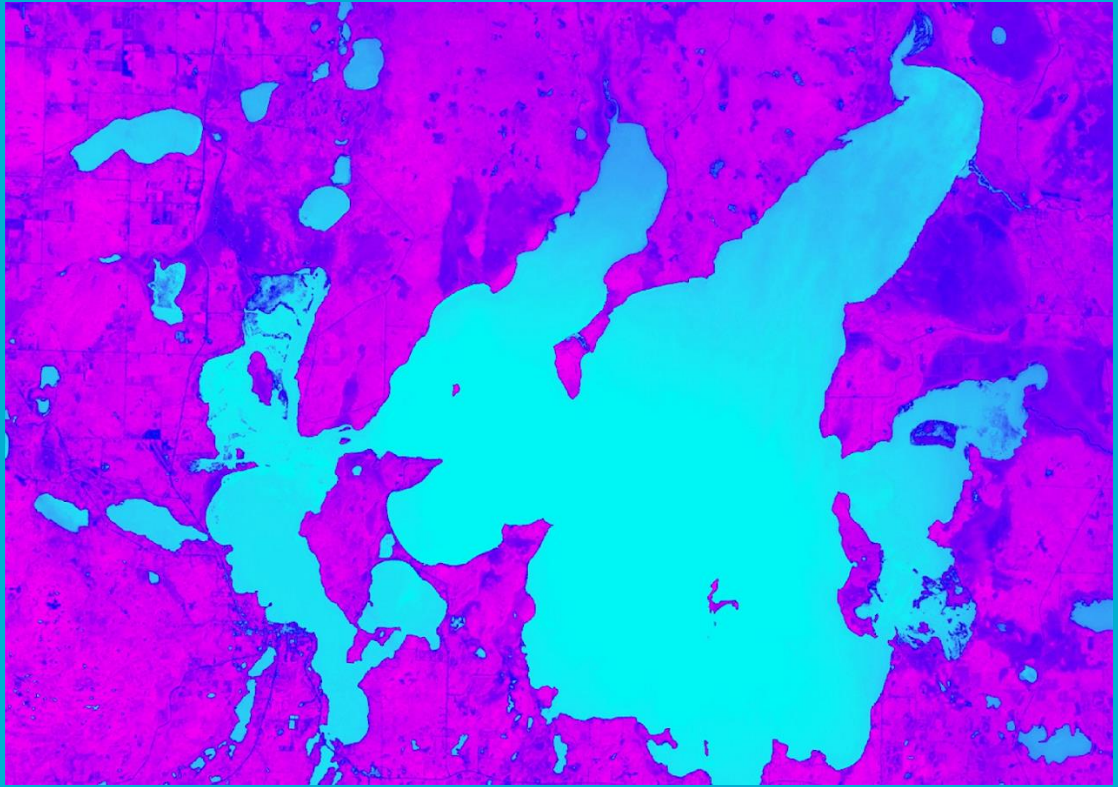
Geospatial Modeling Crash Course



A kitchen sink approach

NASA DEVELOP

10 week feasibility studies to help project partners integrate NASA Earth Observations

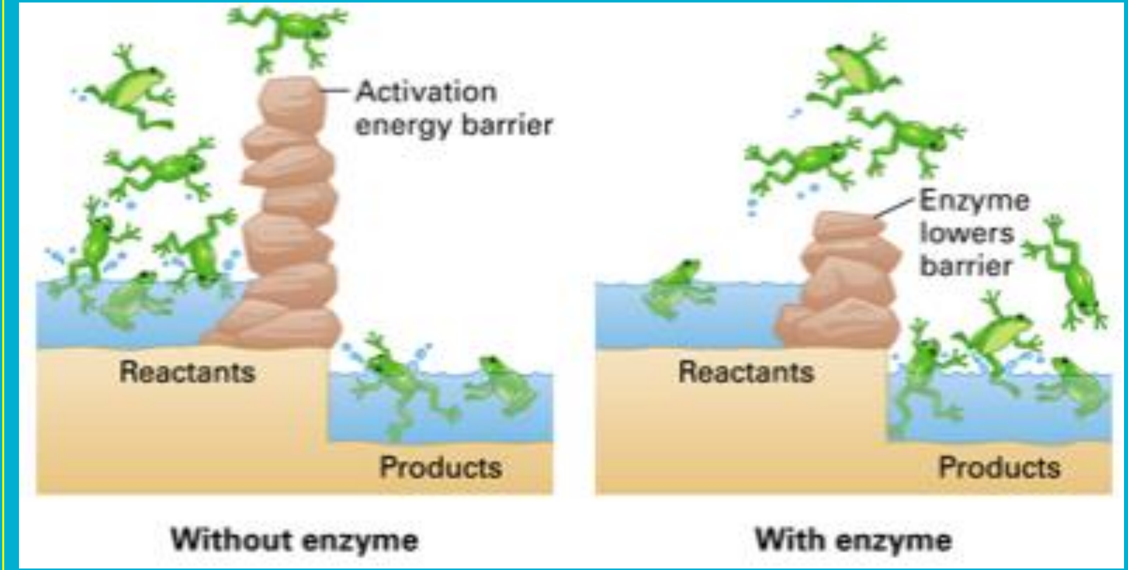
- Tamarisk in Utah
- Russian Olive in Colorado
- Tree mortality in Intermountain West
- Wild Rice in Minnesota
- Ephemeral Water Sources in Utah
- Cranberries in Wisconsin
- Spruce budworm in Colorado

Goal

Provide a training that exposes individuals to the framework and components of a common geospatial modeling process so they can more quickly engage with the material in their own work.

