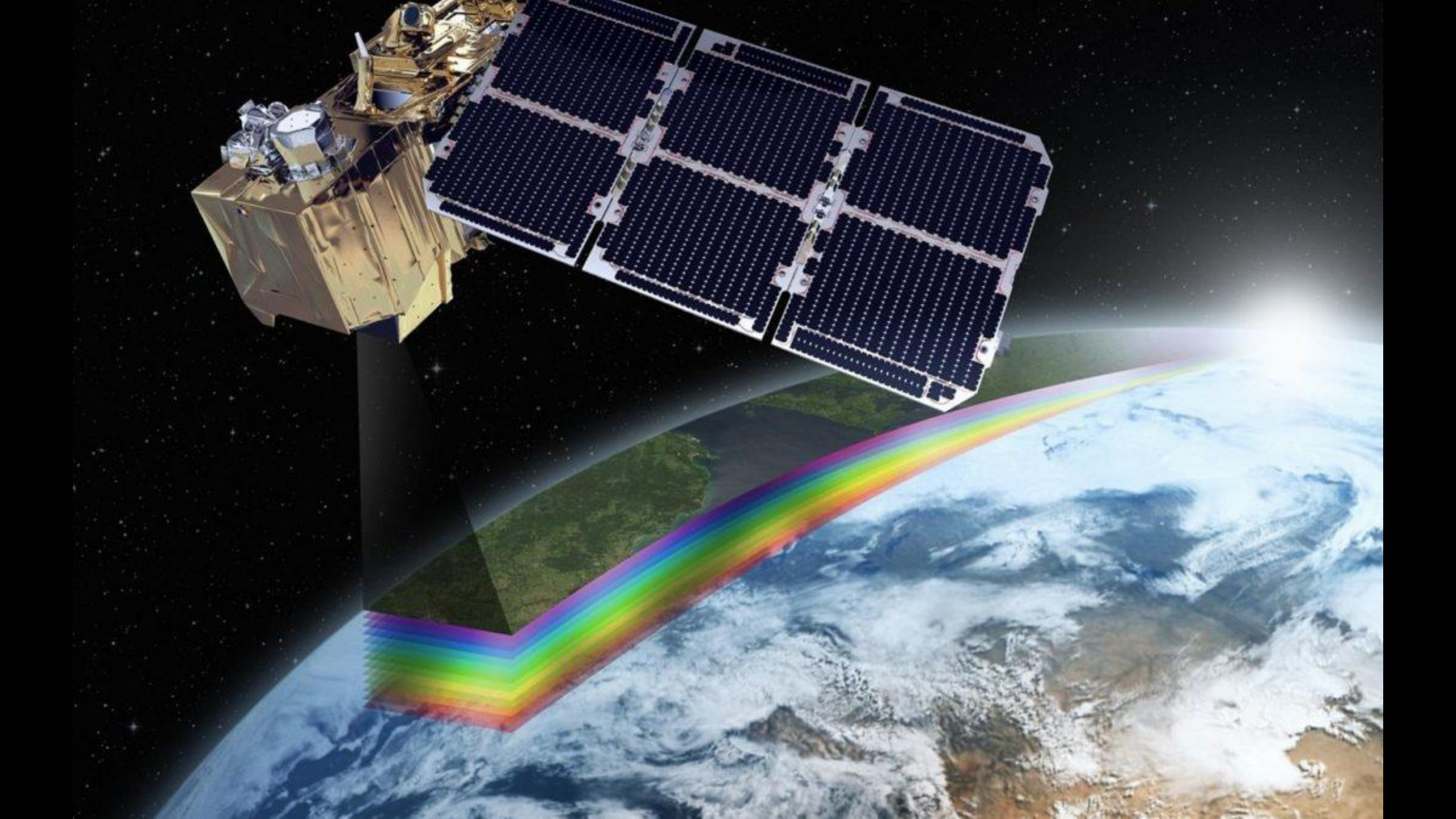
Introduction to Movebank, MoveApps and Room to Roam: Y2Y Wildlife Movements

