

Executive Summary

On January 25, 2013, the Aleutian and Bering Sea Islands Landscape Conservation Cooperative held a workshop to present information about the development of a Strategic Science Plan for the region. The workshop, held in association with the Alaska Marine Science Symposium, was attended by over 50 participants with an interest in the conservation of natural and cultural resources in the Aleutian and Bering Sea Islands region.

Landscape Conservation Cooperatives (LCCs) are self-directed partnerships of Federal, State, and Tribal entities. Of a national network of 22 LCCs, 5 are either wholly or partially contained within the State of Alaska. The Aleutian and Bering Sea Islands (ABSI) LCC, which was formed in 2011, consists of the islands of the Aleutian archipelago, the Pribilof islands, St. Matthew and Hall islands, and St. Lawrence Island, and their surrounding marine waters.

One of the fundamental activities of LCCs is the development of a Strategic Science Plan that identifies important management issues and their associated applied science needs. The ABSI region has a rich legacy of management and conservation planning, ranging from single-species to ecosystems. A review of over 50 existing plans identified six landscape-scale stressors of importance to the ABSI region: climate variability and change, commercial fishing, marine shipping, invasive and introduced species, contaminants and pollutants, and ocean acidification. The ABSI LCC Steering Committee and Staff conducted a systematic assessment of these stressors on both resource categories and ecosystem services. The results identified climate variability and change as the most broad-reaching of the stressors, with the potential to impact all seven resource categories and four ecosystem services that were assessed.

This facilitated workshop was structured to solicit input from the participants on the initial assessment of the six landscape-scale stressors. In addition, participants were asked to identify additional information about the critical management issues, applied science needs, potential collaborators, and the role of the ABSI LCC to advance the science related to that issue. The opportunities for engagement by the ABSI LCC identified at the workshop varied across the six landscape-scale stressors. In the case of commercial fishing and ocean acidification, considerable resources are already directed toward these stressors, suggesting that the ABSI LCC could make more strategic investments in the areas of climate variability and change, marine shipping, invasive and introduced species, and contaminants and pollutants.

Workshop participants expressed an interest in conducting their own assessment of the landscape-scale stressors, and we have responded by creating an online survey tool that can be accessed through the absilcc.org web site. Participants also underscored the importance of cultural resources in the ABSI region, community outreach, and the collection of baseline data.

We consider this Strategic Science Plan workshop to be one part of a longer conversation with resource managers and researchers, which will continue with the online assessment and review of the draft plan later this year.

Citation

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Introduction

The Aleutian and Bering Sea Islands Landscape Conservation Cooperative (ABSI LCC) promotes coordination, dissemination, and development of applied science to inform conservation of natural and cultural resources in the face of climate change and other landscape-scale stressors. We are in the process of developing a Strategic Science Plan to guide our activities over the next five years. As part of the strategic science planning process, we held a facilitated workshop during the 2013 Alaska Marine Science Symposium on January 25, 2013 in Anchorage, Alaska. We sought input from researchers, managers, and stakeholders from the region to specifically identify high priority applied science needs. Our guidance to workshop participants was that identified information needs reflect activities that would:

- enhance understanding of landscape stressors having the greatest potential for adverse effects on natural/cultural resources and ecosystem services;
- have direct application to management issues and policy;
- are not duplicative of existing efforts;
- add value to the aims of regional residents, organizations, managers & researchers.

We began by providing an overview of LCCs both nationwide and within Alaska as well as the mission, geographic scope, and leadership structure of the ABSI LCC. This was followed by discussion with attendees about our approach to exploring applied science needs, a draft synthesis ('threat matrix') of threats to natural/cultural resources and ecosystem services in the region and an interactive session where specific insights from attendees was gathered.

The workshop agenda can be found in Appendix A. A complete list of workshop attendees is included as Appendix B. A summary of the workshop results is presented below.

Landscape Conservation Cooperatives

The establishment of a network of Landscape Conservation Cooperatives (LCCs) was proposed in Department of Interior Secretarial Order 3289 "Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources." Phased in over a three-year period, the development of the National LCC network was summarized by Austen (2011).

Newcomers to these Landscape Conservation Cooperatives often wonder how the geographic boundaries of the LCC network were determined. In June 2009, a team of representatives from the U.S. Fish and Wildlife Service (USFWS) and the U.S. Geological Survey (USGS) met at the National Conservation Training Center in Shepherdstown, West Virginia, to develop a geographic framework which would provide a spatial context for biological planning and conservation design in support of conservation delivery (Millard 2012). The outcome of that workshop formed the initial basis for LCC boundaries.

Five different LCCs are either wholly or partially contained within the State of Alaska (Figure 1). The first to be established in 2009 was the Arctic LCC, followed by the Western Alaska LCC in 2010. The Aleutian and Bering Sea Islands (ABSI) and the Northwestern Interior Forest LCCs were both established in 2011, however the Northwestern Interior Forest LCC has since been re-named the Northwest Boreal LCC.

