# POLAR BEAR WORKSHOP –ALASKA MARINE SCIENCE SYMPOSIUM
## Captain Cook Hotel, Anchorage Alaska, 1/21/2011

***Opening announcements:***
Rosa Meehan started the meeting at 8:06 am with an overall introduction to the program and encouraged input. Terry DeBruyn introduced all the FWS Polar Bear Team members. George Durner introduced the USGS team members. Colleen Matt gave an overview of the workshop and asked for input then turned it over to Jim Wilder

***Polar Bear Conservation/ Recovery Planning Overview - Jim Wilder, FWS***
Jim gave an overview of the planning process including threat assessments. Jim discussed the process and all the steps involved in making the plan as well as a rough outline of completion dates.

***Questions:***

**Brendan Cummings:** Are you using MMPA (population-based) or ESA (whole species-listed) when making this plan?

**Response**: We are focusing on the Alaska subpopulations for this planning effort. However, our U.S. planning efforts are part of a broader international effort by the polar bear Range States to develop a range-wide "action plan" for polar bear conservation. We will submit the US Conservation/Recovery Plan to the Range States as our contribution to that process. We reserve the right, if you will, to adopt in whole or in part, the Range States' global action plan as an addendum to this Conservation/Recovery Plan.

**(Unknown):** Has the science and technical group been formed yet?

**Response**: Not yet. We still need to coordinate the details of the science/tech group internally and with the USGS. Once we have mapped out the details of how the committee will work, we will send out letters of invitation to prospective members.

## Current understanding of threats to polar bear populations

***Ice forecasts - Dave Douglas USGS***
Douglas gave an overview of sea ice forecasts in the Bering and Chukchi Sea. Material based on the USGS open file report available at: http://pubs.usgs.gov/of/2010/1176/

*Question**s***

**(Unknown):** How did the actual ice observations relate to the model projections in 2007?

**Response**: They saw the actual observations were worse than those modeled in all known years.

***Diminishing ice and snow cover; impacts on Arctic Seals – Brendan Kelly NSF (9:02am)***
Ringed seals (RS) and Bearded Seals (BS) populations in Alaska were recently declared threatened under the ESA. These decisions were informed by range-wide status assessments prepared by NOAA. Material presented here are based on the analysis contained in the status assessments. These reports are available on the web at: http://alaskafisheries.noaa.gov/protectedresources/seals/ice.htm.

*Key points:*

- Climate change has evolutionary consequences. Population mixing and hybridization result from the destruction of previous range barriers (e.g., sea ice or other ecological parameters.) Ice seals have evolved to exploit sea ice as a refuge from terrestrial predators. Polar bears diverged from brown bears ancestors to exploit seals situated in the pack ice

habitat. Polar bears are highly specialized predators and are unlikely to adapt to other food resources.

- RS and BS are broadly distributed across the Arctic with several DPS's recognized. There are likely more than are known at this time.
- The greatest anticipated effects of climate change on BS in Alaska are the following: 1) loss of summer sea ice from shallow productive foraging areas; and key whelping and molting periods.
- The greatest anticipated effects of climate change on RS are the following 1) reduced snow cover leading to den failure; 2) loss of pups; and 3) increased rates of predation. Studies suggest that approx 50 cm snow cover is needed for successful denning. In the future, regional variability in snow cover is likely, with the Canadian Arctic Archipelago becoming a likely refuge.
- Even though projections vary, all GCM's show the same general patterns. These patterns, suggest that the general warming trend (and associated ice and snow loss) is fairly certain.

***Effects of Climate change on polar bear habitat use –George Durner USGS (9:20am)***

Climate change is expected to impact polar bear (PB) habitat use patterns chiefly through redistribution, energy and movement, denning access, and inadequate denning conditions.

*Key points:*

1. **Redistribution**:

