Arctic Landscape Conservation Cooperative

Alaska Climate-Biome Shift Model

The Big Picture

Understanding how climate change will affect species distribution and access traditional subsistence resources in the future is a challenge facing land, resource, and conservation agencies in Alaska. To develop this understanding, we need spatially explicate projections that allow managers to visualize future landscape scenarios under different climate change, as they may be altered by changing climate.

Project ID: ARCT2010-01
Year Funded – 2010
Start – April 2010
End – September 2011
Budget – $192,000

Research Partners:
University of Alaska Fairbanks'
Scenarios Network for Alaska & Arctic Planning
Ecological Wildlife Habitat Data Analysis for the Land and Seascape Laboratory
US Fish and Wildlife Service

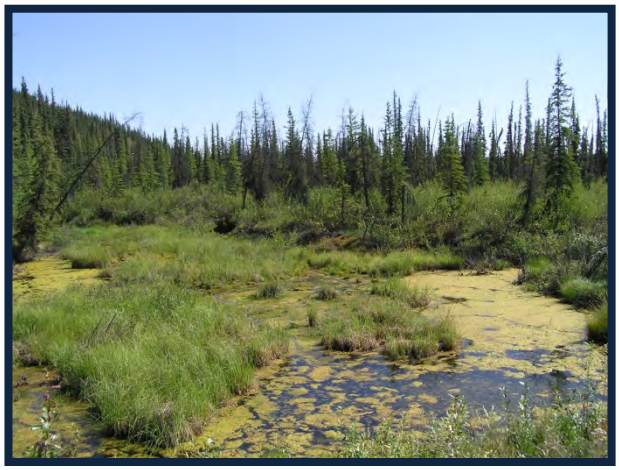
Forecasting temperature and precipitation patterns under future climate scenarios

Project Description

Researchers from the University of Alaska (UAF), The Nature Conservancy, and U.S. Fish and Wildlife Service will use 'climate envelope' models (i.e., models that infer a species' environmental requirements from locations where they are currently found) to explore how patterns in temperature, precipitation, and landcover (i.e., climate-biomes) may shift as a result of changing climate.

Why We Are Interested

The project will give managers and other stakeholders a new tool to visualize how temperature and precipitation patterns may shift as a result of climate change. This information will be useful in considering potential impacts of climate change within a given landscape, and also in designing conservation strategies.



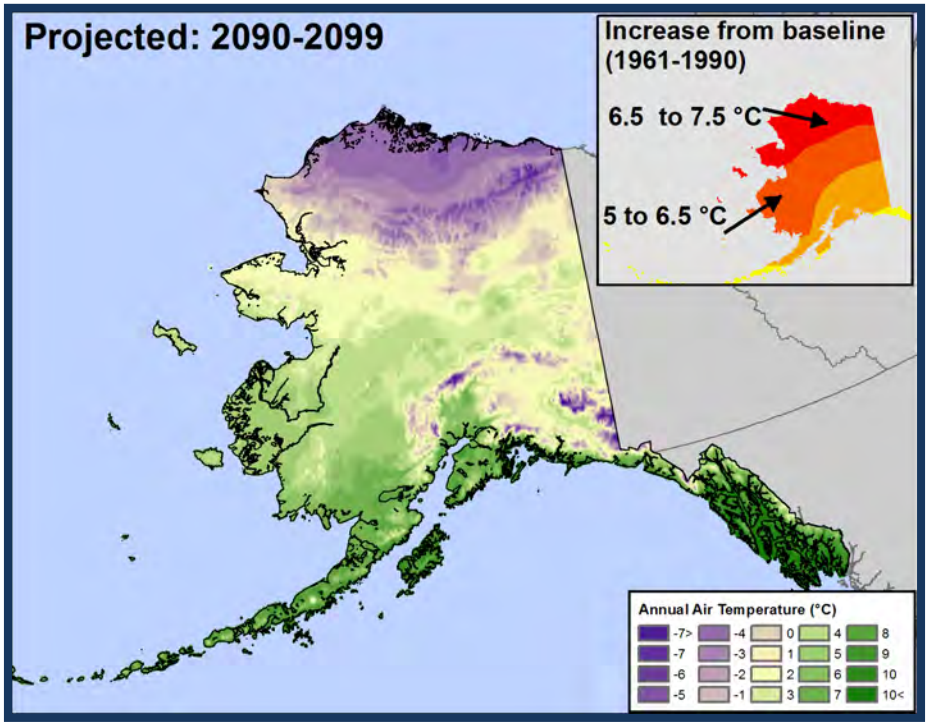
Shallow wetland in interior Alaska. Habitats such as this are sensitive to changes in both air temperature and summer precipitation. Photo by USFWS.

What Will Be Done

This project will use historical climate records for Alaska and Western Canada to identify climate-biomes seen across this region today. These climate-biome models will be coupled with future climate projections in an effort to identify areas within Alaska expected to undergo extreme change, and areas of "refugia" where temperature and precipitation patterns are expected to remain similar to what they are now.

Expected Outcomes

This modeling effort will use climate projections to produce spatially explicate models identifying areas of relative stability and areas of extreme change over the next 100 years. This information has direct applicability to conservation planning and development of vulnerability assessments species of management concern.



Projected average annual air temperature for the decade spanning 2090-2099. Temperatures are projected to increase by 6.5 to 7.5 °C (~11 to 13.5°F). Changes of this magnitude will likely result in the species composition and ultimately the biomes of Alaska and surrounding areas.

Timeline

April 2010 – April 2011: Model development.
September 2011: Final report and complete set of GIS models that represent potential climate-biomes from three different time periods.

The mission of the Arctic LCC is to identify and provide information needed to conserve natural and cultural resources in the face of landscape scale stressors, focusing on climate change, through a multidisciplinary program that supports coordinated actions among management agencies, conservation organizations, communities, and other stakeholders.

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Climate change will eventually shift the species composition and ultimately the biomes of Alaska and Western Canada.

