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Submitted online via: http://ocs5yeareis.anl.gov/involve/comments/index.cfm

RE: 5-Year Program Draft PEIS

Dear Mr. Bennett:

National Audubon Society, Ocean Conservancy, Pew Environment Group, and Oceana submit the following comments on the Draft Programmatic Environmental Impact Statement (PEIS) for the Proposed Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2012–2017 ("2012–2017 Program" or "Proposed Program").[1] We urge the Department of the Interior (DOI) to modify the Proposed Program and the draft PEIS to better reflect this Administration's public commitment to a new approach to decisions about conservation and energy production in the Arctic—an approach based on precaution, preparedness, and good science.

The following comments focus largely on the Beaufort Sea and Chukchi Sea planning areas[2] and address the need for a precautionary approach to the planning and management of oil and gas activities throughout the region. The Arctic contains some of the most extreme, remote, and fragile environments on earth. At the same time, it is home to unique, subsistence-based indigenous communities supported by healthy, functioning ecosystems. In the event of an oil spill, there is extremely limited oil spill response or rescue equipment in this region and no demonstrated technology to clean up spilled oil in broken ice conditions. A significant accident or mistake in the Arctic would have devastating and long-lasting consequences for the region's communities and ecosystems. As a result, DOI must take a different approach to oil and gas activities in the Arctic—one that is deliberate, precautionary, and informed by synoptic science.

Taking a new approach to conservation and energy production in the Arctic means that DOI should not include lease sales in the Beaufort Sea or Chukchi Sea planning areas in the 2012–2017 Program. Rather, the next five years should be used to synthesize existing data, collect additional information, develop and demonstrate the effectiveness of oil spill response capabilities, and implement the changes in management and oversight that have been recommended in the wake of the *Deepwater Horizon* spill. With that information and new direction, DOI would be in a position to make decisions, supported by sound science, about whether to hold additional lease sales and, if so, where, and under what conditions.

At a minimum, if DOI continues to consider Arctic lease sales during the upcoming five-year program, it should modify the Proposed Program and draft PEIS to ensure that decisions about

[1] *See* 76 Fed. Reg. 70,156 (Nov. 10, 2011).
[2] Because recent programs have not considered lease sales in other areas of the Arctic Ocean, such as Hope Basin or Norton Basin, and because the North Aleutian Basin is not included in this program, our comments do not specifically address those areas. To be clear, however, DOI should not schedule new lease sales in any Arctic planning area, including the North Aleutian Basin, Hope Basin, or Norton Basin.

whether and under what circumstances to hold those lease sales are consistent with the stated commitments of DOI leadership and are designed to minimize potential impacts from leasing and oil and gas activities. Specifically, DOI should change the Proposed Program and draft PEIS so that they:

- Significantly expand existing deferrals, include additional deferrals for areas known to be important for subsistence or ecological reasons, and incorporate other restrictions on oil and gas activities to protect biological resources;

- Terminate areawide lease sales and instead require the Bureau of Ocean Energy Management (BOEM)[3] to develop and implement a more targeted approach to Arctic leasing;

- Make future Arctic lease sales contingent upon the development, implementation, and use of a comprehensive, integrated scientific research and monitoring program; and

- Make future Arctic lease sales contingent upon the demonstration of effective oil spill response capability and preparedness.

In addition, DOI should use the five-year program to address a number of significant procedural and regulatory problems related to oil and gas activities in the Arctic. In particular, DOI should use the 2012–2017 Program to commit to a more transparent and meaningful approach to environmental analysis pursuant to the National Environmental Policy Act (NEPA), meaningful stakeholder participation, and additional regulatory reforms.

Fundamentally, DOI should ensure that the 2012–2017 Program is a part of a comprehensive planning effort that looks beyond oil and gas development to balance energy extraction objectives with the conservation of the Arctic's exceptional biological resources. DOI should consider the important connections between marine, coastal, and terrestrial areas in the Arctic, and use this five-year planning process as a step toward more holistic thinking about decisions in the Arctic.

I. THE ARCTIC'S UNIQUE CHALLENGES DEMAND A DIFFERENT APPROACH, BUT THE PROPOSED PROGRAM AND PEIS FALL SHORT.

The Proposed Program considers lease sales in the Gulf of Mexico and the Arctic Ocean. As it crafts the 2012–2017 Program and PEIS, BOEM must bear in mind that the Arctic Ocean is not simply the Gulf of Mexico translocated to a higher latitude: it is different ecologically, and the people in the region view and use the ocean differently. The Gulf of Mexico has comparatively mild weather and ocean conditions, has seen oil and gas drilling for decades, and has extensive infrastructure. The opposite is true in the Arctic Ocean. The Beaufort and Chukchi seas are frontier areas of the OCS. The Arctic Ocean is extremely remote and lacks baseline infrastructure necessary to support offshore drilling, particularly in this harsh and challenging environment. There are many unanswered questions about the potential environmental and community impacts of oil and gas activity in the Arctic. The stark contrast between the Gulf of

[3] For purposes of these comments, "BOEM" refers to the current Bureau of Ocean Energy Management as well as its predecessor agencies, the Bureau of Ocean Energy Management, Regulation and Enforcement and Minerals Management Service.

Mexico and the Arctic gives BOEM the opportunity—and responsibility—to take a fundamentally different approach to the initiation of industrial activities in the Arctic Ocean. Moreover, the *Deepwater Horizon* tragedy unfortunately demonstrated that the approach taken in the Gulf of Mexico does not work. Operators and agencies were unable to effectively clean up a major spill even in good weather with significant infrastructure; decisions have not been made based on science, preparedness, and accountability. We can and must do better in the Arctic.

The previous Administration tried to ignore the fundamental differences between the Arctic Ocean and Gulf of Mexico. It expanded dramatically the scope of oil and gas activities in the Chukchi and Beaufort seas. This expansion was neither informed by sufficient science nor supported by adequate oil spill preparedness, and it resulted in significant and ongoing controversy and litigation. Courts invalidated the analyses underlying the 2007–2012 Program, Chukchi Lease Sale 193, and previous plans to drill exploration wells in the Beaufort Sea on the grounds that they did not comply with laws and regulations designed to ensure informed decision-making and protect environmental and subsistence values. Secretary of the Interior Ken Salazar was correct in describing the prior Administration's OCS policy as a "headlong rush of the worst kind."[4]

This Administration has pledged to do things differently. The President and DOI leadership have committed to using sound science to inform decision-making and to taking a new approach to conservation and energy issues in the Arctic. For example, Deputy Secretary of the Interior David Hayes stated that

> [a] key part of safe and responsible development of our oil and gas resources is recognizing that different environments and communities require different approaches and technologies. In Alaska and off its coast, the Proposed Program recommends that the current inventory of already-leased areas in the Arctic should be expanded only after additional evaluations have been completed, and in a manner that accounts for the Arctic's unique environmental resources and the social, cultural, and subsistence needs of Native Alaskan communities.[5]

Unfortunately, neither the Proposed Program nor the accompanying draft PEIS reflect the Administration's stated commitment to a new approach. In fact, relative to the 2007–2012 Leasing Program, the 2012–2017 Proposed Program greatly expands the Chukchi Sea and Beaufort Sea program areas by extending their outer boundaries all the way to the edge of the planning areas.[6] Furthermore, despite BOEM's Notice of Intent specifically soliciting recommendations on additional deferral areas,[7] the draft PEIS characterized the idea of

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[4] Secretary of the Interior Ken Salazar's Statement on Offshore Energy Strategy (Feb. 10, 2009) *available at* http://www.doi.gov/news/speeches/2009_02_10_speech.cfm.

[5] DOI Press Release: Secretary Salazar Announces 2012–2017 Offshore Oil and Gas Development Program (Nov. 8, 2011) *available at* http://www.doi.gov/news/pressreleases/Secretary-Salazar-Announces-2012-2017-Offshore-Oil-and-Gas-Development-Program.cfm.

[6] *Compare* Minerals Management Service, Proposed Final Program: Outer Continental Shelf Oil and Gas Leasing Program 2007–2012 (Apr. 2007) at 8 (showing Beaufort and Chukchi program areas stopping well short of the outer boundary planning areas) *to* Bureau of Ocean Energy Management, Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012–2017 (Nov. 2011) at 33 & 39 (showing Beaufort and Chukchi program area boundaries extending to the outer edge of the planning areas).

[7] *See* Minerals Management Service, Notice of Intent to Prepare and Scope an Environmental Impact Statement (EIS) for the Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2012–2017, 75 Fed. Reg. 16,828, 16,829 (April 2, 2010) (noting that the agency was considering alternatives that could

including “areal or temporal exclusions or restrictions” at the five-year program stage as “almost foolhardy.”[8]

We acknowledge that the Proposed Program contains some modest improvements over the previous version: it limits the number of lease sales in the Arctic and schedules those sales relatively later in the five-year timeframe. But these improvements miss the mark: there is no compelling reason for DOI to schedule any Arctic lease sales in the 2012–2017 Program.

If BOEM insists on offering new Arctic lease sales in the upcoming five years, the minor improvements contained in the Proposed Program and draft PEIS are not sufficient to ensure adequate protection of subsistence and biological resources in the region. For example, the Proposed Program does not include additional deferrals for areas known to be important for subsistence or ecological reasons, and it does not guarantee that BOEM will develop and implement an alternative to areawide leasing in the Arctic. Despite scheduling lease sales toward the end of the five-year program, the Proposed Program does not require BOEM to use that extra time to obtain additional scientific understanding of the region’s ecology or to develop and demonstrate effective oil spill response capacity. The PEIS associated with the Proposed Program fails to consider an alternative that would accomplish these goals.

In short, the Proposed Program and draft PEIS effectively constitute the same sort of “headlong rush” that Secretary Salazar criticized in the past. Under the Program as proposed, BOEM will continue its historical practice of delaying detailed environmental analyses and protection of resources until it is too late. If this Administration’s promises are to be meaningful, BOEM must incorporate changes as part of the 2012–2017 Program that will establish a new approach to oil and gas leasing and related activities in the Arctic. BOEM should use the 2012–2017 Program and PEIS to demonstrate its promised commitment to doing things differently in the Arctic—establishing a path that is based on sound science and does not risk the Arctic’s peoples, cultures, livelihoods, fish and wildlife. If BOEM takes appropriate steps to revise the draft documents, the 2012–2017 Program and PEIS can be an important step in that direction.

II. BOEM SHOULD NOT SCHEDULE ARCTIC LEASE SALES IN THE 2012–2017 PROGRAM

BOEM should change the draft PEIS to include an additional alternative that excludes both the Beaufort Sea and Chukchi Sea planning areas for the duration of the five-year program and should select this alternative as the Final Program. There is no compelling reason to schedule additional lease sales in the Arctic at this time. Despite insufficient information to support its decisions, BOEM has already leased almost four million acres in the Beaufort and Chukchi seas in previous five-year programs. As a result, existing Arctic leases have been the source of enormous and ongoing public controversy. The controversy over the Arctic leases has spilled over into the courts and has yet to be resolved. Instead of escalating the debate by planning additional Arctic lease sales in the 2012–2017 Program, BOEM should acknowledge that it needs to engage in more thorough preparation before deciding whether, where and how to offer additional leases in the region.

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include, among other things, “limiting areas available for leasing, and excluding parts of or entire planning areas”).

[8] BOEM, Draft Programmatic Environmental Impact Statement, Outer Continental Shelf Oil and Gas Leasing Program: 2012–2017 (Nov. 2011), at 2-11.

BOEM should exclude the Arctic planning areas from the 2012–2017 leasing schedule and focus instead on ensuring that the public, government agencies, and communities have the information they need to make wise decisions about whether and under what circumstances to authorize additional oil and gas activity in the Arctic Ocean. Delaying any lease sales by five years will allow for better information on which to base decisions. Specifically:

> (1) a comprehensive, integrated scientific research and monitoring program that includes three to five years of data collection should be developed and implemented as a basis for policy decisions on whether, when, where and how to proceed;
> (2) important ecological areas, including subsistence use areas, should be identified and protected from the effects of leasing and oil and gas activity; and
> (3) federal agencies should require—and industry should demonstrate—Arctic-specific planning, infrastructure, equipment, technology, and trained personnel sufficient to respond effectively to a worst-case oil spill in Arctic waters.

BOEM is capable of implementing these reforms, but it will not have time to complete these critical steps prior to the proposed 2015 and 2016 Arctic lease sales. As a result, BOEM should not schedule any Arctic lease sales in the 2012-2017 Program. This commitment would set the stage for responsible decisions about development based on good science and preparedness.

III. IF BOEM CONTINUES TO CONSIDER ARCTIC LEASE SALES DURING THE 2012–2017 PROGRAM, IT SHOULD MODIFY THE PROPOSED PROGRAM AND PEIS TO MINIMIZE POTENTIAL IMPACTS FROM FUTURE OIL AND GAS LEASING AND RELATED ACTIVITIES.

If BOEM continues to consider Arctic lease sales during the 2012–2017 Program, it should adopt binding standards and conditions to govern all future leasing, exploration, and production activities. These standards and conditions should focus on increasing available information and reducing potential impacts from future oil and gas activities. By implementing these changes now, at the five-year program stage, BOEM can ensure that future lease sales will proceed only if certain requirements are satisfied.

Specifically, BOEM should adopt changes to the Proposed Program and draft PEIS to ensure that future Arctic lease sales will not proceed unless:

> (1) Areas that are known to be important for subsistence or ecological reasons are identified and deferred before any leasing takes place and other measures necessary to protect the function of those areas are implemented;
> (2) BOEM adopts and specifically describes in the Proposed Plan a targeted approach to leasing in place of an areawide approach;
> (3) BOEM and other agencies develop and implement a comprehensive, integrated Arctic scientific research and monitoring program that is used to inform future leasing decisions; and
> (4) BOEM, other agencies, and industry improve oil spill preparedness and demonstrate effective response capability in Arctic conditions.

BOEM should modify the Arctic leasing alternatives in the draft PEIS to incorporate the foregoing standards and conditions. Doing so at the 2012–2017 Program stage is the best way to ensure that responsible decisions are made.

A. BOEM Should Revise the Beaufort Sea and Chukchi Sea Program Areas to Include Expanded and Additional Deferrals and Restrictions.

If BOEM continues to consider offering Arctic lease sales during the upcoming five-year program—which it should not—the agency should identify and exclude additional areas that are known to be important for subsistence and/or ecological reasons from the Beaufort Sea and Chukchi Sea program areas. In addition, BOEM should require that any leases offered include other restrictions, including time/area closures and seasonal drilling requirements designed to minimize impacts to biological and cultural resources in the region. Finally, the 2012–2017 Program should recommend the establishment of a committee tasked with identifying additional or expanded deferral areas to help inform decisions about future Arctic leasing and other oil and gas activities.

As currently drafted, the Proposed Program establishes no new deferrals beyond what was adopted in the 2007–2012 Program (i.e. two small subsistence use areas in the Beaufort Sea program area, and a 25-mile coastal buffer in the Chukchi Sea program area). However, currently available data demonstrate that these deferrals are far too limited in scope to protect Arctic communities' subsistence needs and the biological resources that support subsistence activities (*see* Attachment A, "Known Subsistence Areas and Important Ecological Areas That Should Be Deferred from Leasing in the 2012–2017 Leasing Program"). BOEM should take immediate action to correct these shortcomings by modifying the alternatives in the PEIS that include potential lease sales in Arctic waters ("Arctic leasing alternatives"). Using the information on subsistence use areas and biological resources contained in Attachment A, BOEM should increase significantly the size of these deferrals to protect subsistence use areas and incorporate additional subsistence deferrals, additional place-based ecological deferrals, and operational restrictions such as time/area closures and protective measures designed to conserve ecological and subsistence resources in the region. BOEM should take a precautionary approach; expanded and additional deferral areas should cover large geographical areas to help provide adequate protection to subsistence use areas and important ecological areas.

The Outer Continental Shelf Lands Act (OCSLA) requires consideration of areas to be excluded from leasing at the five-year program stage.[9] Establishing subsistence and ecological deferrals now will help to ensure that governmental agencies, industry and stakeholders alike have the same understanding as the leasing process continues. If BOEM elects to proceed with leasing in the Arctic Ocean, it is essential for it to act at the five-year program stage.

The process for identifying important ecological areas should be ongoing and adaptive. As research yields a better understanding of the Arctic waters and how they are changing, areas that are revealed to be important should be excluded from future lease sales and five-year programs. That process, however, does not alleviate BOEM of its obligation to defer areas that can be identified as important based on information available now. The following sections explain in general terms why BOEM should act now to expand existing deferral areas and include additional deferral areas; they also describe the data that support these changes.

[9] *See* 43 U.S.C. § 1344(f)(1) ("The Secretary shall, by regulation, establish procedures for . . . receipt and consideration of nominations for any area to be offered for lease or to be excluded from leasing[.]").

(1) Subsistence Deferrals

BOEM should exclude subsistence use deferral areas from the Chukchi Sea and Beaufort Sea program areas in the 2012–2017 Program and PEIS. The Notice of Intent issued by BOEM announcing preparation of the PEIS indicated that BOEM was soliciting recommendations on additional deferral areas.[10] BOEM already has ample information to support deferring subsistence areas relied upon by Arctic coastal communities. Consistently over the last decade, in written comments and in public hearings, North Slope communities and regional organizations have recommended that BOEM exclude subsistence use areas from the oil and gas leasing process. BOEM has funded research to document subsistence use areas and to corroborate them with areas recommended by communities.[11]

We compiled existing subsistence hunting information from Kaktovik, Nuiqsut, Barrow, Wainwright, Point Lay, and Point Hope. Sources include studies by Stephen Braund, Wainwright Traditional Council and The Nature Conservancy, Braund and Burnham, and Sverre Pedersen. Data include hunting areas for bowhead whale, beluga whale, polar bear, seals, walrus, and waterfowl. The data document local subsistence use throughout an area 25 miles to over 100 miles offshore of the six villages. When assembled on a single map, the data show the extent of hunting areas for the six Arctic coastal communities (*see* Attachment A, Map 1, "Important Subsistence Areas"). BOEM should exclude from the 2012–2017 Program and PEIS the important subsistence use areas depicted in Map 1. Attachment A to these comments describes in more detail these subsistence areas, their importance to communities, and the reasons they should be excluded from the 2012–2017 Program and PEIS.

(2) Place-Based Ecological Deferrals

Using information on wildlife concentration areas contained in Attachment A, BOEM should also incorporate expanded and additional place-based ecological deferral areas in the Chukchi Sea and Beaufort Sea program areas in the 2012–2017 Program and PEIS. The current understanding of ecological functioning in the Chukchi and Beaufort seas indicates that a number of sensitive marine habitats are especially important to the region's ecological functioning. These areas should be excluded from future leasing and include, among others, Hanna and Herald shoals, Barrow Canyon, and the Chukchi Sea ice lead system (*see* Attachment A, Map 7, "Proposed Deferral Areas and Seasonal Restrictions"). BOEM should exclude these ecologically important areas from the Chukchi Sea and Beaufort Sea program areas in the 2012–2017 Program and PEIS. Excluding these areas now will help BOEM act proactively to protect areas that are ecologically important and that help sustain the region's subsistence resources.

Attachment A further describes why areas like Hanna and Herald shoals, Barrow Canyon, and the Chukchi Sea ice lead system are ecologically important and why BOEM should exclude

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[10] *See* Minerals Management Service, Notice of Intent to Prepare and Scope an Environmental Impact Statement (EIS) for the Outer Continental Shelf (OCS) Oil and Gas Leasing Program for 2012–2017, 75 Fed. Reg. 16,828, 16,829 (April 2, 2010) (noting that the agency was considering alternatives that could include, among other things, "limiting areas available for leasing, and excluding parts of or entire planning areas").

[11] Braund, S. 2010. Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow. U.S. Department of the Interior, Minerals Management Service. Alaska OCS Region, Environmental Studies Program. MMS OCS Study Number 2009-003. Anchorage, Alaska.

them from the five-year program and PEIS. In brief, we evaluated an array of datasets summarized in the Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas, and further refined by Oceana and North Slope Borough wildlife managers and subsistence hunters. These data document important concentration areas for birds, polar bears, whales, pinnipeds, and other Arctic wildlife (*see* Attachment A, Maps 2–5). In certain areas, these important wildlife concentration areas overlap to a great degree. These "hotspots" include the Chukchi ice lead system, Barrow Canyon, and Hanna Shoal. A coastal buffer 50 to 60 miles offshore in the Chukchi Sea, and variable from 15 to 60 miles offshore in the Beaufort Sea, as well as Hanna Shoal, capture the areas of highest conservation concern within the Chukchi Sea and Beaufort Sea program areas (*see* Attachment A, Map 6).

As noted above, existing information justifies exclusion of area like Hanna and Herald Shoals, Barrow Canyon, and the Chukchi Sea ice lead system from the 2012–2017 Program and PEIS. Excluding these areas from the five-year program is important, but it is not sufficient over the long-term. As described in Part III.C. below, identification of important ecological areas should be an ongoing part of an integrated, long-term scientific research and monitoring program for the Arctic, not a static, one-time event. As an Arctic research and monitoring program gives us a greater understanding of the ecological functioning of Arctic waters, it may reveal additional important ecological areas that BOEM should exclude from future lease sales and other oil and gas activities.

(3) Other Restrictions

Excluding the subsistence use areas and ecological deferrals described above from the 2012–2017 Program and PEIS will help safeguard the resilience of Arctic ecosystems, but these place-based deferrals alone will not be sufficient. BOEM should also identify other areas that warrant protection in the form of targeted restrictions and/or mitigation measures. BOEM should act now, at the five-year program stage, and prior to any new leasing, to require specific, binding restrictions on leasing and oil and gas activities in these regions. Such restrictions may include time/area closures during important migratory periods or in areas that fall upstream or downstream of important ecological areas, or mitigation measures for important wildlife areas.

For example, BOEM should include in the 2012–2017 Program and PEIS a requirement that seasonal and migration corridor restrictions be incorporated into future leases that might be offered on the Beaufort Sea shelf. These areas are depicted by the orange lease blocks shown in Map 7 (*see* Attachment A, Map 7, "Proposed Deferral Areas and Seasonal Restrictions"). This area is important to migrating bowhead whales in the spring and beluga whales in the spring and fall, especially September.[12] BOEM should use the five-year program to require oil and gas operators to cease all industrial activity in these regions during these migration periods and to require protective mitigation measures during times when activities are allowed. BOEM should also use the five-year program to bolster the Alaska Eskimo Whaling Commission Conflict Avoidance Agreement process, including the seasonal and temporal closures designed by the whaling captains in cooperation with offshore operators to protect subsistence hunting. BOEM should work with NMFS, North Slope communities, the Alaska Eskimo Whaling Commission, other marine mammal commissions, and other Alaska Native organizations to develop an alternative for the 2012–2017 Program and PEIS designed to ensure that oil and gas operations do not impede or impact subsistence activities. If BOEM proceeds with Arctic leases, the agency should consider and incorporate additional protective measures at the lease sale stage, before issuing any new leases.

[12] Smith, M.A. 2011. Place-based Summary of the Arctic Marine Synthesis. Audubon Alaska Anchorage, Alaska.

(4) Deferral Committee

As noted above, the long-term process for identifying important ecological areas should be adaptive. To ensure that BOEM affords adequate consideration to additional or expanded deferral areas in future stages of the OCSLA process, the BOEM Director should appoint a committee of relevant experts tasked with recommending additional or expanded areas that merit deferral from leasing or special management consideration. Establishment of this committee could coincide with implementation of the final 2012–2017 Program.

The committee should give special consideration to areas in the Beaufort and Chukchi seas where there are regular aggregations of species; migration routes; important zones of primary productivity; breeding, spawning and birthing habitat; and community subsistence use areas. It should also require the committee to consider the distribution and movement of prey species. The committee's identification of important areas should be based on scientific knowledge; when scientific research is incomplete or unclear, the committee should use precautionary approach that is protective of Arctic marine ecosystem and subsistence uses.

The committee should be composed of representatives from BOEM, National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (FWS), U.S. Geological Survey (USGS), the U.S. Arctic Research Commission, the Interagency Arctic Research Policy Committee, the National Science Foundation Office of Polar Programs, and the North Pacific Research Board, as well as local scientific experts (including those with traditional knowledge) such as North Slope Borough, Alaska Eskimo Whaling Commission, Eskimo Walrus Commission, Polar Bear Commission, and Beluga and Ice Seal Committees. The committee should be tasked with making initial recommendations of important ecological areas or special areas within one year of approval of the Proposed Final Program, and its recommendations should be subject to public review and comment before final approval. This process should be completed prior to designing any future lease sales.

B. DOI Should Modify The Program And PEIS To Guarantee that BOEM Will Not Use an "Areawide" Approach to Leasing in Future Arctic Lease Sales.

The 2012–2017 Program should adopt a new framework to guide future leasing decisions in the Arctic. The new framework should be premised upon a more focused and targeted approach to leasing instead of the "areawide" approach that BOEM has used in the past. DOI should change the Proposed Program and PEIS to require adoption of a non-areawide approach to leasing in the Arctic.