Roland Kays
North Carolina Museum of Natural Sciences
NC State University

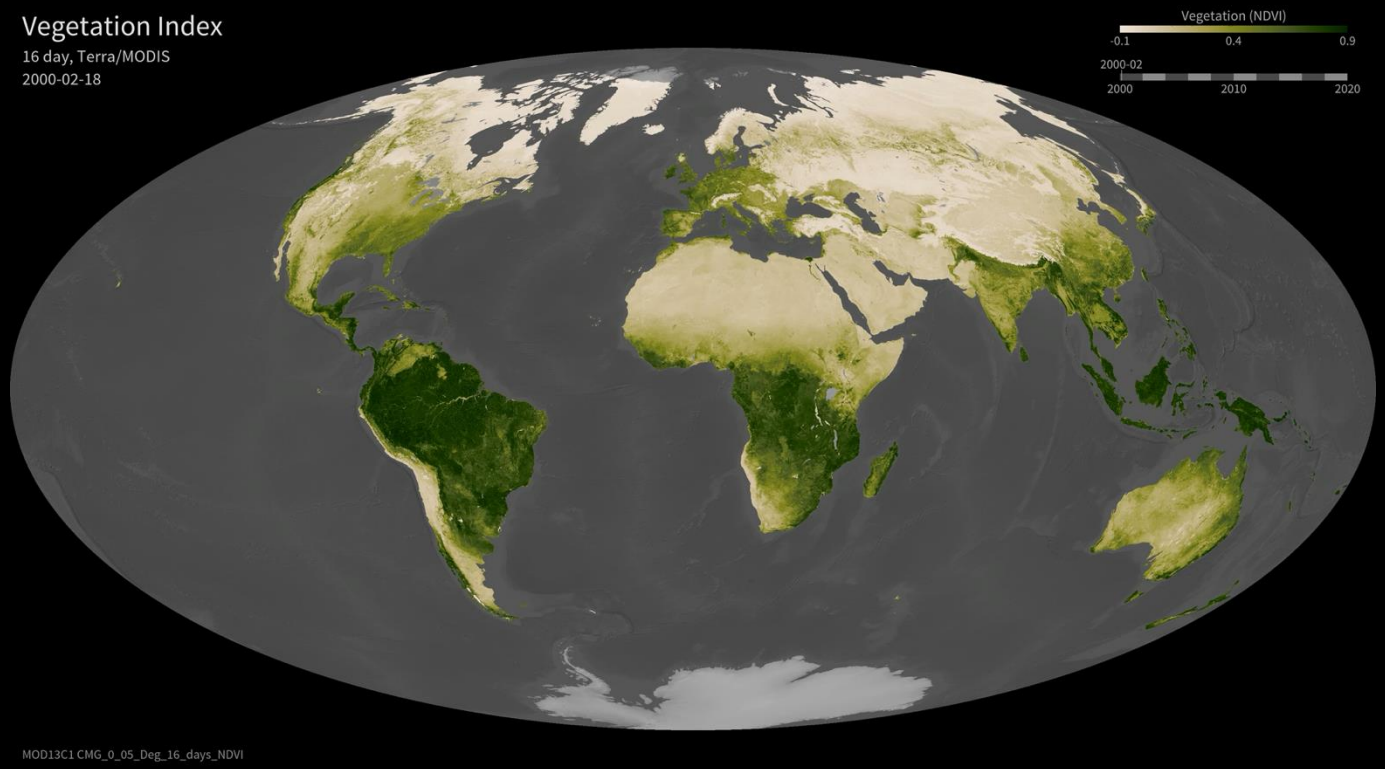
Blue Marble photograph
Apollo 17
1972

Profound impact on humanity’s perception of Earth and the environment



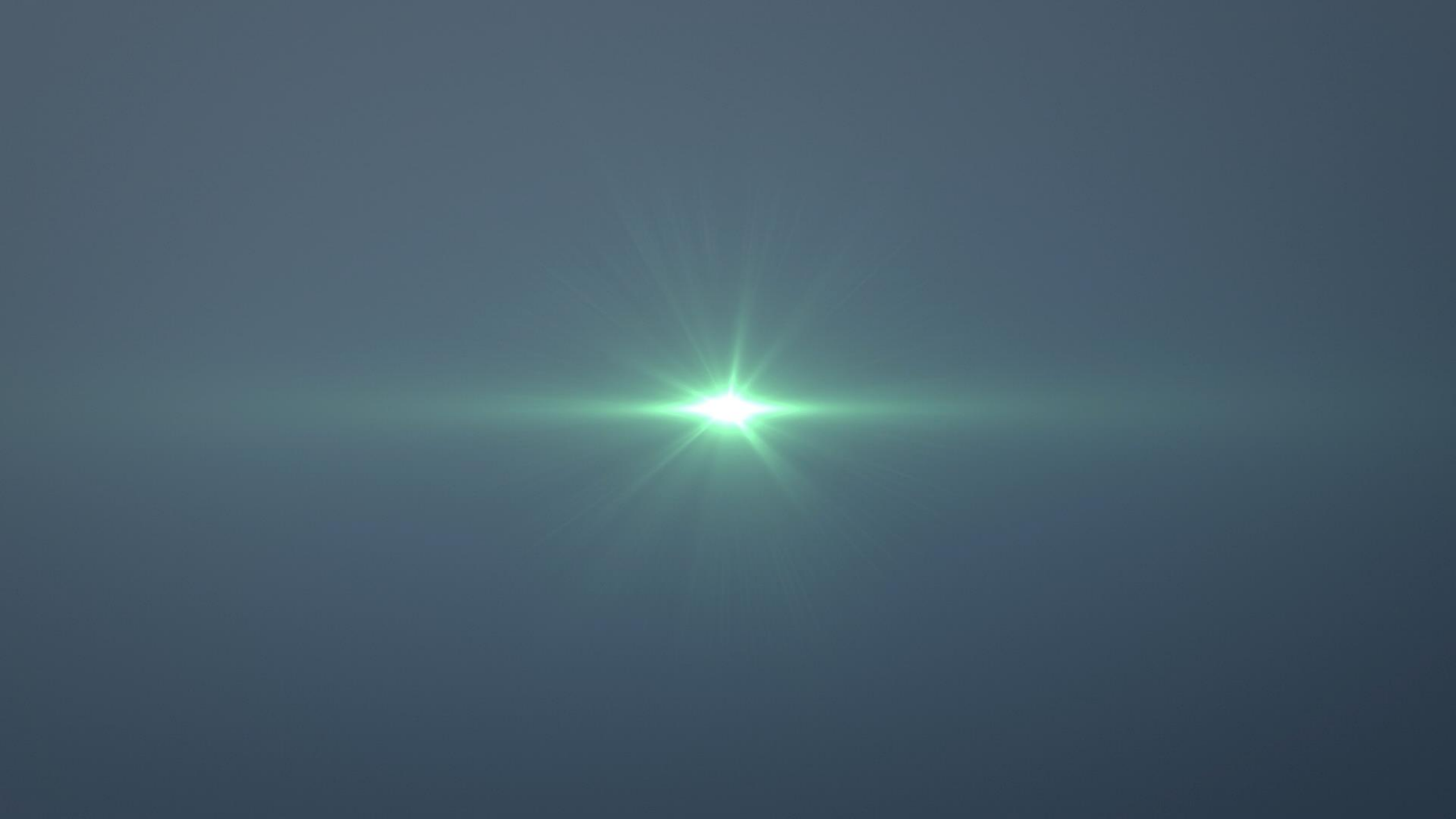
Remote Sensing

Snow cover from Modis



NDVI from Modis

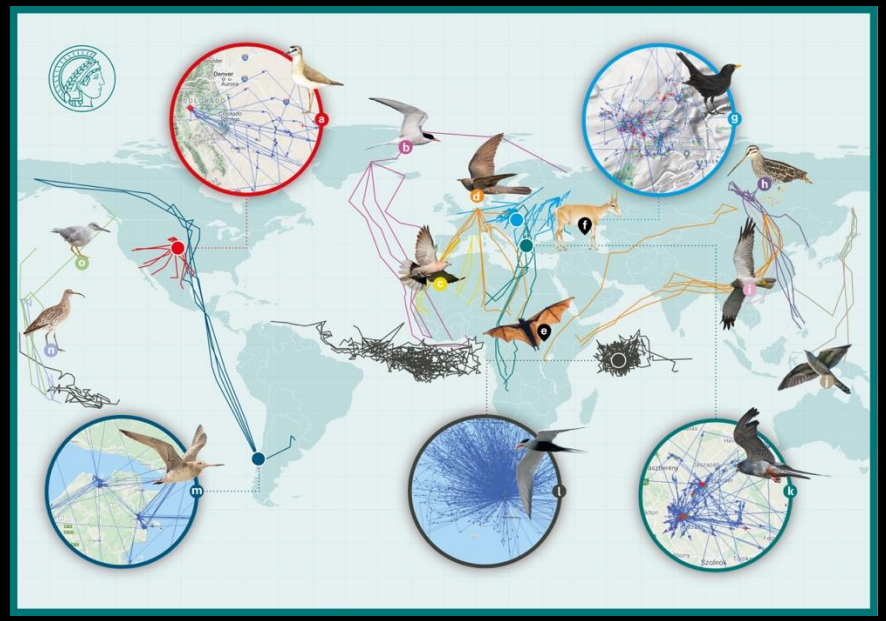
Satellite Animal Tracking

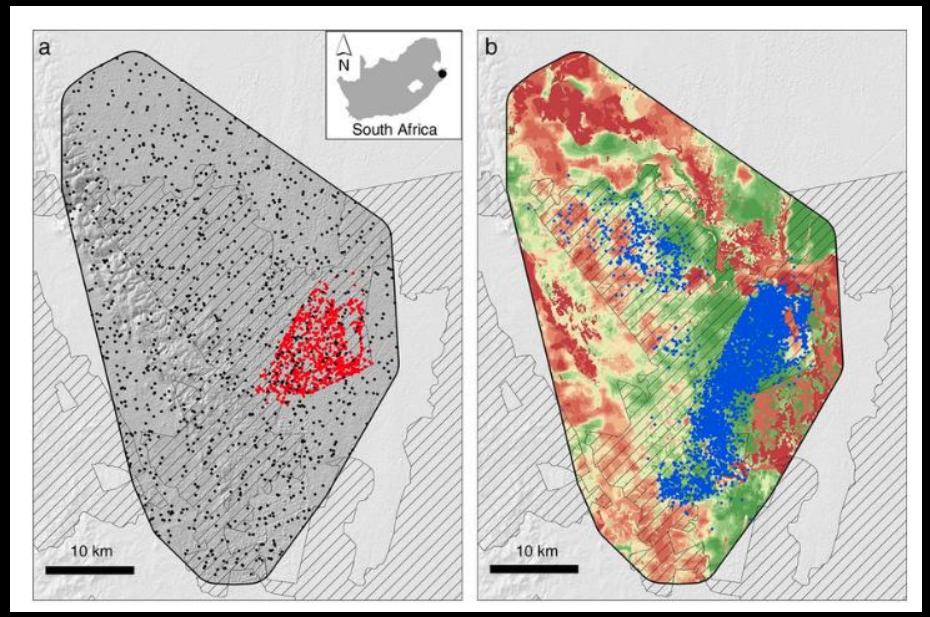


Animal Tracking + Remote Sensing

Where? + Why?

Maps + Resource Selection Functions





Fattebert et al. 2015

It can get complicated

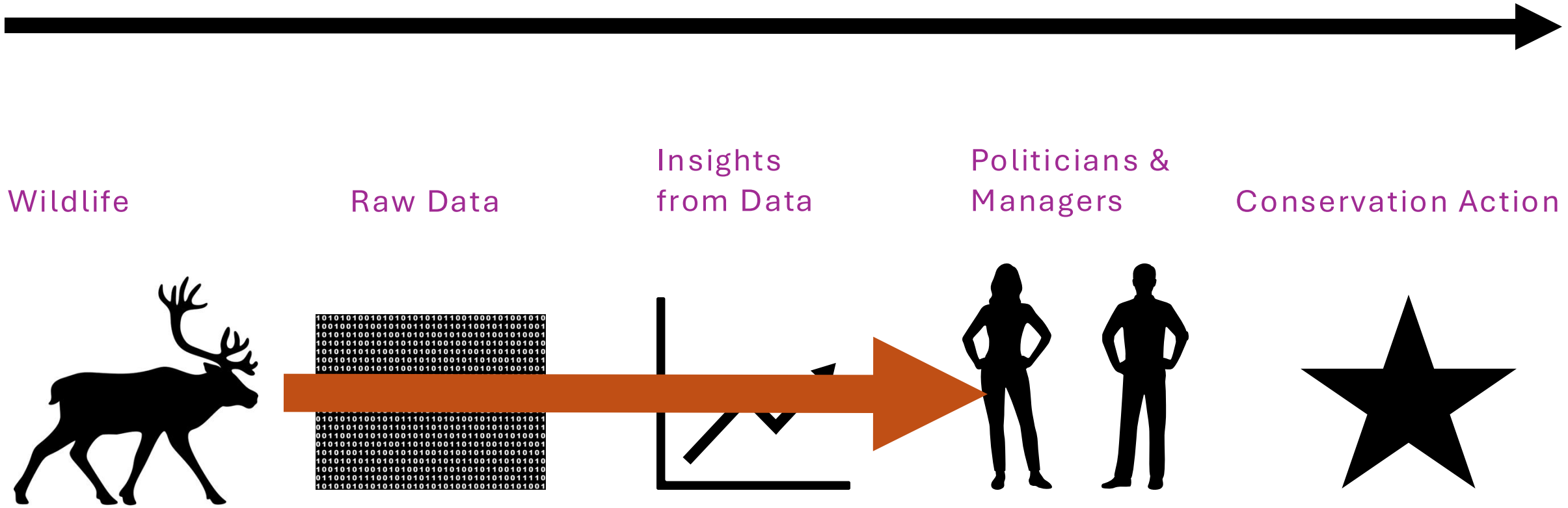

```
#'
#' Load amt libraries
#+warning=FALSE, message=FALSE
library(ezknitr)
library(knitr)
library(lubridate)
library(raster)
library(move)
library(ggplot2)
library(amt)
library(broom)
library(nlme)
library(lme4)
library(purrr)
library(dplyr)
library(forcats)
library(tidyverse)
options(width=165)
opts_chunk$set(fig.width=12,fig.height=4.5, error=TRUE,cache = F)

#' Read in data.
#' Read in annotated available data for RSF modeling
#avail.rsf<-read.csv("data/fisherAvailRSF-envdata-results-available.csv")
rsfdat<-read.csv("data/FisherRSF2018-EnvDATA-results.csv")

#' Simplify some variable names
names(rsfdat)[c(1,8:10)]<-c("id","LandClass", "Elevation", "PopDens")
rsfdat$case_<-as.numeric(rsfdat$case_)

#' Create landcover classes (as suggested by Scott Lapoint :)
rsfdat$LandClass<-as.character(rsfdat$LandClass)
rsfdat<-rsfdat %>% mutate(landC = fct_collapse(LandClass
```

Motivation: How can we make the insights of wildlife data easier to access?