June 2011

To learn more about this project and other Arctic LCC projects visit: arcticlcc.org
or contact Greg Balogh, Coordinator at greg_balogh@fws.gov
or Philip Martin, Science Coordinator at philip_martin@fws.gov

Arctic Landscape Conservation Cooperative

Shorebird distribution maps for Arctic Alaska

The Big Picture

As the Arctic warms, we expect widespread changes in water availability and vegetation, but it is not clear how these changes in habitat may impact bird species. Shorebirds are abundant in the Arctic, and individual species exhibit a wide range of habitat preferences. Therefore we expect differences in their response to climate change. A better understanding of each species' habitat association will provide a solid basis for predicting those responses. As a group, shorebirds may be good indicators of climate-associated ecological shifts.

Project ID: ARCT2010-02
Year Funded – 2010
Start – June 2010
End – June 2012
Budget – $246,966

Research Partners:
Manomet Center for Conservation Sciences
U.S. Fish and Wildlife Service

Using geospatial habitat modeling as a first step in assessing effects of climate change

Project Description

Researchers from the Manomet Center for Conservation Sciences will combine field observations of shorebirds with mapped physical and ecological parameters to develop a series of spatially dependent habitat selection models that predict the contemporary distribution of shorebird species across the Arctic Coastal Plain of Alaska.

Why We Are Interested

Reliably forecasting future species distribution and abundance depends on a solid foundation of empirical data. Unfortunately, the contemporary distribution of shorebirds on the Coastal Plain is poorly known, because few field observations are available. This project lays the ground-work for habitat selection models and models of future population response to climate-associated habitat change

Ruddy Turnstone (*Arenaria interpres*). Photo by USFWS

What Will Be Done

Researchers will compile existing shorebird presence/absence data and nest locations from a variety of sources (Figure 1). They will test whether species distributions are statistically related to measurable habitat characteristics, such as landcover and distance to coast. If so, they will develop habitat selection models that would describe the contemporary distribution of shorebird species across Alaska's Arctic Coastal Plain.

Expected Outcomes

This work will generate predictive models that can be used to predict the presence of various shorebird species throughout Alaska's Arctic Coastal Plain. If these models cannot be developed due to a lack of data, then this project will identify gaps that need to be filled in order to predict species response to climate change.

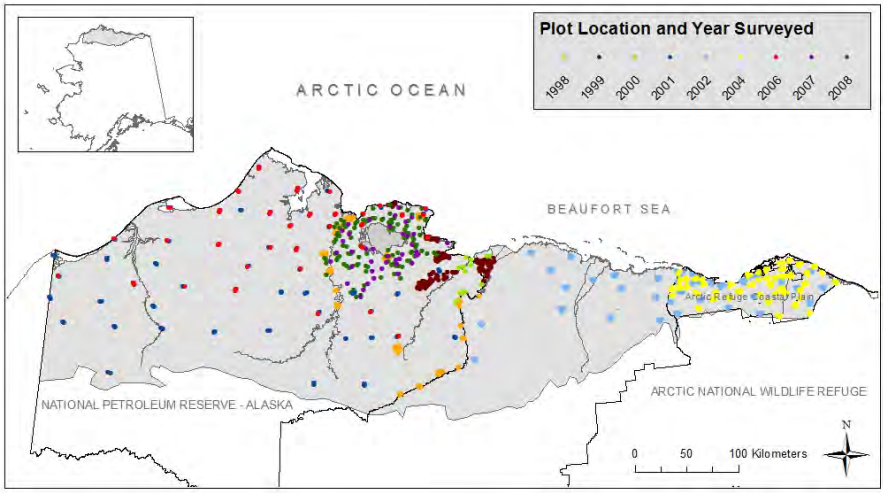

Figure 1: Location of the study area (shaded), major administrative boundaries, major riverine areas, and plots surveyed between 1998 and 2008.

Timeline

July 2011: Text Compile GIS databases on shorebird presence and absence and nest sites; identification of key physical and ecological parameters to include in the model.
July 2012: Final report and predictive models.

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Climate-mediated changes in habitat may have a profound effect on those species of shorebirds that rely on habitats on the Arctic Coastal Plain during the breeding season.

June 2011

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Arctic Landscape Conservation Cooperative

Improved access to natural resource data

The Big Picture

Conservation planning for fish and wildlife species depends on reliable access to up-to-date information on species distribution. In Alaska, however, this information is not easily obtained, even by specialists. To meet this need, we are assembling web-accessible spatial datasets that describe species distribution. These products will inform near-term conservation management actions and serve as a baseline for measuring distribution change, regardless of the cause.

Project IDs:

Fishes– ARCT2010-03
Eiders – ARCT2010-10
Loons – ARCT2010-14

Year Funded – 2010
Start – July 2010
End – September 2011
Budget – $101,078

Research Partners:
Bureau of Land Management
Fish and Wildlife Service

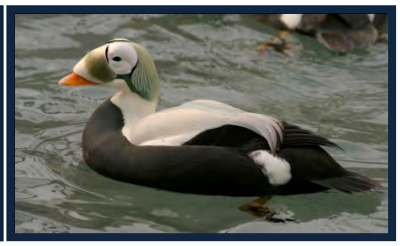
Supporting conservation planning by compiling geospatial data for species of management interest

Description

The Arctic LCC and our partners are working toward creating the first comprehensive database describing the distribution and abundance of Alaska's two threatened eider species. We are also supporting updates to a yellow-billed loon observation database, and a resident and anadromous fish distribution and abundance.

Why We Are Interested

These projects target "high-value" data sets. Better access to eider data will improve the efficiency and effectiveness of Endangered Species Act section 7 consultations and NEPA reviews that address these species. Better yellow-billed loon and fish distribution data will facilitate environmental planning and permitting processes, as well as informing water allocation decisions.



