Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Baseline Inventory of Physical, Chemical and Biological Attributes of
Select Lakes in the Arctic Network (ARCN)

Discipline: Natural

Type of Project: Research

Funding Agency: National Park Service

Other Partners/Cooperators: Utah State University

Effective Dates: 8/1/2005 - 9/30/2008

Funding Amount: $105,033

Investigators and Agency Representative:

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Project Abstract:

   Utah State University will work with the staff of the Arctic I&M Network (ARCN) to sample 10- 20 lakes
per year in the Arctic Network Parklands.Physical characteristics of temperature, light, and lake
morphometry will be measured for each lake. The relative area and depth of each lake will be assessed by
conducting orthogonal cross-lake transects using a Garmin GPS/Depth Echosounder. Latitude, longitude and
depth will be measured along the two transects and used to assess maximum and mean depth of each lake.
These measures will be compared to surface area generated from the GIS data structures for the area. Depth
profiles of light and temperature will be measured at a central station on each lake by lowering a LiCor
photometer with both a photosynthetically active radiation sensor (PAR) and an ultraviolet radiation sensor
(UV-A + UV-B). Extinction curves of radiation energy with depth will be calculated for each lake and serve
as an integrative measure of light energy entering the lake. Both PAR and UV light are sensitive to a
variety of atmospheric and watershed perturbations and provide insight into environmental change.
Temperature will be measured with a Hydrolab datasonde equipped with a SCUFA chlorophyll sensor.
   Chemical characteristics of conductivity, oxygen, total nitrogen, total phosphorus, and chlorophyll
concentration will be measured at the central sampling station at each lake. Depth profiles of
conductivity, chlorophyll and dissolved oxygen will be made using the Hydrolab profiler. Epilimnetic
samples will be taken at three stations in each lake with an integrated tube sampler. Water samples (100 ml
each) will be acidified in the field and preserved for later determination of the concentration of total
nitrogen and total phosphorus in each sample.
   Biological characteristics of the lakes will include sampling for primary producers, zooplankton,
benthic invertebrates and fish. The goal of this sampling is two-fold; 1) to survey the taxa of organisms
present in each lake for comparison with other systems and to provide baseline data to assess changes in
biodiversity, and 2) to assess potential trophic interactions among food web components using tissue sample
for stable isotopes of carbon and nitrogen. Phytoplankton samples will be collected from the integrated
epilimnetic tube sample at three stations per lake. Sample of 100 ml will be preserved in Lugol's solution
for possible later identification and enumeration. A separate sample of phytoplankton will be filtered
onto a 0.45 glass fiber filter and dried for isotopic analyses. Littoral zone plants will be collected.
Some will be preserved for identification and some for isotopic analyses. Zooplankton from the water
column will be collected using a 70 um mesh plankton net to collect both rotifer and crustacean organisms.
At each of three sampling stations per lake, plankton tows will be collected from the bottom of the lake to
the surface and from the bottom of the epilimnion to the surface. Samples will be preserved in Lugols and
identified and enumerated at Utah State University. One additional epilimnetic sample and one whole-water
column sample will be collected and dried for isotopic analyses. Density and biomass of the dominant
organisms will be calculated for each lake. Benthic invertebrates will be collected from bottom Ekman grab
samples collected at four depths per lake. Samples will be sieved in the field through a 200 um mesh net
and preserved in ethanol. Benthic invertebrates from the littoral zone will be collected with a pump
sampler from four locations, sieved and preserved for later identification. A selection of benthic
invertebrates will be selected and dried for isotopic analyses. Fish will be collected by setting three
variable-mesh gill nets (25-256 mm stretch mesh) for between 4 and 12 hours per lake. Ten to twenty minnow
traps will be set along shorelines in 1-m deep water to attempt to capture fish too small for capture with
gill nets. Angling will be used as a possible collection option. Catch per unit effort of each gear will
be estimated for each lake. Species, length, wet mass, tissue for isotopic determination, and otoliths
will be collected from each fish.

Outcomes with Completion Dates:

Jan. 15, 2006 - Draft sampling and analysis plan
May 1, 2006 - Final sampling and analysis plan for 2006 field work
Sept. 1, 2006 - Preliminary report on results of 2006 summer field work
May 1, 2007 - Draft final report on 2006 field work
Sept. 1, 2007 - Completion report

Keywords: lakes, limnology, baseline inventory, biological, chemical, Arctic I&M Network, Kobuk Valley NP,
Gates of the Arctic NP&P, Cape Krusenstern NM, Bering Land Bridge NPres, Noatak NPres, Utah State
University

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Date Annual Report Received:
Date Final Report Received:

Publications, etc. on file: