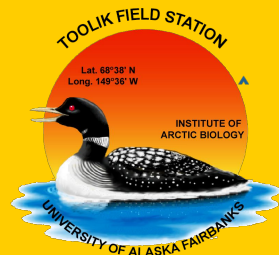


January 2023



# 2023 Environmental Data Center Report

Oct 1, 2022 – Sep 30, 2023 Report  
Amanda Young

# EDC Mission Statement



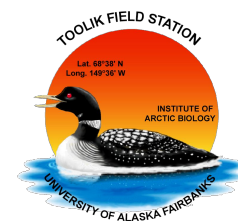
- The EDC was developed to meet the needs of the scientific community.
- Mission:
  - Collect and manage long-term baseline environmental and biological data
  - Maintain a suite of common-use lab and field equipment
  - Assist in the collection of data through fieldwork assistance & Remote Access





# Staffing

# EDC Year-round Staff



## Amanda Young – Spatial and Environmental Data Center Manager

- PhD in physical geography
- Enjoys working with plants and data

## Mayra Melendez-Gonzalez – EDC Technician

- BS in Biological Sciences
- Background in Arctic and alpine ecology with a keen skillset in instrumentation and aquatic sampling

## Abby Jackson – EDC Technician

- MS in Ecology
- Background in soils ecology of cold climates with a special inkling for nematodes

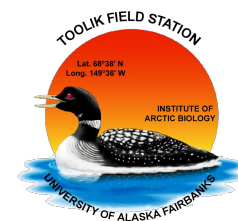
## Colin Edgar – Met Station Technician

- Background in instrumentation, renewable energy, and eddy covariance measurements





# Seasonal Staff



## Seasonal Technicians

- Cuyler Bleecker
  - Background in plant and bryophyte systematics
- Maya Chandar Kouba
  - Enthusiastic recent graduate with an interest in plants

## Naturalist

- Seth Beaudreault
  - Animal and birder extraordinaire
  - Worked at Toolik since 2014





# Data and Equipment Use

# Naturalist Journal

- Remains the top page from the TFS website to be visited.
- Consistent viewership over the past two years.

Year	Views	Unique IP's	Time viewing	Interactions
2022-2023	12,016	2067	5m 45s	33711
2021-2022	10803	1754	5m 37s	29918

## TFS Naturalist Journal

Date of Journal

2023-06-06

<< first

< previous

next >

last >>

Tuesday, 6 June 2023 at 5:30 pm.

Share this entry

### General Comments

It was eerily quiet when I went out at 3 AM this morning, with a thin cloud layer just keeping the sun from touching the landscape. At that time of day/night the sun has hit a low point in the sky and begins to rise again, which acts as a kind of 'dawn' of sorts and provokes a few hours of intense birdsong. Detecting that birdsong was the reason for being out there at such an unseemly hour, and I was able to complete 7 of our 18 camp area point count surveys before breakfast time. Most of the species detected are the common sparrows and longspurs of the area, but two Bluethroats were nice additions to the data. A few of the big, relatively slow emerging mosquitoes were encouraged by overnight temps that stayed in the 40s and hovered clumsily around my head while I recorded data, just enough to be noticeable.

After coffee I went up north to check for Arctic Warblers at Ice Cut and found none, so spent some time photographing and recording Eastern Yellow Wagtails and a Bluethroat along the Sag River. A few Bank Swallows were seen for the first time this season, flying low over roadside ditches and snapping up the emerging insects. A pair of Spotted Sandpipers proclaimed their territorial boundaries along a stretch of the river, and a Northern Harrier flew by with a small rodent in its talons.

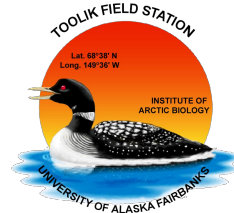
The male Bluethroat was furtive and skulking, per usual, and it took several hundred photos to get any in which it was exposed in the sunlight. They like to land on the ground and scurry towards you like a mouse, keeping behind cover almost all the time and then abruptly flying a hundred meters away to sing from another edge of their territory. In the end, patience was rewarded and I got some nice shots with its throat colors really illuminated. They're the closest thing we get to those fancy birds of paradise around here. -Seth



### Daily Metrics for 6 June 2023



# Data Usage















## EDC Webpage and Direct Requests

- Met station data requests 746  by 70  1294 

 File  
 Downloads  
 People  
 Views

## Arctic Data Center (data has DOI)

- |                                |   |   |
|--------------------------------|---|---|
| • Phenology                    | 116  | 61   |
| • Bird Point Counts            | 105  | 37   |
| • Met Station data             | 40   | 78   |
| • Naturalist Journal – Birds   | 1    | 15   |
| • Naturalist Journal – Mammals | 0    | 20   |
| • Naturalist Journal – Insects | 1    | 272  |



NSF  
**ARCTIC  
Data  
Center**

Phenology and Bird Point count datasets updated  
Met Station and Naturalist Journal occurring post new years



# Arctic Data Center Portal



Hosted by the Arctic Data Center

Sign in with ORCID



## 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

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. TFS-based work has resulted in significant discoveries on adaptations of organisms to the Arctic and population-level changes in animal and plant distributions and phenologies. Because climate is changing rapidly in the Arctic, continuing research into mechanisms of ecosystem response and feedbacks is a high priority. This need and ongoing interest by scientists from many disciplines in use of TFS promise a steady demand for TFS science support in the future. TFS supports the Arctic Long-Term Ecological Research program (LTER), projects in the Arctic Observational Network program (AON), NASA's Arctic Boreal Vulnerability Experiment (ABOVE), the Earthscope Transportable Array, and is a core site for the National Ecological Observatory Network program (NEON). TFS is a founding partner in the EU-sponsored International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT), which links field stations around the circumpolar Arctic, and a member of the Organization of Biological Field Stations (OBFS). At least 993 peer-reviewed journal articles, 161 books or book chapters and 144 dissertations and theses have been published on research based at TFS.

## 36 datasets added in 2023



## 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

### Search

Search these datasets

Search

### Key Words

Key Words

### Author Names

Author Names

### Year

1990 to 2023

### DATASETS 1 TO 25 OF 491

1 2 3 ... 20 Next

Sort by Most recent

Nikolay Shiklomanov (2023). *Seasonal soil active layer measurements from a Circumpolar Active Layer monitoring (CALM) grid, (U32B) Sagwon Hills MAT, Alaska, 1996-2023*. Arctic Data Center. doi:10.18739/A2MGT7FXAN.

Nikolay Shiklomanov (2023). *Seasonal soil active layer measurements from a Circumpolar Active Layer Monitoring (CALM) project for site "Sagwon Hills MNT" (U32 A), Alaska North Slope, United States, Alaska, 1996-2023*. Arctic Data Center. doi:10.18739/A2W0BWJ1P.

Seth Beaudreault, Juliette Funck, Christie Hauptert, Anja Kade, Adeline Murthy, Jorge Noguera, Aari Nugteren, Robin Rauch,

Hide Map

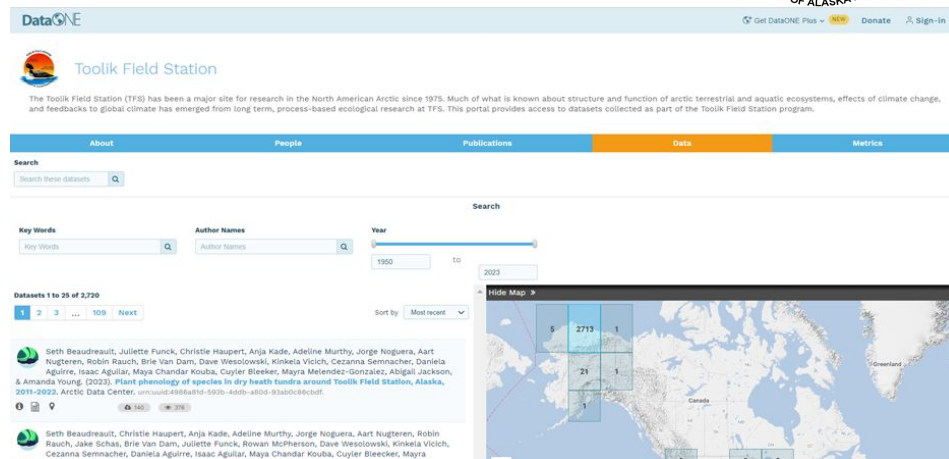
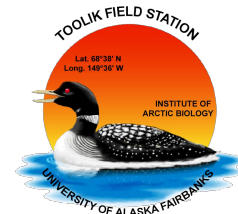


## Toolik Arctic Data Center portal



# DataOne Toolik Portal

- Working with DataONE programmers, we duplicated the Arctic Data Center (ADC) portal to encompass all of DataONE repositories
  - ADC, EDI, NEON, USGS, LTER, etc.
  - Datasets in the portal grew from 491 datasets in the ADC portal to 2720 datasets!
- If these portals are used and appreciated by the community, we will keep them up.



