

Revisiting the evolution of science support at TFS

Amanda Young & Randy Fulweber



Evolution of science support at TFS:

Presentation at the 2012 TFS Steering Committee Meeting

John Hobbie

- 1975-1987
 - travel logistics, room and board, science permits and supplies from UAF, and transportation of samples.
- 1988-2004
 - Continuation + lab spaces, basic lab instrumentation, Toolik trucks on occasion, Year-round fiber, **TFS staff help with construction, fixing equipment and limited sampling.**



Maintenance, Equipment, and Fabrication Science Support

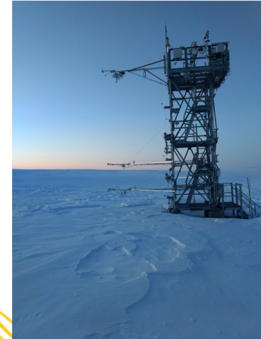


- Fabrication - designing, milling and building equipment
- Repair of equipment
- Snowmachine and small motor training and maintenance
- Field support for autonomous equipment, especially in winter.
- Generators!

Collin Fossum, digging out CO2 traps winter 2020



Faye Ethridge giving a snowmachine tutorial



Scott Houghton and Shelby Bakken engage in science support



Identifying Direct Science Support



- Research Management was identified as a priority during a workshop in 1995 which lead to the report *Toolik Field Station: The Second 20 Years*
 - More specifically 'research management' was to ensure that incompatible projects did not occur on the same spot of land or in the same lake.
 - A GIS technician was recommended.
 - In **2004** the first GIS & Remote Sensing technician- Andrew Balser



Andrew Balser (TFS) and Beth Bartel (UNAVCO) test GPS equipment, TFS, April 2005

TOOLIK FIELD STATION
The Second 20 Years

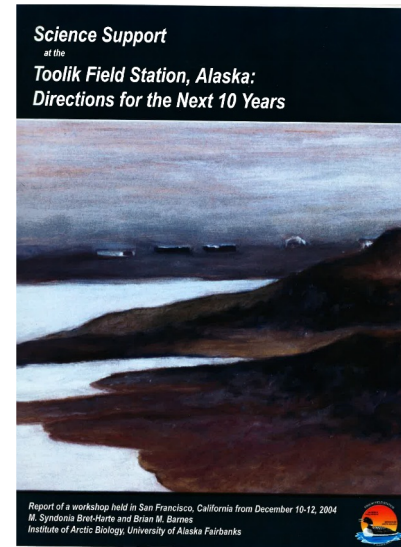


Recommendations on the Science Mission
and the Development of Toolik Field Station

Identifying Direct Science Support



- In 2004, the workshop '*Science Support at the Toolik Field Station, Alaska: Directions for the Next 10 Years*' occurred and it was the genesis of the EDC.
- Recommendations from the workshop were (in priority)
 - Collection of key baseline environmental data to provide a context for research
 - Purchase, maintenance, scheduling of common-use scientific equipment
 - Limited field assistance
- The Environmental Data Center (EDC) was established in 2005 to take on these tasks.
 - Christie Hauptert was the first EDC technician who started in 2005.



Evolution of science support at TFS



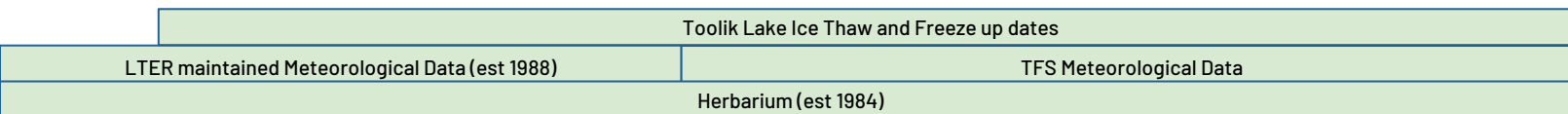
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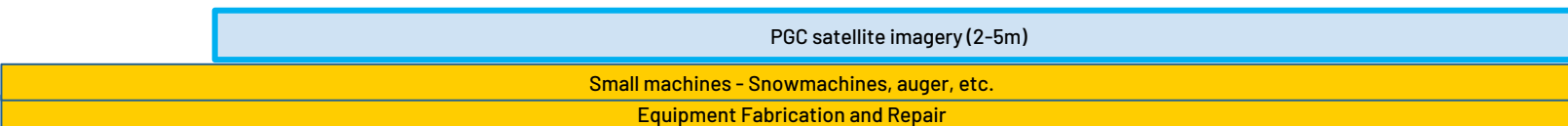
Support & Datasets



EDC



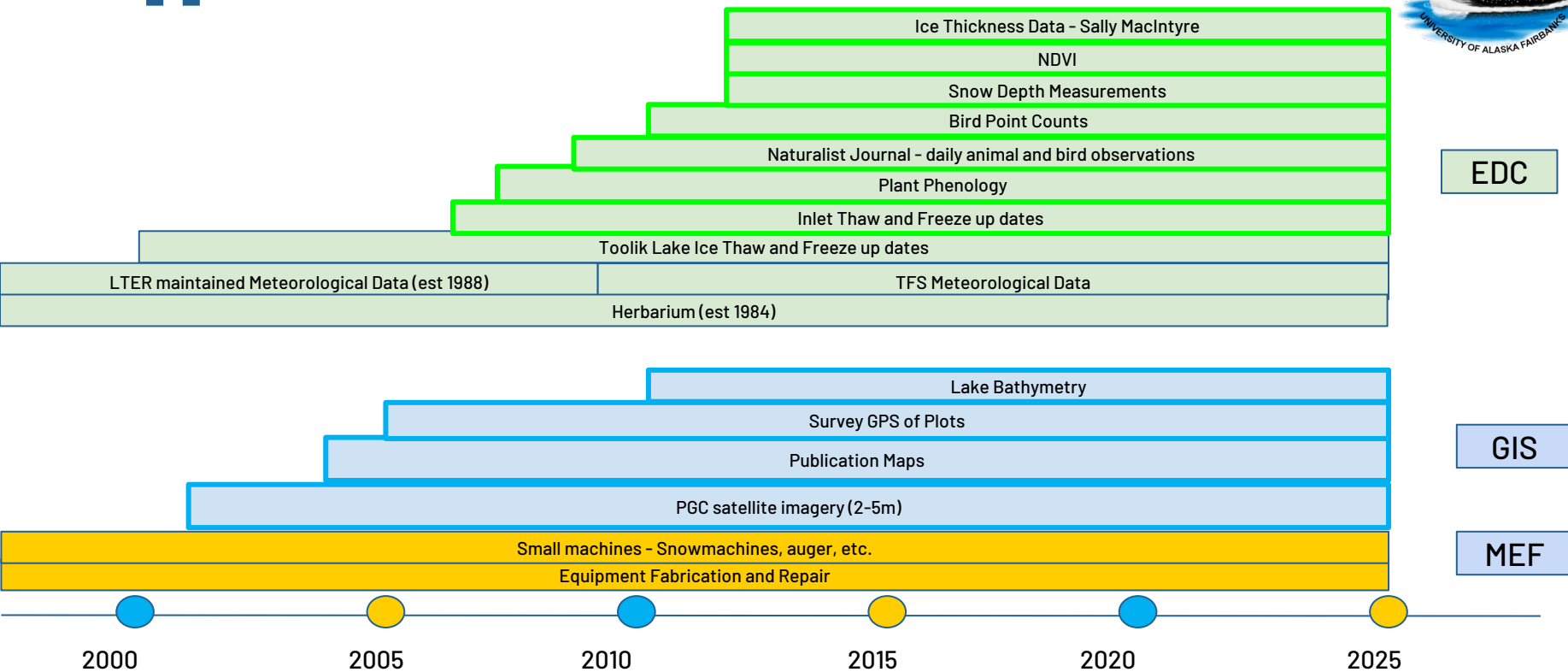
GIS



MEF

2000 2005 2010 2015 2020 2025

Support & Datasets



Naturalist Journal

- Established in 2009, to digitally document the weather and daily sightings at TFS.
- Naturalist Journal is our highest visited page on the website.



TFS Naturalist Journal

TFS / EDC / Naturalist Journal / TFS Naturalist Journal

Date of Journal

2024-05-15

<< first

< previous

next >

last >>

Wednesday, 15 May 2024 at 7:51 pm.

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General Comments

A stiff wind picked up overnight and continued through the day, blowing more ducks and shorebirds up from the south. I went down toward the mountains this morning thinking maybe I'd find a new songbird singing in the willows but all the stages were quiet as the performers hunkered down in what little shelter was available. At the Pump 4 pond I found a pair of Lesser Yellowlegs crouched in the shoregrass, leaning into the wind with beaks pointed like compass needles to the south.

North of camp the wind was a little weaker and the wildlife more abundant. A pair of Redhead, uncommon visitors from the Scaup family of ducks, joined some Greater Scaup, Northern Pintails, and other ducks and geese near Pump Station 3. The Muskox were feeding lazily on short shrubs along the Sag, the recently born calf still not straying far from mother. A fiesty little Merlin, the chihuahua of the raptors, perched on a piece of scientific equipment near Ice Cut, and a Common Raven defending its nearby nest site harassed a much larger Golden Eagle who flew heavily off to unburden itself of the corvid.

A few shorebird species were picking through roadside ditch muck: American Golden Plovers, Long-billed Dowitchers, Baird's and Pectoral Sandpipers, and Red-necked Phalaropes. A flock of seven Whimbrel, having arrived from picking along the beaches of Central and South America, flew in over the Brooks Range, somehow looking just as home here as in their tropical wintering grounds.

Lapland Longspurs blew over the landscape in flocks of a few dozen between camp and Okrukuyik Creek, picking at windblown seeds on the surface of the snow. -Seth



Caribou

Photo credit: ©Seth Beaudreault

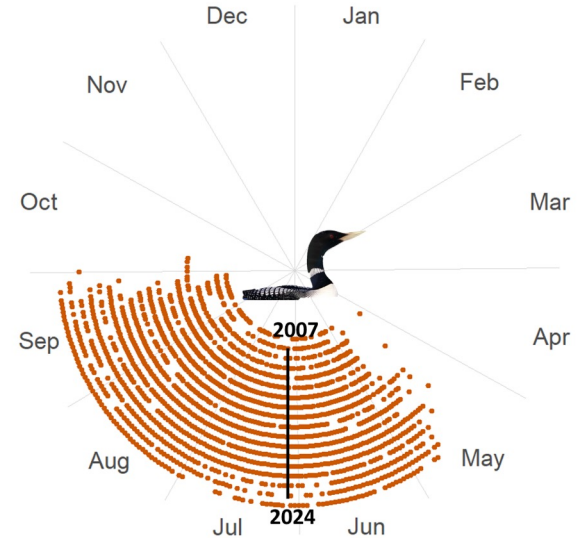
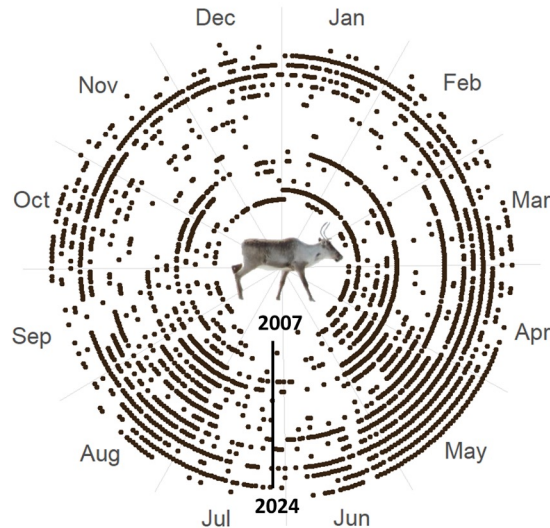
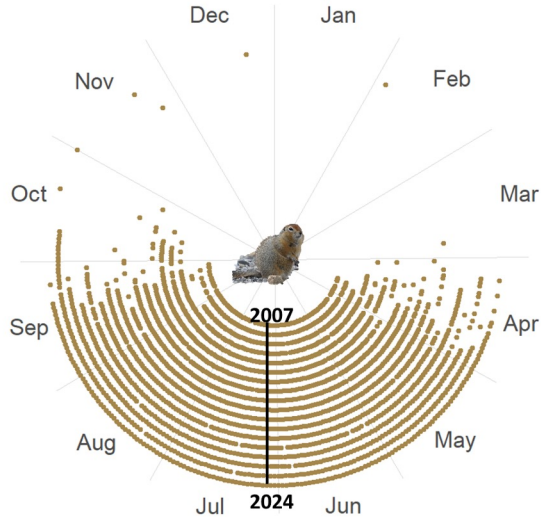
Daily Metrics for 15 May 2024



Biological Monitoring - Naturalist Journal



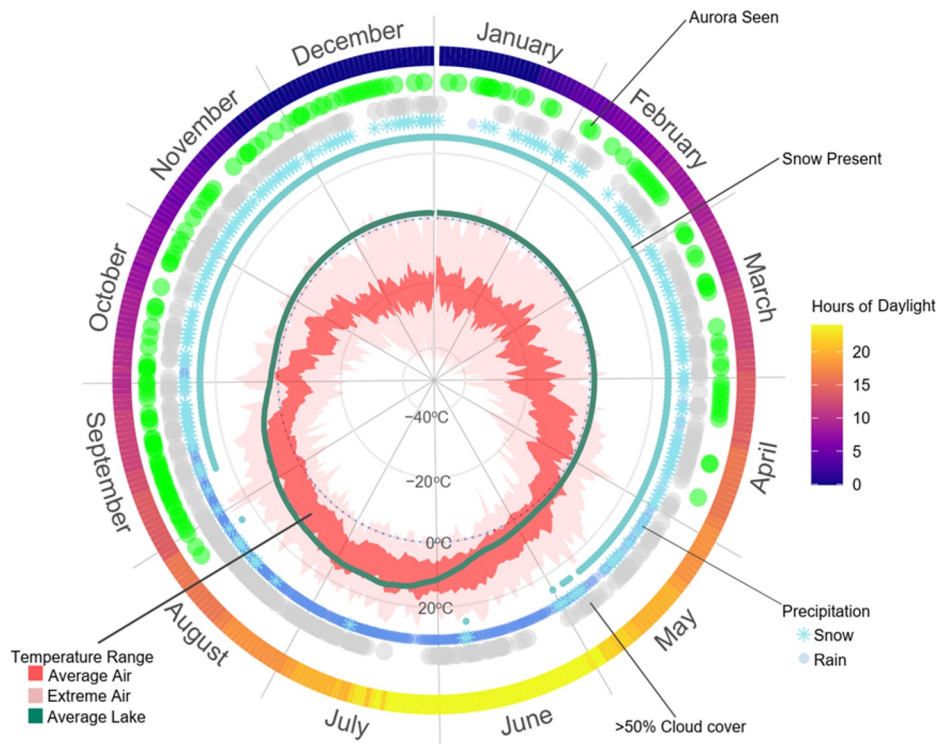
- Daily observations from the Naturalist Journal showing observed presence on the landscape.
 - Each ring is a year and each dot is a daily observation.



[Interactive Animals & Birds Tool](#)



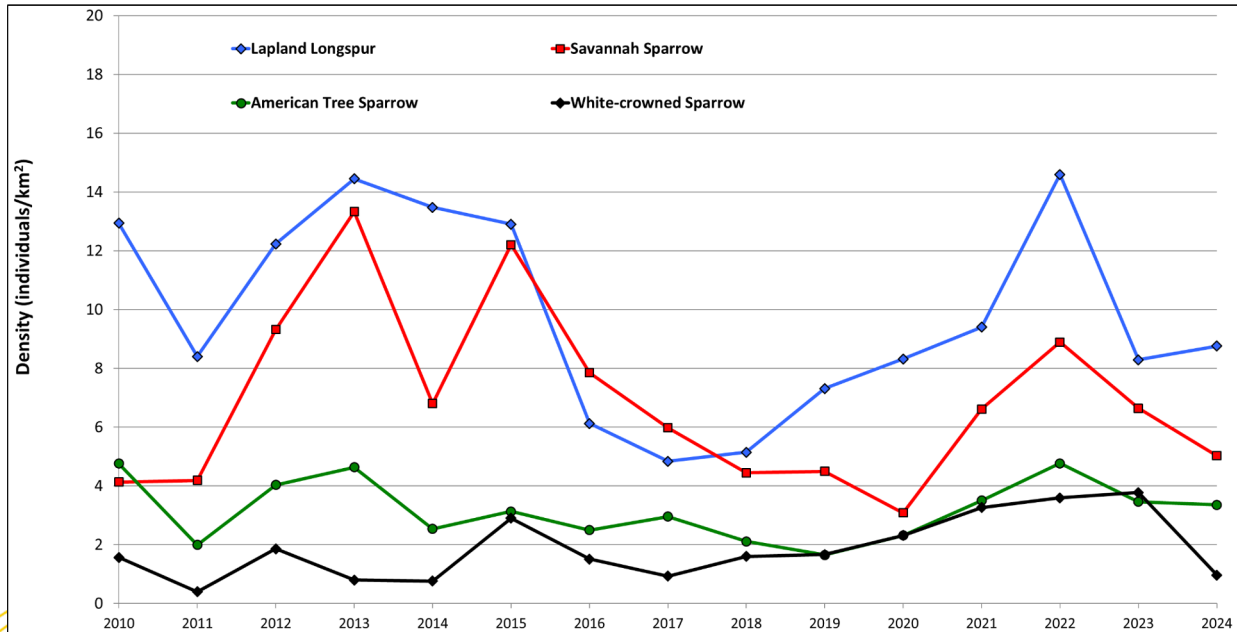
Abiotic Monitoring - Naturalist Journal



Biological Monitoring - Avian



- Avian point counts



Biological Monitoring - Phenology & NDVI



Phenophase

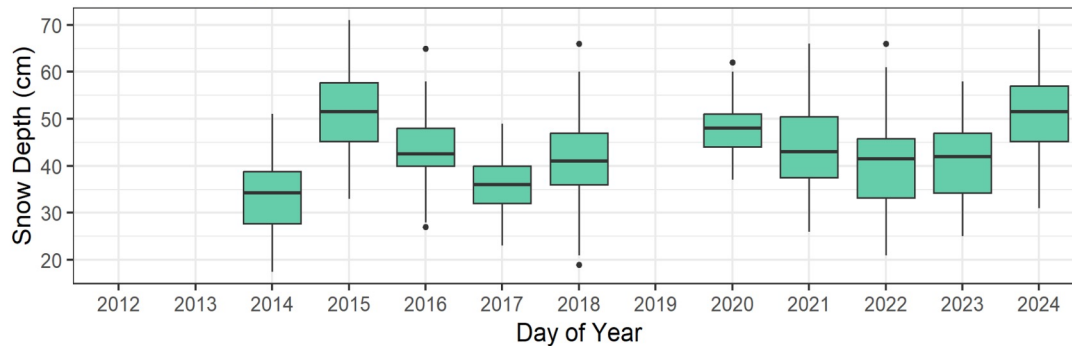
- First Leaf
- First Flower Open
- Snow Free



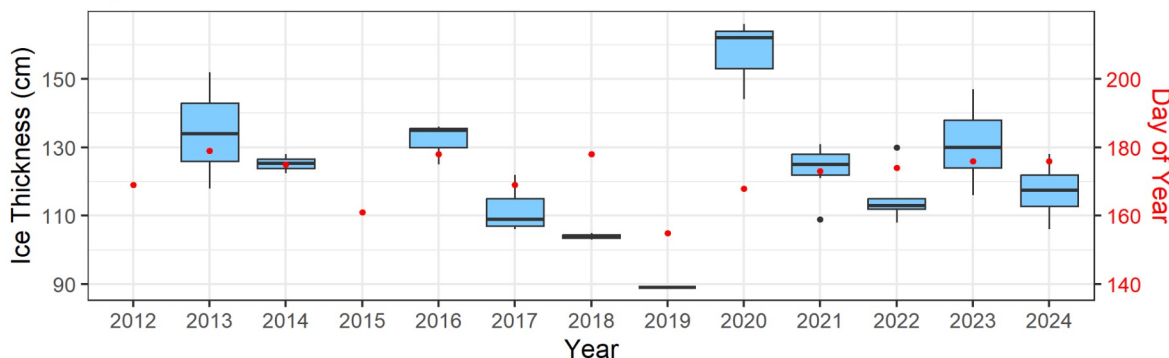
Abiotic Monitoring - Snow & Ice



April Snow Depth



April Ice Thickness



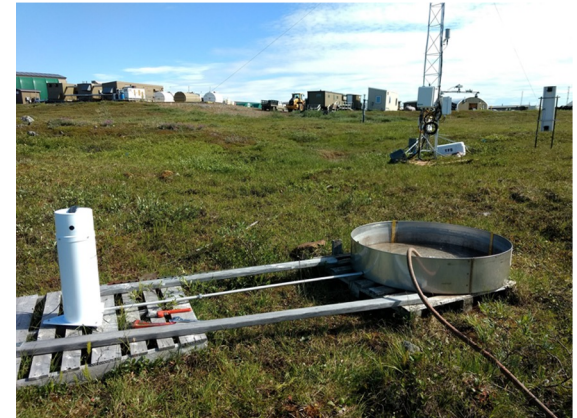
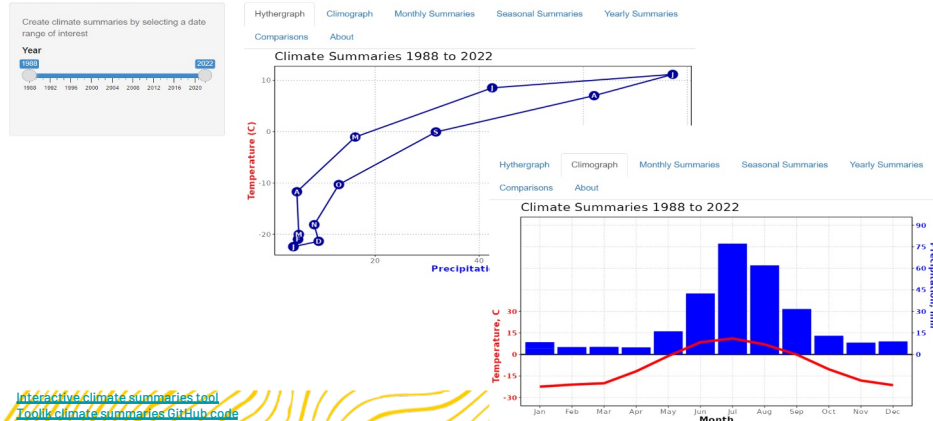
Red dots are dates of ice off
(secondary y-axis)

Abiotic Monitoring - Met Station

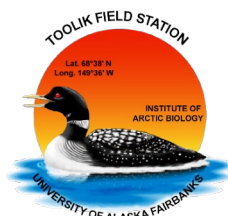


- TFS Meteorological Data
 - 1988-present
 - Data accessible online updated quarterly
 - Maintenance, calibration, repair and addition of new sensors ongoing.


Climate Summaries



Arctic Data Center Portal




Hosted by the Arctic Data Center

 **Toolik Field Station**

The Toolik Field Station (TFS) has been a major site for research in the North American Arctic since 1975. Much of what is known about structure and function of arctic terrestrial and aquatic ecosystems, effects of climate change, and feedbacks to global climate has emerged from long term, process-based ecological research at TFS. This portal provides access to datasets collected as part of the Toolik Field Station program.

About People Publications Data Metrics

About the Toolik Field Station




Overview
Funding
Connect

For more information about Toolik Field Station, please see our main [website](#).

Overview

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EDC baseline datasets and GIS bathymetry and historical aerial photos included!

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About People Publications **Data** Metrics

Search

Search these datasets

Search

Key Words
Key Words

Author Names
Author Names

Year
1950 to 2024

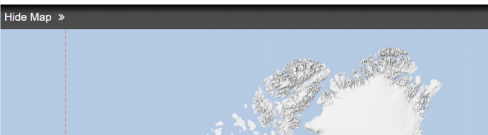
DATASETS 1 TO 25 OF 532

1 2 3 ... 22 Next

Sort by Most recent

Rachel Harris, Sarah Evans, Scott Marshall, Sarah Godsey, Brandon Yokeley, Clara Chew, Emma Fern, Key Hatch, & Noah Caldwell. (2024). [InSitu and Ground Penetrating Radar \(GPR\) Data on a Continuous Permafrost Hillslope in the Galbraith Lake Basin. 2022 -](#)

Hide Map



[Toolik Arctic Data Center portal](#)