While the Proposed Program hints that BOEM will adopt a new approach to OCS leasing in the Arctic, it provides no details—just a vague promise to "develop a more focused leasing approach that would be more targeted to the specific conditions of [the Arctic]."[13] At the same time, however, it explicitly retains the areawide leasing approach as an option for future lease sales.[14] Without a commitment to a new approach to leasing in the Arctic that is incorporated as part of the 2012–2017 Program, there is no assurance that it will be developed. Thus, DOI should change the Proposed Program and PEIS to *require* that a new more targeted approach

[13] Bureau of Ocean Energy Management, Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012–2017 (Nov. 2011) at 4.
[14] *See id*. (noting that "the Proposed Program provides the option of conducting areawide leasing in the Beaufort and the Chukchi").

to leasing be developed before any lease sales are held and to prohibit the use of areawide leasing in the Arctic.

For 30 years, DOI has conducted OCS lease sales under a system known as "areawide" leasing in which entire offshore planning areas, comprising millions of acres, are offered for lease at one time. This system is not required by OCSLA; it was created administratively in 1982 by then-Secretary of the Interior James Watt. Areawide leasing sparked significant criticism that it would result in lower revenue to the federal government and that meaningful environmental analyses of such enormous acreage would be impossible. Those concerns continue today.

When adopted, areawide leasing was a significant departure from the tract selection program that had governed OCS leasing since the mid-1950s. Under that approach to leasing, industry nominated tracts in which they were interested (similar to the system used by the Bureau of Land Management for onshore oil and gas leasing). DOI then considered economic and environmental factors along with the resource potential and potential value of the sale area, and selected specific tracts to be included in a lease sale. In 1985, the Government Accountability Office concluded that the first areawide lease sale resulted in significant loss of revenue to the federal government. More recent analyses have reached the same conclusion.

In addition to potential loss of revenue, areawide leasing makes compliance with NEPA virtually impossible, resulting in litigation and uncertainty. Recent five-year oil and gas leasing programs and individual lease sales have included Arctic program areas that are tens of millions of acres in size. Chukchi Lease Sale 193, for example, was approximately the size of Colorado. An environmental analysis of potential impacts on an area of that magnitude cannot account adequately for the variability that exists across the program area, nor can it anticipate adequately site-specific impacts. The National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling observed that "OCS lease sales cover such large geographic areas that meaningful NEPA review is difficult."[15] It recommended that the Department of the Interior "reduce the size of lease sales so their geographic scope allows for a meaningful analysis of potential environmental impacts and identification of areas of ecological significance."[16]

Despite the problems with the current areawide approach and the recommendation from the National Commission on the Deepwater Horizon Oil Spill, it appears that BOEM seeks to defer any commitment to non-areawide leasing until the lease-sale stage. However, there is no reason that BOEM should not commit to an alternative leasing program now, at the five-year program stage. Specifically, BOEM should use the five-year program to require that future Arctic lease sales—if any—be smaller and targeted to those areas with the highest likelihood of oil production. Doing so will establish certainty for both communities and the industry as to what to expect going forward. In addition, targeted leasing in smaller areas can help to focus future and ongoing research in the Arctic Ocean toward smaller areas more likely to be impacted by drilling activities. It should also help encourage competition among companies and increase the value received by the American public for their resources.

[15] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deep Water: The Gulf Oil Disaster and The Future of Offshore Drilling* (Jan. 2011), at 261.
[16] *Id.* at 262.

C. DOI Should Revise the Proposed Program and PEIS to Make Any Future Arctic Lease Sales Contingent on the Development, Implementation, and Use Of a Long-term Scientific Research and Monitoring Program.

If DOI continues to consider offering Arctic lease sales during the upcoming five-year program, the agency should change the Proposed Program and PEIS to ensure that new Arctic lease sales do not go forward unless they are preceded and informed by a long-term scientific research and monitoring program. Attachment B to these comments describes in more detail the elements and objectives of such a plan (*see* Attachment B, "BOEM Lacks Adequate Arctic Science, and Current Research Efforts Do Not Address Gaps Identified by the USGS Review."). The following paragraphs explain how BOEM should incorporate the science program into the Proposed Program and PEIS.

As described in Attachment B, BOEM should work with other agencies within and outside of DOI—such as NOAA, FWS, USGS, the U.S. Arctic Research Commission, and others—to develop an Arctic science program designed to fill existing information gaps and provide an understanding of the spatial and temporal variability of Arctic ecosystems, their components, and their functioning. To track changes in the Arctic, the science program should be supported by a comprehensive, long-term monitoring program with dedicated funding.

A long-term scientific research and monitoring program could be conducted in three phases over the next five to seven years:

(1) gap analysis and planning (2012–2013);
(2) research and monitoring (2013–2016, with monitoring continuing into the future); and
(3) integrating new and older information to provide decision-makers the basic understanding needed to make effective decisions (2016–2017).

The goal of the long-term scientific research and monitoring program is not endless study, but targeted research and analysis relevant to decisions about offshore oil and gas development. A long-term scientific research and monitoring program would enable managers to determine if, when, where, and how industrial activities should occur, and facilitate the identification of alternatives that may allow for development while protecting the ecosystem and subsistence way of life.

Local and traditional knowledge must be an integral part of the long-term scientific research and monitoring program. Local and traditional knowledge is a different but equally valid knowledge system that can help expand understanding of the Arctic and supplement and enhance existing knowledge. Indigenous peoples who have lived in the Arctic Ocean region for millennia have developed a wealth of knowledge about the region. Residents of the region depend on local plants and animals for food, clothing, and shelter, and know a great deal about the species they use and see. Traditional knowledge can help fill some of the gaps in our understanding of Arctic ecosystems as well as guide future efforts to collect necessary information.

Among other objectives, the long-term scientific research and monitoring program, informed by the deferral committee described above (*see* Part III.A.4), should be designed to identify additional areas that are important to the functioning of Arctic ecosystems and the support of subsistence resources. While we already know that certain areas of the Beaufort and Chukchi seas are important for ecological or subsistence purposes (*see* Part III.A.2 above), our

knowledge is incomplete, and the Arctic is changing rapidly. As a result, identification of important ecological areas should be an ongoing concern. Identification of additional important ecological areas—based on essential habitats and functions in the Arctic ecosystem along with traditional cultural activities—is a necessary step toward protecting traditional-use areas and critical wildlife habitats and ensuring ecosystem functionality.

Finally, it is not enough that BOEM design and implement long-term scientific research and monitoring program such as the one described above and in Attachment B. The 2012–2017 Program should make clear that additional Arctic lease sales should not proceed unless and until the long-term scientific research and monitoring program has yielded information sufficient to fill the critical gaps, including those identified by the USGS science report. We have included more detailed information on the USGS science report as an attachment (*see* Attachment C, An Independent Review of USGS Circular 1370: "An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska"). In addition, the 2012–2017 Program should make clear that the decision to hold future Arctic lease sales—and decisions about the size, location, and timing of new lease sales—must be informed by information gained from the long-term scientific research and monitoring program.

If the federal government commits to comprehensive, long-term scientific research and monitoring in the U.S. Arctic Ocean, managers will be in a much better position to determine if, when, where and how industrial activities should occur and how to protect the ecosystem and subsistence way of life. If BOEM continues to consider offering Arctic lease sales during the upcoming five-year program, the 2012–2017 Program should ensure that new Arctic lease sales do not go forward unless they are preceded and informed by a long-term scientific research and monitoring program as described above. BOEM should change the Arctic leasing alternatives in the PEIS to incorporate the Arctic science program requirements described above.

D. DOI Should Change the Proposed Program to Make Future Arctic Lease Sales Contingent upon the Development and Demonstration of Effective Oil Spill Response Capability and Preparedness.

DOI's Proposed Program and PEIS should acknowledge and better address the current inability to respond effectively to oil spills in the remote Arctic environment.

By its own standards, DOI should remove all Arctic lease sales from the Proposed Program due to the lack of infrastructure in the region. The Proposed Program does not include lease sales in the Mid- and South Atlantic planning areas in part because of that region's "current lack of infrastructure to support oil and gas exploration and development, as well as spill preparedness and response."[17] This decision is a wise one. Even though the Atlantic coast includes well-developed, major port facilities, U.S. Coast Guard bases, professional oil spill response organizations, major population centers, major airports, and a well-developed highway and road infrastructure, there has been no showing that an effective response can be mounted to a

[17] *See* BOEM Fact Sheet, Proposed Outer Continental Shelf Oil and Gas Leasing Program for 2012–2017 (undated) at 2 ("While an OCS development strategy announced in 2009 included the Mid- and South- Atlantic planning areas under consideration for potential inclusion in the Proposed Program, a number of specific considerations supported the Secretary's decision not to include these areas, including the current lack of infrastructure to support oil and gas exploration and development, as well as spill preparedness and response.") *available at* http://www.boem.gov/uploadedFiles/5-Year_Program_Factsheet.pdf.

significant oil spill. The situation is even more dire along the U.S. Arctic Ocean coastline—especially on the Chukchi coast—where there is little basic infrastructure such as roads, ports, and docks, and limited airport access due to few airports and routinely bad weather. DOI should remove Arctic lease sales from the Proposed Program and PEIS because, even more than the Atlantic coast, the Arctic planning areas lack the infrastructure to support drilling and response activities.

The Proposed Program states that "the Beaufort Sea Planning Area has well-developed oil and gas infrastructure on adjacent land and in state waters." However, this superficial conclusion fails to take into account the fact that existing infrastructure in this region is concentrated on land at Prudhoe Bay and is not sufficient to support response and cleanup of an oil spill in marine waters. Transportation-related infrastructure is minimal, and what exists is concentrated in the Prudhoe Bay oil field area. Heavy lift cranes and protected small boat shelters are found only at Prudhoe Bay's West Dock. Getting this limited equipment to needed locations would be difficult given that the communities within this region are not connected by a permanent road system and airports and related facilities are limited. Airports at Barrow, Kotzebue, and Deadhorse have scheduled jet service and are owned and maintained by the State of Alaska.

If DOI continues to consider offering Arctic lease sales during the upcoming five-year program—which it should not—DOI should make future leasing contingent on the development and demonstration of effective oil spill preparedness and response based on Arctic conditions. There should be no new lease sales in Arctic waters unless and until government agencies and OCS drilling operators have developed and demonstrated the ability to clean up a major oil spill when sea ice is present and the necessary physical and human resources are available for immediate deployment. Some of the most important points follow.

To improve oil spill preparedness in the Arctic, the 2012–2017 Program should provide that all future Arctic leases contain a stipulation that no drilling activity take place unless and until operators have trained response personnel in the region and Arctic-grade response equipment is pre-staged along vulnerable Arctic coastlines. The window for Arctic OCS exploration, and potentially drilling a relief well, could stretch into freeze-up where operators will encounter ice conditions. Arctic leases should ensure that operators are prepared for such a scenario by, among other things, requiring them to provide trained response personnel and pre-staged ice-class equipment sufficient to respond to a regional worst-case discharge. Even by Alaska standards, the Beaufort and Chukchi sea coasts are especially remote and vulnerable to an oil spill due to a lack of pre-staged equipment.

Further, the 2012–2017 Program should not allow any new lease sales in the Arctic unless and until potential lessors have demonstrated their ability to respond effectively to a worst-case discharge in icy Arctic waters. The history of OCS oil and gas operations has shown that oil spills will happen. The PEIS recognizes the difficulty of responding to oil spills in ice, but DOI fails to take the next step. DOI should use the 2012–2017 Program to ensure improvements in spill response capabilities by requiring that spill response technology is proven to work effectively in Arctic conditions before proceeding with any new Arctic leasing.

The program also should require the development and testing of Geographic Response Strategies (GRS) for the entire U.S. Arctic Ocean, both in the nearshore and offshore, before any new leasing goes forward. Ecologically sensitive areas should be identified and GRSs should be developed and tested to protect such areas from the effects of a worst-case discharge. While some protection strategies have been developed for the Northwest Arctic Borough for select sites on the Chukchi coast, the process should be completed for the rest of

the Chukchi coast and the Beaufort coast and ensure that necessary and adequate equipment is pre-staged nearby.

The 2012–2017 Program should also ensure that future Arctic leases contain a stipulation requiring Arctic Certification for Oil Spill Response Organizations (OSROs) as a precondition to any future drilling activity in the Arctic. Current classifications for OSROs do not address operating in Arctic conditions, yet operators plan to rely on Alaska Clean Seas (ACS)—the sole OSRO in the U.S. Arctic—for significant assistance during a spill response. ACS does not have the capacity to respond in the offshore during freeze-up conditions. Before any drilling activities proceed, BOEM should work with the Coast Guard to ensure that OSROs in the Arctic are capable of operating in all conditions in which an oil spill might take place.

In addition, the 2012–2017 Program should require all future Arctic leases to contain a stipulation that restricts exploratory non-emergency drilling operations in the OCS to summer only. This provision would eliminate increased risk associated with late-season drilling. If designed properly, it would dovetail with drilling restrictions associated with the subsistence fall whaling season in the Beaufort (~August 25th) and Chukchi seas (~September 15th). The 2012–2017 Program should also require that any future Arctic leases contain a stipulation that mandates same-season relief well drilling capacity.

Again, BOEM should eliminate Beaufort Sea and Chukchi Sea lease sales from the Proposed Program because the Arctic lacks the infrastructure necessary to support oil and gas exploration and development. If BOEM continues to consider Arctic lease sales—which it should not—the agency should change the Proposed Program to incorporate the foregoing oil spill response standards and conditions. Similarly, the agency should modify the Arctic leasing alternatives in the draft PEIS so that they reflect the standards and conditions discussed above.

IV. DOI SHOULD ADDRESS PROCEDURAL AND REGULATORY ISSUES

A. NEPA Issues

If DOI continues to consider offering Arctic lease sales during the upcoming five-year program, the agency should address a number of longstanding issues with its environmental analysis under NEPA before it takes any additional action.

BOEM's PEIS must do a better job of analyzing the effects—including cumulative and synergistic impacts—of climate change and ocean acidification. Among other things, the PEIS should consider the climate-change impacts that will stem from the consumption of oil and gas from leases considered in the analysis. The PEIS attempts to avoid this analysis, stating that "consumption of the refined oil is not considered because the scope of this draft PEIS is limited to issues that have a bearing on the decisions for the proposed leasing program."[18] It would be difficult to find a better example of circular reasoning. BOEM should revise the PEIS to include a full analysis of the climate-change impacts of the proposed program, including consumption of the hydrocarbons that may be extracted from OCS leases.

The PEIS must provide a more meaningful analysis of cumulative impacts. The analysis in the PEIS contains a great deal of information about the potential for cumulative impacts, but its conclusions as to the level of impact are frequently subjective or arbitrary. BOEM should revise

[18] BOEM, Draft Programmatic Environmental Impact Statement, Outer Continental Shelf Oil and Gas Leasing Program: 2012–2017 (Nov. 2011), at 1-18.

the PEIS to provide more objective measures of cumulative impact. For example, it should quantitatively assess impacts for all activities for potentially impacted species. In addition, the PEIS analyzes cumulative effects in a piecemeal, sector-by-sector fashion. The PEIS often concludes that specific resources will experience "minor" or "moderate" impacts, and that the incremental impact that would result from the proposed action is "small." However, the PEIS never assesses whether all these minor or small impacts would combine, in an additive or synergistic fashion, to have more significant overall effects. That assessment should be at the heart of a cumulative impact analysis.[19] BOEM should revise the PEIS to more meaningfully address cumulative impacts.

In addition to revising the PEIS to better analyze climate change and cumulative impacts, BOEM should commit to additional NEPA-related changes. For example, BOEM should develop and take public comment on a NEPA handbook designed to guide the agency's environmental analysis of OCS oil and gas issues. In a review of the Alaska Region office, the Government Accountability Office noted that "[t]he lack of a comprehensive NEPA guidance handbook, combined with high staff turnover, leaves the process for meeting NEPA requirements ill-defined for the analysts charged with developing NEPA documents."[20] The National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling recommended that BOEM, in consultation with the Council on Environmental Quality (CEQ), "develop and make public a formal NEPA handbook."[21] The National Commission recommended that the handbook "provide guidelines for applying NEPA in a consistent, transparent, and appropriate manner to decisions affecting OCS oil and gas activities."[22] Before BOEM undertakes any additional action in the Arctic that requires environmental analysis under NEPA, the agency should commit to developing and making available for public comment a NEPA handbook as recommended by the National Commission.

In addition, before deciding whether to hold new lease sales in the Arctic, BOEM should commit to reforming its implementation of NEPA to ensure that oil and gas activities will receive adequate, site-specific analysis. Under current practice, the agency fails to engage in a detailed, site-specific environmental analysis at the lease sale stage, claiming that such an analysis will take place at the exploration and development stages. However, BOEM's cramped interpretation of a statutory 30-day exploration plan approval deadline keeps the agency from preparing detailed, site-specific analysis at the exploration plan stage. Instead, the agency rushes to perform a less-detailed environmental assessment (EA) that is "tiered" to the original EIS. BOEM's current practice creates a shell game in which the agency promises—but never prepares—detailed, site-specific analyses of the potential environmental impacts of OCS oil and gas activities. CEQ recommends that BOEM "reexamine its NEPA implementation policies to ensure that its use of tiering is both clear and well-defined, and is not being used to limit site-specific environmental analysis."[23] The National Commission recommends that BOEM address

[19] *See, e.g.*, 40 C.F.R. § 1508.7 ("Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.").
[20] Government Accountability Office, GAO-10-276 Offshore Oil and Gas Development: Additional Guidance Would Help Strengthen the Minerals Management Service's Assessment of Environmental Impacts in the North Aleutian Basin (March 2010) at 21.
[21] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deep Water: The Gulf Oil Disaster and The Future of Offshore Drilling* (Jan. 2011), at 261.
[22] *Id.*
[23] Council on Envtl. Quality, Report Regarding the Minerals Management Service's National Environmental Policy Act Policies, Practices, and Procedures as They Relate to Outer Continental Shelf Oil and Gas Exploration and Development (Aug. 16, 2010), at 23.

the issue of tiering in the proposed NEPA handbook noted above.[24] Before deciding whether to proceed with any new leasing in Arctic waters, BOEM should commit to preparing full, site-specific environmental analyses for all OCS activities, and explain to the public how it will abide by its commitment.

B. Meaningful Stakeholder Engagement

Because offshore oil and gas development is an enormous industrial undertaking with significant impacts to both offshore and onshore ecosystems, BOEM should afford local communities a meaningful opportunity to express their concerns, opinions and suggestions for whether, when and how offshore oil development occurs. This is particularly true for residents of Arctic communities, who have developed significant knowledge and who depend on the ocean for subsistence harvest of marine mammals and fish.

To ensure there is meaningful opportunity for stakeholder involvement, BOEM should take into account the burden on Alaska Native communities that are buried in overlapping public comment periods for very technical documents which can be more than 1,000 pages each. In this case, BOEM's decision to have different comment deadlines for the PEIS and Proposed Program served only to increase confusion and undermine the public process. BOEM should strive to release documents with sufficient time for review by communities, and should coordinate internally and with sister agencies to reduce confusion and simultaneous comment periods.

In the past, BOEM's solicitation of input from local communities has largely been limited to poorly run and thinly attended *pro forma* public hearings. Many coastal communities in Alaska depend on marine resources for subsistence uses and have valuable traditional knowledge about those resources that can help to inform BOEM's decisions. The agency should more meaningfully engage local residents, tribes, marine mammal commissions, and other Alaska Native organizations in decisions concerning whether and how to lease and develop OCS lands. When scheduling public hearings in Arctic communities, BOEM should be aware of subsistence activities or other events and ensure that comment periods are timed so as to allow full participation by local residents. Further, BOEM should ensure that it conveys the importance and purpose of the hearings in advance. Merely holding hearings will not ensure that BOEM gets adequate advice and counsel from communities, tribes, and others who seek to improve the equality of the decisions made by the agency. In addition, merely holding hearings in a Native community does not constitute adequate government-to-government consultation.

We are pleased that the North Slope Borough is a cooperating agency in the preparation of the PEIS. The North Slope Borough offers an important voice and special expertise to the process. However, this participation alone will not satisfy BOEM's responsibility to engage local communities, especially tribal governments. President Obama has directed agencies to consult with tribes on decisions that affect them, consistent with Executive Order 13175. Effective consultation will require more than a hearing. BOEM should invite local communities to share traditional knowledge of resources and weather conditions and submit recommendations for whether, when, where, and how offshore drilling will occur. BOEM should incorporate that information and recommendations into its decisions.

[24] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deep Water: The Gulf Oil Disaster and The Future of Offshore Drilling* (Jan. 2011), at 261.

C. Regulatory Reform

BOEM should revise its OCS regulations—especially with respect to activities in the Arctic—before proceeding with additional oil and gas activity in the Arctic. The *Deepwater Horizon* disaster demonstrated vividly that our nation's approach to OCS oil and gas activities is fundamentally flawed. The National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling noted that "[t]o assure human safety and environmental protection, regulatory oversight of leasing, energy exploration, and production require reforms even beyond those significant reforms already initiated since the *Deepwater Horizon* disaster."[25] Oil spill response regulations have not been updated since the Commission issued its report.

While we acknowledge and appreciate the agency's progress on workplace safety regulations, BOEM has yet to implement all the necessary reforms to the OCS process. Among other things, BOEM should revise its regulations to require the availability of specific baseline science information prior to making any area of the OCS available for leasing; the identification and protection of important ecological areas before leasing and exploration, and the implementation of Arctic-specific oil spill prevention, preparedness, and response standards. BOEM should not proceed with any new lease sale or exploration activity until it reforms its regulations and significantly improves spill response standards so that they better protect marine ecosystems and subsistence resources.

V. THE 2012–2017 LEASING PROGRAM SHOULD BE PART OF A NEW APPROACH TO CONSERVATION AND MANAGEMENT OF INDUSTRIAL ACTIVITIES IN THE ARCTIC

DOI should use the Proposed Program and PEIS to explain how its management of oil and gas activities is part of a larger, holistic approach to conservation and management of industrial activities in the Arctic. In addition to addressing issues related to oil and gas activities in the Arctic, this approach should consider the broad array of challenges that face the rapidly changing Arctic. The Administration should think holistically about what the American people want and need from the Arctic region and how best to achieve those competing and complementary goals. We should craft a vision that helps define what we want the Arctic to look like in the future. The 2012–2017 Program can be an important piece of thinking about how we, the American public, want the Arctic region to look in the future.

In the past, BOEM has viewed the ocean through the lens of oil and gas development. The agency's decisions about offshore oil and gas activities—which may affect broad areas of the ocean and impact other sectors of the economy—were not integrated with decisions about other ocean uses. The result has been fragmented and inefficient management and a failure to prioritize the health of ocean and coastal ecosystems. This "silo" approach to management sets the stage for a loss of ecosystem resilience, environmental degradation, and possible ecosystem collapse. Unless BOEM changes its practice, current users of marine resources in the U.S. Arctic Ocean, principally subsistence hunters, are likely to experience a decline in resources as industrial development expands. The intense pressures of climate change, ocean acidification, and expansion of industrial activities require a shift to more holistic, ecosystem-based management in the Arctic. The Proposed Program should set the stage for this new approach.

[25] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deep Water: The Gulf Oil Disaster and The Future of Offshore Drilling* (Jan. 2011), at vii.

In July 2011, the President established the Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska ("Working Group") to, among other things, "engage in longterm planning," facilitate sharing of scientific and cultural knowledge and traditional information, and coordinate scheduling of regulatory and permitting activities in the Arctic.[26] The Proposed Program should clarify how BOEM will engage with the Working Group. Although the Proposed Program claims that the Arctic leasing schedule is "consistent" with the Executive Order that established the Working Group,[27] it fails to explain what role BOEM will play in the Working Group or how participation in the Working Group process will inform BOEM decision-making about OCS leasing and related activities in the Arctic. The draft PEIS does not mention the Working Group at all. BOEM should revise the Proposed Program and the PEIS to provide the public more information about how BOEM will use the Working Group to coordinate with other federal agencies, share information, and inform management decisions about leasing activities in the Arctic. We encourage BOEM to use the Working Group process to promote more coordinated, holistic, long-term planning in the region.

BOEM should also modify the Proposed Program and PEIS to address more fully the 2010 National Ocean Policy. In July 2010, the President signed Executive Order 13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes.[28] That executive order established that it was the nation's policy to, among other things, "protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes" and "improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies."[29] Pursuant to Executive Order 13547, federal agencies must implement the National Ocean Policy and its stewardship principles "to the fullest extent consistent with applicable law."[30] As a practical matter, this means that BOEM should take steps to ensure that sufficient baseline scientific information, appropriate monitoring programs, and adequate environmental protections are in place—and that other uses, such as subsistence uses, have been fully considered—before scheduling or holding additional lease sales in the Arctic. BOEM should explain how the 2012–2017 Proposed Program protects, maintains, and restores the health of vulnerable Arctic marine ecosystems to the fullest extent possible consistent with existing law, and how the Proposed Program improves the resiliency of Arctic marine ecosystems to the fullest extent possible consistent with existing law.