- Observed changes in habitat use patterns have occurred in Beaufort Sea over the past 20 years. Sea ice now regularly retreating from shallow shelf areas in late summer. Telemetry data suggests a general shift of polar bears to the west (Chukchi Sea) in summer in response to ice loss in SBS.
- Optimal polar bear habitat has already declined, and further reductions in optimal habitat in the SBS are anticipated in the future. Habitat loss has been greatest in summer.
- Preferred sea ice habitat recovers fully in the winter, and this pattern of winter recovery is expected to persist into the future. However, projections show that freeze up will occur later, causing sub-optimal conditions to increase.
- Most ice projections are based on fairly course models. Fine-scale analysis suggests that PB may be able to exploit areas of marginal/sparse sea ice (e.g. small amounts of sea ice that may have gone undetected in satellite imagery) and maintain their position in productive forage areas. Anecdotal observations suggest that polar bears can use these remnant marginal ice fields to hunt during periods of low ice cover (e.g. observations of polar bears in marginal sea ice conditions in Chukchi Sea in 2007, and seal kill sites suggesting some foraging occurs).
- Management concerns: as ice retreats offshore, polar bears are expected to redistribute to coastal habitats bringing them into contact with humans. Interactions can be expected to increase mortality. In addition, concentrations of polar bears along the coast are more vulnerable to catastrophic events such as oil spills, and a greater proportion of the population may be affected. However; it is also noted that animals on shore may have greater access to productive (near shore) habitats than bears that move with the ice beyond the shelf, and that sea ice forms early along the coast so animals are able to quickly respond when sea ice begins to reform.

2. **Energy expenditures and movements**:

- Scientists anticipate that sea ice loss will cause polar bears to expend more energy moving looking for and accessing preferred habitats.

- Polar bears facing the loss of sea ice from offshore feeding areas may respond by making long distance movements between sea ice habitats and the coast. These long distance movements may affect body condition and survivorship. For example, USGS radio-tagged a female with a yearling cub. Telemetry data suggests she swam 687 km for a cumulative 232 hours from the coast to the ice edge. When she was recaptured, she was no longer accompanied by her dependent cub and she had lost more than 20% of her body mass.
- Durner noted that physiological impacts are generally greater for smaller animals, and so impacts to cubs and subadults are more likely in stressful environments.
- Females will likely travel farther and experience higher energetic costs are as ice retreats further offshore, in part because they must travel greater distances to den on shore.

3. **Effects on denning habitat:**

- Unlike other polar bear subpopulations, a large proportion of SBS bears traditionally den on sea ice (most other PB pops primarily den on land). However, sea ice changes in the Beaufort Sea over the past decade have coincided with an increased proportion of bears now denning on land.
- In general, polar bears need approximately 1.5 m of snow cover for successful denning. As noted by Brendan Kelly (NSF), snow depth will likely diminish in offshore areas, in part because early snow will fall onto the open ocean due to delayed freeze up. Snow conditions may be better along the coast, however episodic warming events during the denning season may result in den failures and mortalities. Some reports of this have been published.
- Because of sea ice loss, longer open water periods, and increasingly strong storm surges, coastal erosion is also expected to increase. Accelerated rates of coastal erosion may change the availability of preferred denning habitats.
- In addition, sea ice loss may result in increased industrial and other human activities in coastal denning areas. Increased human activities in denning areas may incur increased instances of den abandonment.

***Questions:***

**Jack Omelak (ANC):** Please elaborate on the perceived westward shift of Beaufort Sea polar bears.

**Response**: In the early 1990s, collared bears typically summered in the central Beaufort Sea. Many animals are now traveling west to the Chukchi Sea in summer instead of the summer open water in the near shore region of the SBS.

**Brendan Cummings (CBD):** Are the fine-scale sea ice habitats described for the Chukchi Sea summer months viable as habitat?

**Response**: (Steve Amstrup) We have anecdotal observations of polar bears exploiting this type of habitat and successfully capturing seals, however this is not a well-studied phenomenon.

***Implications of climate-change induced habitat loss for polar bear populations – Karyn Rode, FWS***

Rode's talk (and research) focused on existing data on polar bear habitat use patterns and demographics to gauge likely effects of climate change on SBS and CS polar bear populations. Corollaries with other polar bear subpopulations in different ecozones were also explored.

*Key points:*

- Rode reviewed key life history traits: pagophillic, rely principally on Ringed (RS) and Bearded (BS) seals for prey.
- Some PB populations in Canada (e.g. Hudson Bay) spend more time on shore than SBS and CS bears. Based on aerial survey and telemetry data, only a small proportion SBS and CS bears use

terrestrial environments. In the CS subpopulation, two exceptions are denning habitat on Wrangel Island and the northern coast of Chukotka. Different subpopulations have different habitat use patterns.

