NASA ABoVE: Discovering Datasets at a Regional Level

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Introduction

This booklet presents a variety of datasets created through NASA's Arctic-Boreal Vulnerability Experiment (ABoVE). ABoVE is a NASA Terrestrial Ecology Program field campaign being conducted in Alaska and western Canada which began in 2015. It is a diverse large-scale study of the impacts of environmental change on arctic and boreal terrestrial and freshwater ecosystems, and the implications of these changes for social and ecological systems. It encompasses the variability in the key types of ecosystems that are both unique to Arctic and boreal regions in North America as well as being representative of the larger Northern High Latitude region.

We aim to make the data more widely available and accessible to communities, governments, and other organizations.

For each type of data, there is a page with a general explanation and a map of the full extent that the data covers. We also provide the following information:

What do the data show?

This section explains the importance of the dataset, as well as the type of information that can be interpreted from the maps provided.

How were the data produced?

This section explains the methods for capturing the data. This may include whether the data were collected through airborne campaigns (in which sensors attached to aircraft gather information about the earth's surface) or satellites (which contain instruments to collect images as they orbit the earth). Additionally, this may explain models or algorithms that were used to produce data.

Spatial Resolution:

This includes a value that tells the distance between each measurement that is recorded. Smaller distances lead to a higher level of detail, but less area can be covered in the same amount of time.

Spatial Coverage:

This details the regional extent that the dataset includes.

Temporal Resolution:

This tells how often the data were measured, whether this occurred only once or how frequently measurements recurred.

Temporal Coverage:

This includes a data range that tells the time period that the dataset covers.

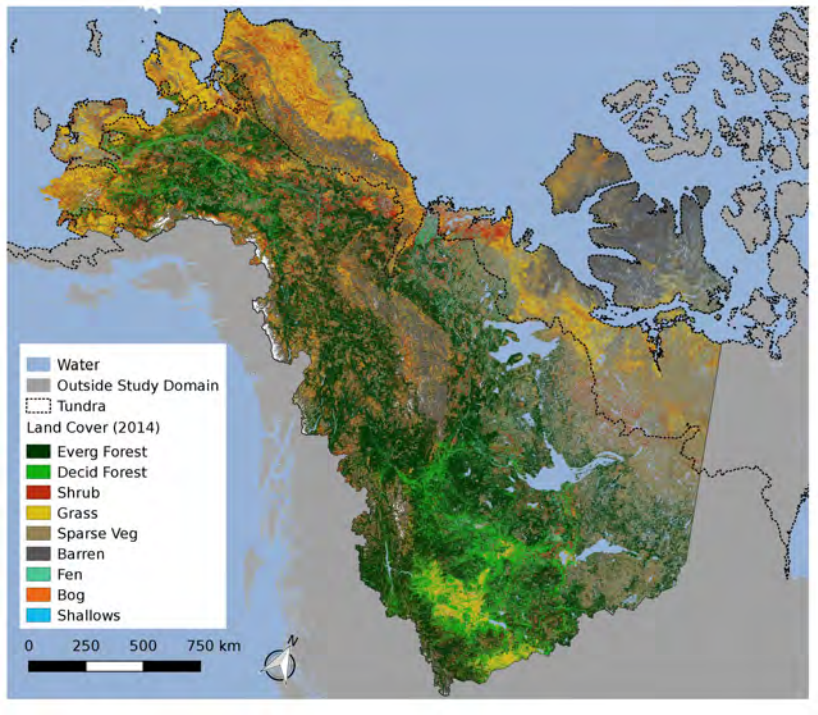
Citation

There is also a citation with a link to further information and a platform to download each dataset.

Alaska and Canada Example Maps

Where applicable, additional regional maps for regions in Alaska and Canada are provided. These show how the data can be visualized at a community or local level.

ABoVE: Landsat-derived Annual Dominant Land Cover Across ABoVE Core Domain, 1984-2014



Land cover across ABoVE core domain 2014.

What do the data show?

These data include land cover classifications over Alaska and western Canada from 1984-2014. One dataset classifies land cover into fifteen classes of forest and shrub types, and the other simplifies this classification into ten categories.

How were the data produced?

The datasets were produced by determining the dominant plant type in each 30 meter by 30 meter pixel (square). Thus, each square is classified according to which plant type covered the largest area.

Spatial Resolution: 30 m

Spatial Coverage: Alaska and Canada

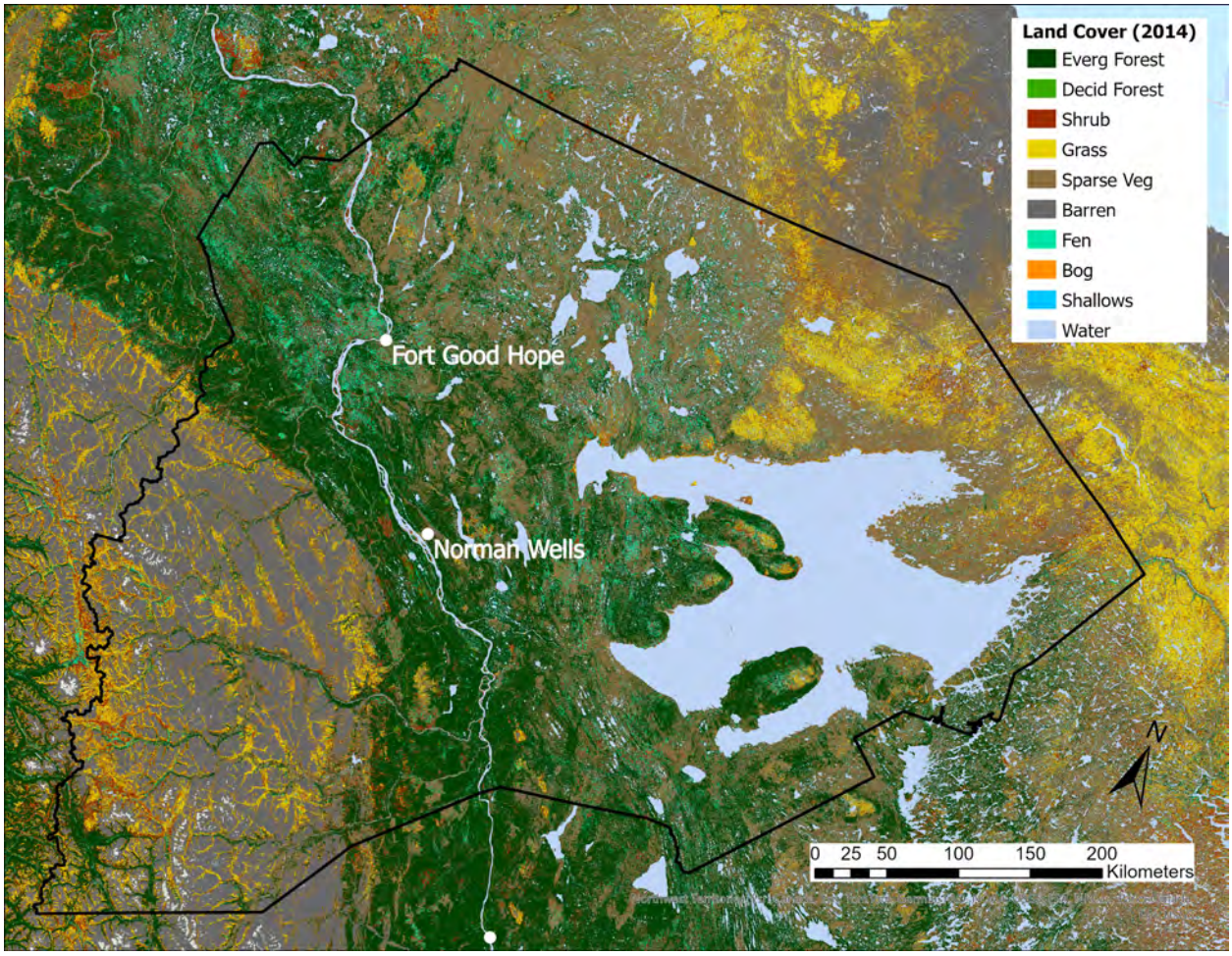
Temporal Coverage: 01-01-1984 to 12-31-2014

Temporal Resolution: Annual

Citation:

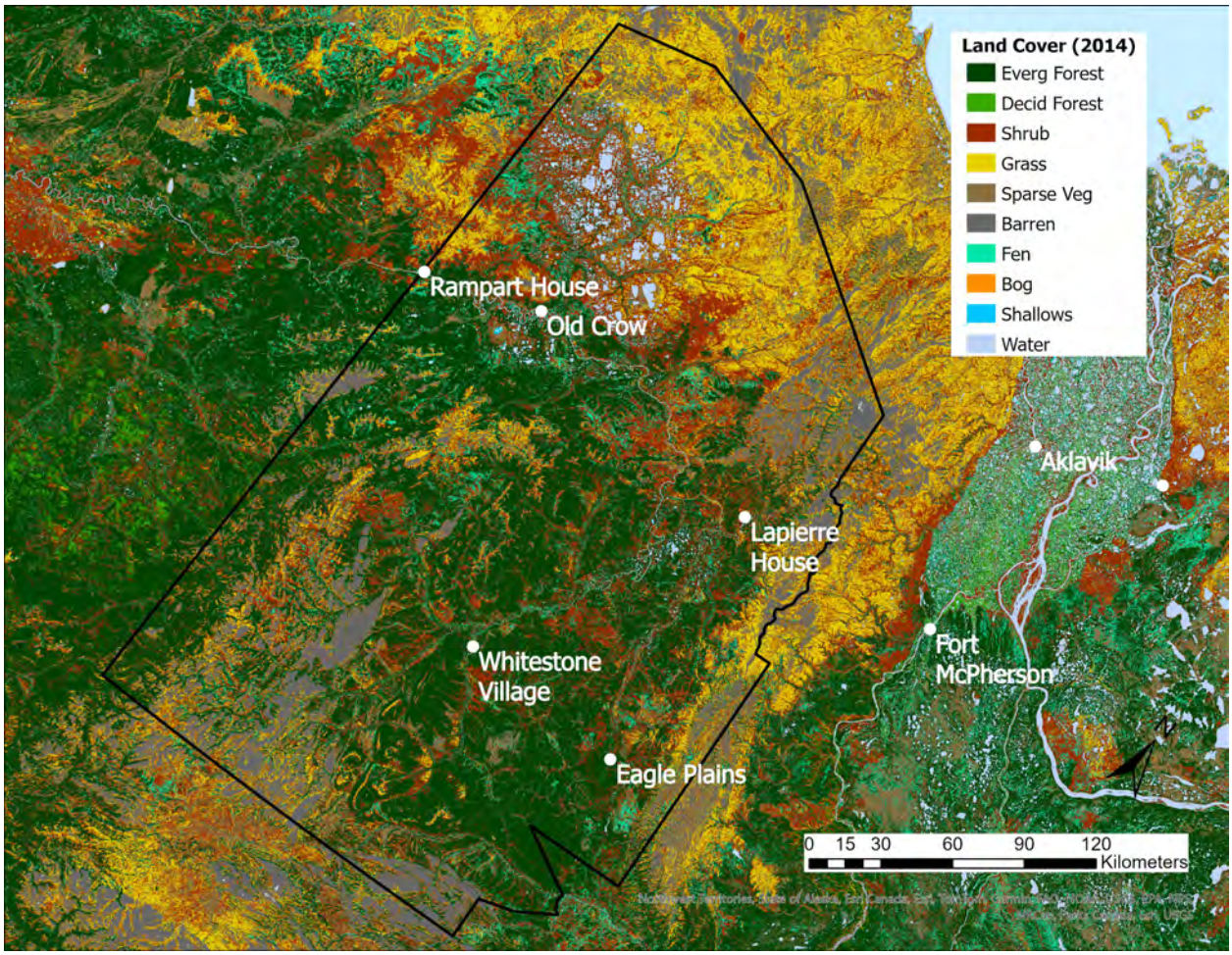
Wang, J.A., D. Sulla-Menashe, C.E. Woodcock, O. Sonnentag, R.F. Keeling, and M.A. Friedl. 2019. ABoVE: Landsat-derived Annual Dominant Land Cover Across ABoVE Core Domain, 1984-2014. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1691

Sahtu Region



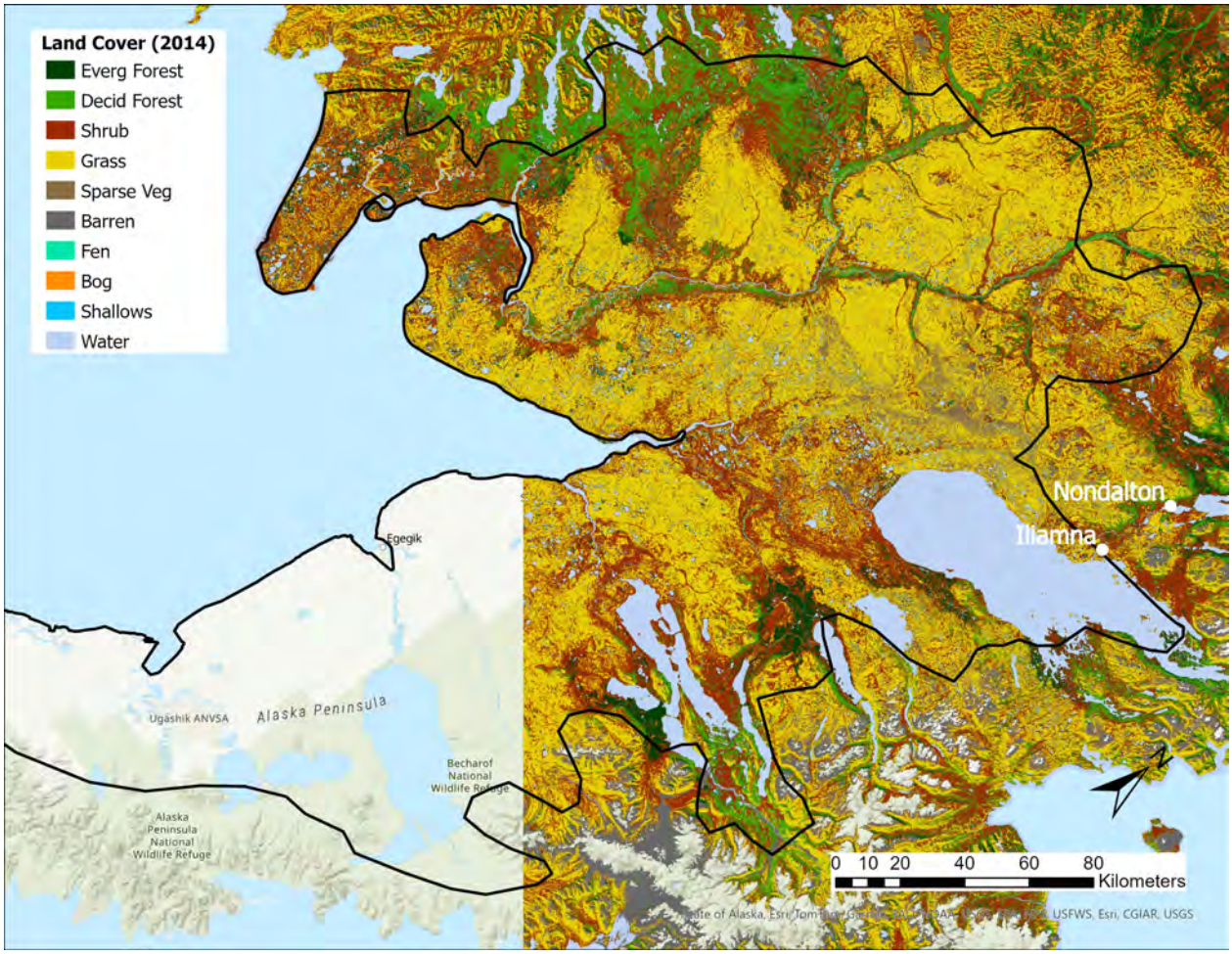
Land cover in Sahtu Region 2014.

Vuntut Gwitchin Traditional Territory



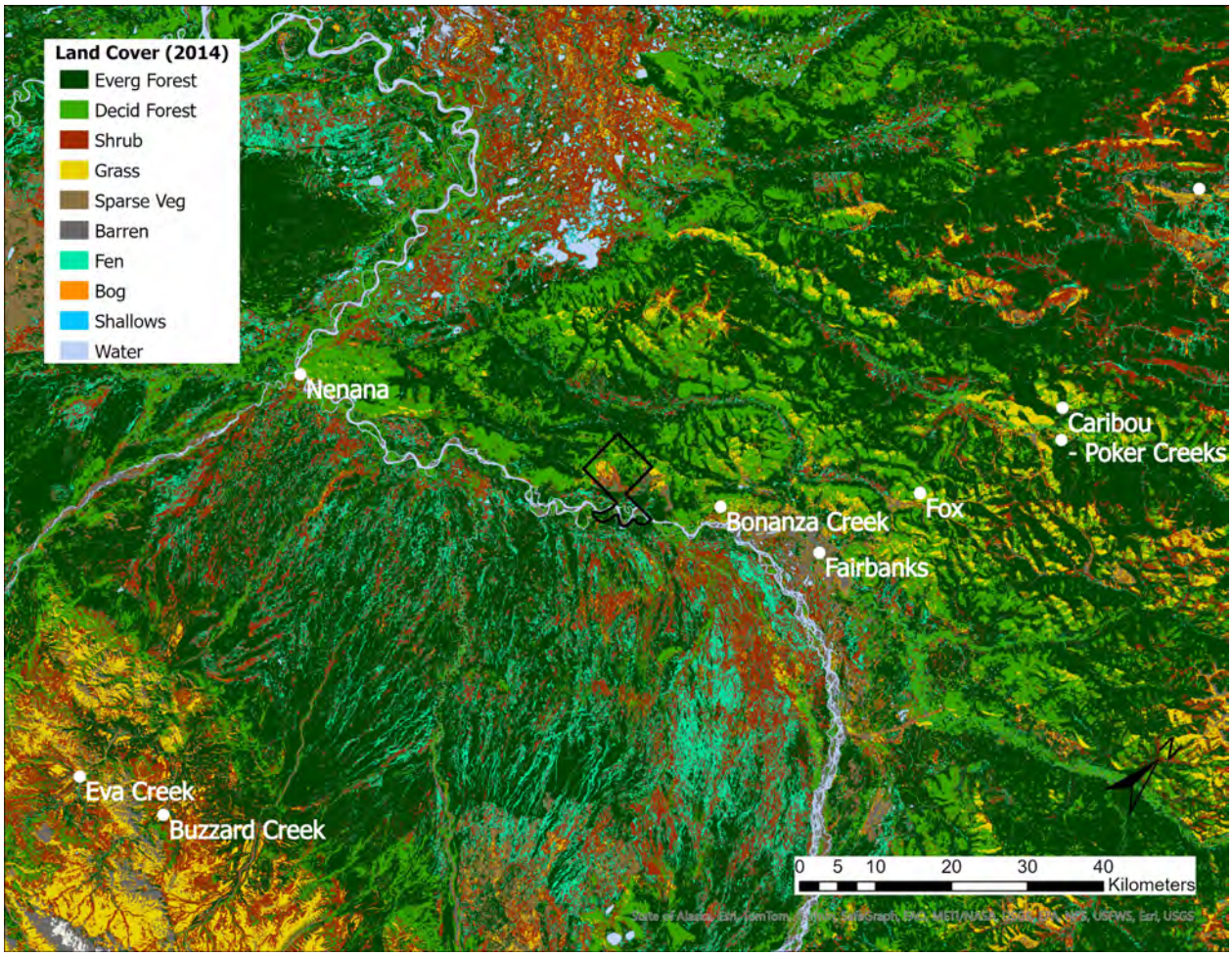
Land cover in Vuntut Gwitchin traditional territory 2014.

