

# RMBL Spatial Data Science Webinar Series

## Webinar 1: Intro to the RMBL Spatial Data Platform

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# RMBL Spatial Data Science Webinar Series

## Webinar Schedule

### **Tuesday September 22nd 2020**

*Introduction to the RMBL Spatial Data Platform,*  
How to access RMBL SDP data in GIS and  
programming environments, and where we are  
going with the platform.

### **Tuesday October 20th 2020 Designing Robust Field Studies using Geospatial Tools**

How to optimize site selection using GIS and  
the RMBL SDP.

### **Tuesday January 26th, 2021 Successful UAV Data Collection in Mountain Environments**

How to design and execute UAV flights for  
high-quality scientific data in challenging  
environments.

### **Tuesday February 23rd, 2021 Leveraging Point Cloud Data from Lidar and UAV Photogrammetry**

Mapping vegetation structure and function  
using 3D data from lidar and drones.

### **Tuesday March 23rd, 2021 Linking Field Data with Remote Sensing for Spatial Prediction**

How to leverage high-resolution remote  
sensing from imaging spectroscopy and lidar  
to map species, traits, and processes.

### **Tuesday April 20th, 2021 What's New in the RMBL Spatial Data Platform**

Introduction to new snow and phenology  
datasets that form part of the SDP Release 2  
and Release 3.

# Outline

- **Why?**

*Why is this a good time for field researchers to build their spatial data science skills?*

- **What?**

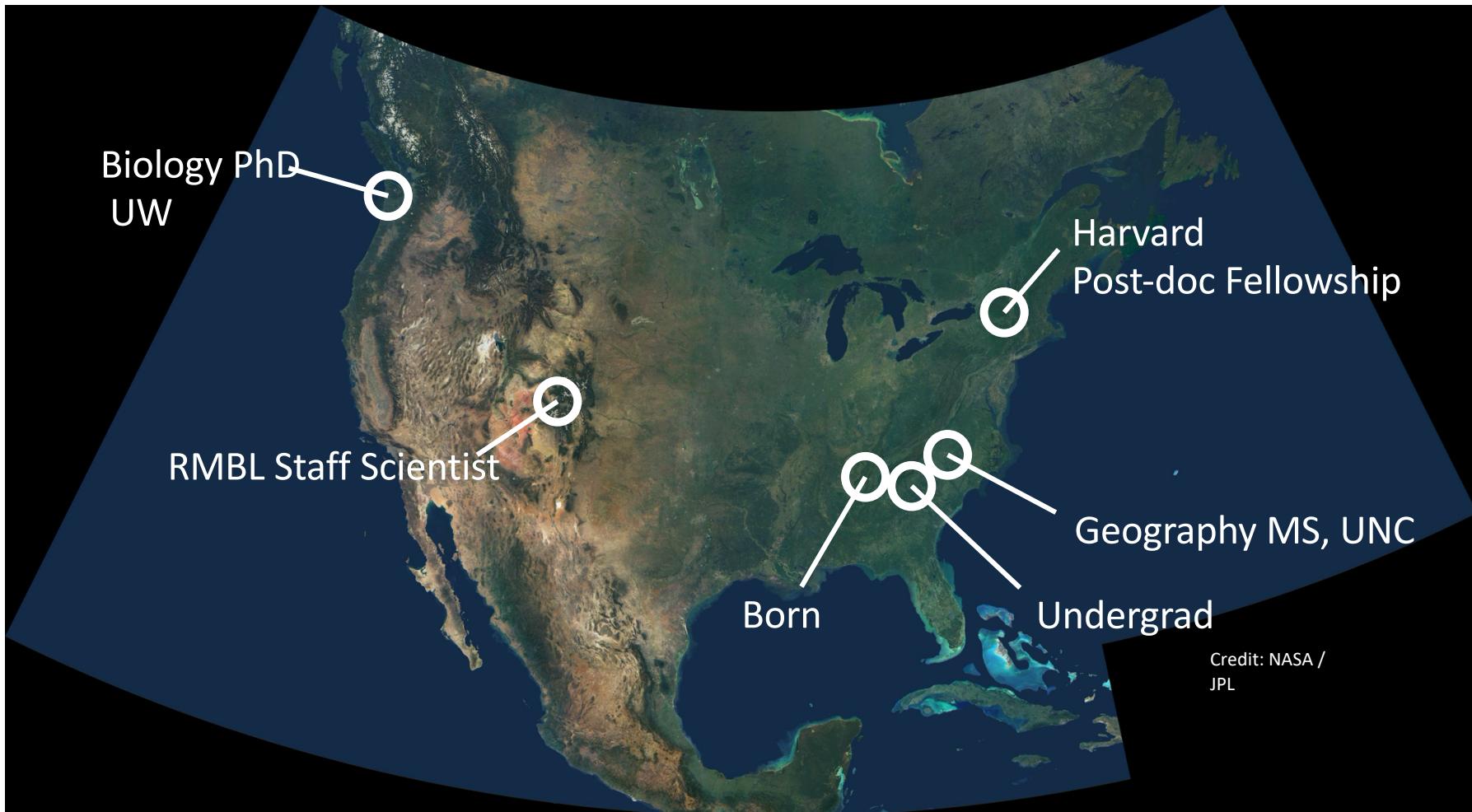
*What foundational concepts do I need to know to use spatial data effectively?*

