

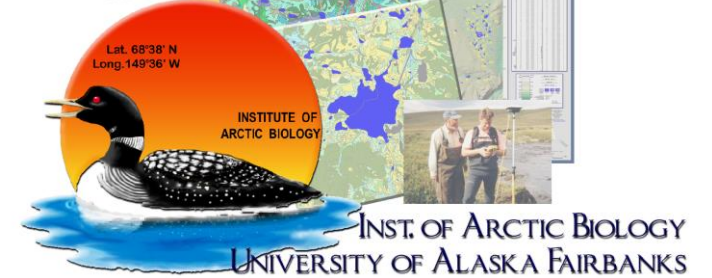
TOOLIK GIS REPORT

OCT 1, 2018 – SEPT 30, 2019

JASON STUCKEY

TOOLIK FIELD STATION

GIS



OVERVIEW



- Highlights From 2019
- Website Usage & Metrics
- Improved Drone Platform & Sensors
- Spatial myToolik System
- Arctic Data Center Submission
- 2nd Archaeological Survey
- Landscape Planning Update

REQUESTS FULFILLED



- 2015: 213 Requests from 36 Projects
- 2016: 203 Requests from 39 Projects
- 2017: 224 Requests from 34 Projects
- 2018: 207 Requests from 33 Projects
- 2019: 197 Requests from 32 Projects

WEBSITE USAGE - METRICS



- Downloads – Oct. 1, 2018 through Sept. 30, 2019
 - Maps – 444 Unique Users, 193 Maps, 1952 Downloads
 - GIS Data – 226 Unique Users, 51 Files, 1651 Downloads

IMPROVED DRONE PLATFORM & SENSORS

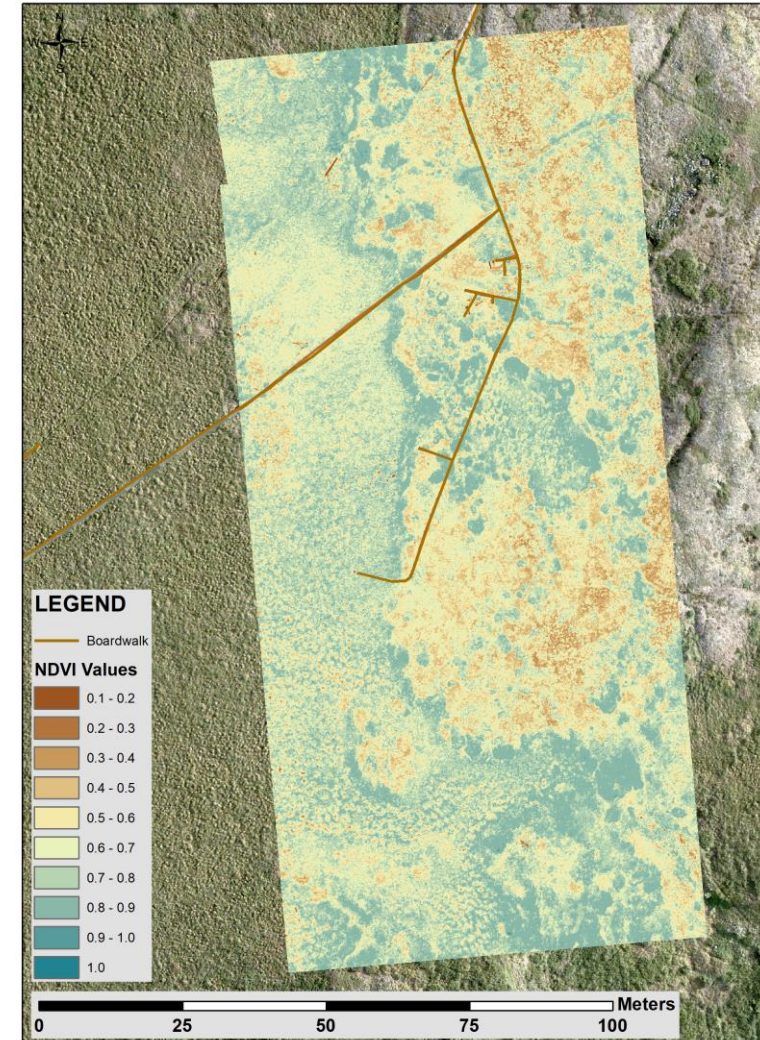


- Greater Range of Weather Conditions
 - Cold Temperatures (-20 C)
 - High Winds (12 m/s)
- Research Grade Mutli-Spectral Camera
- High-Resolution RGB Camera

CONTINUED UAS SERVICES



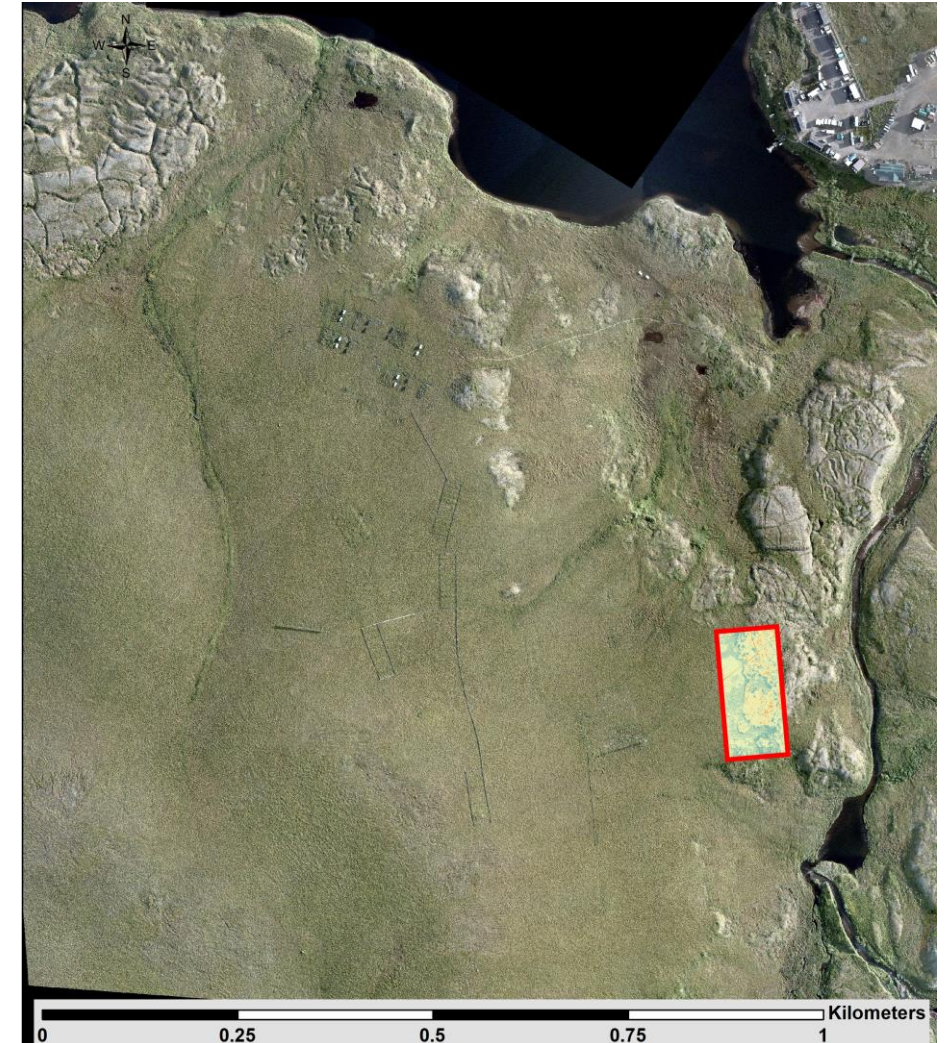
- Supported 25 Research Projects
- 50 Missions Flown (July-August)
- ITEX – AON Project



CONTINUED UAS SERVICES



- Supported 25 Research Projects
- 50 Missions Flown (July-August)
- ITEX – AON Project



OBLIQUE AERIAL PHOTOGRAPHS



SUMMER STUDENT ASSISTANT



- Processing Drone Imagery
- Student Returned for 3rd Season
 - Knowledgably & Experienced

SPATIAL MYTOOLIK SYSTEM



- Online Mapping Web-Application
 - Search Historic & Current Toolik Research Projects
 - Location of Research Sites
 - Publications
 - Website Links to Project Data
 - Contact Information
 - Photos

SPATIAL MYTOOLIK SYSTEM



Research Plots Operation Dashboard

https://data.tfs.alaska.edu/portal/apps/opdashboard/index.html#/113ed608ee942468052804aac3d301b

Most Visited | Getting Started | Tutorials / Data Recipe... | R Tutorial on Reading... | Toolik Field Station:GL...