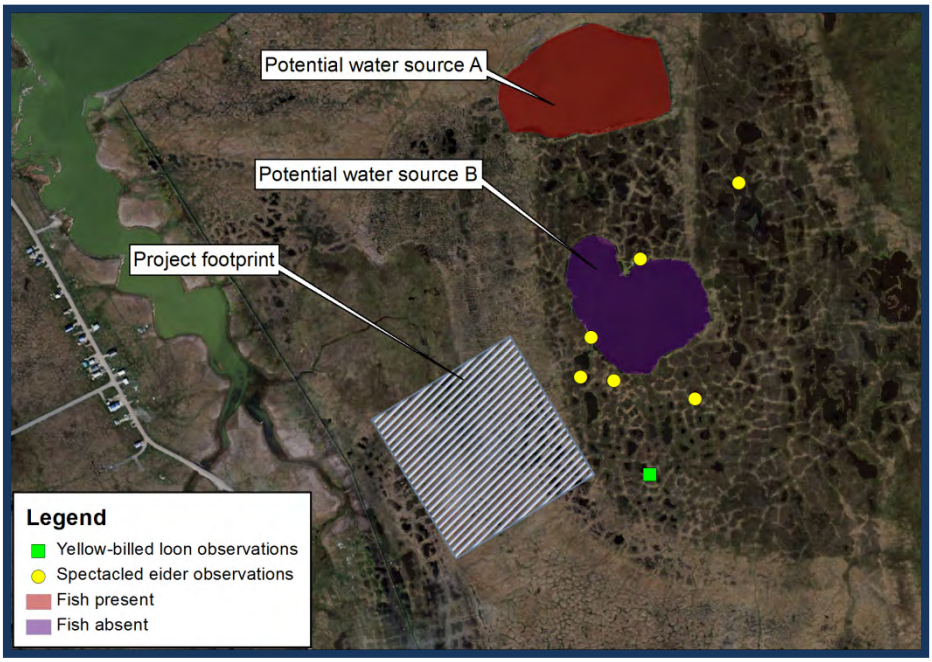
Left: Lake trout (*Salvelinus namaycush*) & *Right*: A male spectacled eider (*Somateria fischeri*).

What Will Be Done

Development of these databases requires gathering, re-formatting, and compiling data from many sources including state and federal agencies, private research firms, and individuals. When complete, these datasets will be made available through a website that can be accessed by all and viewed in either tabular or map views.

Expected Outcomes

These projects represent our first steps towards our goal of improving access to natural resource data. We intend to provide the technical and/or financial support necessary to keep these datasets as current as possible.



Example of how these three datasets could be combined and used to evaluate the environmental impacts of a potential project.

Timeline

July 2010 – August 2011: Data acquisition and synthesis.
September 2011: Spatial and tabular data will be made available to resources managers, industry, and the general public.

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Improved access to natural resource data will facilitate environmental review and planning for development projects, helping to streamline permitting processes and achieve more effective conservation.

June 2011

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or Philip Martin, Science Coordinator at philip_martin@fws.gov

Arctic Landscape Conservation Cooperative

Inventory and rescue of hydro-climate data

The Big Picture

Global climate models project a warmer and potentially wetter future for northern Alaska. How and where water will be distributed on the landscape is a crucial aspect of habitat change. We need to know how hydrologic processes may change under different climate scenarios, and to do that we need the most complete historical baseline possible. A first step is to inventory and compile available hydrologic and climate data.

Project ID: ARCT2010-04
Year Funded – 2010
Start – July 2010
End – February 2012
Budget – $268,000

Research Partners:
University of Alaska Fairbanks
International Arctic Research Center
Water and Environmental Research Center

First step toward developing a hydrology monitoring network in Arctic Alaska

Project Description

Researchers from the University of Alaska Fairbanks are working with state, federal, and private entities in an effort to inventory and compile data related to hydrology and climate in Arctic Alaska. These data will be used in an analysis that identifies key locations for future environmental monitoring efforts in Arctic Alaska and parameters to measure at these locations (e.g., stream flow, air and soil temperature, snow depth, and solar radiation)

Why We Are Interested

This project gathers together scarce hydrology data, currently scattered among many places and institutions, and places it within one data structure and location. While there are many uses for these data, we are most interested in their ability to inform the design of a long-term hydrologic observation network for the Arctic LCC.

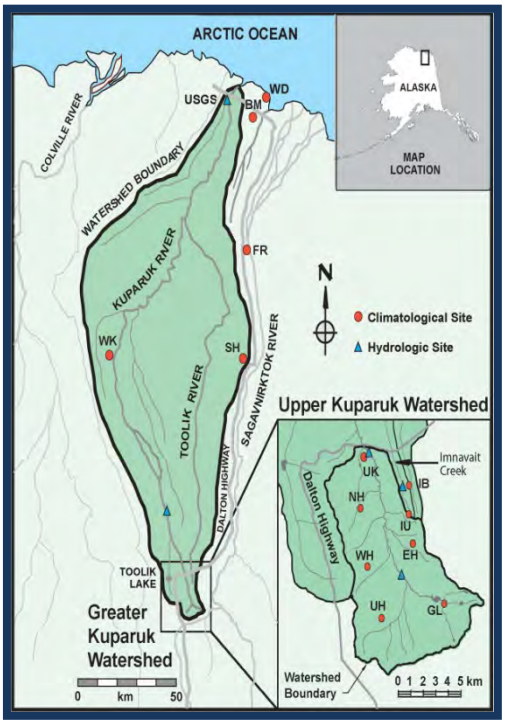
Upper Kuparuk River near the Dalton Highway. Photo credit: Rob Gieck/WERC.
http://ine.uaf.edu/werc/projects/NorthSlope/upper_kuparuk/images

What Will Be Done

This work will be completed in two phases. During phase one, we will inventory available data related to hydrology and climate in Arctic Alaska and start to compile data within a relational geodatabase. During the second phase, we will make the data accessible through the web, and use it to design an improved climate and hydrologic monitoring network for Arctic Alaska.

Expected Outcomes

This work is the first step towards developing a network of long-term monitoring sites designed to enhance our understanding of water balance in arctic habitats and improve forecasts of future habitat conditions. In the near-term, the scientific, conservation, and engineering community will benefit from the existence of a comprehensive hydro-climate database.



The Greater Kuparuk Watershed is one of the few rivers systems in Arctic Alaska with a history of long-term hydrologic monitoring. Map courtesy of Erica Betts/UAF.

Timeline

2010-2011: Inventory available hydro-climate data; design database; compile records.
February 2012: Final report that identifies key location for maintaining or re-establishing long-term monitoring.

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Changes in water balance are expected to occur as the Arctic warms, but given the scant historical record, they may be difficult to document. Compiling data collected by numerous institution into a single database will help analyze trends.

