil Spill

The *Exxon Valdez* oil spill was caused by human error and occurred despite the assurances that the best available technology would make such events extremely unlikely and that new response methods would limit environmental damage should a spill occur. After hitting Bligh Reef just after midnight, the *Exxon Valdez* began discharging oil, creating an oil slick that expanded at a rate of nearly half a football field per second, and it continued expanding at this rate for two and a half days. By the time it was daylight a few hours later, containment was probably not feasible even in optimal circumstances and no matter how well prepared the responders were. Once a winter storm developed three days later, any remaining hope of containment was lost.

Nearly 11 million gallons of oil spilled from the *Exxon Valdez*. Despite heroic efforts involving more than 11,000 people, 2 billion dollars, and aggressive application of the most advanced technology available, only about 8% of the oil was ever recovered. This recovery rate is fairly typical rate for a large oil spill. About 20% evaporated, 50% contaminated beaches, and the rest floated out to the North Pacific Ocean, where it formed tarballs that eventually stranded elsewhere or sank to the seafloor.

The spilled oil had devastating effects on the area. Thousands of marine mammals, hundreds of thousands of seabirds, and millions of fish were killed by encounters with spilled oil. Beaches were oiled along 1,200 miles of the coast, killing untold numbers of intertidal plants and animals, with additional losses caused by aggressive chemical and physical attempts to clean the shorelines. Together, the oil, chemicals, and other clean up methods caused habitat alteration that will persist for a century or more. Oil penetrated into some beaches, creating toxic reservoirs that are still there today and are likely to remain for decades more. These toxic oil reservoirs guaranteed unforeseen impacts that continued for well over a decade after the incident.

Long-term monitoring led to numerous insights regarding the ways that oil pollution impacts ecosystems. Field observations led to our discovery that the toxic components of oil are deleterious to embryonic development of salmon at concentrations in the parts per billion, over 100-fold lower than had previously been considered dangerous. This finding suggests that oil pollution from non-point sources everywhere could pose a much greater threat to fish habitat than previously recognized. Furthermore, the initial mass mortalities of wildlife that died from contact with oil had destabilizing effects on ecosystem function. For example, prey populations exploded following removal of their predators and rockweed removal in the intertidal areas deprived animals of the protective cover needed to avoid dehydration or predation. It took more than a decade for some areas to recover from these destabilizing effects, and recovery is still in progress in some of the hardest hit places. Another long-term impact came from pockets of oil beneath some beaches that were surprisingly resistant to natural degradation. These pockets retained most of their toxic components for more than a decade, occasionally re-contaminating sea otters and sea ducks that forage in the intertidal areas in search of clams, worms and other prey found there. This chronic re-exposure is likely a substantial if not primary reason why populations of sea otters and birds in the areas hardest hit by oil are only now recovering.

The persistence of oil had serious impacts on the most important predator of all—humans. Despite millions of dollars spent on analyses which demonstrated the absence of oil contaminants in subsistence food items, Alaska Natives in the region would occasionally dig up oil unexpectedly instead of clams. For this good reason, many Native Alaskans had legitimate questions about the accuracy of the chemical analyses, which led many to foreswear subsistence foraging, with devastating consequences for their culture. During the process of collecting, preparing, sharing, and consuming food collected from nature, much of the culture of these peoples is transmitted from one generation to the next, binding the generations together. Hence, severing the link with subsistence, in a very real sense, severs the link between generations, often with tragic results. Because it arises from the perception that their environment has been irreversibly fouled and violated, augmented by suspicion regarding any attempts by outsiders to demonstrate otherwise, this consequence cannot be remedied monetarily. Once lost, it is nearly impossible to re-establish the reverence the younger generation held for their elders, whose knowledge, skills, and abilities are no longer seen as relevant. With their trust in the wholesomeness of the subsistence way of life compromised, many turn to western culture for their future.