Executive Order 13547 also created the National Ocean Council (NOC), an interagency body charged with providing direction to federal agencies to ensure that federal agencies implement the National Ocean Policy and related objectives. The NOC is a useful way for BOEM to take a broader view as it conducts planning and management activities on the OCS. Like engagement with the Working Group, participation in the NOC should facilitate improved communication and coordination among different agencies with respect to decisions about oil and gas and other industrial activities in the Arctic, and could lead to more holistic planning in the Arctic. The Proposed Program and PEIS should explain how BOEM will use the NOC process to help inform decisions about OCS leasing and related industrial activities in the Arctic.

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[26] Executive Order 13580: Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska (July 12, 2011).
[27] Bureau of Ocean Energy Management, Proposed Outer Continental Shelf Oil and Gas Leasing Program 2012–2017 (Nov. 2011), at xii.
[28] Executive Order 13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes (July 19, 2010).
[29] *Id.*
[30] *Id.*

The 2012–2017 Program should lay a foundation for more comprehensive, integrated planning that considers the interconnectedness of marine ecosystems and industrial activities in the Arctic. To facilitate this broader thinking, BOEM's Proposed Program and PEIS should incorporate more information about the Working Group, National Ocean Policy, and National Ocean Council.

CONCLUSION

We urge DOI to modify the 2012–2017 Program and the accompanying PEIS to take steps to implement this Administration's public commitment to a new approach to conservation and energy production in the Arctic—an approach based on precaution, preparedness, and good science. The foregoing comments identify a number of changes that DOI should make to the PEIS and Proposed Program to help ensure that OCS oil and gas operations will be conducted safely and in a manner that does not threaten the health of Arctic marine ecosystems or continued viability of the subsistence way of life.

To allow time for meaningful change, DOI should not schedule any lease sales in the Beaufort Sea or Chukchi Sea planning areas in the 2012–2017 Program. At a minimum, if DOI continues to consider holding Arctic lease sales during the upcoming five-year program, it should modify the Proposed Program and PEIS to ensure that any future lease sales are consistent with the stated commitments of DOI leadership. Specifically, DOI should change the Proposed Program and PEIS so that they:

- Significantly expand existing deferrals, include additional deferrals for areas known to be important for subsistence or ecological reasons, and incorporate other restrictions on oil and gas activities to protect biological resources;

- Preclude areawide leasing for any future Arctic lease sales and instead require the Bureau of Ocean Energy Management (BOEM) to develop and implement a more targeted approach to Arctic leasing;

- Make future Arctic lease sales contingent on the development, implementation, and use of a long-term scientific research and monitoring program; and

- Make future Arctic lease sales contingent on improved oil spill preparedness and the demonstration of effective response capability.

In addition, DOI should address long-standing problems with its environmental analysis pursuant to NEPA, commit to meaningful stakeholder participation, and move swiftly to enact additional OCS reforms. Finally, DOI should ensure that the 2012–2017 Program is a part of a holistic planning effort that looks beyond oil and gas to consider multiple sectors and acknowledges the important connections between marine, coastal, and terrestrial areas in the Arctic.

Going forward, decisions about whether and how to authorize oil and gas activities in the U.S. Arctic Ocean must be based on sound scientific information, thoughtful planning, and a demonstrably effective safety, spill containment, response, and rescue capability.

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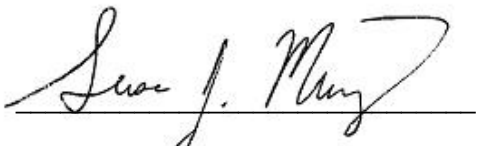

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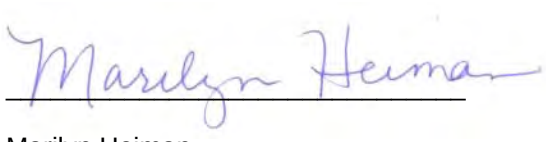

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ATTACHMENT A

Known Subsistence Areas and Important Ecological Areas That Should Be Deferred From Leasing in the 2012–2017 Leasing Program

Impacts from oil and gas activities may adversely affect the subsistence resources upon which many Alaska Native communities rely (*see, e.g.*, Minerals Management Service, Chukchi Sea Oil and Gas Lease Sale 193 Final Environmental Impact Statement (OCS EIS/EA MMS 2007-026) at II-34-39 and IV-157). For example, noise from seismic operations, exploration drilling, and/or development and production activities may cause bowhead whales to avoid traditional feeding or migration areas, making them more difficult to hunt. Aircraft associated with oil and gas operations may negatively affect other subsistence resources, including polar bears, walrus, seals, caribou, and coastal and marine birds, making it more difficult for indigenous hunters to obtain these resources. Water pollution could release toxins that bioaccumulate in top predators, including humans. A large oil spill could have a disastrous impact on a range of subsistence resources.

Subsistence resources have long provided a source of healthy food for North Slope communities. Subsistence foods are high in nutritional value and protect against health problems like high blood pressure, obesity, diabetes, and cardiovascular disease. For many Native Alaskans, subsistence hunting is an important aspect of their culture. Negative impacts to subsistence resources, such as reduced abundance or contaminated habitats, could decrease food security, encourage consumption of store-bought foods with less nutritional value, and deteriorate the cultural fabric of Alaska Native communities. Thus, when industrial activities adversely affect subsistence resources, they also cause harm to the people who depend on those resources. For all these reasons, BOEM must take a careful look at potential impacts to subsistence resources and show their commitment towards ensuring these resources are protected at the earliest stage possible in the planning process.

Protection of subsistence resources and subsistence practices requires sound environmental management. BOEM should take immediate action to remove areas of ecological or cultural importance from the 2012–2017 Program in the Beaufort and Chukchi Seas. Doing so at this stage of the planning process will set clear, transparent public policy. Establishing subsistence and ecological deferrals at the first stage of the OCS leasing process will provide certainty for government agencies, industry and community residents alike regarding which areas of the OCS will be protected from leasing because of the vital habitat and food production values they provide. Without that certainty at the beginning of the OCS process, all stakeholders end up wasting time and resources. There is no legal, scientific or political justification not to remove these areas at this stage of the OCSLA process or to mandate that any future leases include specific stipulations and drilling restrictions such as time/area closures or mitigation measures during species migrations in order to protect subsistence resources.

Important Subsistence Areas (Map 1)

Indigenous residents of the Chukchi and Beaufort seas depend on resources from the ocean to maintain a subsistence way of life. In addition, they have valuable knowledge about their environment and its resources that can help inform planning and decision-making. At the end of the day, it is the residents of the Arctic who will live with the consequences of Arctic OCS policy and management decisions. Thus, in order to ensure that Arctic communities subsistence resources are adequately protected, we strongly recommend that BOEM designate expanded

and additional subsistence use areas as deferral areas excluded from future lease planning areas in the Chukchi and Beaufort Sea program areas in the final 2012–2017 Program and PEIS. These recommendations have been made by local communities repeatedly during the multi-year public process. The former Minerals Management Service funded research that document subsistence use areas supporting those areas recommended for deferral by communities.[1] Furthermore, in the Notice of Intent for the 2012–2017 Program, BOEM specifically indicated that it was seeking recommendations on deferral areas. There is ample information to support deferring subsistence areas relied upon by Arctic coastal communities.

We compiled existing subsistence hunting information from Kaktovik, Nuiqsut, Barrow, Wainwright, Point Lay, and Point Hope on a single map which shows the extent of hunting areas for those six Arctic coastal communities (Map 1). Data included hunting areas for bowhead whale, beluga whale, polar bear, seals, walrus, and waterfowl. Data sources included studies by Braund,[2] Wainwright Traditional Council and The Nature Conservancy,[3] Braund and Burnham,[4] and Pedersen.[5] The data documents local subsistence use throughout an area 25 miles to over 100 miles offshore of the six villages. Map 1 shows subsistence use areas that BOEM should defer and remove from the program areas included in the final Program and PEIS.

Wildlife Concentration Areas

The maps described below depict important concentration areas for Arctic marine wildlife. Data were based on a large number of datasets summarized in the *Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas*[6] and further refined by Oceana and North Slope Borough wildlife managers and subsistence hunters.[7] These maps provide scientific justification for excluding important wildlife concentration areas from the final Program and PEIS.

Bird Concentration Areas in the Arctic (Map 2)
This map depicts seabird and waterbird abundance and proposed globally significant Important Bird Areas (IBAs), which are places that regularly hold greater than 1% of the global population of a species. Using the North Pacific Pelagic Seabird Database (courtesy of USGS),[8] we summed and displayed the total abundance of all species present in the Arctic OCS program areas. Also shown are proposed IBAs for a variety of species. [9] Hotspots are shown along most

[1] Braund, S. 2010. Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow. U.S. Department of the Interior, Minerals Management Service. Alaska OCS Region, Environmental Studies Program. MMS OCS Study Number 2009-003. Anchorage, Alaska.
[2] Ibid.
[3] Wainwright Traditional Council (WTC) and The Nature Conservancy (TNC). 2008. Wainwright Traditional Use Area Conservation Plan Map Book.
[4] Braund, S., and D. Burnham. 1984. Subsistence Economics and Marine Resource Use Patterns. In Barrow Arch Environment and Possible Consequences of Planned Offshore Oil and Gas Development. Prepared by LGL Ecological Research Associates, Inc. Prepared for U.S. Department of Interior, Minerals Management Service and Department of Commerce, NOAA. Anchorage, Alaska.
[5] Pedersen, S. 1979. Regional Subsistence Land Use, North Slope Borough, Alaska. Occasional Paper No. 21 Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks, Alaska and Conservation and Environmental Protection, North Slope Borough, Barrow, Alaska.
[6] Smith, M.A. 2010. Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas. Audubon Alaska and Oceana: Anchorage.
[7] Oceana. 2011. Whale, Ice Seal, and Walrus Concentration Areas. GIS shapefiles. Juneau, Alaska.
[8] Drew, G. and J. Piatt. 2011. North Pacific Pelagic Seabird Database, version 2.0. Microsoft Access database. US Geological Survey. Anchorage, Alaska.
[9] Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, and I. Stenhouse. Unpublished Report. A Standardized Method for Mapping Marine Important Bird Areas Using At-sea and Colony-based Survey Data. Audubon Alaska. Anchorage, Alaska.

of the Chukchi and Beaufort coast, and at Hanna Shoal and Barrow Canyon. IBAs are found at Cape Lisburne, Ledyard Bay, Icy Cape, Peard Bay, Barrow Canyon, Smith Bay, and Camden Bay.

Polar Bear Concentration Areas in the Arctic (Map 3)
Two populations of polar bears, the Southern Beaufort Sea and the Chukchi/Bering Sea, den and feed in the US Arctic. The concentration areas shown here are based on two publications. The US Geological Survey has satellite-tracked these two populations for several years,[10] and published spatial data representing the 50% core use area for these bears. Kalxdorff[11] documented local knowledge of polar bear concentration areas for feeding and denning. Together these two datasets represent the known primary areas for offshore polar bear feeding and denning within the Arctic OCS program areas.

Whale Concentration Areas in the Arctic (Map 4)
Three whale species regularly occur in the US Arctic. Bowhead and beluga whales migrate north offshore of the Chukchi Sea coast in the spring, feed primarily in Canadian waters during the summer, then migrate west offshore of the Beaufort Sea coast in the fall. Barrow Canyon is a very high concentration area for bowhead whales feeding in the fall. For gray whales, the Chukchi Sea is their final destination, the end of an annual migration from Mexico. Beginning with data compiled in the *Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas*, Oceana worked with local wildlife managers to update whale concentration areas based on current research and local knowledge. The latest satellite-tracking information for bowhead whale migration was a primary source of information.[12] The updated information is shown here, including concentration areas for bowhead and beluga whales, and high concentration areas for all three species. Areas of particularly high conservation concern include the Chukchi lead system, Barrow Canyon, Peard Bay, Hanna Shoal, and the shelf break offshore in the Beaufort Sea.

Pinniped Concentration Areas in the Arctic (Map 5)
Three species of ice seals (ringed, bearded, and spotted) and walrus are known to concentrate in high numbers within the Arctic OCS program areas. Beginning with data compiled in the *Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas*, Oceana worked with local wildlife managers to update ice seal and walrus concentration areas based on current research and local knowledge. The latest satellite-tracking information for walrus migration was a primary source of information.[13] The map displays the overlap of concentration areas for walrus, ringed, bearded, and spotted seals in the Chukchi Sea, and bearded and ringed seals in the Beaufort Sea. The highest numbers of species are found along the Chukchi coast from Ledyard Bay to Peard Bay, with all four species present near Kasegaluk Lagoon. Walrus concentrate at and travel between Hanna and Herald Shoal in mid-s to late summer.

Wildlife Concentration Areas in the Arctic (Map 6)
This summary map overlaps eight individual species (bowhead, beluga, and gray whales, spotted, ringed, and bearded seals, walrus and polar bear) and globally significant IBAs. All

[10] Amstrup, S. C., G. M. Durner, I. Stirling, and T. L. McDonald. 2005. Allocating harvests among polar bear stocks in the Beaufort Sea. Arctic 58:247-259.
[11] Kalxdorff, S.B. 1997. Collection of local knowledge regarding polar bear habitat use in Alaska. Technical Report MMM 97-2. Marine Mammals Management, US Fish & Wildlife Service Region 7. Anchorage, Alaska.
[12] Quakenbush, L. 2009. Summary maps of fall movements of bowhead whales in the Chukchi Sea. Alaska Department of Fish and Game. Fairbanks, Alaska.
[13] US Geological Survey. 2011. Walrus radio-tracking in the southern Chukchi Sea 2011. US Geological Survey. Anchorage, AK.

colored areas on the map are a concentration area for one or more species of concern. Areas of highest overlap include the Chukchi lead system, the Beaufort shelf, and Hanna Shoal. A coastal buffer 50 to 60 miles offshore in the Chukchi Sea, and variable from 15 to 60 miles offshore in the Beaufort Sea, as well as Hanna Shoal, captures the areas of highest conservation concern within the Arctic OCS program areas.

Place-based Ecological Areas

Given our current level of understanding of ecological functioning in the Chukchi and Beaufort seas, several regions of sensitive marine habitat should be excluded from future lease planning areas, including at a minimum Hanna and Herald Shoals, Barrow Canyon, and the Chukchi Sea ice lead system. By excluding these areas from the final Program and PEIS, BOEM will proactively protect areas that are important to subsistence resources. Below, we provide some of the rationale as to why these areas are ecologically important. We would like to emphasize that identification of important ecological areas should be an ongoing part of an integrated, long-term scientific research and monitoring program for the Arctic and not something that happens once. The areas that we recommend for exclusion are based on current knowledge, but a research and monitoring program could identify additional areas from which leasing should also be excluded.

Hanna and Herald Shoals

During a time of rapid change, Hanna and Herald shoals appear to be important sea ice areas over the long term. These shallow areas divert warm water masses flowing northward from the Bering Sea, holding colder water long into the summer season.[14] As a result, sea ice persists there longer into the season as well.[15] A pack ice feature near Hanna Shoal called Post Office Point was historically a meeting point known for its reliable ice all summer long. The area was given its name because ships would meet at this dependable location to exchange mail and information at sea.[16] Recent warming has changed the structure of this persistent lobe of ice, and the minimum September sea ice extent has come that far south only once in the last decade.[17] In comparison, Hanna Shoal and Post Office Point were ice-covered seven out of ten years in the 1980s and four out of ten years in the 1990s. Nonetheless, Post Office Point and Hanna and Herald shoals continue to be areas of persistent ice floes, which are very important for ice-associated wildlife. Although the pack ice is expected to further recede with climate change, the seafloor topography is likely to continue to divert warm waters. Hanna and Herald shoals have the potential to provide substantial lingering ice floes well into the future compared to other areas in the region,[18] and may become a last stronghold for some ice-associated species. Recent satellite-tracking data emphasizes the importance of the Hanna Shoal area

[14] Weingartner, T., K. Aagaard, R. Woodgate, S. Danielson, Y. Sasaki, and D. Cavalieri. 2005. Circulation on the north central Chukchi Sea shelf. Deep Sea Research Part II: Topical Studies in Oceanography 52:3150-3174.
[15] Martin, S. and R. Drucker. 1997. The effect of possible Taylor columns on the summer ice retreat in the Chukchi Sea. Journal of Geophysical Research 102:10473-10482; Spall, M.A. 2007. Circulation and water mass transformation in a model of the Chukchi Sea. Journal of Geophysical Research 112.
[16] Aldrich, H.L. 1915. Lands in the Arctic: what may be beyond ice as old as the year one. New York Times. http://query.nytimes.com/mem/archive-free/pdf?_r=1&res=9C00E0D81138E633A25757C2A96F9C946496D6CF . Accessed October 2008.; Bockstoce, J.R. 1986. Whales, men and ice: the history of whaling in the western Arctic. University of Washington Press, Seattle, Washington.
[17] National Snow and Ice Data Center. 2010. Monthly sea ice extent. GIS shapefile. ftp://sidads.colorado.edu/DATASETS/NOAA/G02135/shapefiles/. Accessed January 2010.
[18] Spall, M.A. 2007. Circulation and water mass transformation in a model of the Chukchi Sea. Journal of Geophysical Research 112.

during bowhead whale migration in the fall[19] and both shoals for walrus foraging and resting, especially during the summer.[20]

Barrow Canyon

Barrow Canyon straddles the boundary between the Beaufort and Chukchi seas. This submarine canyon runs along the Chukchi Sea coast, approximately 5 to 15 miles offshore from Point Franklin to Point Barrow, then cuts through the shelf break and drains into the Canada Basin. It is 150 miles long and about 15 miles wide, with a depth that is 1200 feet below the surrounding cliffs and peaks.[21] The Alaska Coastal Current follows the Chukchi Sea coast through Barrow Canyon into the 4000-meter deep Canada Basin; part of the water mass flows east around Point Barrow eventually dispersing into the Beaufort Gyre.[22] Occasionally warmer water originating in the Atlantic flows the other direction (southwestward) through the canyon,[23] making this a place where the Atlantic and Pacific meet. Complex water mass mixing, upwelling, and sea ice dynamics make the waters around Point Barrow and Barrow Canyon very productive compared to other nearby areas and the oligotrophic Canada Basin.[24]

Pseudocalanus copepods and euphausiids concentrate off Point Barrow to the shelf break,[25] serving as a very important food source for bowhead whales feeding there in the fall.[26] Benthic resources are not well known in this area, but were dominated by brittle stars and Opilio crab in recent surveys.[27] The southern canyon is essential fish habitat for saffron cod.[28] Much of the southern nearshore canyon is open water through the winter, and the northern offshore portion has concentrated ice present for about nine months,[29] making this area accessible to migrating wildlife most of the year. As wildlife move between the Beaufort and Chukchi seas, they must round Point Barrow and pass over Barrow Canyon. The area is a migration bottleneck for birds and marine mammals, which pass there during both spring and fall migration.

Barrow Canyon is important habitat for Arctic marine mammals. It is a concentrated feeding area for polar bears[30] and is designated critical feeding habitat by the FWS. Ringed seals, the

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[19] Quakenbush, L. 2009. Summary maps of fall movements of bowhead whales in the Chukchi Sea. Alaska Department of Fish and Game. Fairbanks, Alaska.

[20] US Geological Survey. 2011. Walrus radio-tracking in the southern Chukchi Sea 2011. US Geological Survey. Anchorage, AK.

[21] Rozell, N. 1996. Barrow Canyon: Where Atlantic Meets Pacific. Article # 1298. UAF Geophysical Institute: Fairbanks, AK.

[22] UAF (University of Alaska – Fairbanks) Institute of Marine Science. 2009. Chukchi Sea Circulation. Digital Map. Accessed at http://www.ims.uaf.edu/chukchi/. March.

[23] Garrison, G.R. and P. Becker. The Barrow submarine canyon: A drain for the Chukchi Sea. Journal of Geophysical Research 81(24):4445-4453.

[24] Mathis, J.T., D.A. Hansell, D. Kadko, N.R. Bates, and L.W. Cooper. 2007. Determining net dissolved organic carbon production in the hydrographically complex Western Arctic Ocean. Limnology and Oceanography 52(5):1789-1799.

[25] NOAA (National Oceanic and Atmospheric Administration). 1988. Bering, Chukchi, and Beaufort Seas Coastal and Ocean Zones Strategic Assessment Data Atlas.

[26] Moore, S.E. and Laidre, K.L. 2006. Trends in sea ice cover within habitats used by bowhead whales in the Western Arctic. Ecological Applications, 16(3):932-944.

[27] Rand, K.M., and L.A. Logerwell. 2011. The first demersal trawl survey of benthic fish and invertebrates in the Beaufort Sea since the late 1970s. Polar Biology 34:475-488.

[28] NMFS (National Marine Fisheries Service). 2005. Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska. NOAA NMFS, Alaska Region: Anchorage, AK.

[29] Eicken, H., L.H. Shapiro, A.G. Gaylord, A. Mahoney, and P.W. Cotter. 2005. Mapping and characterization of recurring spring leads and landfast ice in the Beaufort and Chukchi seas. OCS Study MMS 2005-068. MMS: Anchorage, Alaska.

[30] Kalxdorff, S. 1997. Collection of Local Knowledge Regarding Polar Bear Habitat Use in Alaska. Technical Report MMM97-2. USFWS, Marine Mammal Management: Anchorage, AK.

primary food source of polar bears, and bearded seals, a secondary food source, also concentrate in the Barrow Canyon area from about July to September.[31] This is also a concentrated feeding area for female walrus and their young in June to October.[32] Bowhead whales migrate northeast up the Chukchi coast in spring, passing Point Barrow and Barrow Canyon in April and May before heading farther offshore on their way to the Canadian Beaufort Sea for summer feeding. In the fall, they follow the Alaskan Beaufort Sea coast back west and stop at Barrow Canyon for fall feeding between late August and early November.[33] Much like bowhead whales, beluga whales pass through this area twice per year during migration and concentrate in large numbers in the fall to feed on fish.[34]

Nearshore areas by Point Barrow are marine feeding areas for many species of birds, including Yellow-billed and Red-throated Loons, Spectacled, Steller's, King, and Common Eiders, Long-tailed Ducks, Northern Fulmars, and Short-tailed Shearwaters.[35] There are IBAs for multiple species at Barrow Canyon. Within the Barrow Canyon area there are proposed IBAs for King Eider, Arctic Tern, Long-tailed Duck, and Red Phalarope.[36] Like marine mammals, these and other bird species migrate through this area twice per year when moving between the Beaufort and Chukchi seas in spring and fall.

A portion of Barrow Canyon is currently not open to leasing, and no leases have been sold in the areas that are open. However, this area is frequented by ships, and has a very low to medium human impact score.[37] In addition, it is "downstream" of the lease areas, so particular attention should be given to potential pollution impacts, including oil spills.

Chukchi Sea Lead System

The Chukchi Sea lead system along the entire Alaskan coastline is an important ecological area which serves as an essential corridor for migrating species such as the bowhead whale, walrus, ice seals, waterfowl, gulls, and seabirds, and in turn for indigenous subsistence hunters.

The wind and currents in the Chukchi Sea allow for an area of open water leads that create an important zone between the landfast and pack ice. As a result, this area provides an important migration corridor for animals in spring and fall. Most of the bird species that migrate to/from the Arctic slope breeding grounds pass through the lead system.[38] There are multiple globally significant IBAs located along this system.[39] Within the Chukchi lead system there are several

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[31] NOAA (National Oceanic and Atmospheric Administration). 1988. Bering, Chukchi, and Beaufort Seas Coastal and Ocean Zones Strategic Assessment Data Atlas.
[32] *Id.*
[33] ADFG (Alaska Department of Fish and Game). 2011. Bowhead Movements May 2006-July 2010. Marine Mammal Program: Juneau, AK. Accessed at http://www.adfg.alaska.gov/index.cfm?adfg= marinemammalprogram.bowheadmovements. March 25.
[34] NOAA (National Oceanic and Atmospheric Administration). 1988. Bering, Chukchi, and Beaufort Seas Coastal and Ocean Zones Strategic Assessment Data Atlas; Suydam, R. and ADFG. 2004. In North Slope Borough. 2006. North Slope Borough Area Wide Comprehensive Plan.
[35] Smith, M.A. 2010. Arctic marine synthesis: altas of the Chukchi and Beaufort seas. Audubon Alaska and Oceana, Anchorage, Alaska.
[36] Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, and I. Stenhouse. Unpublished Report. A Standardized Method for Mapping Marine Important Bird Areas Using At-sea and Colony-based Survey Data. Audubon Alaska. Anchorage, Alaska.
[37] Halpern, B., S. Walbridge, K. Selkoe, C. Kappel, F. Micheli, C. D'Agrosa, et al. 2008. A global map of human impact on marine ecosystems. Science 319:948-952.
[38] Smith, M.A. 2011. Place-based Summary of the Arctic Marine Synthesis. Audubon Alaska Anchorage, Alaska.
[39] Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, and I. Stenhouse. Unpublished Report. A Standardized Method for Mapping Marine Important Bird Areas Using At-sea and Colony-based Survey Data. Audubon Alaska. Anchorage, Alaska.