- Understand potential and follow the process
- Have a resource to look back on

Please Ask Questions



Outline

Part 1: Intro to the Question

Part 2: Sampling Data (GEE)

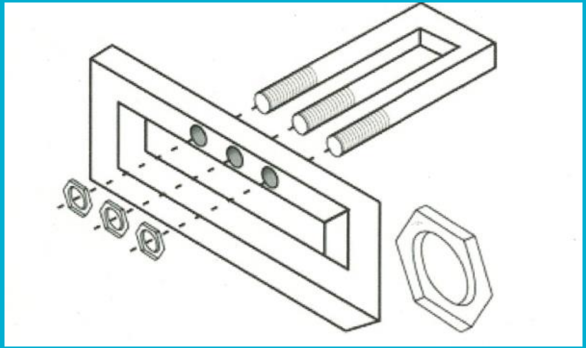
Part 3: Interoperability (GEE)

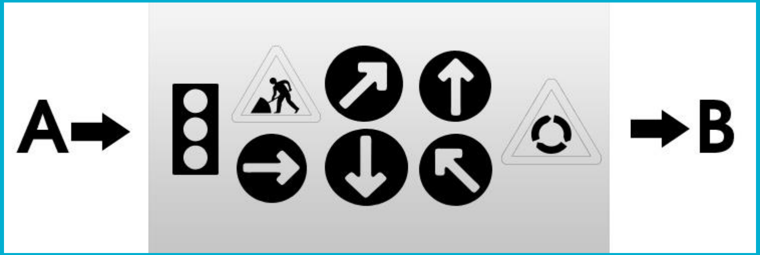
Part 4: Modeling (GEE)

Part 5: Variable Selection (‘R’)

Part 6: Modeling 2 (GEE)

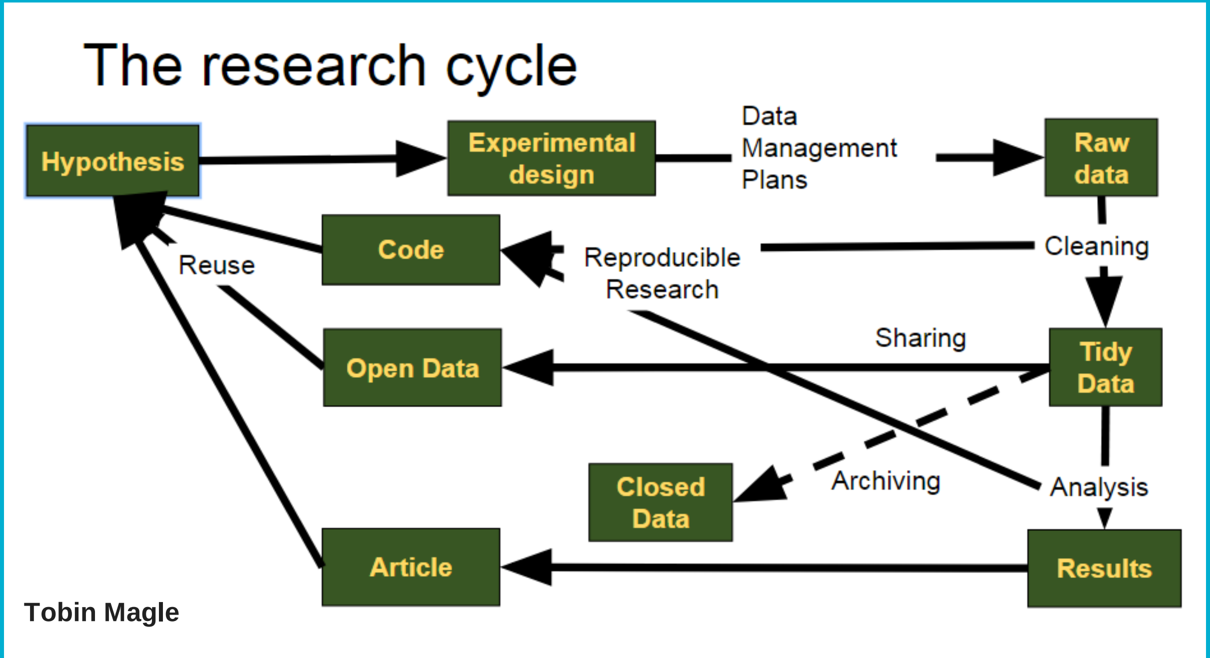
Part Last: Conclusion and extra resources (‘R’)