*What data is out there that is useful in my work?*

- **How?**

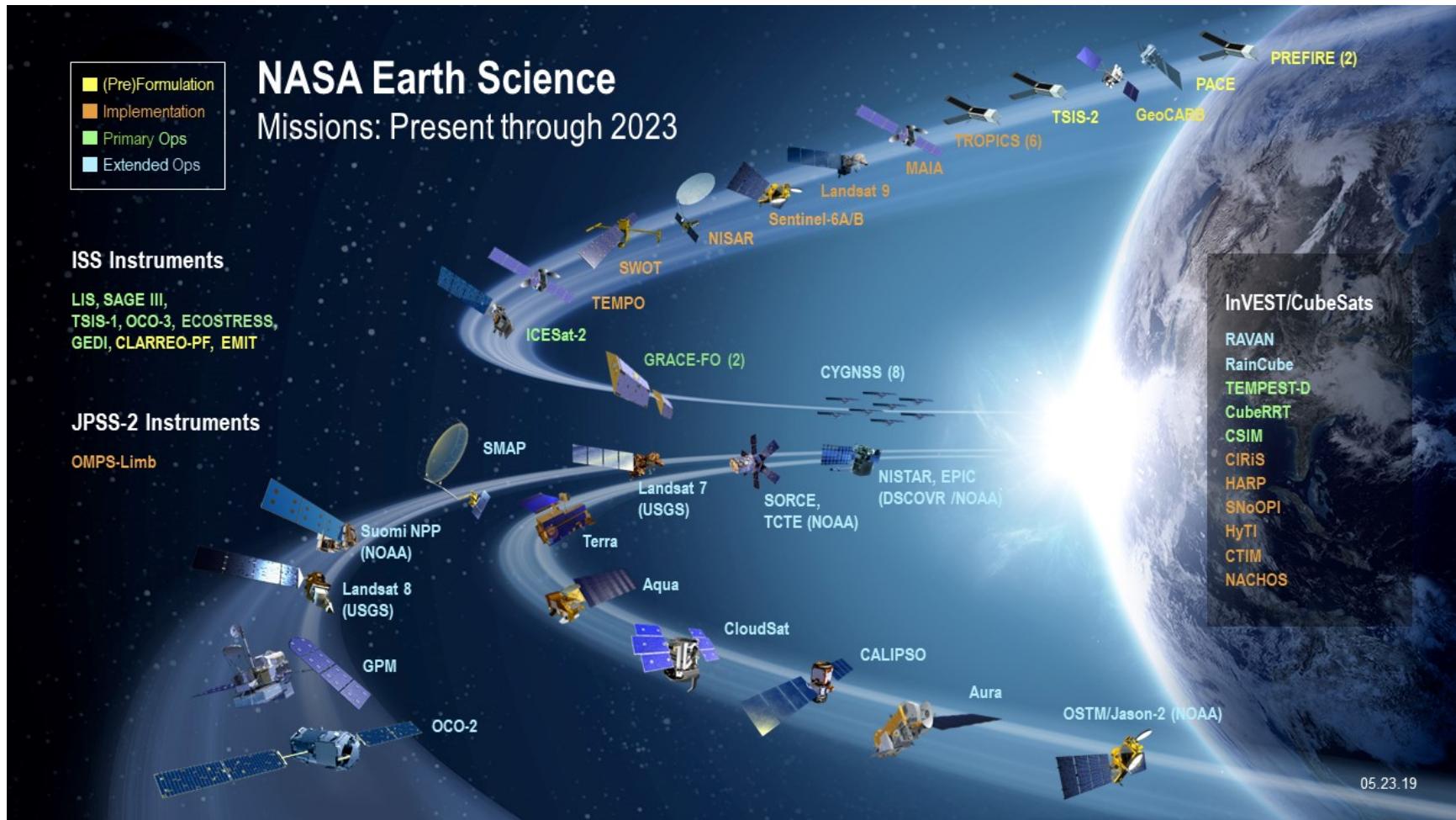
*How do I build the skills necessary?*

# About me:



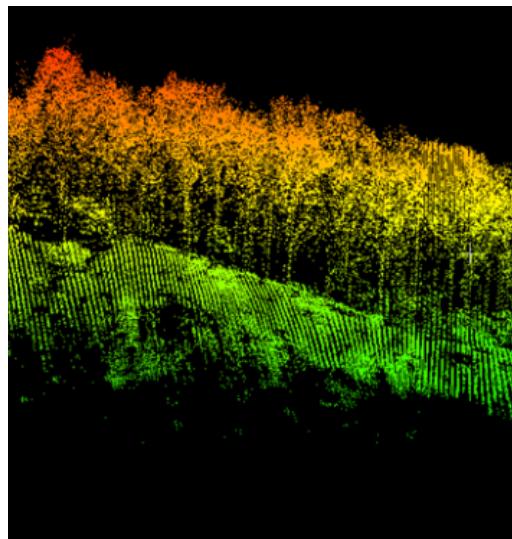


# Remote sensing: an inflection point



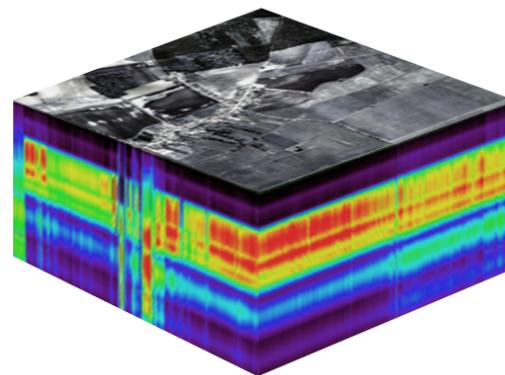
# Remote sensing: an inflection point

LiDAR



<https://geolabforest.blog/>

Imaging  
Spectroscopy



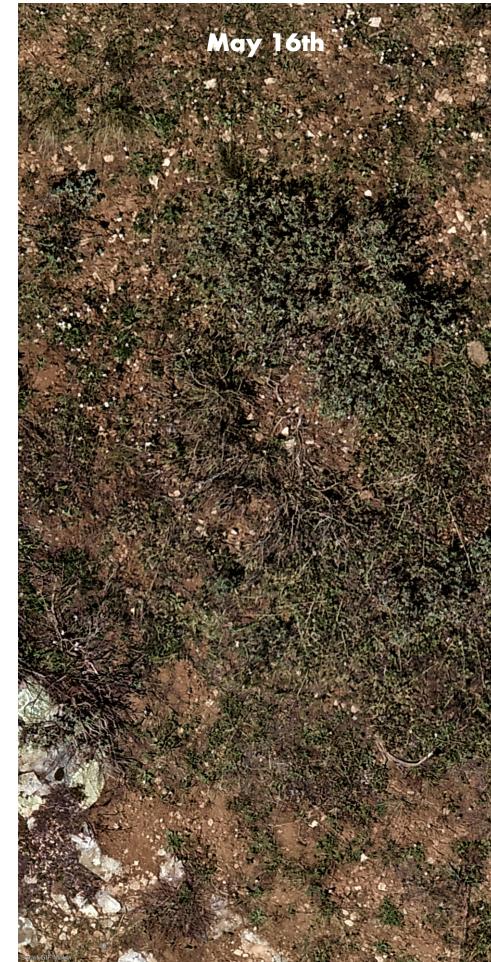
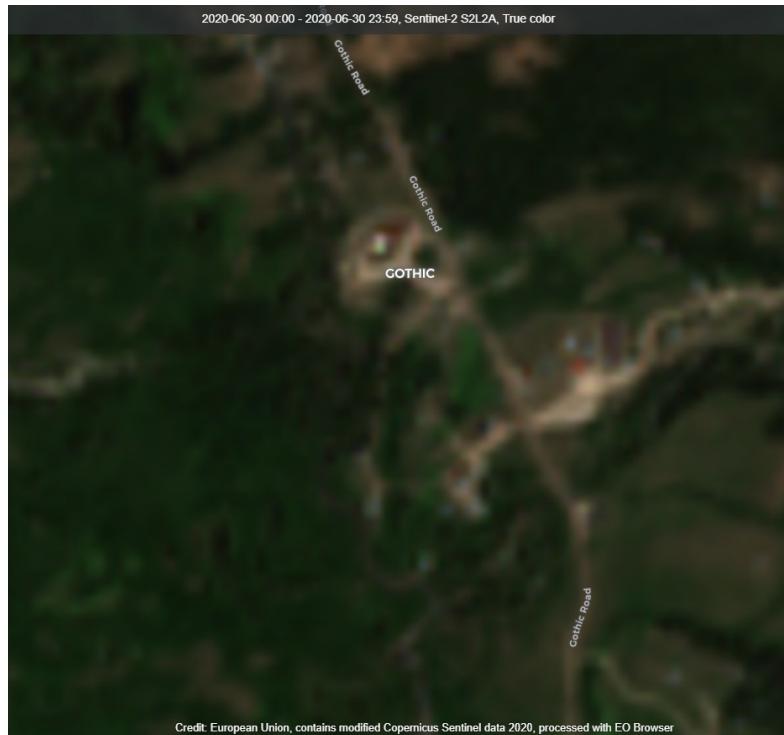
<https://eo-college.org/>

Drone Imaging

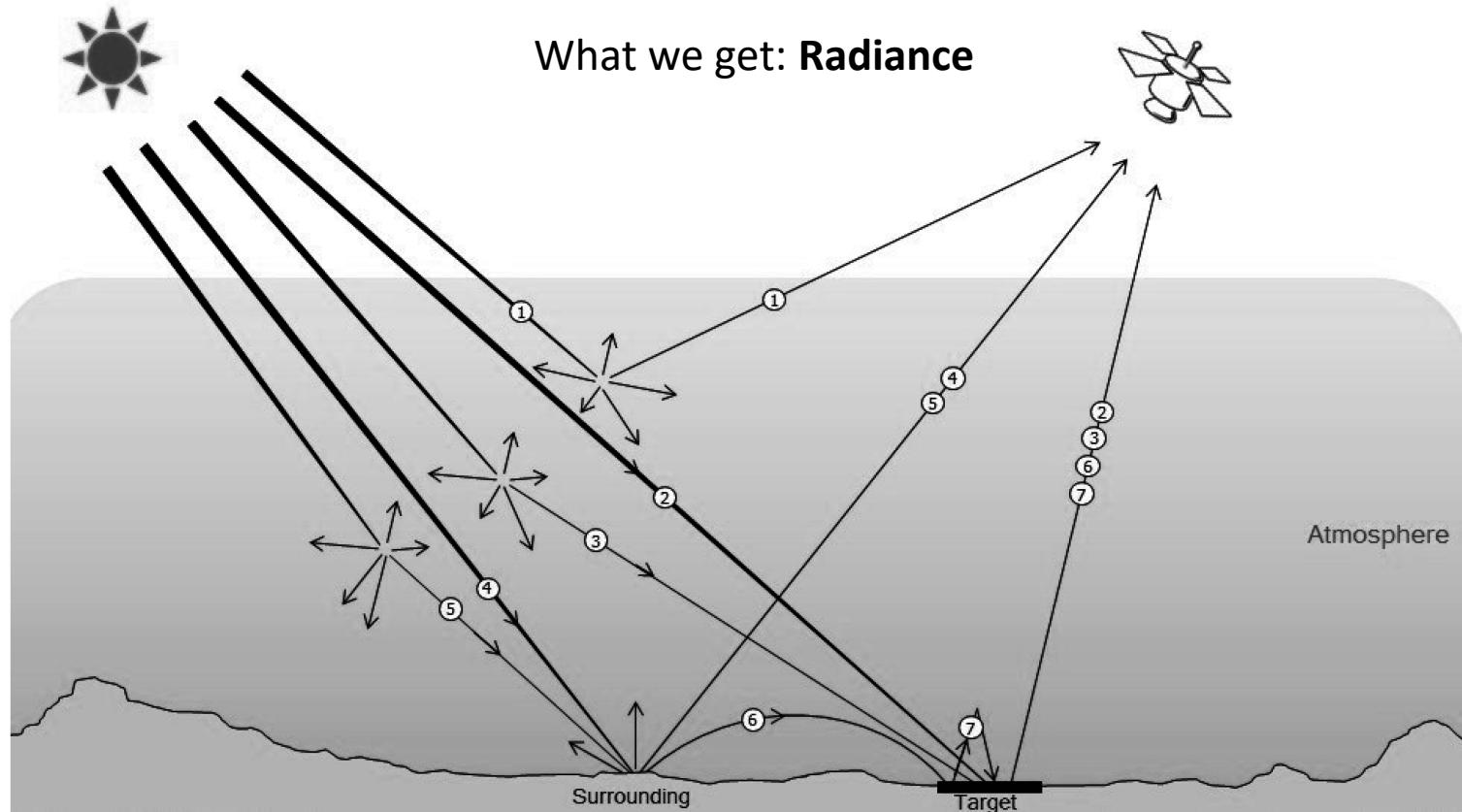


<http://mapir.camera>

# Some of this data is at the same scale as field data



# Automated processing makes lots of observations analysis-ready



# New computational tools make it feasible to wrangle big spatial datasets

Core Technologies



Languages / Software



Cloud Platforms



Google Earth Engine

# There are still “last mile” problems

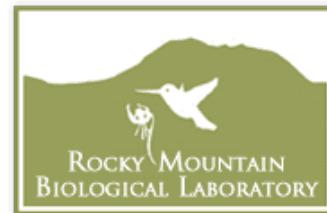


Phil Price / Wikimedia Commons

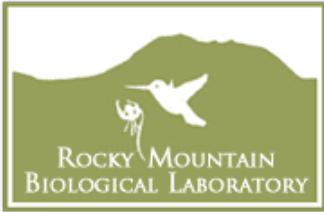
Translating remote measurements into environmentally relevant data.