[Toolik DataONE portal](#)

# Data and Equipment in Use in Publications

Article | [Open access](#) | [Published: 23 November 2023](#)

## Genomic evidence that microbial carbon degradation is dominated by iron redox metabolism in thawing permafrost


[Karl J. Romanowicz](#), [Byron C. Crump](#) & [George W. Kling](#) 

[ISME Communications](#) **3**, Article number: 124 (2023) | [Cite this article](#)

**Integrative taxonomy of two morphologically similar species of the subgenus *Cryobius* Chaudoir, 1838 (Coleoptera: Carabidae: *Pterostichus* Bonelli, 1810) from northern Eurasia and North America**

NATALIA A. ZUBRII <sup>1,2\*</sup>, BORIS YU. FILIPPOV <sup>2</sup>, ALEXANDER V. KONDAKOV <sup>1,2</sup>,  
OLGA A. KHRULEVA <sup>3</sup> & LEONID B. RYBALOV <sup>3</sup>

## Climate-induced hydrological fluctuations shape Arctic Alaskan peatland plant communities

[Mariusz Gałka](#) <sup>a</sup> , [Andrei-Cosmin Diaconu](#) <sup>b</sup>, [Anna Cwanek](#) <sup>c</sup>, [Lars Hedenäs](#) <sup>d</sup>,  
[Klaus-Holger Knorr](#) <sup>e</sup>, [Piotr Kołaczek](#) <sup>f</sup>, [Edyta Łokas](#) <sup>c</sup>, [Milena Obremska](#) <sup>g</sup>, [Graeme T. Swindles](#) <sup>h i</sup>,  
[Angelica Feurdean](#) <sup>b j</sup>



88 publications in 2021

84 publications in 2022

66 publications in 2023

## Microbial iron cycling is prevalent in water-logged Alaskan Arctic tundra habitats, but sensitive to disturbance

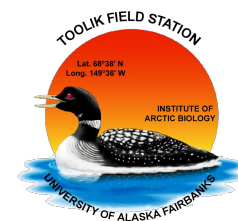
Alexander B. Michaud , Rémi O. Massé, David Emerson

## Snow and vegetation seasonality influence seasonal trends of leaf nitrogen and biomass in Arctic tundra

[Katharine C. Kelsey](#) , [Stine Højlund Pedersen](#), [A. Joshua Leffler](#), [Joseph O. Sexton](#), [Jeffrey M. Welker](#)



# Common Use Equipment



## New Equipment

- New YSI probe
- Rechargeable double AA batteries
- Microscope phone adaptor
- SIPRE Auger
  - Donated by Laurel Lynch and Josh Schimel to TFS
  - 2023 – adding 2 extensions
- BioTek multi-mode microplate reader
  - Donated by Michelle Mack and Donie Bret-Harte
- 0.1mg scale
- Russian Peat Auger
- MagnaProbe
- Metal detector
- 2 new (to us) microscopes
  - Donated by Breck Bowden

## Suggested new equipment

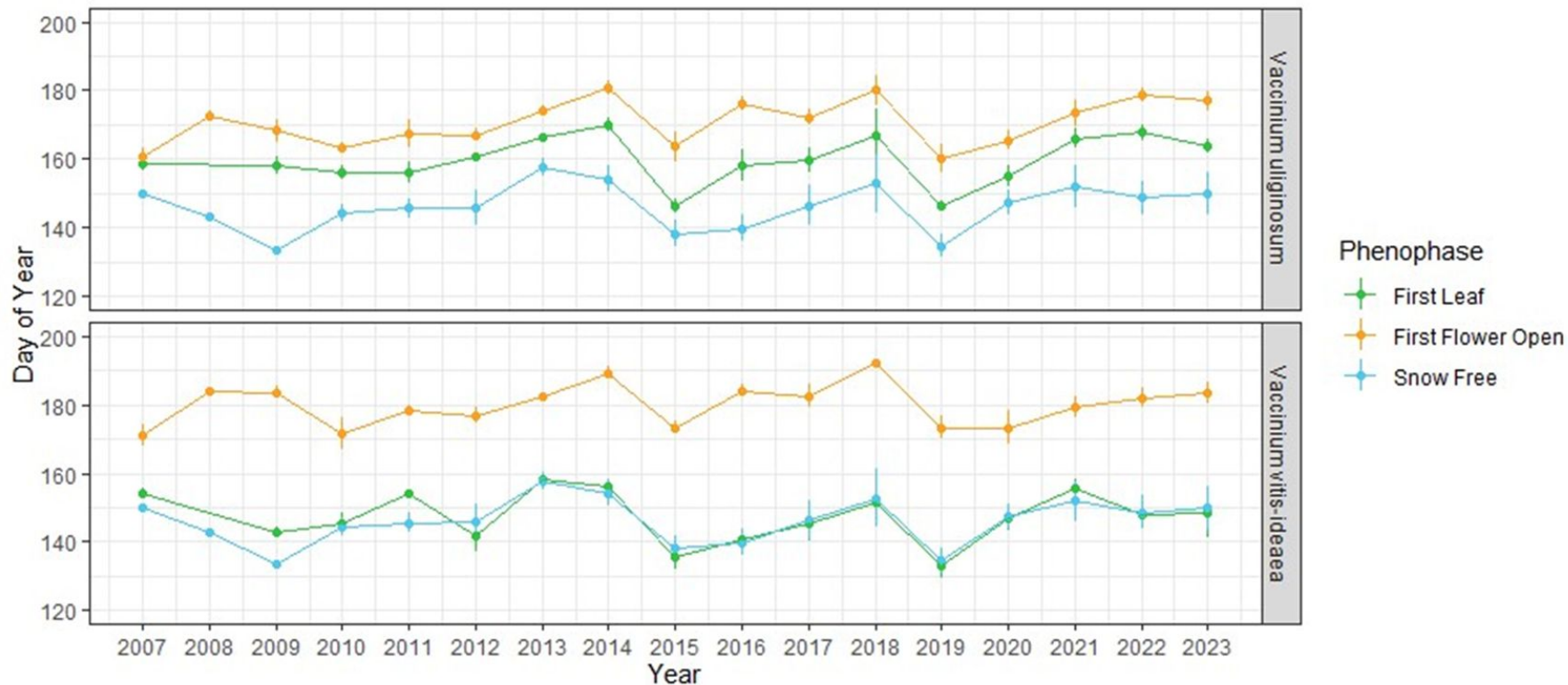
- Laminar flow hood
- New freeze dryer
- Shelf for the muffle furnace
- Ekman Grab Sampler
- Extension for federal snow auger