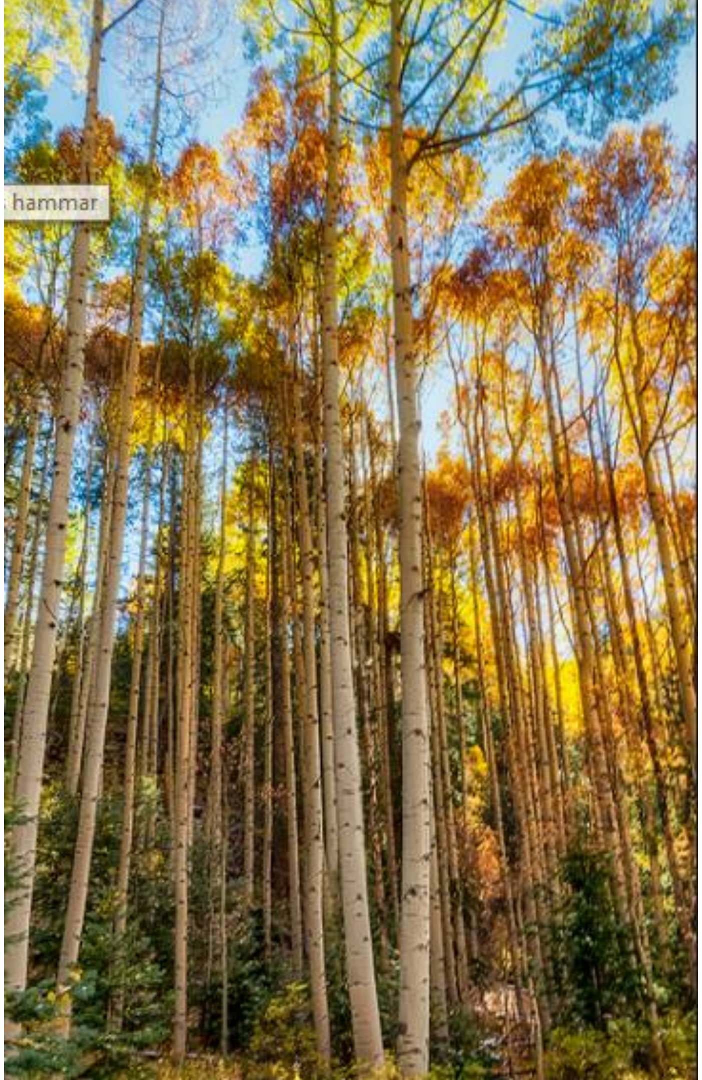




How to do this well

- Collaboration
- Reproducibility
- Always learn
- Engaging in peer review process at various levels

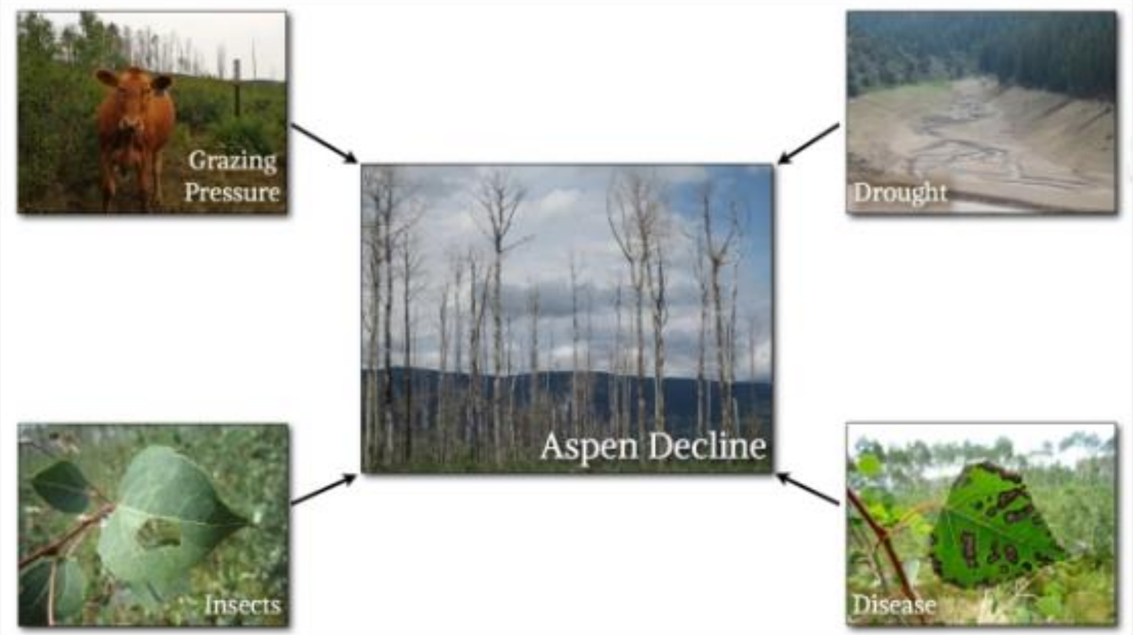



hammar

Sudden Aspen Decline (SAD)

- Drought Stress
- Grazing
- Minimum Winter Temps
- Most common:
  - Southern Latitudes
  - Southern aspects

Correlated to heat...



— Sudden Aspen Decline flow chart. All photos taken on Sudden Aspen Decline research sites in southwestern Colorado (Sarah Bisbing, 2012).

Worrall et al 2013

- Suzuki et al 1999
  - Aerial photography
- Bretfeld et al 2016
  - Resampling 1970 veg plots
- Sankey 2011
  - Elvaulated Lidar/RS
- Hamilton et al 2009
  - RS detection of Aspen

“ Advances in remote sensing technologies can provide cost-effective ways to obtain spatial and quantitative information about aspen to support restoration activities at multiple scales”