Project List

An LTER Program for the Alaskan Arctic

Pi: Shaver, Gaius
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 8702328
Dates: 8/31/1987 to 1/31/1993

Arctic LTER: Climate Change and Changing Disturbance Regimes in Arctic Landscapes

Pi: Shaver, Gaius R.
Institution: Marine Biological Laboratory
Funding Source: US/Federal/NSF/BIO/DEB
Award Number: 1026843
Dates: 2/28/2011 to 1/31/2018

LTER: The Arctic LTER Project: The Future Characteristics of Arctic Communities, Ecosystems, and Landscapes

Pi: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 9810222
Dates: 11/30/1998 to 10/31/2005

LTER: The Role of Biogeochemical and Community Openness in Governing Ecological Change in Arctic Ecosystems

Pi: Rastetter, Ed
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 1637459
Dates: 2/28/2017 to 1/31/2023

The Arctic LTER Project: Regional Variation in Ecosystem Processes and Landscape Linkages

Pi: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 423385
Dates: 11/30/2004 to 10/31/2011

The Arctic LTER Project: Terrestrial and Freshwater Research on Ecological Controls

Pi: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 9211775
Dates: 8/31/1992 to 11/30/1999

Project List | Project Description

Pl: [Dropdown Menu]

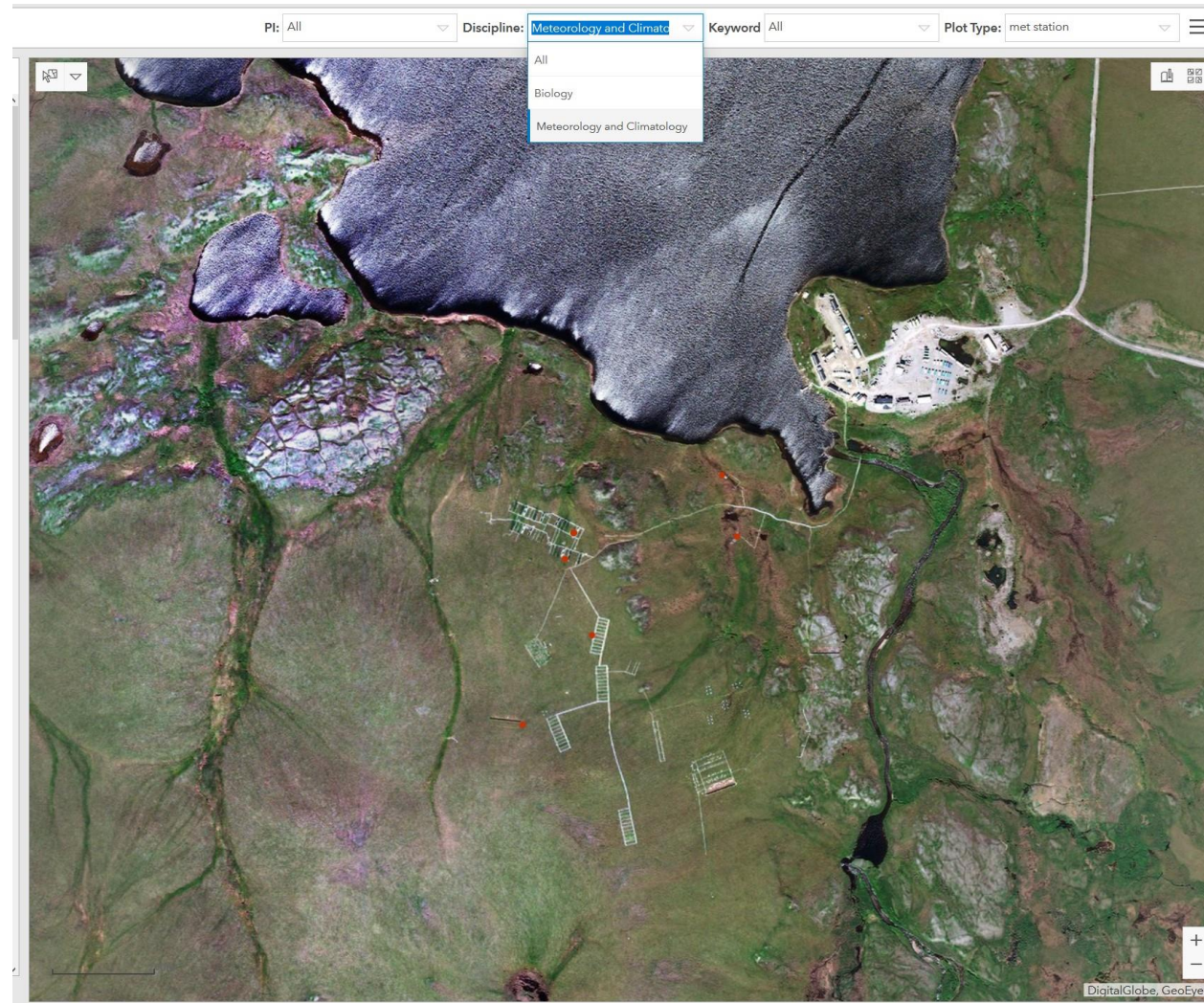
Discipline: All | Keyword: All | Plot Type: All

Map showing research plots (red dots) and study areas (orange rectangles) in the Arctic region. The map includes a scale bar and a legend.

Map controls: +, -, Full Screen, Print, Download Image

Map data: DigitalGlobe, GeoEye

SPATIAL MYTOOLIK SYSTEM



SPATIAL MYTOOLIK SYSTEM



Research Plots Operation Dashboard

https://data.tfs.alaska.edu/portal/apps/opendashboard/index.html#/113ed606eae942468052804aac3d301b

Most Visited Getting Started Tutorials / Data Recipe... R Tutorial on Reading ... Toolik Field Station: GL...

Pl: All Discipline: All Keyword: All Plot Type: All

Project List

An LTER Program for the Alaskan Arctic

PI: Shaver, Gaius
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 8702328
Dates: 8/31/1987 to 1/31/1993

Arctic LTER: Climate Change and Changing Disturbance Regimes in Arctic Landscapes

PI: Shaver, Gaius R.
Institution: Marine Biological Laboratory
Funding Source: US/Federal/NSF/BIO/DEB
Award Number: 1026843
Dates: 2/28/2011 to 1/31/2018

LTER: The Arctic LTER Project: The Future Characteristics of Arctic Communities, Ecosystems, and Landscapes

PI: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 9810222
Dates: 11/30/1998 to 10/31/2005

LTER: The Role of Biogeochemical and Community Openness in Governing Ecological Change in Arctic Ecosystems

PI: Rastetter, Ed
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 1637459
Dates: 2/28/2017 to 1/31/2023

The Arctic LTER Project: Regional Variation in Ecosystem Processes and Landscape Linkages

PI: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 423385
Dates: 11/30/2004 to 10/31/2011

The Arctic LTER Project: Terrestrial and Freshwater Research on Ecological Controls