Problem 1
Monitoring Caribou Populations

Problem 2
Communicating results to stakeholders

Room to Roam: Yellowstone to Yukon Wildlife Movements

Y2Y partners

HawkWatch International — Conserving Raptors and Our Shared Environment

Yellowstone to Yukon Conservation Initiative

Yukon Canada

teton raptor center

CENTER for LARGE LANDSCAPE CONSERVATION

Northwest Territories

Development partners

The Ohio State University

University of Minnesota Driven to Discover®

North Carolina Museum of Natural Sciences

Max-Planck-Gesellschaft

MoveBank

NASA

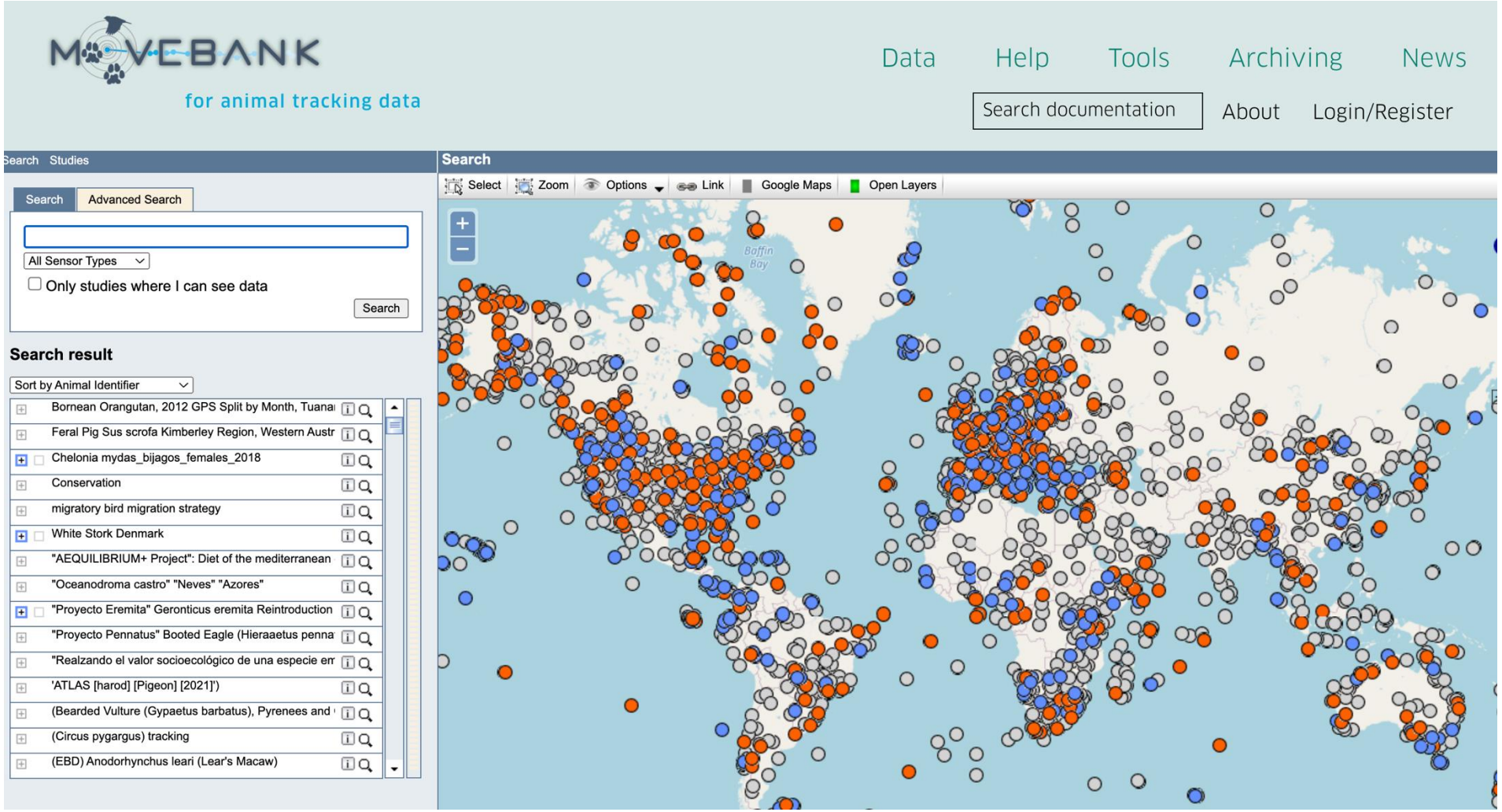
https://ceg.osu.edu/Y2Y_Room2Roam

Room2Roam goals

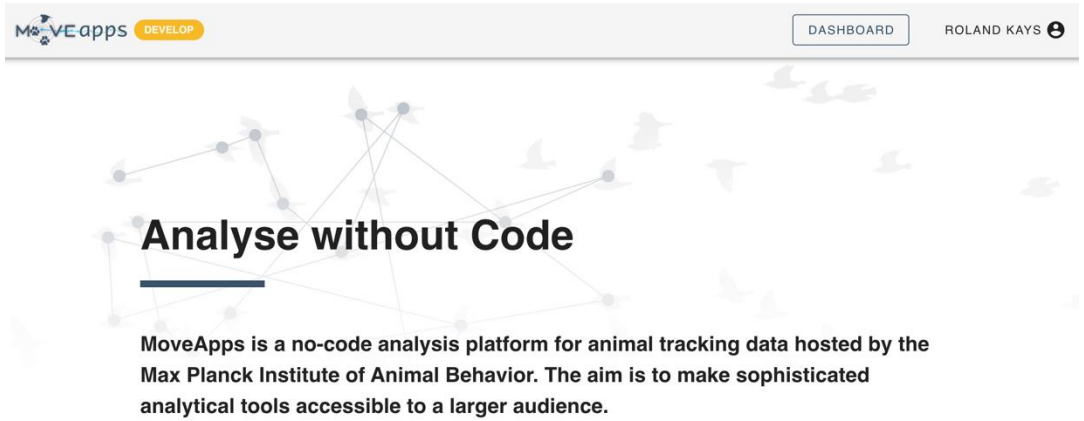
1. Build an archive of wildlife tracking data in the Y2Y.
2. Identify analysis needs in the region.
3. Develop open and shared tools to meet these needs.