IBAs which are recognized or proposed for Spectacled and King eiders, Black-legged Kittiwakes, Glaucous Gulls, Pomerine Jaegers, Long-tailed Ducks, Arctic Terns, Sabine's Gulls, Brant, and Kittlitz's Murrelet. Within the two program areas, the highest known densities for all bird species combined is found in the Chukchi lead system near Peard Bay, closely followed by concentrations in Ledyard Bay, Kasegaluk Lagoon, and offshore of Cape Lisburne.

It is also an important area for breeding and feeding polar bears because of the high concentration of ice seals, particularly ringed seals. Pacific walrus also utilize this zone, particularly after the sea ice retreat in late summer. They make trips to/from Hanna Shoal once they haul out on the shoreline off Icy Cape, and then forage on benthic organisms until they migrate along the Chukchi coast south.[40] The Chukchi Sea lead system is very important for endangered migrating bowhead whales. Almost the entire population travels along the Chukchi Sea coast during spring months, from March through June.

Furthermore, the National Oceanic and Atmospheric Administration (NOAA) has recognized the ecological and cultural importance of the Chukchi Sea lead system. In a letter to BOEM regarding the Chukchi Lease Sale 193 NOAA recommended that BOEM should designate a deferral area constituting a buffer of 60 miles from the Chukchi Sea shoreline. This recommended buffer would exclude oil and gas activity to protect the lead system and the important wildlife concentration that exists there. We agree with NOAA's recommendation and urge BOEM to adopt this buffer as a deferral in the final Program and PEIS.

Recommendations for Deferral Areas and Restriction Zones (Map 7)

The Marine Mammal Protection Act (MMPA) requires that any incidental take authorized will not have "an unmitigatable adverse impact on the availability of such species or stock for taking for subsistence uses" by Alaska Natives (16 U.S.C. § 1371(a)(5)(D)(i)(II)). BOEM must ensure oil and gas activities do not reduce the availability of any affected population or species to a level insufficient to meet subsistence needs (50 C.F.R. § 216.103). This is particularly important because BOEM consults with NMFS about potential impacts to marine mammals in the EIS process. One way for BOEM to ensure that oil and gas activities will not negatively impact marine mammal resources is for BOEM to identify areas in the Beaufort and Chukchi planning areas, at this stage of the OCSLA process, that require specific restrictions and/or mitigation measures. For example, restrictions may include time/area restrictions during important migratory periods or in areas that fall upstream/downstream of important ecological areas. BOEM should also require mitigation measures for important wildlife areas at this stage of the leasing process.

We recommend that BOEM include, in the final Program and PEIS, seasonal and migration restrictions to oil and gas activity on the Beaufort Sea shelf. This would be the orange lease blocks represented in Map 7. This area is important to migrating bowhead whales in the spring and beluga whales in the spring and fall, especially September.[41] BOEM should use the five-year program to require oil and gas operators to cease all industrial activity in these regions during these migration periods and to require protective mitigation measures during times when activities are allowed.

[40] Jay, C.V., A.S. Fischbach, and A.A. Kochnev. 2011. Walrus foraging areas in the Chukchi Sea during years of scarce summer sea ice. 19th Biennial Conference for the Society for Marine Mammalogy, November 26 - December 3, 2011, Tampa Bay, FL, USA.
[41] Smith 2011 ibid.

BOEM should also use the five-year program to bolster the Alaska Eskimo Whaling Commission Conflict Avoidance Agreement process, including the seasonal and temporal closures designed by the whaling captains in cooperation with offshore operators to protect subsistence hunting. BOEM should work with NMFS, North Slope communities, the Alaska Eskimo Whaling Commission, other marine mammal commissions, and other Alaska Native organizations to develop an alternative for the 2012–2017 Program and PEIS designed to ensure that oil and gas operations do not impede or impact subsistence activities. If BOEM proceeds with Arctic leases, the agency should consider and incorporate additional protective measures at the lease sale stage, before issuing any new leases. Furthermore, BOEM should create additional seasonal management areas to protect important bowhead feeding and migratory corridors in the Beaufort Sea (e.g., Map 4.)

In summary, we recommend that BOEM include in the final Program and PEIS additional deferral areas for important subsistence areas and the areas of the Chukchi and Beaufort seas that, given our current understanding, will help protect those important subsistence resources. At a minimum, the areas identified by Braund[42] should be included in the deferral, as well as Hanna and Herald Shoal, Barrow Canyon, and the Chukchi Sea lead system. The process for identifying ecologically important areas should be adaptive; as we gain a better understanding of the Arctic Seas, those areas deemed important should be included in future deferrals. Furthermore, we recommend that BOEM act at this stage of the OCSLA process to implement additional seasonal and time/area closures and other mitigation measures for those areas that have high concentrations of wildlife. BOEM should established and included these protections in the final 20121–2017 Program and PEIS.

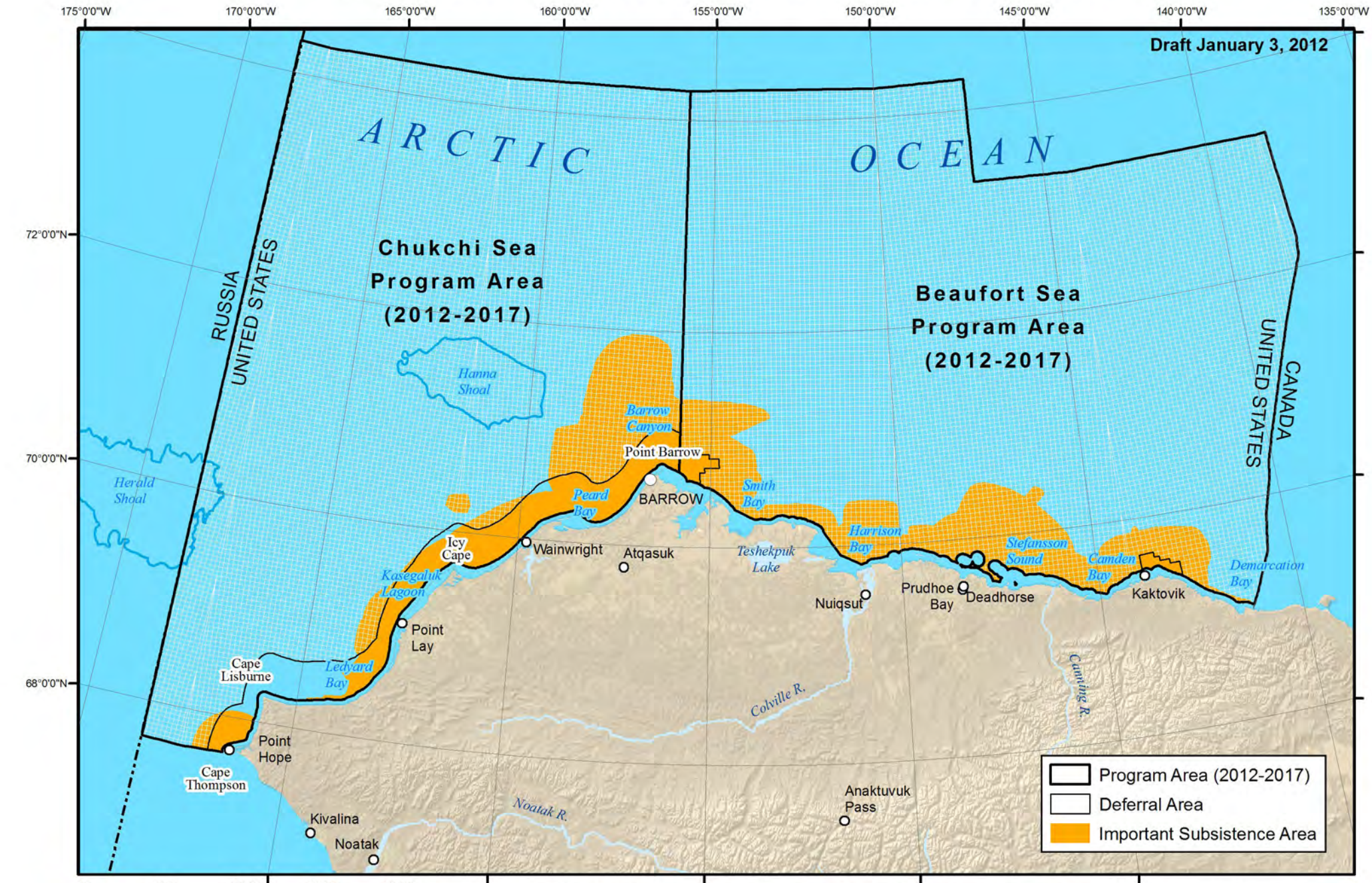
[42] Braund, S. 2010. Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow. U.S. Department of the Interior, Minerals Management Service. Alaska OCS Region, Environmental Studies Program. MMS OCS Study Number 2009-003. Anchorage, Alaska.

Attachment A

Map 1

“Important Subsistence Areas in the Arctic Ocean”

Important Subsistence Areas in the Arctic Ocean



*This map reflects the revised 2012–2017 OCS Arctic Program Areas, which include an additional 70,000 square miles of leasing blocks compared to the current 2007–2012 boundaries.

Braund, S. 2010. Subsistence Mapping of Nuiqsut, Kaktovik, and Barrow. U.S. Department of the Interior, Minerals Management Service. Alaska OCS Region, Environmental Studies Program. MMS OCS Study Number 2009-003. Anchorage, Alaska.

Braund, S., and D. Burnham. 1984. Subsistence Economics and Marine Resource Use Patterns. In Barrow Arch Environment and Possible Consequences of Planned Offshore Oil and Gas Development. Prepared by LGL Ecological Research Associates, Inc. Prepared for U.S. Department of Interior, Minerals Management Service and Department of Commerce, NOAA. Anchorage, Alaska.

Pedersen, S. 1979. Regional Subsistence Land Use, North Slope Borough, Alaska. Occasional Paper No. 21 Anthropology and Historic Preservation, Cooperative Park Studies Unit, University of Alaska, Fairbanks, Alaska and Conservation and Environmental Protection, North Slope Borough, Barrow, Alaska.

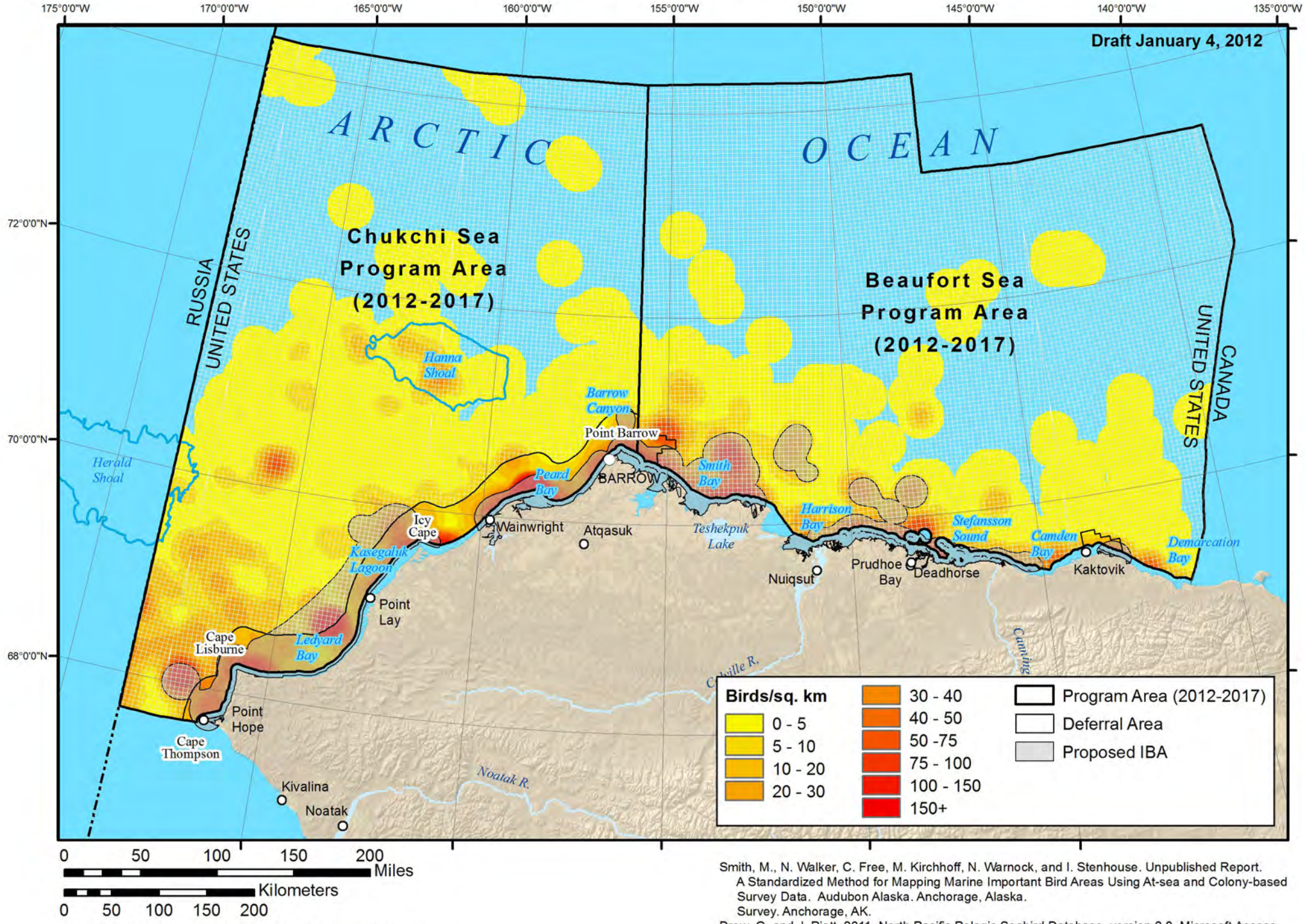
Wainwright Traditional Council (WTC) and The Nature Conservancy (TNC). 2008. Wainwright Traditional Use Area Conservation Plan Map Book.

Attachment A

Map 2

“Bird Concentration Areas in the Arctic Ocean”

Bird Concentration Areas in the Arctic Ocean



*This map reflects the revised 2012–2017 OCS Arctic Program Areas, which include an additional 70,000 square miles of leasing blocks compared to the current 2007–2012 boundaries.

Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, and I. Stenhouse. Unpublished Report. A Standardized Method for Mapping Marine Important Bird Areas Using At-sea and Colony-based Survey Data. Audubon Alaska. Anchorage, Alaska.
Survey. Anchorage, AK.

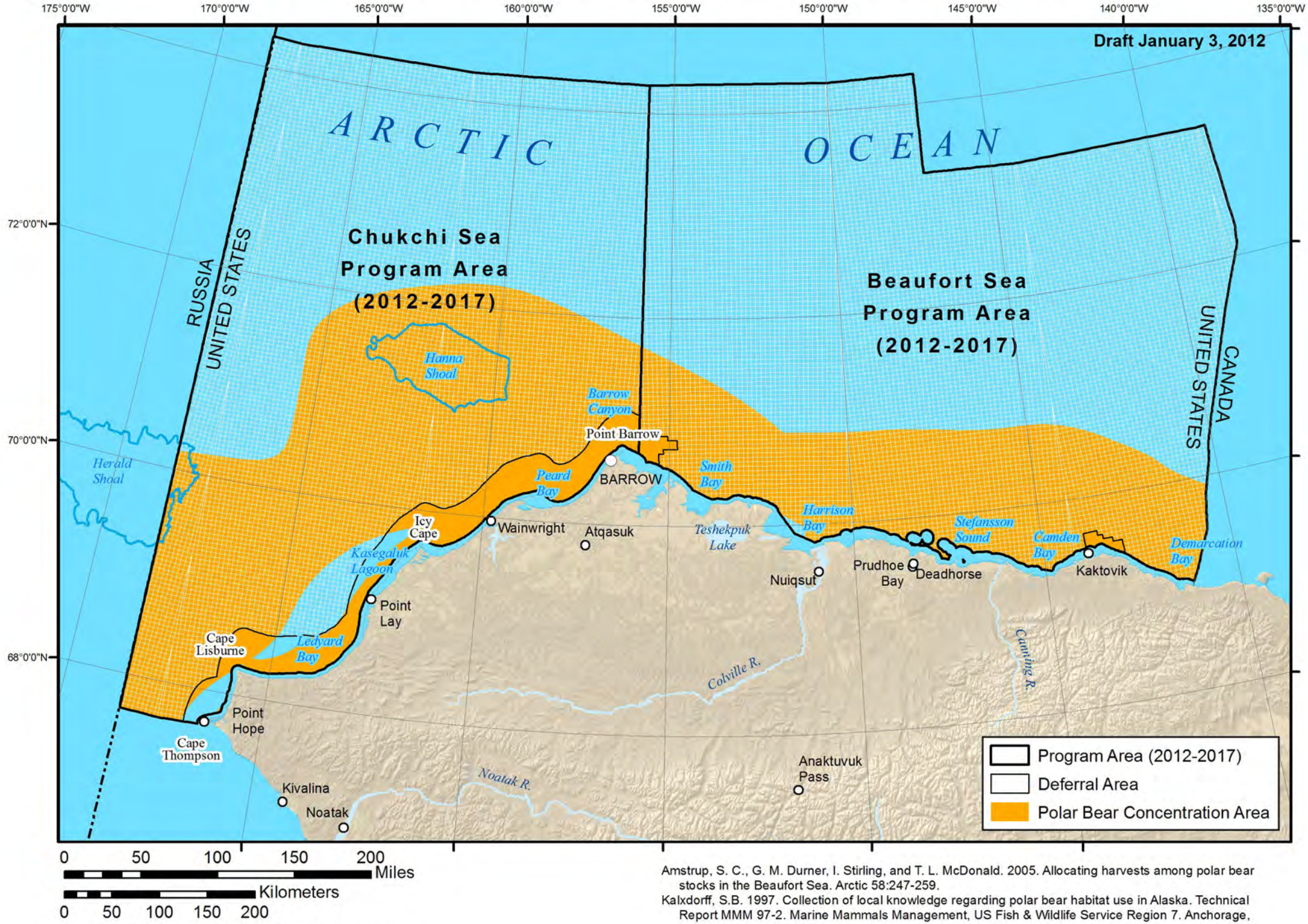
Drew, G. and J. Piatt. 2011. North Pacific Pelagic Seabird Database, version 2.0. Microsoft Access database. US Geological Survey. Anchorage, Alaska.

Attachment A

Map 3

“Polar Bear Concentration Areas in the Arctic Ocean”

Polar Bear Concentration Areas in the Arctic Ocean



*This map reflects the revised 2012–2017 OCS Arctic Program Areas, which include an additional 70,000 square miles of leasing blocks compared to the current 2007–2012 boundaries.

Amstrup, S. C., G. M. Durner, I. Stirling, and T. L. McDonald. 2005. Allocating harvests among polar bear stocks in the Beaufort Sea. Arctic 58:247-259.

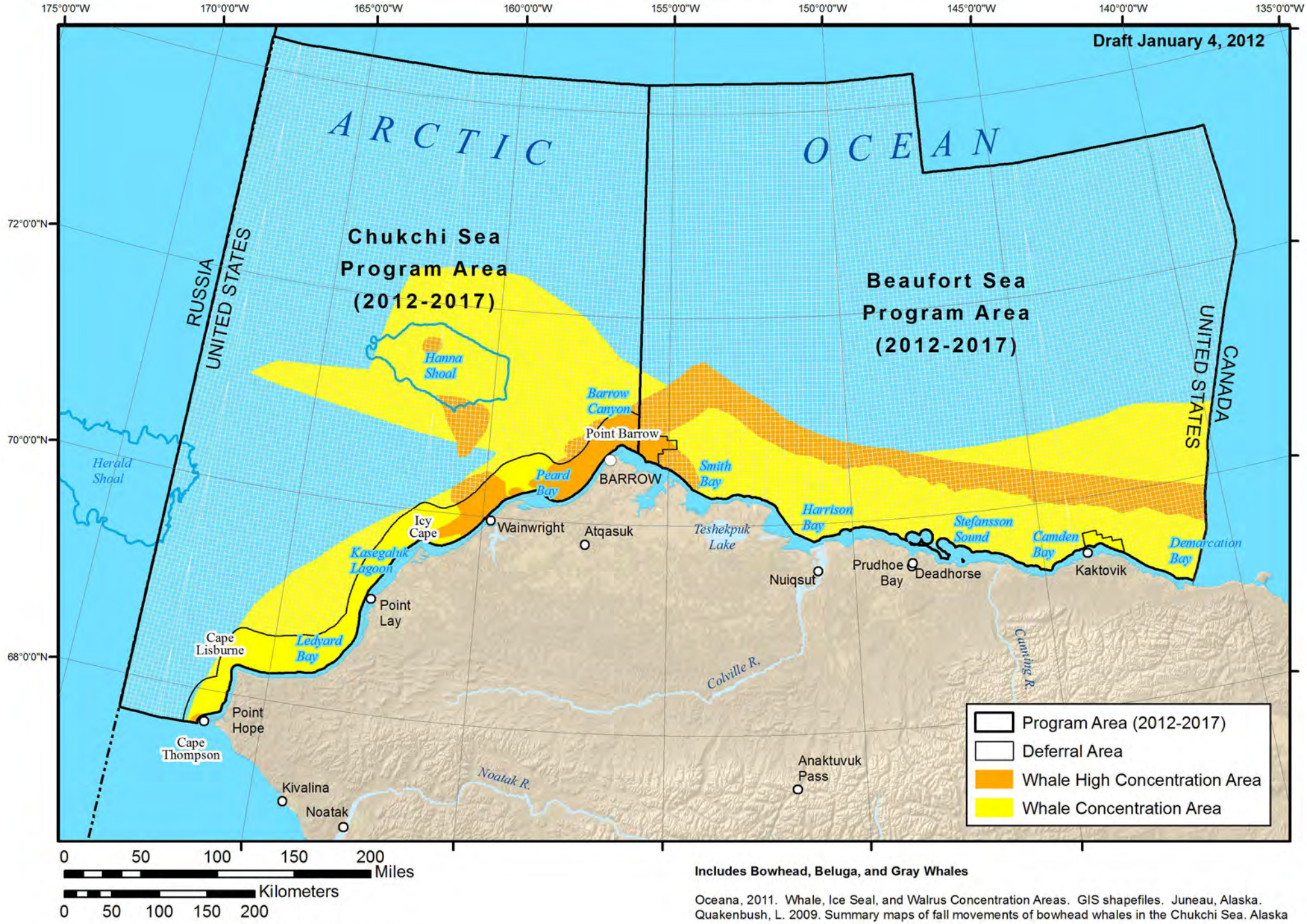
Kalxdorff, S.B. 1997. Collection of local knowledge regarding polar bear habitat use in Alaska. Technical Report MMM 97-2. Marine Mammals Management, US Fish & Wildlife Service Region 7. Anchorage, Alaska.

Attachment A

Map 4

“Whale Concentration Areas in the Arctic Ocean”

Whale Concentration Areas in the Arctic Ocean



*This map reflects the revised 2012–2017 OCS Arctic Program Areas, which include an additional 70,000 square miles of leasing blocks compared to the current 2007–2012 boundaries.

Includes Bowhead, Beluga, and Gray Whales

Oceana, 2011. Whale, Ice Seal, and Walrus Concentration Areas. GIS shapefiles. Juneau, Alaska.

Quakenbush, L. 2009. Summary maps of fall movements of bowhead whales in the Chukchi Sea. Alaska Department of Fish and Game. Fairbanks, Alaska.