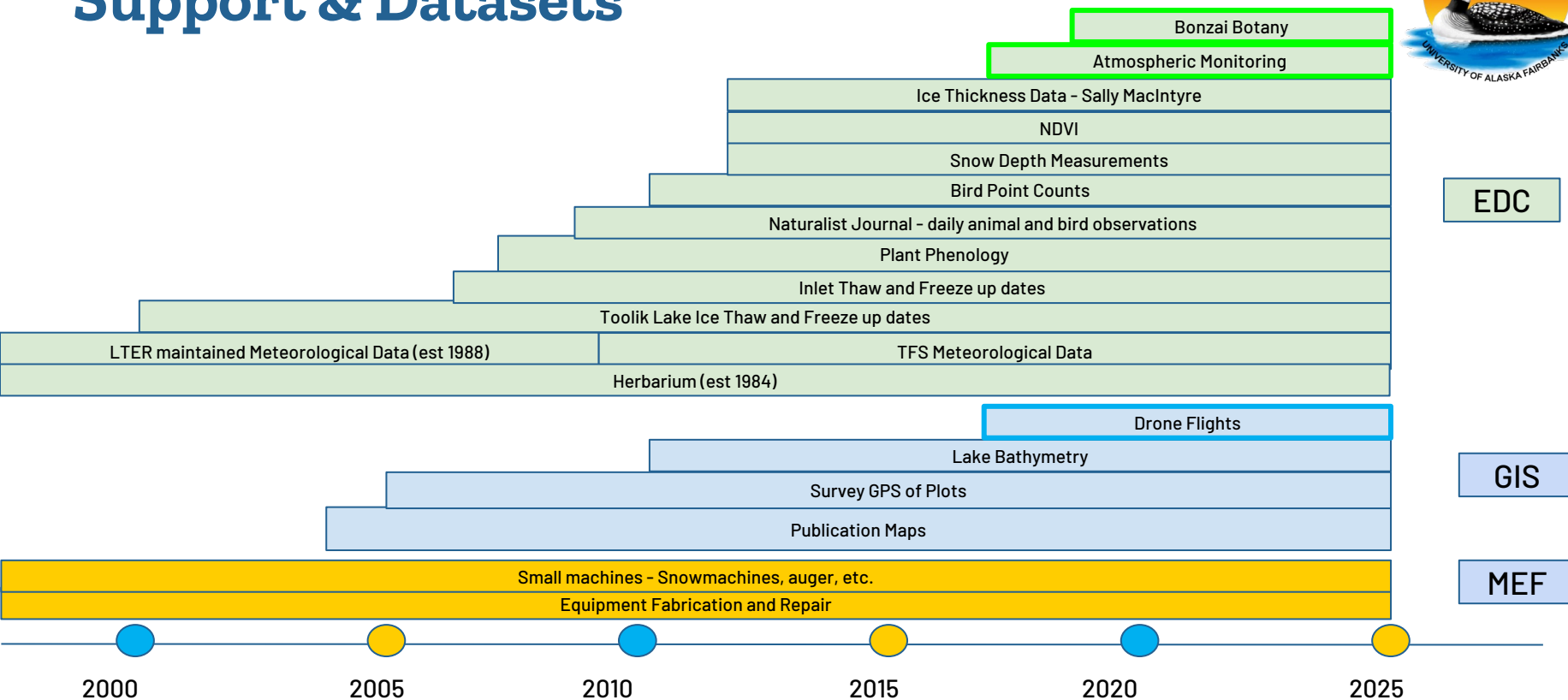
Evolution of science support at TFS



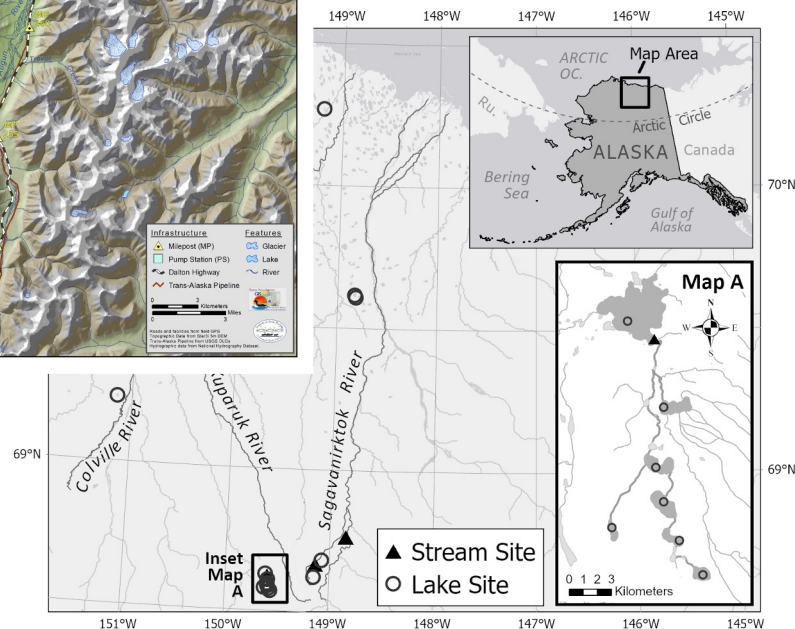
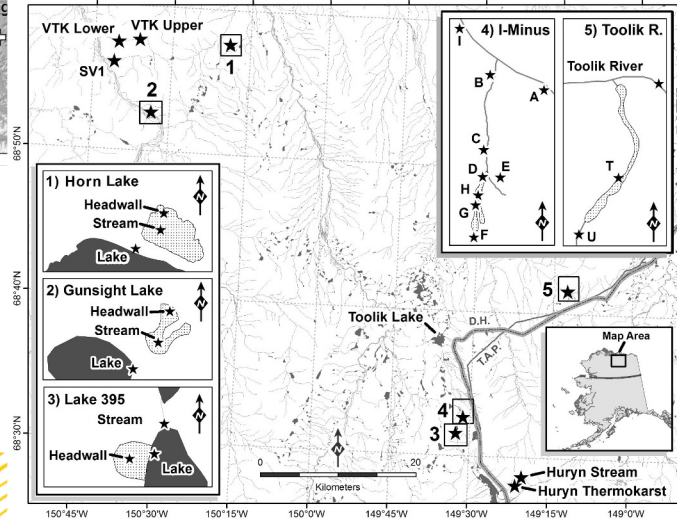
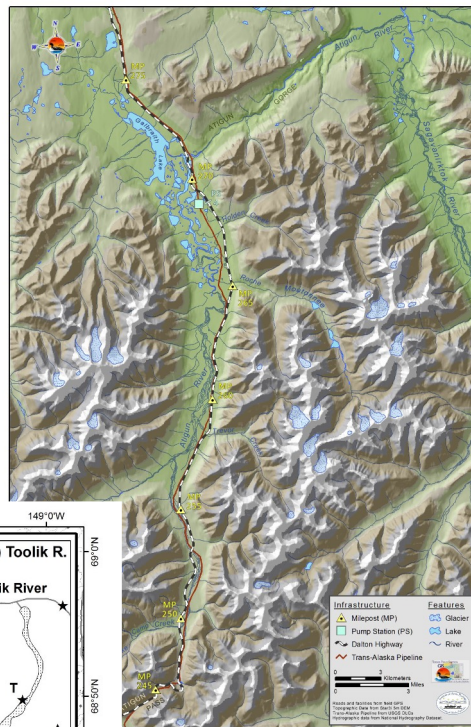