The *Exxon Valdez* oil spill took a considerable toll on western commercial enterprises in the region as well. Direct economic losses were likely in excess of $300 million, mostly because of fishery closures to avoid gear contamination by floating oil during the year immediately following the spill, followed by impacts on recreational fishing and tourism. These losses directly affected some 32,000 people whose livelihoods depended at least in part on ecosystem services provided by the region prior to the spill. In addition, the interruption in supply led to permanent loss of market share for pink salmon, the most lucrative fishery in the region. Combined with subsequent population crashes of pink salmon and herring from disease outbreaks and other factors that may have been caused at least in part by the spill, most of these once thriving businesses have never recovered. Using contingent valuation to evaluate costs to Americans who care about wild, productive, and unspoiled places like Prince William Sound even if they do not ever visit them resulted in another $1 billion loss estimated from the spill.

The *Exxon Valdez* oil spill did lead to welcome, if belated, improvements in tanker safety in Prince William Sound. As a result of the Oil Pollution Act of 1990, and despite recalcitrance from ExxonMobil Corporation, double-hulled tankers are being phased in. The U.S. Coast Guard has implemented substantial improvements in ice detection and tanker guidance systems. Tankers are accompanied by dual tugs, one of which is towed stern-to-stern by exiting tankers to act as a forceful brake if needed, and the state of oil spill response capability now far exceeds that available prior to the *Exxon Valdez* spill. While these measures undoubtedly reduce the chances of another horrific oil spill, they do not eliminate it, at least in part because each of these systems is still vulnerable to the same sorts of human error that caused the *Exxon Valdez* spill.

The last lesson from the *Exxon Valdez* oil spill concerns hubris. Large marine oil development proposals are invariably presented as engineering challenges, often with scant regard for the complexity of the environment in which they would occur. Oil spill contingency plans are presented as exercises in damage control, under the implicit assumption that the important variables and their interactions are adequately understood, predictable, and manageable. Yet each spill is unique, the environment is extremely complex, and we do not yet understand how these systems interact with and respond to oil. A crucial reason for which the long-term impacts of the *Exxon Valdez* spill have been viewed as so surprising derives from the simple fact that enormous resources were available to evaluate them in comparison with any other spill before or since. In truth, our knowledge of how oil behaves in the environment and how it affects organisms is still in its infancy, especially in the more remote regions of our planet. Hence, any claim that we adequately understand and can foresee how oil pollution will affect even more challenging environments such as the Arctic continental shelf deserves skepticism.

It is clear that oil spills will continue to happen. We need only look to recent news stories to confirm this. The continued use and production of oil has led to spills already this year, in spite of the improvements described above, and there is no reason to think spills will not continue. In addition to the direct effects of spills, offshore drilling results in considerable releases of oil and other hazardous contaminants that threaten marine life. Furthermore, our use of oil makes a substantial contribution to the impacts of climate change, which is acidifying our oceans. For this reason alone, we should be moving away from oil development, not expanding it. Accordingly, Oceana believes we need to limit offshore drilling by reinstating and extending the pre-existing moratoria on offshore drilling. Furthermore, it is imperative that we take action in the Arctic, where oil and gas activities already have begun. The *Exxon Valdez* experience suggests that the Arctic is at particularly great risk, as described below.

III. Lessons Applied to Offshore Oil Development in the Arctic

The most important lesson we can learn from the *Exxon Valdez* spill is to take every possible precaution to ensure that nothing like it ever happens again. Nonetheless, over the past several years, decisions have been made to open vast new areas of our coastline to offshore oil leasing, exploration, and development. The risks from these activities are particularly acute in the Arctic, where the oceans play a critical role in the culture of Native peoples, there is little available response, rescue, or clean-up capability, and little information about the environment or impacts from oil development is available.

The Beaufort and Chukchi Seas

The Arctic is at once one of the most beautiful and forbidding places on Earth and a critical component of the planet's ability to sustain life. In the Arctic, life swings between twenty-four hour days of sunshine in the summer and the long, cold, and dark winter. Despite those harsh conditions, the Arctic is home to vibrant communities and functioning ecosystems. The Beaufort and Chukchi seas are central to the very existence of Native communities, provide important habitat for countless species of wildlife, and play a vital role in regulating the world's climate.

Tens of thousands of people inhabit the Arctic region of the United States, which is entirely in Alaska. The majority of these residents consider themselves to be Alaska Natives and, though organized into towns and villages like elsewhere in the country, lead a much different life. For many Arctic residents, culture is dependent on subsistence harvesting, sharing of food, travel on snow and ice, traditional knowledge, and adaptation to Arctic conditions. Subsistence harvest of marine and terrestrial mammals, fish, and other resources provides more than just highly nutritious food. Just as with Alaska Natives in Prince William Sound, those activities also ensure cultural continuity and vibrancy by providing spiritual and cultural affirmation, and they are crucial for passing skills, knowledge, and values from one generation to the next.