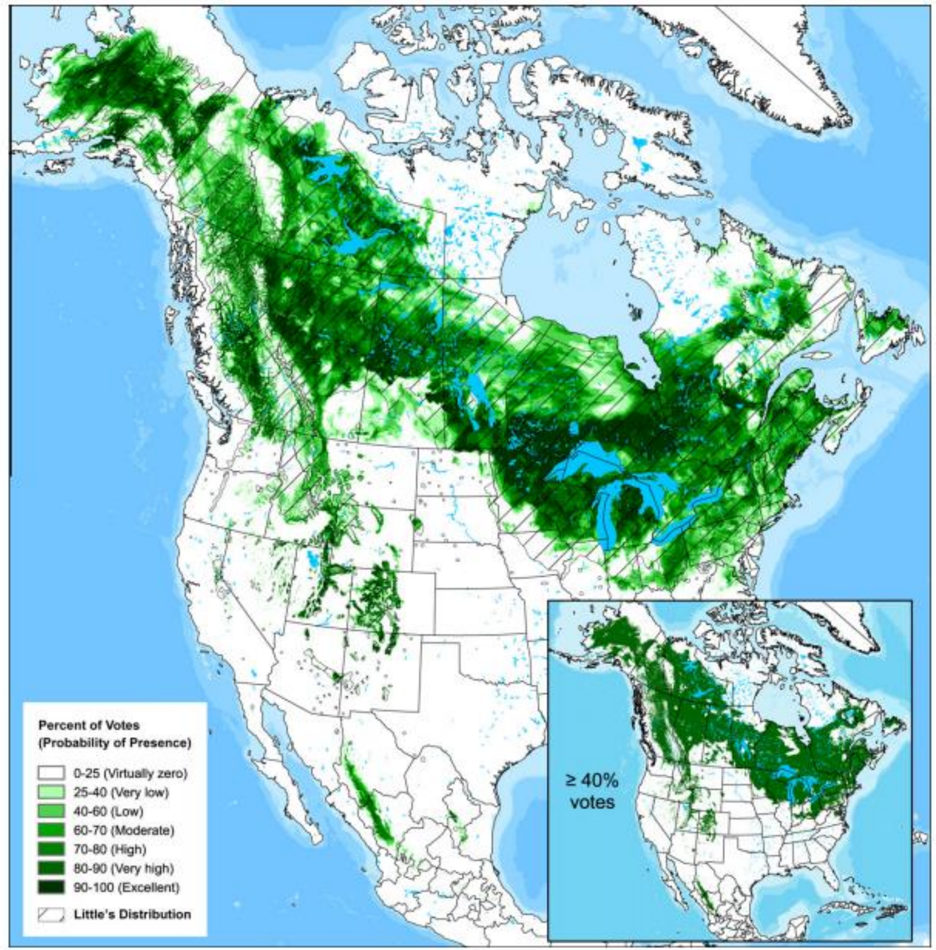
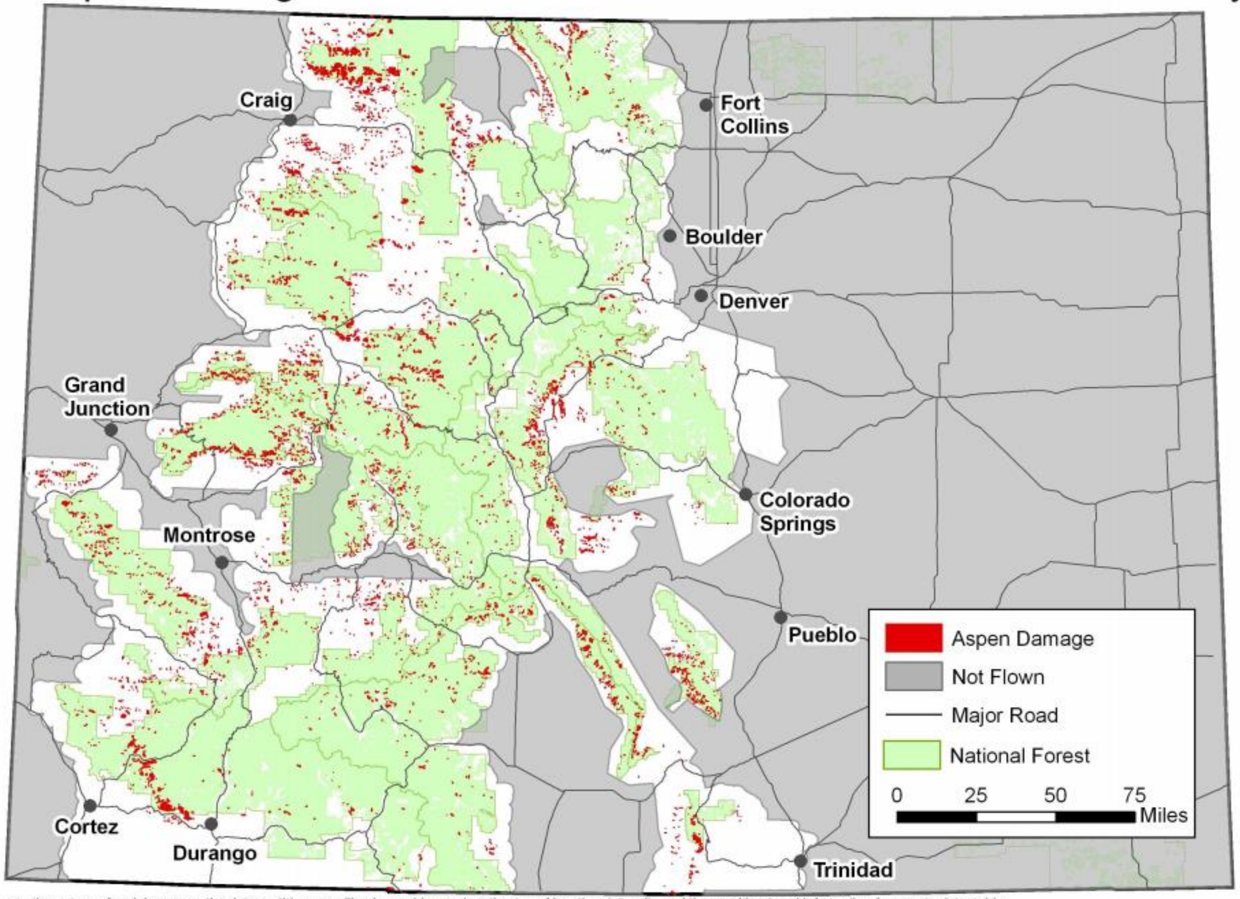


Fig. 1. Distribution of aspen's climatic niche in North America as determined through the bioclimate model, based on the reference period 1961–1990. Percent of votes generated by the model, indicating climatic suitability, is shown together with the corresponding probability of presence of aspen (Supplement 1: Fig. 1). Also shown is Little's (1971) range map.

USFS

- Aerial Detection Survey

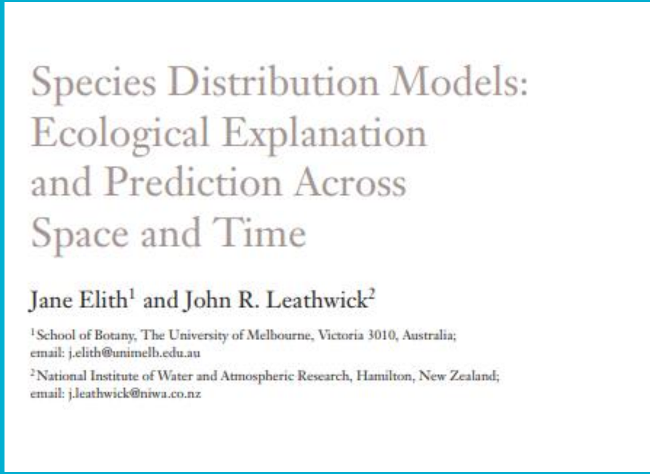
Aspen Damage in Colorado from the 2007 Aerial Detection Survey



Due to the nature of aerial surveys, the data on this map will only provide rough estimates of location, intensity and the resulting trend information for agents detectable from the air. Many of the most destructive diseases are not represented on this map because these agents are not detectable from aerial surveys. The data presented on this map should only be used as a partial indicator of insect and disease activity, and should be validated on the ground for actual location and casual agent. Shaded areas show locations where tree mortality or defoliation were apparent from the air. Intensity of damage is variable and not all trees in shaded areas are dead or defoliated.