June 2011

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Arctic Landscape Conservation Cooperative

Integrated Ecosystem Model (IEM) for Alaska

The Big Picture

The physical and biotic components of arctic and boreal ecosystems - permafrost, hydrology, disturbance (e.g., fire), and vegetation - are tightly linked and sensitive to climate change. Managers need tools to visualize potential future landscapes that result from the interaction of ecosystem components and physical processes. IEM provides a framework for forecasting ecosystem change and will help with vulnerability assessments, and guide inventory and monitoring activities.

Project ID: ARCT2010-05
Year Funded – 2010
Start – February 2010
End – September 2011
Budget – $410,000

Research Partners:
UAF
The Wilderness Society

Improving our understanding of ecosystem change in response to changing climate

Project Description

Researchers from the University of Alaska Fairbanks (UAF) and collaborators from The Wilderness Society developed a framework for linking several existing models to produce a single integrated model that simulates vegetation succession, disturbance regimes, hydrology, and permafrost dynamics. The ultimate goal is to produce maps for the entire state that forecast ecological conditions under specified climate scenarios.

Why We Are Interested

Researchers have developed three models that forecast the response of permafrost, vegetation communities, and fire to changing climate. These models provide important information on how the Alaskan landscape may respond to climate change. However, an integrated model would provide resource managers with more accurate forecasts of future habitat conditions, in a more useable form.

Post-fire succession in Interior Alaska, Mark Bertram/USFWS.

What Was Done

Work completed in 2010-2011 was the first stage of a multi-year effort to develop a model (Fig. 1) that combines output from Boreal-ALFRESCO, the Terrestrial Ecosystem Model (TEM), and the Geophysical Institute Permafrost Model-1 (GIPL-1). Using climate projections from two Global Circulation Models and the Yukon River basin as a study area, researchers linked fire regime outputs of ALFRESCO to TEM, thus simulating the impact of fire on soils. Moss and organic layer thickness outputs from TEM were then used to drive the GIPL-1.

Outcomes

Simulations by the GIPL-1 model driven by ALFRESCO coupled with TEM organic layers indicate fire produces significant changes in ground temperatures and permafrost throughout the 21st Century. These results suggest that there are important linkages between the fire regime, forest composition, and the structure of soil organic horizons that influence the vulnerability of permafrost degradation in interior Alaska.

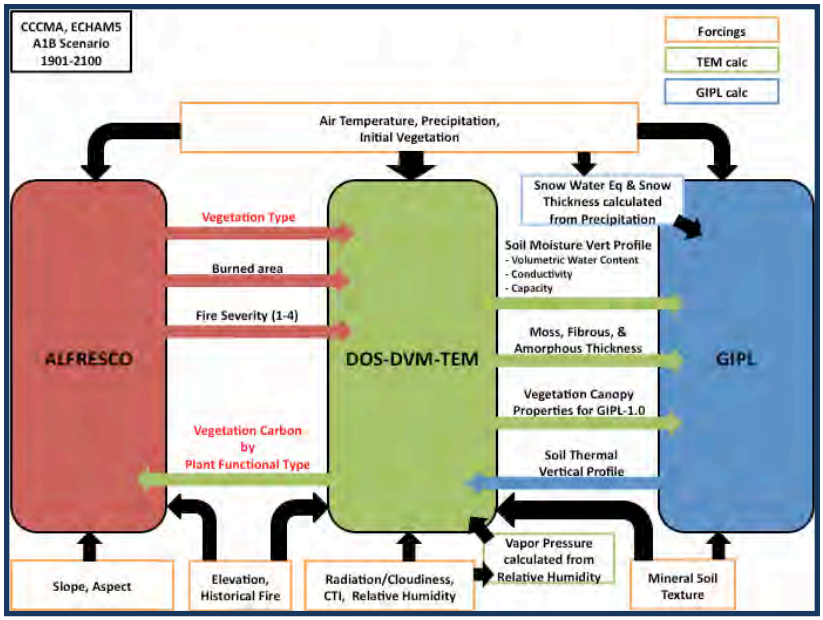

Figure 1: Modeling framework for proposed synchronous coupling among ALFRESCO, TEM and GIPL-1.

Reports & Publications:

Rupp, T. S. et al. 2012. *Integrated Ecosystem Model for Alaska*. Final report prepared for the Arctic Landscape Conservation Cooperative, Fairbanks, Alaska. 30p.
http://arcticlcc.org/projects/landscape/integrated-ecosystem-model-iem-for-alaska/

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The IEM will improve our understanding of ecosystem change in response to changing climate and also could inform the structure, design, and location of monitoring activities across agencies.

January 2012

To learn more about this project and other Arctic LCC projects visit: arcticlcc.org
or contact Greg Balogh, Coordinator at greg_balogh@fws.gov
or Philip Martin, Science Coordinator at philip_martin@fws.gov

Arctic Landscape Conservation Cooperative

Linking Climate, Stream Flow, and Fish Migration

The Big Picture

Fish on the North Slope rely on seasonal migrations to access spawning, summer feeding, and overwintering areas. To complete their annual cycle, fish migrate between main stem rivers, small headwater streams, deep lakes, and shallow ponds. Maintaining surface water connectivity between these habitats is essential for successful migration. These ephemeral waterways are sensitive to changes in precipitation. This work will help managers identify fish populations whose seasonal migrations may be impacted by a warmer, drier Arctic.

Project ID: ARCT2010-06
Year Funded – 2010
Start – July 2010
End – June 2012
Budget – $100,244

Research Partners:
UAF, Water and Environmental Research Center

Understanding how changing climate could influence fish migration on the North Slope

Project Description

Researchers from the University of Alaska Fairbanks (UAF) will develop a model that examines the relationship between measured steam flow and surface water connectivity between summer feeding and overwintering habitats for fish on the North Slope. Work initiated in 2010 will focus on the Upper Kuparuk River (Figure 1).

Why We Are Interested

Recent observations suggest that portions of some North Slope stream-beds become dry during brief periods in later summer and early fall. This is cause for concern because climate models forecast even drier summers in the future. This could pose a problem for migrating fish, which must be able to move back and forth from breeding and summer feeding areas to scarce overwintering sites.