Making it as seamless as possible to extract measurements where you need them.

# Efforts to cross the last mile



Spatial  
Data  
Platform



Spatial  
Data  
Platform

# Design Principles

- ***Reproducibility*** – Full processing pipeline and source data publicly available.
- ***Open Access*** – Permissive license that allows redistribution with acknowledgement.
- ***Quantifying Uncertainty*** – Mapping what we don't know

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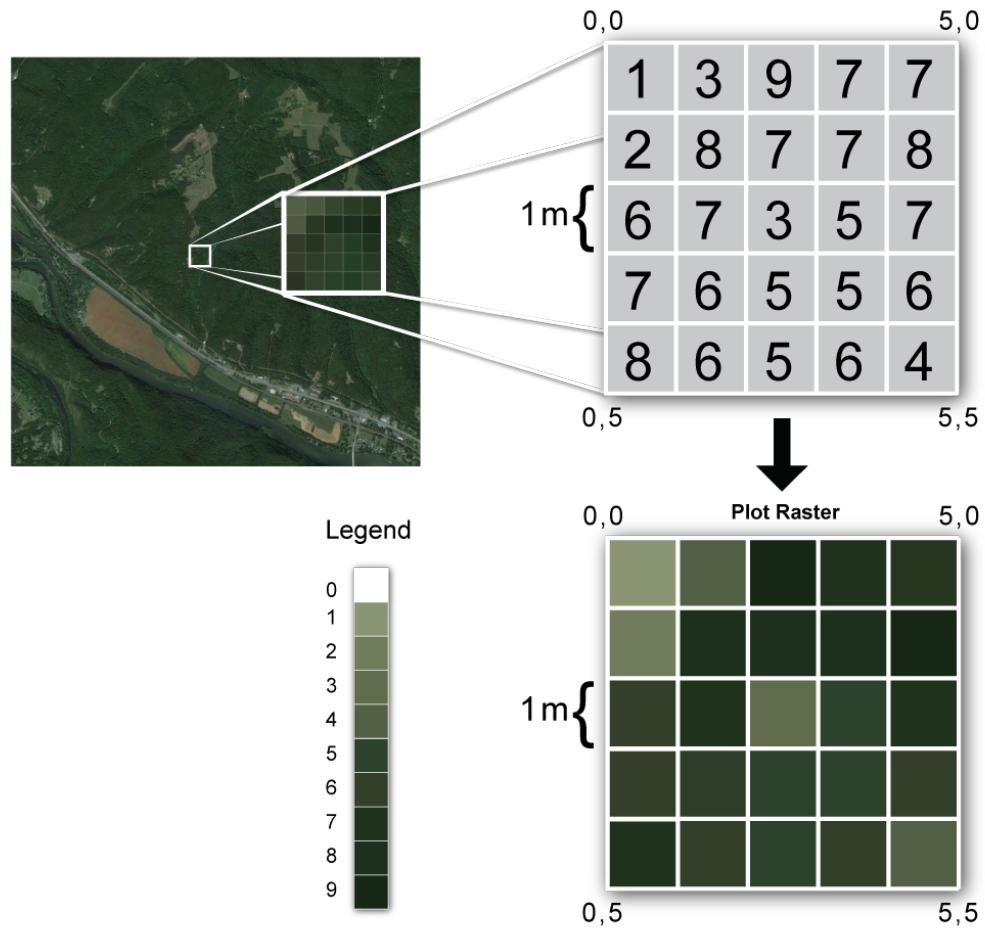
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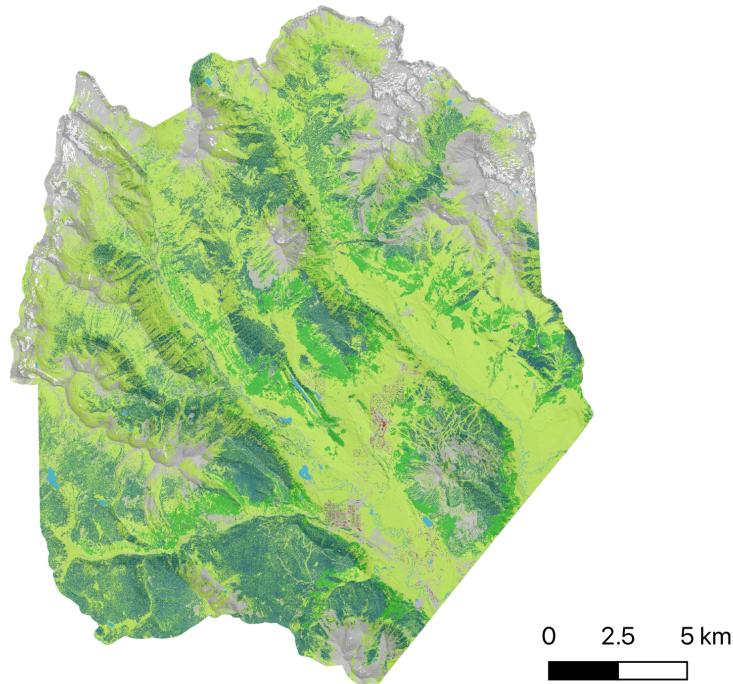
*How do I build the skills necessary?*

# Raster Data

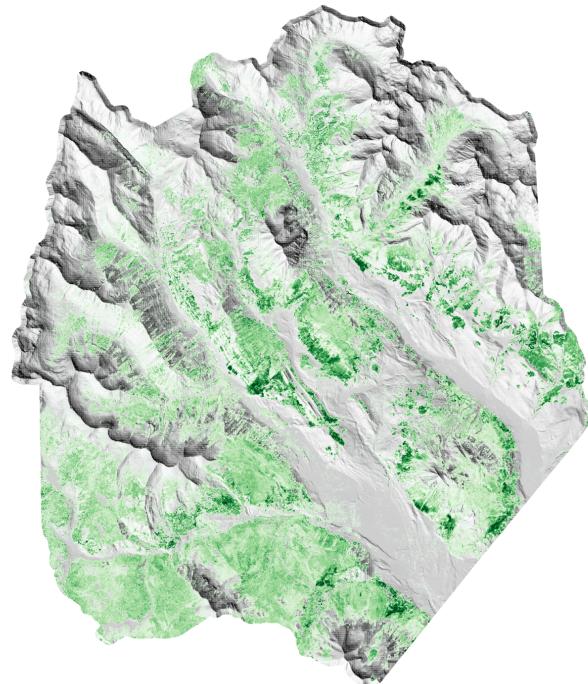


# Example Raster Datasets

**Landcover**



**Canopy Height**

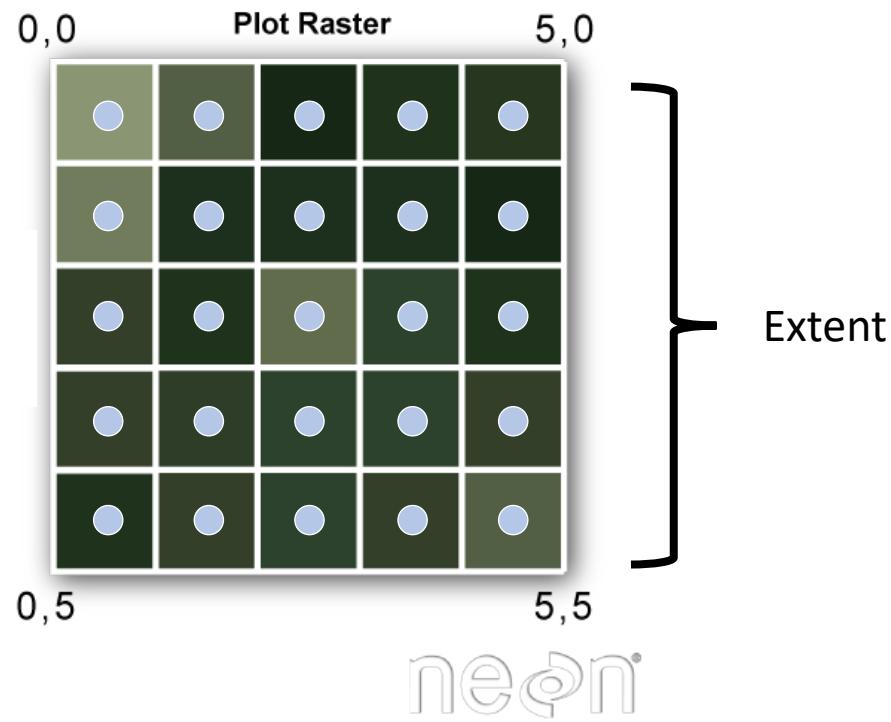


<https://www.rmbi.org/scientists/resources/spatial-data-platform/>

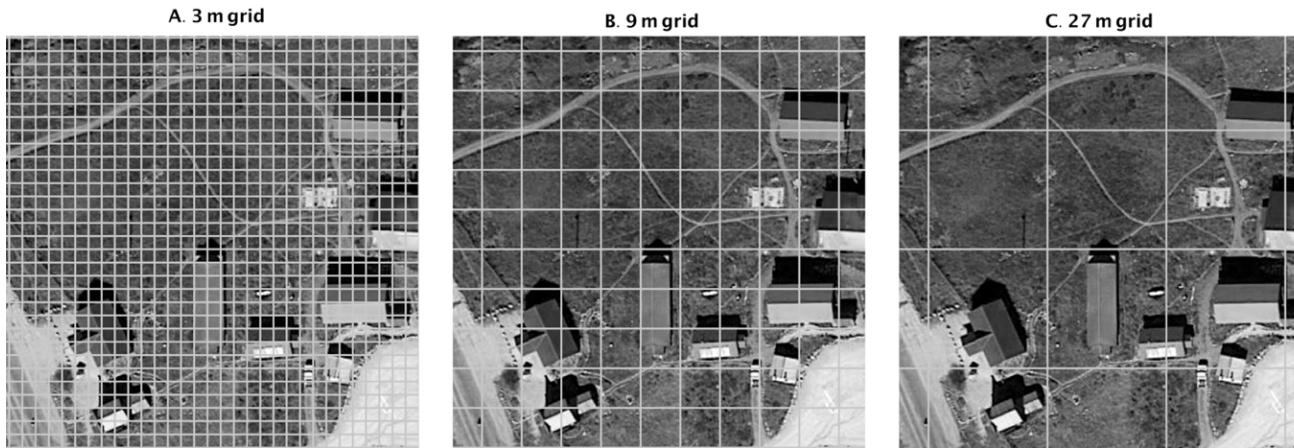
# 4 Key Concepts for Raster Data

- ***Extent and Grain*** - *Is the data I've got at an appropriate scale to be useful?*
- ***Spatial Autocorrelation*** – *How spatially “smooth” is the attribute I’m trying to represent?*
- ***Sampling and Resampling*** - *How do I extract useful data from a raster at my field sites?*
- ***Projections and Coordinate Systems*** – *What is a good 2D system for a 3D world?*