Model aspen

- Rely on best practices


Species Distribution Models: Ecological Explanation and Prediction Across Space and Time

Jane Elith[1] and John R. Leathwick[2]

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email: j.elith@unimelb.edu.au

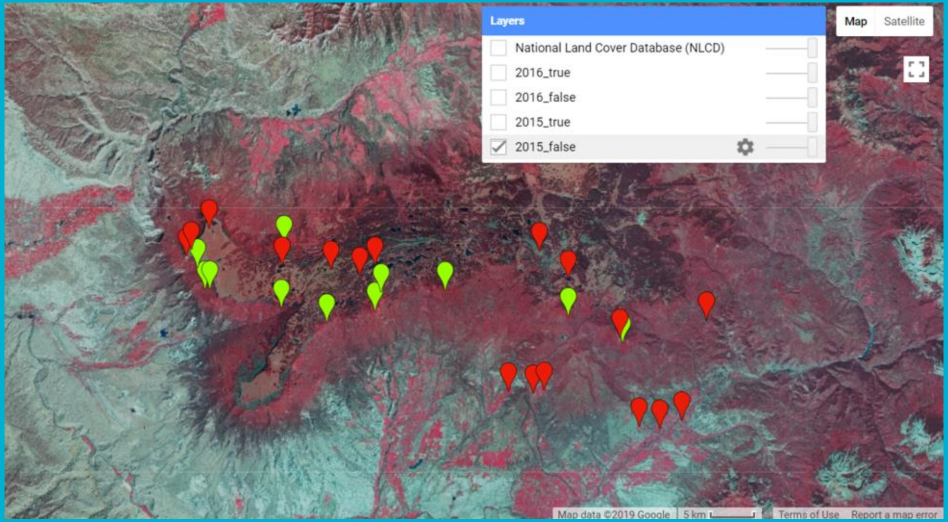
[2]National Institute of Water and Atmospheric Research, Hamilton, New Zealand;
email: j.leathwick@niwa.co.nz

Interact with GEE Drop Points (Part 2)

Generate potential training data in GEE

- NAIP imagery
- GEE basic functions

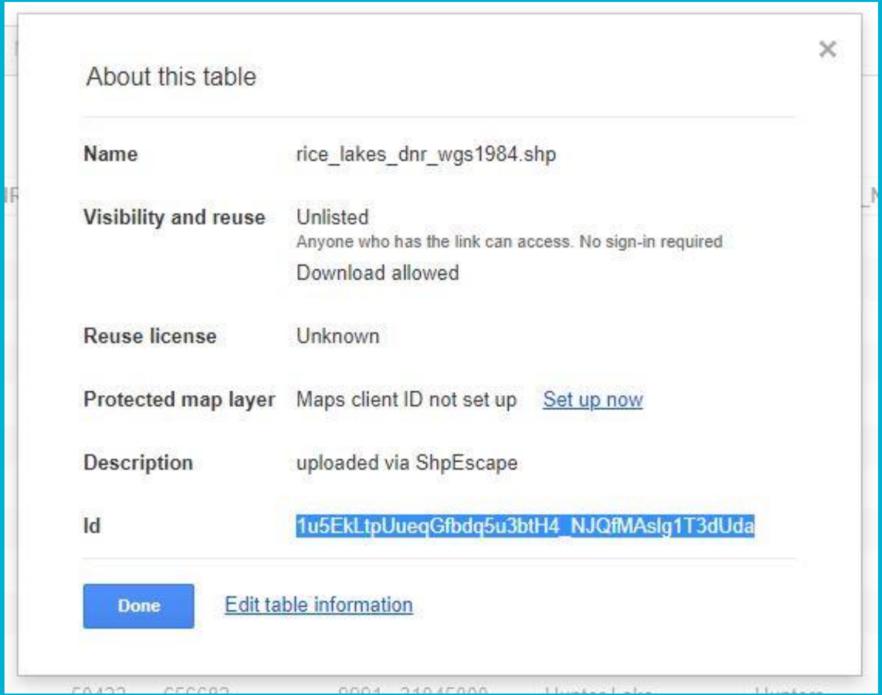
Best Practice :



Import features in GEE (Part 3)

Learn how it import existing datasets into GEE

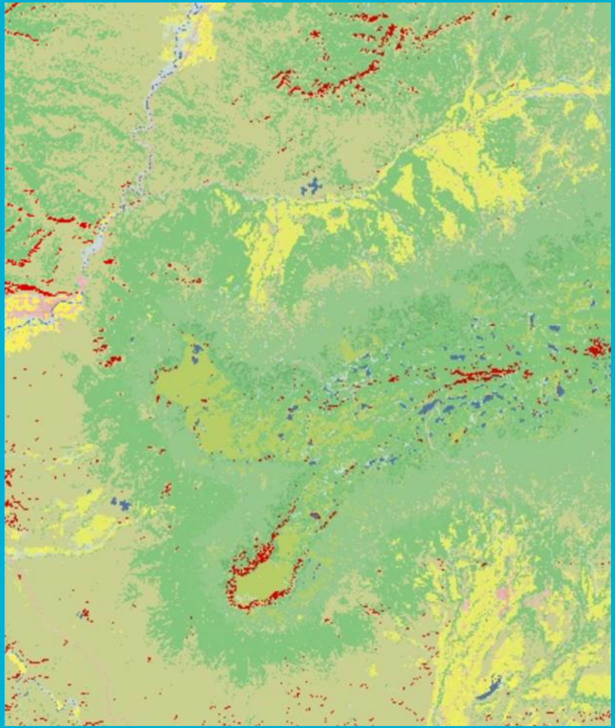
- Interoperability



Modeling In GEE (Part 4)