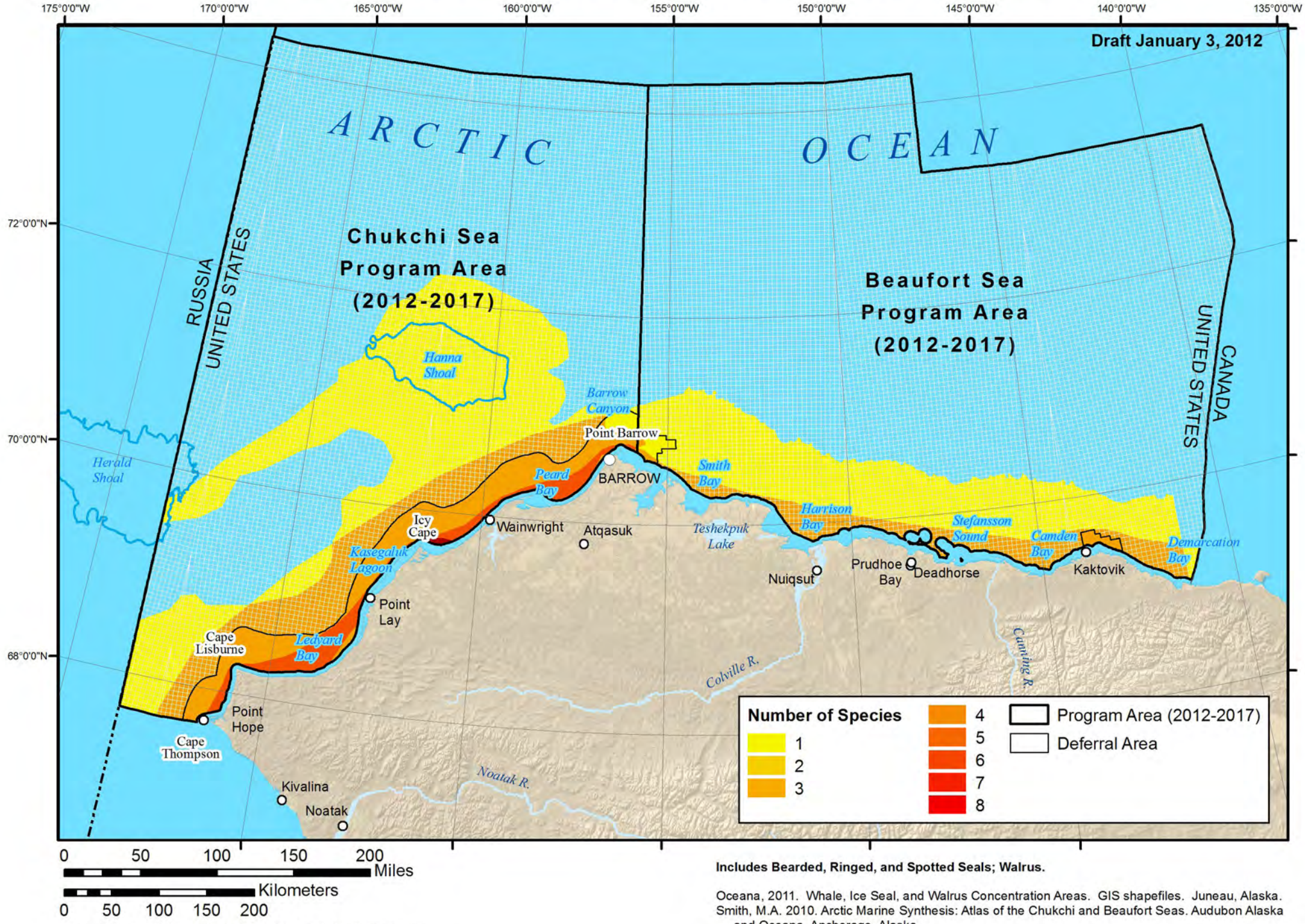
Smith, M.A. 2010. Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas. Audubon Alaska and Oceana. Anchorage, Alaska.

Attachment A

Map 5

“Pinniped Concentration Areas in the Arctic Ocean”

Pinniped Concentration Areas in the Arctic Ocean



*This map reflects the revised 2012–2017 OCS Arctic Program Areas, which include an additional 70,000 square miles of leasing blocks compared to the current 2007–2012 boundaries.

Includes Bearded, Ringed, and Spotted Seals; Walrus.

Oceana, 2011. Whale, Ice Seal, and Walrus Concentration Areas. GIS shapefiles. Juneau, Alaska.

Smith, M.A. 2010. Arctic Marine Synthesis: Atlas of the Chukchi and Beaufort Seas. Audubon Alaska and Oceana. Anchorage, Alaska.

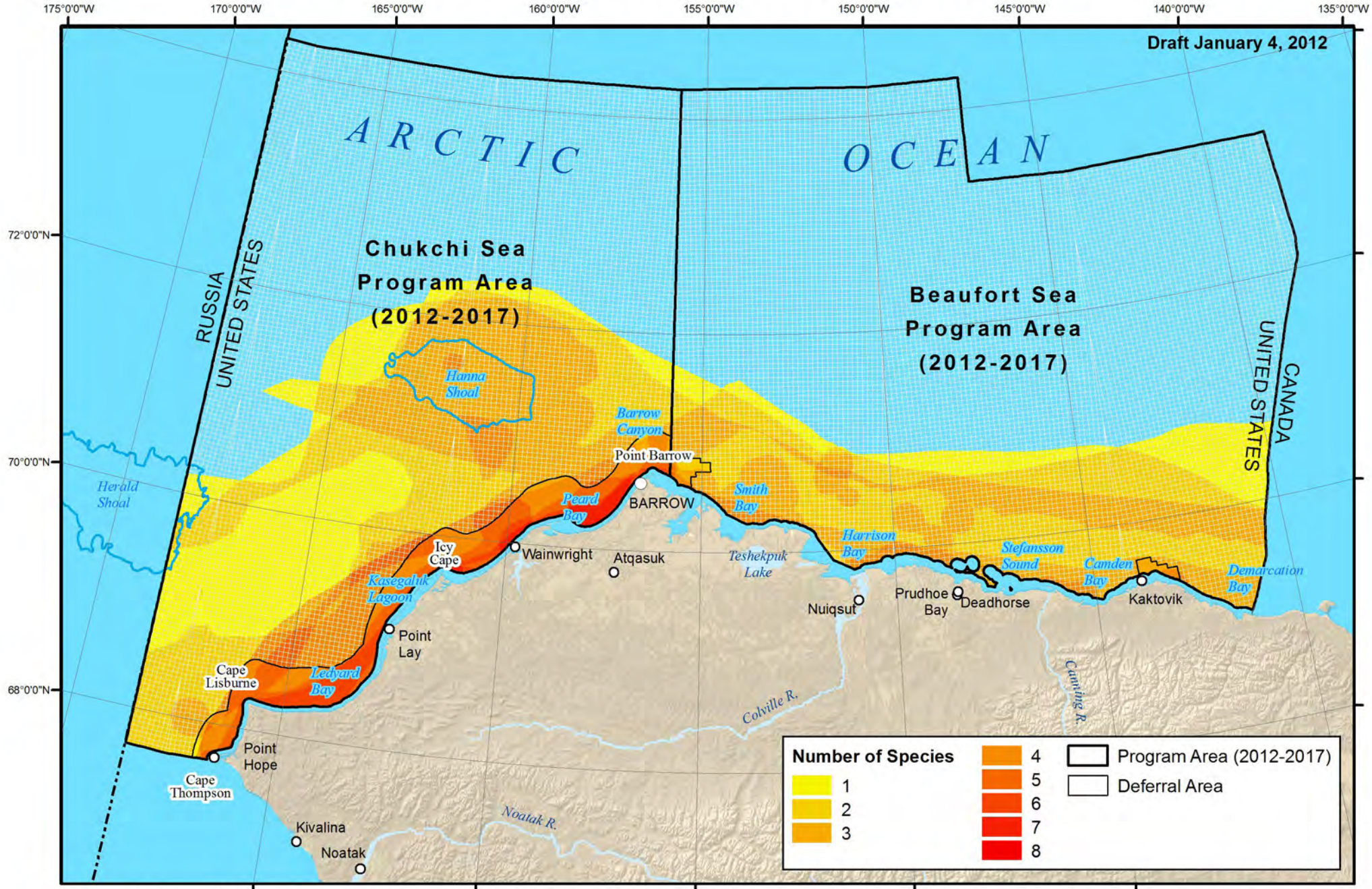
US Geological Survey. 2011. Walrus radio-tracking in the southern Chukchi Sea 2011. US Geological Survey. Anchorage, AK.

Attachment A

Map 6

“Wildlife Concentration Areas in the Arctic Ocean”

Wildlife Concentration Areas in the Arctic Ocean



Includes Bowhead, Beluga, and Gray Whales, Bearded, Ringed, and Spotted Seals, Walrus, Polar Bears, and Proposed IBAs.

*This map reflects the revised 2012–2017 OCS Arctic Program Areas, which include an additional 70,000 square miles of leasing blocks compared to the current 2007–2012 boundaries.

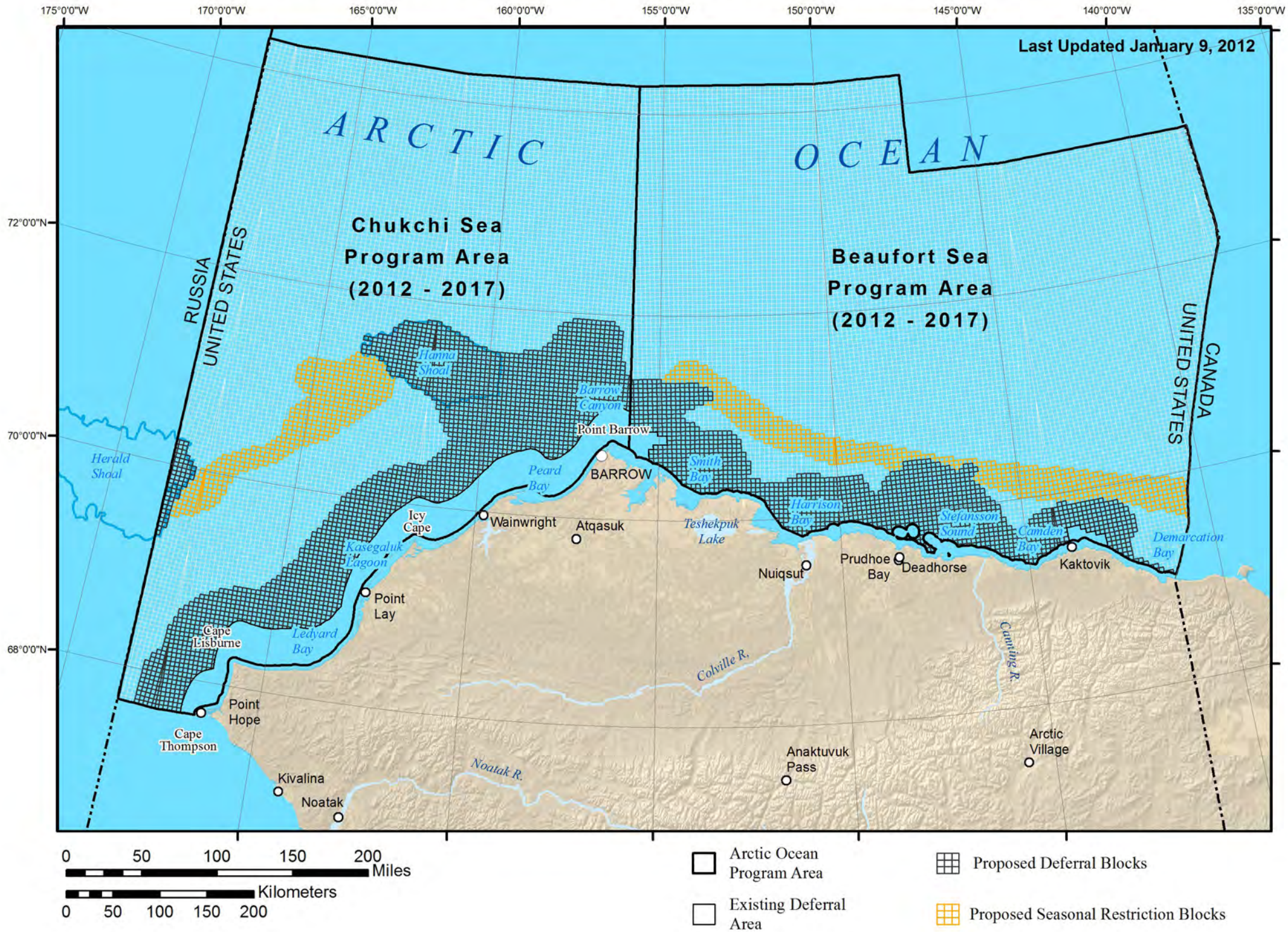
Amstrup, S. C., G. M. Durner, I. Stirling, and T. L. McDonald. 2005.
Drew, G. and J. Piatt. 2011.
Kalxdorff, S.B. 1997.
Oceana. 2011.
Quakenbush, L. 2009.
Smith, M.A. 2010.
Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, and I. Stenhouse. Unpublished Report.
US Geological Survey. 2011.

Attachment A

Map 7

“Proposed Deferral Areas and Seasonal Restrictions”

Proposed Deferral Areas and Seasonal Restrictions



ATTACHMENT B

BOEM Lacks Adequate Arctic Science, and Current Research Efforts Do Not Address Gaps Identified by the USGS Review.

We know less about the U.S. Arctic Ocean ecosystems than we do about other areas in the U.S. OCS, including the Pacific and Mid- and South Atlantic, which will not be opened to leasing in the 2012–2017 Program.[1] Scientists currently have a limited understanding of marine ecosystem structure and functioning in U.S. Arctic ecosystems. Even basic information such as knowledge of the species that inhabit the U.S. Arctic Ocean, either permanently or seasonally, is substantially incomplete. Secretary Salazar acknowledged this informational gap when DOI cancelled the remaining Arctic leases in the 2007–2012 leasing program. The Secretary determined "that the country must take a cautious approach in the Arctic, and gather additional scientific information about resources, risks, and environmental sensitivities before making decisions about potential future lease sales in frontier areas."

Studies designed to provide comprehensive information and understanding of the health, biodiversity, and functioning of Arctic marine ecosystems and the potential impacts of industrial activities were conducted 30 years ago pursuant to the Outer Continental Shelf Environmental Assessment Program (OCSEAP). However, because there has not been continued monitoring of key parameters studied in OCSEAP, it is unclear if the baseline information gathered 30 years ago remains accurate—especially given the rapid climate change that has occurred since those initial studies. As a result, much OCSEAP information is of limited use in informing current management decisions.

We are aware that in recent years, BOEM has worked with government, academic, and industry researchers to gather significant scientific data on OCS resources.[2] However, these more recent research efforts have significant limitations. Since the conclusion of the OCSEAP program, OCS studies have focused "on topical studies in smaller areas to answer specific questions and fill identified information needs."[3] For example, some studies have focused on specific drilling lease sites of interest to industry. While these studies provide valuable information about the physical and biological aspects of a relatively small geographic area, they do not provide adequate information about the broader ecosystem or changes over time. In addition, although this research generates potentially informative data, BOEM often fails to analyze and synthesize those data in a useful way, which makes it difficult to apply the results of scientific research to management decisions. As a result, although proponents of OCS development in the Arctic can point to new Arctic studies, those studies have not generated the synoptic data necessary to inform leasing decisions.

BOEM's current "piecemeal" approach to scientific research and monitoring is not sufficient to inform the decision of whether, where, when, and how oil and gas activity should occur. Without

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[1] *See* DOI Press Release, "Salazar Announces Revised OCS Leasing Program" (Dec. 1, 2010) (noting that the Mid and South Atlantic planning areas are no longer under consideration for potential development through 2017").

[2] *See, e.g.,* BOEMRE. 2010. Alaska annual studies plan Final FY 2011. Alaska Outer Continental Shelf Region. DOI, BOEMRE. 181pp. http://alaska.boemre.gov/ess/essp/sp2011.pdf; Funk, D. W., R. Rodrigues, D. S. Ireland, and W. R. Koski. Joint Monitoring Program in the Chukchi and Beaufort seas, July-November 2006. LGL Alaska Report P891-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., Bioacoustics Research Program, Cornell University, and Bio-Wave Inc. for Shell Offshore, Inc., ConocoPhillips Alaska, Inc., and GX Technology, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 316 p. plus Appendices; Shell. 2010. Science of the U.S. Arctic Continental Shelf. Volume 1, November 2010.

[3] *See* Alaska Annual Studies Plan Final FY 2011 3 (October 2010), *available at* http://alaska.boemre.gov/ess/essp/sp2011.pdf.

an overarching purpose and scientific plan to guide and tie the research together, individual studies have been insufficient in advancing knowledge of Arctic Ocean ecosystems. As a result, there remain significant gaps in our knowledge of Arctic ecosystems.

For example, although we have information about certain marine mammals, such as the population size of the Beaufort Sea polar bear subpopulation and bowhead whales, we still do not know population size, abundance, distribution or other important life history characteristics of all other marine mammals.[4] Our knowledge about fish species in the Beaufort and Chukchi seas is also very limited. Scientists working in the Arctic are still discovering new species and species using habitats not known before. A 2008 pilot study in the vicinity of Barrow Canyon in the Beaufort Sea was the first survey for fish in that area in 31 years,[5] and many areas of the Beaufort Sea remain unsampled. Current research is far from estimating very basic regional information such as abundance and distribution of fishes and population trends. These knowledge gaps may preclude decision-makers from making accurate assessments of the impacts of proposed oil and gas activities on the Arctic OCS.

BOEM Must Design and Implement a Comprehensive, Long-Term Scientific Research and Monitoring Plan for the Arctic.

To maximize utility in informing leasing and other management decisions, BOEM must conduct Arctic research and monitoring under a holistic plan. BOEM should work with other agencies within and outside of DOI—such as NOAA, FWS, USGS, the U.S. Arctic Research Commission, and others—to develop a comprehensive, integrated scientific research and monitoring plan to improve our understanding of Arctic marine ecosystem structure and functioning.

This plan should be designed to fill existing information gaps and provide an understanding of the spatial and temporal variability of the ecosystem, its components, and its functioning. Furthermore, it should include establishment of a comprehensive long-term monitoring program with dedicated funding to track changes in the Arctic. The Gulf of Alaska Ecosystem Monitoring and Research (GEM) plan is a useful model. The GEM plan was developed following the *Exxon Valdez* Oil Spill to provide critical information in Prince William Sound for quantitatively predicting and assessing the potential impacts should another spill occur. It stressed an interdisciplinary, integrated, ecosystem approach to research and monitoring, which more effectively and efficiently elucidates the processes that determine the structure and functioning in an ecosystem. The knowledge gained from carrying out a holistic research and monitoring plan would greatly improve decision-making and should be used to help determine if industrial activities should occur in the Arctic and if so, when, where and how.

Importantly, local and traditional knowledge must be incorporated into any Arctic science plan. Local and traditional knowledge is a different but equally valid knowledge system that can help expand understanding of the Arctic and supplement and enhance existing knowledge. Indigenous peoples who have lived in the Arctic Ocean region for millennia have developed a wealth of knowledge about the region. They depend on local plants and animals for food, clothing, and shelter, and know a great deal about the species they use and see. In recent years, an increasing amount of research has focused on traditional knowledge in the Arctic.

[4] Coastal Response Research Center, Natural Resources Damage Assessment (NRDA) in Arctic Waters: The Dialogue Begins (2010).
[5] Logerwell, E., K. Rand, S. Parker-Stetter, J. Horne, T. Weingartner, and B. Bluhm, Beaufort Sea Marine Fish Monitoring 2008: Pilot Survey and Test of Hypotheses, Final Report BOEMRE 2010-048 (2010).

Major projects, such as the Arctic Council's Arctic Climate Impact Assessment,[6] have incorporated traditional knowledge in efforts to understand what is taking place in the region. Nonetheless, there is much more to be done to make the knowledge of Arctic peoples more widely available, such as incorporating traditional knowledge in management processes that directly impact people, including in this EIS process.

Traditional knowledge can help fill some of the gaps in our understanding of Arctic ecosystems as well as guide future efforts to collect necessary information. Some of our groups previously submitted a bibliography with selected references that should help provide guidance and provide examples of situations where traditional knowledge has been effectively utilized.[7] Co-management organizations and institutes of public governance are one way of incorporating, not just knowledge, but the holders of that knowledge into the decision-making process. Greater involvement by Arctic peoples in the governance of their regions and communities allows their knowledge to benefit modern institutions. These approaches can help in the development of long-term solutions to economic and environmental challenges in the Arctic.

To provide the basic information required to make informed decisions about the resources of the Arctic, including the subsistence way of life, and to guide decisions about oil and gas and other industrial activities, a new comprehensive research and monitoring program should:

> (1) integrate existing information to give a more holistic picture of what is known and conduct an analysis of the gaps in information to determine the most pressing research and monitoring needs;[8]
> (2) develop a more comprehensive inventory of species, populations and habitats (including seasonal migrations) through repeated, systematic regional wildlife surveys similar to OCSEAP, and using other technology such as GPS tracking of populations;
> (3) track physical forcing factors that influence and determine biological productivity, habitat occupancy, and migration pathways;
> (4) secure a better understanding of trophic linkages, physical and biological processes affecting productivity and other facets of ecosystem structure and functioning, and effects of anthropogenic perturbations;
> (5) study potential ecological and sociological impacts; and
> (6) integrate these scientific data to identify important ecological areas as well as processes and habitats that are sensitive and vulnerable to perturbation, and furnish a basis for marine spatial planning.

If the federal government commits to comprehensive, long-term research and monitoring in the Arctic OCS, managers will be in a much better position to determine if, when, where and how industrial activities should occur, including the identification of alternatives that may allow for development while protecting the ecosystem and subsistence way of life. A comprehensive research and monitoring program could be conducted in three phases over the next five to seven years:

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[6] Arctic Climate Impact Assessment, Impacts of a warming Arctic: Arctic Climate Impact Assessment. Arctic Council and the International Arctic Science Committee (IASC) (2004). http://www.acia.uaf.edu.

[7] *See* Pew Environment Group, Comments Re: Chukchi Sea Lease Sale 193 Draft Supplemental Environmental Impact Statement (Nov. 29, 2010), Attachment 3 (Selected References for Traditional Knowledge (TK)).

[8] President Obama and Secretary Salazar have directed the USGS to assess "resources, risks, and environmental sensitivities in Arctic areas. *See* Secretary Salazar Unveils Arctic Studies Initiative that will Inform Oil and Gas Decisions for Beaufort and Chukchi Seas, *available at* http://www.doi.gov/news/pressreleases/2010_04_13_releaseA.cfm. We support the current USGS review of Arctic science, and hope the USGS review will be first step toward the completion of a more comprehensive gap analysis undertaken by an independent entity, such as the National Research Council.

(1) gap analysis and planning (2012–2013);

(2) research and monitoring (2013–2016, with monitoring continuing into the future); and

(3) integrating new and older information to provide decisions-makers the basic understanding needed to make effective decisions (2016–2017).

As described above, each of these phases must be informed by local and traditional knowledge, including planning and peer-review. The goal is not endless study, but targeted research and analysis relevant to the decisions to be made regarding offshore oil and gas development. It would enable managers to determine if, when, where, and how industrial activities should occur, and could facilitate the identification of alternatives that may allow for development while protecting the ecosystem and subsistence way of life.

Of course, to make a practical difference, regional managers must take science seriously and be willing to apply the results of research, analysis, and synthesis to management decisions. Secretarial Order No. 3305, *Ensuring Scientific Integrity within the Department of the Interior,* and the new Scientific Integrity Policy demonstrate a real commitment by the Department to the principles of scientific and scholarly integrity. Implementing the Scientific Integrity Policy will require leadership from DC to ensure there is a meaningful cultural shift in the way employees who are conducting scientific reviews are treated and how their work is used. We urge DOI to ensure that these practices are carried out at the regional level.

BOEM Must Identify and Protect Important Ecological Areas as Part of a Comprehensive, Long-Term Scientific Research and Monitoring Plan for the Arctic.

Strong support exists for ecologically important and sensitive areas to be identified and protected.[9] Areas within an ecosystem are not equal in biological and ecological terms; some areas are more important than others, and contribute disproportionately to ecosystem function or use by human populations. Identification of important ecological areas, based on essential habitats and functions in the Arctic ecosystem along with traditional cultural activities, is a necessary step toward protecting traditional-use areas and critical wildlife habitats and ensuring ecosystem functionality.[10]

Examples of important ecological areas include areas of the ocean with high productivity or biodiversity, migration corridors, or habitat for threatened or important species (e.g., Hanna Shoal and Barrow Canyon). A comprehensive science plan for the Arctic Ocean should include identification of important ecological areas, which should be mapped and incorporated into marine spatial planning and decisions about where and when offshore drilling can occur. The most ecologically sensitive areas in the U.S. Arctic Ocean should be protected prior to the leasing process. Protecting these areas will contribute towards preserving the health, biodiversity and resiliency of Arctic marine ecosystems and viable coastal communities by supporting the subsistence way of life. Protection of subsistence resources and subsistence

[9] *Cf.* BP Deepwater Horizon Oil Spill Incident Specific Preparedness Review (ISPR) Final Report. January 2011, at 22 *available at* http://www.uscg.mil/foia/docs/DWH/BPDWH.pdf. (recommending that the Coast Guard undertake a number of improvements to the identification and protection of environmentally sensitive areas including developing a program to ensure that the equipment and trained personnel necessary to implement oil spill protection strategies are in place and that these protection plans should be tested with periodic full deployment exercises).

[10] Smith, M.A. 2010. Arctic marine synthesis: altas of the Chukchi and Beaufort seas. Audubon Alaska and Oceana, Anchorage, Alaska; Ayers et al., Important Ecological Areas in the Ocean: A Comprehensive Ecosystem Protection Approach to the Spatial Management of Marine Resources (Aug. 23, 2010), *available at* http://na.oceana.org/en/news-media/publications/reports/important-ecological-areas-in-the-ocean.

practices requires sound environmental management in preparation for increasing industrial activity in offshore waters of northern Alaska.