- CS bears are likely to become more like Hudson Bay (HB) bears in the future due to projected sea ice loss. Scientists predict a shift from "Divergent Sea ice" ecotype to "Seasonal Sea ice" ecotype in the CS. As with the HB subpopulation, we will likely see an increased dependence on terrestrial environments, and consequential poor body condition and cub survival. HB subpopulation research suggests that body condition is a function of sea ice availability, which in turn influences successful reproduction.
- SBS stock is also currently classified as a Divergent Ice ecotype. The USGS long-term database suggests that changing ice conditions have coincided with declines in body size, animal condition and cub survival. Reduced body condition is likely a function of declining access to prey. Sea ice variability is also likely influencing cub survival; observed survivorship of females and cubs is lower during poor ice years. This has implications for population growth if the frequency of "bad" or inadequate ice years increases as expected. It is difficult to quantify the precise abundance of SBS bears, but based on a variety of different information sources, the population is believed to be in decline.
- We have less demographic and population information available for the CS subpopulation than the well studied SBS stock. Recently, the FWS began research to investigate CS subpopulation demographics. Preliminary results suggest that condition of sampled bears is quite good, which is surprising considering that sea ice loss has been much greater than in the Chukchi Sea. CS bears appear to have a broader distribution and possibly more available food resources than SBS bears, resulting in greater flexibility. Rode also noted that climate change effects might include short-term gains or better opportunities for polar bears , e.g., if seal snow lairs are failing, this may increase available food over the short term.

***Questions:***

**Jason Herreman (NSB):** Is it fair to compare SBS/CS stocks with HB bears since HB bears have limited migration options, while Alaska bears have greater ability to move to find preferred habitat areas.

**Response**: Rode is not aware of any restrictive barriers to movement by HB bears.

***Greenhouse gas mitigation, sea ice loss, and polar bear persistence - Steve Amstrup (PBI)***

Presented results of recent modeling research published in *Nature*: "Greenhouse gas mitigation can reduce sea-ice loss and increase polar bear persistence".

*Key Points:*

- Amstrup reviewed model assumptions that the survival of polar bears is dependent on the persistence of sea ice habitats. There is no evidence that they can adapt or survive on land.
- The USGS polar bear reports developed to inform the ESA listing decision concluded that many polar bear populations were likely to become extinct by mid-century given the trajectory and magnitude of sea ice forecasts. Many people interpreted this to mean that extinction is inevitable. The purpose of the recent study was to investigate whether mitigation of GHGs could influence future population outcomes.
- For their method, the authors used CC3M3 GCM, the best ice predictor of the IPCC set, under various GHG forcing scenarios. They used the GCM to investigate differences in projected ice loss under different GHG concentrations. The examined GHG scenarios included a) Capping emissions at Y2K levels; b) holding emissions constant at 450ppm; c) AIB (business as usual); and d) B2.

- The authors did not just look at effects on summer ice minima, they also looked at projected sea ice characteristics from a polar bear life history perspective.
- The study resulted in this key observation**:** a) There appears to be a linear relationship between global temperatures and sea ice; and consequently b) No "tipping point" was apparent in the ice modeling results. This is an important point because previously it was though that sea ice loss might be irreversible due to a variety of feedback mechanisms. The implication is that mitigation of GHGs can lead to recovery of ice habitats.
- The authors developed a Bayesian model to examine population outcomes under the various emission scenarios. Amstrup noted that holding GHG emissions below 450 ppm significantly reduced the risk of extinction for a number of polar bear subpopulations. He also noted that mitigating other anthropogenic stressors (e.g., hunting, disturbance) also resulted in positive population outcomes.
- In order to stabilize GHG emissions at 450 ppm, global energy use would have to peak by year 2020. Amstrup acknowledged that accomplishing this goal would take considerable political will and international concessions.

***Questions:***

**Susi Miller (FWS):** Is your ice model based on the whole Arctic or a divergent region?

**Response**: The model is based on the whole Arctic.

**Brendan Kelly (NSF):** How might your choice of GCMs influence your results? Could other GCMs show a tipping point?

**Response**: The CC3M3 is the best model of all the IPCC models at tracking ice conditions. This was why it was chosen. It is unlikely that different models would perform differently.

**George Divoky:** Expressed concern that this study could lead to false optimism. People might conclude that the authors are saying polar bears won't go extinct after all. He has seen some of this already in press coverage.

**Response**: This false optimism would be misguided. The point is that if action is taken to address GHG emissions, positive effects will occur.

**George Divoky**: Given our human evolutionary and social history of resource exploitation, is it realistic to assume that people will actually agree to change their ways and accept a reduced standard of living, (i.e., reduce their carbon footprint)?