Produce a geospatial model in GEE

- Apply advanced functions
- Generate Indices
- Visualize results

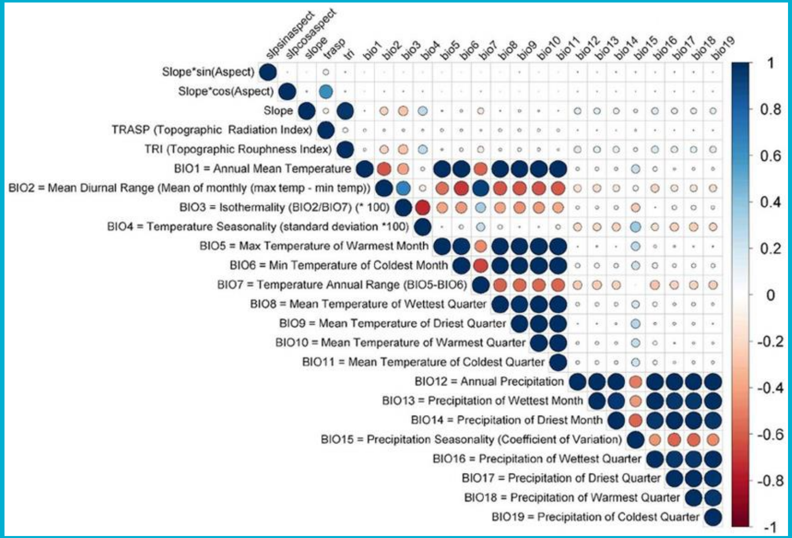


Break

Variable Selection in R (Part 5)

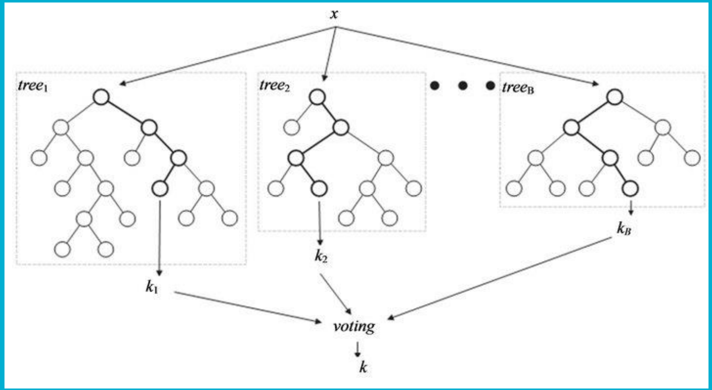
Engage with R packages to inform which predictors are important

- Manipulate dataframes
- Apply algorithms
- View statistical results



Modeling In GEE - 2 (Part 6)

Integrate information from R back into GEE



General Notes on Geospatial Modeling

Modeling is full of assumptions, know them

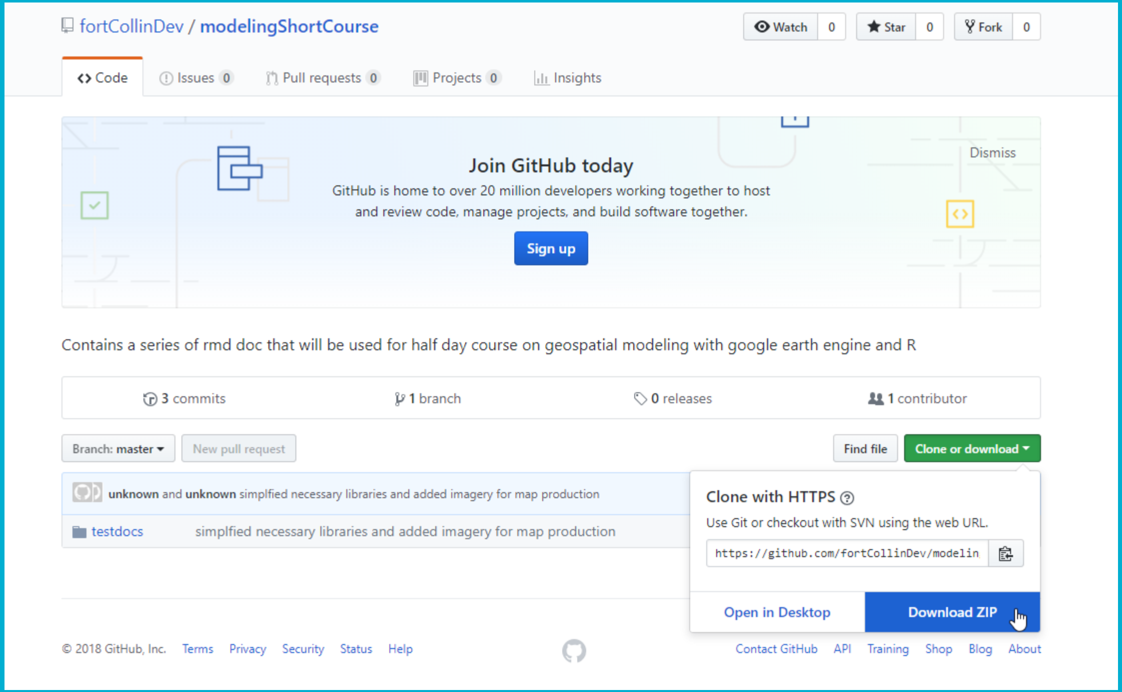
Understanding what it does poorly is equally as important as what it does well