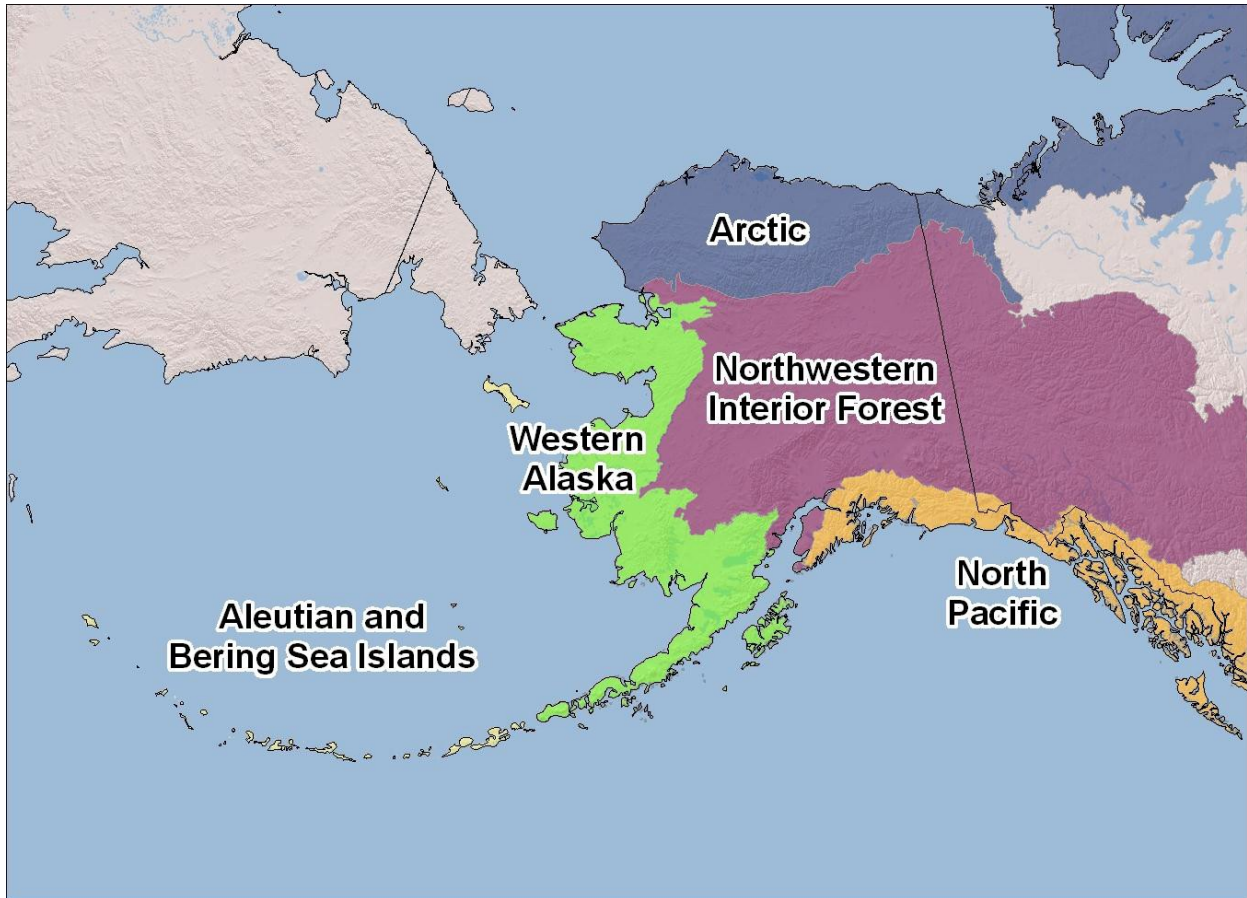


Figure 1. Geographic location of five LCCs in Alaska.

The initial composition of the ABSI LCC Steering Committee was determined through an extensive scoping process conducted in the summer of 2011. The Interim Coordinator contacted Federal, State, and Tribal Government entities to inquire about interest in participating on the ABSI LCC Steering Committee. Several agencies that participate on the Steering Committees of other Alaska LCCs, such as the National Park Service and the Bureau of Land Management, declined to do so for the ABSI LCC because they own little or no lands within the region. In the end, the initial membership on the Interim Steering Committee included representatives of four Federal agencies (Environmental Protection Agency, National Oceanic and Atmospheric Administration, USGS, and USFWS), the State of Alaska (Alaska Department of Fish and Game), and one Alaska Native Tribe (Qawalangin Tribe of Unalaska).

The State of Alaska initially participated on the Interim Steering Committee, but withdrew from further participation when the LCC charter was finalized and adopted on March 5, 2012. During the first year of operation, the EPA re-assessed its role in working with LCCs, and elected to withdraw from further participation at the Steering Committee level. During the same time, the Aleutian Pribilof Islands Association (APIA), a non-profit Alaska Native tribal organization, requested a seat on the Steering Committee and became a member shortly thereafter. The current membership of the Steering Committee is presented in Table 1.

Table 1. ABSI LCC Steering Committee Members

Name	Affiliation	Department
John Bengtson	NOAA	National Marine Mammal Laboratory
Tony DeGange	USGS	Alaska Science Center
Joel Garlich-Miller	USFWS	Marine Mammals Management
Stephen Gray	USGS	Alaska Climate Science Center
William Lekanoff	Qawalangin Tribe of Unalaska	Tribal Council
Patricia Livingston	NOAA	Resource Ecology and Fisheries Management Division
Heather Renner	USFWS	Alaska Maritime National Wildlife Refuge
Lyman Thorsteinson	USGS	Office of the Regional Director for Alaska
Karen Pletnikoff	Aleutian Pribilof Islands Association	Community Services

As evidenced by the changes in membership that occurred in 2012, the composition of the Steering Committee is dynamic and open to change. LCCs reflect a self-directed partnership and a broader participation by representatives of the Partnership Community is desired. Continued outreach to Alaska Native Tribes and organizations has been an ongoing focus of the ABSI LCC staff, who have made presentations at a variety of forums including the Bureau of Indian Affairs (BIA) Tribal Providers Conference and the Alaska Forum on the Environment.