Upper Kuparuk River during the drought of 2005. Note the dry streambed. Photo courtesy of Doug Kane/UAF.

What Will Be Done

This work uses the best available long-term stream gaging data set for the North Slope (the upper Kuparuk River watershed) to develop a model to assess the vulnerability of stream systems to periodic drought, and the vulnerability of migrating fish to a temporary loss of stream flow. The project complements studies of fish migration and ecology conducted by US Fish and Wildlife Service and Woods Hole Marine Biological Laboratory.

Expected Outcomes

This project will establish a relationship between streamflow and water depth within the portions of the Kuparuk River that are prone to drying. Using these data, researchers will develop a hindcast model to explore the frequency, timing, and duration of low flow events over the years for which we have steamflow data.

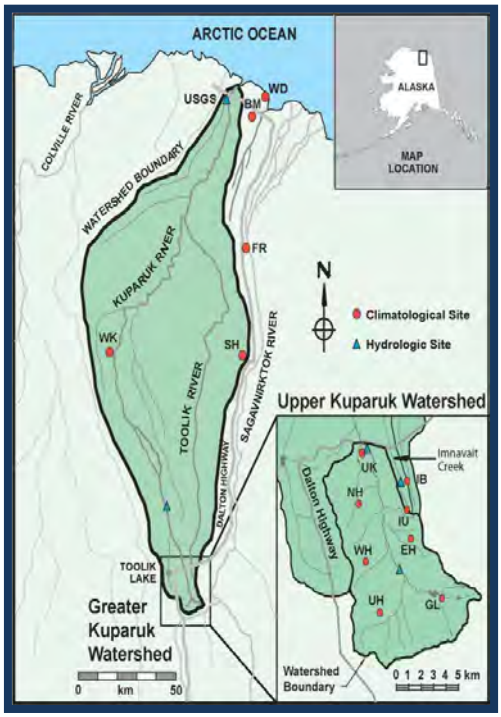

Figure 1. Location of stream gages, meteorological stations, and project locations on the North Slope of Alaska

Timeline

July 2010 – May 2012: Field work and model development
June 2012: Report of manuscript summarizing results of data analysis and models.

The mission of the Arctic LCC is to identify and provide information needed to conserve natural and cultural resources in the face of landscape scale stressors, focusing on climate change, through a multidisciplinary program that supports coordinated actions among management agencies, conservation organizations, communities, and other stakeholders.

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This project represents the necessary first step towards quantifying the importance of low water conditions and fish migration on the North Slope of Alaska.

May 2011

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or contact Greg Balogh, Coordinator at greg_balogh@fws.gov
or Philip Martin, Science Coordinator at philip_martin@fws.gov

Arctic Landscape Conservation Cooperative

Monitoring glaciers & rivers in Arctic Alaska

The Big Picture

The overarching goal of this work is to integrate study of McCall Glacier with other research on the impacts of climate change on the landscape of Arctic Alaska. Glaciers in the Eastern Brooks Range supply water to rivers systems that support important Dolly Varden subsistence fisheries. Recent work suggests that these glaciers are melting quickly and will likely be lost by the end of the century. Managers and subsistence users need a better understanding of how these systems may change after these glaciers melt.

Project ID: ARCT2010-07
Year Funded – 2010
Start – July 2010
End – December 2014
Budget – $240,000

Research Partners:
University of Alaska Fairbanks

Understanding the impacts of climate change on glacier dominated systems in the Arctic

Project Description

Researchers from the University of Alaska Fairbanks (UAF) will investigate glacier-climate interactions within the Arctic National Wildlife Refuge, including impacts of glacier change on the downstream aquatic ecosystems. This work builds upon the only long-term monitoring program of glaciers in Arctic Alaska.

Why We Are Interested

Glaciers in the Brooks Range of Arctic Alaska are losing ice mass at an accelerating rate, and if current trends continue, the glaciers will disappear over the next century. When the glaciers disappear, streamflow in rivers such as the Jago, Okpilak, and Hulahula will decrease (Figure 1). Diminished flows, will affect local fisheries and the subsistence users that depend on them, and likely result in changes to conditions in coastal estuaries.

A

B

Images of McCall Glacier, Brooks Range Alaska. Image "A" taken in 1958 by Austin Post; image "B" was taken in 2003 by Matt Nolan.

What Will Be Done

The baseline efforts include primarily the maintenance of the long-term monitoring on McCall Glacier. In addition, this work will include measurement of mass balance on McCall Glacier and site investigations of Esetuk Glacier for a short-term comparison study of mass balance and glacier-climate interactions. This project complements streamgaging activities on both the Hulahula and Jago rivers.

Expected Outcomes

Results from this project, combined with other research activities, will foster a better understanding of just how much of the water in the Hulahula and Jago river systems is derived from glacier meltwater. With this understanding, researchers will have a better sense of what water levels in these systems may be in the future and how that may impact stream ecology and subsistence fisheries.