# Baseline Monitoring Biotic

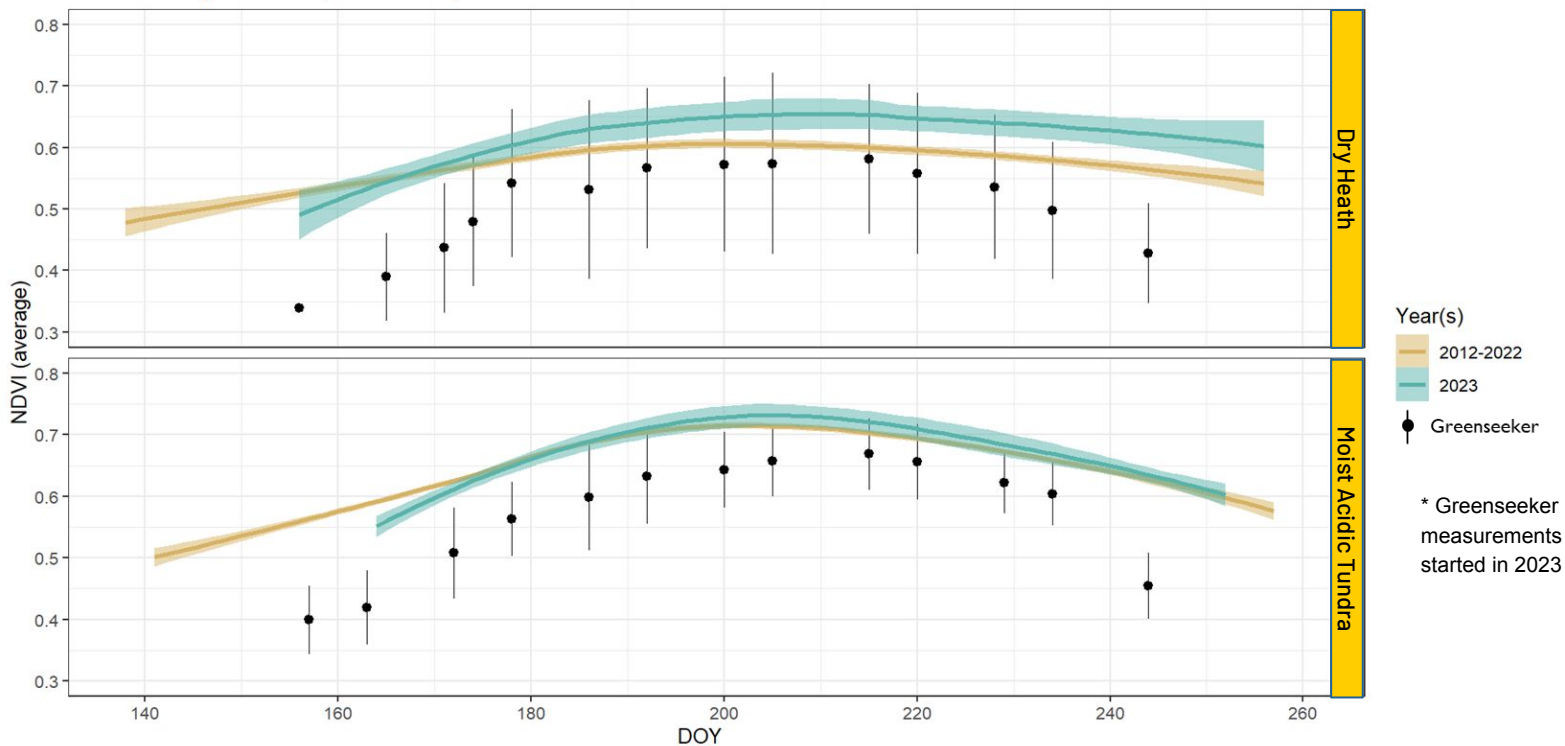
# Biological Monitoring - Phenology



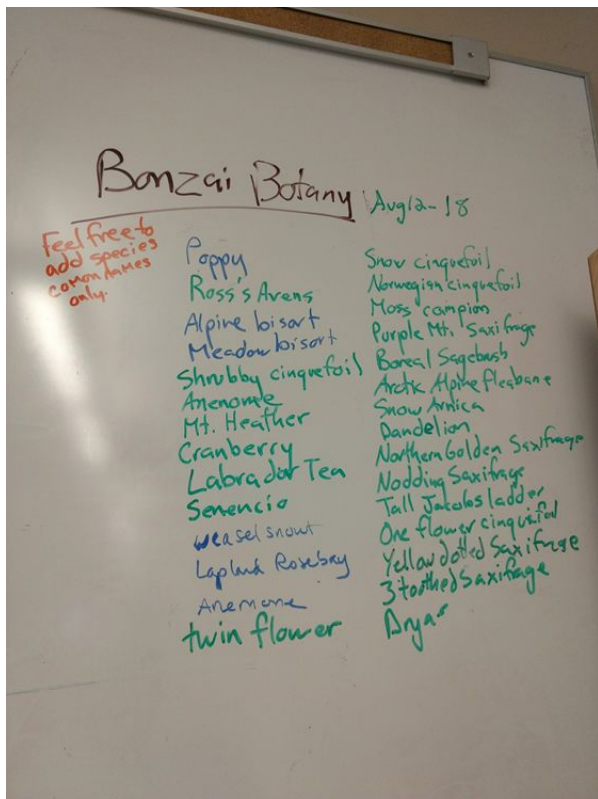
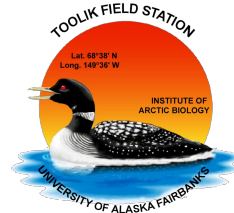
# Biological Monitoring - NDVI



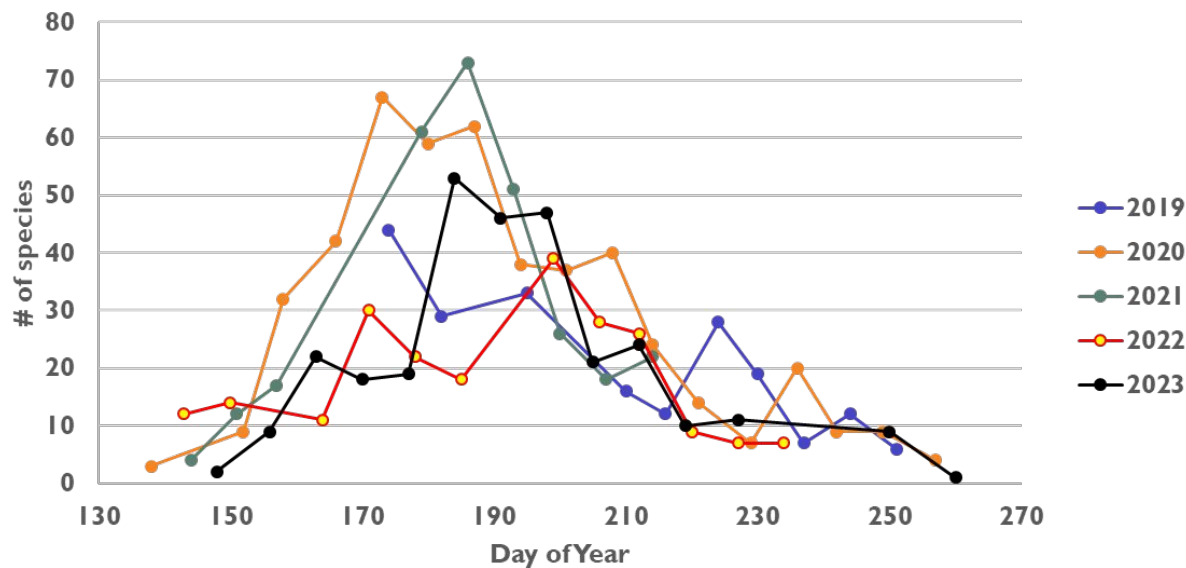
Toolik EDC plot NDVI (2012-2023)