The concept of protecting the most ecologically important regions of the ocean is not new; Norway has undertaken a thorough planning process that includes the identification of areas that are important to the ecological functioning of the Barents Sea ecosystem. Norway has set an example of how to balance uses in the offshore environment in their forthcoming update of the 2006 integrated management plan for the Barents Sea – Lofoten Area. While allowing for offshore activity to expand in areas already developed, Norway has continued to protect ecological integrity of important marine resources by protecting sensitive areas. The updated plan will protect ecologically sensitive areas like the important fish spawning areas in the Lofotens and the marginal ice zone and the polar front, which is an oceanographic feature important to the healthy functioning of the Barents Sea.[11] Furthermore, the new plan will also call for more knowledge and scientific studies to address unknown environmental processes and effects. One of these is the need to understand cumulative environmental effects of both environmental stresses (e.g., climate change, ocean acidification) and anthropogenic activities (e.g., fisheries, shipping, oil and gas activities) on the marine environment.

The long-term process for identifying ecologically important areas should be adaptive. To ensure that BOEM affords adequate consideration of additional or expanded deferral areas in future stages of OCSLA, the BOEM Director should appoint a committee of relevant experts tasked with recommending additional or expanded areas that merit deferral from leasing or special management considerations. Establishment of this committee could coincide with implementation of the final 2012–2017 Program.

The committee should be composed of representatives from BOEM, NOAA, FWS, USGS, the U.S. Arctic Research Commission, the Interagency Arctic Research Policy Committee, the National Science Foundation Office of Polar Programs, and the North Pacific Research Board, as well as local scientific experts (including those with traditional knowledge) such as North Slope Borough, Alaska Eskimo Whaling Commission, Eskimo Walrus Commission, Polar Bear Commission, and Beluga and Ice Seal Committees. The committee should be tasked with making initial recommendations of important ecological areas or special areas within one year of approval of the Proposed Final Program, and its recommendations should be subject to public review and comment before final approval. This process should be completed prior to designing any future lease sales.

Areas to be deferred would at a minimum include:

- Regular aggregations of species;
- Migration routes;
- Important zones of primary productivity;
- Distribution and movement of prey species;
- Breeding, spawning and birthing habitat; and
- Community subsistence use areas.

[11] Anon, St.meld.nr. 8 (2005–2006) Helhetlig forvaltning av det marine miljø i Barentshavet og havomra°dene utenfor Lofoten (forvaltningsplan). Ministry of Environment, Oslo (2006) (available in English from the Norwegian Ministry of Environment).

ATTACHMENT C

An Independent Review of USGS Circular 1370: "An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska"

Prepared for the Pew Environment Group
and Ocean Conservancy

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Contents

I. Introduction

The Arctic Ocean, within the territorial waters of the United States, holds large quantities of fossil fuels that have contributed and can further contribute to domestic energy needs, and therefore there is intense pressure for their full exploration and development. Currently there are several offshore petroleum production facilities in the Beaufort Sea on gravel islands along Alaska's North Slope, and there are plans for continued exploration and development. More exploration is proposed for the summer of 2012. The Chukchi Sea to the west has experienced only limited exploratory drilling for petroleum, but extensive seismic surveying has been conducted. Several lease sales have been held in the Chukchi Sea, and further exploratory drilling could be imminent. Eight predominantly Alaska Native communities on the coastlines of the Beaufort and Chukchi seas utilize marine waters for subsistence and transport. There are former military bases along the Arctic coast and port facilities at Prudhoe Bay and Red Dog Mine. In addition, persistent organic pollutants are transported to the Arctic from lower latitudes and enter the food web. Overall, however, the U.S. Arctic Ocean is more pristine than almost any other ocean.

The same factors that have limited development—extreme cold, extensive ice, intense storms, and limited industrial infrastructure—make drilling and extraction of hydrocarbons more risky in these seas than in other offshore areas of the United States. These conditions also make response to and control of an oil spill or blowout more challenging than in other areas of the country. In the *Exxon Valdez* and *BP Deepwater Horizon* oil spills, both of which occurred in more favorable climates and conditions, only a relatively small fraction of spilled oil was recovered from the sea. According to the environmental impact statement for oil and gas Lease Sale 193 in the Chukchi Sea, the chance of a large oil spill (more than 1,000 barrels) is estimated at 40 percent for the lifetime of extraction of offshore resources under Department of the Interior (DOI) Alternative I.[1] There is thus strong incentive to reduce the risk of a spill and to increase the chance that spill impact might be limited.

The Arctic ecosystems are unique, complex, and not fully characterized. The Chukchi Sea, for example, has a rich benthic fauna and large numbers of seabirds, walrus, seals, and whales, yet we have a limited understanding of how this ecosystem responds to various physical and chemical factors. Arctic marine ecosystems are driven in large part by sea ice dynamics that are key to productivity. Ice also provides habitat for algae, invertebrates and much of the megafauna. Climate change is accelerating warming of the Arctic, and the extent, thickness, and duration of sea ice are shrinking. This accelerating change will cause widespread ecological responses even in the absence of further industrial development.

The ecological value of the Arctic seas to indigenous people and others, and its intrinsic value, has prompted a vigorous debate on the level of knowledge needed to proceed safely with development, and whether development should proceed at all. Although

technology improvements and control of human error are key parts of the risk equation, our level of scientific understanding of the environment and the effects of seismic surveys, oils spills, and infrastructure development, all in the face of climate change, are central to questions of readiness. Therefore, responding to a directive from Interior Secretary Ken Salazar, the U.S. Geological Survey (USGS) conducted an extensive review of science needs for offshore development in the Arctic Ocean in Alaska. In late June 2011, the USGS presented its findings in the report "An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska" (USGS Circular 1370).[2] The report consists of an introduction and chapters on geology; ecology and subsistence; climate change; oil spill risk, response and impact; marine mammals and anthropogenic noise; and cumulative impacts. Throughout the main body of the report, findings and recommendations on a series of issues are highlighted.

Why this review of a review? The Pew Environment Group and Ocean Conservancy have a keen interest in the conservation of the Chukchi and Beaufort seas. They initiated an evaluation of the USGS report findings and solicited recommendations on what next steps should be taken scientifically. They requested that the evaluation be independent of the DOI and contributed to by scientists who are mainly associated with universities, conservation organizations and consultancies. The requested evaluation was undertaken shortly after the release of the USGS report. Twelve scientists with expertise in a variety of marine science fields and extensive Arctic experience agreed to review Circular 1370 and provide comment. Here we present the findings of this independent review.

Our comments come under two headings: 1. The adequacy of the identified science needs in the Arctic relative to future development; and 2. Recommended actions to improve science management in the Arctic and better integrate science and policy.

II. Adequacy of the Report

1. Completeness

The USGS has identified the major gaps in scientific knowledge about the Arctic Ocean in the face of potential further industrial development, particularly offshore oil development. The agency has taken a thoughtful approach and dealt with the issues without bias. This effort is a significant advance toward reducing uncertainty about the impacts of outer continental shelf (OCS) development in the Arctic. The report is highly successful in putting a large amount of material into a structured and accessible format. Of particular value is the effort that went into reviewing and synthesizing findings from reports by industry and agencies that often are not as easily accessed as mainstream scientific literature. We therefore commend the effort of the USGS team in putting together this broad assessment. We offer specific constructive comments on the report in this evaluation.

2. What Is Missing?

a. Lacks Historical Context

Somewhere in this report, and certainly in future syntheses, there should be a summary of the major environmental studies conducted in the Beaufort and Chukchi seas beginning, at least, with the Outer Continental Shelf Environmental Assessment Program (OCSEAP) in the 1970s. Those efforts provided most of our current understanding of these regions and produced a wealth of data that are available for retrospective analyses, model verification, and comparison with future data. We should recognize the people and organizations that contributed, and provide a historical overview of these research efforts, their foci, geographic coverage, key goals, and results. Much of the data collected in these programs resides in government archives and is thus available for environmental and engineering design considerations. A similar comment could be made about research efforts underway or planned. These include a variety of efforts supported by the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), the petroleum industry, the North Slope Borough, and the state of Alaska.

In addition, findings from the Project Chariot studies in the eastern Chukchi Sea from 1959 to 1961 could profitably have been reviewed, despite some less favorable aspects of the studies, to aid in understanding contemporary regional ecology and the nature of change. This large project included a broad range of disciplines, both marine and terrestrial, but is seldom mentioned in recent literature.

b. Dissemination Lags

Although the USGS report did in many instances dig deep into unpublished material, there is much more research occurring in the Chukchi and Beaufort seas than Circular 1370 indicates. This phenomenon is due in large part to the time it takes for research results to be published and disseminated to the wider scientific community. The lag was noticed particularly by our reviewers with active research programs in, for example, physical oceanography, biological oceanography, and marine mammal studies. While it may not have been appropriate to include unpublished research results, it would be relevant to note active research programs that are addressing identified gaps.

c. Lacks Priority Setting

The USGS report was quite thorough in identifying knowledge gaps and science needs for the Chukchi and Beaufort seas with respect to oil and gas development. Indeed, it was a veritable laundry list of nearly all things imaginable. However, it lacked a priority ranking by which gaps must be filled, e.g., high, medium, and low priority, which would serve to guide future research. Research to address all the gaps identified is beyond the current financial and logistical capability of U.S. marine science. This is not to say that there is one single thing that should be addressed first, but it should be explicitly recognized that some things are clearly more important than others.

d. Lacks Specific Recommendations for Some Larger Issues

If Arctic science is to improve, there must be progress on:

- Implementation of large-scale integrated monitoring.
- Agreed-upon methods for assessing cumulative impacts.
- Improved data management, comparability and exchange.
- More timely communication of results.
- Better integration of studies.

It is not enough to reiterate these problems; these are areas that require specific recommendations in order to progress. Having conducted this review, USGS would have been uniquely positioned to recommend how best to move forward.

3. Highlights from Comments on the Main Chapters of the USGS Report

The following comments on Chapters 2 to 7 are in most cases direct quotes from individual reviewers. Some editing was done for complete sentences, etc., but every effort was made to stay true to the reviewers' comments.

a. Comments on "Geological Context," Chapter 2

Chapter 2 does an excellent job of highlighting the uncertainties associated with various oil and gas resource distribution and economic assessments. The key question emerging from this chapter, and the report as a whole, is whether or what specific actions can be taken to reduce these uncertainties. Above all, it is projections of undiscovered resources and economic viability that drive a lot of activities in the early stages of resource exploration and production. Hence, better constraining these estimates may improve planning at the policy and management level and reduce the amount of effort expended by regulatory agencies, communities, and possibly industry.

An appropriate next step would be to specify the type of geological or geophysical (or other) information that could help reduce uncertainty in resource estimates at a range of scales. This should be followed by an evaluation of approaches that might lead to the release of well or seismic data without harm to economic or strategic interests. Possibly looking toward other countries, such as Canada or Norway, to identify innovative approaches for greater transparency on resource estimates may be of value. At the very least, a comparison of industry, agency, and (if available) academic estimates of resource potential may be feasible.

b. Comments on "Ecological and Subsistence Context," Chapter 3

i. Physical Factors

The discussion of physical oceanography is extremely thin and includes few details, which could easily have been gleaned from the publications cited or drawn from the peer-reviewed literature. There is a considerable body of data on aspects of the coastal meteorology. For example, the climate atlases assembled by Brower *et al.* (1977)[3] are exceptionally good and deserve to be noted. It is stated that the wind field is poorly understood. This comment was probably taken from a Minerals Management Service (MMS) workshop report from 2003 or 2004. The situation has changed substantially since then. For example:

- BOEMRE has funded a substantial data-mining and regional (high-resolution, state-of-the-art) meteorological monitoring program over the past few years.
- Industry has deployed several wave and meteorological buoys in the Chukchi Sea during the open-water season.
- There have been extensive studies on the marine atmospheric boundary layer under a variety of Arctic conditions. Such studies are almost certainly relevant to air pollutant dispersal issues likely to arise in any offshore development scenarios.

In summary, our knowledge of the regional wind field is much better than it was five years ago, and this should allow updating of the circulation and spill-trajectory models.

With regard to Hanna Shoal, an area important biologically and also a prime region for industrial exploration: both industry and BOEMRE are, or will shortly be, supporting efforts to examine the water circulation around the shoal. These studies include physical and marine ecological studies ranging across several trophic levels. BOEMRE is currently sponsoring state-of-the-art modeling efforts in the Chukchi and Beaufort

seas relevant to offshore development activities. Evaluation of these models will include comparison with historical data and the large amounts of data now being collected. The modeling effort builds on a variety of historical sea ice and circulation modeling efforts, none of which was mentioned in this section.

The sea ice dynamics discussion is similarly thin. The authors note land-fast ice and pack ice, but nothing is said about the circulation differences in these regions or why these different forms of ice are present. The box on Page 43 is about circulation interactions between land-fast and pack ice, but nothing in the text serves as a context for this issue.

Nothing is said in the sea ice section about ice grounding and scour, the stamukhi zone, ridging intensity, ice thickness distribution, or the seasonal variability in many of these parameters. These issues are pertinent to any development scenario and certainly are important ecological phenomena. There has been work (in some cases, a considerable body) on several of these topics, but they are not addressed here. While the report refers to the complicated hydrography of the Hanna Shoal and Chukchi shelf break regions in the vicinity of the Chukchi lease areas, there is a broader, possibly urgent need to improve understanding of this region because ice conditions are quite complicated as well. Thus, ice grounds on Hanna Shoal in about 66 feet (just over 20 meters) of water depth every year, with ice trapped over that location into the summer, most likely as a result of the local circulation. Local ice features may present hazards to operations early in the season, but at the same time lingering ice may be of value to walrus and other marine mammals as the ice edge recedes farther north each year. While not a high priority, some kind of synthesis of available information on this region and its potential significance in the context of development may be in order.

ii. Biology and Ecology

The summary and superficial nature of many sections of Chapter 3 might suggest we know relatively little, when in fact we know major patterns and properties. Some of the recommendations (basically from Hopcroft *et al.* 2008)[4] are no longer concerns because of recent or ongoing research. It is notable that with the exception of some sections on the birds and mammals, there is no new synthesis here or in other chapters.

(1) Primary and Secondary Production

The primary production, microbial, and protist sections are accurate; however, significant progress has been made in understanding the relative importance of some gelatinous nekton groups since the text was written, although more remains to be learned. There is agreement with Sidebar 3.03—industry has made major contributions in this area, as well as most recently NOAA, with concepts such as the Distributed Biological Observatory (DBO) and the Circumpolar Biodiversity Monitoring Program (CBMP) holding promise.

In addition to the findings and recommendations stated, more focus should have been placed on the impact of shorter ice seasons and longer open-water seasons on primary production. Alterations of upwelling dynamics are just one way biological (primary) productivity may be affected. An attempt to model the expected changes in primary productivity based on longer open-water seasons should be established as a baseline. How will inorganic nutrient dynamics mitigate primary production despite a longer growing season?

To further develop the issue of rapid coastal erosion affecting biological processes, primary production needs to be a specific target of future research. Alterations of forcing factors on primary production can cause ecosystem-wide impacts. To what extent will sediment be transported through coastal waters, and where will the sediment ultimately be deposited? How will water clarity changes affect the attenuation of photosynthetically active radiation in the water column and benthos? How will increased suspended sediment load change the clarity of sea ice and affect sea ice algal photosynthesis? These questions also apply to any sedimentation events that occur from drilling activities.

The relative contributions by phytoplankton, ice algae, and benthic microalgae to total primary production and to the support of higher trophic levels are poorly understood. Further efforts using multiple tracers (e.g., bulk and compound-specific stable isotopes, biomarkers) should be emphasized in future studies to better understand which primary producers provide carbon subsidies to which consumers. A NASA program, “Impacts of Climate change on the Eco-Systems and Chemistry of the Arctic Pacific Environment” (ICESCAPE), in the Chukchi Sea is just finishing its last year of

fieldwork, and the focus of the program has been primary production by phytoplankton.

(2) Benthos and Epibenthos

There is very little discussion of the benthic substrates in this chapter despite the fact that they are a key determinant of the variability of benthic communities that are particularly important for higher trophic level organisms in the Chukchi Sea. Chapter 3 reviews Arctic ecology, including fishes, but does not cite a significant and important research report: NOAA's Alaska Fisheries Science Center's survey of the Beaufort Sea in 2008. This important survey, funded by MMS (now BOEMRE), used standard bottom trawl survey techniques, as are used in the Bering Sea and Gulf of Alaska, to survey fishes and invertebrates at stations offshore and northeast of Barrow. This was the first survey of Beaufort fishes since Frost and Lowry's surveys in the mid-1980s and was conducted along specific transects. This survey found many species of fish and invertebrates, and some species range extensions.

(3) Fish

This section is much better than the section on marine mammals. Diadromous fishes in the Beaufort are a very good example of how, during OCSEAP, science needs were assessed, research was done to address those needs, and mitigation was put in place based on the science. The report's authors might make good use of this example. In contrast, it's very discouraging to see that for marine fishes there has been relatively little increase in knowledge since needs were identified in OCSEAP research and workshops in the late 1970s. Much more has been learned about other animal groups than about fish.

There is no mention of recent syntheses of fish inventory data by the Census of Marine Life. Shell Oil Co. is one of three industry members co-sponsoring new research in the Chukchi on fish, although it acts alone in the Beaufort. Another fish study is starting soon sponsored by BOEMRE.

The overview section highlights consequences of spills much more than other sections, but not climate change, which is probably of greater consequence and certainty and is discussed in the following chapter. Sidebar 3.07 seems much more specific here than in other sections, although that is probably true of the Hopcroft *et al.* report

from which much of this is extracted. Similar to previous sections, notable progress has been made on these research needs through recent funding by industry, NOAA and BOEMRE.

(4) Seabirds

This section does not credit the sources of information on which it relies. In terms of information needs, it does not include the most recent (and extensive) industry surveys. It credits Shell for BOEMRE's Chukchi Offshore Monitoring in Drilling Area (COMIDA) program but wrongly credits the joint Shell/Statoil/ConocoPhillips Chukchi Sea Environmental Assessment Program (CSEAP) that is trying to make linkages between birds and their prey. Otherwise, Sidebar 3.06 (marine birds) seems reasonable.

(5) Marine Mammals

The U.S. Arctic is not the most diverse region in terms of absolute species numbers, but all of the many species there are well represented by many individuals. For Sidebar 3.05 (marine mammals), previous figures show we are now learning much more about movements of animals by tagging, plus population structure through genetics, but enumeration remains problematic for the more cryptic ice-associated seals. More extensive real-time data could result in a greater harvest by local hunters. Industry has been making significant efforts to identify threshold levels of noise, and this does not appear to be reflected in the report (this topic is handled extensively in Chapter 6 but with similar problems).

The marine mammal section is not very useful for establishing risk. The thumbnail descriptions of the focal marine mammal species are very brief and nearly without citations (about six for the seven NMFS species and eight for the two U.S. Fish and Wildlife species). The findings and recommendations could be paraphrased as "We need to learn more about just about everything." In contrast, the background, findings, and recommendations on marine mammals in Chapter 6 (sound impacts) are quite well written and focused. In fact, a number of the recommendations in Chapter 6 (e.g., 6.09 (bowhead whales and anthropogenic noise), 6.12 to 6.15 (critical habitat for beluga whales, gray whales, and ice seals; noise in marine systems), and 6.19 (walrus habitat)) should be in this section. Although they do pertain to data needed to assess sound impacts, the same information is needed to consider physical impacts on habitats, plan for response scenarios, assess cumulative effects, etc.

This section could be improved by starting with identifying the research questions. Although many approaches might be used, a simple order might be:

- What are the important places and habitats used by each species?
- Why are those places and habitats important?
- How might OCS activities affect use of those habitats?

Then one looks at the data available, and if the questions can all be answered sufficiently there are no science needs. If not, then the needs should be described. It should be possible to do this, especially given the recent status reviews for several key species. Obviously the conclusions will vary by species. For the first question, data are probably sufficient for polar bears and bowhead whales. For the other species the data are insufficient and additional satellite telemetry studies and/or aerial or ship surveys are needed. Passive acoustics might be helpful for beluga and gray whales. The second question is difficult, and data might be considered sufficient only for polar bears. One often assumes that seals and whales spend their time in places where they feed, but that can be verified using advanced telemetry devices. Seals and belugas may also concentrate in places for birthing and molting, and that can be investigated by direct observations—aerial, shipboard, or land. Migration routes can be determined by satellite tagging. The third question requires the sort of sound sensitivity/response information discussed in Chapter 6 as well as information on prey distribution and behavior, and modeling.

If the purpose of this report is only to inform where and when development should occur, then some of the recommendations are not needed. Examples include enumeration of population abundance, wintering distribution and habitats if they are not in lease areas, and population dynamics. Obviously these are good things to know, and they become very important when assessing the potential impacts of development, cumulative effects, and damages if they occur. Also, considering that most species are listed or close to being listed under the Endangered Species Act (ESA), studying and monitoring of population abundance and vital parameters are very important in the big picture. Monitoring is barely mentioned in this section and should have been given a fuller treatment. The authors should consult a recent report[5] from a workshop on this subject.

iii. Subsistence

Subsistence Patterns, Variability and Trends

Many studies have examined various aspects of subsistence production by North Slope residents and communities. In most cases, the documentation of use areas and harvest levels has been done at intervals too great to assess interannual variability, the causes thereof, and possible trends over time. Such studies are, however, time-consuming and often intrusive for North Slope residents, and require their full involvement in design, implementation, and analysis. A collaborative effort should be made with the North Slope Borough and North Slope tribes to identify a subsistence monitoring program to gather pertinent data on use areas, effort and travel, harvest levels, and distribution and sharing.

iv. Traditional Knowledge

(1) Retrospective Studies

Several studies have documented traditional knowledge of North Slope residents on various ecological topics, including beluga and bowhead whales, polar bears, walrus, and sea ice. Many more topics could be covered and are likely to be identified in relation to other ongoing studies and topics of scientific and management significance. North Slope residents, tribes, and organizations often call for greater recognition of traditional knowledge and expertise, indicating strong local support for such work. At the same time, such studies are often time-consuming and can be seen as intrusive for North Slope residents, so some degree of coordination may be desirable to avoid excessive numbers of requests or too many within a given period of time. A collaborative effort should be undertaken with the North Slope Borough and North Slope tribes to determine whether and how they would like traditional knowledge studies to be coordinated.

(2) Prospective Studies

North Slope hunters and fishermen spend considerable time on the land and sea throughout the year. They are careful observers of their surroundings, watching both the animals they pursue and the physical conditions that determine safety and access. Relatively little has been done to tap into this potential observing network, but a number of methods and tools exist to do so, from GPS-equipped

data recorders to photo journals to post-trip interviews. Such efforts are time-consuming and may be seen as intrusive, so careful planning in collaboration with the North Slope Borough and North Slope tribes is essential when designing, carrying out, and storing and analyzing data from such a program. Nonetheless, the engagement of even a modest number of hunters in a continuing data-gathering exercise would contribute both to the body of available information and to the sense of involvement that can in turn lead to greater collaboration and mutual understanding of the Arctic environment among scientists, managers, and local residents.

The Indigenous People's Council for Marine Mammals[6] "is a coalition of tribal marine mammal commissions, councils and other Native organizations formed for the purpose of identifying and addressing marine mammal issues of common concern." Included among the member organizations are the Alaska Eskimo Whaling Commission, Eskimo Walrus Commission, Alaska Nanuuq Commission, Ice Seal Committee, Alaska Beluga Whale Committee, and others. These organizations are possible partners for collaborative research and monitoring.

(3) Data Management

The information generated from traditional knowledge studies is often qualitative and may come in a variety of media, from interview notes to audio and video recordings to maps, photos, artwork, songs, and so on. Organizing these data, providing appropriate protection from misuse, and allowing legitimate users to discover and access data where permitted, are all essential aspects of data management. At present, no such system exists for traditional knowledge from the North Slope (or anywhere else in Alaska). Some organizations, such as the Exchange for Local Observations and Knowledge in the Arctic,[7] are developing tools for traditional knowledge data management and can provide advice and assistance where needed. A system of data management that places information under the control of appropriate bodies (e.g., tribes, co-management organizations, etc.) but facilitates data discovery will help increase the use of traditional knowledge, better store the work that has been done, and reduce redundant studies.

c. Comments on "Climate Change Considerations," Chapter 4

As pointed out in the report, the "primary source of information about future climate conditions in the Arctic is the suite of projections provided by fully

coupled atmosphere-ocean global climate models (AOGCMs)"; "secondary sources include downscaled AOGCM projections, physical understanding of the processes governing regional climate processes, and recently observed climate changes." With the recognized uncertainties in interpolating climate model output to the regional level (which the report mentions explicitly), this raises an important question that is left open in the report: What can be done to provide a better range of plausible future climatic conditions (ocean, ice, atmosphere) at the regional or local level in the context of permitting and planning? Could paleoclimatic or historic data contribute to such assessments, along with local and traditional knowledge and other approaches such as complex system models? This question needs to be evaluated with a comparatively high degree of urgency. The key goal is to provide a more realistic (though possibly wider) set of bounds on the future climate regimes that will govern operations and decisions in the region. In this context, quantitative assessments of predictability (vs. actual predictions without specification of error bounds) may be just as valuable in assessing the potential impacts of climate change.