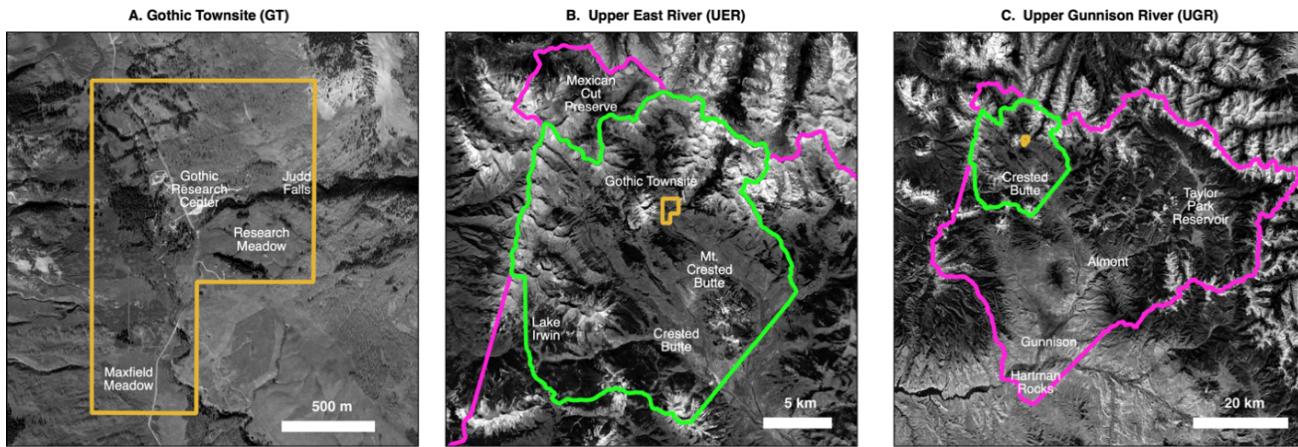
# Extent and Spatial Grain



# Grain and Extent in the SDP

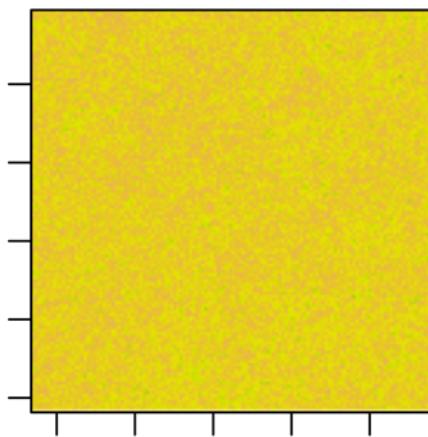


Not shown: nested 1m, 81m grids

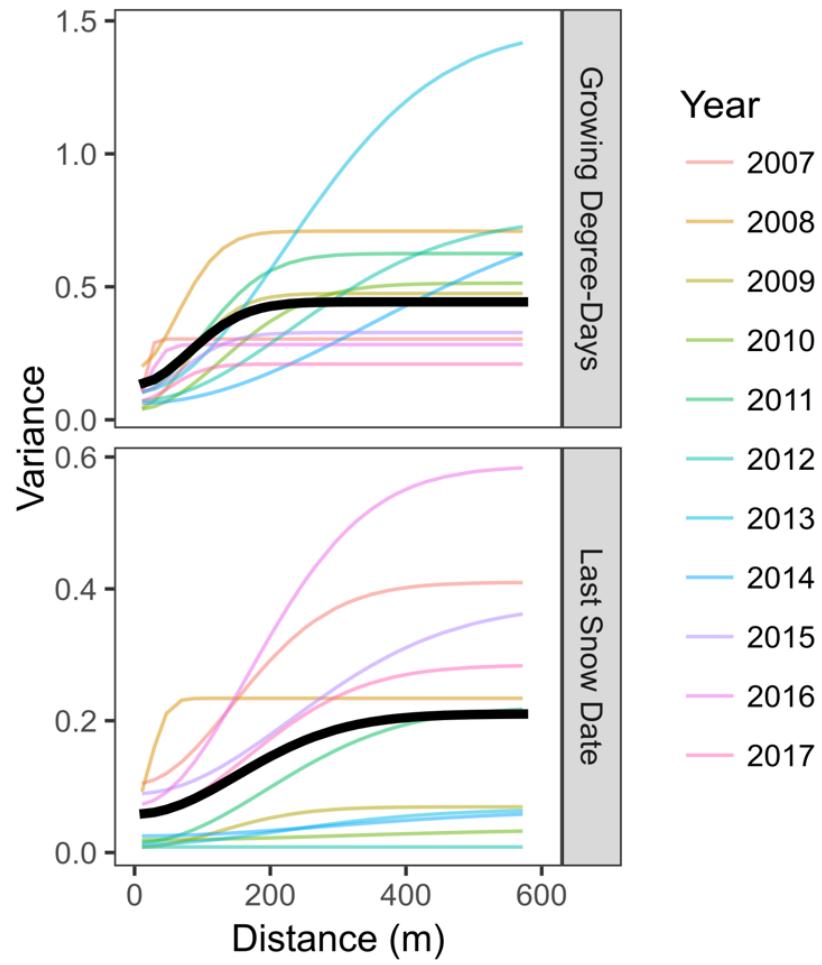
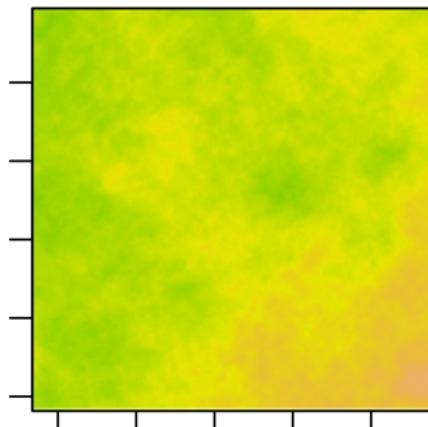


# Spatial Autocorrelation (smoothness)

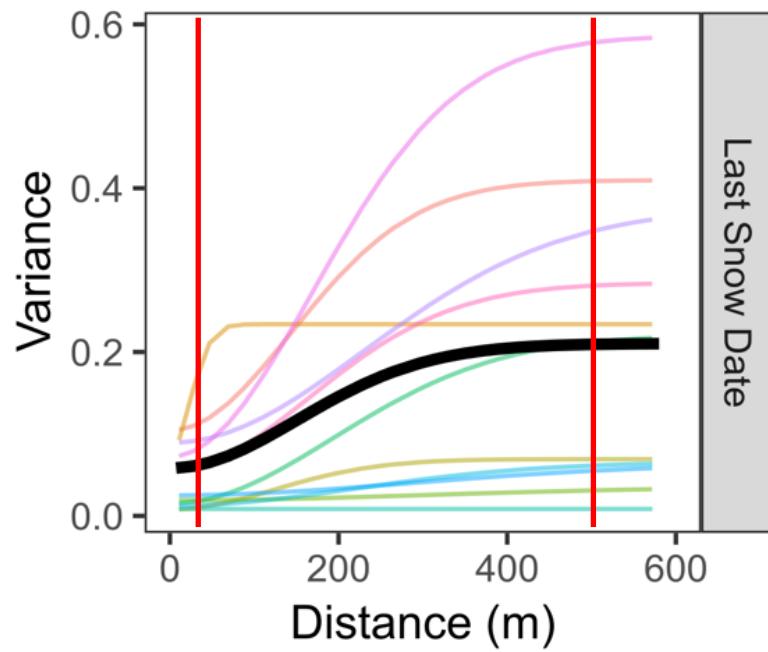
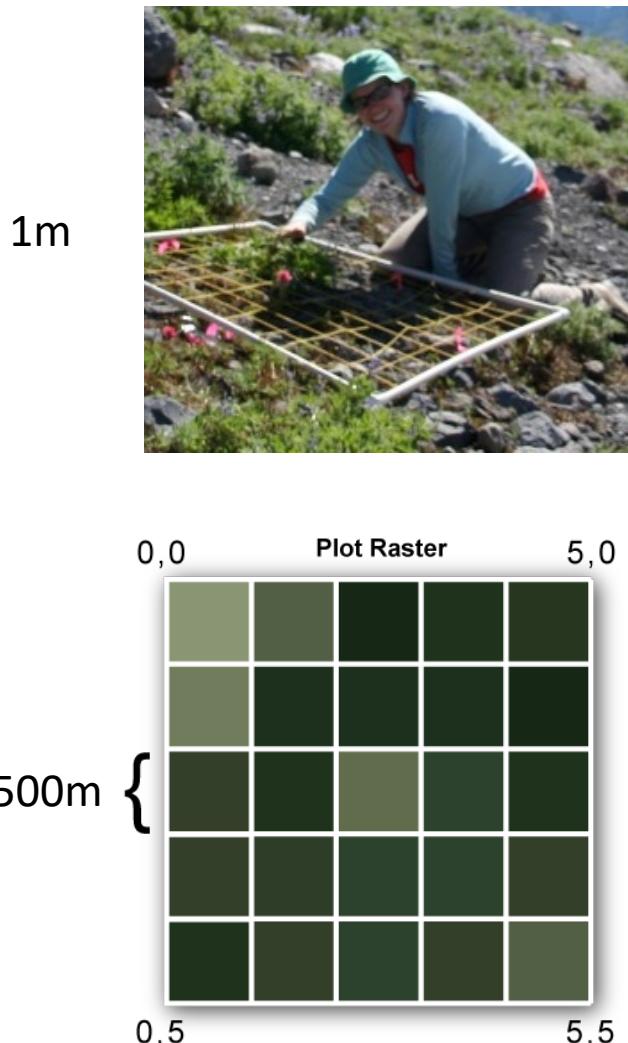
## Growing Degree-Days