**Response**: Amstrup agreed that changes would take considerable collective political will. Hopefully, an awakening is occurring along with a recognition that our actions will impact the world of our children. Hopefully, this will translate into political action.

**Dwayne Biggs:** We do a lot of outreach about the effect of global climate change on Arctic species such as polar bears. They are a good ambassador that could raise awareness about the need to address climate change.

**Matt Cronin:** Could you clarify the differences between the models presented earlier by Dave Douglas and those presented here.

**Response**: The results are drawn from same subset of models. The CC3M3 was chosen based on its accuracy in predicting changes that, in hindsight, occurred in nature. The biggest difference is in the forcing scenarios examined (looked for mitigation scenarios).

**Vicki Cornish:** Have you looked at how various GHG thresholds, e.g. 350 pm vs. 450 ppm, might trigger regional polar bear extinctions?

**Response**: It's not quite that straightforward; while the response of ice to GHG levels is direct, the subpopulation responses are not. It's difficult to predict the precise extinction thresholds for various subpopulations.

**Joel Garlich-Miller :** You mentioned your model also considered mitigation of other human stressors. Any indication which of these stressors has the greatest influence on PB subpopulations? This information would help focus conservation and management efforts.

**Response**: No one particular mitigation action stands out. However, mitigation of all stressors does have a positive population outcome.

**Brendan Cummings (CBD):** Is there a tipping point for polar bear extinctions?

**Response**: As noted previously, the response of subpopulations do not necessarily scale with projected ice conditions. There are likely different thresholds for different subpopulations. For example, HB bears appear on the edge now and may have lower thresholds for future change than other more robust populations.

## Actions & Strategies - What are the actions that we must take to address the following threats?

### Discussion Topic 1: Redistribution of polar bears to where they are more vulnerable to impacts.

***Community mitigations for polar bear conflict - Jason Herreman (NSB)***

**Herreman** touched on current bear deterrence efforts in the villages, and whalebone piles, viewing guidelines, hair snares project, biopsy darting, and minimizing collaring of animals.

Seven small groups were established. Participants were asked to discuss and record the following:

- Current actions that are being taken to mitigate the threat of polar bear redistribution to where they are more vulnerable to impacts.
- New actions that can be taken to mitigate this threat.

At the end of the discussion sessions, volunteers from each group shared some of the actions their group discussed and recorded. A full list of current actions and new recommendations are in Appendix B of these minutes.

### Discussion Topic 2: Inadequate conditions for denning and loss of access to denning areas

***Polar Bear Denning Threat Mitigation Measures- Christopher Putnam (FWS)***

Putnam gave brief overview of the Incidental Take Programs, den identification, and Industry protocols.

***Questions:***

**Vicki Cornish:** How long do bears use a den?

**Response**: Pregnant females generally den between Nov and April. Denning on land is increasing and FWS expects to find more dens on the land in the future.

Participants in the seven small groups were then asked to discuss and record the following:

- Current actions that are being taken to mitigate the threats of inadequate conditions for denning and loss access to denning areas
- New actions that can be taken to mitigate these threats.

At the end of the discussion sessions, volunteers from each group shared some the actions their group discussed and recorded. A full list of current actions and new recommendations are in Appendix B of these minutes.

**Discussion Topic 3: Increased movement, energy expenditure, loss of access to prey and impacts to prey species**

Participants in the seven small groups were then asked to discuss and record the following:

- Current actions that are being taken to mitigate the threats of Increased movement, energy expenditure, loss of access to prey and impacts to prey species
- New actions that can be taken to mitigate these threats.

At the end of the discussion sessions, volunteers from each group shared some the actions their group discussed and recorded. A full list of current actions and new recommendations are in Appendix B of these minutes.

## Next steps in the process, opportunities for public input

Colleen Matt reviewed the following upcoming recovery plan workshops

- PUBLIC WORKSHOP: The "Human-Caused Removals" workshop will take place at the Alaska Forum for the Environment, Dena'ina Convention Center, Anchorage, on February 8, 2011, from 2:00 pm to 6 pm. The purpose of the workshop is similar to today's workshop: to gather recovery action recommendations
- A Science/Technical Committee is still in the process of forming. USGS and other partners will convene to develop criteria for recovery. The dates for the Science/Technical Committee Meetings will be announced.
- There will be a joint public workshop for the Conservation Partners and the Science/Technical Committee in July 2011. The date, time and location are to be announced. Tasks will include: synthesis of previous suggestions; prioritize objectives/action items: identify responsible parties, time frames, and budgets.