For coastal villages, the Arctic seas are the centerpiece of life. Coastal people depend on marine plants and animals for food, clothing, and other necessities. For those villages that hunt bowhead whales, that hunt is at the heart of their existence. As stated by Edward Hopson:

> For the coastal Inupiat Eskimo, the hunting of the bowhead whale [agviq] is the heart of our culture. It is the preparation for the hunt, the hunting, and the sharing of the successful hunt that are important. They must all be considered together. The successful hunt feeds us. The successful hunt affirms our shared values and traditions. The successful hunt gives us reason to celebrate together our spirit and sense of identity.

While relatively few whales are taken each year and the hunt is carefully regulated, the importance of the bowhead to coastal Arctic communities cannot be overstated. It is their existence as adapted across generations to the weather, isolation, and rhythms in the Arctic.

In addition to the vibrant communities that have adapted to the top of the world, the Arctic also supports some of the last remaining relatively pristine terrestrial and marine ecosystems. The Arctic is home to populations of some of the world's most iconic wildlife species. Bears, caribou, wolves, foxes, and others patrol the land while the Arctic seas are home to 23 species of marine mammals, including polar bears; bowhead, beluga, and gray whales; narwhal; walruses; and bearded, ringed, and ribbon seals. A diversity of fish and invertebrates can be found in the Arctic as well, including forage species like krill, Arctic cod, and capelin, which are vital to the marine food web. The Arctic nurtures some of the largest seabird populations in the world, and more than 280 species breed there. Several Arctic areas are critical to the birds' survival and have been designated by the National Audubon Society as Important Bird Areas.

These species come to the Arctic seas because they are among the biological crown jewels of the world's oceans. They are especially productive because oxygen concentrations are twice those of tropical waters and strong currents often drive upwelling that supplies nutrients to plants at the base of the food chain, and the productivity of these plants is more sensitive to light than to heat in comparison with their terrestrial counterparts. All these favorable factors are abundant in the Bering Sea, the southern Chukchi Sea, and to a lesser extent the western Beaufort Sea. The annualized rate of plant growth for phytoplankton, the microscopic algae that support the rest of the offshore marine food web, in the southern Chukchi Sea is among the highest in the world. These factors combine to make Bering Sea fisheries the most productive in the United States, as well as making the Bering Sea a biological oasis for a considerable proportion of the world's migratory birds and marine mammals. The southern Chukchi Sea is a biological stronghold for a comparably rich food web supporting Arctic cod, seals, walrus, polar bears, and humans.

These areas also play an important role in regulating our climate. The long periods of little to no sunlight and the high reflectivity of snow and ice when sunlight is present result in a net loss of heat. These factors help drive the circulation of the Earth's atmosphere and ocean currents which transport heat from the tropics to the poles where it is released from the planet. Thus, the health of the Arctic is important to the Earth's atmospheric and oceanic circulation patterns, which affects climate, weather, and natural systems worldwide.

The Changing Arctic

The remoteness and unforgiving climate of the Arctic have provided some protection from the extraordinary human expansion of the last 200 years. Until recently the Beaufort and Chukchi seas were covered in sea ice for much of the year. Now, however, the region is changing. The dramatic reduction in Arctic sea ice over the last few years opens the Arctic Ocean to the possibility of unprecedented industrialization. The expansion of high-risk activities such as oil and gas exploration and development, large-scale commercial fishing, and shipping would add additional pressures to the already-stressed communities, animals, and ecosystems of the far north.

The Arctic is at the forefront of global climate change. It is warming at twice the rate of the rest of the planet, and that warming is causing unprecedented losses of Arctic sea ice. In 2007, the seasonal minimum sea ice extent reached a record low—23% lower than it had been since 1979 when satellite measurements began. In 2008, the minimum sea ice extent was lower than any year but 2007. In addition, ice cover was more diffuse and the ice pack was thinner, suggesting that 2008 may have established a record low ice volume. The rate at which sea ice cover is declining exceeds even the most sensational predictions from just a few years ago, and scientists now predict the Arctic could be seasonally ice-free by 2030.