The gaps in knowledge of the effects of ocean acidification on the Arctic Ocean and neighboring shallow seas are apparent. What is the expected pH change? To what depth will the pH change permeate? How fast will the change occur? To what extent will the calcium carbonate compensation depth (the depth below which calcium carbonate is dissolved faster than it is accreted) shoal (become shallower)? Both NSF and NOAA have ocean acidification programs, and an explicit focus on the Chukchi and Beaufort shelf and slope regions should be included.

More should be said, in the main text and in the findings/recommendations, about potential climate change impacts on beluga whales. Both of the beluga populations of concern concentrate every summer in traditional coastal/estuarine areas (the Kasegaluk Lagoon area for the Chukchi population and the Mackenzie Delta for the Beaufort population). These areas have particular physiographic and oceanographic conditions that are very likely to change with climate warming. Unfortunately, there is no clear understanding of why whales select these particular areas. If studies were done to describe the features that make these places special for the whales, projections of what will change with warming (increases in sea level, changes in freshwater and sediment flows, etc.) could allow some prediction of what climate change impacts might be on belugas. Belugas are not as high-profile as bowheads and polar bears, but they are a very important subsistence resource in towns adjacent to lease areas, such as Point Hope, Point Lay, and Wainwright.

d. Comments on "Marine Mammals and Anthropogenic Noise," Chapter 6

The USGS did a thorough review of Arctic marine mammals and noise, but did

not mention that efforts are underway by industry to determine thresholds for disturbance. There are also some minor comments in the appendix on this chapter.

e. Comments on "Cumulative Impacts," Chapter 7

This chapter provides a general overview of the status of cumulative effects analysis (CEA) in the Arctic and the broad issues associated with cumulative impacts, and makes some general recommendations. Among the most critical recommendations are synthesizing available information; establishing baseline data; standardizing the approach and methodology for CEA; and accounting for uncertainty, future actions, and climate change (including ocean acidification) in the evaluation of cumulative impacts. This chapter also identifies many of the basic problems (independent/uncoordinated agency assessments of cumulative impacts, project-specific focus vs. regional analysis), and presents some general solutions. However, the report misses an important opportunity to provide specific recommendations of next steps for improving CEA. In particular, it does not outline a process for setting scientific priorities or next steps to support regulatory and management decisions by federal agencies responsible for energy development in the OCS. There are numerous references to the 2003 National Research Council report on cumulative impacts, which also was fairly generic and did not describe a clear path forward for the implementation of broad system-level recommendations. Likewise, this report makes observations on the current status of the CEA process in the Arctic, and identifies several important problems with that process, without recommending specific solutions.

The chapter also recommends implementation of ecosystem management and marine spatial planning without providing a logical linkage to CEA, addressing how these concepts might benefit management decisions, or recommending specific science needs related to those concepts. For instance, Recommendation 7.05 states: "A methodology for comprehensive, quantitative cumulative impact analysis that is transparent, externally vetted, and adopted consistently across at least the Bureaus of the DOI and other key agencies should be developed. … A common language and a common set of metrics should be developed." So, what should the "language" include? What units can be used to quantify cumulative impacts and assess interactions between impacts to different resource types? How do we start to resolve this problem? Approaches to synthesis in applied ecological studies have been developed by the North Slope Borough in its requirements for monitoring industrial development in the Prudhoe Bay region. These models should be considered. One could consult with Dr. John Kelley at the University of Alaska Fairbanks (UAF), who chaired a North Slope Borough committee responsible for advising the borough on its large-scale synthesis and monitoring program for the Endicott Development.

CEA will become much more useful when information from different research programs can be integrated coherently. The idea of standardized assumptions—such as agreement on reasonably foreseeable future actions (RFFAs), metrics and analytic techniques for CEA—is crucial. Standardized metrics are needed so that interactions between impacts on different resource types from different projects can be estimated objectively. Given the number of lease sales and resource development projects awaiting approval, the number of regulatory agencies involved, and federal budget implications, recommendations are needed on immediate, practical next steps to improve CEA, in addition to bigger-picture recommendations.

Chapter 7 does not recognize impacts of past development, a key component of National Environmental Policy Act (NEPA) CEA, nor the roles of commercial whaling, Cold War military facilities, scientific research, or oil and gas development (abandoned sites, spread of infrastructure), in cumulative effects. This shortcoming is exemplified in a statement that "the Arctic has seen little development, and today's conditions could represent a baseline." The cumulative effects from the spread of oil and gas infrastructure along the Beaufort Sea coast, especially roads, pipelines, and gravel pads, have long been a stakeholder concern. Solutions to this concern are difficult to impose at the individual project or applicant level and may require regional solutions, such as private-public partnerships to finance and operate common facilities.

Chapter 7 only touches on one of the important agency tools for assessing and mitigating cumulative impacts: adaptive management and associated monitoring and mitigation requirements. This is another broad concept that has been challenging to implement under NEPA. Specific recommendations on how adaptive management should focus on areas of uncertainty, missing information, mitigation measures, monitoring, and reassessing results would be helpful. Also needed is to run some scenarios of negative ecosystem effects to determine whether the regulatory machinery in place can alter already-approved activities. In other words, can true adaptive management occur under the current circumstances in response to research and ecosystem monitoring results?

Note: For consistency and brevity in the main body of this report, some additional comments and recommendations from Chapters 3, 6 and 7 have been placed in Appendix 1.

III. Overarching Issues and Recommendations

Here we discuss several issues and make recommendations for improving Arctic marine science and its application to management and conservation. Topics discussed in this section include data management, synthesis, coordination, the need for long-term monitoring, setting research priorities, adaptive management, and identification of

areas of special significance. Many of these topics and our recommendations are interrelated. For example, as recognized by the USGS report, there is a serious lack of synthesis of the data we have in the Arctic. The first step in improving synthesis is to make as much data as possible available to scientists working in the Arctic. Optimistically, data integration might lead to improved coordination among parties carrying out research, which in turn would provide a basis for crafting a long-term, broad-scale monitoring program that is needed for almost all of the identified issues revolving around energy development impacts.

1. Data Management

The single most important and urgent issue emerging from the USGS report, in terms of what is missing and essential next steps, concerns data management. There is a lack of concerted, cutting-edge effort to integrate the mostly disparate data sets and data streams of environmental variables into a single, unified context that allows derivation of data and information products at spatial-temporal scales and in formats relevant to decision makers, operators and the public. Industry may have made the most progress in this regard, but unfortunately there is comparatively little discussion of industry data, most likely because such data are not always easily accessible. In general, a conclusion that is implicit in the different sections of the report, but never made explicit with the degree of urgency it deserves, is that despite increasing coverage and volume of environmental, and to a lesser extent biological, data collected in the Arctic, there is no easy way to access different data streams in a unified, coherent setting that enables integration and derivation of usable data products. Rather, as illustrated by Figure 5-3 in the report, it would involve a significant effort even to assemble all the relevant data sets shown in the Alaska Ocean Observing System's (AOOS) Arctic Assets Application, let alone consolidate these into a single computing environment. Yet, such an environment would facilitate decisions that consider all the relevant information. For retrospective data analysis that is so relevant to permitting or leasing decisions, these challenges may be surmountable for small subregions involving a limited number of data sets. For operational settings, however, or in the context of spill response tactics where rapid access is needed to information directly related to the task at hand, the great potential of existing data is not fully realized. To be sure, industry is likely to have systems in place that perform some of these functions, but given the amount of observing system assets in place, a broader, more integrated effort to consolidate these data streams is needed.

The most appropriate next step to address this issue is to intensify and concentrate efforts to catalog existing and planned observing efforts, similar to AOOS' Arctic Research Assets Map. This would not require meetings, but rather more effective outreach and incentives or support to allow the relevant assets to be captured. Because a number of parallel activities are underway that offer such information nationally and internationally, these groups may have to agree on a joint strategy

and division of tasks and responsibilities. In the long run, only a single entity that is robust, relevant and accessible is likely to be able to attract a large pool of (self-reporting) data acquisition and reporting systems.

The next step would be to use existing agreements and frameworks (such as the Arctic Observing Network supported by NSF, the Arctic Research Commission, or BOEMRE programs such as COMIDA or the Arctic Nearshore Impact Monitoring in the Development Area program, and industry efforts) to move from mutual information about observing asset deployment to coordination, development of common formats and standards, and eventually a more integrated observing system that can address the information needs highlighted in the USGS report. Thus, the subsequent logical step in scientific management would be improved program coordination.

2. Syntheses of Existing Information

Large-scale synthesis of existing data sets is underway at UAF for fish (Norcross, Mecklenburg), benthos (Blanchard, Bluhm), zooplankton (Hopcroft), and sea-ice communities (Gradinger). Industry is working to do the same for seabirds (through Alaska Biological Research) as well as some aspects of marine mammals. A multidisciplinary regional synthesis is needed after that. Industry is sponsoring an overall synthesis of its work in the Chukchi Sea over the past three years this fall. BOEMRE has funded a large synthesis of Arctic research by NOAA. A synthesis effort is underway by the Pacific Arctic Group (PAG) that will result in a 13-chapter book in 2012 (J. Grebmeier, ed.). A report on the Bering Strait summarizes a wide consensus of science status and needs in the region (Cooper *et al.* 2011).[8]

It will be informative to see the results of the UAF synthesis on Arctic fishes. Much of the work conducted over the past decades on fish was very limited spatially, and rarely, if ever, replicated, and investigators used a wide variety of sampling equipment, so results are not always comparable. We need more work like that completed by Logerwell *et al.* in 2008[9] in the western Beaufort. In addition, most of the historic and recent marine fisheries studies completed in the Chukchi and Beaufort seas are reviewed in the 2009 North Pacific Fishery Management Council Arctic Fishery Management Plan's accompanying Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis.

The assessment of cumulative impacts can be seen as another form of synthesis, especially in regard to cumulative effects from many stressors (as opposed to the cumulative impacts of noise from a single stressor, such as many ships or drill rigs). What are the relative contributions of different activities, locations, times, and stressors to impacts on benthos, fish, birds, marine mammals, and subsistence? Are there priority targets for mitigation? For further study?

3. Research and Monitoring Coordination

The USGS report's identification of areas that would benefit from further scientific research is a first step for improved management of Arctic science. Although the recommended further research would undoubtedly advance our knowledge base and allow for better decisions, there is in reality little likelihood that all of it can be funded given the current situation with government budgets. In addition, there are greatly overlapping goals and potential inefficiencies in having so many separate participants in Arctic science. Many state and federal agencies and universities across the United States are developing Arctic programs and projects. Consortiums of groups are being formed to coordinate and cooperate in Arctic scientific studies. Do we really need all of these groups working independently, each within its particular but overlapping area of interest?

We already have BOEMRE, the NAS Polar Research Board, NSF's Office of Polar Programs, AOOS, PAG, North Pacific Research Board (NPRB), North Pacific Marine Science Organization (PICES), Pacific Science Center, Scott Polar Research Institute, the Army's Cold Regions Research and Engineering Laboratory, Arctic Council, Russian-American Long-term Census of the Arctic, National Snow and Ice Data Center, International Arctic Science Committee/Marine Working Group, Arctic Research Consortium, Barrow Arctic Science Consortium, Smithsonian's Arctic Science Center, and many NOAA programs and groups, to name a few. Industry also has sponsored research efforts.

There are many valid interests, regulatory needs and mandates, and other reasons for so many entities, but are all of these groups essential, given pressing needs and tight budgets? What is a possible "solution" to the existence of so many entities initiating programs in the Arctic? Could greater efficiencies be achieved by bringing all of the major scientific efforts under one umbrella management structure, or at least a substantially smaller number of management structures? We believe that this single act, challenging as it might be to accomplish, is one of the best things that could be done for Arctic science. This probably would have to be done in steps and with powerful (monetary) incentives, but the benefits would be enormous: more could be learned over a wider area for the long-term; greater efficiencies in vessel usage could be achieved; duplicate work could be avoided; data management and sharing could be improved; synthesis efforts could be sponsored more easily; common approaches could be applied to evaluating cumulative development effects across the Arctic.

We have already alluded to coordinated data management as a first step toward greater integration and coordination. It may take a federal interagency effort to streamline some of the many entities mentioned above.

Another mechanism for greater communication and integration is geographically specific scientific meetings. At present, the Alaska Marine Science Symposium (AMSS) is a good forum for exchanging scientific findings well in advance of publication. Marine scientists exchange ideas, compare research approaches and discuss opportunities for coordinated research at this meeting. However, the session devoted to the Arctic Ocean has been limited to one day. This could profitably be expanded. Additionally, some organizations, such as the Exxon Valdez Oil Spill Trustee Council (EVOSTC) have made funding contingent on presenting study results at the AMSS. If all of the funding organizations made such a requirement, greater coordination of research activities at the level of principal investigators would result. Support is also needed for scientists to attend larger national and international forums to allow broader evaluation of science in the Arctic relative to other global regions. The EVOSTC was successful in coordinating large, multidisciplinary ecosystem studies in the northern Gulf of Alaska for about a dozen years, involving state and federal government agencies, private consultants, and universities. Studies were proposed, peer reviewed with the objective of achieving ecosystem restoration goals, and adaptively managed. The advantage of the EVOSTC process was that there was one pot of money to start with, and that provided a powerful incentive for coordination by participating institutions. Another model with a somewhat similar structure is the NPRB.

Another intermediate state, or possible evolutionary step, toward a fully integrated scientific research and monitoring effort would be large ecosystem-based studies with participation of multiple funding institutions. The Sound Ecosystem Assessment and the Nearshore Vertebrate Predator studies conducted under the EVOSTC umbrella are two examples that brought together investigators from state and federal governments, universities, and private organizations in integrated research programs. Other notable focused, highly productive studies in the Bering and Chukchi seas were Processes and Resources of the Bering Sea Shelf (PROBES), Inner Shelf Transfer and Recycling (ISHTAR), Western Arctic Shelf-Basin Interactions' (SBI) global change program, and the Bering Sea Integrated Ecosystem Research Project (BSIERP), which serve as excellent models for the organization of tractable scientific programs within a comprehensive management structure.

One way to conceptualize the evolution of greater integration among institutions doing Arctic research and monitoring is presented in Figure 1. The early steps in this evolution would involve joint data management: getting institutions to find ways to share and derive benefit from a common pool of Arctic data, and solve the myriad problems of common formats, data exchange mechanisms, and data preservation. This could naturally develop into identifying syntheses of benefit to all, with the possibility of joint funding, to the benefit once again of all institutions. With input from an expanded Arctic forum such as the AMSS, it is not difficult to imagine a progression to joint research programs. A similar progression in designing a large monitoring program, using existing ongoing measurements and new ones, would be

another step in aggregating functions common to the needs of participating institutions. This is a very preliminary sketch of how further integration might take place and would need further consideration and refinement. However, it offers the prospect of progress toward greater integration and efficiency without immediate reorganization.

We are not practitioners in institutional architecture, but we do know that the best environmental science is done in a coordinated way, has access to all relevant data, is ecosystem-based, has explicit conceptual models and hypotheses, and is peer-reviewed, cross-disciplinary and adaptively managed. It may be too difficult to implement an umbrella governance structure in the short run because of differing mandates, data needs, and funding sources, but some aggregation surely is possible. Beginning with small steps would be better than what exists now.

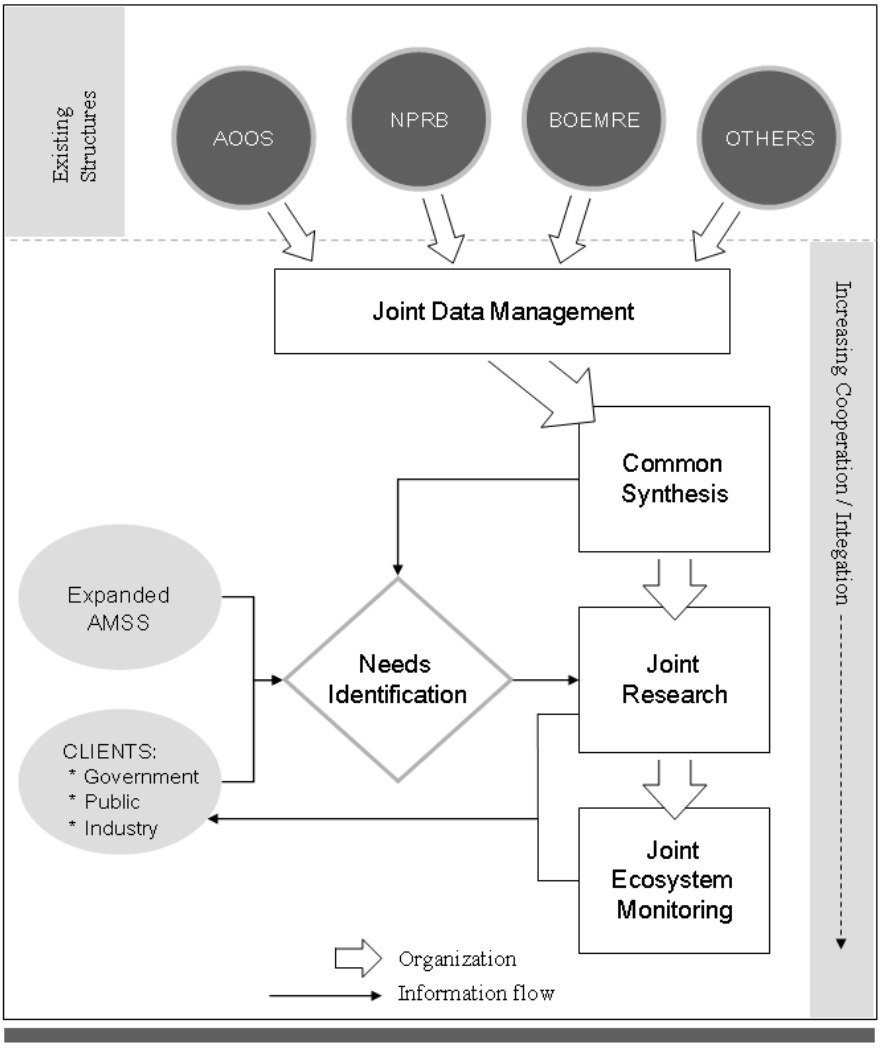

Figure 1. Suggested framework for enhanced cooperation and integration among institutions carrying out Arctic marine ecosystem research. This proposes a step-by-step evolution of integration.

4. Long-Term Monitoring

Almost every marine scientist now appreciates the absolute necessity of long-term monitoring for understanding ecosystem change and for gathering the necessary information for ecosystem-based management. The problem is finding sufficient and stable financial resources to support a program of basic measures at all levels of the ecosystem that will last for decades, including time scales on which ecosystems fluctuate in response to climate and other pressures. Again, political support and institutional strength are likely to improve if there is a concerted and coordinated structure for science management. Our reviewers recommend the following next steps:

- Develop a series of monitoring stations at which physical, chemical, and biological data are collected repeatedly, over the long-term.
- Develop a list of core physical, chemical, and biological measurements for monitoring that will be measured at the time-series stations. Other stations and measurements can be tailored to specific needs at sites of prospective development or where key ecological processes with broad importance occur, e.g., Barrow Canyon or Hanna Shoal.
- Link monitoring to the outcomes of a comprehensive, issue-driven, integrated ecosystem-based research program; consider the DBO concept and NPRB's BSIERP. Findings 3.03 (long-term plankton monitoring), 3.04 (monitoring hot spots of biological activity), 5.24 (use of the DBO), and 5.25 (using existing study frameworks for Arctic science) are high priority items.

5. Setting Research Priorities

One of the most important next steps in setting the agenda for Arctic marine science in the Beaufort and Chukchi seas is a process for prioritizing research and monitoring needs. There are two approaches to identifying research priorities: applied risk assessment and basic ecosystem research. Both are needed. The USGS report includes a recommended methodology, "Structured Decision Making" (SDM) (Appendix C), for improving the way decisions are made in the OCS and thereby helping to determine what information is needed to make them. Key components of this SDM are risk and uncertainty. The USGS report has: 1) described a large number of unknowns such that if we had nearly inexhaustible resources to research those unknowns we could reduce uncertainty, and 2) provided a recommended process for making decisions using existing and new information to describe risk. What is missing is a way to link these two and a process for prioritizing the science that needs to be done with finite resources. The missing process involves some way of assessing risk from OCS activities, identifying the important unknowns (or asking the appropriate questions, or, more formally, stating the important hypotheses).

Risk assessment, even with its known weaknesses, is an appropriate process for identifying the "known unknowns." It is a structured process that needs to be strengthened to more closely and explicitly link policy decisions to scientific findings. The weakness of risk assessment, as we have recently seen in the nuclear plant disasters in Japan, is that some elements of risk are not identified and that risk assessment often provides a level of confidence in decisions that is unwarranted. So we need to continue to do basic research on Arctic ecosystems and the ways in which anthropogenic effects are manifest in these systems, to identify the "unknown unknowns" as much as possible.

If the management of risk is truly carried out in an adaptive mode, then the risk assessment will be an iterative process that is continually refined by research into ecosystems, informed by ecosystem monitoring and then linked to real control of

development. An increased ecosystem understanding will also help inform the design of long-term monitoring efforts needed for risk assessment, identifying cumulative effects of OCS activities and providing the information needed for adaptive management of policy—by which we mean the ability to change established policies if they are ineffective.

One of the most fruitful approaches to understanding changes in Arctic ecosystems, and one that would help greatly in understanding cumulative change, designing new monitoring efforts, and identifying areas of priority research, would be to repeat some of the studies carried out in the 1970s and '80s in OCSEAP. An assessment of OCSEAP results should be made to identify which studies and measurements should be repeated and why they would be relevant to current decisions.

Four areas that should be considered among the top priorities for basic biological research on Arctic ecosystems are:

- Population dynamics of key pinnipeds, cetaceans, marine birds, forage fishes, and commercial fishes. Programs are underway and have been for many years for some species. For others, there still is no reliable estimate of abundance, much less trend in abundance. Rationale: Population size and trend are the ultimate indicators of the biological status of a species.
- Habitat use by cetaceans, pinnipeds, and marine birds, including breeding locations and foraging and movement/migration patterns. Rationale: With respect to resource development, conflicts between habitat needs of wildlife and the desires of industry (and consequences of accidents such as oil spills) must be understood and resolved.
- Pelagic and benthic food web structure, including particularly diets of key species of marine fishes, birds, and mammals. Traditional and novel methods such as the use of molecular biomarkers should be employed. Rationale: Knowledge of trophic dependencies of species is key to understanding their natural histories, and changes in diet are important indicators of change in populations of forage species and community structure.
- Phytoplankton, zooplankton, and benthic community structure and productivity. This would again include traditional approaches as well as novel methods. Rationale: Primary and secondary production set the upper limit of biomass yield in ecosystems, and there is concern over possible alterations in Arctic production budgets due to climate change and the loss of sea ice.

6. True Adaptive Management

True adaptive management that is protective of resources must seamlessly integrate monitoring with ongoing risk assessment and be able to adjust the scope of anthropogenic activities. Adaptive management must receive a serious commitment for implementation and the funds necessary to support it. Such a system does not

exist on a large scale today in the Arctic Ocean of the United States. The report does mention adaptive management, but only superficially. Given the myriad guiding legislative and decision-making processes, additional review is needed to determine whether, to what extent, and how adaptive management can be applied in the Arctic. Without the flexibility to respond in a timely and adaptive way to what is learned by research and monitoring, which is at the heart of adaptive management, there is less incentive to study the outcomes of policy decisions and the cumulative impacts of development in the Arctic.

7. Identification of Areas of Special Significance for Protection

There is a need to continue undertaking workshops and syntheses of information on biological hot spots, building upon results of similar recent exercises to avoid duplicating efforts.

An overview synthesis of Ecologically and Biologically Significant Areas (EBSAs) in the Arctic was completed by the International Union for Conservation of Nature (IUCN) and the Natural Resources Defense Council (NRDC) in April 2011 following a "Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment" in La Jolla, Calif., in November 2010. "The purpose of the La Jolla workshop was to advance the process of identifying EBSAs in the Arctic marine environment. In addition, the workshop served as a venue to bring together and build on the work of several parallel projects, including those undertaken under the auspices of the Arctic Council, the World Heritage Arctic marine site identification process, and mapping efforts by non-governmental organizations including the World Wildlife Fund, Oceana, and the National Audubon Society."[10]

A second synthesis of information on Arctic ecosystems, "Arctic Ocean Synthesis: Analysis of Climate Change Impacts in the Chukchi and Beaufort Seas with Strategies for Research," was produced in 2008 by the Institute of Marine Science at UAF and funded by NPRB. "The goal of this effort was directed at summarizing the current state of knowledge and then identifying: (1) the most crucial information gaps, (2) 'pulse points' in the biological/physical environment that require monitoring, and (3) how climate change might impact biota through its influence on: sea ice extent/characteristics, shelf currents and transport through Bering Strait, coastal currents along Alaska's north coast and their relationship to various biological processes and life histories."