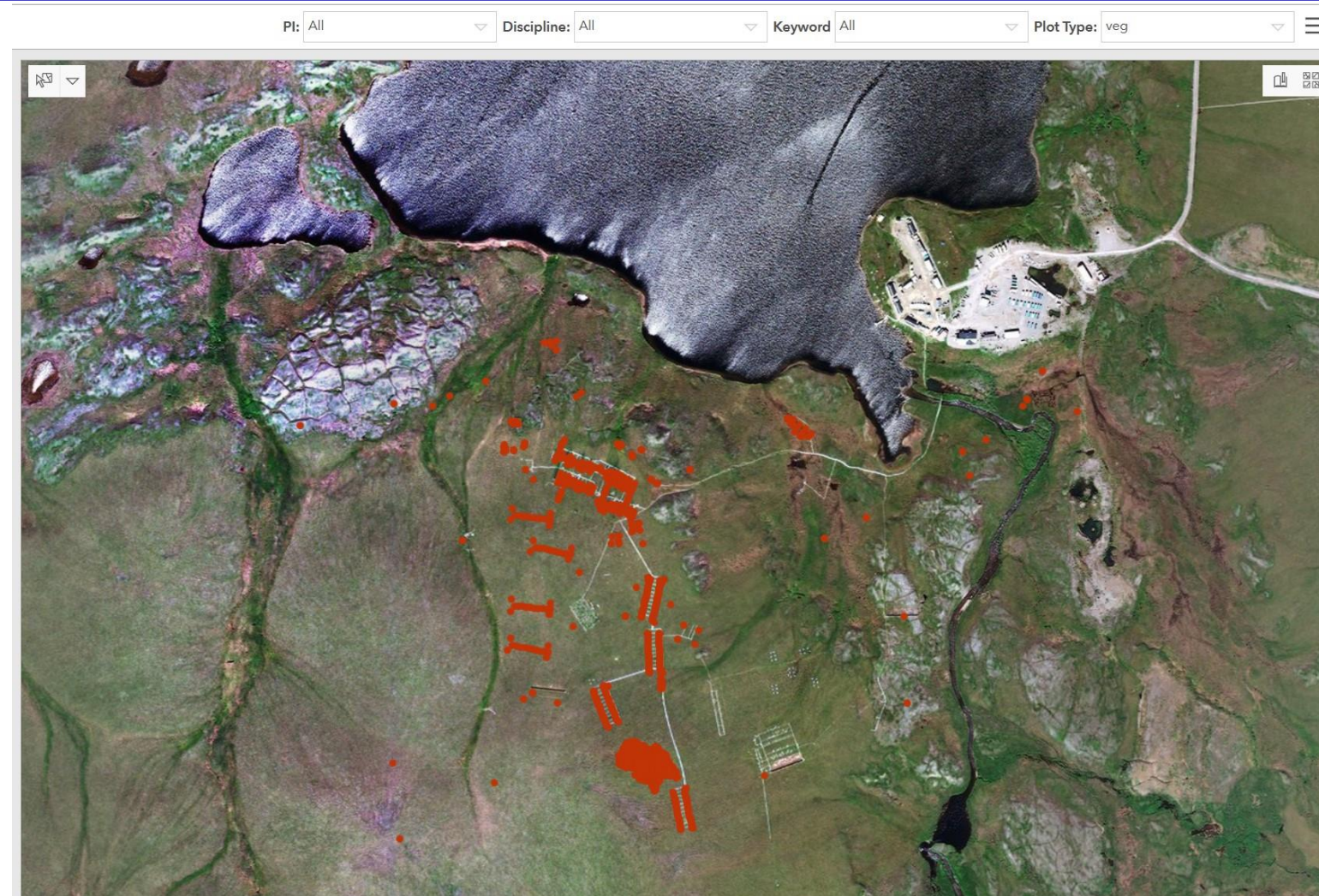
PI: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 9211775
Dates: 8/31/1992 to 11/30/1999

met station
permafrost
pitfall trap
pluviometer
snow
soil
soil pit
spider
transect point
veg
veg, soil

Project List Project Description


DigitalGlobe, GeoEye

SPATIAL MYTOOLIK SYSTEM



SPATIAL MYTOOLIK SYSTEM





PI: All ▼ Discipline: All ▼ Keyword: All ▼ Plot Type: All ▼

Project List

PI: Shaver, Gaius
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 8702328
Dates: 8/31/1987 to 1/31/1993

Arctic LTER: Climate Change and Changing Disturbance Regimes in Arctic Landscapes

PI: Shaver, Gaius R.
Institution: Marine Biological Laboratory
Funding Source: US/Federal/NSF/BIO/DEB
Award Number: 1026843
Dates: 2/28/2011 to 1/31/2018

LTER: The Arctic LTER Project: The Future Characteristics of Arctic Communities, Ecosystems, and Landscapes

PI: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 9810222
Dates: 11/30/1998 to 10/31/2005

LTER: The Role of Biogeochemical and Community Openness in Governing Ecological Change in Arctic Ecosystems

PI: Rastetter, Ed
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 1637459
Dates: 2/28/2017 to 1/31/2023

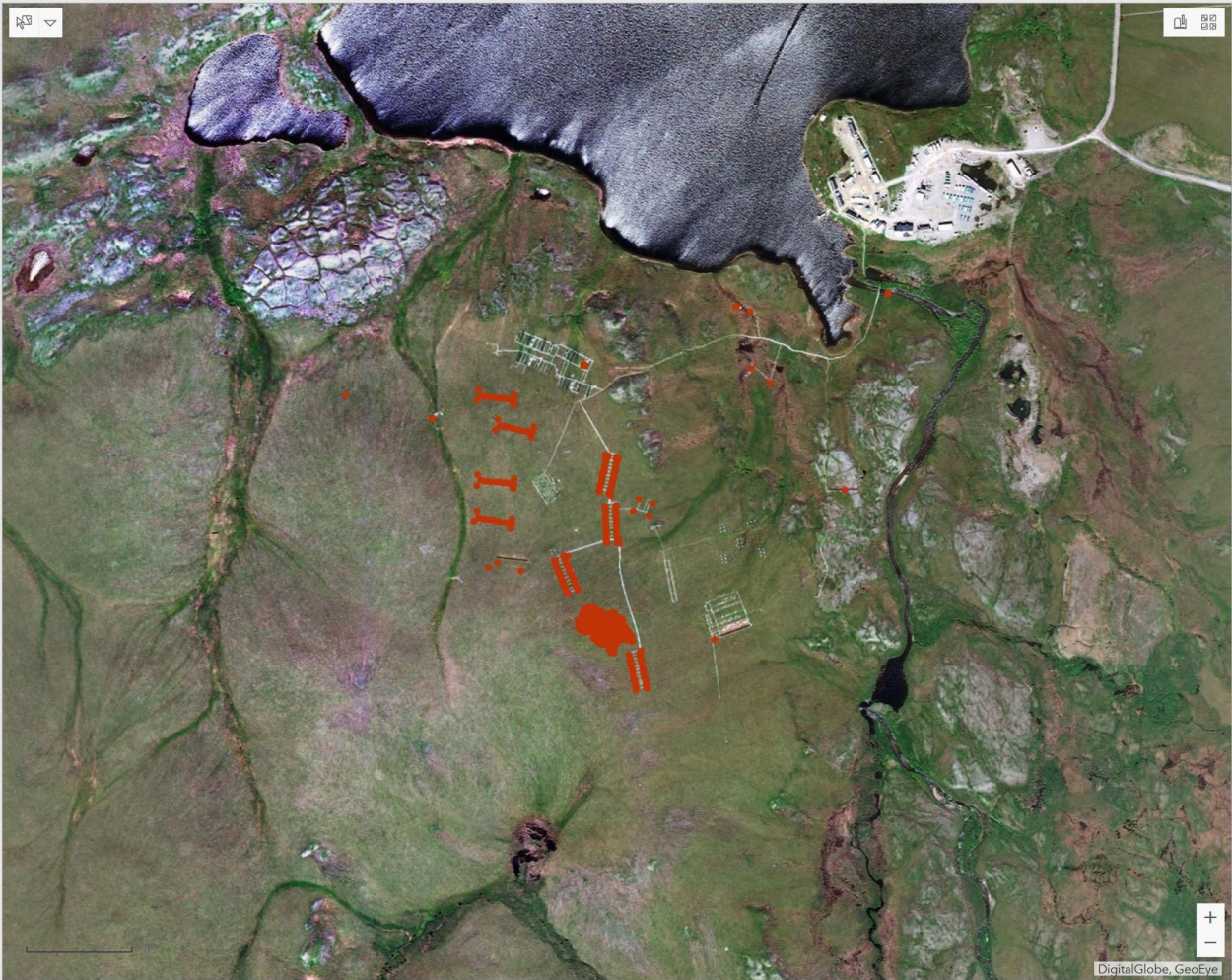
The Arctic LTER Project: Regional Variation in Ecosystem Processes and Landscape Linkages

PI: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 423385
Dates: 11/30/2004 to 10/31/2011

The Arctic LTER Project: Terrestrial and Freshwater Research on Ecological Controls

PI: Hobbie, John
Institution: Marine Biological Laboratory
Funding Source: NSF
Award Number: 9211775
Dates: 8/31/1992 to 11/30/1999

[Project List](#) [Project Description](#)