Bristol Bay



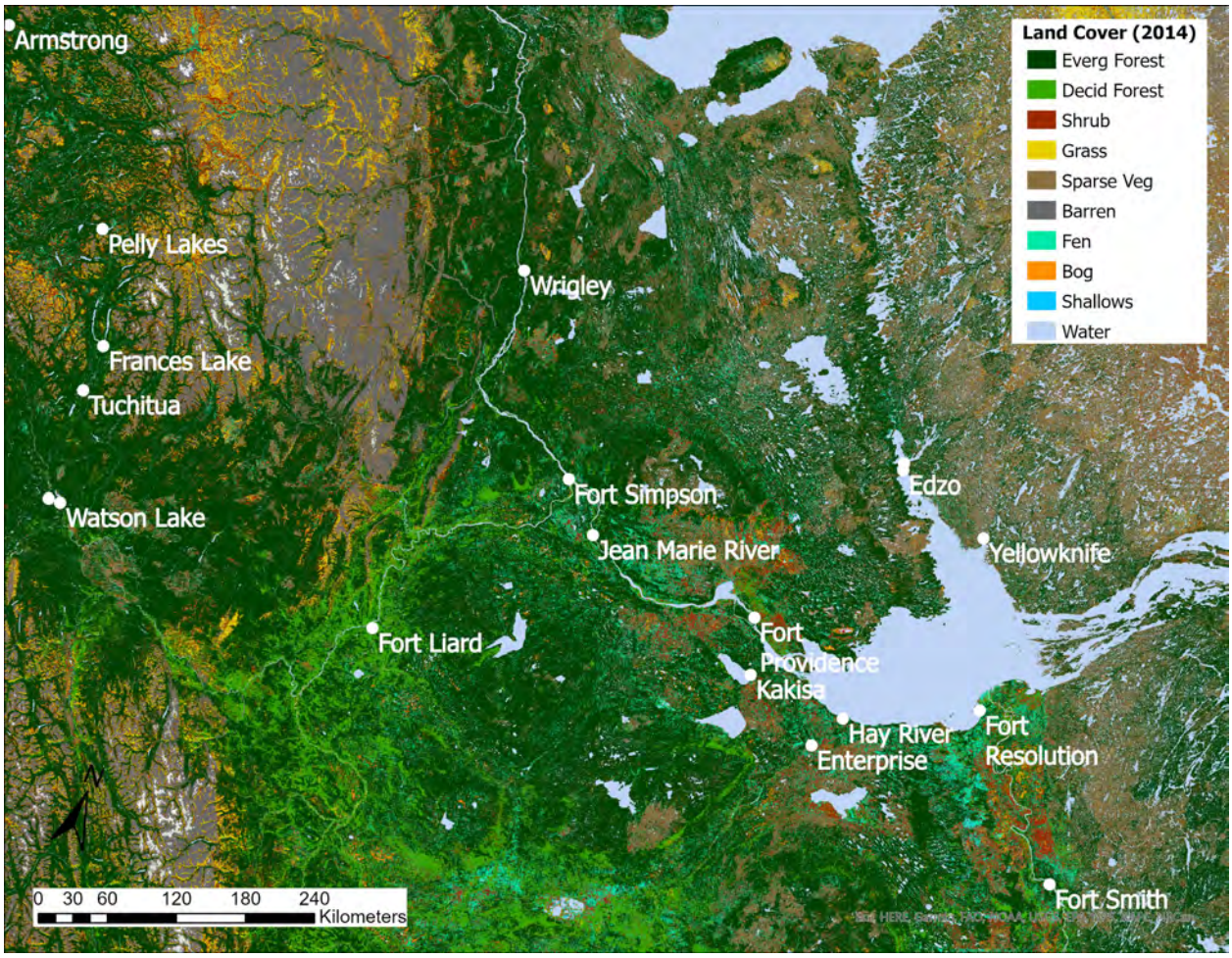
Land cover in Bristol Bay 2014.

Bonanza Creek



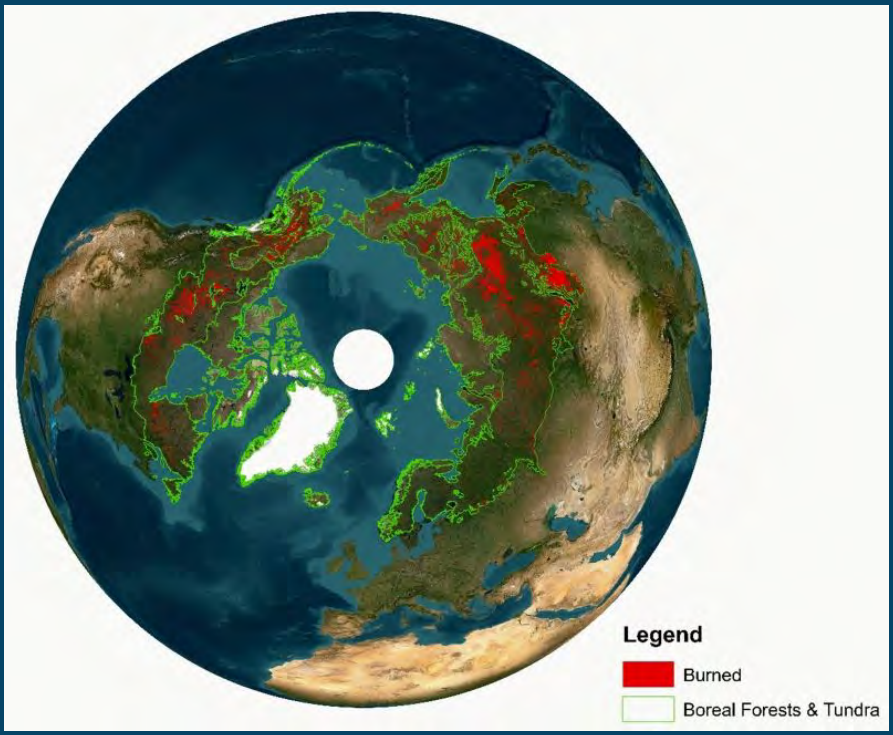
Land cover 2014 with Bonanza Creek Long Term Ecological Research area delineated in center.

Deh Cho Region



Land cover in Deh Cho Region 2014.

Arctic Boreal Annual Burned Area, Circumpolar Boreal Forest and Tundra, V2, 2002-2022



Burned area between 2002 and 2022.

What do the data show?

The dataset provides the amount of area that was burned in boreal forests and tundra in the northern latitudes (areas above 50 degrees north latitude) each year from 2002 to 2022.

How were the data produced?

The data were produced using satellite data at ~500m spatial resolution (MODIS data) through an algorithm that captures the difference before and after a fire to assess the amount of area burned. In particular, this algorithm was intended to capture fires that occur late in the season (near the end of the northern hemisphere summer months) and unburned areas within fire perimeters.

Spatial Resolution: 463 m

Spatial Coverage: High northern latitudes (circumpolar above 50 degrees N)