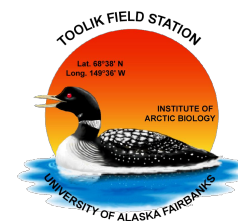
# Biological Monitoring - Bonsai Botany



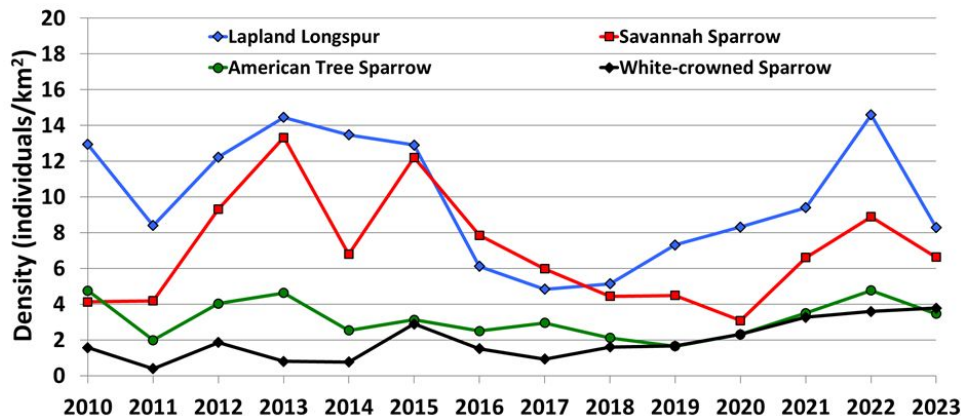
- Recorded plants in flower during each week
- Common names only so all can participate



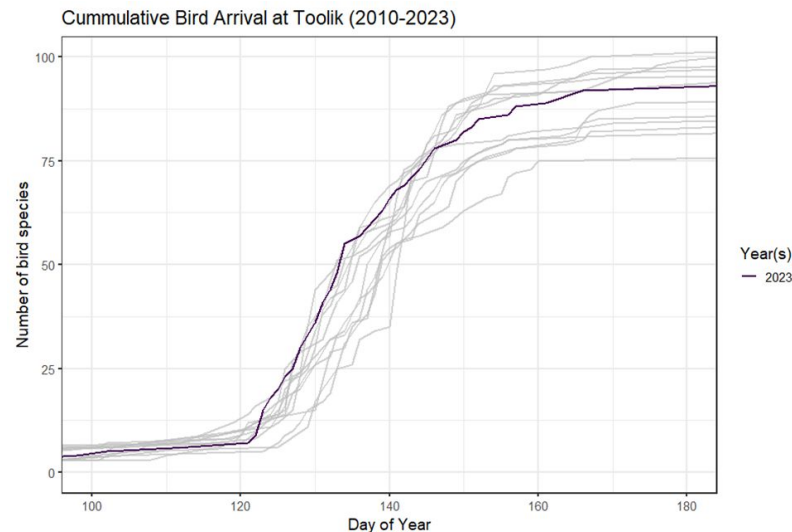
# Biological Monitoring - Avian



- Avian point counts

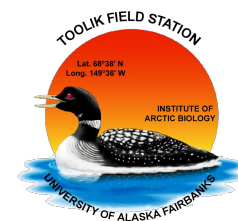


- Date of arrival of bird species from the Naturalist Journal





# Biological Monitoring - Audio Recordings



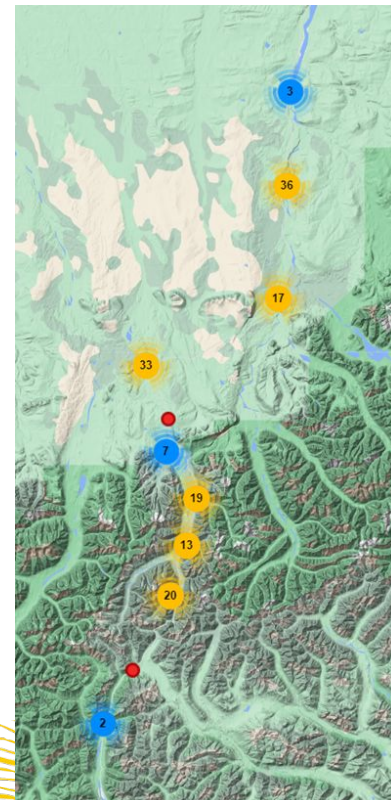
- Audio recording of bird species continues now with 212 recordings from the Toolik area
  - Up from 152 last year
  - Calls are added to the Naturalist Bird Guide



[Northern waterthrush, June 2022](#)

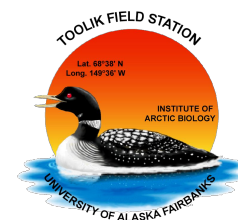


[Surfbird \(Mt Dalton\), June 2022](#)

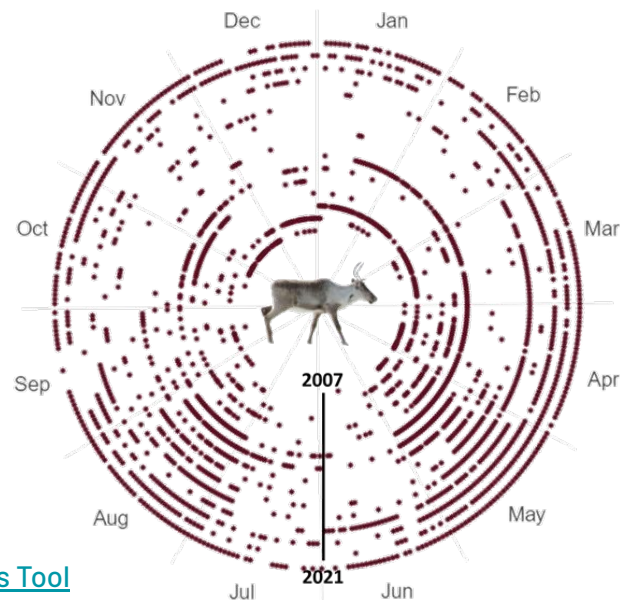
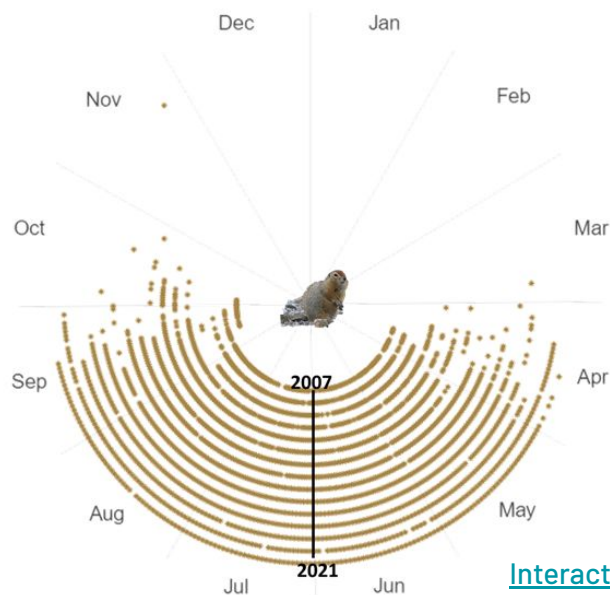




