



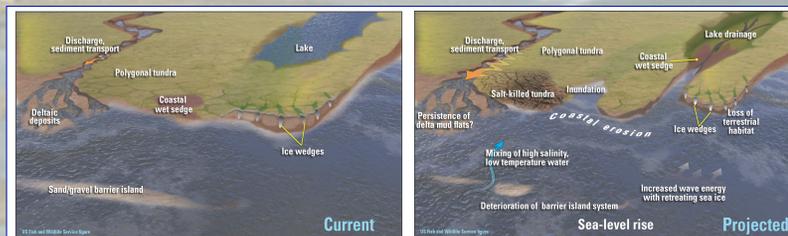
# Wildlife Response to Environmental Arctic Change (WildREACH): Predicting Future Habitats of Arctic Alaska

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WildREACH participants reviewed information on how climate, permafrost, hydrology, and geomorphic processes might affect important habitat elements for arctic fish and wildlife.

## The Challenge of Conserving Fish and Wildlife in a Changing Arctic

The Fish and Wildlife Service is responsible for managing fish, wildlife, and habitats in an arctic environment that we expect will be altered significantly by a changing climate over the next century. The Arctic is warming at a rate almost twice the global average, and there is strong scientific consensus that changes in temperature, precipitation, and sea level will impact natural systems. Low mean annual air and ground temperatures constrain timing of breeding, annual productivity, and habitat structure in the Arctic. Therefore, a warming trend will undoubtedly lead to changes in habitat suitability for a suite of arctic-adapted species. Currently, there are few tools available to assist wildlife managers in predicting the net effect of climate-driven changes on habitat availability and quality.



Schematic of arctic coastline landscape, current and projected, illustrating elements likely to change as a result of climate change. Similar models were developed for the coastal plain, foothills, and floodplain ecosystems.

We addressed fish, birds, and mammals in separate breakout groups, and made a preliminary assessment of species that are likely indicators of climate-associated changes. These species were proposed as candidates for more intensive monitoring and research.

We identified cross-cutting themes and priority scientific needs, and recommended first steps toward improving our understanding of change in the arctic environment.

### Examples of indicator species, predicted climate change effects, and suggested parameters to monitor.

Species	Predicted change	Parameter to measure
<b>Birds</b>		
Yellow-billed loon	Prey availability	Distribution and abundance
Red phalarope	Wet meadow drying	Distribution and abundance
Black brant	Change in plant phenology	Growth rate
Common eider	Loss of barrier islands	Nesting success
<b>Fish</b>		
Arctic grayling	Habitat fragmentation	Instream migration
Broad whitefish	Increase in water temperature	Growth rate
Dolly Varden	Habitat fragmentation	Distribution and abundance
Lake trout	Increase in water temperature	Population density
<b>Mammals</b>		
Polar bear	Loss of sea ice	Distribution of denning habitats
Musk ox	Rain on snow events	Distribution and abundance
Caribou	Change in plant phenology	Distribution and abundance
Lemmings	Change in population cycles	Distribution and abundance

### Major Scientific Themes and Research Priorities

#### Hydrologic processes:

- Improve projections for annual and seasonal (winter vs. summer) precipitation and evapotranspiration.
- Determine if the proportion of precipitation falling as rain vs. snow will change.
- Develop models that address snow density and potential for icing events.
- Improve understanding of how changes in evapotranspiration, permafrost depth, and thermokarst could impact storage and distribution of surface water.

#### Vegetation community and phenology:

- Understand how changes in growing season could impact phenology, species composition, and nutritional quality of forage.
- Predict how changes in stream flow patterns will influence development of riparian communities.

#### Invertebrate populations:

- Understand temperature induced changes in:
  - Life cycle.
  - Aquatic and terrestrial productivity.
  - Prevalence of parasites, disease, and biting insects.

#### Coastal dynamics:

- Understand how altered coastal dynamics will impact barrier island systems.
- Determine how changes in cloud cover and fog might influence air temperature in the coastal zone.
- Understand erosion and sediment deposition within river deltas.

### Wildlife Response to Environmental Arctic Change

Predicting Future Habitats of Arctic Alaska



The report "Wildlife Response to Environmental Arctic Change: Predicting Future Habitats of Arctic Alaska," summarizes projected responses by fish and wildlife to expected changes in climate, permafrost, and hydrology.

<http://alaska.fws.gov/wildreach.htm>

### History of WildREACH

The Service worked with partners and convened a Wildlife Response to Environmental Arctic Change (WildREACH) workshop in November 2008 in Fairbanks, Alaska. The goal of WildREACH was to identify priority research, modeling, and syntheses needed to advance our knowledge about effects of climate change on fish, birds, and mammals of arctic Alaska. A conceptual modeling approach, based on the Service's Strategic Habitat Conservation framework, was used to identify potential changes that would most strongly influence habitat suitability for a broad suite of species. The research and monitoring needs, and key data gaps identified from WildREACH will be addressed through the newly formed Arctic Landscape Conservation Cooperative (Arctic LCC).

### Conclusions and Recommendations

Establish at least three long-term observatories in the Arctic to collect integrated hydrologic, climate, and geophysical data. Water budgets should be estimated for key fish and wildlife habitat types.

Develop predictive models coupling soil temperatures, hydrologic regimes, and biological systems. These models must be constructed at appropriate spatial and temporal scales.

Centralize data storage and interpretation for the benefit of all stakeholders.

Refine selection of focal species and develop monitoring and research to support conservation design.

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