## Last Snow Date

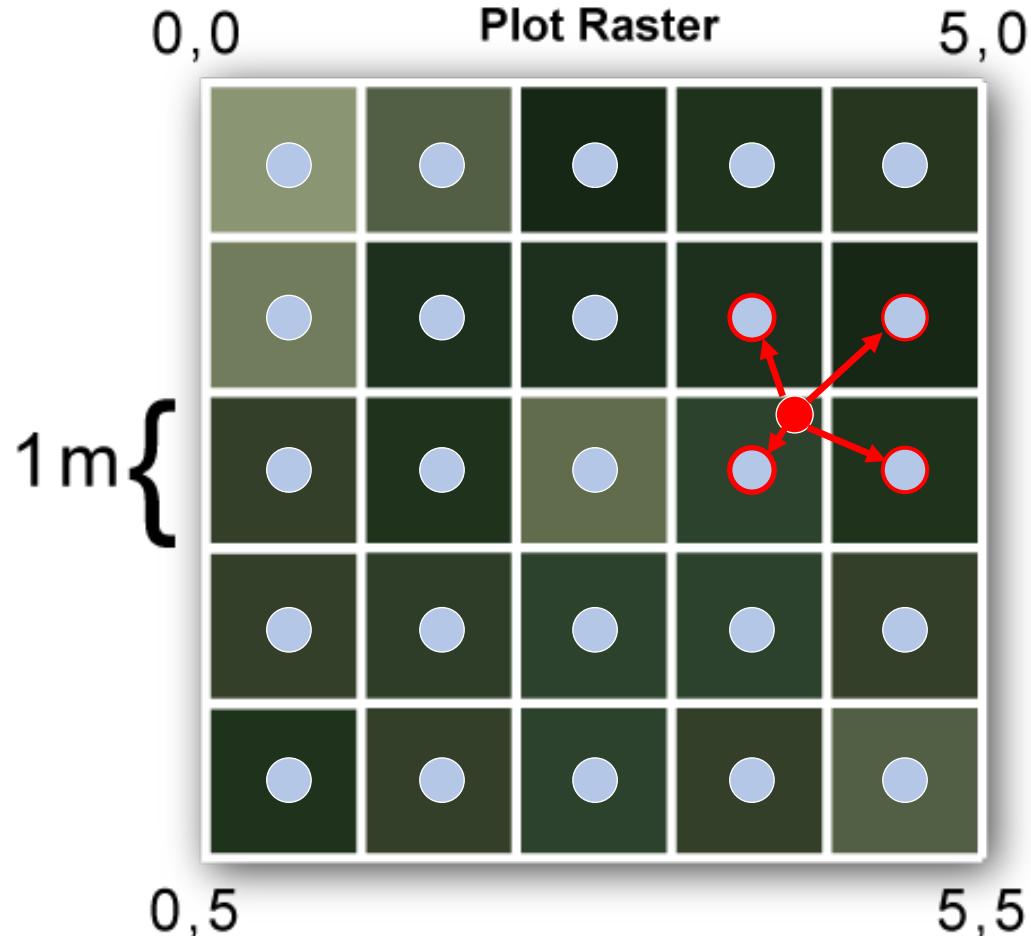


# Is the Data at the Right Scale?



Rule of thumb: is there more than a 25% difference in variance between the scale of field sampling and raster data I want to use?