# Biological Monitoring - Animal Observations



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



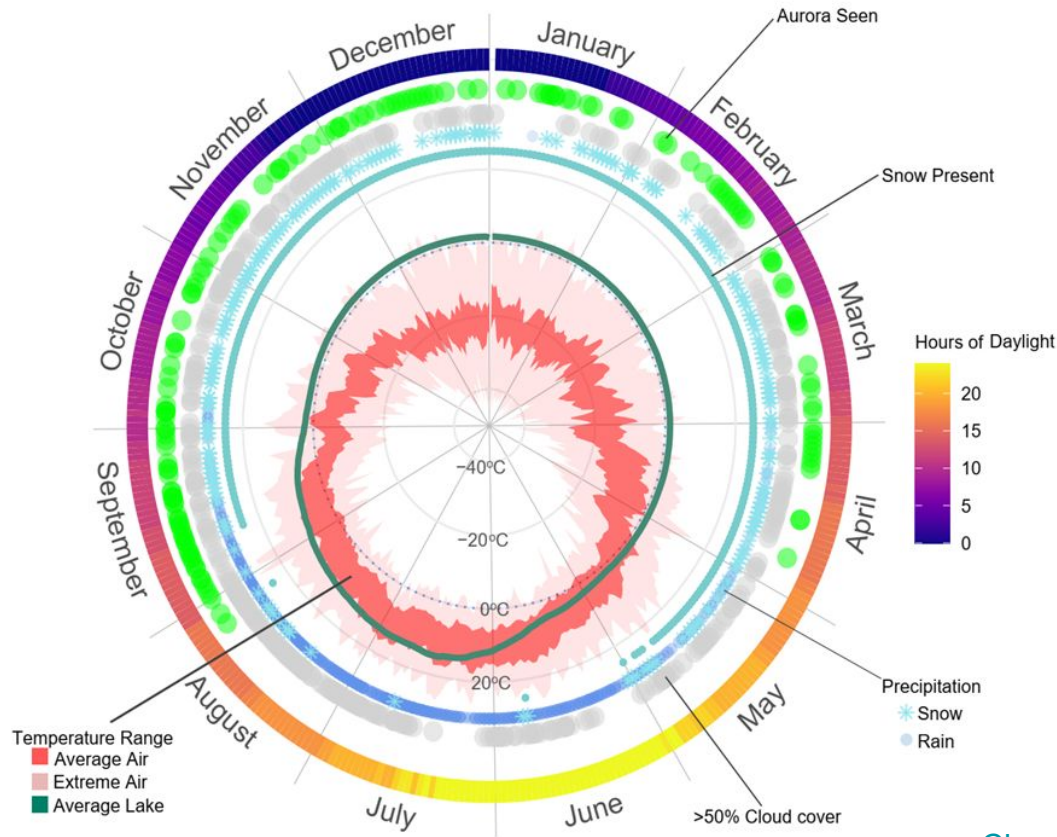
[Interactive Animals & Birds Tool](#)



# Baseline Monitoring Abiotic

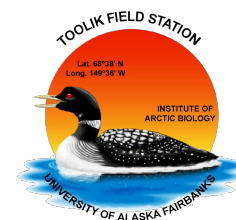
# Through the year at Toolik

Data from the TFS Met Station and Naturalist Journal (2007-2021)



[Circular Seasonality Plots GitHub code](#)

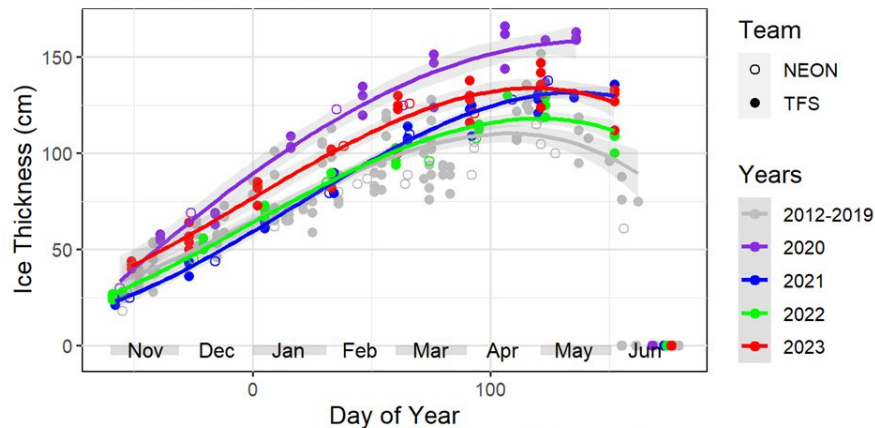
# Abiotic Measurements - Ice Thickness



- Ice thickness

Toolik Lake Ice Thickness 2012-2023

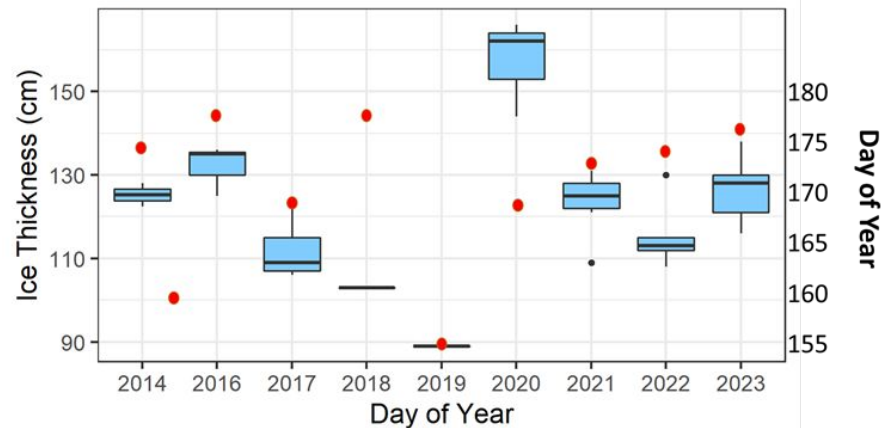
Ice Off dates (2012-2023)



TFS = Toolik Field Station, SEDC data  
NEON = National Ecological Observatory Network, 2023. Data Product DP1.20254.001, Depth profile at specific depths.  
Provisional data downloaded from <http://data.neonscience.org> on Oct 30, 2023. Battelle, Boulder, CO, USA NEON, 2023.