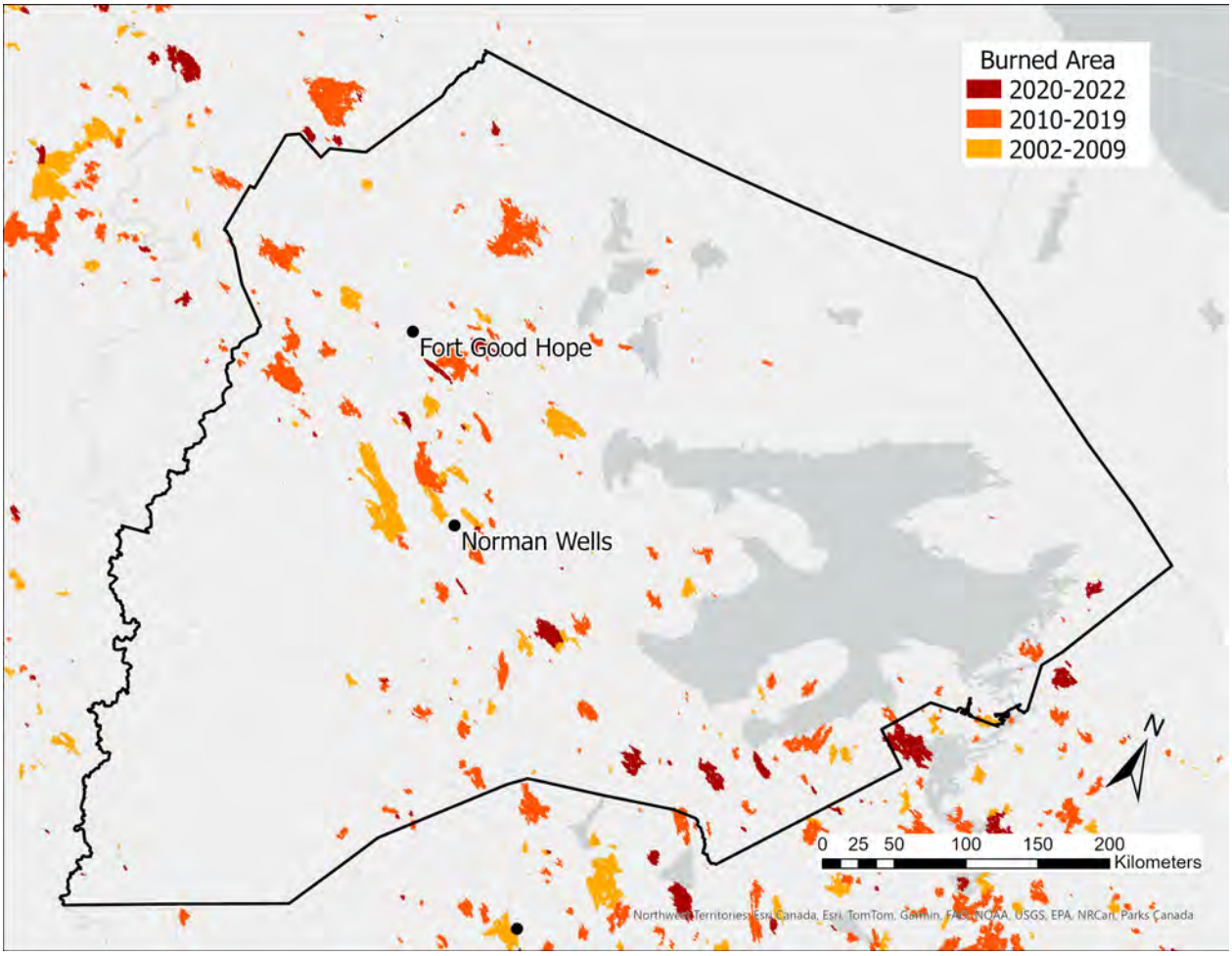
Temporal Coverage: 2002 to 2022

Temporal Resolution: Annual

Citation:

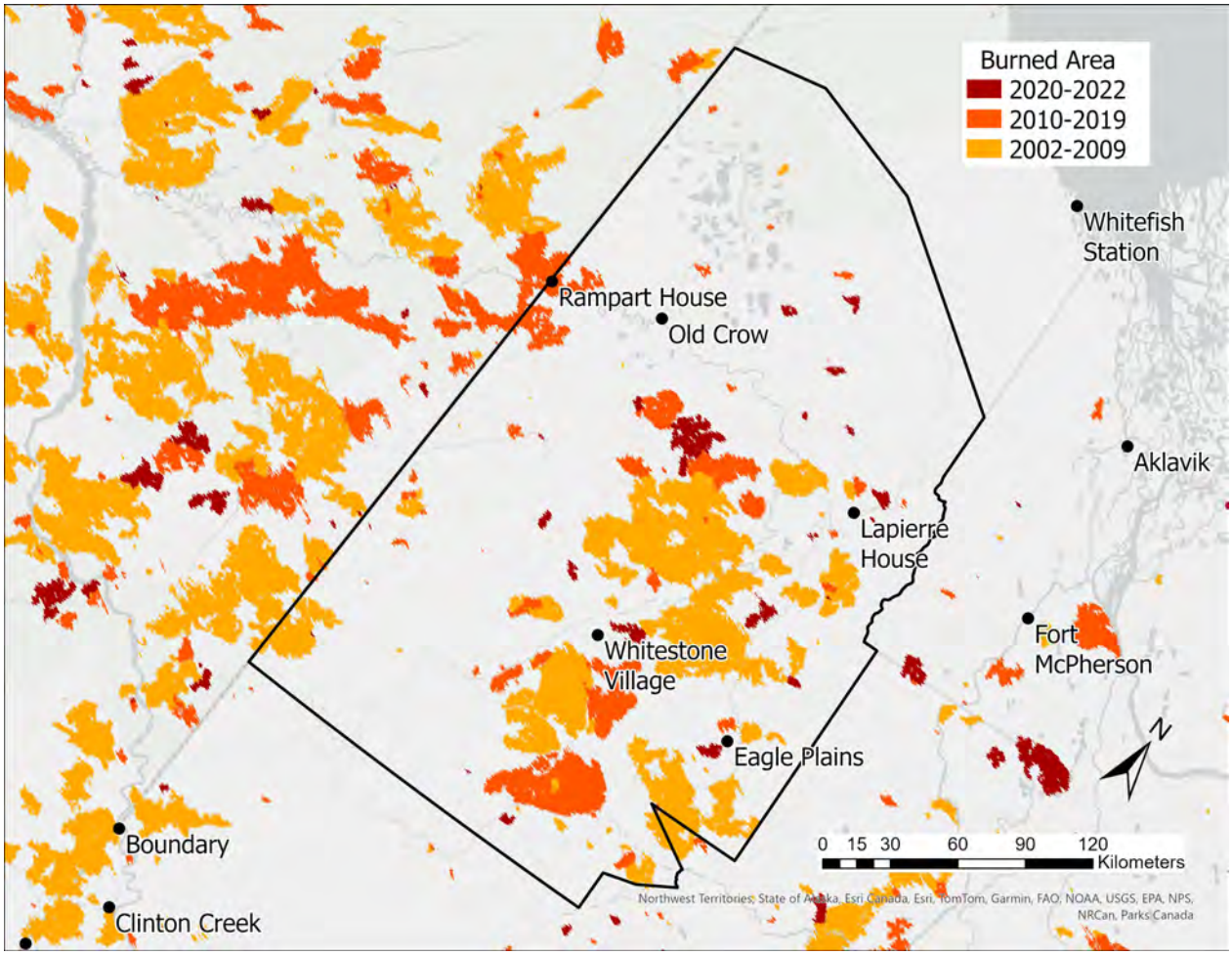
Loboda, T.V., J.V. Hall, D. Chen, A. Hoffman-Hall, V.S. Shevade, F. Argueta, and X. Liang. 2024. Arctic Boreal Annual Burned Area, Circumpolar Boreal Forest and Tundra, V2, 2002-2022. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2328

Sahtu Region



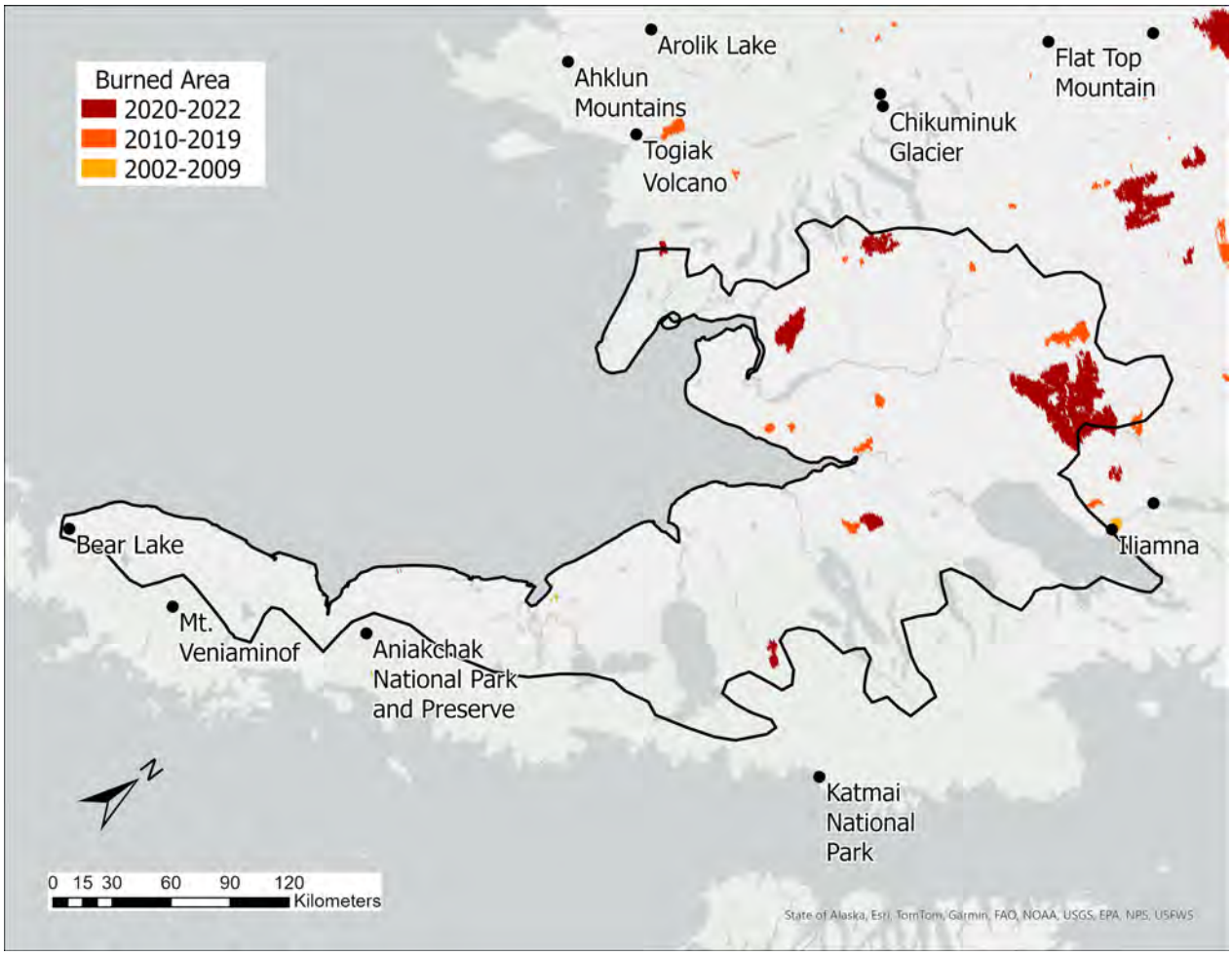
Sahtu Region burned area between 2002 and 2022.