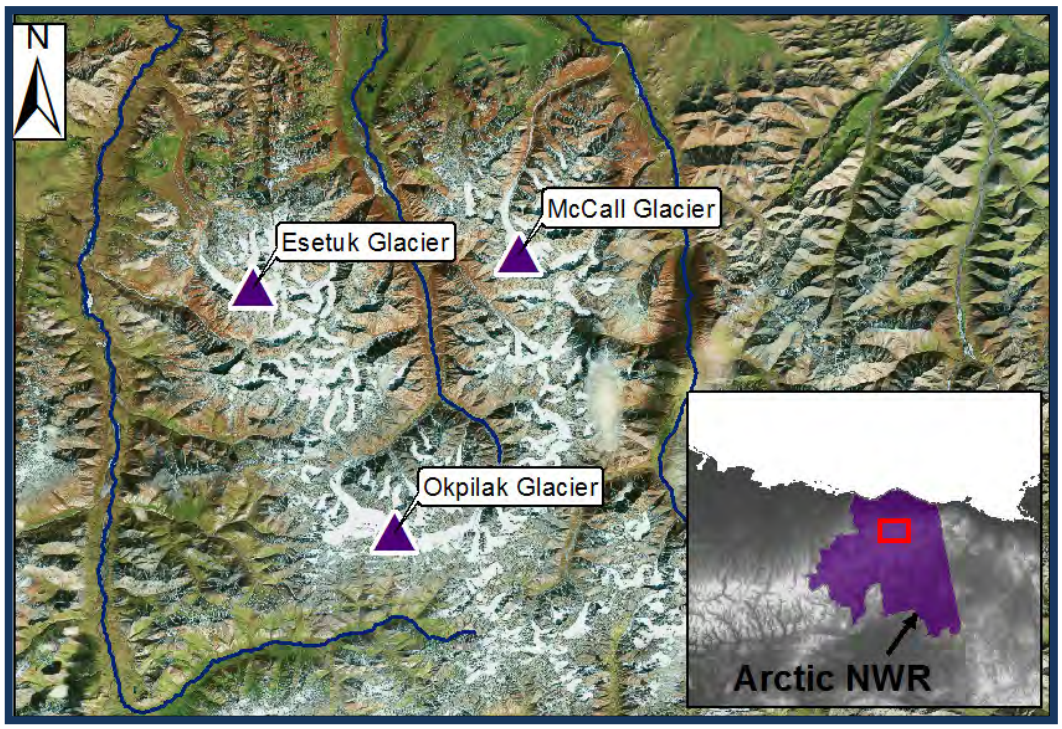

Figure 1: Location of selected glaciers within Arctic NWR (see inset). McCall Glacier drains into the Jago River; Okpilak Glacier drains into the Okpilak River; and Esetuk Glacier drains into the Hulahula River.

Timeline

Summer 2010 – Summer 2014: Field work
Fall 2014: Report and/or manuscript detailing results of this investigation.

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The rate at which glaciers in Arctic Alaska are losing ice is accelerating and if current trends continue, glaciers within the Brooks Range will disappear over the next century

June 2011

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Arctic Landscape Conservation Cooperative

River monitoring in Arctic Alaska

The Big Picture

There are far fewer stream gages in Alaska than in other comparably size parts of the U.S. The result is a lack of baseline hydrological data for streams in Alaska's Arctic. Without these data it is difficult to understand current flow regimes and projecting future streamflow becomes difficult at best. To help meet this need, the Arctic LCC is contributing to streamflow monitoring in five river systems

Project IDs:

Kuparuk and Putuligayuk – ARCT2010-08
Canning and Tamayariak – ARCT2010-12
Hulahula River – ARCT2010-13

Year Funded – 2010
Budget – $245,000

Research Partners:

University of Alaska Fairbanks' Water and Environmental Research Center
North Slope Science Initiative
US Geological Survey
US Fish and Wildlife Service

Contributing to an improved understanding of Arctic hydrologic systems

Project Description

The Arctic LCC and partners are supporting stream gages in five different river systems. The rivers being monitored fall into three broad categories: glacial streams originating in the Brooks Range (Hulahula river), streams with only minor glacial input (Kuparuk, Canning & Tamayariak rivers), and non-glacial streams that are contained entirely within the Arctic Coastal Plain, such as the Putuligayuk River (Figure 1).

Why We Are Interested

Rivers in Alaska Arctic will likely respond differently to climate change depending on the source of water (e.g., glacier-fed systems vs. precipitation driven systems). Unfortunately, hydrologic data for these rivers are sparse, and fewer still have associated long-term (> 20+ year) datasets. This lack of baseline information hinders our ability to assess long-term alterations in streamflow due to changing climate conditions.

A B

Examples of glacier-influenced (A) and precipitation-driven (B) river systems. Both systems are sensitive to changes in air temperature and summer precipitation, but will likely respond differently. Photos by USFWS.

What Will Be Done

Arctic LCC provided stop-gap funding to continue long-term stream monitoring of the Kuparuk and Putuligayuk rivers and contributed funds in support of stream gaging programs on the Canning and Tamayariak Rivers. We also provided support for installation of a new stream gage on the Hulahula River that will be in operation for a period of 5 years.

Expected Outcomes

The streamgages, in combination with other LCC projects are intended to build toward establishment of a Hydrologic Monitoring Network. These data will be integrated into the Arctic LCCs hydroclimatological database (see project ARCT2010-04). This will improve our understanding of water availability across the North Slope and will inform models that project how water balance may change under a scenario of continued arctic warming.

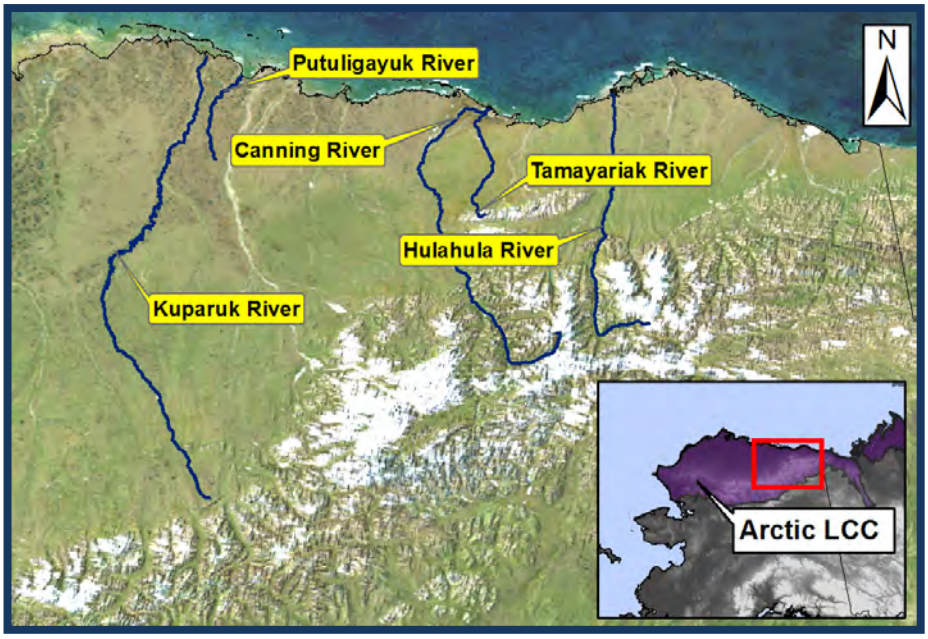

Figure 1: Location of rivers where the Arctic LCC is contributing to stream monitoring efforts. The Kuparuk and Putuligayuk rivers are the only two systems in Arctic Alaska for which we have long-term datasets.