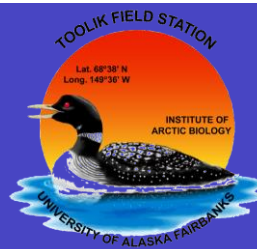


+

-

DigitalGlobe, GeoEye

SPATIAL MYTOOLIK SYSTEM



PI: AllDiscipline: AllKeyword AllPlot Type: All

Description of project

The Arctic LTER Project: Regional Variation in Ecosystem Processes and Landscape Linkages

This is the fourth stage of the Arctic LTER (ARC) located at the Toolik Lake Field Station, Alaska, where the ecology of tundra, streams, and lakes is studied to understand controls on ecosystem structure and function within the long-term goal of predicting the effects of environmental change. Research has been ongoing at the station since the 1970s, with the LTER project focusing on the biogeochemical components of a series of connected streams and lakes that collectively flow into and affect Toolik Lake, as well as the adjacent headwaters region of the Kuparuk River. Extensive variability exists among the various terrestrial and aquatic ecosystems in the study area, but all are linked via water and materials transport. The goal for this next phase of ARC is to understand changes in the Arctic system at catchment and landscape scales through enhanced knowledge of these linkages and interactions. Research will identify and quantify intra- and inter-system linkages, determine controls of the linkages and how they will be affected by a changing environment, and predict how the entire landscape will respond to environmental change. A suite of biogeochemical studies will target the interactions among the component terrestrial, stream, lake ecosystems within this landscape. Short-term studies will focus on specific materials to better understand inputs, climate drivers and transformations of materials. Long-term studies will investigate effects of changes in species composition, temperature, light and nutrients on four types of tundra and the effects of nutrient loading and climate variability. Lake studies will focus on landscape-to-lake linkages to understand controls of terrestrial patchiness on productivity patterns in lakes. Researchers will also examine in-lake processes and their relations to watershed inputs of nutrients and dissolved organic matter. Objectives are to measure pelagic and benthic production and coupling, elucidate food web structures, and determine how watershed-stream-lake linkages regulate transformations in water chemistry and patterns of productivity. Broader Impacts center around the use of ARC research results to address the important societal goal of predicting responses of Arctic ecosystems to environmental change. Data and insights will be provided to Federal and State officials regulating the development of oil and gas on the Alaskan North Slope. A collaborative undergraduate/graduate course will be held for two weeks in the summers, with undergraduate students trained in the field along with graduate students from ten universities. The MBL's Science Journalism Course facilitates journalist visits to Toolik Lake. The ARC LTER Schoolyard project involves a majority of Native Alaskan students. K-12 students conduct and observe local field experiments similar to those at Toolik Lake. Finally, participating ARC scientists actively engage students, residents and local community officials in the region by presenting volunteer lectures on science topics.

Project ListProject Description

A satellite map view of the Toolik Lake Field Station area in Alaska. The map shows a large body of water (Toolik Lake) at the top right, surrounded by a complex network of rivers and streams. The terrain is predominantly green and brown, indicating tundra and forested areas. Several red annotations are overlaid on the map, including a cluster of red rectangles near the center, a red line extending from the center towards the bottom left, and several red dots scattered across the landscape. A scale bar is visible in the bottom left corner.

DigitalGlobe, GeoEye

SPATIAL MYTOOLIK SYSTEM



Pl: All Discipline: All Keyword All Plot Type: All

Description of project

The Arctic LTER Project: Regional Variation in Ecosystem Processes and Landscape Linkages

This is the fourth stage of the Arctic LTER (ARC) located at the Toolik Lake Field Station, Alaska, where the ecology of tundra, streams, and lakes is studied to understand controls on ecosystem structure and function within the long-term goal of predicting the effects of environmental change. Research has been ongoing at the station since the 1970s, with the LTER project focusing on the biogeochemical components of a series of connected streams and lakes that collectively flow into and affect Toolik Lake, as well as the adjacent headwaters region of the Kuparuk River. Extensive variability exists among the various terrestrial and aquatic ecosystems in the study area, but all are linked via water and materials transport. The goal for this next phase of ARC is to understand changes in the Arctic system at catchment and landscape scales through enhanced knowledge of these linkages and interactions. Research will identify and quantify intra- and inter-system linkages, determine controls of the linkages and how they will be affected by a changing environment, and predict how the entire landscape will respond to environmental change. A suite of biogeochemical studies will target the interactions among the component terrestrial, stream, lake ecosystems within this landscape. Short-term studies will focus on specific materials to better understand inputs, climate drivers and transformations of materials. Long-term studies will investigate effects of changes in species composition, temperature, light and nutrients on four types of tundra and the effects of nutrient loading and climate variability. Lake studies will focus on landscape-to-lake linkages to understand controls of terrestrial patchiness on productivity patterns in lakes. Researchers will also examine in-lake processes and their relations to watershed inputs of nutrients and dissolved organic matter. Objectives are to measure pelagic and benthic production and coupling, elucidate food web structures, and determine how watershed-stream-lake linkages regulate transformations in water chemistry and patterns of productivity. Broader Impacts center around the use of ARC research results to address the important societal goal of predicting responses of Arctic ecosystems to environmental change. Data and insights will be provided to Federal and State officials regulating the development of oil and gas on the Alaskan North Slope. A collaborative undergraduate/graduate course will be held for two weeks in the summers, with undergraduate students trained in the field along with graduate students from ten universities. The MBL's Science Journalism Course facilitates journalist visits to Toolik Lake. The ARC LTER Schoolyard project involves a majority of Native Alaskan students. K-12 students conduct and observe local field experiments similar to those at Toolik Lake. Finally, participating ARC scientists actively engage students, residents and local community officials in the region by presenting volunteer lectures on science topics.

1 of 3

Research Plots Attributes

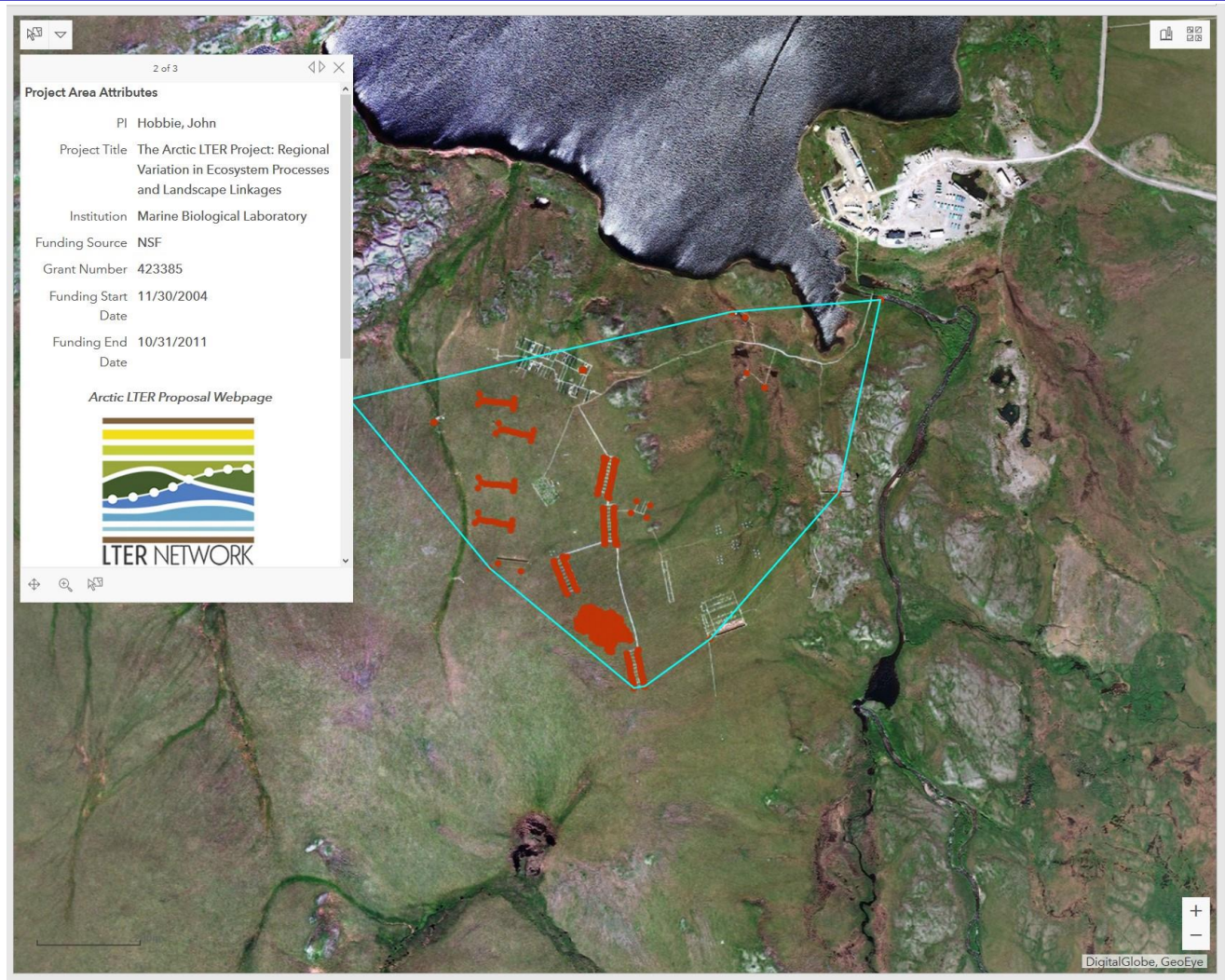
OBJECTID	244
PI	Kling, George
Data Title	Tussock Watershed stream discharge, electrical conductivity, and temperature measurements from 2005
Point Name	TW Weir
Plot Type	water
Description	
Research Site	TW Weir
Link to Data	http://dx.doi.org/10.6073/pasta/045236b13d660da362f20f690f657b92
User Group	Arctic LTER
Start Year	2005
End Year	2005
Discipline	Biology
Keyword	EARTH SCIENCE>SOLID