Vuntut Gwitchin Traditional Territory



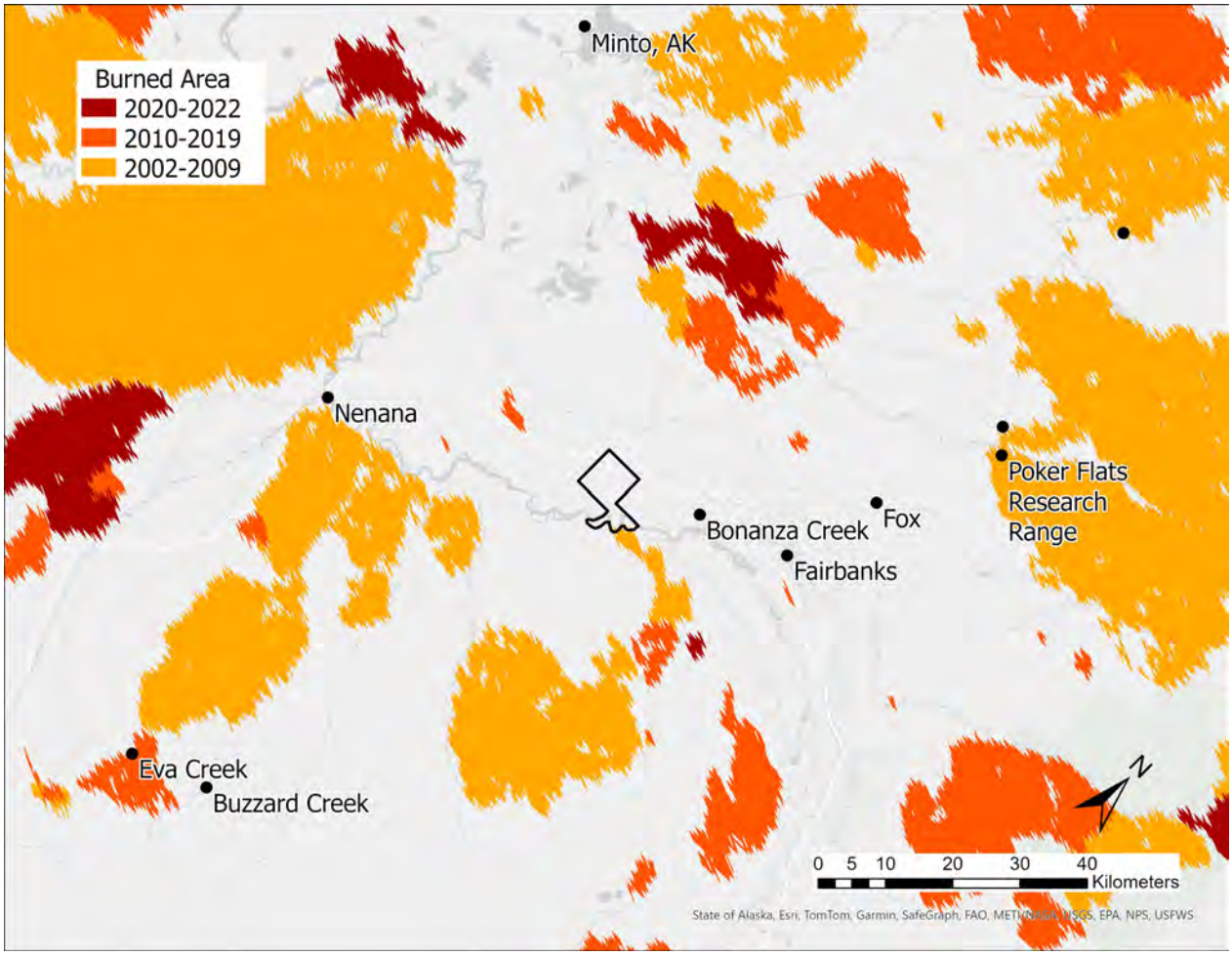
Vuntut Gwitchin traditional territory burned area between 2002 and 2022.

Bristol Bay



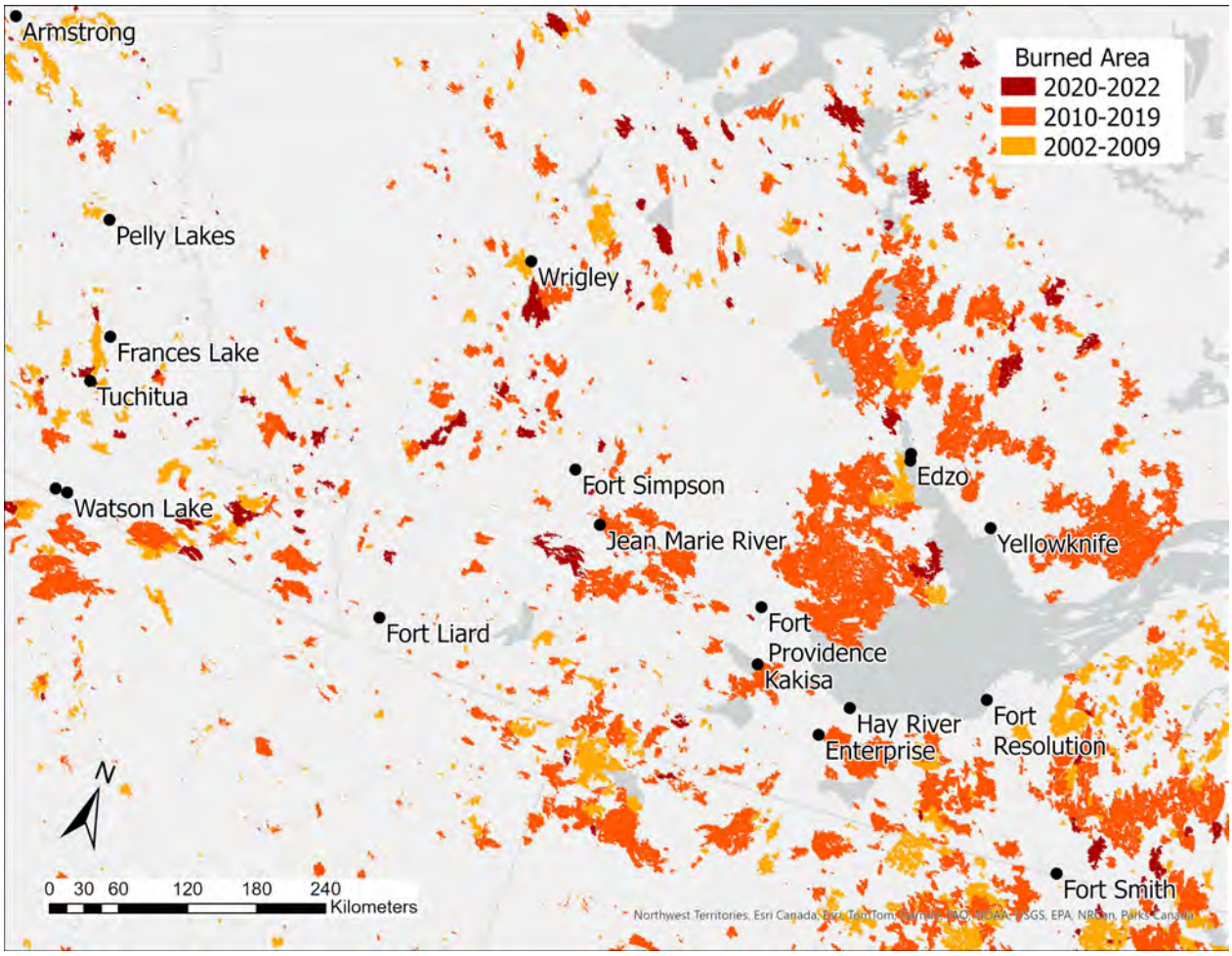
Bristol Bay burned area between 2002 and 2022.