These syntheses are both broad treatments that identify particular locations and systems of ecological and cultural importance in need of study and protection. With respect to the findings of these reports and the USGS report's Recommendation 3.07, "Biological hotspots for long-term research and monitoring," syntheses of available information on some or all of the individual sites should be undertaken.

This has been done at some level for regions from the northern Bering Sea to Barrow Canyon.[11, 12]

Among the hot spots listed in Recommendation 3.07, Ledyard Bay has been identified as a Super EBSA in the IUCN/NRDC report and as an Important Bird Area (IBA) of global significance by the National Audubon Society. Ledyard Bay includes the embayment between Cape Lisburne (itself an IBA of global significance) and Point Lay, the lagoons, and nearshore waters. Although much remains to be done scientifically in Ledyard Bay to properly characterize it physically and biologically, and to understand the processes that cause it to be of such ecological importance, considerable work has been done there and enough information has been gleaned about it to warrant synthesis. Some has been published, but much has not. Of note with respect to Recommendation 3.07, "Capes Lisburne and Thompson (seabird colony and fishery oceanography dynamics)," a beginning foundation of understanding was established from the 1970s to the 1990s on forage fish variability as revealed through studies of seabird diets, the supporting marine food webs, and responses of forage fishes to climate change operating through those food webs. Recent studies related to Lease Sale Area 193 have added additional information. Inasmuch as Ledyard Bay is adjacent to Area 193, and despite the special recognition it was afforded under the ESA (Ledyard Bay Critical Habitat Unit), it is deserving of extra attention beginning with a synthesis of all available information.

A second location of considerable ecological and cultural importance is Kasegaluk Lagoon, also within an IUCN/NRDC Super EBSA and an Audubon IBA of global significance. As with Ledyard Bay, much remains to be learned about the ecological processes that cause it to be of such significance and about its sensitivity to disturbance. However, at Kasegaluk Lagoon there already has been enough work done scientifically, as well as through traditional ecological knowledge (TEK), that a synthesis of available information is warranted.

Although the Bering Strait region has been a focus of attention for decades, and syntheses of information on various components have been undertaken, including ecological processes and anthropological significance, none has fully integrated the multitude of features of this ecoregion in a suitably holistic way. In lieu of a synthesis *per se*, which would indeed be a monograph, an annotated bibliography of scientific studies, syntheses, and TEK would be an important first step to acquaint the modern world with the historical knowledge available for the region. It could be organized in a synthetic way—that is, it would follow logical and connected pathways to arrive at a description and understanding of this ecoregion, if and how it has changed in recent decades, and how and why it might be altered by resource development and climate change in the future.

IV. Conclusions and Recommendations

The USGS did a creditable job of summarizing the numerous gaps in our knowledge of Arctic marine ecosystems and the effects of OCS activities and climate change. Some parts of the report, such as aspects of the physical oceanography are incomplete. The report calls attention to the large body of scientific information that has been gathered about this environment, but much of this information has not been synthesized and therefore not accessible in a form that benefits the scientific community and even less so for policy decision makers and the public. In addition, the report calls attention to the many critical gaps in existing information, but does not give a sense of priority to guide the allocation of limited funding to address those gaps. The USGS report is a good starting point for further discussion, work, and integration, but the question of how much and what science is needed to support informed decisions about oil and gas activity in the Arctic remains unresolved. The DOI, having commissioned the report, should follow up on this first step along with other federal agencies in making science more relevant in the Arctic.

Following are our specific conclusions and recommendations:

1. Setting research priorities: The USGS report does not indicate which of the many science gaps are most important to fill. RECOMMENDATION: The DOI and other agencies need to set research priorities as there are not enough resources to study all of the topics suggested in the report. The SDM process outlined in Appendix C of the USGS report, as well as a more formal risk assessment process, should be used to identify immediate research needs.

2. Supporting basic ecosystem research: RECOMMENDATION: In addition to filling specific science gaps, the DOI and the federal government must continue to support a fully integrated scientific research and monitoring effort.

3. Identifying the next steps: The report lacks specific recommended next steps for study of some problematic areas, such as determining the cumulative effects of development and how to integrate the many monitoring activities across the Arctic. RECOMMENDATION: Specific next steps need to be identified as part of an overall strategy of integrated and relevant research and monitoring.

4. Assessing cumulative effects: Properly assessing cumulative effects is essential to informed decision making about oil and gas activities in the Arctic. For example, there is a considerable body of information about the impacts of noise on movements of bowhead whales, but very little is known about the cumulative impacts of multiple simultaneous or sequential noise events. RECOMMENDATION: The DOI and other federal agencies should undertake an assessment of cumulative

impacts, beginning with the development of a range of scenarios for industrial activities over the next few decades.

5. Improving timely dissemination of information: There is a significant lag in the communication of study results so that some of the areas suggested by USGS for research are being addressed already. For example, the USGS summary of nutrient chemistry and biology of non-vertebrates differs little from that reported by Hopcroft *et al.* (2008), although significant progress has been made since then in initiating new research on these topics.

6. Improving information exchange: A broader, more integrated effort at consolidating, coordinating, and sharing data streams is needed. RECOMMENDATION: The DOI and all participating institutions should develop better and more timely ways to share results among Arctic scientists and managers at a broadly based scientific forum such as the AMSS, the National Marine Fisheries Open Water Meeting, the Arctic Research Commission process, or the North Slope Science Initiative.

7. Implementing better monitoring: It is likely that climate change will overwhelm other sources of ecosystem forcing, and it is important to account for this probability in the design of monitoring. RECOMMENDATION: It is imperative that the DOI integrate existing and new monitoring into data systems that can then be used to answer pressing questions about ecosystem response to climate change and the accumulative effects of OCS development across the Arctic over many decades. This requires annual monitoring supported by stable long-term funding and enhanced planning and coordination.

8. Improving data management: RECOMMENDATION: The DOI and other institutions engaged in Arctic research need to do a better job of data management. Accessing various data streams for synthetic purposes is an urgent emerging issue requiring concrete next steps, including and surpassing those identified in the USGS report.

9. Improving research and monitoring coordination: RECOMMENDATION: Further integration of research and monitoring activities is needed. Greater efficiencies could be achieved by bringing all of the major scientific efforts under one umbrella management structure, or at least a substantially smaller number of management structures. We suggest that this start with coordinated data management and eventually aggregate research and monitoring functions via a smaller number of managing entities. The Interagency Working Group on Arctic Resource Development established by President Obama should provide incentives for further integration of what is now a piecemeal approach to the management of Arctic resources.

10. Implementing true adaptive management: RECOMMENDATION: To conserve Arctic resources, true adaptive management must be in place. The DOI should be able to revisit its policies and decisions on an ongoing basis, and change them in response to

research and monitoring findings. We recommend an additional independent examination of decision-making processes to determine whether this can be accomplished under existing laws, regulations and procedures, and what can be done in these areas to ensure that invaluable Arctic ecosystems can be protected.

11. Synthesizing existing knowledge: RECOMMENDATION: Syntheses—as well as new data—are needed for a number of priority topics. There are a number of biological syntheses underway at present. When these are completed the DOI in cooperation with other federal agencies should complete a regional ecological synthesis. Such a synthesis would help address basic questions about oil and gas activity, such as whether, where and when to allow such activities, and would also help identify geographic areas requiring enhanced protection and aid design of new monitoring programs.

12. Interpreting data and results: It is important that existing information about the Arctic marine environment are synthesized and interpreted for the benefit of decision makers and the public. If the goal is to inform policy decisions on oil and gas activities in the Arctic, the necessary information must be made available in timely and accessible ways. RECOMMENDATION: The DOI should develop an interpretation program to make results of scientific activity more broadly accessible to and understandable by nonscientists. The data used in OCS decision making should also be publically available for independent analysis.

13. Increasing assessment and incorporation of local and traditional ecological knowledge: RECOMMENDATION: The DOI needs to make greater efforts to incorporate local and traditional knowledge into Arctic research and resource management, as these sources can provide insight on environmental trends and relationships that might not be available from other sources. Doing this in partnership with Alaska Native tribes and organizations will ensure that it is done in ways that the holders of local and traditional knowledge approve and find suitable.

14. Identification of areas for enhanced protection: RECOMMENDATION: The DOI and other appropriate government agencies, e.g., NOAA, should make a concerted effort to protect areas of special biological and ecological importance based on available information and to give such areas priority in research and monitoring programs to better understand the underlying features and processes that make them important. Examples of important areas are Hanna Shoal, Ledyard Bay and Barrow Canyon, and unique habitats such as the Boulder Patch in the Beaufort Sea

V. Appendices

Appendix 1: Additional Reviewer Comments on Chapters 3, 6 and 7

a. Additional Comments on Chapter 3, "Ecological and Subsistence Context"

Physical factors: Caution should be exercised in using the Figure 3.1 cartoon because it obscures the many details known about the circulation. There was no discussion on the wind field over the Chukchi Sea and how this influences ice and water movements. There was a brief remark on the winds in the Beaufort Sea. There are seasonal wind variations that are well understood. There has been work on storm surges and some work on waves, but none of this work is mentioned in the text. Nothing was stated about how the discharge from North Slope rivers or the Mackenzie River affects the circulation characteristics of the Beaufort shelf and slope. Moreover, there was no clear connection between this presentation and the items highlighted in the recommendations box on Page 43. How did the authors decide on the recommendations in Box 3.01 given the discussion presented?

In the box on Page 43, Beaufort Sea: What is meant by the large-scale circulation of the Beaufort Sea and its thermohaline structure? Is this meant to be about the whole Beaufort Sea, the shelf (including the Mackenzie component), the slope or the adjacent basin? What are the crucial issues that connect interannual variability in ice and winds to the circulation and thermohaline fields? This recommendation is extremely vague.

There is far more detail presented on Page 83 regarding model analysis methodologies with respect to future climate scenarios than on the physical oceanography and sea ice sections. (In general, the sections in Chapter 4 [Pages 83 to 90] are far more illuminating and detailed than Pages 42 to 47.) Better balance, at the very least, is needed on these topics. The reviewer did not notice any mention of likely changes in the river discharge cycles. These will occur and result in increases in discharge and, perhaps more importantly, changes in the onset, duration, and persistence of runoff events and the seasonal cycle.

b. Additional Comments on Chapter 6, "Marine Mammals and Noise"

We note that the same topics are brought up in multiple chapters, but they don't necessarily refer to the same information. As an example, when ocean acidification is first mentioned, one is expecting to read about how this could impact calcium carbonate users such as bivalves and how this in turn could affect walrus foraging (on top of the issues walrus will have with reduced sea ice cover). Although this information was identified in the report, it's scattered. Another example is the reference to the AOOS website with all the oceanographic mooring information—this isn't referenced at all in the acoustics

chapter although more than 100 acoustic recording packages are shown on this site. These points are very minor but noticeable, possibly because the rest of the report was so nicely done.

Only four stocks of bowhead whales are recognized currently; the Davis and Baffin stocks have been merged.

There is no assessment of how many harbor porpoises there are in the Arctic seasonally. Therefore, one can't say "low abundance," because we don't know how many there are.

Gray whales are regular summer-long visitors to the Beaufort Sea and have been seen as far east as Canada. They generally appear to continue bottom feeding but some have been seen skim feeding on euphausiids. There has been no comprehensive assessment of gray whales in the Beaufort Sea.

Beluga whales are important subsistence species for coastal villages (especially at Point Lay) in northwestern Alaska. Finding 6.12 concerns spatial and habitat needs of beluga whales. Given their distribution over vast areas of ice-covered water, scientists need an improved survey methodology for this species in the Chukchi and Beaufort seas.

What this report highlighted was that we who work in the Arctic are not getting information out in a timely enough manner and that there is not enough coordination among researchers. It's not clear how to make this happen, although a workshop might be useful to connect people, possibly during the AMSS meeting or at the International Polar Year meeting in Montreal in 2012.

We also note the following specific errors:

- There are a couple of errors in the literature cited.
- Table 6-2 should be Delphinapterus, not Delphinus.
- Harbor porpoise = high frequency cetacean.

c. <u>Additional Comments and recommendations on Chapter 7, "Cumulative Impacts"</u>

Specific recommendations made in Chapter 7 that will improve cumulative impact assessment include the following:

- A single methodology could be consistently applied to different areas, account for regional variables, and allow for a comparison of results; there should be a single DOI approach.

- What seems to be missing from many of the cumulative impact analyses is consideration of future actions; there should be a consistent approach to "reasonably foreseeable" actions, and trans-boundary impacts need to be addressed.
- Monitoring is an important part of the iterative nature of cumulative impact analysis, to assess the accuracy of predictions of effects and to evaluate the success of mitigation.
- To develop a new cumulative impacts assessment methodology will require evaluating best practices across all agencies, domestic and international, and taking advantage of new analytical approaches emerging in fields outside of environmental sciences.
- Efforts to develop such a methodology should consider how best to incorporate more than single projects. The methodology and resultant analysis should include a plan for the number and types of projects in the region and be able to account for positive and negative trade-offs.
- Development and implementation of cumulative impact analysis must include the various stakeholders in the Arctic.
- A thorough synthesis of the existing Arctic literature is needed to develop a body of knowledge about cumulative impacts from which to develop the cumulative impact assessment.
- Cumulative impact assessment could benefit from applications of sophisticated geospatial techniques and regular synthesis of environmental data information.

Specific recommendations made in Chapter 7 that are problematic include the following:

- Consider using cost/benefit analysis to sort out the potential adverse/beneficial socioeconomic effects. This would be very difficult to do, and agreement among stakeholders on methodology would be difficult to attain.
- Cumulative impact assessment could benefit from applications of ecological forecasts and multidimensional evaluations of human developments. This concept needs more thought and specific suggestions in order to be helpful.
- Marine spatial planning is currently a controversial topic in Alaska. Issues associated with intent, jurisdiction, implementation, and stakeholder participation will need to be sorted out before there is broad acceptance of the concept.

While recommending an integrated DOI cumulative impact assessment, Chapter 7 was not able to address challenges associated with different agencies conducting individual cumulative impact assessments, including:

- Uneven treatment of Valued Ecosystem Components (VECs)/elements of the Arctic environment.
- No commonality on past, present, and reasonably foreseeable future activities.
- Different direct/indirect effects evaluated for cumulative impacts, and differences in addressing most probable vs. worst-case impacts.
- Determining significance thresholds for cumulative impacts is often difficult and problematic.
- Uneven use of modeling and predictive impact systems.
- Differences in reaching conclusions on significance of cumulative effects vs. the contribution of the proposed action and alternatives to cumulative effects.
- Different temporal and spatial frames of analysis.
- Different approaches in addressing uncertainty and missing information.
- Assessment of cumulative impacts at different stages in project development (lease sales vs. specific project development).
- Differences in the extent that cumulative impact assessment modifies alternatives and drives mitigation.
- Different philosophies on implementing mitigation:
    - Permit requirements.
    - Preventative measures—conflict avoidance agreements.
    - Compensatory mitigation—local requirements for impact mitigation funds; oil spill mitigation bonds.
- Different agency mandates, interests, budgets, and research needs.

<u>Detailed Additional Recommendations for Cumulative Effects Analysis</u>

Additional recommendations for CEA are presented on two major areas of discussion: the NEPA cumulative impact assessment process, and research needs associated with cumulative impact assessment.

Through a recent executive order, the president has established an Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska, which presents a tremendous opportunity to address improvements to assessing and recommending research on cumulative impacts. With regard to cumulative impacts, a recommendation would be for this working group to set up a subcommittee to address cumulative impacts, supported by scientific and stakeholder advisory groups. This is a similar model used by NMFS for its Arctic Open Water Meetings and Beluga Whale Recovery Plan. The advisory groups should include representatives of: federal, state, and local government; the oil and gas industry; Alaska Native organizations; NGOs; and scientific research organizations such as universities and independent research institutes. The working group should address procedural improvements to

assessment of cumulative impacts under NEPA and research priorities that assist with NEPA compliance and other decision making.

Recommendations for consideration by the working group and participants in a cumulative impact assessment subcommittee include the following:

Working Group Procedural Guideline Recommendations:

- Recognize pressures of available funding, presidential/congressional interest in sound Arctic resource development.
- Agree on priorities for immediate action in cumulative impact assessment and research.
- Be constructive, flexible and solution-oriented.
- Agree on general principles that need to be included in all CEA.
- Explore avenues for a common regional cumulative impact baseline assessment, focusing an analysis of past, present, and reasonably foreseeable future activities, particularly climate change. Such a study could then be used for tiering individual agency NEPA compliance efforts from a common point of reference.

Specific Working Group NEPA Cumulative Impact Assessment Recommendations:

- Focus on the resource/elements/VECs of greatest concern for susceptibility to cumulative impacts; these can be short-term areas of emphasis for impact assessment and research.
- Develop a common understanding of key past and present contributors to cumulative impacts and trends, cause and effect.
- Develop a common understanding of RFFAs and how to update them.
- Reinforce Council on Environmental Quality guidance on speculative RFFAs.
- Evaluate causality and common assumptions.
- Reach consensus on key resources/elements/VECs for the focus of cumulative impact assessment.
- Focus on the mechanisms/events likely to cause cumulative impacts (noise, persistent contaminants, climate change).
- Focus on the sources of those mechanisms/events (air and vessel traffic, spills).
- Climate change is a big driver of past, present and future cumulative impacts; a common approach and analysis are needed that can be used by all agencies, perhaps driven by NOAA.
- Investigate use of modeling and predictive impact systems.
- Focus on thresholds and yardsticks of determining cumulative effects' significance (for example, potential biological removal).
- Develop a common vision of priorities for baseline studies.
- What geographic areas (sensitive and control areas).

- Institute a "look back" review on impact projections—what happened, what didn't.
- Focus on mitigation and regional solutions:
    - What are best management practices that should be commonly used to reduce cumulative impacts? What worked, what didn't?
    - Focus on what potential mitigation is within the purview and jurisdiction of individual agencies and where it can be implemented.
- Focus on the requirements and responsibilities for meaningful monitoring programs.
- Implement a comprehensive, documented approach to adaptive management:
    - Stakeholder involvement.
    - Prescribed milestones for monitoring reassessment permit stipulations.
    - Revisiting required mitigation.
- Evaluate how a regional approach can be used to develop efficient common infrastructure and avoid the spread of potential duplicative facilities—for example, public-private partnerships.

Specific Working Group Research Recommendations:

- Identify who is conducting/managing/coordinating research programs on the Arctic:
    - NSF.
    - Federal/state/local agencies.
    - Industry.
    - NGOs.
    - Universities.
    - North Slope Science Initiative.
- Inventory the research/programs that should be synthesized and integrated.
- Identify research priorities:
    - VECs.
    - Geographic areas sensitive to cumulative impacts and control areas for baseline research.
    - Long-term monitoring for fish and wildlife population levels and trends.
    - Long-term monitoring for subsistence harvest levels and trends.
- Best management practices—what is working to incrementally reduce cumulative effects?
- Focus research on the mechanisms/events likely to cause cumulative impacts (noise, persistent contaminants, climate change) and standardized metrics for quantifying interactions among mechanisms/events.
- Assess use of modeling and predictive impact systems.
- Provide a consistent funding stream and monitoring research.
- Focus on involvement of Alaska Natives and incorporation of TEK.
- Require mandatory annual presentations on research results and progress, and information sharing

Appendix 2: Acronyms

ABA	Arctic Biodiversity Assessment
AMSS	Alaska Marine Science Symposium
AOGCM	Atmosphere-Ocean Global Climate Models
AOOS	Alaska Ocean Observing System
ArcOD	Arctic Ocean Diversity
ARMS	Arctic Register of Marine Species
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BSIERP	Bering Sea Integrated Ecosystem Research Program
CBMP	Circumpolar Biodiversity Monitoring Program
CEA	Cumulative Effects Analysis
COMIDA	Chukchi Offshore Monitoring in Drilling Area
CSEAP	Chukchi Sea Environmental Assessment Program
DBO	Distributed Biological Observatory
DOI	U.S. Department of the Interior
EBSA	Ecologically and Biologically Significant Areas
ESA	Endangered Species Act
EVOSTC	Exxon Valdez Oil Spill Trustee Council
IBA	Important Bird Area
ICESCAPE	Impacts of Climate change on the Eco-Systems and Chemistry of the Arctic Pacific Environment
ISHTAR	Inner Shelf Transfer and Recycling (Program)
IUCN	International Union for Conservation of Nature
MMS	Minerals Management Service
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPRB	North Pacific Research Board
NRDC	Natural Resources Defense Council
NSF	National Science Foundation
OCS	Outer Continental Shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
PAG	Pacific Arctic Group
PICES	North Pacific Marine Science Organization
PROBES	Processes and Resources of the Bering Sea Shelf
SDM	Structured Decision Making
TEK	Traditional Ecological Knowledge
UAF	University of Alaska Fairbanks
USGS	U.S. Geological Survey
VEC	Valued Ecosystem Components

Appendix 3: Useful Links

a. Arctic Ocean Diversity (ArcOD). www.arcodiv.org. This contains data sets, some sections being a bit dated but all are served through Ocean Biogeographic Information System (OBIS). www.iobis.org.

b. Arctic Register of Marine Species (ARMS). www.marinespecies.org/arms.

c. Arctic Biodiversity Assessment (ABA). http://www.caff.is/aba

d. Circumpolar Biodiversity Monitoring Program (CBMP). http://cbmp.arcticportal.org. Includes background and implementation plan.

e. Pacific Arctic Group (PAG). http://pag.arcticportal.org.

f. University of Maryland Arctic Studies Group. http://arctic.cbl.umces.edu.

VI. Endnotes

[1] Minerals Management Service, Alaska OCS Region. 2007. Chukchi Sea Planning Area, Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea. Final Environmental Impact Statement. OCS EIS/EA MMS 2007-026. Vol. I. www.alaska.boemre.gov/ref/EIS%20EA/Chukchi_FEIS_193/LS%20193%20FEIS%20Vol%20I.pdf.

[2] U.S. Department of the Interior and the U.S. Geological Survey. 2011. An Evaluation of the Science Needs to Inform Decisions on Outer Continental Shelf Energy Development in the Chukchi and Beaufort Seas, Alaska. Circular 1370. http://pubs.usgs.gov/circ/1370/pdf/circ1370.pdf.

[3] Climatic Atlas of the Outer Continental Shelf Waters and Coastal Regions of Alaska. Arctic Environmental Information and Data Center, University of Alaska Anchorage. http://gcmd.nasa.gov/KeywordSearch/Metadata.do?Portal=GCMD&KeywordPath=&NumericId=26208&MetadataView=Full&MetadataType=0&lbnode=mdlb3.

[4] Hopcroft, R., *et al.* 2008. Arctic Ocean Synthesis: Analysis of climate change impacts in the Chukchi and Beaufort Sea with strategies for future research. www.arcdiv.org/news/NPRB_report2_final.pdf.

[5] Simpkins, M., *et al.* 2007. A Framework for Monitoring Arctic Marine Mammals: Findings of a Workshop Sponsored by the U.S. Marine Mammal Commission and U.S. Fish and Wildlife Service, Valencia. CAFF International Secretariat, CAFF CBMP Report No. 16. www.mmc.gov/reports/workshop/pdf/valencia_report.pdf.

[6] Indigenous People's Council for Marine Mammals. www.ipcommalaska.org.

[7] Exchange for Local Observations and Knowledge of the Arctic. www.eloka-arctic.org.

[8] Available at http://arctic.cbl.umces.edu under the DBO link.

[9] *Polar Biology,* in press.

[10] Speer, L., and T.L. Laughlin. 2010. IUCN/NRDC Workshop to Identify Areas of Ecological and Biological Significance or Vulnerability in the Arctic Marine Environment. Workshop Report. http://data.iucn.org/dbtw-wpd/edocs/Rep-2011-001.pdf

[11] For example, Grebmeier, J.M., *et al.* 2006. "Ecosystem Dynamics of the Pacific-Influenced Northern Bering and Chukchi Seas." *Progress in Oceanography* 71:331-361. www.sciencedirect.com/science/article/pii/S0079661106001303. And Grebmeier, J.M., *et al.* 2010. "Biological Response to Recent Pacific Arctic Sea Ice Retreats" *Eos* 91(18):161-162. http://wordpress.clarku.edu/kfrey/files/2011/01/Grebmeier_Eos2010.pdf.

[12] Publication products of the NSF Shelf-Basin Interactions program. http://arctic.cbl.umces.edu/sbi/web-content/index.html.