Project List

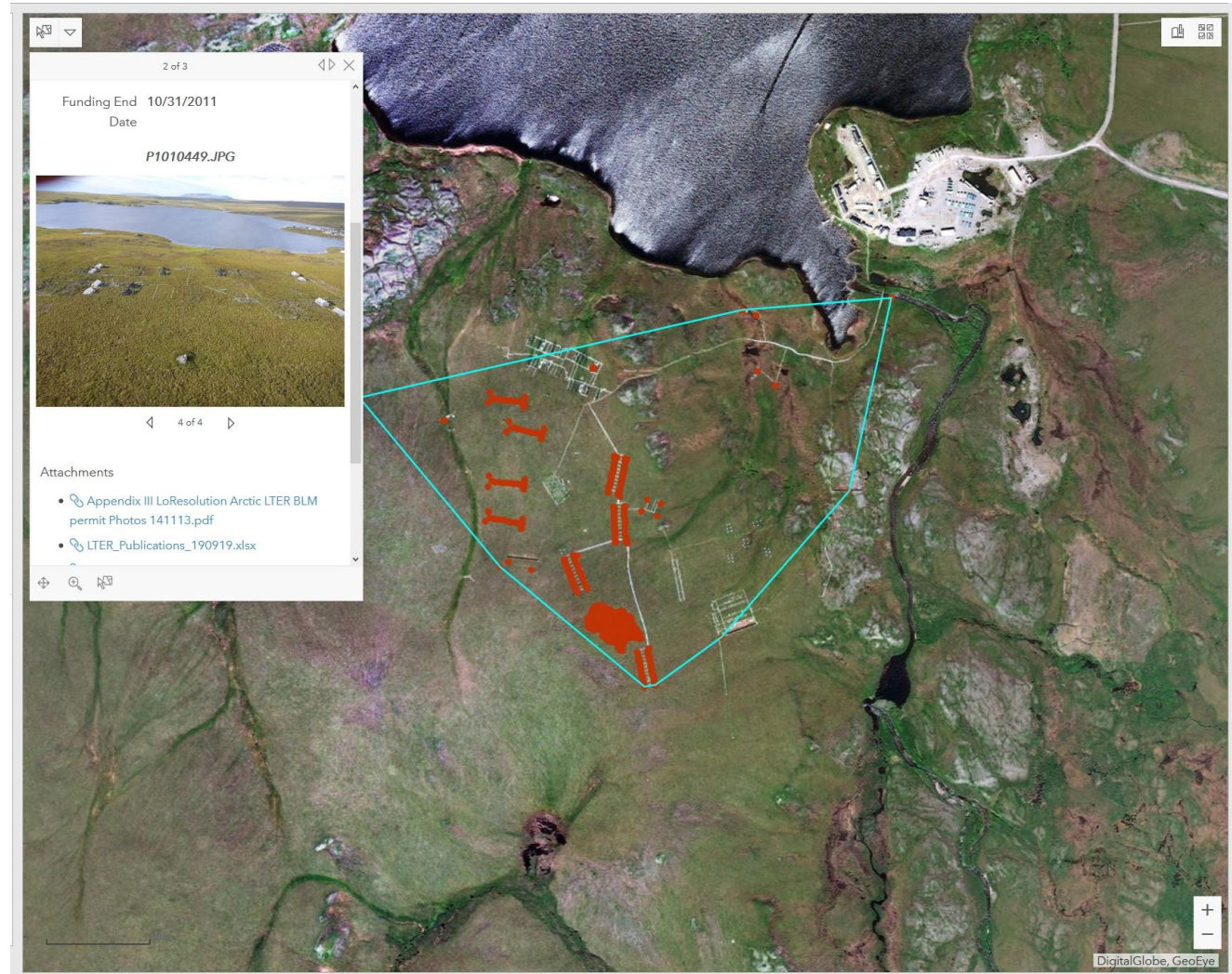
Project Description

DigitalGlobe, GeoEye

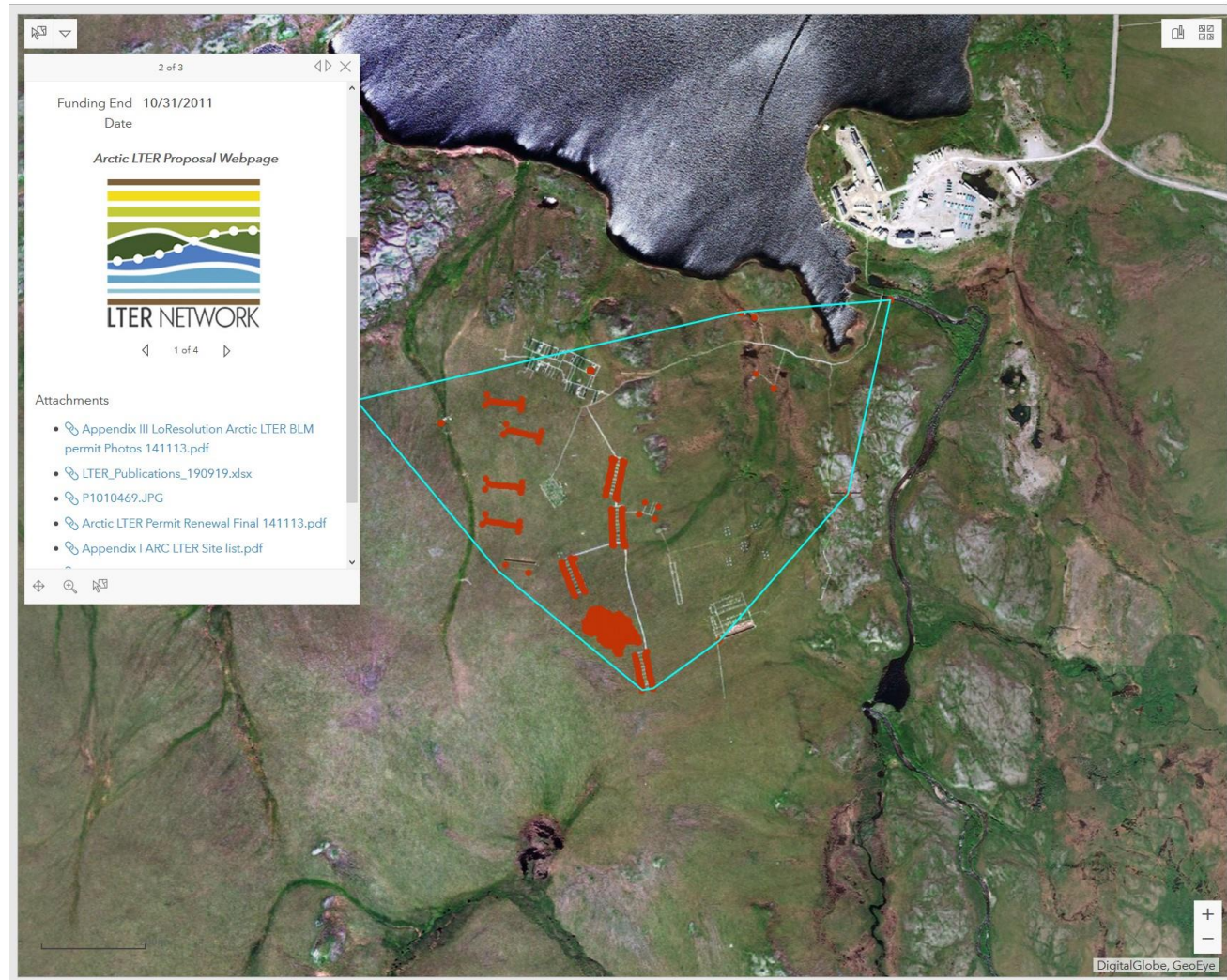
SPATIAL MYTOOLIK SYSTEM



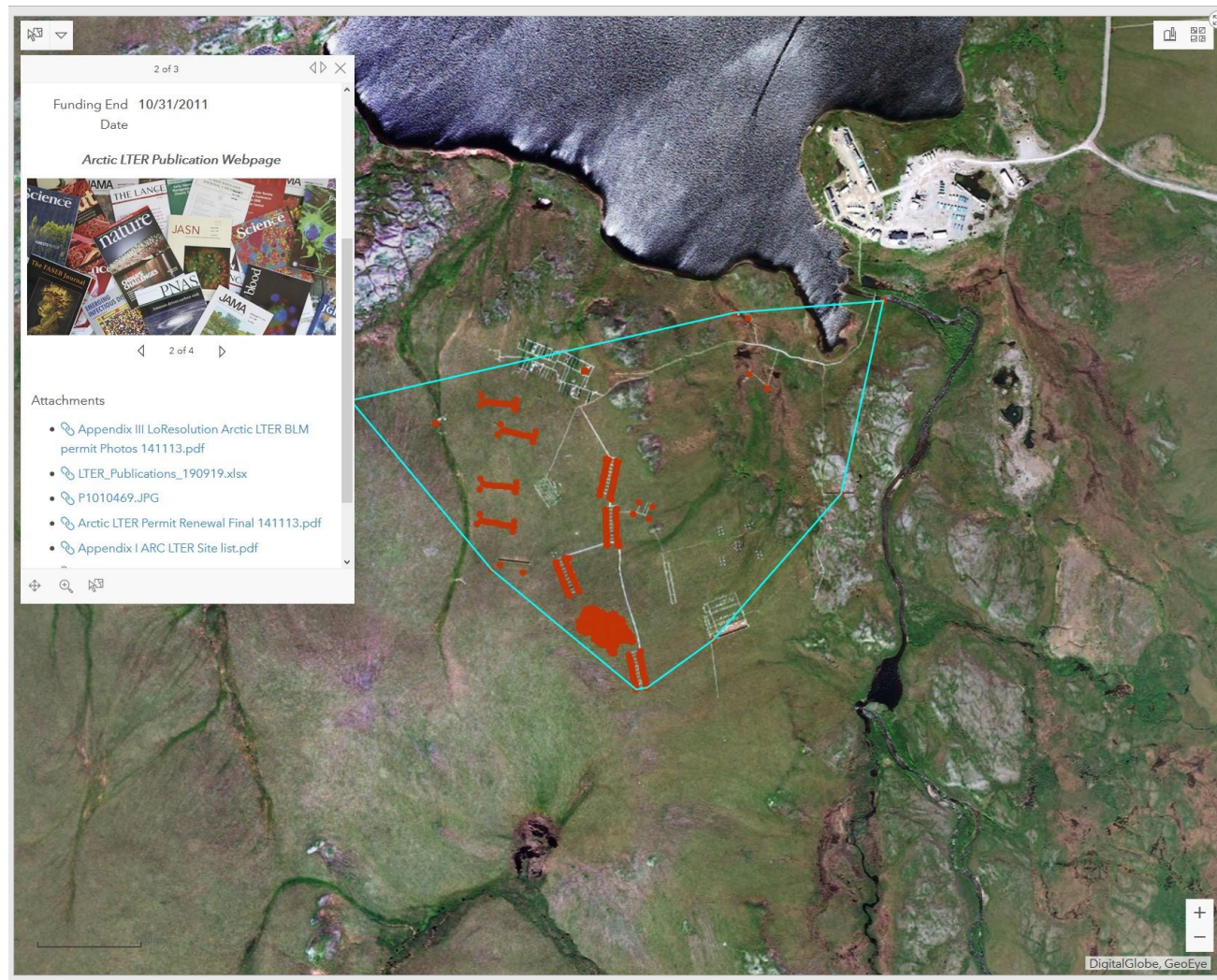
SPATIAL MYTOOLIK SYSTEM



SPATIAL MYTOOLIK SYSTEM



SPATIAL MYTOOLIK SYSTEM



ADDITIONAL ONLINE MAPPING WEB-APPLICATIONS



Bowden_Kup_Edges_Map



ADDITIONAL ONLINE MAPPING WEB-APPLICATIONS



Bowden_Kup_Edges_Map

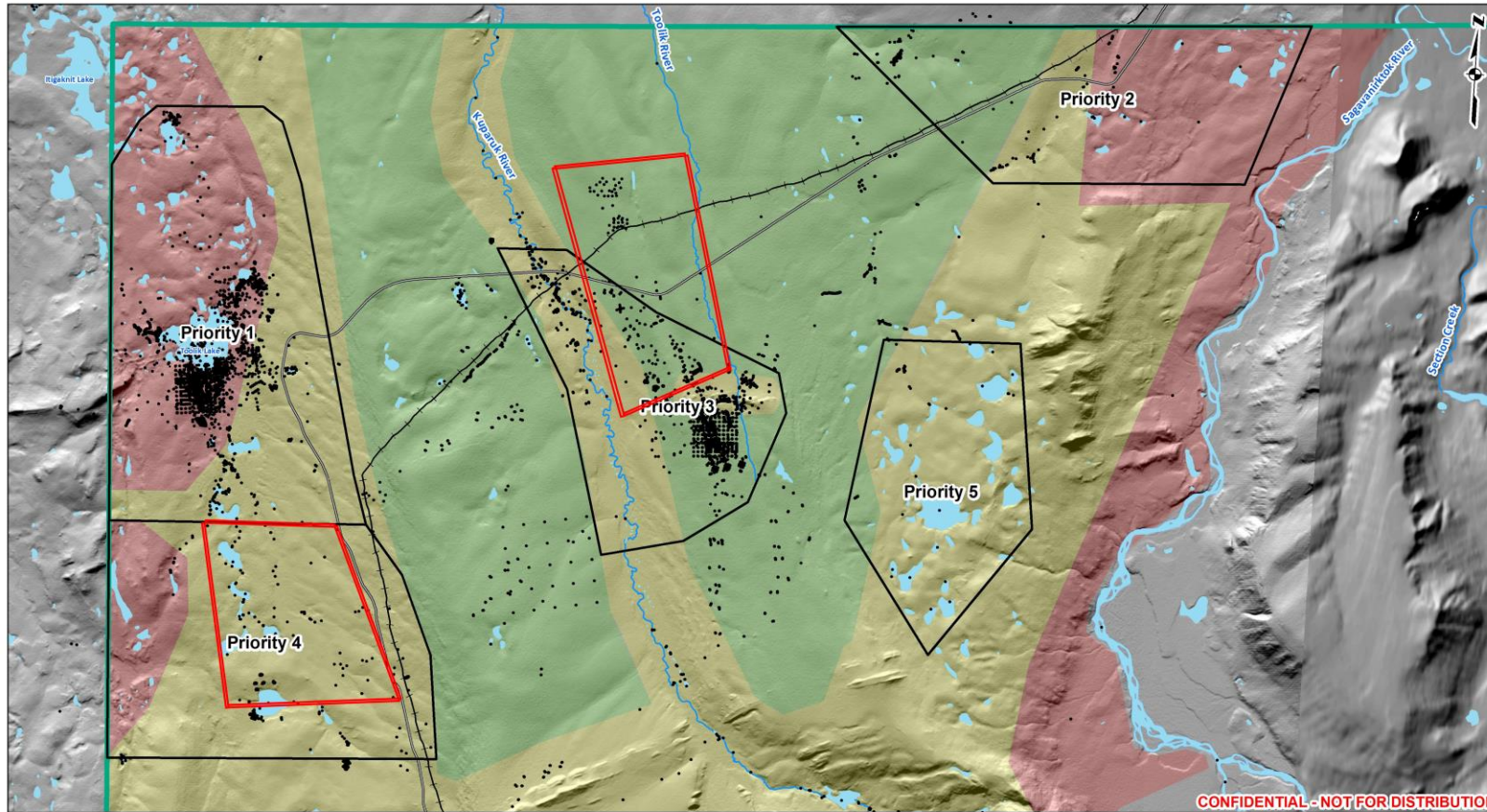


ARCTIC DATA CENTER SUBMISSION



- Standardized Metadata
- 65 Datasets Submitted
 - 4 Aerial Photo Datasets
 - Catalog of Bathymetric Lakes
- Continued Efforts
 - Toolik Dedicated Landing Page

2ND ARCHAEOLOGICAL SURVEY



Legend

- | | |
|-----------------------|---------------------|
| BLM-Managed Lands | BLM Survey Priority |
| Dalton Highway | Probability |
| Trans-Alaska Pipeline | High Probability |
| Research Plots | Medium Probability |
| Lakes | Low Probability |



The data used in this map are provided by BLM "as is" and may contain errors or omissions. The User assumes the risk associated with the use of this map and bears all responsibility for determining whether the data fit the User's intended use. Scale and accuracy may vary across the dataset.