The geographic scope of the ABSI LCC includes the islands of the Aleutian archipelago, the Pribilof Islands of St. Paul and St. George, St. Matthew and Hall Islands, and St. Lawrence Island (Figure 2). Little Diomedede Island in the Bering Strait falls within the geographic scope of the Western Alaska LCC and is not considered part of the ABSI LCC. The extent of the ABSI LCC into marine waters is defined primarily by management issues and applied science needs, rather than an explicitly defined boundary.

Funding for LCCs comes primarily through the USFWS. Other partners, such as USGS, have also dedicated funds to accomplish LCC priority science projects. The goal at the national level is to have other partners contribute funds to LCC activities. The ABSI LCC budget for FY2013 is approximately \$584K. Much of that is allocated to personnel costs and administrative overhead, leaving ~\$150K available for projects. This year's funding included an increase of \$200K over the FY2012 level. To illustrate the potential for future budget increases, some of the LCCs that were established in the first year receive budget allocations of up to \$2M.



Figure 2. The geographic scope of the ABSI LCC.

Strategic Science Plan Development

The ABSI LCC compiled over [50 existing research and management plans](#) relevant to the ABSI region. These plans range in scope from single and multi-species plans to those proposing strategies for ecosystem-wide management. Collectively they represent a rich legacy of effort from countless resource managers and researchers working in the region over decades. Through an analysis of these plans we have identified six landscape-level stressors facing the ABSI region:

- Climate Variability and Change
- Commercial Fishing
- Marine Shipping
- Invasive and Introduced Species
- Contaminants and Pollutants
- Ocean Acidification

A subsequent, issue-based analysis of each stressor identified seven broad resource categories and four ecosystem services that are impacted by these stressors. These resource categories and ecosystem services were also commonly identified in the research and management plans that we inventoried. The resulting organizational structure has a manageable number of categories that include the most visible and/or important features of the ABSI region.

Resource Categories

- Coldwater Corals
- Cultural Artifacts/Sites
- Fishes
- Invertebrates/Shellfish
- Marine Mammals
- Seabirds
- Terrestrial Vegetation

Ecosystem Services

- Commercial Fishing
- Human Community Sustainability
- Subsistence Culture
- Trophic Function

An initial exercise in prioritization was completed by six Steering Committee members and two LCC staff using a series of six online surveys – one for each landscape-scale stressor. Respondents were asked to use ordinal scores to describe the relative threat of the interaction of each stressor on each resource category and ecosystem service using the following definitions:

Resource Categories

0. None: No reasonably foreseeable effects.
1. Possible: Suspected or potential localized effects impacting species or resources of conservation or management concern.
2. Moderate: Demonstrated or potential broad scale effects impacting species or resources of conservation or management concern.
3. High: Demonstrated broad scale effects on many taxa OR potential population level impacts to key species of conservation or management concern.

Ecosystem Services

0. None: No reasonably foreseeable effects.
1. Possible: Suspected or potential effects.
2. Moderate: Demonstrated effects on some key linkages.
3. High: Known widespread affects to many key system linkages that will result in negative effects.

Average scores were computed for each interaction between stressor and resource/service and a quartile classification was applied to the range of values to delineate four threat categories across an overall *threat matrix* (Table 2). The threat matrix was presented at the workshop for

discussion asking participants to consider if those interactions in red and orange (high and moderate, respectively) should become priority science areas for the ABSI LCC.

Table 2. ABSI LCC Threat Matrix of landscape-scale stressors on resource categories and ecosystem services.

RESOURCE or SERVICE	Climate Variability and Change	Commercial Fishing	Marine Shipping	Invasive and Introduced Species	Contaminants & Pollutants	Ocean Acidification
Seabirds	2.3	1.7	2.3	2.8	1.8	1.0
Marine Mammals	2.8	1.9	2.3	1.0	1.8	1.0
Fishes	2.1	2.1	1.6	1.4	1.5	1.3
Invertebrates/ Shellfish	2.1	1.7	1.3	1.6	1.4	2.0
Subsistence Culture	2.1	1.4	1.6	1.4	1.8	1.5
Commercial Fishing	1.6	2.0	1.7	1.1	1.1	1.3
Trophic Function	2.3	1.6	1.0	1.1	1.1	1.7
Human Community Sustainability	1.8	1.5	1.1	0.8	1.1	1.5
Coldwater Corals	1.6	2.0	0.8	0.7	0.6	1.7
Terrestrial Vegetation	1.9	0.1	0.1	1.8	0.9	0.0
Cultural Artifacts/Sites	1.5	0.5	0.8	0.6	0.8	0.0

Minimal: 0 - 0.75	Low: 0.76-1.5	Moderate: 1.51 - 2.25	High: 2.25 – 3.0
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Workshop participants were also asked to offer their opinions on the process used to generate the threat matrix, but to hold in-depth comments on stressor rankings for the second portion of the meeting. The following sections contain questions and insights offered by participants.

Insights and Questions on Our Assessment

Participants wanted to know if the assessment represented the opinions of the LCC Steering Committee or of the broader Partnership Community. The assessment presented above is based on six Steering Committee members and two staff members. There was general interest by participants in providing their own responses, and an online survey tool is now available to the broader Partnership Community (See Next Steps in this report) to help expand the sample size for this assessment.