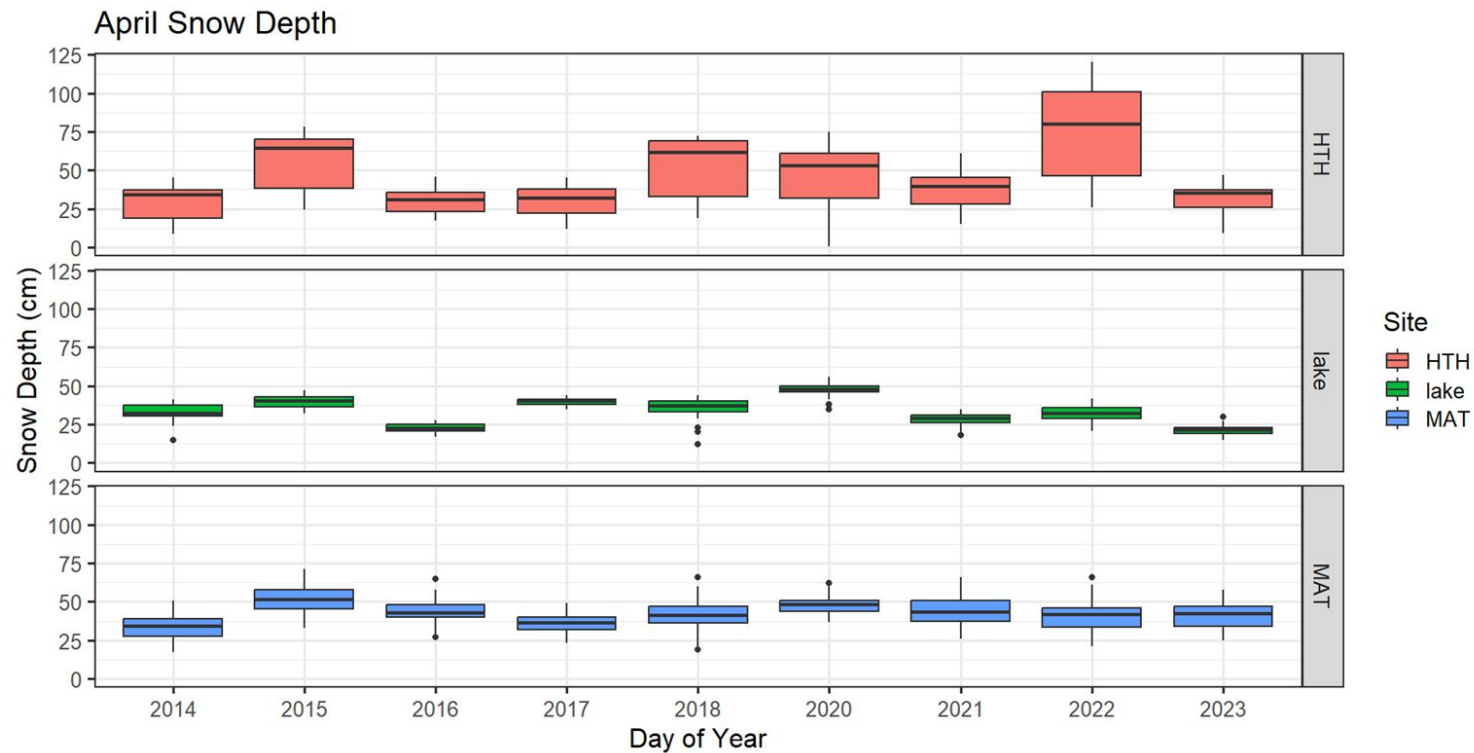
- Peak ice thickness, measured in April

April Ice Thickness



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

# Abiotic Monitoring - April Snow Depth

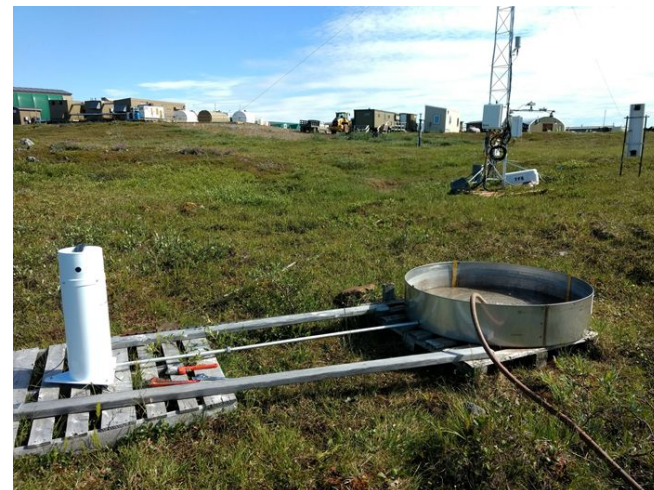




# Met Station Report



- TFS Meteorological Data updates
  - 2023 error checked data is in progress and will be posted on the TFS website under the Meteorological Data Query once ready.
- Frequent communication between Colin Edgar and other EDC staff to troubleshoot issues and installation as they arise.
- Sensor Upgrades in 2023
  - Soil heat flux plates
  - Fixed the fabric on the Wyoming Gauge
  - Precipitation gauge calibrations
  - New soil temperature probes



# Climate Summaries and Comparisons



## Climate Summaries

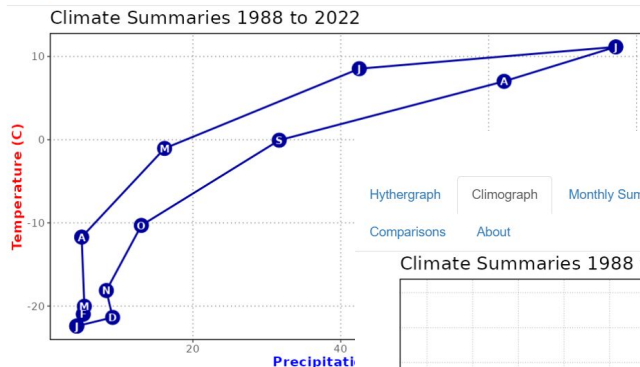
Create climate summaries by selecting a date range of interest

Year

1988 2022

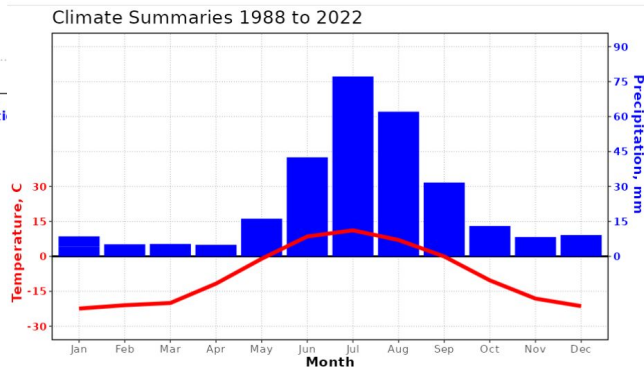
Hythergraph Climograph Monthly Summaries Seasonal Summaries Yearly Summaries

Comparisons About



Hythergraph Climograph Monthly Summaries Seasonal Summaries Yearly Summaries

Comparisons About



Hythergraph Climograph Monthly Summaries Seasonal Summaries Yearly Summaries

Month	Temp (Mean)	Precip (Sum)	% Temp Data	% Precip data
January	-22.40	4.29	98.24	50.93
February	-20.97	5.18	97.00	49.36
March	-20.02	5.32	96.97	44.87
April	-11.71	4.96	94.71	55.59
May	-1.05	16.17	94.97	82.54
June	8.54	42.50	94.10	93.33
July	11.16	77.20	94.93	97.05
August	7.02	62.09	93.46	95.48
September	-0.06	31.68	99.80	89.80
October	-10.30	13.03	100.00	72.20
November	-18.13	8.30	100.00	66.86
December	-21.36	9.15	100.00	69.54

[Interactive climate summaries tool](#)  
[Toolik climate summaries GitHub code](#)





# Network Participation

# Atmospheric Monitoring



- Ozone Monitoring – 2009 to Present (ADC repository of data)
- National Atmospheric Deposition program (NADP) – 2017 to present
  - National Trends Network
  - Mercury Deposition Network
  - Ammonia Monitoring Network
- Inter-agency Monitoring of Protected Visual Environments (IMPROVE) – 2018 to present
  - Re-funded by the BLM until 2064
- Purple Air – June 2019 to present
  - Particulate matter sampling
  - 2 additional sensors added in 2022
- Mercury Passive Air Sampler – January 2020 to present
  - Changed quarterly
  - Lower than average Mercury for the Arctic



# Network Participation



## LIFEPLAN – A Planetary Inventory of Life

- Weekly spore sampling
- Camera and audio traps
  - Community training of AI to process data
  - Audio traps
- Malaise trap
- Soil sampling



## myThaw

- EDC NDVI/snow survey transect
- Thaw depth, veg height, snow depth
- Data collected is online at [permafrostthaw.org](http://permafrostthaw.org)



## CoCoRaHS – Community Collaborative Rain, Hail & Snow Monitoring

- Daily record of precipitation and snow water equivalency



## Aurorasaurus

- Observations of aurora activity
- Toolik is an Ambassador member



## Fresh Eyes on Ice

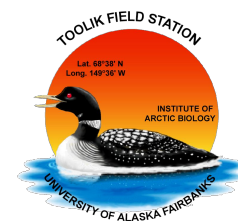
- Monthly ice measurements





# Remote Access

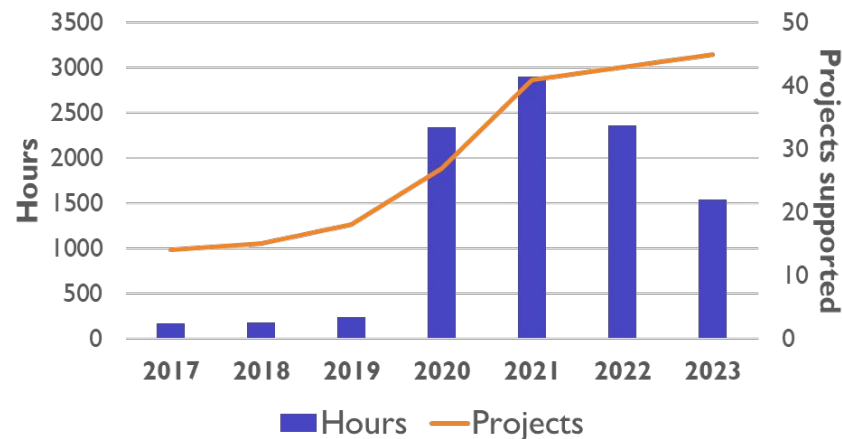
# Field Work Assistance



- 2017: 170 hours of assistance to 14 projects for 14 different researchers.
- 2018: 179 hours of assistance to 15 projects for 14 different researchers.
- 2019: 242 hours of assistance to 18 projects for 29 different researchers.
- 2020: 2344 hours of assistance to 27 projects
- 2021: 2899 hours of assistance to 41 projects
- 2022: 2361 hours of assistance to 43 projects
- **2023: 1543 hours of assistance to 45 projects**