LANDSCAPE PLANNING

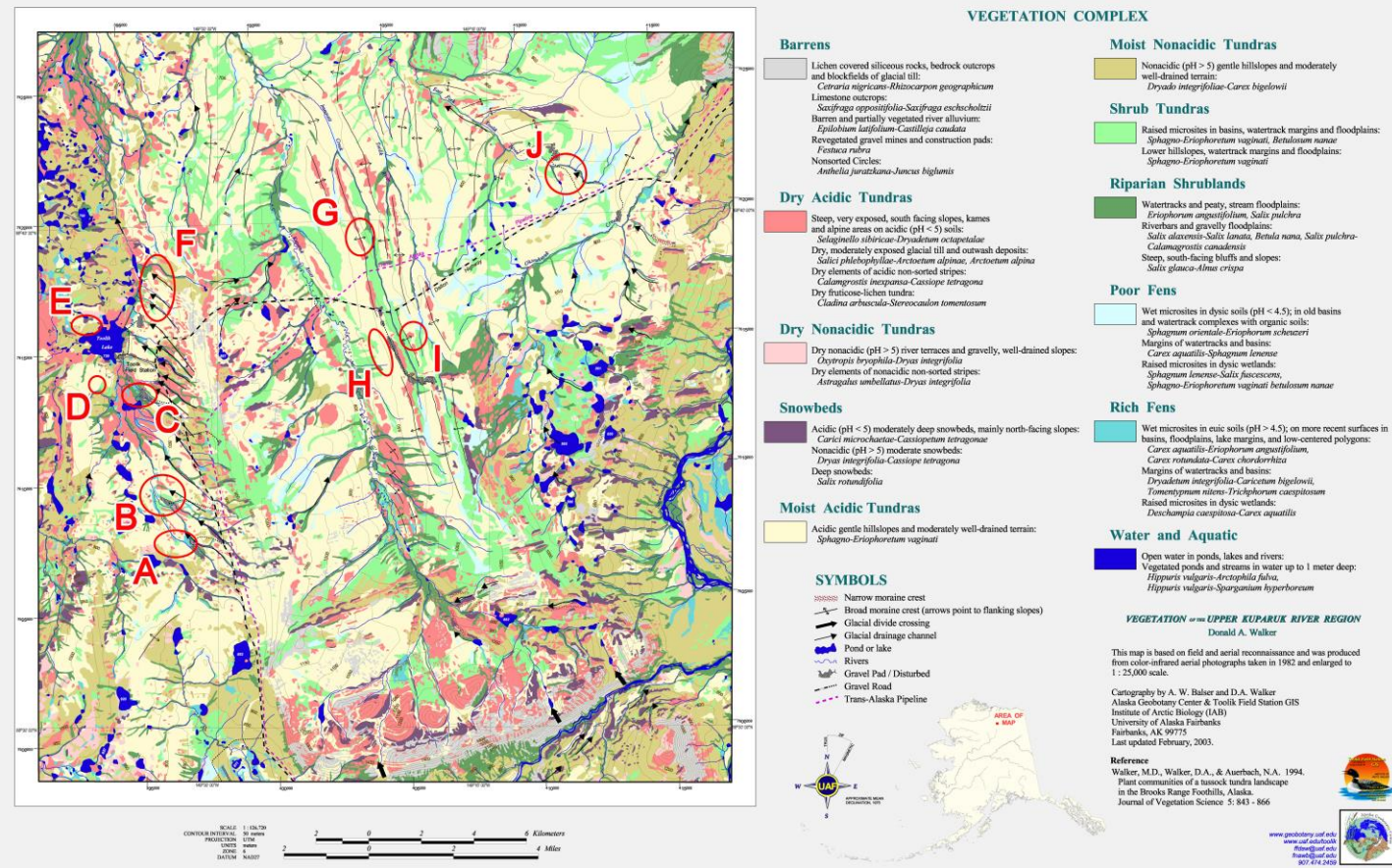


- High-Use Areas Filling Up
- Breakout Group at All Scientists Meeting – Jan. 2019
 - Identified 10 Potential New Research Areas
 - Vegetation Type
 - Glacial Geology
 - Proximity to Streams/Water Tracks
 - Proximity to TFS

LANDSCAPE PLANNING



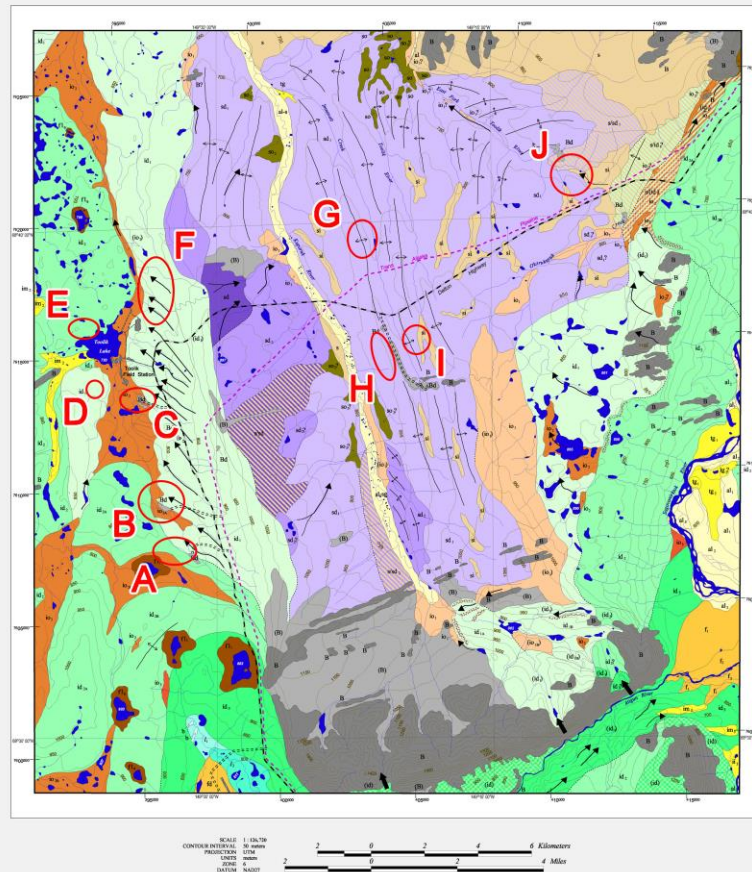
VEGETATION OF THE UPPER KUPARUK RIVER REGION



LANDSCAPE PLANNING



GLACIAL GEOLOGY OF THE UPPER KUPARUK RIVER REGION



GLACIAL DEPOSITS

Note: () represents thin and discontinuous drift overlying bedrock

Itkillik Glaciation

- M₁ Drift of latest Itkillik readvance
- M₂ Drift of Itkillik Phase II
- M_{2a} Drift of Itkillik Phase II (younger advance)
- M_{2b} Drift of Itkillik Phase II (older advance)
- M₁ Drift of Itkillik Phase I
- M_{1a} Drift of Itkillik Phase I (younger advance)
- M_{1b} Drift of Itkillik Phase I (older advance)
- M Undifferentiated Itkillik drift

Sagavanirktok River Glaciation

- M₁ Drift of Sagavanirktok River age
- M₂ Drift of younger Sagavanirktok River age
- M₃ Drift of Older Sagavanirktok River age

GLACIAL OUTWASH DEPOSITS

Note: () represents thin and discontinuous drift overlying bedrock

Itkillik Outwash Deposits

- O₁ Outwash of latest Itkillik readvance
- O₂ Outwash of Itkillik Phase II
- O_{2a} Outwash of Itkillik Phase II (younger advance)
- O_{2b} Outwash of Itkillik Phase II (older advance)
- O₁ Outwash of Itkillik Phase I
- O_{1a} Outwash of Itkillik Phase I (younger advance)

Sagavanirktok River Outwash Deposits

- O₁ Outwash of Sagavanirktok River age
- O₂ Outwash of younger Sagavanirktok River age

Ice Stagnation Deposits

- S₁ Subglacial meltwater deposits of latest Itkillik readvance
- S₂ Subglacial meltwater deposits of Itkillik Phase II
- S₃ Inwash deposits of latest Itkillik readvance

Colored diagonal stripes designate the two elements of each compound unit.

