

# QGreenland: Enabling Science through GIS

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November 24, 2022

## Abstract

Geoscientists often spend significant research time identifying, downloading, and refining geospatial data before they can use it for analysis. Exploring interdisciplinary data is even more challenging because it may be difficult to evaluate data quality outside of one's expertise. QGreenland, a newly funded EarthCube project, is designed to remove these barriers for interdisciplinary Greenland-focused research and analysis via an open data, open platform Greenland GIS tool. QGreenland will combine interdisciplinary data (e.g., glaciology, human health, geopolitics, hydrology, biology, etc.) curated by an international Editorial Board into a unified, all-in-one GIS environment for offline and online use. The package is designed for the open source GIS platform QGIS. QGreenland will include multiple levels of data use: 1) a fully downloadable base package ready for offline use, 2) additional disciplinary and/or high-resolution data extension packages for select download, and 3) online-access-only data to facilitate especially large datasets or updating time series. Software development has begun and we look forward to discussing techniques to create the best open access, reproducible methods for package creation and future sustainability. We also now have a beta version available for experimentation and feedback from interested users and the Editorial Board. The version 1 public release is slated for fall 2020, with two subsequent annual updates. As an interdisciplinary data package, QGreenland is designed to aid collaboration and discovery across fields. Along with discussing QGreenland development, we will also provide an example use case to demonstrate the potential utility of QGreenland for researchers, educators, planners, and communities.

# QGreenland: Enabling Science through GIS



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**Why QGreenland?**



**OPEN**

**QGreenland Team and Partners**



**NSIDC Development Team**  
 Twila Moon Principal Investigator  
 Matt Fisher Software Developer

**OPEN**

**Developing an Open Access Tool**

**Development goals**

- Reproducible, automated builds
- Open-source and easy for users to contribute
- Consistent codebase with linking to enforce continued consistency
- Easy to extend to support custom builds for specific regions or different dataset packages

**Prior Art**

Quantarctica, a QGIS data package for Antarctica. The popularity and success of Quantarctica inspired the QGreenland project, and collaboration with the Quantarctica team allows us to learn from their experience.

**Tools/Libraries Used**

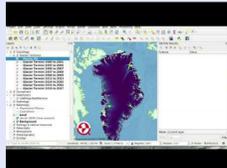
QGIS  
 Docker  
 Python 3.8  
 Luigi  
 Rasteno  
 GeoPandas  
 GDAL



**OPEN**

**Explore QGreenland Beta Version**

Visit [QGreenland.org](http://QGreenland.org) to download the QGreenland Beta release! (Download username: "guest", password: "QGRules")



**Community Driven Effort**

QGreenland is designed to serve researchers, educators, planners, communities, and the interested public. Their input helps to ensure QGreenland is a useful - and used - tool.

**User Communities**

- Scientific Institutions
- Local Greenland communities
- Educators and communicators
- Arctic focused organizations and projects
- Decision makers and planners

**QGreenland use & contribution via:**

- QGreenland website
- Email list and social media
- Online collaboration forums
- QGreenland Training Workshops



**OPEN**

**Data in QGreenland**

**Data Categories**

QGreenland is being designed to accommodate three categories of data:

- Standard Base Package
- Disciplinary-specific extensions
- Online access data

The layers listed below are included in the current beta version, and are not final. If you have suggestions for data layers, please contact us via [QGreenland.org](http://QGreenland.org)!

**Base Map Layers**

Natural Earth 2 Shaded Relief and Water  
 Natural Earth 2 Coastlines  
 Natural Earth 2 1:100,000

**OPEN**

**Next Steps for QGreenland**

**v1.0.0 and beyond!**

Release of the first public QGreenland v1.0.0 is slated for early November 2020.

v1.0.0 will include:

- Fully curated datasets
- Expanded data and metadata
- Finalized geographic extent
- Finalized colormaps
- Support for WMS layers

**OPEN**

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PRESENTED AT:



**2020 EarthCube Annual Meeting  
 Virtual – June 18, 2020**

# WHY QGREENLAND?

[VIDEO] <https://www.youtube.com/embed/1BaialSDUuc?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0>