There will be opportunities for conservation partners to review the draft Polar Bear Conservation/Recovery Plan in March, 2011, August 2011, and October 2011. The draft plan is scheduled for review in the *Federal Register,* January 2012

## Closing comments and questions

**Steve Amstrup :** We cannot overemphasize the need to regulate greenhouse gas emission. FWS needs to work in collaboration with other agencies to address GHG emission. This is a really important issue.

**Diane Sanzone:** The FWS has the opportunity to become involved in alternate energy sources.

**Brendon Cummings:** Ultimately, the plan needs to include criteria and evaluate a success level. Can we model the level of ice habitat needed? Without talking about gas emissions, can we just talk about ice?

**Response:** Steve Amstrup: We could try to model the minimum requirements of sea ice to support a minimum subpopulation of polar bears. However, there are a lot of unknowns and many uncertainties in the Beaufort Sea. With additional data we could do that, but we already know that we have to deal with emissions. We can do a lot of other research to tackle the unknowns but the major step is restricting emissions.

**Steve Amstrup**: Is there a meeting this summer on supplementary feeding? Is there a date and who is invited?

**Response:** Susi Miller said that meeting will take place June 8-9 in Anchorage. Objectives are to evaluate the pros and cons of supplemental and diversionary feeding; determine if they would be effective; evaluate the possibility for bone piles on the North Slope. No invitations have been sent out yet. Please see Karla Dutton or Susi Miller for more information.

## Closing remarks

Rosa Meehan spoke briefly about the rest of the planning process. Feel free to contact Jim Wilder (FWS) or Rosa Meehan (FWS) with more questions or comments.

Meeting adjourned 4:00pm

# APPENDIX A: WORKSHOP PARTICIPANTS

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# Appendix B: Current and New Recovery Action Recommendations

**Polar Bear Recovery Plan Public Workshop, 1/21/11**

## Topic #1 Threat: Redistribution of polar bears to where they are more vulnerable to impacts

**Current Actions**

- Bear/human Patrols
- Oil and Gas mitigations
- Research
- Oil industry has more/tighter restrictions and so easier to manage than village interactions
- Polar bear patrols/deterrence
    - In villages, at hunting/whaling camps
    - In oil and gas
- Interaction guidelines for people living/working in polar bear habitat
    - Interaction plans for villages, oil and gas
    - Includes minimizing attractants
- Polar bear viewing guidelines
- FLIR – improved detection methods (for dens) and for detecting bears that approach work sites – permanently mounted cameras can aid in earlier detection, which improved human safety and response time
- 1-mile buffer for known dens
- Improved ability to identify habitat through snow modeling (recent effort)
- Oil spill planning
- Expand polar bear patrols in villages to reduce negative interactions
- Develop site-specific polar bear interaction plans for oil and gas exploration programs – LOA/IHA Participate in and expand education campaigns to broaden the reach and comprehension of the education messages.
- Continue to fund an support investigation of human/bear interaction, and conduct research on deterrence programs (how, who, male/female, age differences and responses),
- Continue to participate in regulatory process
- Continue to improve data quality through training
- Attend June 8-9, 2011 workshop on supplemental and diversionary feeding
- Continue to provide information to wide audience on polar bear issues (Defenders)
- Polar bear patrols in villages (need more funding)
- Protect denning habitat on land
- Successful mitigation for oil industry development
- Continue to work closely with North Slope Borough and Alaska Nanuuq Commission on sustainable subsistence management
- Polar bear deterrence program
- Increased education and outreach
- Monitor habitat use by bears in response to global warming
- Continue support for food storage containers for subsistence-harvested foods
- Continue funding North Slope Borough patrol and deterrence and education
- Continue to work with industry to mitigate interaction and develop technology
- Improve current subsistence harvest monitoring and sampling