This loss of sea ice dramatically alters the ways in which these ecosystems function and places them under profound stress. This stress is apparent in changes in the location of phytoplankton growth from the edge of the ice pack to the open water column, a likely increase of productivity in the more open water parts of the Beaufort and Chukchi seas, a general northward displacement of marine life to production regimes for which they are not entirely adapted, and the displacement of habitat for ice-dependent marine mammals from the most productive parts of the seafloor on which they depend to provide for their young.

These stresses are compounded by a companion threat from ocean acidification. Rising levels of carbon dioxide in the atmosphere, which are attributable to fossil fuel combustion by humans, have increased the rate at which carbon dioxide dissolves into the surface of the ocean. Once dissolved, carbon dioxide reacts with water to form carbonic acid, making the ocean waters more acidic. The resulting acidity can attack the calcium carbonate that hardens the exoskeletons of a wide array of organisms ranging from some phytoplankton species to tube worms, clams, crabs, snails, corals, and many others. The Arctic is the most vulnerable ocean in the world to this acidification process. It is so vulnerable because carbon dioxide, like oxygen, is more soluble in cold water, and because the ability of surface seawater to neutralize the resulting carbonic acid is diluted by the large freshwater discharges of the Mackenzie and Yukon rivers in North America and similarly large rivers in Eurasia.

IV. Impacts of Offshore Oil, Leasing, Exploration, and Development in the Alaskan Arctic

At the same time these sensitive ecosystems are changing, large swaths of the Beaufort and Chukchi seas and Bristol Bay are being made available for oil and gas leasing. For much of the past several decades, efforts to expand oil production in Alaska have focused on terrestrial areas, and there was little attention paid to the Arctic Ocean. That has changed dramatically. Prior to 2008, no leases were owned in the Chukchi Sea. That year, the Minerals Management Service (MMS) held the first lease sale in that area since 1991. It offered more than 34 million acres of the outer continental shelf, and sold leases encompassing nearly 3 million acres. Under the current 2007-12 Five-Year Planning Program, MMS plans to hold two additional lease sales in this area in which approximately 37 million acres would be offered to oil companies.

Similarly, MMS is moving forward aggressively with leasing in the Beaufort Sea. Between 2003 and 2007, three lease sales were held in the Beaufort Sea. In those sales, oil companies purchased rights to leases encompassing more than one million acres. Under the current 2007-12 Five-Year Planning Program, MMS plans to hold two additional lease sales in this area in which roughly 32 million acres would be offered to oil companies. The 2007-12 Five-Year Planning Program also includes a proposed sale encompassing 5.6 million acres in the sensitive Bristol Bay area and a "special interest sale" option for a sale in Cook Inlet.

Much of what we have learned over the past twenty years from the *Exxon Valdez* oil spill applies directly to the leasing, exploration, and development in the Arctic. Given the remoteness and sensitivity of those marine systems, however, those threats may be magnified. We know relatively little about how these ecosystems function, especially north of the Bering Sea. While the Bering Sea has received increasing scientific attention over the last few decades, we still know almost nothing about processes that occur during winter, the critical season when death is most likely and hence when year class survival is most likely to be set. This dearth of knowledge is much worse north of the Bering Sea, where perennial Arctic sea ice has until recently limited our ability to even find out what organisms live there. The lack of scientific knowledge makes the impacts of oil and gas activities extremely difficult to predict, particularly in light of the rapid changes occurring there.

The most dramatic risk, of course, is another catastrophic spill, and MMS estimates that at least one major spill is more likely than not over economic lifetimes of oil reserves in the Beaufort and Chukchi seas. In the environmental impact statement for the 2007-12 Five-Year Leasing Program, MMS estimates that there will be one large spill in either the Beaufort or Chukchi seas. In its 2008 Draft Environmental Impact Statement for the Chukchi and Beaufort Planning Areas produced, MMS estimates that there is a 40% chance of a large spill in the Chukchi Sea and a 26% chance of a large spill in the Beaufort Sea. These percentages may understate the risk because the final technology that would be deployed for oil extraction is not clear, and it is difficult to realistically account for human error.