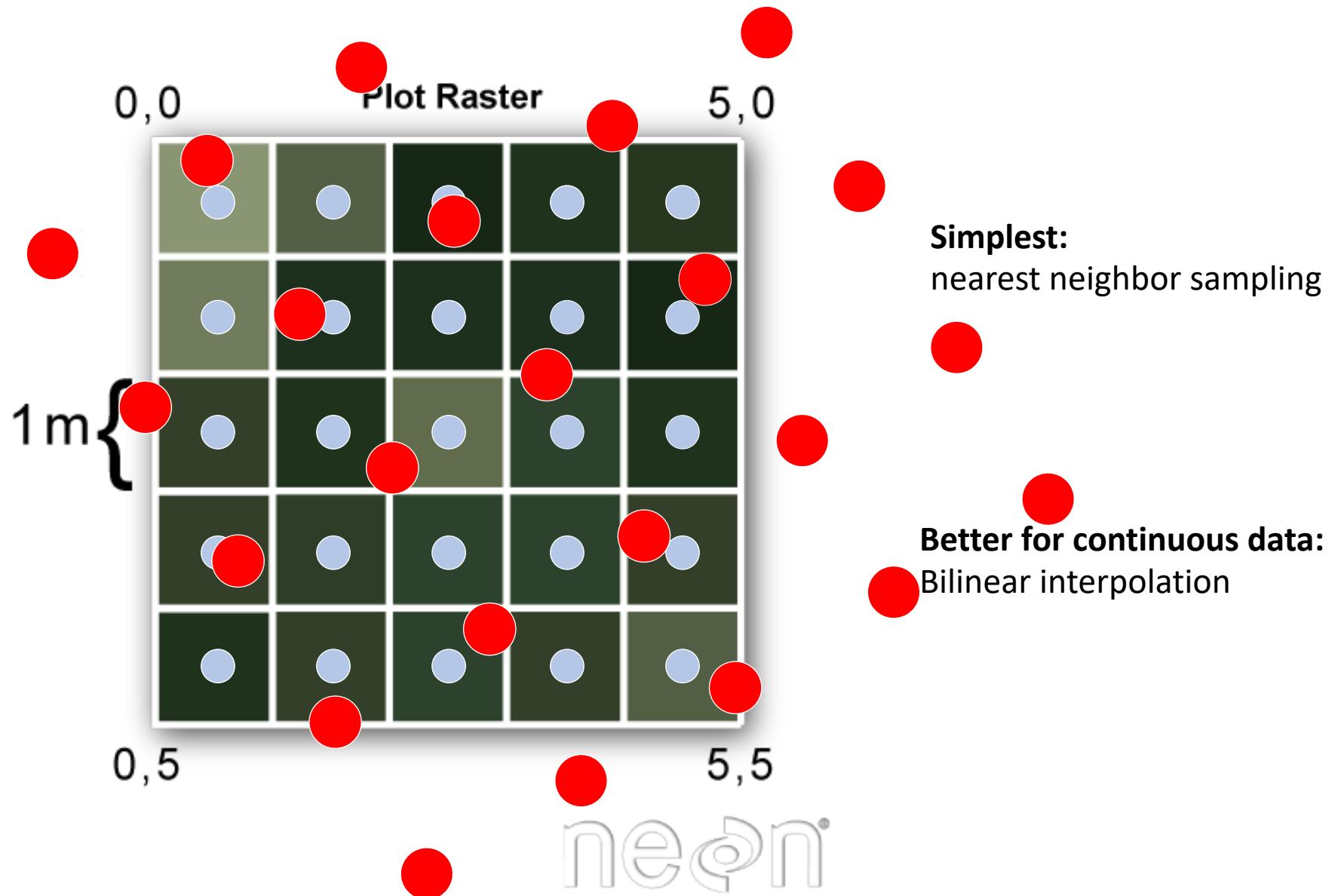
# Sampling and Resampling



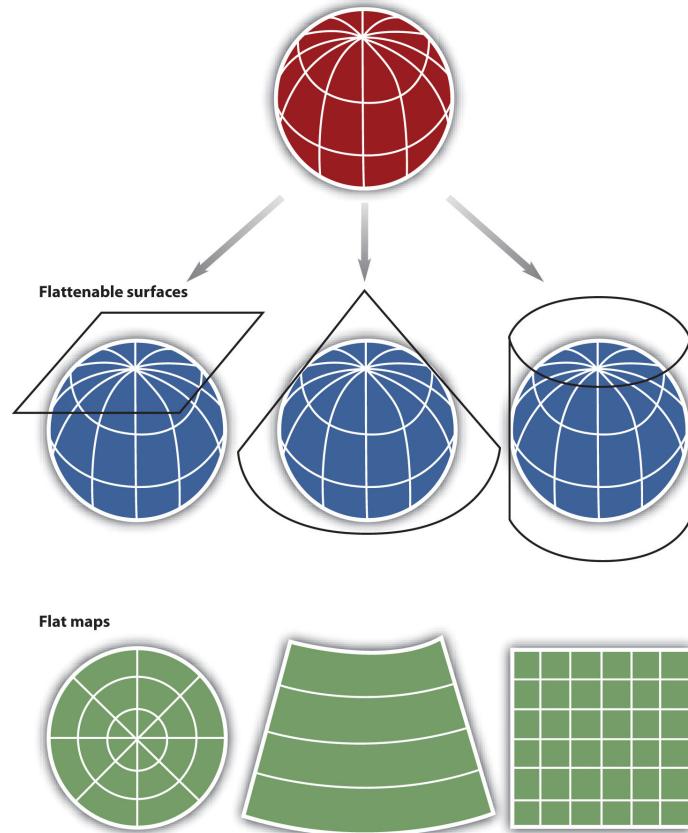
**Simplest:**  
nearest neighbor sampling

**Better for continuous data:**  
Bilinear interpolation

# Sampling and Resampling



# Projections and Coordinate Systems



<https://2012books.lardbucket.org>

<https://spatialreference.org>

**Usually:** re-project data to a common projection and coordinate system

**Beware:** some systems do not allow correct area and / or distance calculations

**For local scale work:**  
UTM systems are usually a good choice

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- **How?**

*How do I build the skills necessary?*

# Discovering Environmental Datasets

- [Earth Engine Data Catalog](#) Global
- [USGS Earth Explorer](#) Continental
- [RMBL Data Catalog](#) Local

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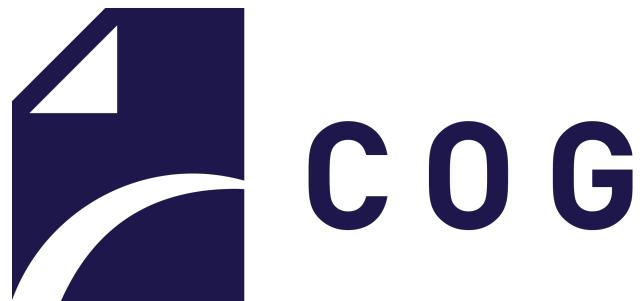
*What data is out there that is useful in my work?*

- **How?**

*How do I build the skills necessary?*

Demo: Exploring and sampling  
SDP Datasets in QGIS

# SDP Data Format



Cloud  
Optimized  
Geotiff

# Demo: Accessing SDP datasets using R

# Additional Resources

- Earth Observations for Biodiversity – recent papers
  - <https://doi.org/10.1016/j.rse.2019.111218>
  - <https://doi.org/10.1111/geb.12887>
- NASA Decadal Survey
  - <https://www.nationalacademies.org/our-work-decadal-survey-for-earth-science-and-applications-from-space>
- Working with Raster Data in R
  - <https://www.neonscience.org/raster-data-r>
- RMBL SDP Implementation Plan
  - <https://www.rmbl.org/scientists/resources/spatial-data-platform/>

# Thanks!

## Contact Me:

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