**New Action Recommendations**

- Collect data to differentiate cause of bear deaths
    - Was the bear was defense killed or harvested?
    - Look at mortalities within a radius of village (e.g., 2 miles)
    - Assess need to have a harvest as bears move to shore. Is this on the table?
- Develop outreach/education efforts emphasizing need to understand how to minimize the risk
    - Tailored to industry,
    - Tailored to villages
    - Tailored to recreation
- Develop community mitigation plan tailored to each community (e.g., Sarah Medill in Nunavut)
- Employ local residents as harvest monitors
- Pay for samples as incentive reporting
- Is there a positive interaction or conditioning resulting from the industry's and FWS's policy to watch/guard bears around facilities? We need to study to assess habituation of bears: and their vulnerability to subsequent harvest
- Develop consistent North Slope-wide garbage management policy
- We need to prepare for extreme events such as oil spills and oiled wildlife, mass bear strandings, low immune response to pathogens, and lack of whale carcasses at Kaktovik. Preparations that are needed include the following:
    - North Slope-wide drill
    - Updated maps for potential oiling sites
    - Evaluated the sufficiency of existing equipment
- Assess need to establish polar bear jail similar to Churchill, Manitoba, Canada
- Continue to reduce attractants in North Slope communities (and expand efforts)
- Continue and expand efforts to keep polar bears out of North Slope Communities through bear patrols
- Improve oil spill prevention and response efforts on and off shore
- Maintain and/or improve polar bear travel corridors and seasonal movement areas.
    - Identify, research, and monitor the corridors
- Continue and improve FLIR technology for den monitoring
- Use Unmanned Aerial Systems (UAS) (with FLIR, etc.) for den surveys, marine mammal monitoring, etc.
- Expand involvement of local communities and residents in all areas of polar bear conservation, research and management
- Establish protocols and capabilities to clean and handle oiled bears
- Involve elders more in creating and disseminating conservation message
- Increase outreach to younger generations in schools or through a citizen-science program.
    - Give them specific projects
    - Involve them in studies
- Present FWS research, management at elder/youth conferences
- Involve other scientists in polar bear and climate change issues
- Increase FLIR capacity
    - Obtain aerial camera/aircraft platform/pilot(s) that are dedicated solely to FLIR mission e.g. 1-2 weeks in December

    - Train more FLIR camera operators Refine den habitat maps (currently being done and should be available by the end of the year per KO)
    - Expand mapping to the west and into NPR-A
- Develop site-specific polar bear interaction plans for oil and gas exploration programs – LOA/IHA future
- Pair citizen scientists with community polar bear deterrence patrols so that data on the bears, locations, body conditions could be collected and added to our larger polar bear data set for Alaska
- Better coordination between USCOE/USFWS Section 7 when reviewing permits
- Information sharing for Biological Assessment and Biological Opinion –
- Distribute research results and data beyond professional and scientific circles to communities and other stakeholders
- Develop historical denning site maps for land use planning
- Develop FLIR technology for ice road construction
- Share Defenders' "Sea Bear under Siege" recommendations
- Develop standardized methods for polar bear patrols
- Evaluate current methods of research
- Use non-invasive techniques
- Gather new information, e.g., coastal disturbance patterns or continued monitoring
- Share information with all interested parties and provide annual updates
- Broaden outreach to local residents and to others
- Augment patrols and data collection, e.g., citizen scientist program,
- Engage school kids with citizen-science programs and media contests
- Consider supplemental feeding (e.g., bonepiles) and diversionary feeding (Note: a diversionary feeding workshop is tentatively planned for June 2011).
- Plan for captive breeding and archive for sperm, etc.
- Use hunting to manage bears at low K value (carrying capacity)
- Use polar bear viewing as a public relations tool for importance of GHG mitigation.
- This could lead to improved acceptance of viewing among Native communities
- Coordinate and work with State Area Biologists, e.g., Geoff Carroll and Gay Sheffield, to gather more on-the-ground intelligence, etc.
- Cooperate with and incorporate North Slope Borough, Alaska Nanuuq Commission, Native hunters in research activities.
- Invite co-investigators in grant-funded research (e.g. Tribal wildlife grants)
- Establish an outreach coordinator for FWS, villages and oil and gas industry
- Make artificial platforms as stepping stones between sea ice and shore
- Move bone piles to reduce bear concentrations
- Study implications of shipping for habitat use by bears, especially regarding marginal ice
- Minimize activities offshore and onshore during critical periods (i.e. fall open water period, den emergence)
- Use bear-proof dumpsters
- Provide storage facilities for subsistence harvest new in some areas ongoing in Kaktovik
- Monitor the long-term use of land use by polar bears
- Institute shipping safety to prevent spills
- Monitor real-time shipping
- Sign routing agreements with all countries