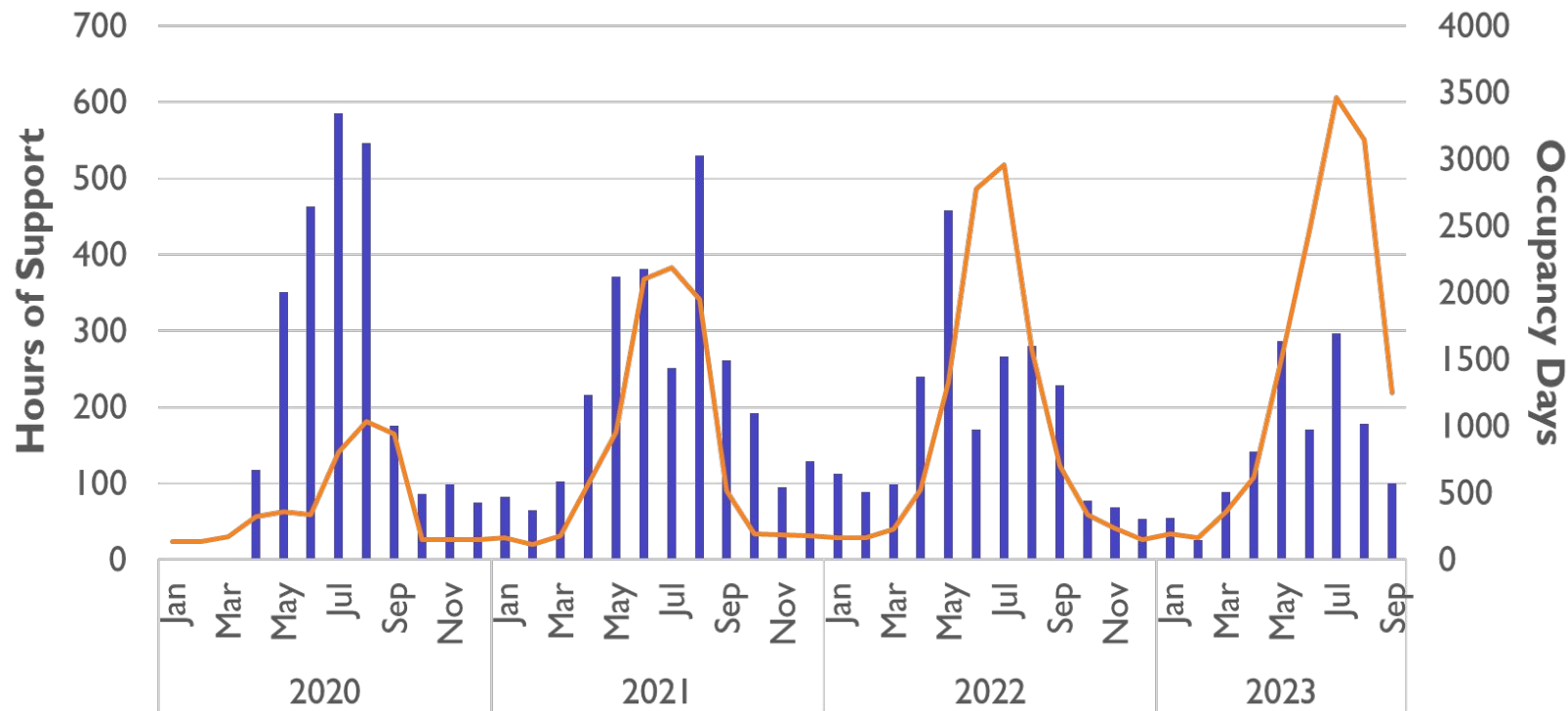
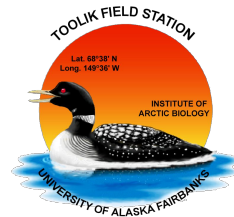
## Examples of assistance (Not exhaustive):

- Met Station setup, downloads, and troubleshooting
- Phenology and NDVI measurements
- River discharge
- Soil sampling
- Tussock tiller measurements

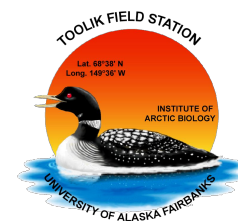


\*Not all projects supported have hours recorded

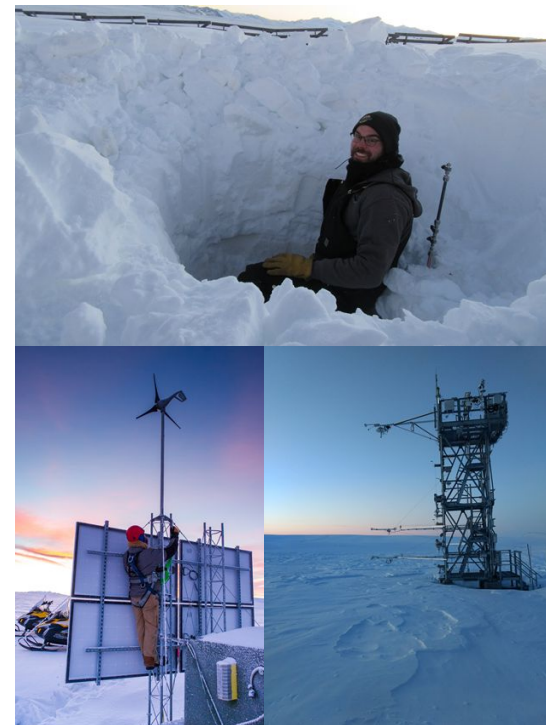
# Support Hours Through Sept 2023



# Winter Remote Access



- 20-40 hours of remote access per week.
- EDC staff at Toolik year-round working with Maintenance staff
- Activities:
  - Autonomous equipment
    - Preventative maintenance checks
    - Data download
    - Power system charging and repairs
    - Sensor swap
  - Snow depth measurements
  - Lake ice
    - Ice thickness measurements
    - Sonde casts
    - Water sampling and filtering
  - Atmospheric measurements
  - Access assistance via snowmachines

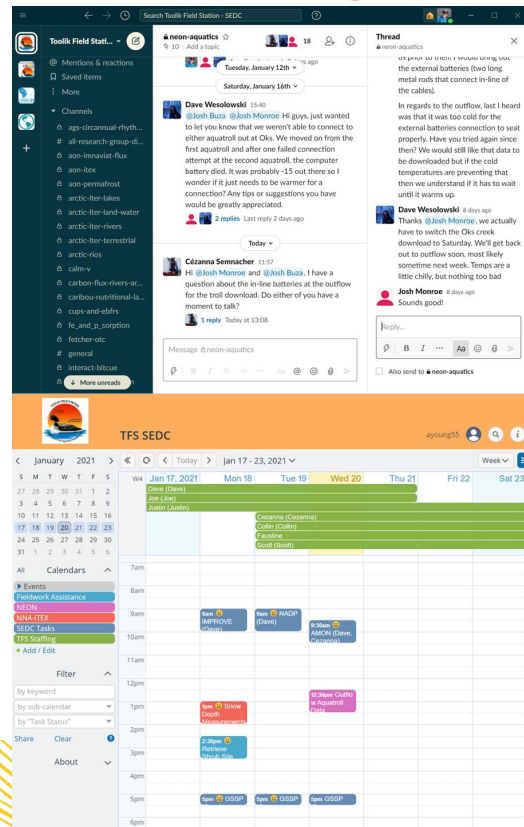
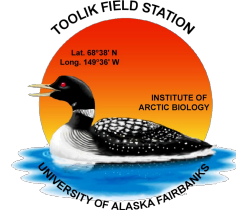




# Remote Access Going Forward

- Continue to provide remote access to users who cannot make it to Toolik
  - Year-round support
- Provide additional field support to researchers at Toolik
- Continue to improve communication between the SEDC and research groups
- Staff with wide array of skills
  - Hiring year-round staff to decrease turnover of knowledge
  - Staff participation in remote access across departments has led towards a greater sense of community and sense of belonging.