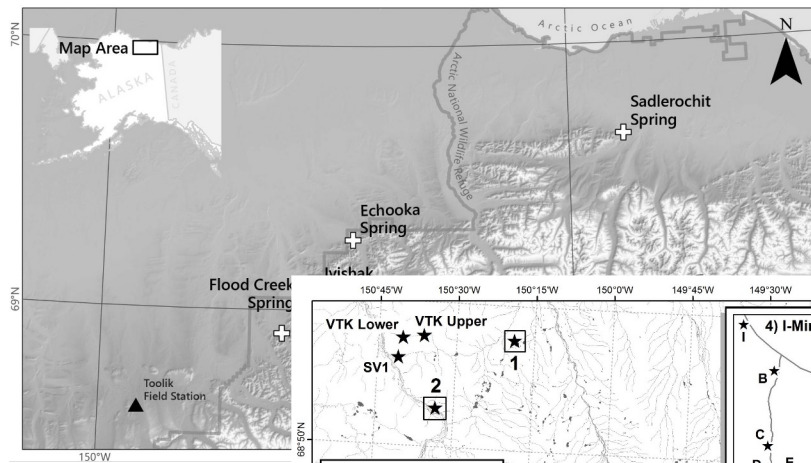
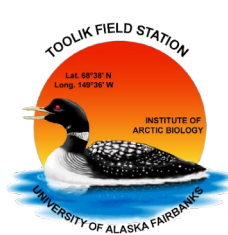
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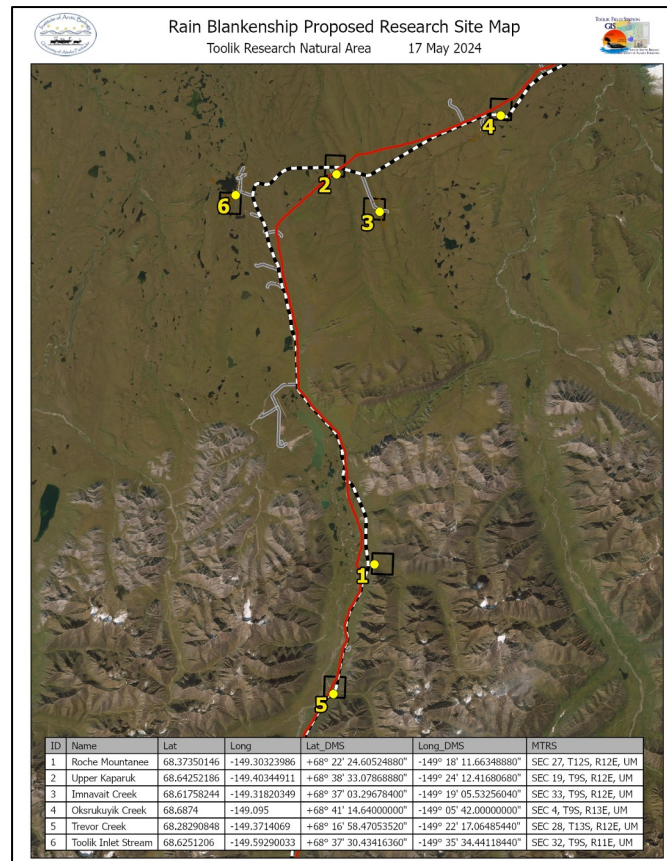
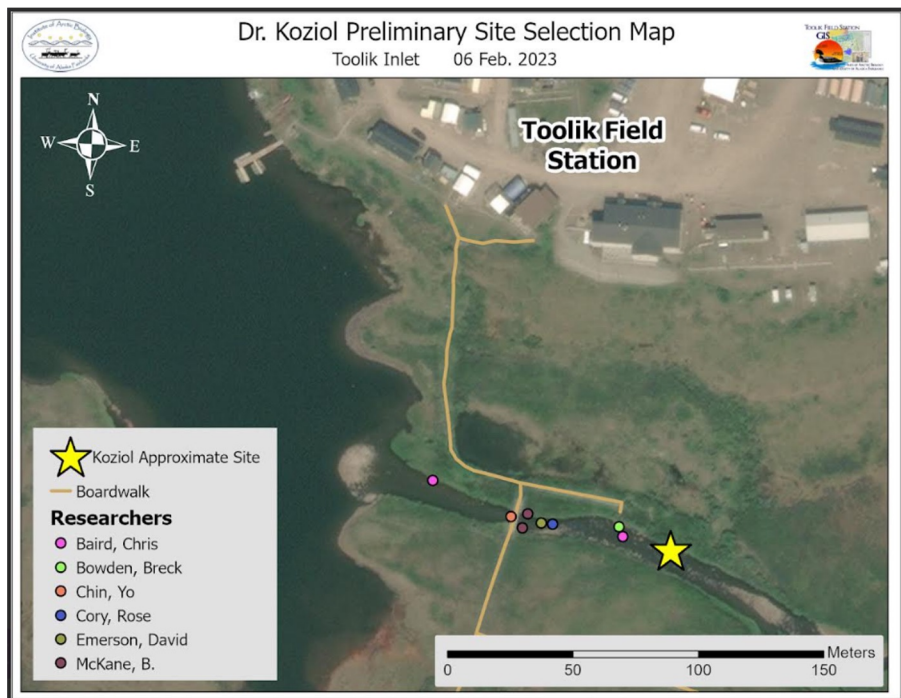
Support & Datasets