- Devise rescue plans, including rescue tug
- Arctic RCAC for oil industry oversight and oil spill prevention and response
- Improve oil spill prevention and response plan
- More response equipment
- Devise a plan for oiled bears
- Plan to deter bears from oil, tugs
- Improve management of food and garbage in communities, including in-shore communities
- Assess highest risk areas for negative polar bear/human encounters
- Manage walrus haulouts for safety of walruses, bears, and people
- Add to critical habitat
- Include all life cycles;
- Be flexible as bears' movement patterns change
- Provide corridors for bears to safely move seasonally
- Improve monitoring of substance harvest
- Increase and provide secure long-term funding for community education, outreach, and safety programs
- Co-sign the Law of the Seas, and become more involved in international waters policy

**Topic #2 Threats: Inadequate conditions for denning & Loss of access to denning areas**

**Current Actions**

- Existing laws such as the 1973 Polar Bear Agreement and the Endangered Species Act (ESA) call for habitat protection
- ESA section 7 consultations include evaluation of potential impacts to critical habitat such as denning areas, and allows for mitigation of those potential impacts
- The Marine Mammal Protection Act (MMPA) established the incidental take regulations which provide the opportunity for the oil and gas industry and FWS to work together to mitigate potential impacts to denning bears/den habitat
- Existing tools: use of FLIR and scent-trained dogs to detect dens so they can be avoided by industry activity
- 1-mile buffer is placed around all known dens until emergence/natural abandonment of den
- Den habitat mapping – den maps have been created for northern Alaska and are used as a tool for planning future activities
- Interaction/safety plans – these have been developed by both oil and gas operators, villages, and others who work or live in bear country; plans typically include bear awareness training for all employees, identify safety procedures to follow if a bear is encountered, and outline reporting requirements, proper hazing techniques, etc.
- Develop FLIR technology
- Conduct more dog-led denning surveys
- Tailor ice roads, exploration activities based on proximity to habitat quality
- Select sites for activity away from locations with higher probability of dens
- Develop bear viewing guidelines that include dens (for future, use Kaktovik as a template for other villages)
- Expand implementation of one-mile buffer around found dens
- Enforce existing regs regarding human activities around den sites (e.g. "with contractors") in the oil fields
- Intensively survey denning habitat in areas of proposed activities.

- Expand ITRs – Incidental Take Regulations for other folks than oil and gas activities
- Keep Wrangel Island as a Preserve
- Educate communities to minimize disturbance of denning areas

**New Action Recommendations**

- Project current research models into future
- Do existing industry gravel pads qualify as potential denning sites? (i.e., > 1.5 m relief)
- Initiate cumulative effects study
- Test snow fences as potential for accumulating enough snow for denning sites.
- Increase FLIR technology use through joint industry/FWS efforts
- Create new polar bear denning habitat as a mitigation measure for the loss of other habitat. Can we create a suitable substrate for drifted snow with sufficient aspect and relief for snow to drift and accumulate? E.g., an abandoned gravel pad ("staging pad").
- Identify dens using UAS unmanned aerial systems with FLIR or other remote sensing
- Continue research to determine bear denning trends
- Documentation of den abandonment related to human disturbance
- Investigate necessary snow parameters for den success , e.g., number of inches of snow needed to persist for entire season
- Model precipitation changes and how they may affect den structure success, similar to what was done for ice seal lairs
- Study/monitor effects of shorter denning seasons on reproductive success (cub survival)
- Improve den detection methods
    - Equipment capacity
    - Increase the number of people trained to use FLIR (and other methods) to detect dens
- Improve guidance and mitigation for relevant groups:
    - Research camps
    - Recreational travelers
    - Photographers
    - Commercial guides
    - Military
- Develop denning habitat models that incorporate microhabitat features, bear movement patterns, and annual snow/weather patterns
- Apply LOA/Polar Bear Interaction Plan to all non-oil and gas activities
- Consider leaving abandoned pads and/or re-contour pads to improve them for habitat (however, contaminants must be addressed)
- Investigate the sensitivity of emergent bears at den sites , especially human/industrial disturbances
- Promulgate uniform regulations that apply to all activities in denning habitat during the denning season
    - photographers, bear viewers
- Work with communities to direct travel routes away from denning habitat
- Engage directly with oil and gas regarding developments in Russia
- Encourage oil and gas companies to use of polar bear conservation to bolster their "green" image
- Continue to develop FLIR technology
- Establish a dedicated FLIR Team, helicopter and FLIR unit
- Continue research on den location and trends