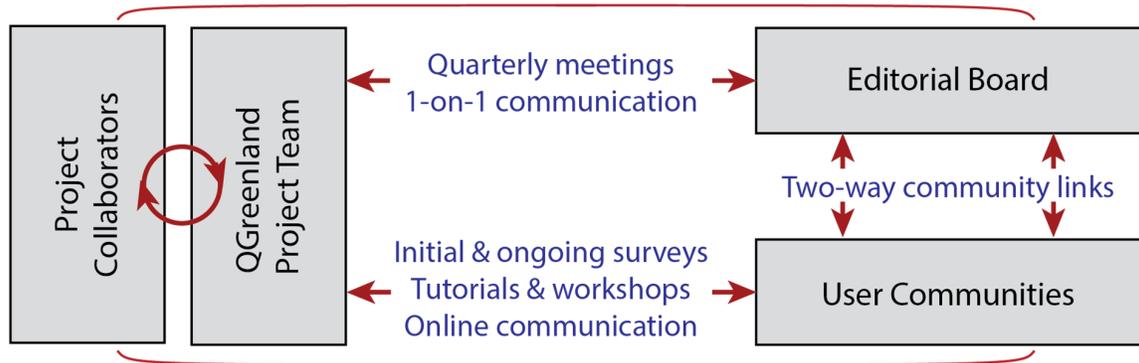
Current Greenland-focused Geospatial Information System (GIS) platforms are highly disciplinary, have limited analysis and visualization functionality, and require online access, with little ability to download individual or group data layers. For those who want to create their own full-function GIS environment, they must start from scratch, downloading and transforming raw data. The process is time-consuming, and creates a major barrier for exploring multiple datasets or new disciplines. This poses major barriers to discovery in geoscience, and also for increasing Greenland-focused education and providing full-function exploration tools for communities.

QGreenland addresses these limitations, providing a new platform that is:

- Free and open source, designed for use on the QGIS platform
- Inclusive of interdisciplinary data across Greenland ice, land, flora, fauna, people, and ocean
- Fully functional offline for remote fieldwork where internet is not available
- Developed by an international Editorial Board of discipline efforts, with input from a broad user community

# QGREENLAND TEAM AND PARTNERS

QGreenland is hosted at the National Snow and Ice Data Center (NSIDC), a part of CIRES at the University of Colorado Boulder. The project team includes scientists, developers, advisors, and collaborators.



## NSIDC Development Team

**Twila Moon** Principal Investigator

**Matt Fisher** Software Developer

**Trey Stafford** Software Developer

**Lynn Harden** Education Specialist

**Mary Ellen Byers** Website Developer

**Audrey Payne** Social Media Assistant

## Editorial Board

**Niels J. Korsgaard** Geologic Survey of Denmark and Greenland

**Ruth Mottram** Danish Meteorological Institute

**Rene Forsberg** Technical University of Denmark

**Irina Overeem** University of Colorado Boulder

**Lauren Culler** Dartmouth University

**Eva Matzler** Asiaq

**Christian Brogaard Pedersen** Geologic Survey of Denmark and Greenland

**Karl Zinglensen** Greenland Institute for Natural Resources

## Project Collaborators

De Nationale Geologiske Undersøgelser for Danmark og Grønland

Dansmarks Tekniske Universitet

Dansmarks Meteorologiske Institut

Norsk Polarinstitut

Arctic Data Committee

International Arctic Science Committee

WWF-Danmark

U.S. Polar Geospatial Center

Greenland Ice Sheet Ocean Science Network

N.S.F. Polar Computing RCN

Asiaq

Isaafik

# DEVELOPING AN OPEN ACCESS TOOL

## Development goals

- Reproducible, automated builds
- Open-source and easy for users to contribute
- Consistent codebase with linting to enforce continued consistency
- Easy to extend to support custom builds for specific regions or different dataset packages

## Prior Art

[Quantarctica](https://www.npolar.no/en/quantarctica/) (<https://www.npolar.no/en/quantarctica/>), a QGIS data package for Antarctica. The popularity and success of Quantarctica inspired the QGreenland project, and collaboration with the Quantarctica team allows us to learn from their experience.