Several participants expressed the opinion that the assessment was heavily weighted toward marine species and issues, and appeared to undervalue cultural resources that are generally terrestrial in location. It is important to recognize that the purpose of the assessment was not to identify which natural or cultural resources are most important, but rather to obtain an initial assessment of their potential vulnerability to the landscape-scale stressors identified. In the case of cultural resources, they are identified in the [ABSILCC mission statement](#), and are considered a focus for our work. One potential way that the LCC could help support applied science related to cultural resources would be to work with the existing Aleutian Islands Cultural Resources Working Group to identify priority applied science needs.

Other participants were concerned that community perspectives from residents of the ABSILCC were not reflected in the preliminary results. They noted that changes in marine ecosystems might result in substantial impacts to local residents. This concern also could be addressed by broadening the participation in the online survey as described above.

One participant noted that there is uncertainty surrounding the current state of knowledge about the impacts of these landscape-scale stressors. For example, there is relatively little known about the western end of the Aleutian archipelago as compared with the eastern end. They asked if this uncertainty or lack of information could be incorporated into the assessment of these landscape-scale stressors. In particular, understanding where uncertainty exists from a geographic perspective could help inform the ABSILCC's priorities as we try to assess information gaps and needs.

One participant stated that the ABSILCC is home to approximately 80% of the breeding seabirds in the United States. The importance of this region to seabirds and their dependence on marine ecosystems should support their priority consideration by the ABSILCC.

Another participant asked how the LCC might deal with site-specific threats, such as Pebble Mine and the potential for disruption of nutrient flow into Bristol Bay. LCCs are designed to address conservation issues on a landscape (i.e. large) scale. Activities that may occur within a small geographic area but could have a large-scale impact on resources would therefore be within the purview of an LCC to address. In the case of the Pebble Mine project, the activity itself is located within the range of the Western Alaska LCC, with potential impacts to the waters of Bristol Bay, which are not considered to be within the geographic scope of the ABSILCC.

One participant asked if ocean acidification was actually a subset of climate change. Both climate change and ocean acidification share the same underlying cause: increased concentrations of CO₂ in the atmosphere, and are therefore related. In addition, although the principle expression of climate change (increased temperature) has indirect effects that interact with ocean acidification, it is not the primary cause of this phenomenon. It was noted that climate change stressors will interact with the other five landscape-scale stressors and the effects of these interactions must be understood for effective management of natural and cultural resources.

A participant suggested that it might be informative to compile a list of the different organizations that are currently engaged in activities related to these various resource categories, ecosystem services, and landscape-scale stressors, to help identify where deficiencies exist. That information could be helpful for the steering committee to look at when making decisions about applied science priorities.

One member of the ABSI LCC Steering Committee noted when discussing “priorities,” it is important to consider *for whom* are they priorities, who will address those priorities, and who will pay the price to do so. In the case of the Strategic Science Plan, we are looking to identify priority applied science needs that the ABSI LCC could address directly and in partnerships with others. And while partnerships may provide opportunities to leverage our limited funding to address issues of common interest, the ABSI LCC has no authority to direct how other agencies and organizations conduct their business.

The role of education about the impacts of landscape-scale stressors was also discussed. Some of these stressors, such as climate change, are a topic of interest in other LCCs in Alaska, and the development of educational materials should be considered and developed on a broader scale than a single LCC.

Landscape Scale Stressor Evaluation & Discussion

Discussion of the threat matrix was followed by a more detailed examination of each of the six landscape-scale stressors. To help provide structure, we asked the workshop participants to consider the following five questions that we hoped would inform our efforts toward collaborative, strategic science planning in the ABSI region:

1. Are these relative rankings within each stressor reasonable/acceptable?
2. What are the critical management issues for each stressor relative to these resource categories and ecosystem services?
3. What are the applied science needs to help address these management issues identified in question #2?
4. Who is currently working to address these science needs?
5. Is there a role for the ABSI LCC to help address these science needs?

Climate Variability and Change

The ABSI region is one of demonstrated climate change effects and rapid climate regime shifts. A clear driver in the system is changing sea ice and impacts relative to changes in trophic function, storm patterns, and coastal erosion. Changing conditions are expected to affect the sustainability of many species/resources as well as human communities that depend on subsistence activities and/or commercial fishing. Our initial assessment is that climate change and variation has been shown to be a clear stressor to *all* resources categories and ecosystem services. Climate variability and change is the only landscape-scale stressor specifically identified by name in the ABSI LCC mission statement and is considered a focus of all 22 LCCs across the country.

There was general discussion about the importance of understanding climate change and the potential impacts to natural and cultural resources in the ABSI region. Based on the input provided, we have identified three potential management issues for which the ABSI LCC could invest (Table 3).

Table 3. Climate Variability and Change: Issues, Needs, and Investment Opportunities for the ABSI LCC.

Management Issue #1	Cultural sites and artifacts are located mostly near the coast and are vulnerable to erosion and sea level rise.
Applied Science Need	A vulnerability assessment of known cultural sites would identify which sites are the most at risk.
Ongoing Work	There is an existing Aleutian Islands Cultural Resources Working Group that has begun meeting regularly.
Potential ABSI LCC Role	It is not clear if information about cultural resources is currently stored in a format that is suitable for use in a vulnerability assessment. Development of a spatially-explicit database may be needed. ShoreZone data are helpful for identifying areas of coastal erosion. At the time of the workshop, none of the coastline within the ABSI LCC region have been imaged or mapped by ShoreZone.
Management Issue #2	
	Impacts of climate change on natural and cultural resources are not well understood.
Applied Science Need	Better climate predictions for use by resource managers.
Ongoing Work	There are existing efforts to develop downscaled climate models for the Aleutian and Bering Sea region attempting to link predictions to resource vulnerabilities.
Potential ABSI LCC Role	There is a need for improved climate modeling and validation of modeled results. In some cases, data may already exist but needs to be gathered and synthesized. In addition, different scenarios could be modeled to help provide residents with better information about the potential impacts of climate change.
Management Issue #3	
	There is often a disconnect between researchers and managers when conveying information about climate change and its impacts.
Applied Science Need	Better communication between researchers and managers.
Ongoing Work	The North Pacific Research Board (NPRB) and the Scenarios Network for Alaska and Arctic Planning (SNAP).
Potential ABSI LCC Role	Work with others to help make climate change science products more accessible to resource managers via workshops, tools, etc.