- Protect man-made structures that provide denning habitat such or the staging pad which is well-known
- Manage activities in post-den emergence period along the shore-fast ice
- Expand and refine identification of dens
- Include international areas, coordinate across borders
- Improve feedback on den mapping from users
- Expand/refine designated critical habitat for denning and for feeding areas for mothers with new cubs, as well as corridors for travel
- Investigate sensitivity of bears to human activity (i.e., boats, industry) during pre and early open water denning.
- Institute regulations dependent of findings
- Build snow fences to improve denning habitat for bears on barrier islands and other prime denning habitat
- Monitor change in distribution of dens, and regulate according
- Improve cooperation with villages on locating and monitoring dens
- When dens are identified, share with community so people will avoid them and create buffers
- Establish a probabilistic estimate whether habitat could be used for denning; if so, move to protect these areas
- Improve understanding of denning ecology in western Chukchi Sea

### Topic #3 Threats: Increased movement, energy expenditure, loss of access to prey and impacts to prey species

**Current Actions**

- Continue to allow opportunities for polar bears to rest as part of bear deterrence program
- Continue to support commercial fishing moratorium until marine mammal management protection plans and mitigation measures are in place.

**New Action Recommendations**

- Protect ice seals and their important habitat components future
- Encourage lower trophic-level studies by NSF, NOAA, NMFS, and others
- Consider green house gas emissions as part of the planning process
- Investigate and mitigate impact of noise on seals and polar bears in marine environments.
- Investigate potential introduction of exotic organisms into Arctic marine ecosystems via ships, drill rigs, etc.
- Investigate offshore drilling discharge impacts on Arctic marine ecosystems such as drill mods, drill cuttings, etc.
- Ensure protection of prey base and food web
    - Collaborate with other agencies and organizations
    - E.g., prohibit commercial fishing north of the Bering Strait
- Enforce disturbance laws
- Increase awareness regarding resting bears, especially with air carriers/pilots
    - e.g. brochures at Fairbanks, Prudhoe Bay
- Evaluate importance of alternative prey, e.g., subsistence-harvested whale remains (bone piles), walrus haul-outs in Russia
- Work with NOAA and co-management partners to…
- Possibly use polar bear distribution to inform survey designs for seals

    - Acquire better prey (seal) population information, e.g., abundance, distribution, and population (stock) structures (Chukchi & SBS planned for 2014-2015); and
    - Use these data to create habitat and resource selection function (RSF) maps for seals
    - Integrate seal RSF habitat use data with polar bear RSF data to help identify future habitat use areas
- Study and incorporate information about marginal ice and its ecological role, i.e., what is the fate of ice cover under all GHG scenarios?
- Coordinate GHG management goals
- Address the disconnection between EPA Clean Air Act regulations and USFWS and ESA regulations
- Investigate carbon dioxide equivalents, not just carbon dioxide reduction technology interaction between pollutants to ensure ultimate levels are livable/workable., i.e., if FWS research indicates 450 ppm that EPA not set level at 500 ppm.
- Continue and expand knowledge of ice-dependent species to refine models
- Explore connection between species and habitat (polar bears, seals and ice)
- Investigate competition between polar bears and humans for seal resource
- How important are marginal ice areas and how will increased shipping affect this marginal habitat?
- Investigate existing mitigation measures as sea ice environment changes
- Evaluate polar bears' ability to adapt
- Evaluate whether or not the increasing number artificial structures of provide an attraction, or proved artificial habitat.
- What are potential contaminant pathways?
- Install floating platforms
- Educate the public about the fact that polar bears are unlikely to subsist on terrestrial resources
- Assess supplementary and diversionary feeding options
- Reduce greenhouse gas emissions
- If concentrated walrus haulouts continue, move carcasses away from villages for safety and polar bear feeding areas
- Increase research on prey species, e.g., life cycles, etc.
- Develop plan to immobilize and relocate problem bears if harvest becomes unsustainable
- Develop plan to handle rescuing bears onshore if population levels warrant it
- Increase research on ice seals (ringed, bearded, and spotted);
- Investigate supplemental feeding to see if it is feasible, desirable and useful from a population level approach
- Plan for removal of bone piles to reduce areas of bear concentrations (i.e. lessen the effects of oil spills)
- Maintain refuge areas that are free from disturbance and can conserve energy during critical periods of nutritional stress
- Work with other governmental agencies to deal with Greenhouse gases and alternative energy sources
- Investigate how bears respond to changes in sea ice conditions; e.g., do bears spend more time in marginal ice areas? Do they switch prey to Pacific walrus?
- Protect important Pacific walrus haulouts (as potential prey for polar bears)
- Reduce disturbances to minimize energetic demands