HELLO
MY NAME IS
Ashley
HELLO
MY NAME IS
John
HELLO
MY NAME IS
Sarah
HELLO
MY NAME IS
Nilanjan
HELLO
MY NAME IS
Gil

Movebank animal tracking database



Moveapps analysis platform



- Apps: small analysis tools with customizable settings
- Workflows: combinations of multiple apps
- Any programmer can make an app
- Workflows and apps are published, citable, and sharable

Case study: Ungulate calving behavior

Chisana herd, Kathi Egli, Yukon Government

Yukon CANADA

Northwest Territories

NEED: Identify calving events

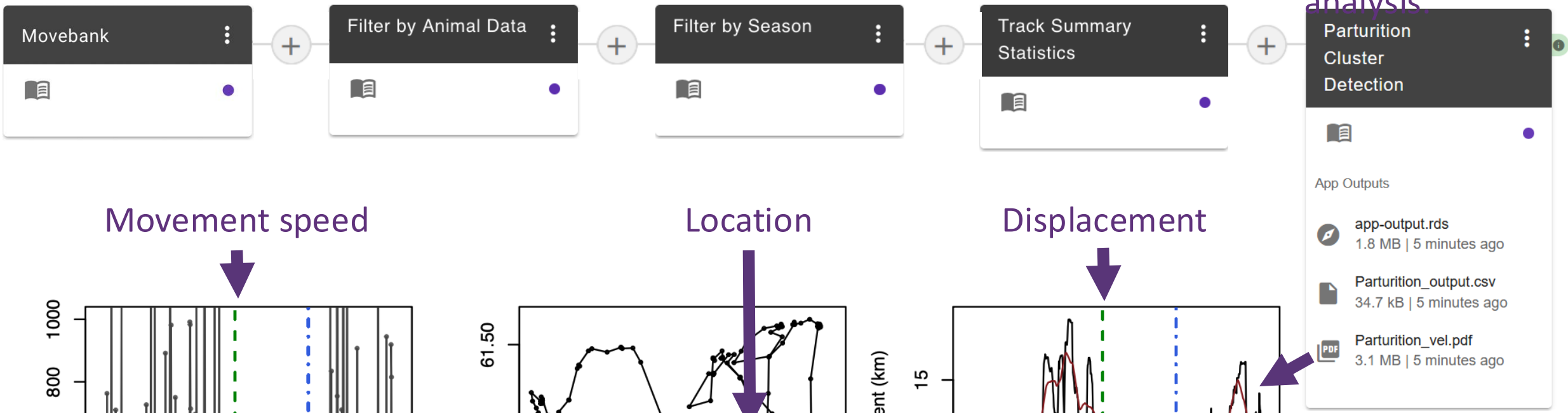
Solution 1

Get data.

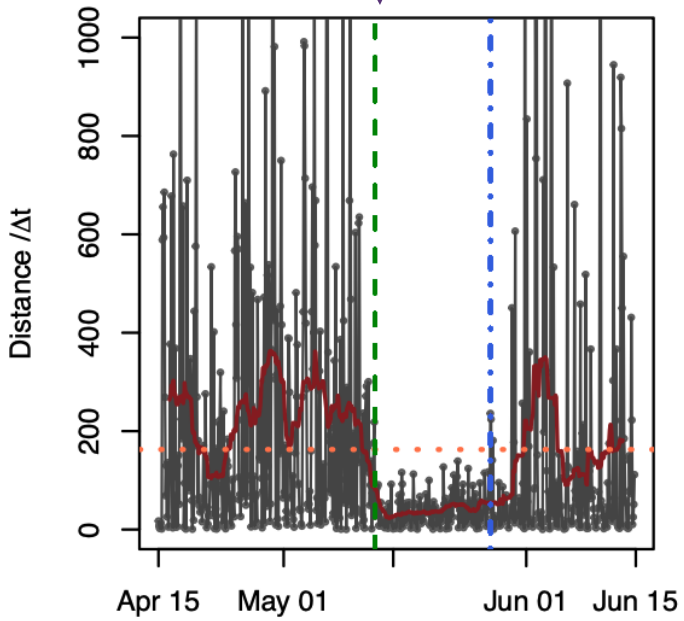
Reduce to females and calving period.

Assess sampling.

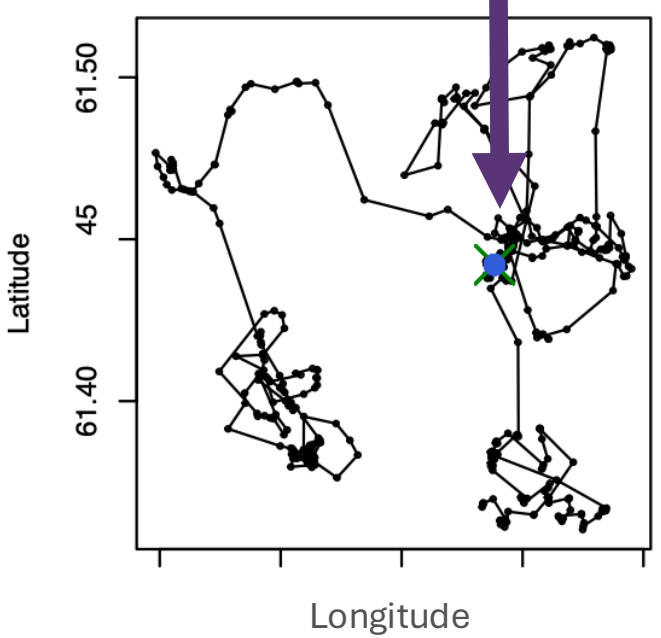
Run calving analysis.