Commercial Fishing

Commercial fishing is a vital economic engine within the ABSI region and more broadly within the State of Alaska, the Pacific Northwest, and the nation. Given its significance, fisheries management for the Bering Sea and Aleutian Islands has complex jurisdictional considerations. Organizations such as the North Pacific Fishery Management Council (NPFMC) and the North Pacific Research Board (NPRB) that currently make significant investments in research and management associated of commercial fisheries in this region as does the State of Alaska. Recognizing the extent of these activities, the ABSI LCC may be organizationally better suited to a supporting role with respect to funding projects related to this commercial fishing. Workshop participants noted that commercial fishing is a clear and tangible human activity that impacts the ecosystem of the Aleutian and Bering Sea Islands. Several management issues were raised for ABSI LCC consideration (Table 4).

Table 4. Commercial Fishing: Issues, Needs, and Investment Opportunities for the ABSI LCC.

Management Issue #1	Cultural sites and artifacts are subject to looting by commercial fishermen.
Applied Science Need	A vulnerability assessment of known cultural sites would identify which sites are the most at risk.
Ongoing Work	There is an existing Aleutian Islands Cultural Resources Working Group that has begun meeting regularly.
Potential ABSI LCC Role	It is not clear if information about cultural resources is currently stored in a format that is suitable for use in a vulnerability assessment. Development of a spatially-explicit database may be needed.
Management Issue #2	
	Interactions between commercial fishing and climate change may impact existing food webs.
Applied Science Need	Integration of climate predictions into ecosystem models used by fishery managers.
Ongoing Work	The North Pacific Fishery Management Council (NPFMC) and North Pacific Research Board (NPRB) make substantial investments in research and management of commercial fisheries.
Potential ABSI LCC Role	There may not be a clear role for the ABSI LCC at this time, however, better coordination with the NPFMC and NPRB may reveal opportunities for strategic investments. For example, the ABSI LCC has supported a targeted study of seabirds as indicators of forage fish stocks that is led by the U.S. Geological Survey and the Alaska Maritime National Wildlife Refuge. Results of this study are incorporated into the Aleutian Islands Ecosystem Assessment conducted by the National Marine Fisheries Service.

Marine Shipping

There is increased traffic and new routes for commercial shipping through the Aleutian Islands and Bering Strait. In addition to vessels that transit through the region, there is also a large and active fishing fleet that operates in the ABSI region. Marine vessel traffic carries the potential risk of oil spills, invasive species introductions, and other forms of disturbance (e.g., noise effects) of marine species vital to subsistence communities. Shipping through the Bering Strait is monitored by a network of land-based Automatic Identification System (AIS) receivers. The link between marine shipping and marine debris was also recognized. Workshop participants confirmed our assessment that this stressor is a high priority for the ABSI region, and identified several management issues and investment opportunities for the LCC (Table 5).

Table 5. Marine Shipping: Issues, Needs, and Investment Opportunities for the ABSI LCC.

Management Issue #1	Natural resources and ecosystem services may be impacted by oil spills from grounded vessels.
Applied Science Need	Improved vessel tracking by extending the existing AIS receiver network to the western Aleutian Islands. Vulnerability assessment that identifies areas most likely to be impacted by marine shipping.
Ongoing Work	The Marine Exchange of Alaska (MXAK) develops and operates a land-based AIS network in Alaska. The MXAK currently collects and archives vessel traffic data. Broader coverage may be available from satellite-based AIS receivers.
Potential ABSI LCC Role	Assist MXAK to fill in areas within the ABSI region that currently have no AIS receiver coverage. Conduct a geospatial analysis of AIS data that can be used in vulnerability assessments.
Management Issue #2	
	In the event of an oil spill, areas of biological importance need to be protected and coastlines within ABSI don't have the basic inventory information.
Applied Science Need	Information to improve existing Geographic response strategies (GRS).
Ongoing Work	The Alaska Department of Environmental Conservation is currently developing new GRSs sections of coastline within the ABSI region.
Potential ABSI LCC Role	ShoreZone data are useful for identifying areas of biological significance and help in the development of response strategies. At the time of the workshop, none of the coastline within the ABSI LCC region have been imaged or mapped by ShoreZone.

Management Issue #3	Emergency response capabilities to respond to drifting vessels are insufficient.
Applied Science Need	Improved understanding of near-shore currents and models to predict the location of vessel groundings.
Ongoing Work	When a drifting vessel incident occurs, the National Oceanographic and Atmospheric Administration (NOAA) provides the U.S. Coast Guard with predictions about where the vessel may run aground. The Aleutian Islands Risk Assessment and others are working to position Emergency Towing Systems at strategic locations within the region.
Potential ABSI LCC Role	Provide support for improvement of existing current and surface trajectory models.