Bonanza Creek



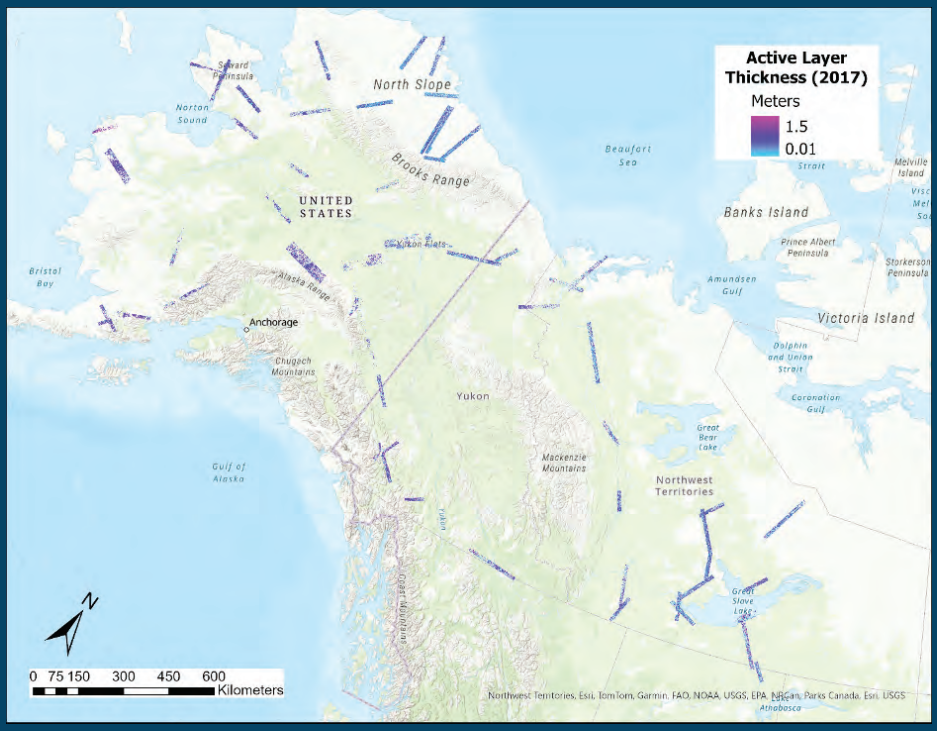
Burned area between 2002 and 2022 with Bonanza Creek Long Term Ecological Research area delineated in center.

Deh Cho Region



Deh Cho Region burned area between 2002 and 2022.

ABoVE: Active Layer Thickness from Airborne L- and P- band SAR, Alaska, 2017, Ver. 3



Active layer thickness from ABoVE flightpaths 2017.

What do the data show?

This dataset estimates changes in the presence of permafrost and soil moisture by calculating active layer thickness, seasonal subsidence, and the vertical soil moisture profile at the time of predicted maximum thaw in 2017. The active layer thickness is the depth of the ground that thaws each summer. The seasonal subsidence is how much the Earth's surface moves downward each year due to the ground becoming drier. The vertical soil moisture profile is how much the quantity of water in the soil changes as the depth of the soil changes, which impacts how quickly water can pass through soil and how quickly soil will dry out.

How were the data produced?

These data were produced through NASA's ABoVE airborne campaign. Sensors attached to aircraft gathered images of the earth's surface above Alaska and Canada. The data product was created by the Permafrost Dynamics Observatory (PDO) project.

Spatial Resolution: 30m

Spatial Coverage: 51 sites across the ABoVE Domain, including 39 in Alaska and 12 in Canada; Alaska, Yukon, Northwest Territories

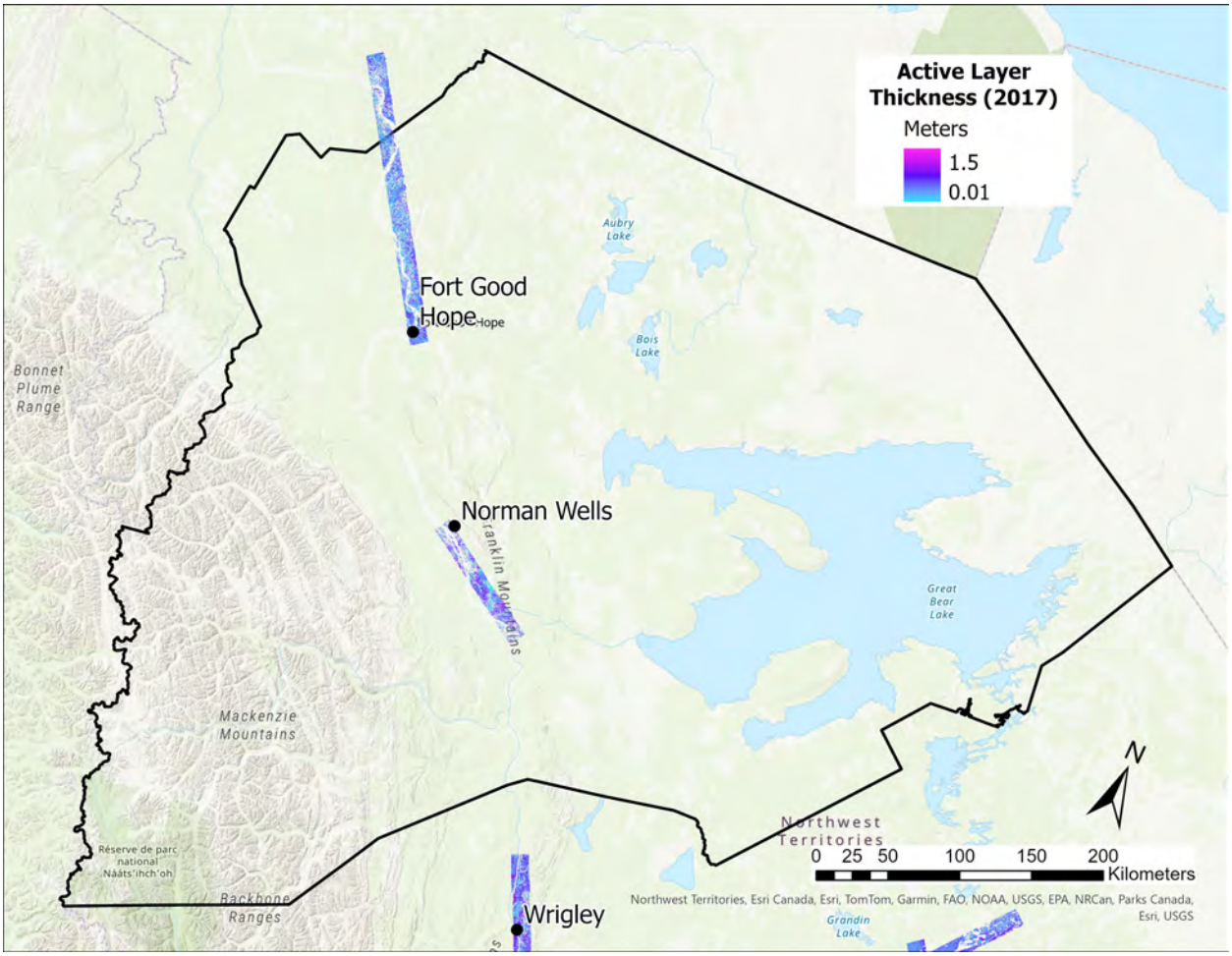
Temporal Coverage: 06-19-2017 to 09-16-2017

Temporal Resolution: One-time estimates in 2017

Citation:

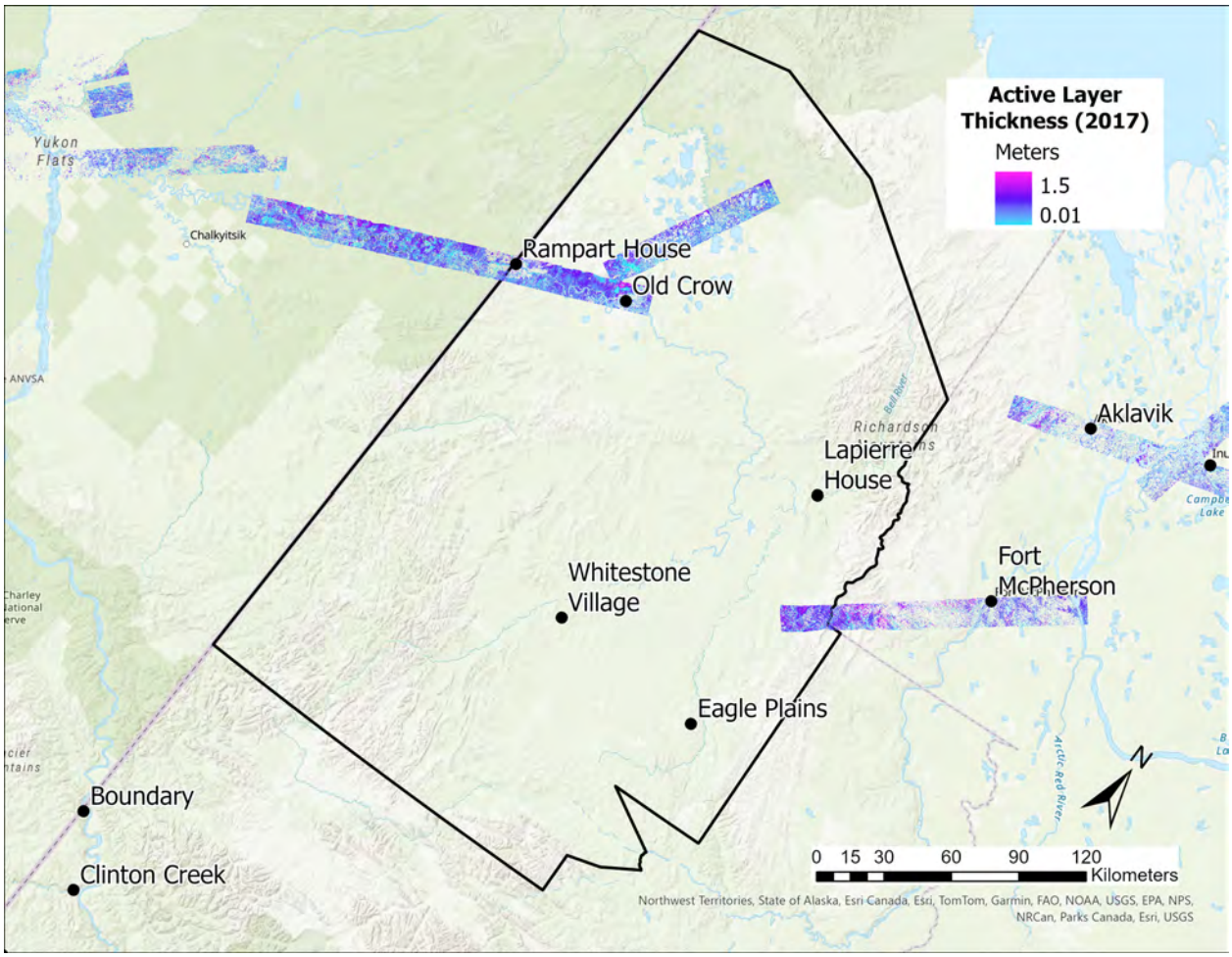
Chen, R.H., R.J. Michaelides, J. Chen, A.C. Chen, L.K. Clayton, K. Bakian-Dogaheh, L. Huang, E. Jafarov, L. Liu, M. Moghaddam, A.D. Parsekian, T.D. Sullivan, A. Tabatabaeenejad, E. Wig, H.A. Zebker, and Y. Zhao. 2022. ABoVE: Active Layer Thickness from Airborne L- and P- band SAR, Alaska, 2017, Ver. 3. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2004