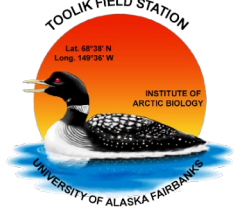
Publication Maps



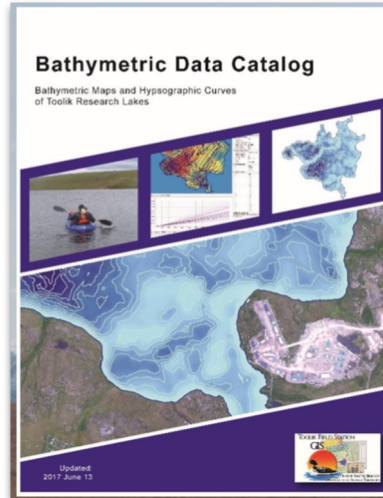
Site Selection



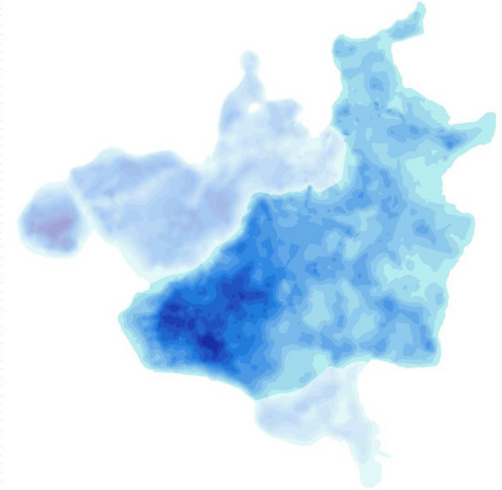
Bathymetric Data



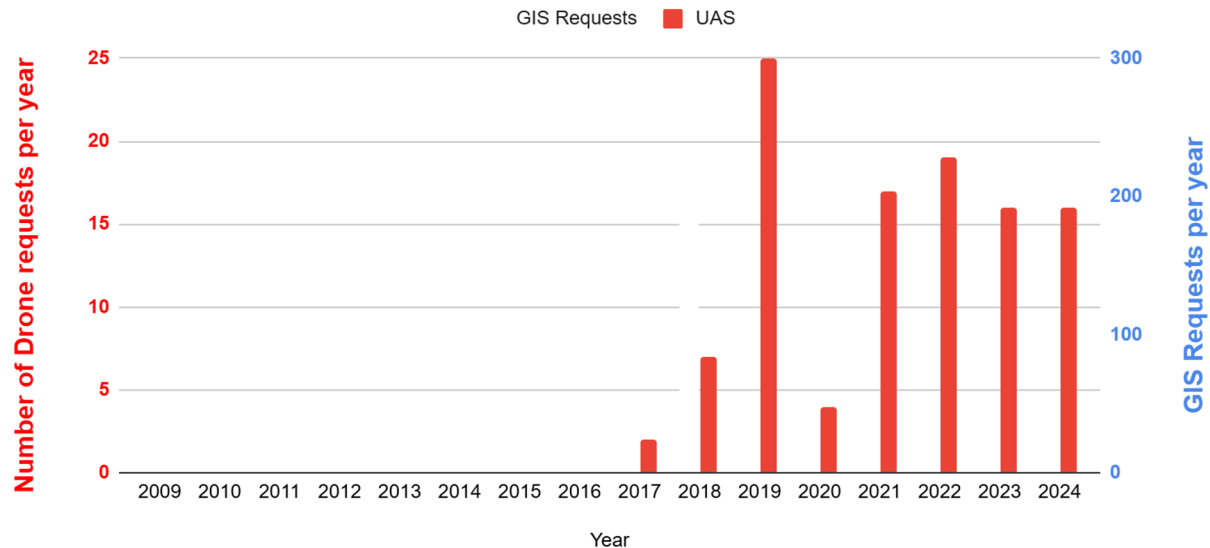
- 68 research lakes have bathymetry and hypsographic curves



Toolik Main Basin				Water Surface Area (m ²)		Perimeter (m)		Water Volume (m ³)	
Depth (m)	Area (m ²)	Perimeter (m)	Volume (m ³)	Area (m ²)	Perimeter (m)	Volume (m ³)	Area (m ²)	Perimeter (m)	Volume (m ³)
0	10	24	941395.25	355721.39	6536440.02				
1	10	24	900775.73	347225.37	6514385.22				
2	10	24	821779.6	835132.5	4810443.97				
3	10	24	743877.23	759144.77	4027493.68				
4	10	24	646396.39	657012.16	3330576.4				
5	10	24	548208.2	557077.78	2728360.25				
6	10	24	463739.87	472094.11	2230730.06				
7	10	24	384860.84	39127.26	1807954.6				
8	10	24	312380.45	338084.82	1460443.88				
9	10	24	252334.44	257533.93	117968.48				
10	10	24	202636.94	208714.02	890902.64				
11	10	24	175365.34	179404.35	763374.81				
12	10	24	150403.09	153374.75	697084.72				
13	10	24	127225.22	127883.8	463774.95				
14	10	24	108665.36	11884.69	34652.8				
15	10	24	91865.68	93057.56	248723.22				
16	10	24	71867.94	73391.16	91702.17				
17	10	24	56483.75	57883.13	10395.6				
18	10	24	38794.31	39618.32	57867.22				
19	10	24	22381.8	22390.29	28504.47				
20	10	24	10773	1841.22	12338.68				
21	10	24	5463.54	5773.98	5333.39				
22	10	24	2435.58	2481.96	1740.41				
23	10	24	544.74	554.13	137.32				
				Total =	955721.39	6536440.02			



The rise of the drones

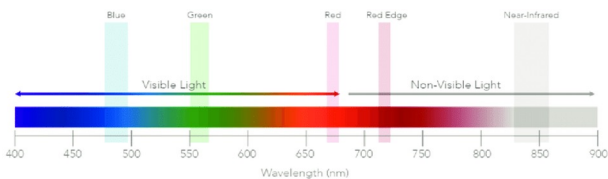


Repeat Imagery: NDVI



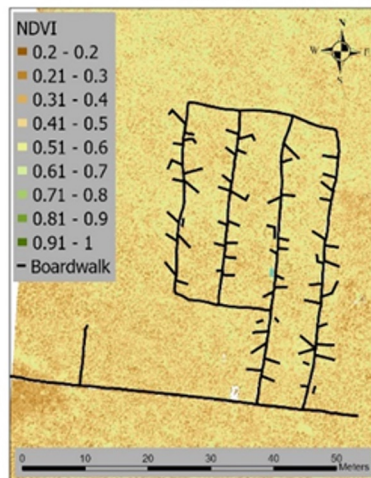
(a) RedEdge-MX Camera

- Five Spectral Bands
- SD Card Storage
- Manual Trigger Button
- Removable Mount
- DLS 2 With Embedded GPS

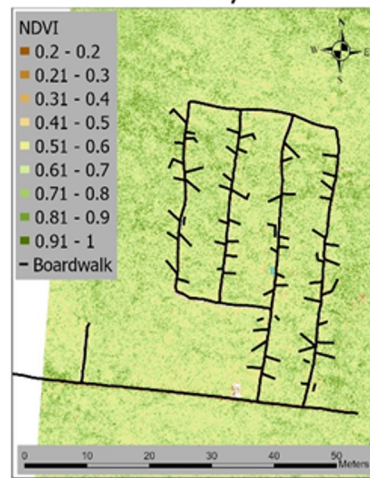


(b) Spectral resolution of the RedEdge-MX Multispectral Sensor.