Invasive and Introduced Species

A substantial amount of terrestrial work has been done by the Alaska Maritime National Wildlife Refuge (AMNWR) to address the impacts of introduced predators (such as rats and foxes) including prevention, inventory and eradication. The potential for introduction of invasive marine species and terrestrial plant species is less well understood. Introduced ungulates are also known to have effects on upland and coastal habitats. Introduced and invasive species clearly represent a continuing threat to seabird colonies and natural vegetation as well. There may be a role for the ABSI LCC in compiling a comprehensive geospatial database of what is known about introduced and invasive species to help prioritize future work on this stressor. The ABSI LCC could also work to foster citizen science efforts aimed at early detection and response, especially for marine invasive species adjacent to remote communities. The importance of education, especially about the prevention of invasive and introduced species, was recognized as a high priority need by workshop participants. The role of marine debris in the transport of invasive species was also discussed. Table 6 provides a list of the issues, needs, and investment opportunities identified during the workshop.

Table 6. Invasive and Introduced Species: Issues, Needs, and Investment Opportunities for the ABSI LCC.

Management Issue #1	Introduced predators such as rats and foxes have demonstrated significant effects on seabird colonies.
Applied Science Need	A vulnerability assessment to identify high priority areas for both prevention of future and eradication of existing predators.
Ongoing Work	The Alaska Maritime National Wildlife Refuge (AMNWR) has considerable institutional knowledge of introduced predator populations in the Aleutian islands. Organizations such as the Alaska Natural Heritage Program (ANHP) and Island Conservation maintain databases of invasive and introduced species.
Potential ABSI LCC Role	Work with AMNWR and others to enter information about invasive and introduced predators into existing spatially-explicit database(s). Information about eradication efforts should also be incorporated in these databases.

Management Issue #2	Introduced ungulates including reindeer, cattle, and horses have impacts on terrestrial vegetation communities and cultural sites.
Applied Science Need	A vulnerability assessment to identify high priority areas at risk from introduced ungulates.
Ongoing Work	The Alaska Maritime National Wildlife Refuge (AMNWR) has considerable institutional knowledge of introduced ungulate populations in the Aleutian islands. Organizations such as the Alaska Natural Heritage Program (ANHP) and Island Conservation maintain databases of invasive and introduced species.
Potential ABSI LCC Role	Work with AMNWR and others to enter information about invasive and introduced ungulates into existing spatially-explicit database(s). NOTE: the ABSI LCC would not be engaged in eradication efforts, but would instead work to provide information that would factor into decisions by the appropriate management entities regarding eradication of ungulates.
Management Issue #3	Marine invasive species may be introduced, establish and spread by exchange of vessel ballast water. Some marine invasive species may impact subsistence and/or commercially-fished resources.
Applied Science Need	Monitoring for marine invasive species
Ongoing Work	There is relatively little work going on to address this need within the ABSI region.
Potential ABSI LCC Role	The ABSI LCC co-authored a proposal to NPRB with the Alaska Natural Heritage Program (ANHP) to develop a marine invasive monitoring program. In addition, monitoring and assessment of vessel ballast water could be of value to address this impact.
Management Issue #4	Potential impacts of both terrestrial and marine invasive and introduced species.
Applied Science Need	Inventory of invasive and introduced species.
Ongoing Work	The Alaska Maritime National Wildlife Refuge (AMNWR) has considerable institutional knowledge of invasive and introduced species in the Aleutian islands. Organizations such as the Alaska Natural Heritage Program (ANHP) and Island Conservation maintain databases of invasive and introduced species.
Potential ABSI LCC Role	Development of a community-based monitoring program that engages residents of the ABSI region in early detection efforts.

Management Issue #5	Potential impacts of rat eradication agents on non-target species.
Applied Science Need	Improvements in rat eradication technologies.
Ongoing Work	The AMNWR is has conducted rat eradication at several islands within the ABSI region.
Potential ABSI LCC Role	Clinical studies to develop improved rodenticides that reduce the hazards to non-target species.
Management Issue #6	
	Restoration of native species.
Applied Science Need	Assessment of potential restoration sites for native species.
Ongoing Work	Unknown in the ABSI LCC.
Potential ABSI LCC Role	The ABSI LCC could support the development of an assessment of potential restoration sites for native species.

Contaminants and Pollutants

Contaminants and pollutants may enter the ecosystem of the Aleutian and Bering Sea Islands region by global transport of contaminants in the atmosphere and marine waters, “bio- transport” by migratory species, or from Formerly Used Defense Sites (FUDS) that are located throughout the region. This stressor also includes marine debris which may pose both a physical and toxicological hazard to wildlife resources. Impacts through bio-accumulation for top-level predators and their cascading effects via subsistence lifestyles is another topic of concern.

Participants also noted that FUDS sites are often located at important cultural sites, which should be a consideration during cleanup activities. Several opportunities were identified where the ABSI LCC could make a meaningful investment in the area of contaminants and pollutants (Table 7).

Table 7. Contaminants and Pollutants: Issues, Needs, and Investment Opportunities for the ABSI LCC.