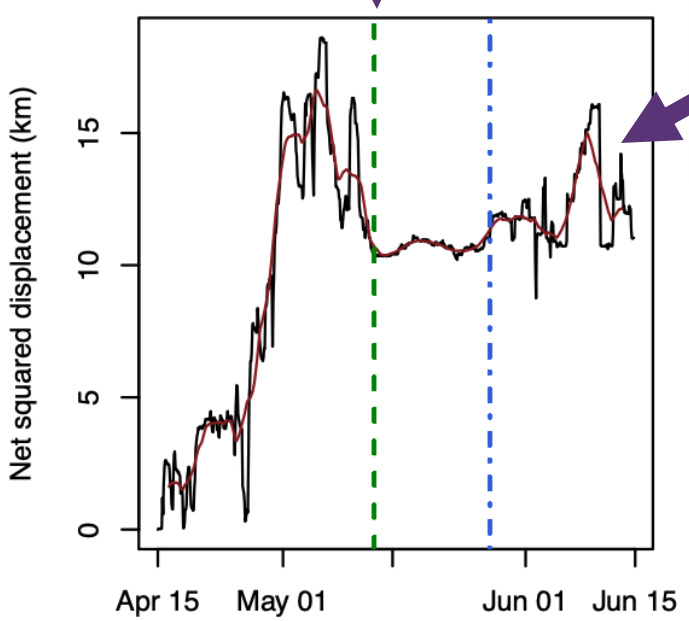
Movement speed



Location



Displacement



Government of Northwest Territories

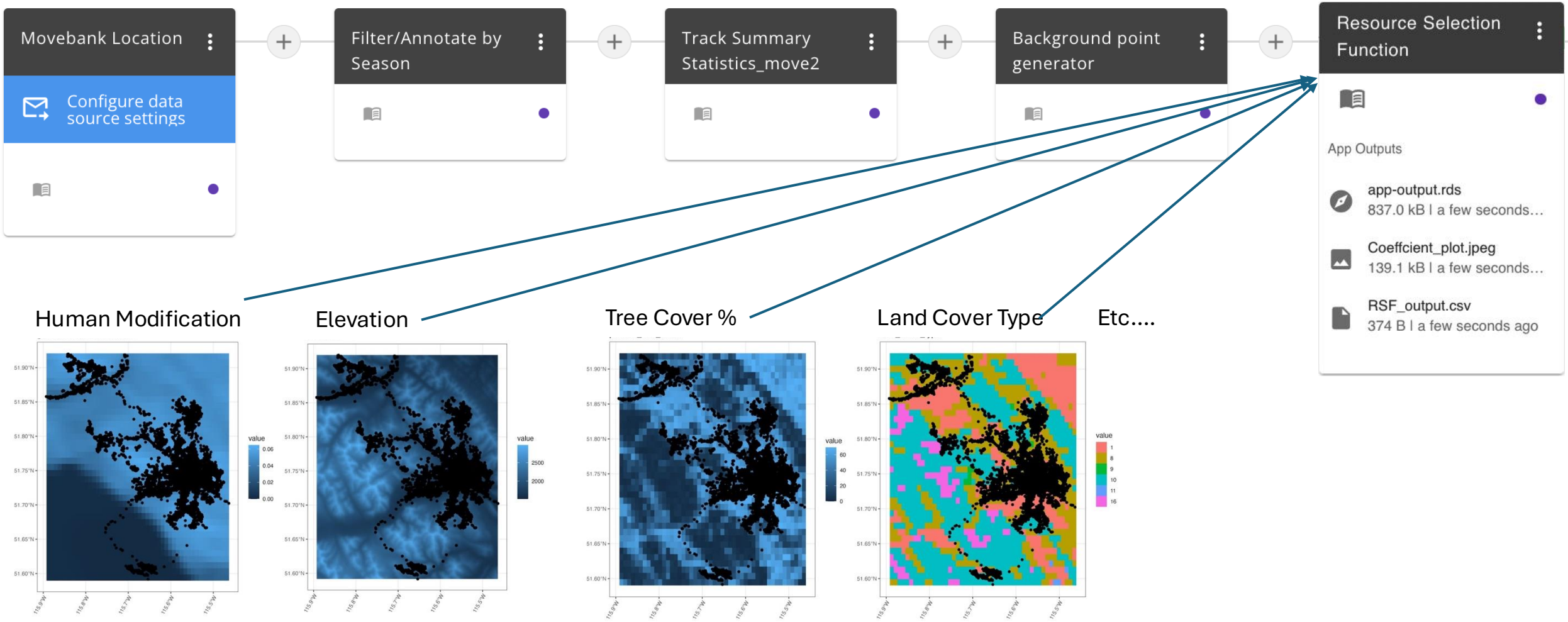
Boreal caribou monitoring data

Validating this season with aerial surveys
Hope its last year of these flights

Impact 1

Mike Suitor: We are using the parturition tool this weekend to identify priority animals to be viewed while flying parturition surveys on the Yukon North Slope. This work costs tens of thousands of dollars, so we don't want to be wasteful.

Resource Selection App



Listening to stakeholders - They want animations

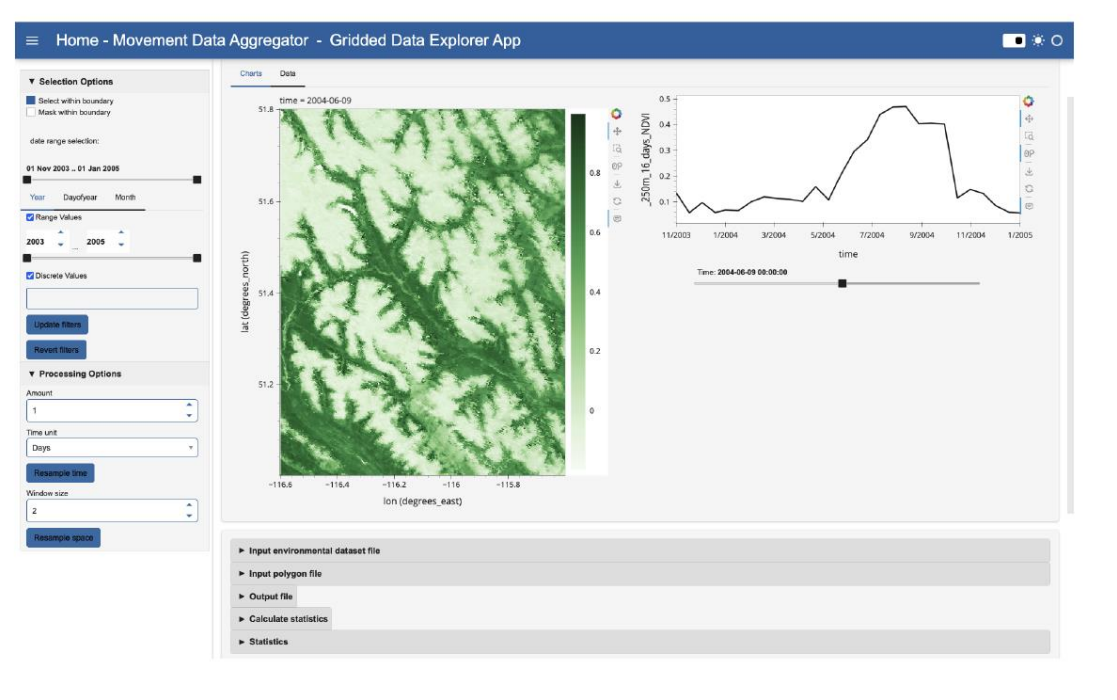
Kelsey Russell & Mike Suitor, Yukon Fish and Wildlife