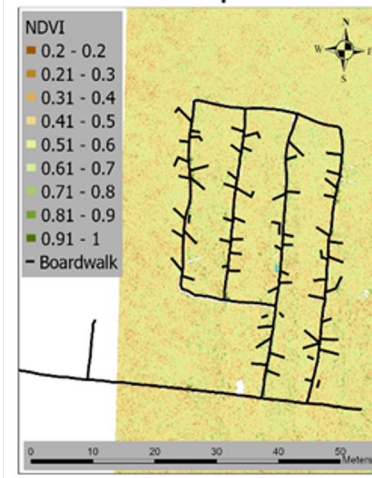
11 June



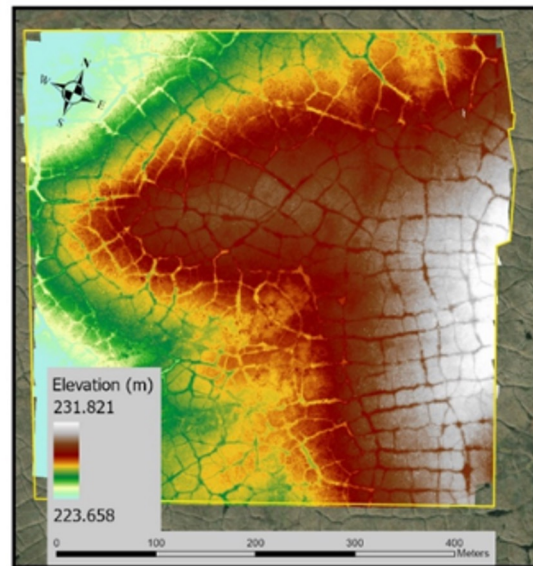
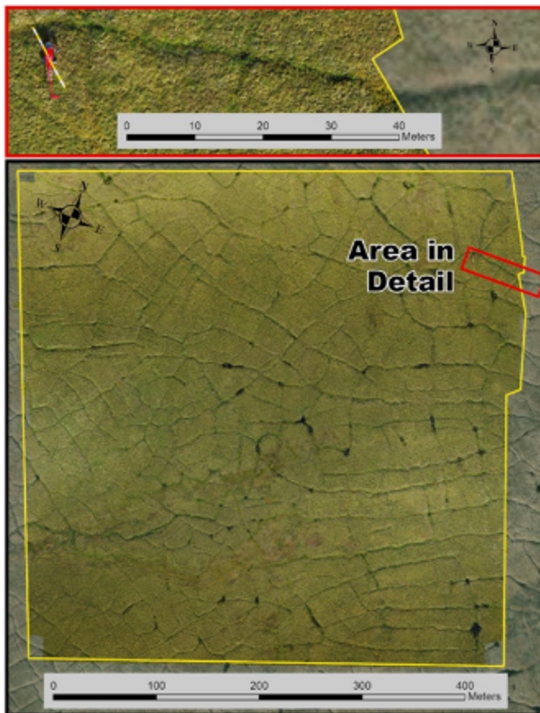
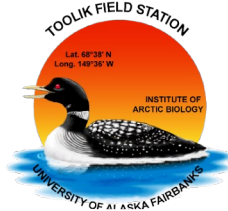
22 July



02 Sept.



Elevation Models



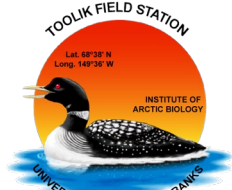
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- 2017-2020
 - Continuation + **Drone program**, increased data availability through the website and online repositories, myToolik to manage reservations and projects at Toolik
- 2020- present
 - Continuation + Increase of field support due to COVID Pandemic and the creation of **Remote Access and Support Request System** in myToolik



Many Types of Remote Access



Justin Johnson Ice Fishing, May 2020



Bodie Davis and researcher Javier Acuna fixing wind turbine, July 2020



Dani Aguirre mosquito sampling, July 2021



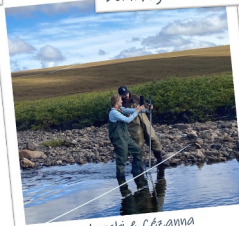
Amanda Young digging herself into a hole, 2022



Max Wasser & Dave Wesolowski setting up camera traps, May 2020



Joe Franich helping researcher Lexy Salinas install an Eddy Covariance Tower, May 2021



Dave Wesolowski & Cezanna Semnacher measuring discharge, August 2021



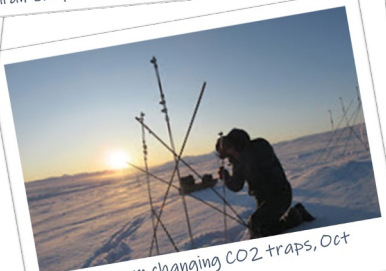
Jenny Grischuk meas 2022



er measuring discharge in a 2



Amanda Young vole trapping, June 2020



Collin Fossum changing CO2 traps, Oct 2020



Aurora Researcher Kylee Branning filming a rocket launch, April 2022

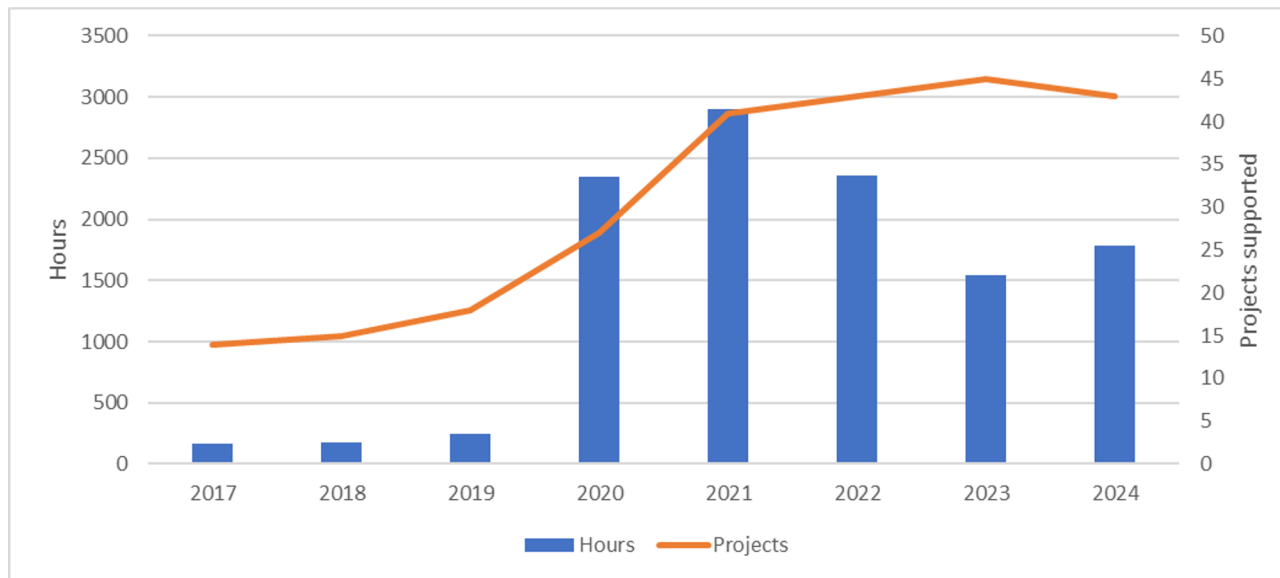


Mayra Melendez Gonzalez carrying the ice auger back from a day in the field, May 2022

Evolution of science support at TFS: Remote Access



Remote Access Hours



Thankyou SEDC staff





Evolution of science support at TFS: What does the future hold?

- **Drones**
 - Sensors
 - Platforms
- **Equipment**
- **Services**
- **Datasets**
 - Baseline monitoring
 - Imagery analysis
- **Undergraduate Training**

What are your ideas?

ayoung55@alaska.edu
rfulweber@alaska.edu



Drone-mounted GPR kit. Model shown can penetrate 12m below ground surface.