Management Issue #1	Effectiveness of cleanup efforts at FUDS sites is unknown.
Applied Science Need	Assessment of biological availability of contaminants at FUDS sites that have undergone cleanup.
Ongoing Work	We have no knowledge of post-cleanup assessments conducted at FUDS though toxicologists from UAA are currently collecting contaminants data in proximity to these sites to map global contaminants pathways.
Potential ABSI LCC Role	Support efforts to conduct an assessment of biological availability of contaminants at FUDS sites that have undergone cleanup.
Management Issue #2	Contaminants may impact the fitness of important species of wildlife.
Applied Science Need	Improved understanding of contaminant transportation.
Ongoing Work	The University of Alaska system, the Alaska Department of Conservation and ADF&G are collecting contaminants samples in key subsistence species as well as commercial target species.
Potential ABSI LCC Role	Support the integration of these datasets and/or sample collection to better understand transport pathways.
Management Issue #3	Marine debris may be impacting wildlife species including toxicological effects from plastics and their component chemicals
Applied Science Need	An improved understanding of the toxicological effects of plastics in the marine environment. Documentation of seabird mortality and marine debris deposition.
Ongoing Work	While there are medical data about phthalates and other contaminants, there is less research to understand their effects on wildlife and ecosystems though a current effort is underway by UAA in the Aleutians focused on seabirds. The COASST program through the University of Washington is a citizen-science program looking for dead seabirds and has recently added marine debris to its data collection efforts.
Potential ABSI LCC Role	Support research on the toxicological effects of plastics in the marine environment on wildlife. Implement a citizen-science program similar to COASST to document seabird mortality and levels of marine debris.

Ocean Acidification

Ocean Acidification (OA) is a poorly understood threat that could have cascading effects up through food webs and could potentially impact all natural resources and ecosystem services within the ABSI region. Effects are thought to be especially acute within North Pacific and Arctic marine waters. This stressor also has a number of complex interactions with climate change. Our initial evaluation notes that this stressor is less well understood and specific impacts are difficult to predict. Therefore investments that result in applied science products are less clear at this point when compared to the other stressors under consideration. Further, there are a number of organizations working on this, currently led by NOAA nationally and in state by the Alaska Fisheries Science Center as well as the School of Fisheries and Ocean Science at the University of Alaska Fairbanks (UAF SFOS).

Knowledge of this stressor will change substantially as more research is conducted on OA in the laboratory and field. The results of this research and monitoring may indicate priority needs and investment opportunities for the ABSI LCC (Table 8).

Table 8. Ocean Acidification: Issues, Needs, and Investment Opportunities for the ABSI LCC.

Management Issue #1	It is difficult to predict the impacts of OA on natural resources and ecosystem services.
Applied Science Need	Expansion of the geographic range of OA monitoring
Ongoing Work	The UAF School of Fisheries and Ocean Sciences deploys mooring buoys to monitor pH, although their current plans do not include a buoy in the western Aleutians.
Potential ABSI LCC Role	Facilitate the deployment of an OA monitoring buoy in the western Aleutians.

Final Thoughts from Workshop Participants

The workshop was designed to focus discussions on each of the six landscape-scale stressors that had been identified as priorities for the ABSI LCC. In addition to these discussions, the participants also offered suggestions and observations that may not have fit neatly into the established framework. In this way, the workshop served as a form of peer review, and the additional suggestions require additional attention in the ongoing strategic science planning.

A participant questioned why were local community members not considered more in gathering data, in asking communities what they are worried about and what they need to know, or having scientists better connect to communities when out doing their work. The role of Traditional Ecological Knowledge (TEK) was emphasized as a way to incorporate what local residents have learned about the ABSI region. Another participant noted that the North Pacific LCC has done quite a bit of work on TEK, which could provide an example for the LCC to follow.

One challenge associated with increased community involvement is the geographical scope of this LCC. Money is needed for travel to facilitate partner agencies and group face-to-face outreach and community work. One approach the ABSI LCC has been using is to leverage existing meetings such as the BIA Tribal Providers Conference and the Alaska Forum on the Environment to meet with residents.

Another participant noted that there is a difference between basic science and applied science needs. The LCCs seem to be more management-oriented in their science efforts. Ocean acidification is an example of needs for basic information, but the application of this science remains unclear.

Finally, Tony DeGange, Chair of the ABSI LCC Steering Committee, closed the workshop with the following statement: “ Three hours is really not sufficient to fully address the applied science needs within the region. I am glad to see such a large group with an interest in the ABSI region and want to thank everyone for their participation. Your thoughts have provided us with some very good information, but this was just a start and there are many more people out there that with whom we need to engage.”

Key Themes

Several key themes emerged during the workshop:

- Many workshop participants expressed an interest in providing their perspectives on the importance of these landscape-scale stressors, and would be willing to participate through an online survey tool.
- Increased consideration of cultural resources and the perspectives of cultural resource specialists and stakeholders are needed.
- An effort should be made to share this Strategic Science Plan process with communities and gain their insights on important science needs.
- Education/outreach and facilitating the sharing of scientific information broadly, including with stakeholders and communities in the region should be a key activity for the LCC. This could be accomplished in part by having local communities help with data collection and sharing.
- Investments in baseline data like ShoreZone as well as those that synthesize existing data to power better models (AIS and current data for vessel and spill response as well as climate and community models) are worthwhile for a number of managers.

Next Steps

Throughout February and March, the ABSI LCC will incorporate input from this workshop through a series of targeted collaborations/discussions (e.g., the recently-formed Aleutian Islands Cultural Resources Working Group, Aleutian Islands Risk Assessment). We have developed an online survey tool for interested participants and other regional experts to provide us with further input as we continue to develop the Strategic Science Plan. To take the survey, visit absilcc.org and sign up for a user account. Once you have a user account, visit [https://absilcc.org/science/Lists/Landscape Scale Stressors/](https://absilcc.org/science/Lists/Landscape%20Scale%20Stressors/) and sign in to complete the survey.

Pending the availability of travel funds we hope to attend already scheduled meetings in ABSI communities or other gatherings of regional stakeholders and managers to gain further insights about applied science needs. We are interested in learning about opportunities within the region to further share our approach. Our goal is to have a final version of the Strategic Science Plan by the end of September 2013. We anticipate making the draft Strategic Science Plan available for reviews during summer of 2013.