Gil Bohrer, OSU, PI

Solution 2

ECODATA – software to animate RS + Tracking

Software



Workflow

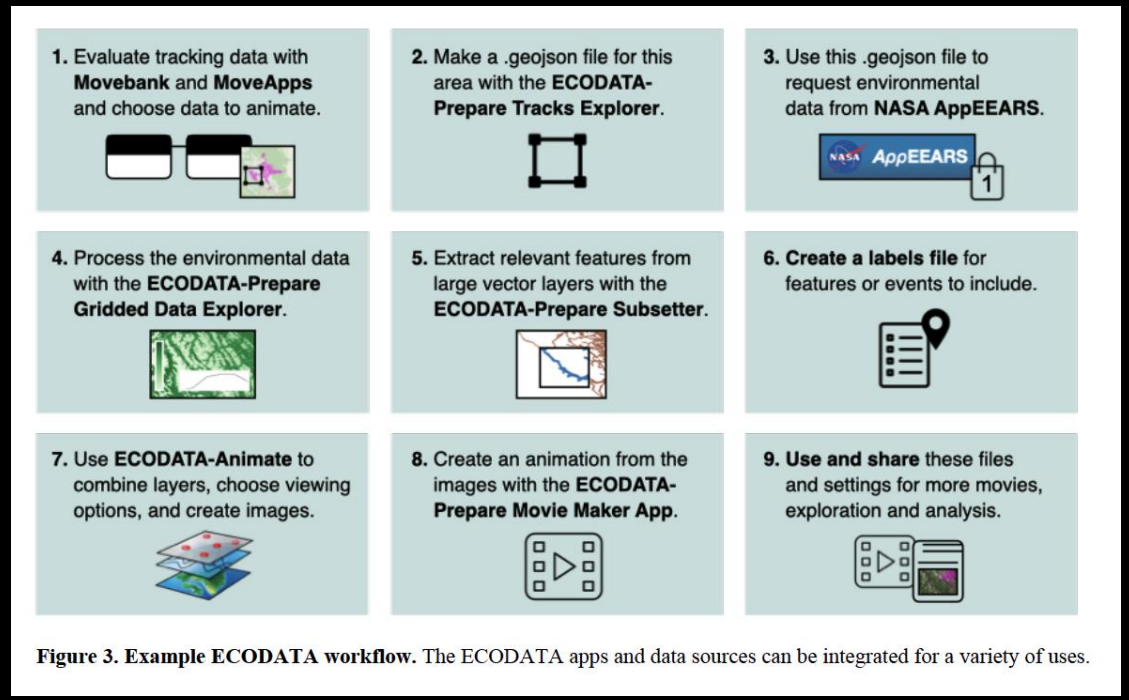


Figure 3. Example ECODATA workflow. The ECODATA apps and data sources can be integrated for a variety of uses.

Missik et al in review

Need: Create custom animations.