Ideally your model provides more information then was previously available

Understand where the largest uncertainty is and use that to limit the specificity of your output

https://github.com/fortCollinDev

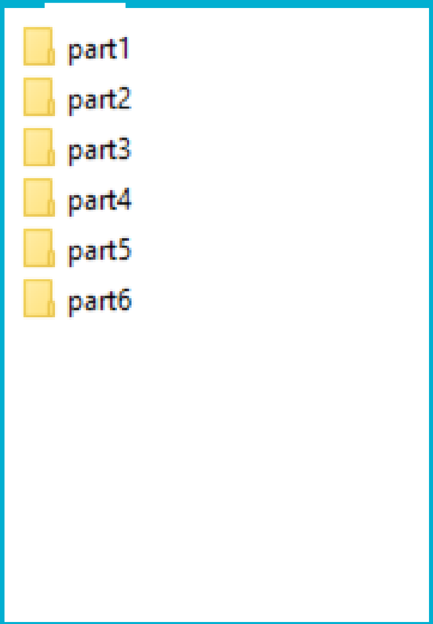
- Click on “modelingShortCourse”

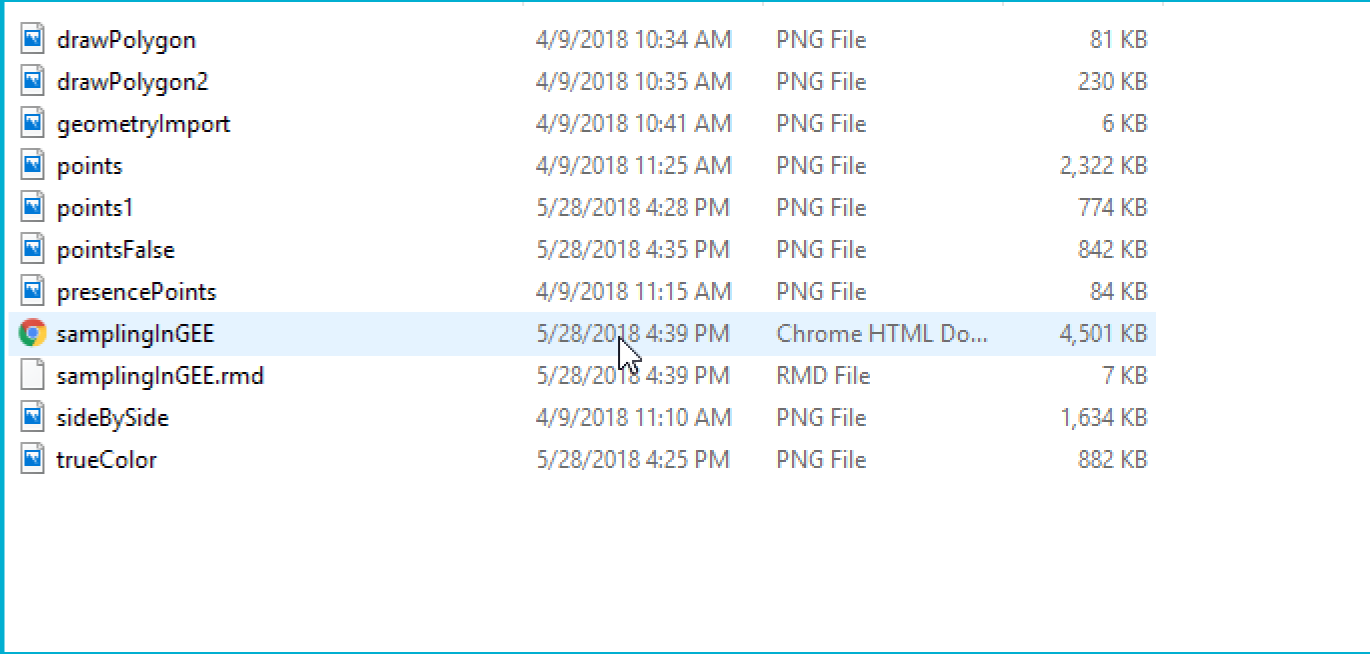


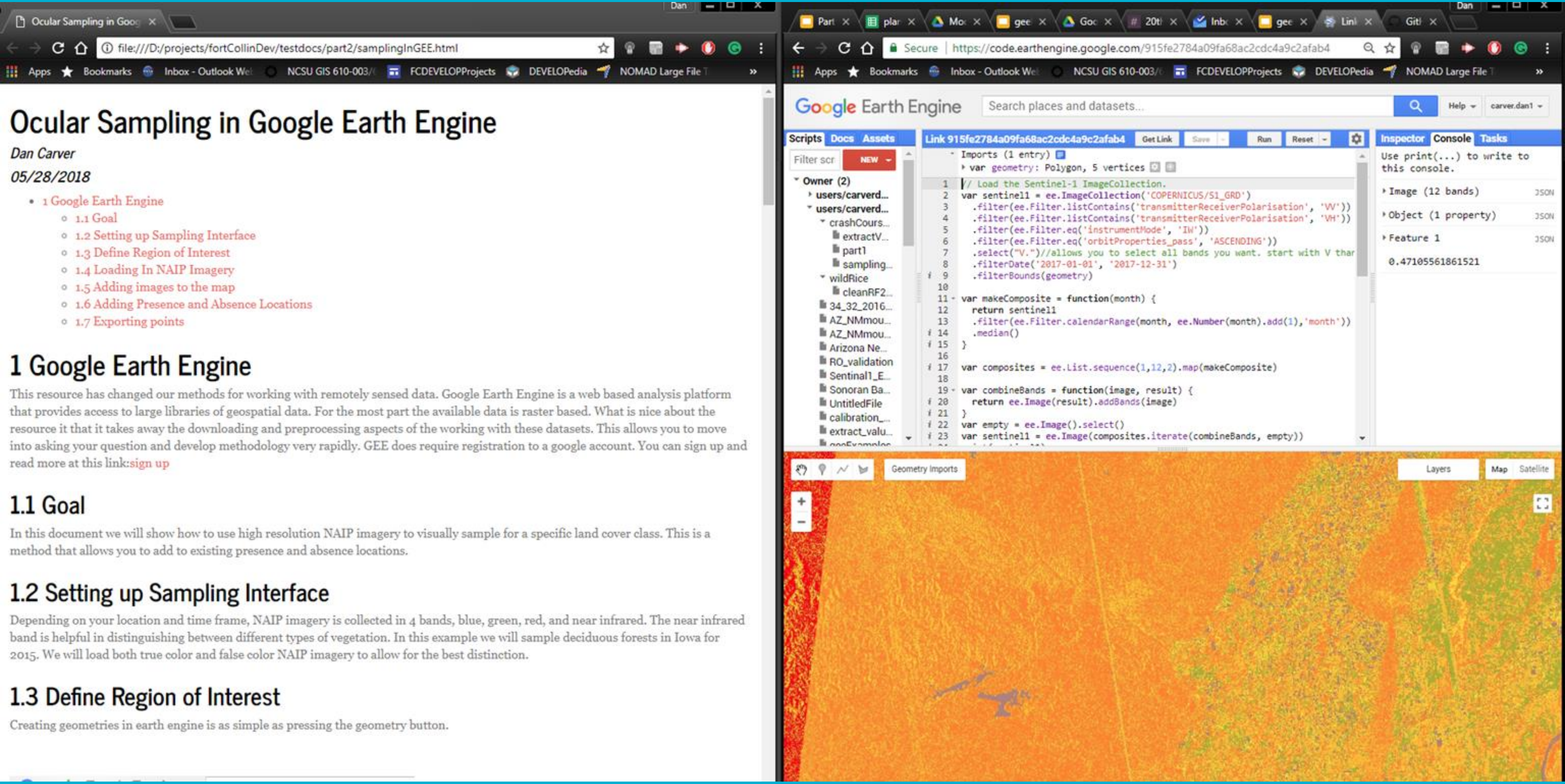
Jupyter notebook

Add link here. (email out before hand)

Follow Along by opening the html file







Ocular Sampling in Goog
file:///D:/projects/fortCollinDev/testdocs/part2/samplingInGEE.html
Apps
Bookmarks
Inbox - Outlook We
NCSU GIS 610-003/
FCDEVELOPProjects
DEVELOPedia
NOMAD Large File
Ocular Sampling in Google Earth Engine
Dan Carver
05/28/2018
1 Google Earth Engine
1.1 Goal
1.2 Setting up Sampling Interface
1.3 Define Region of Interest
1.4 Loading In NAIP Imagery
1.5 Adding images to the map
1.6 Adding Presence and Absence Locations
1.7 Exporting points
1 Google Earth Engine
This resource has changed our methods for working with remotely sensed data. Google Earth Engine is a web based analysis platform that provides access to large libraries of geospatial data. For the most part the available data is raster based. What is nice about the resource it that it takes away the downloading and preprocessing aspects of the working with these datasets. This allows you to move into asking your question and develop methodology very rapidly. GEE does require registration to a google account. You can sign up and read more at this link:sign up
1.1 Goal
In this document we will show how to use high resolution NAIP imagery to visually sample for a specific land cover class. This is a method that allows you to add to existing presence and absence locations.
1.2 Setting up Sampling Interface