Given that we have some project funds for the Fiscal Year 2013 (ending in September) the ABSI LCC will make some applied science investments prior to the full completion of the Strategic Science Plan. It is our intention that these projects have direct ties to one or more of the landscape-scale stressors we have identified, and ideally offer applied science products that benefit multiple natural/cultural resources and ecosystem services. Further, when it comes to considering projects our Steering Committee will be most interested in those which leverage additional resources and can be accomplished working in partnership with the ABSI LCC.

Acknowledgements

The ABSI LCC thanks Chris Beck for a terrific job as the facilitator for our workshop. His insights during the initial planning phase helped us to focus the discussion and insure that the outcome was successful. We also thank Lisa Matlock, who despite suffering an injury to her Achilles tendon the night before, showed up at the workshop to take the notes that would form the basis for this report. Lastly, we thank the North Pacific Research Board and Rosa Meehan for their logistical support to provide meeting space for the workshop.

References

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MEETING AGENDA

Intro & Purpose of the meeting	<i>10 min</i>
Overview of ABSI LLC	<i>20 min</i>
Applied Science Priorities	<i>120 min</i>
○ Rankings of Relative Impacts of Six Different Stressors	
○ Management Issues & Applied Science Needs by Stressor	
Wrap up	<i>30 min</i>
○ Final Priorities	
○ Next Steps	

MEETING PURPOSE

Refine priorities for applied science needs to inform the ABSI LCC Strategic Science Plan that will guide our activities over the next 5 years.

Specifically, identify activities that:

- provide understanding on issues with greatest potential adverse impacts on natural resources & ecosystem services
- have direct application to management issues and policy
- do not duplicate past or ongoing research
- add value to the work and supports the missions of regional residents, organizations, managers & researchers

DISCUSSION - FOR EACH STRESSOR:

- 1. Are these rankings reasonable?**

(note: there is an option to submit your detailed views later)

- 2. What are the critical management issues within each stressor, relative to resource categories and ecosystem services?**
- 3. What are the applied science needs to help address one or more of these management issues?**
- 4. Who is currently working on these science needs?**
- 5. Is there a role for the ABSI LCC to help address these science needs?**

Appendix B. Workshop Participant List.

Name	Organization
Aaron Poe	Aleutian and Bering Sea Islands Landscape Conservation Cooperative
Amy Holman	National Oceanic and Atmospheric Administration
Bob Gerlach	Alaska Department of Environmental Conservation
Catherine Berg	U.S. Fish and Wildlife Service
Chris Beck	Agnew:: Beck
Dan Monson	U.S. Geological Survey
David Irons	U.S. Fish and Wildlife Service
Debra Corbett	U.S. Fish and Wildlife Service
Diane Granfors	U.S. Fish and Wildlife Service
Diane Hanson	University of Alaska Anchorage
Douglas Burn	Aleutian and Bering Sea Islands Landscape Conservation Cooperative
Douglas Causey	University of Alaska Anchorage
Ellen Lance	U.S. Fish and Wildlife Service
Gary Drew	U.S. Geological Survey
Jeremy Karchut	National Park Service, Alaska Region
<i>Jeremy Littell</i>	<i>U.S. Geological Survey, Alaska Climate Science Center</i>
<i>Joel Garlich-Miller</i>	<i>U.S. Fish and Wildlife Service</i>
<i>John Bengtson</i>	<i>National Oceanic and Atmospheric Administration</i>
John Piatt	U.S. Geological Survey
Judy Miller	Brendan Environmental
Julie Speegle	National Marine Fisheries Service, Alaska Region
<i>Karen Pletnikoff</i>	<i>Aleutian Pribilof Islands Association</i>
Kathleen Roush	Alaska Department of Fish and Game, Commercial Fisheries Division
Kimberly Klein	U.S. Fish and Wildlife Service
Leah Kenney	University of Alaska Anchorage
Lisa Matlock	U.S. Fish and Wildlife Service
Liza Mack	University of Alaska Fairbanks, School of Fisheries and Ocean Sciences
Lynn Fuller	Pacific Coast Joint Venture
Maeva Gauthier	Coastal and Ocean Resources/ShoreZone
Marc Romano	U.S. Fish and Wildlife Service
Mary Morris	Archipelago Marine/ShoreZone
Maryann Fidel	University of Alaska Anchorage, Bering Sea Sub-Network
Matt Carlson	University of Alaska Anchorage
Mayumi Arimitsu	U.S. Geological Survey
Nils Warnock	Audubon Alaska
Paul Tate	Norseman Maritime Charters, LLC
Philip Johnson	U.S. Fish and Wildlife Service
Rob Suryan	Oregon State University

Name	Organization
Robb Kaler	U.S. Fish and Wildlife Service
Roberta Gordaoff	University of Alaska Anchorage
Sarah Hazell	Alaska Department of Fish and Game, Subsistence Division
Sarah Schoen	U.S. Geological Survey
Sean Mack	Bureau of Indian Affairs
Tamara Zeller	U.S. Fish and Wildlife Service
Tara Jones	Alaska Sealife Center
Ted Parsons	University of Alaska Anchorage
Tim Plucinski	U.S. Fish and Wildlife Service
Tim Robertson	Nuka Research
Tom Evans	U.S. Fish and Wildlife Service
Tom Van Pelt	Transboundary Ecology, LLC
<i>Tony DeGange</i>	<i>U.S. Geological Survey</i>
Veronica Padula	University of Alaska Anchorage

ABS I LCC Steering Committee members indicated by italics.