Missik et al in review
Government of the Northwest Territories, Canada

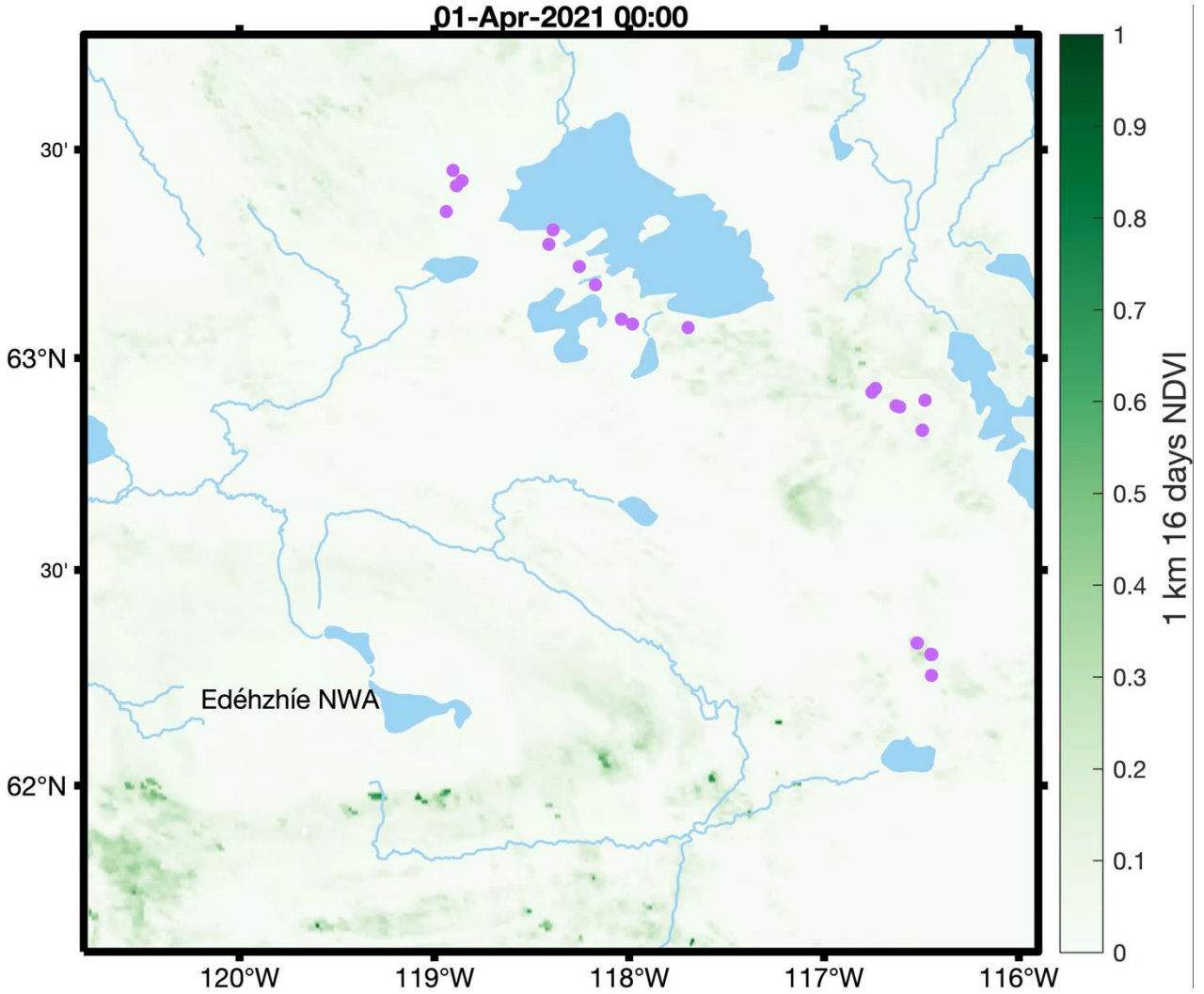
ECODATA

- Explore movements
- Communicate with stakeholders
- Process large geospatial layers

Mike Suitor

The inclusion of the animations is a game changer

The number of times I've heard "this is how science should be presented" or "this is really good information that I can understand" this year can't be counted on my fingers!



Impact 2

Bonus Impact

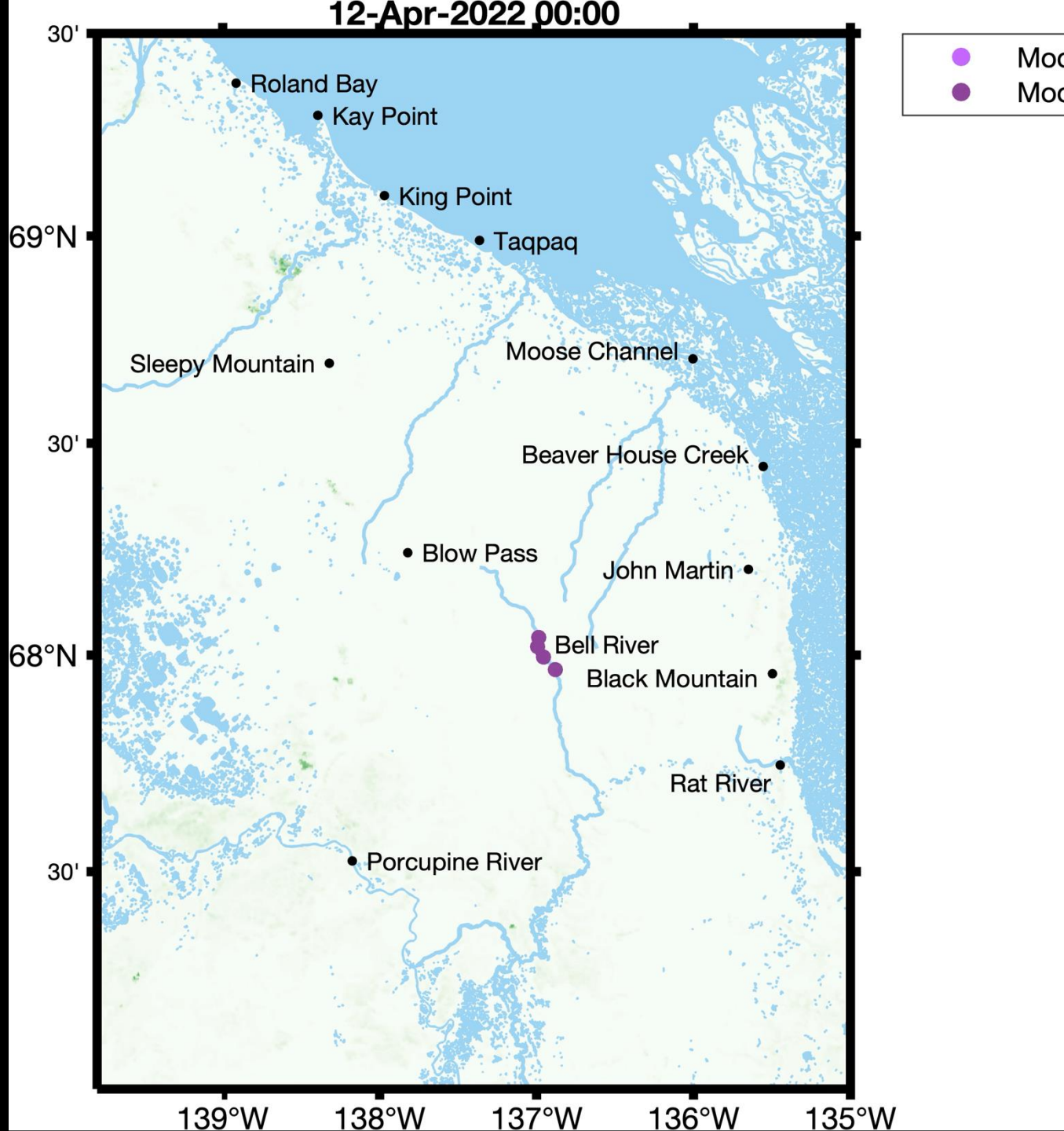
Mike Suitor

I've had a number of students really stuck on the green wave theory which totally doesn't work up here. **Instead of arguing until my face turned red, I just have to show them the animations with green up.**

Its very clear what's going on and that arctic species pre-empt green up with their migration to be in the right spot when it occurs relative to lactation demands.

Watching the Ecodata animations its clear it has to do with senescence of willows in the Mackenzie Delta.

As a result we can get our graduate students to form appropriate hypotheses and we will be building their models using satellite data in the coming year, guided by these initial findings



Room2Roam goals

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2. Identify analysis needs in the region.
3. Develop open and shared tools to meet these needs.
4. Expand our coalition across the Y2Y…

…and beyond.

Acknowledgements

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PIs

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