Given the dearth of experience with producing oil in waters exposed to seasonal pack ice and the acknowledged inability to respond to or clean up any oil releases in the presence of ice, the stage is being set for impacts that could substantially exceed those of the *Exxon Valdez* oil spill. Once again, Alaska Natives, whose continuous inhabitation of this region is longer by far than any other human settlement in North America, and who depend on the ocean for food and culture, stand to lose the most in the event of a major spill.

In addition to a catastrophic spill, oil leasing, exploration, and development bring other threats to the Arctic. Offshore activities necessitate networks of pipelines needed to collect and transport the oil from the fields to the shore from as much as 50 miles away, new storage and port facilities along the coast, airstrips, marine vessel as well as aircraft and helicopter traffic. Together, these industrial facilities would cause: noise pollution from seismic testing, increased vessel traffic, and oil platform operations; increased likelihood of vessel strikes to marine mammals; transport of invasive species in ballast water or on the external surfaces of vessels and drilling rigs; and increased risk of pollution from oil and other contaminants associated with exploration and production. Many of these activities are occurring already. Seismic studies have been conducted in the Beaufort and Chukchi seas, and there are proposals to drill exploratory wells.

Oil production in the Arctic would also increase air pollution and contribute to global warming by producing soot. Soot consists of black carbon particles formed by the incomplete combustion of fuels, including flares that may be used to dispose of excess natural gas produced by oil wells. These black carbon particles contribute to a positive feedback loop that could accelerate warming in the Arctic. The soot may eventually settle on ice and snow, where it can dramatically accelerate melting during spring and summer, transforming surfaces that reflect sunlight back into the atmosphere into liquid water, which efficiently absorbs sunlight. The absorbed sunlight warms the water, which warms the surrounding region, causing faster permafrost melting and releasing stored greenhouse gases, such as carbon dioxide and methane, into the atmosphere. The release of these greenhouse gases, in turn, causes more snow and ice to melt, which causes more warming, and so on. This positive feedback loop is amplified by the warming effect of the black carbon particles, which can accelerate the rate of warming across the whole planet. This increased warming, which disproportionately affects the Arctic, would place the marine ecosystems under commensurately increased stress.

While we know these ecosystems face large and rapid stress, our ability to measure these impacts is severely limited by the logistical challenges of sampling in this region and the paltry baseline data available. In such a situation, it is prudent to proceed cautiously and avoid adding additional stress to the system unless absolutely necessary. The current and proposed leasing in the Arctic do not meet either of these criteria. As discussed above, these activities will dramatically increase the stress on the region. In addition, reserves in the Beaufort and Chukchi lease areas would supply only a small fraction of the U.S. energy needs. Thus, their necessity is questionable, and these activities should not be considered in the absence of a comprehensive plan to move toward renewable energy and sustainable living.

V. Science-Based, Precautionary Management

On the 20th anniversary of the *Exxon Valdez* spill, we stand at a crossroads in the way the United States approaches energy and our oceans. As detailed above, we have learned much about the effects of oil in our oceans and the risks from offshore activities. At the same time, we know that we have a relatively poor understanding of the functioning of Arctic ecosystems and that we cannot effectively respond to or clean up an oil spill in the Arctic. While twenty years ago we might have pleaded ignorance, there is no excuse now for failing to address the risks and unknowns as we make decisions about our oceans.

For those reasons, we must stop the ongoing and planned leasing, seismic, and other activities in the Beaufort and Chukchi seas and Bristol Bay. Instead of rushing ahead in the absence of science and thorough planning, the federal government should develop a comprehensive Arctic conservation and energy plan based on a full scientific assessment of the health, biodiversity, and functioning of Arctic ecosystems to guide decisions about whether, when, where, and how industrial activities are permitted. Creating a comprehensive plan would begin with a gap analysis and research plan developed by independent scientists, such as the National Research Council. Further, the plan could be created in conjunction with broader climate and energy plans for America.

Such an approach has been started with regard to commercial fishing in the Arctic. In February 2009, the North Pacific Fishery Management Council (NPFMC) adopted a fishery management plan for the Beaufort and Chukchi seas. In recognition of the profound stresses on those ecosystems and our very limited knowledge of them, that plan precludes commercial fishing in U.S. Arctic waters until scientific evidence shows that such fishing can be conducted without harming the ecosystem or opportunities for the subsistence way of life. The plan was adopted unanimously and with support from scientists, industry, Native entities, and conservation groups. This "look before we leap" approach provides a model for addressing other proposed activities in the region.