Depending on your location and time frame, NAIP imagery is collected in 4 bands, blue, green, red, and near infrared. The near infrared band is helpful in distinguishing between different types of vegetation. In this example we will sample deciduous forests in Iowa for 2015. We will load both true color and false color NAIP imagery to allow for the best distinction.
1.3 Define Region of Interest
Creating geometries in earth engine is as simple as pressing the geometry button.
Secure
https://code.earthengine.google.com/915fe2784a09fa68ac2cdc4a9c2afab4
Google Earth Engine
Search places and datasets...
Help
carver.dan1
Scripts
Docs
Assets
Link 915fe2784a09fa68ac2cdc4a9c2afab4
Get Link
Save
Run
Reset
Inspector
Console
Tasks
Filter scr
NEW
Owner (2)
users/carverd...
users/carverd...
crashCours...
extractV...
part1
sampling...
wildRice
cleanRF2...
34_32_2016...
AZ_NMmou...
AZ_NMmou...
Arizona Ne...
RO_validation
Sentinal1_E...
Sonoran Ba...
UntitledFile
calibration_...
extract_valu...
Imports (1 entry)
var geometry: Polygon, 5 vertices
// Load the Sentinel-1 ImageCollection.
var sentinel1 = ee.ImageCollection('COPERNICUS/S1_GRD')
.filter(ee.Filter.listContains('transmitterReceiverPolarisation', 'VV'))
.filter(ee.Filter.listContains('transmitterReceiverPolarisation', 'VH'))
.filter(ee.Filter.eq('instrumentMode', 'IW'))
.filter(ee.Filter.eq('orbitProperties_pass', 'ASCENDING'))
.select("V.")//allows you to select all bands you want. start with V thar
.filterDate('2017-01-01', '2017-12-31')
.filterBounds(geometry)
var makeComposite = function(month) {
return sentinel1
.filter(ee.Filter.calendarRange(month, ee.Number(month).add(1),'month'))
.median()
}
var composites = ee.List.sequence(1,12,2).map(makeComposite)
var combineBands = function(image, result) {
return ee.Image(result).addBands(image)
}
var empty = ee.Image().select()
var sentinel1 = ee.Image(composites.iterate(combineBands, empty))
Use print(...) to write to this console.
Image (12 bands)
JSON
Object (1 property)
JSON
Feature 1
JSON
0.47105561861521
Geometry Imports
Layers
Map
Satellite

Ask questions