SYMBOLS

- Narrow moraine crest
- Broad moraine crest (arrows point to flanking slopes)
- Glacial divide crossing
- Glacial drainage channel
- Contact between units (dashed where inferred)
- P Pond or lake
- R Rivers
- G Gravel Pad
- GR Gravel Road
- Trans-Alaska Pipeline



RIVER DEPOSITS

- A Undifferentiated alluvium
- A₁ Modern alluvium
- A₂ Low floodplain deposits
- A₃ Higher floodplain deposits
- A₄ Silty alluvium overlying channel deposits ranging from gravel to sandy gravel
- A₅ Silty alluvium overlying channel deposits ranging from silt with sparse sand to fine gravel
- T₁ Undifferentiated alluvial terrace deposits
- T₂ Low alluvial terrace deposits
- T₃ Higher alluvial terrace deposits

FAN DEPOSITS

- F₁ Modern fan deposits
- F₂ Older fan deposits
- F₃ Oldest fan deposits
- F₄ Fan-delta deposits

LACUSTRINE DEPOSITS

- L₁ Lacustrine deposits (younger)
- L₂ Lacustrine deposits (older)
- B Beach deposits

COLLUVIAL DEPOSITS

- C Solifluction deposits *
- C₁ Ice-rich silt deposits
- C₂ Talus rubble
- C₃ Active tundra earthflow
- C₄ Inactive (vegetated) tundra earthflow

* "C₄" Represents areas where generally thin solifluction sheets overlie glacial deposits of various ages.

BEDROCK

- B Bedrock
- BS Near-surface bedrock
- BE Bedrock exposed by human disturbance

GLACIAL GEOLOGY OF THE UPPER KUPARUK RIVER REGION

Thomas D. Hamilton

This map is based on a previous map of the region at 1 : 250,000 scale (Hamilton, 1978) and field reconnaissance in 1996. It was mapped from color-infrared aerial photographs taken in 1982 and enlarged to 1 : 25,000 scale. Some parts are subject to revision. Areas that are most uncertain are tagged with a "?".

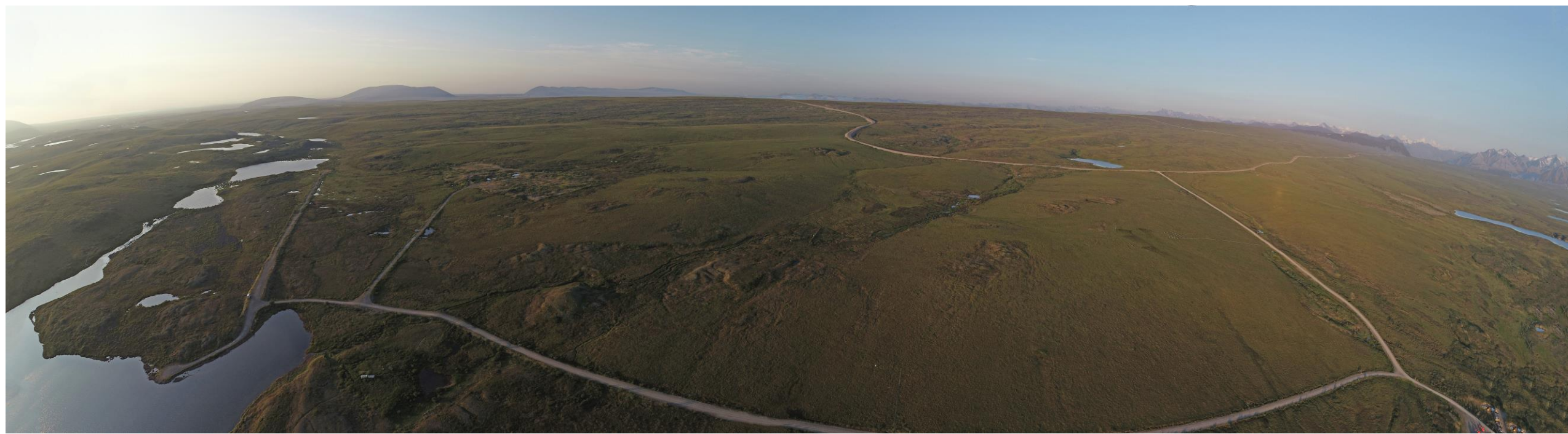
Cartography by A. W. Bahner, D.A. Walker, and J.A. Anderson
The Alaska Geobotany Center (AGC), Institute of Arctic Biology (IAB),
University of Alaska Fairbanks, Fairbanks, AK 99775
Last updated September, 2001.

References

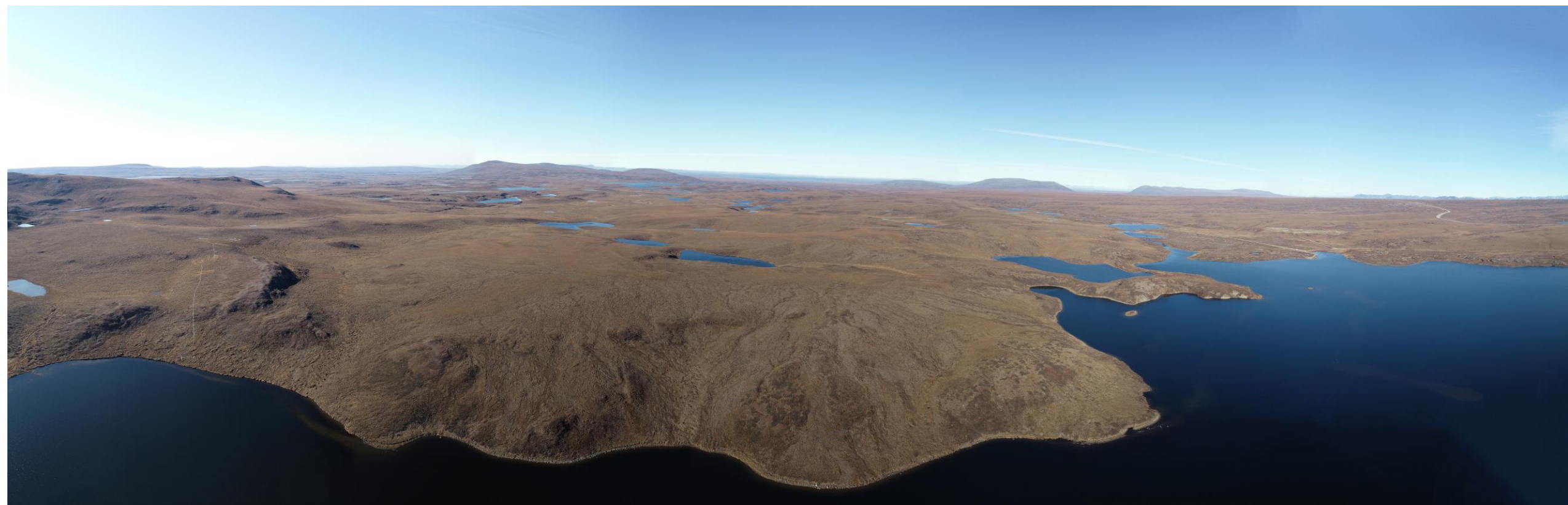
- Hamilton, T.D., 1978, Surficial geologic map of the Philip Smith Mountains quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-879-A, scale 1 : 250,000.



LANDSCAPE PLANNING



LANDSCAPE PLANNING



TOOLIK GIS



QUESTIONS?