Developing a comprehensive plan for the Arctic would involve coordinating expertise from a variety of sources including government agencies (such as NOAA, FWS, MMS, BLM, the Coast Guard, EPA), local governments, Native entities, scientists, and others. An interagency task force should be created to incorporate their expertise and actions related to the Arctic. This task force would oversee the creation and implementation of an Arctic conservation and energy plan and could be headed by a new position in CEQ or by the NOAA Administrator. As this process proceeds, local and traditional knowledge must play an important role.

Further, for any areas in which oil and gas activities are considered, we must ensure that they can be conducted without harming ecosystems or impacting the subsistence way of life. Doing so requires the best available technology and, at minimum:

a. Clear evidence that accidents can be controlled, contained and cleaned up;
b. Adequate response capabilities, including tugs, booms, equipment and trained on-site personnel;
c. Zero discharge of produced waters, drilling muds, or other byproducts;
d. Monitoring and tracking for all vessels and materials; and
e. Processes and procedures to protect marine mammals and other resources from the effects of seismic activities, noise, and other pollution;

A comprehensive, science-based plan for managing ocean resources and appropriate standards for any activities permitted are only one part of the equation. At the same time, we must work to develop alternative sources of energy, such as wind, and, we must provide incentives to conserve.

I live in Juneau, Alaska, a town of 31,000 people that is run almost entirely on hydropower. Last April, an avalanche severed the transmission line from our power source, forcing us to immediately switch to diesel-generated electricity and increasing costs by 500% overnight. Within a week, we lowered our consumption of electricity by over 30%. We did mainly this by reducing needless waste. No businesses closed, no one froze and, while the stores ran out of compact fluorescent light bulbs, life went on pretty much as normal. Even after the transmission line was fixed, our consumption rate has remained about 10% below what it was.

Through simple conservation efforts, the United States could achieve similar savings. Even a 10% reduction of petroleum consumption would remove nearly 2 million barrels of oil per day from the oil market, which would lower the price of gas much more quickly than the decades required for new oil reserves to come on-line. Besides lowering the price of gas for everyone, this relatively small conservation effort would improve our balance of payments, reduce our reliance on foreign sources of oil, and lower our emissions of carbon dioxide to the atmosphere. It would slow both global warming and ocean acidification, set a compelling example to the rest of the world, and preclude placing the last great biological strongholds in jeopardy from oil pollution. Were we to actually achieve a 30% reduction in fossil fuel use through conservation, the improvement in the atmosphere would be detectable within a year. Were we to augment the savings from conservation with a deliberate transition to alternative energy sources combined with more efficient ways of using energy, we could cut our carbon dioxide emissions in half much sooner than we currently think possible. Indeed, energy from offshore wind sources has the potential to replace fossil fuels for electrical power generation in much of the northeastern U.S. and southern California. We will still need fossil fuel generation if only for back-up supplies, but it does not have to be the dominant source of power generation. We must demonstrate the will and leadership to accomplish these goals. When I was young, we made a national commitment to go to the moon in ten years, and what we face today to change our power generation infrastructure is not nearly as technologically challenging.

VI. Conclusion

As I think back on the last twenty years, I am struck by cyclical nature of these events. Before the *Exxon Valdez* oil spill, we were told that oil development was safe and necessary. In the intervening decades, science has shown us that it is not. While we have made some progress in transport safety as well as response and rescue capability, we still cannot clean up a spill in Arctic waters, and we still do not understand those systems—let alone how they might be affected by industrial activities. Nonetheless, oil companies and others would have us believe that, this time, it will be fine. This time, we should be smart enough to recognize all that we don't know and all that we stand to lose.

For those reasons, we must stop all ongoing and planned activities offshore in Alaskan waters and begin the development of a science-based, precautionary conservation and energy plan for the Arctic that provides a bridge from oil to renewable energy and conservation. We also must reinstate and extend the moratoria on offshore drilling in U.S. waters. We owe it to ourselves and those whose lives depend on preventing a repeat of the *Exxon Valdez* oil spill.