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These datasets are invaluable to modeling efforts that forecast stream flows under scenarios of changing climate, and the associated changes in the ecology of rivers, floodplains, and nearshore marine environments.

July 2011

To learn more about this project and other Arctic LCC projects visit: arcticlcc.org
or contact Greg Balogh, Coordinator at greg_balogh@fws.gov
or Philip Martin, Science Coordinator at philip_martin@fws.gov

Arctic Landscape Conservation Cooperative

Arctic Lake Drainage

The Big Picture

Lakes of the Arctic Coastal Plain of northern Alaska provide essential habitat for many species of water birds and fish. In this low-precipitation environment, abundant lakes persist because of low temperatures and the presence of continuous permafrost. These habitats, therefore, are uniquely vulnerable to the effects of a warming climate. The Arctic Lake Drainage project provides managers with a spatially explicit model of projected landscape change due to lake drainage.

Project ID: ARCT2010-09
Year Funded – 2010
Start – July 2010
End – September 2011
Budget – $94,000

Research Partners:
Geophysical Institute, UAF
Alaska Science Center, U.S. Geological Survey

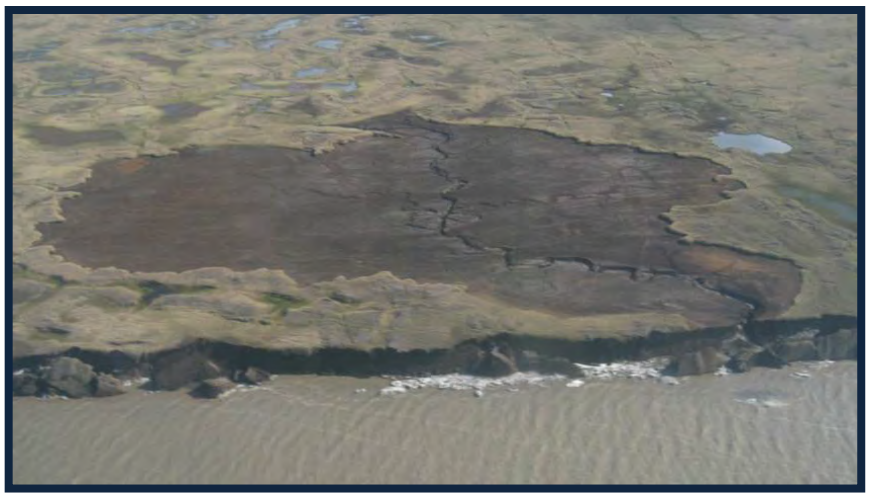
Vulnerability to climate change and projection of future lake loss on the North Slope

Project Description

Researchers from the University of Alaska Fairbanks (UAF) and U.S. Geological Survey developed a spatially explicit model that identifies relative risk of individual lakes to drainage due to natural geomorphic processes that may be enhanced in a warmer climate. This work was focused on lakes located across a vast region of western Arctic Coastal Plain and portions of the National Petroleum Reserve–Alaska (Fig. 1).

Why We Are Interested

Mean annual air temperature in Arctic Alaska is projected to increase 7°C by 2100 (5-7 times the national average). A warming climate will influence permafrost in ways that can either promote or jeopardize the persistence of individual lakes. Understanding the potential changes in the abundance and distribution of these habitats is an important first step in assessing the vulnerability of species that depend on them.



A lake recently 'tapped' by rapid erosion of the Beaufort Sea coastline. Note the drainage way bisecting the lake basin. Photo courtesy of Benjamin Jones/USGS.

What Was Done

Researchers developed a spatially explicit model that projects the relative vulnerability of individual lakes to drainage as a function of permafrost conditions and topography. This model was used to generate maps that identify lakes at risk of draining during the 21st Century.

Outcomes

Based on drainage gradients and historical lake expansion rates, researchers identified 36 lakes in the year 2025 class, 167 lakes in the year 2050 class, and 452 lakes in the year 2100 class as being at risk of draining. Because changes in air temperature and precipitation may increase lake expansion rates, the model was run using a scenario which assumes lake expansion at twice the historical rate. Under this scenario, they identified 206, 452, and 1,966 lakes at risk of draining by the years 2025, 2050, and 2100, respectively.

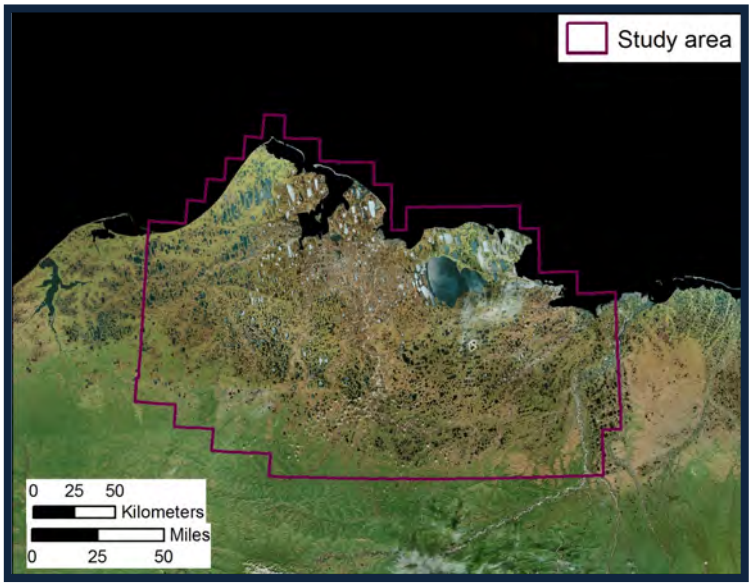


Figure 1: Western Arctic Coastal Plain study area. Image courtesy of SDMI-GINA (www.alaskamapped.org).