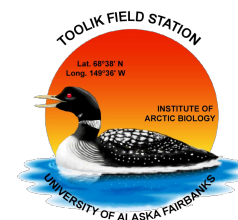
Planning on an evaluation survey of remote access in 2024





# Other

# EDC Website



- Abiotic

- Weather
- Met Station Data Query
- Snow
- Ice Thickness
- Atmospheric
- Time Lapse
- Other

- Biotic

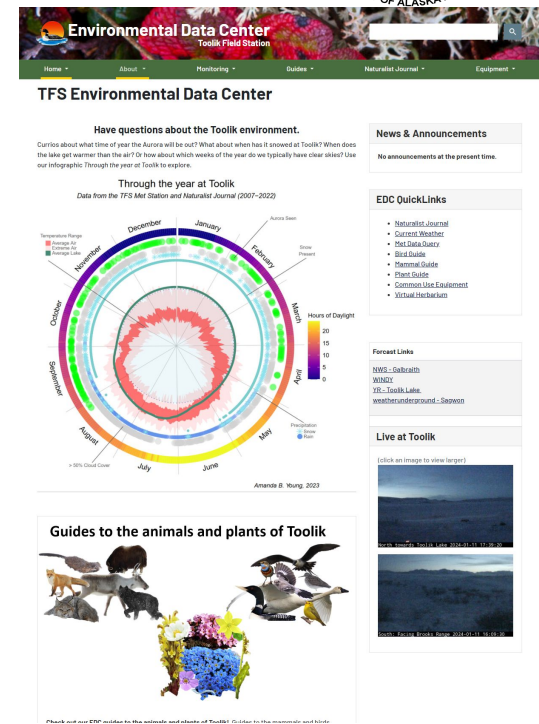
- Bird Point Counts
- Plant Phenology
- NDVI Measurements

- Guides

- Mammals
- Birds
- Fish
- Plants
- Virtual Herbarium

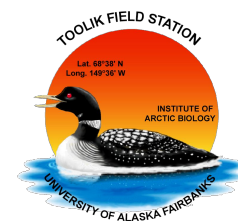
- Naturalist Journal

- Annual Summaries



What do you wish to see added?

# Meetings and Outreach



- Meetings

- American Geophysical Union
  - Exhibit Hall booth
  - Poster: 15 Years of Abiotic and Biotic Phenological Change in the Arctic (2022)
  - Session: Creating & Sustaining Safety & Community at Field Stations, Field Camps, Marine Labs & Research Vessels (2022)
  - Session: Consequences of Changing Seasonality for Phenology and Biogeochemical Cycling in a Warming Arctic (2023)

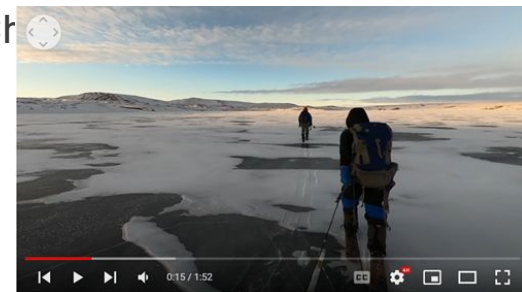
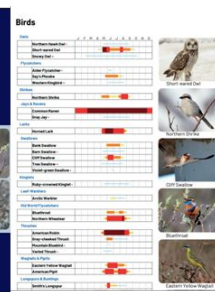
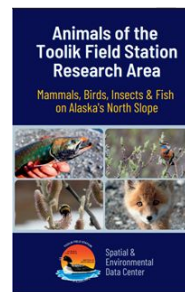
- Tours of Toolik

- 20 site visits in 2023!

What other kinds of deliverables would you like to see?

## Outreach Deliverables

- AKDatUM - Alaska Data for Undegrad. Ed. Modules
  - [Mosquito Diversity in Alaska](#) Module using NEON data
- [Immersive videos](#) (360° & VR)
  - Link - best viewed in a VR headset or smartphone with resolution set to 4k





# Trainings & Workshops

- Strategic Planning for Herbarium (Spring 2023, Amanda)
- Cultural Humility Workshops (Fall 2023, Amanda & other TFS staff)
- Arctic Research is Respect course (Fall 2023, Amanda)
- Augmented Reality Workshop (Fall 2023, Amanda & Randy)


## Upcoming

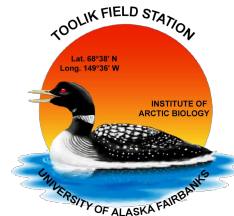
- Arctic Data Center Training (Spring 2024, Abby & Mayra)





# Herbarium

- Strategic Plan (2023-2025)
  - One-page version 
- Accessioning new specimens
  - Remote locations
    - Arctic springs
    - Ice Cut
  - Replication
  - Species not seen since the early 2000s
    - *Koenigia islandica*
- Donation of aquatic mosses from Breck Bowden



## Toolik Field Station Herbarium Strategic Plan (2023-2025)

### Mission Statement

The Toolik Field Station (TFS) Herbarium serves to house and maintain records of botanical specimens collected in the course of research and inventories by researchers working at TFS and online through our virtual herbarium.

### Vision Statement

Toolik Field Station Herbarium strives to provide excellent high-latitude research and educational opportunities at a local and pan-arctic scale.

### Our strategy

Toolik Field Station Herbarium provides an Arctic specific herbarium to researchers and educators while collaborating with pan-Arctic groups to develop collaborative resources.

### Core Values

- To understand and interpret—through research and collecting—the uniqueness of the biodiversity of Arctic Alaska while maintaining a global and pan-arctic perspective.
- To collect and preserve herbarium specimens for research and as a continuous record of the changing world for future generations;
- To appreciate the historical uses of natural resources by Alaska Natives on whose ancestral land the Toolik Field Station resides.
- To provide opportunities for physical and digital visitors to the herbarium opportunities to research and explore.



### Capitalizing on Opportunities

The TFS herbarium is situated in the Arctic to be used by researchers studying arctic flora. It is uniquely situated to be used while doing fieldwork and to collaborate with our circum-polar neighbours.

### Maintaining Strengths

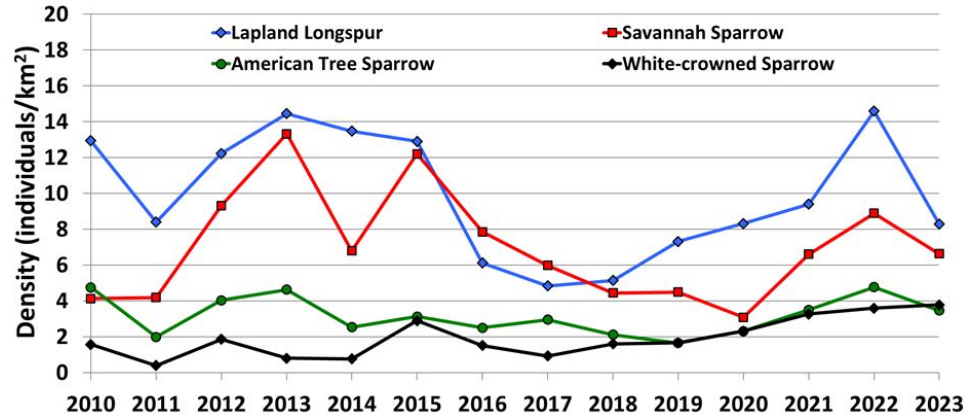
The main strengths of the TFS Herbarium is that species and content specialists from around the world visit, use, and contribute to the herbarium. Due to the long-term curation by Peter Ray, the specimens have been acquired continuously and systematically for the past 20 years. Maintaining the herbarium's capacity to meet its goals and objectives involves best-practice curation of the specimens through empowering staff and researchers to discover and innovate the collection.

# Let me know if you have any feedback



[ayoung55@alaska.edu](mailto:ayoung55@alaska.edu)

## Baseline Datasets



## Remote Access and Field Support