Sahtu Region



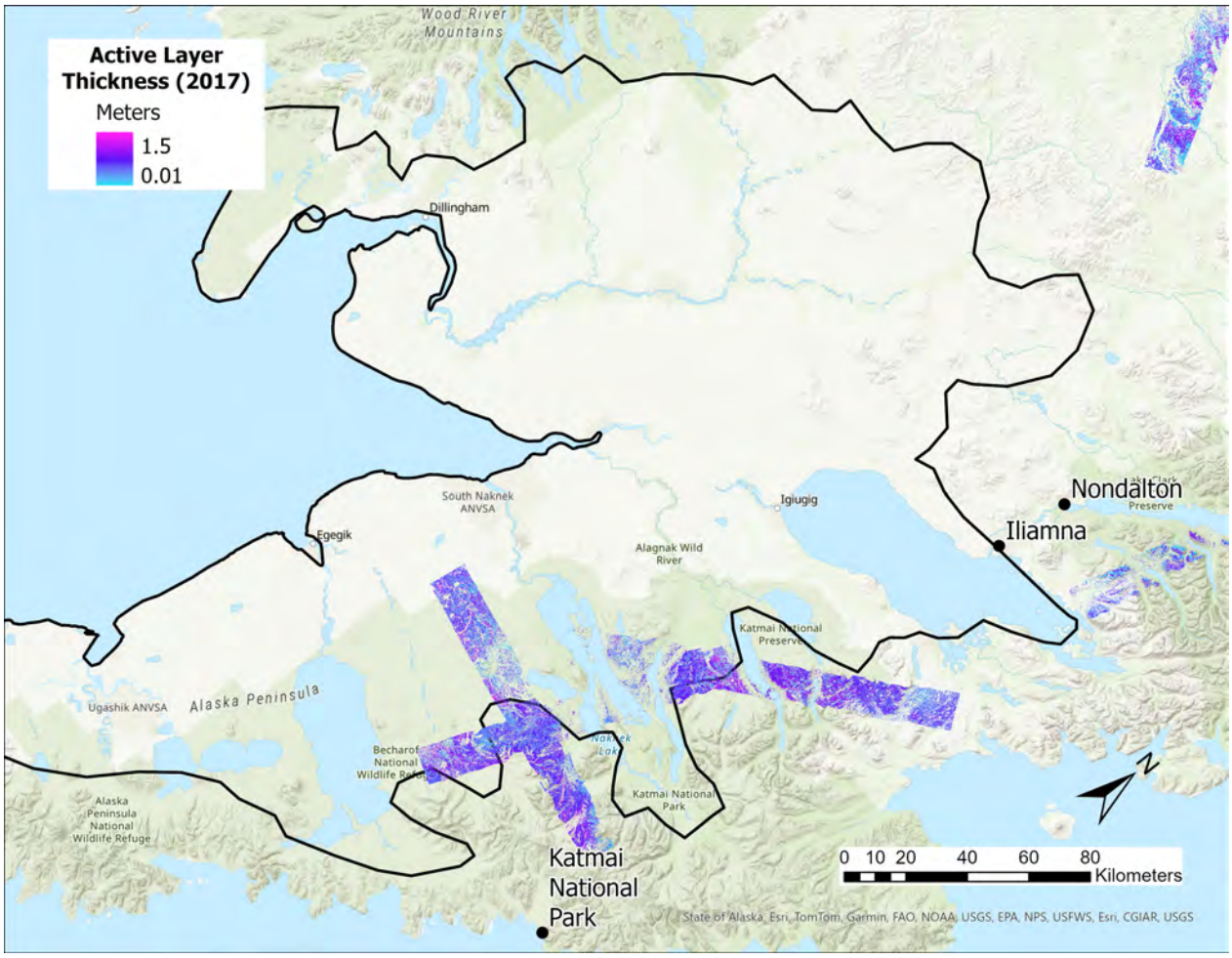
Sahtu Region active layer thickness 2017.

Vuntut Gwitchin Traditional Territory



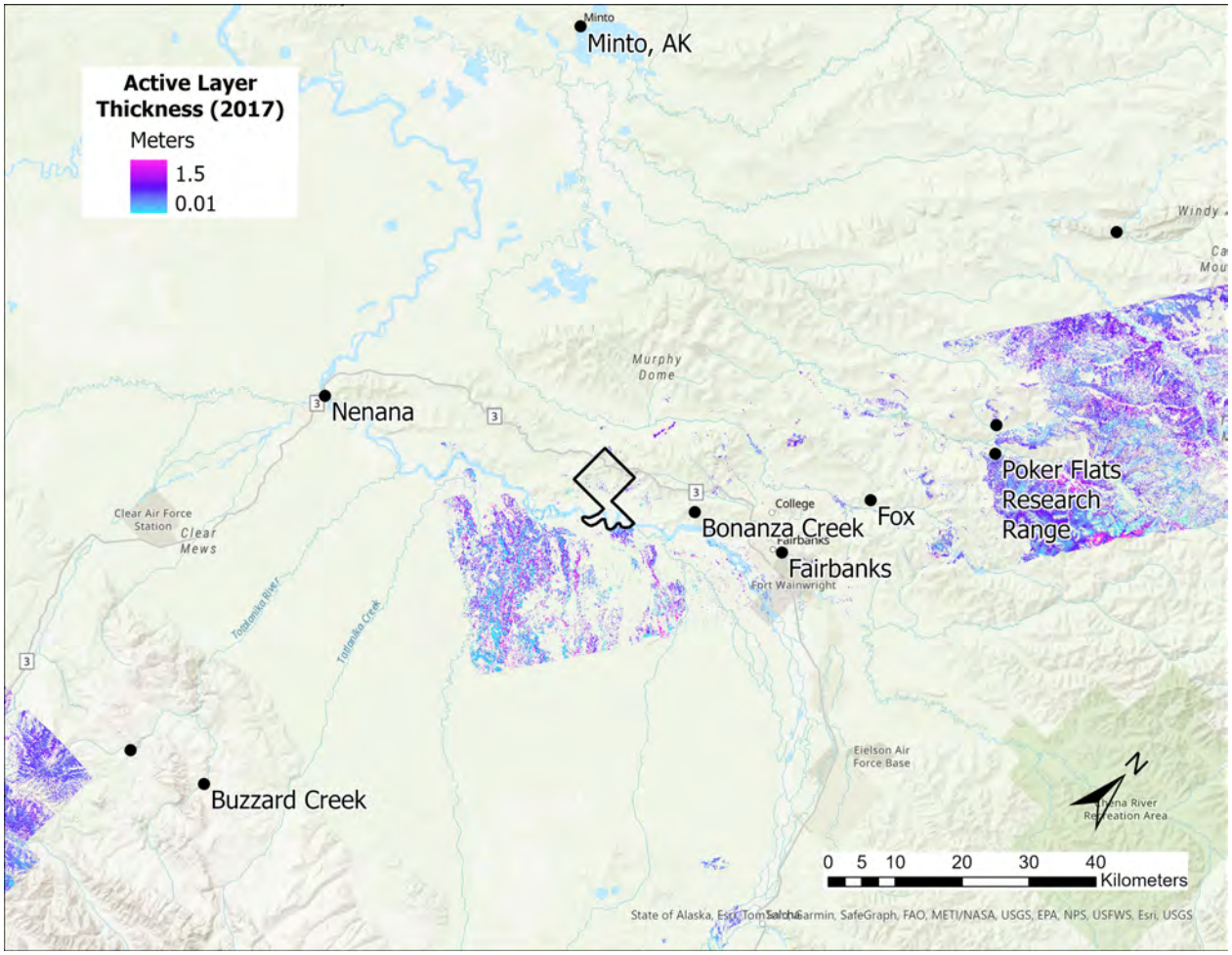
Vuntut Gwitchin traditional territory active layer thickness 2017.