Reports & Publications

Grosse, G. and B. Jones. 2012. *Thermokarst Lake Drainage - Vulnerability to Climate Change and Prediction of Future Lake Habitat Distribution on the North Slope*. Project summary prepared for the Arctic Landscape Conservation Cooperative, Fairbanks, Alaska. 3p.

Jones, B., Grosse, G., Jenkins, J., Martin, P. 2010 (in prep). Analysis of drainage gradients using a digital elevation model and development of a lake drainage potential dataset for the western Arctic Coastal Plain of northern Alaska.

The mission of the Arctic LCC is to identify and provide information needed to conserve natural and cultural resources in the face of landscape scale stressors, focusing on climate change, through a multidisciplinary program that supports coordinated actions among management agencies, conservation organizations, communities, and other stakeholders.

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Warming of air and water temperature will likely increase erosion of permafrost along lake shores allowing some lakes to grow . Other lakes, however, may be susceptible to sudden drainage and convert to a different habitat.

January 2012

To learn more about this project and other Arctic LCC projects visit: arcticlcc.org
or contact Greg Balogh, Coordinator at greg_balogh@fws.gov
or Philip Martin, Science Coordinator at philip_martin@fws.gov

Arctic Landscape Conservation Cooperative

Shorebird Demographics and Climate Change

The Big Picture

Arctic shorebirds are declining and climate-associated habitat change could further impact population levels. The goal of the Arctic Shorebird Demographic Network is to better understand the causes of shorebird declines by studying their demography (e.g., nest success, and adult survival). This information will help managers develop conservation strategies that tackle the most pressing problems facing these species.

Project ID: ARCT2010-11
Year Funded – 2010
Start – July 2010
End – June 2012
Budget – $187,787

Research Partners:
Manomet Center for Conservation Sciences
Kansas State University
Simon Fraser University
USFWS
Environment Canada
Wildlife Conservation Society
Trent University
Cornell University
University of Quebec

Enhancing our understanding of how shorebirds may respond to a changing Arctic

Project Description

The Arctic Shorebird Demographic Network (Network) is an international collaboration dedicated to gaining a better understanding of why arctic-nesting shorebirds are in decline and determine which life history stage (i.e., breeding success vs. adult survival) is limiting shorebird population growth or driving declines.

Why We Are Interested

This work will enhance our understanding of how shorebirds may respond to climate-driven changes, such as changes in food resources, snow cover, surface water, and availability coastal habitats. This knowledge is critical to development of contemporary species-habitat association maps and models that allow managers to explore projections of future shorebird distribution under different climate scenarios.

Long-billed Dowitchers (*Limnodromus scolopaceus*) foraging for invertebrate prey. Photo by USFWS.

What Will Be Done

Researchers established a network of sites (figure 1) where they collect information on shorebird breeding success and a suite of environmental variables, such as distribution of surface water, phenology of invertebrates, and air temperature, that may influence shorebirds and are likely affected by climate change. These parameters will be correlated with measures of shorebird distribution, ecology, and demography.

Expected Outcomes

This work will enhance our ability to target conservation activities in the places and for the species in which the need is greatest. The accompanying habitat studies will allow us to integrate the long-term climate-change outlook into these activities.

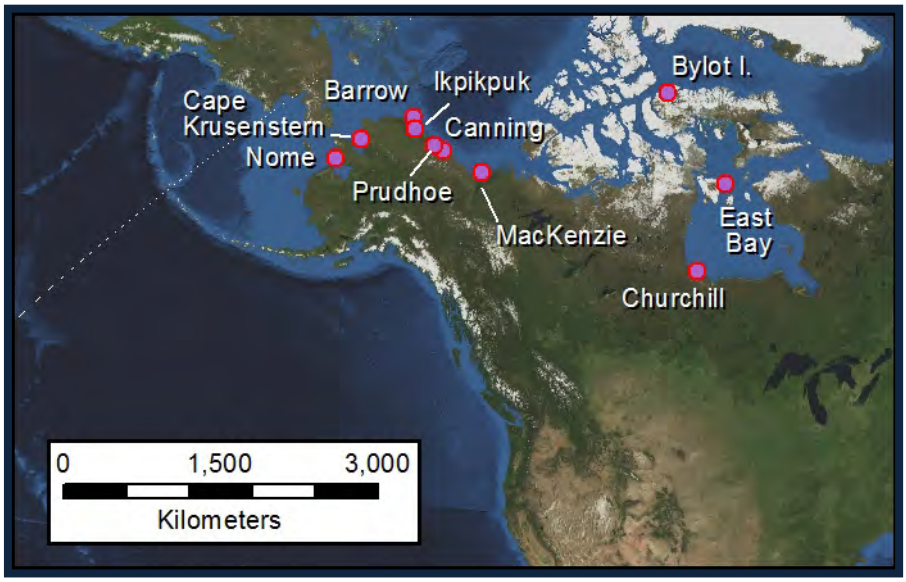

Figure1: Location of Network sites in 2010. The Nome site is operated by Kansas State University & Simon Fraser University; Cape Krusenstern & Barrow sites are operated by the USFWS; Ikpikpuk and Prudhoe Bay sites are operated by the Wildlife Conservation Society; Canning River site is operated jointly by the USFWS & Manomet, Inc.; Mackenzie Delta site is operated by the Environment Canada; East Bay site is operated by Environment Canada & Paul Smith Consulting; Churchill site is operated by Trent University & Cornell University: Bylot Island is operated by the University of Quebec at Rimouski.

Timeline

Summer season 2010 –2012: Field work and data synthesis. The Network hopes to continue work at least through 2014.

The mission of the Arctic LCC is to identify and provide information needed to conserve natural and cultural resources in the face of landscape scale stressors, focusing on climate change, through a multidisciplinary program that supports coordinated actions among management agencies, conservation organizations, communities, and other stakeholders.

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Data collected by the Network and their collaborators will allow researchers to assess the potential impacts of climate change on shorebirds breeding in the Arctic.

June 2011

To learn more about this project and other Arctic LCC projects visit: arcticlcc.org
or contact Greg Balogh, Coordinator at greg_balogh@fws.gov
or Philip Martin, Science Coordinator at philip_martin@fws.gov