## Tools/Libraries Used

[QGIS](https://qgis.org/en/site/) (<https://qgis.org/en/site/>)

[Docker](https://www.docker.com/) (<https://www.docker.com/>)

[Python 3.8](https://www.python.org/) (<https://www.python.org/>)

[Luigi](https://github.com/spotify/luigi) (<https://github.com/spotify/luigi>)

[Rasterio](https://github.com/mapbox/rasterio) (<https://github.com/mapbox/rasterio>)

[GeoPandas](https://geopandas.org/) (<https://geopandas.org/>)

[GDAL](https://gdal.org/) (<https://gdal.org/>)

[VIDEO] <https://www.youtube.com/embed/U3NwAWuWAN0?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0>

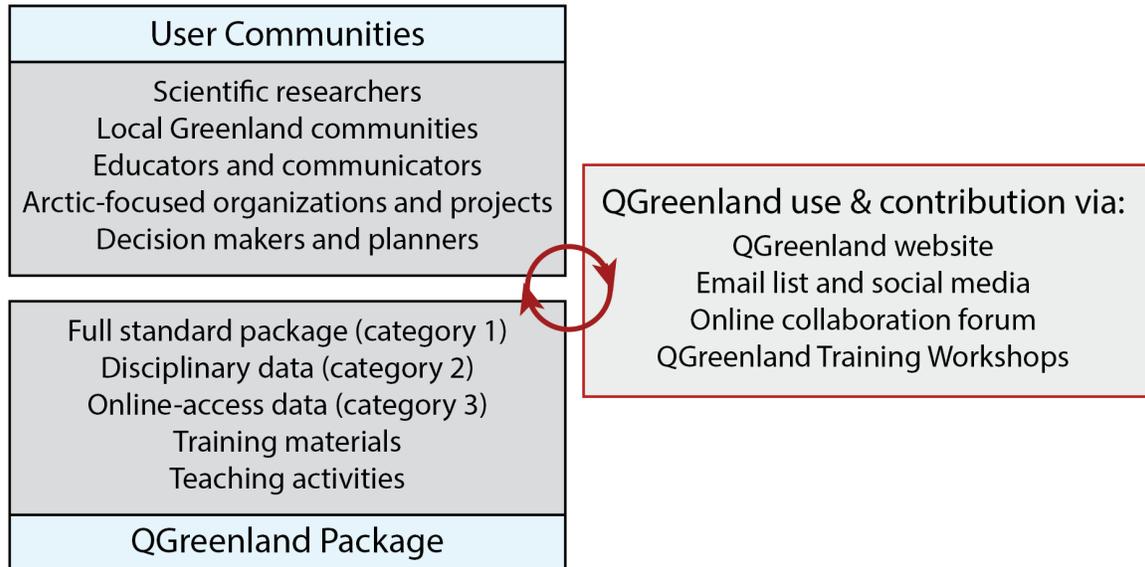
# EXPLORE QGREENLAND BETA VERSION

Visit [QGreenland.org](https://qgreenland.org) (<https://qgreenland.org/explore>) to download the QGreenland Beta release! (Download username: 'guest', password: 'QGRrules')

[VIDEO] <https://www.youtube.com/embed/NyzWfmPxRDc?feature=oembed&fs=1&modestbranding=1&rel=0&showinfo=0>

## Community Driven Effort

QGreenland is designed to serve researchers, educators, planners, communities, and the interested public. Their input helps to ensure QGreenland is a useful - and used - tool.



The project is Open Source and hosted on [GitHub](https://github.com/nsidc/qgreenland) (<https://github.com/nsidc/qgreenland>). Community discussion and contribution is encouraged. Comments and feedback can be made through the [QGreenland website](https://qgreenland.org/form/comments-and-data-suggestions) (<https://qgreenland.org/form/comments-and-data-suggestions>).