Bristol Bay



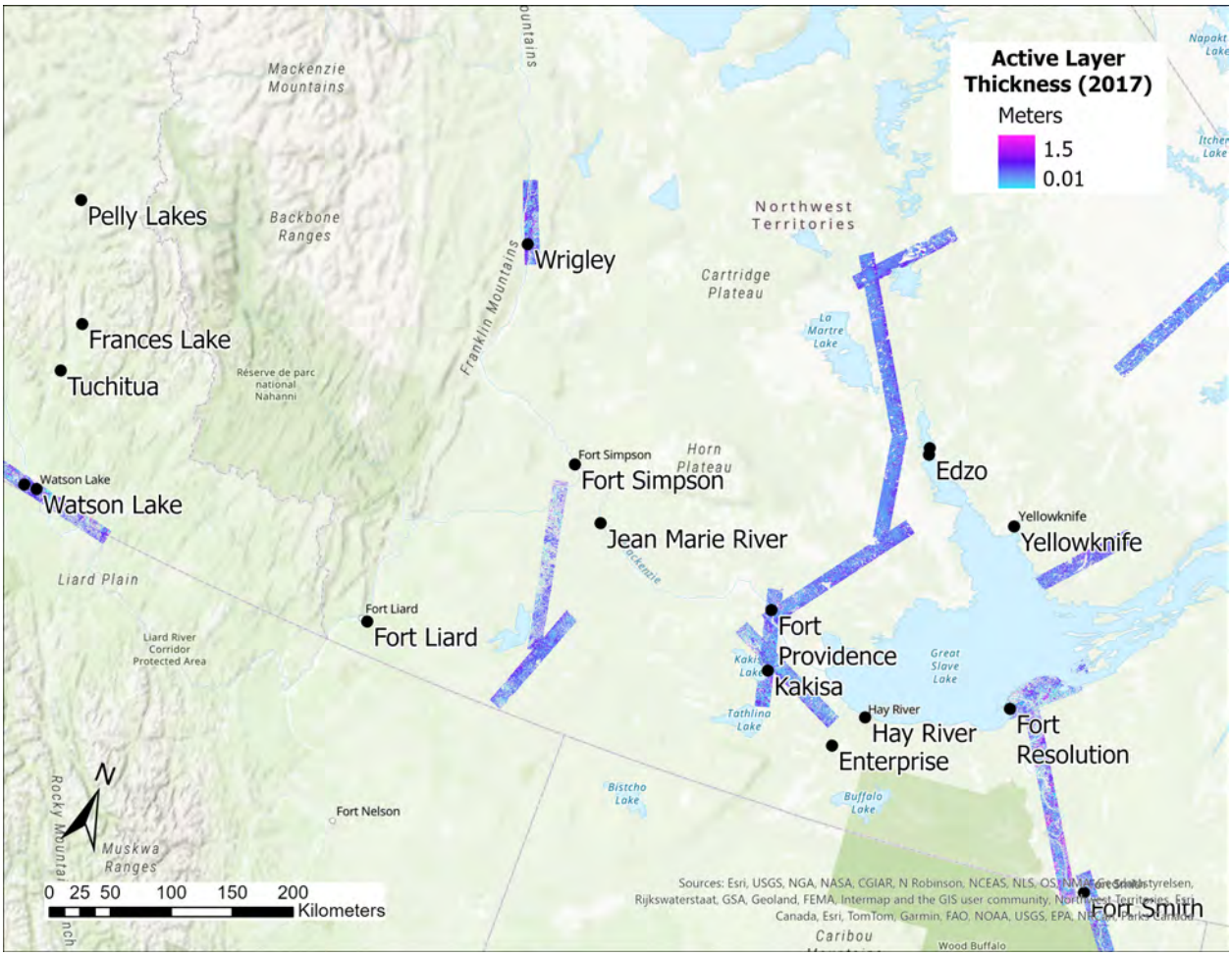
Bristol Bay active layer thickness 2017.

Bonanza Creek



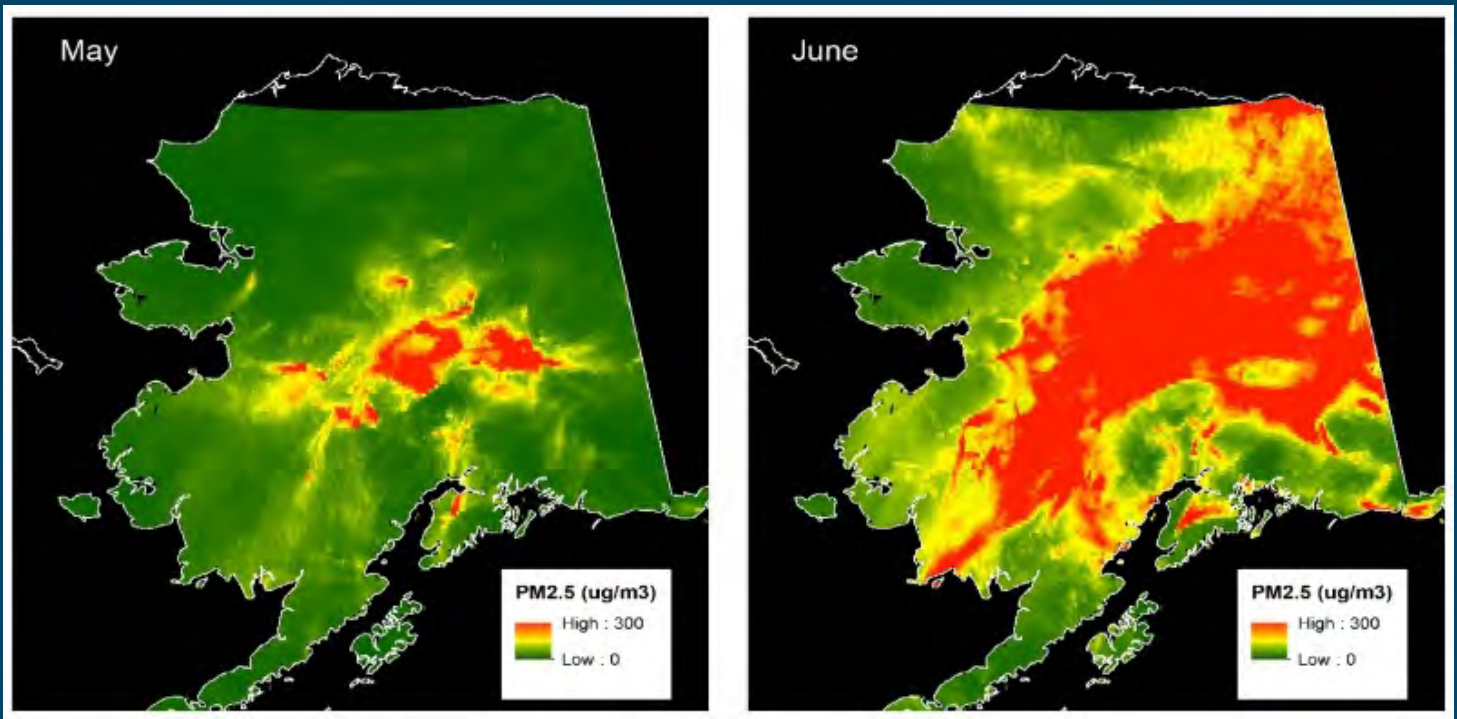
Active layer thickness 2017 with Bonanza Creek Long Term Ecological Research area delineated in center.

Deh Cho Region



Deh Cho Region active layer thickness 2017.

Simulated Fine Particulate Matter (PM2.5) Estimates over Alaska, 2001-2015



Maximum PM2.5 concentration maps for May and June of 2001-2015.

What do the data show?

This dataset estimates the concentration of PM2.5 over Alaska, U.S from May to September between 2001 to 2015. PM2.5 is particulate matter (PM) with a diameter less than or equal to 2.5 microns. PM refers to solid or liquid particles in the air that are too small to see but can cause health problems for people and organisms that inhale them.

How were the data produced?

The dataset was produced using fire emissions and burning data over Alaska. These data were inputted into multiple models to map the amount of particulate matter over Alaska at a given time. These models use data that is available to make informed predictions for locations or times where data is unavailable.

Spatial Resolution: 0.10 degree (near 1 kilometer)

Spatial Coverage: Alaska, U.S.

Temporal Coverage: 05-10-2001 to 09-28-2015

Temporal Resolution: Daily

Citation:

Chen, D., M. Billmire, N.H.F. French, T.V. Loboda, and A.E. Bredder. 2023. Simulated Fine Particulate Matter (PM2.5) Estimates over Alaska, 2001-2015. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2157

ABoVE: Boelman Alberta American Robins

Seasonal migration paths (2016) of four selected American robins, with names chosen by 4th and 5th graders at Cottage Lane Elementary in Blauvelt, New York.

What do the data show?

The data show the seasonal movement patterns of American robins throughout Alaska and northwestern Canada between 2016 and 2018.

How were the data produced?

The data were produced by tagging American robins with GPS sensors to track their movement and through the use of satellite remote sensing to assess environmental factors that influence their movement and habitat selection.

Spatial Resolution: Point-resolution

Spatial Coverage: Alaska and northwestern Canada

Temporal Coverage: 04-23-2016 to 06-08-2018

Temporal Resolution: Periodic readings from April to July during 2016 to 2018

Citation:

Oliver, R.Y., P.J. Mahoney, E. Gurarie, N. Krikun, B.C. Weeks, M. Hebblewhite, G. Liston, and N. Boelman. 2020. Behavioral responses to spring snow conditions contribute to long-term shift in migration phenology in American robins. Environmental Research Letters. 15(4):045003. https://doi.org/10.1088/1748-9326/ab71a0

Access More Datasets in the Movebank Arctic Animal Movement Archive:

https://www.movebank.org/cms/movebank-content/arctic-animal-movement-archive