# DATA IN QGREENLAND

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## Base Map Layers

Natural Earth 2 Shaded Relief and Water

Natural Earth 2 Coastlines

Natural Earth 2 Land

Natural Earth 2 Populated Places

## Data Layers

Arctic DEM

IceBridge BedMachine

ITS\_LIVE Velocity Mosaic

MEaSURES Glacier Terminus

Hydrologic Sub-Basins

# NEXT STEPS FOR QGREENLAND

## v1.0.0 and beyond!

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v1.0.0 will include:

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## Training Workshops

Development for QGreenland training material is also underway. We are designing material for virtual events and for in-person workshops. With travel restriction due to COVID-19, we are creating virtual training content first. This will include an Online User Guide as well as demonstration videos.

We plan to host interactive virtual workshops to align with the 2020 Fall AGU Meeting and the 2020 Greenland Science Week. Plans remain flexible as both events respond to COVID-19.

## Education Activities

The QGreenland environment is an ideal tool for educators. We will create some curricular material for the middle school, high school, and college levels. We are also exploring hosting a teaching material repository to foster open source activity development that can serve a wide range of educators - from basic exploration to learn about Greenland to advance GIS classes using the full capabilities of QGIS.

## Community Building

Please take the [community survey](https://cuboulder.qualtrics.com/jfe/form/SV_0cTfjnDZWBhHvtX) (https://cuboulder.qualtrics.com/jfe/form/SV\_0cTfjnDZWBhHvtX) to provide us with your ideas.

Keep up to date with news and events [here](https://qgreenland.org/events-and-news) (https://qgreenland.org/events-and-news).

Watch for our June newsletter! If you aren't on our mailing list yet, sign up on the QGreenland website (<http://www.qgreenland.org>)!

We are sorry to inform you that the content of your iPoster has changed in our database since your last save.

The probable reason is that there are multiple people logged into your account, you are logged into your poster at multiple locations, that you have multiple tabs open with your iPoster or that you have requested help from our support staff and they have made corrections/adjustments to your iPoster.

To avoid losing any content, we recommend you open a new tab/window and access your iPoster again, and copy any missing content from this view to the new view. You will see the latest content saved in our database for your iPoster in the new view.

Because of maintenance we have just saved your content and will within a few minutes logout all users and restart our server. We will be back in a moment.

Sorry for the inconvenience!

Because of maintenance we will within a few minutes restart our server. We will be back in a moment.

Sorry for the inconvenience!

# CV

QGreenland Contact Information:

[QGreenland.info@gmail.com](mailto:QGreenland.info@gmail.com)

[www.QGreenland.org](http://www.QGreenland.org)

Reach PI Twila Moon at 406-579-3088

# ABSTRACT

Geoscientists often spend significant research time identifying, downloading, and refining geospatial data before they can use it for analysis. Exploring interdisciplinary data is even more challenging because it may be difficult to evaluate data quality outside of one's expertise. QGreenland, a newly funded EarthCube project, is designed to remove these barriers for interdisciplinary Greenland-focused research and analysis via an open data, open platform Greenland GIS tool. QGreenland will combine interdisciplinary data (e.g., glaciology, human health, geopolitics, hydrology, biology, etc.) curated by an international Editorial Board into a unified, all-in-one GIS environment for offline and online use. The package is designed for the open source GIS platform QGIS. QGreenland will include multiple levels of data use: 1) a fully downloadable base package ready for offline use, 2) additional disciplinary and/or high-resolution data extension packages for select download, and 3) online-access-only data to facilitate especially large datasets or updating time series. Software development has begun and we look forward to discussing techniques to create the best open access, reproducible methods for package creation and future sustainability. We also now have a beta version available for experimentation and feedback from interested users and the Editorial Board. The version 1 public release is slated for fall 2020, with two subsequent annual updates.

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# CHAT INFORMATION

The chatroom will open 10 minutes before start. If you missed the chat, but would like to contact me, please use the Contact Author button at the bottom of my iPoster

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# LIVE SESSION

**Meeting time:**

*Please note that the time and date displayed here is Central European Summer Time – UTC +2 hours. If you need help in converting to your local time, please click here (<https://www.thetimezoneconverter.com/>).*

**GO TO SESSION**