

RMBL Spatial Data Science Webinar Series

Webinar 6: What's New in 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 should you invest time in learning Spatial Data Science?

Why should you be excited about the RMBL SDP?

- **What?**

What new data products are available?

What's coming down the pipe in 2021 and 2022?

- **How?**

How do I find SDP Datasets?

How can I put them on a map?

How can I take them into the field?

How can I use them in analysis?

Webinar Series Feedback Survey

Spatial Data Science Webinar Series - Feedback
2021

Form description

What is your career stage?

- Undergraduate / Post-undergrad
- Graduate Student
- Post-doc / Research Scientist
- Professor / PI
- Other...

How did you find out about the series?

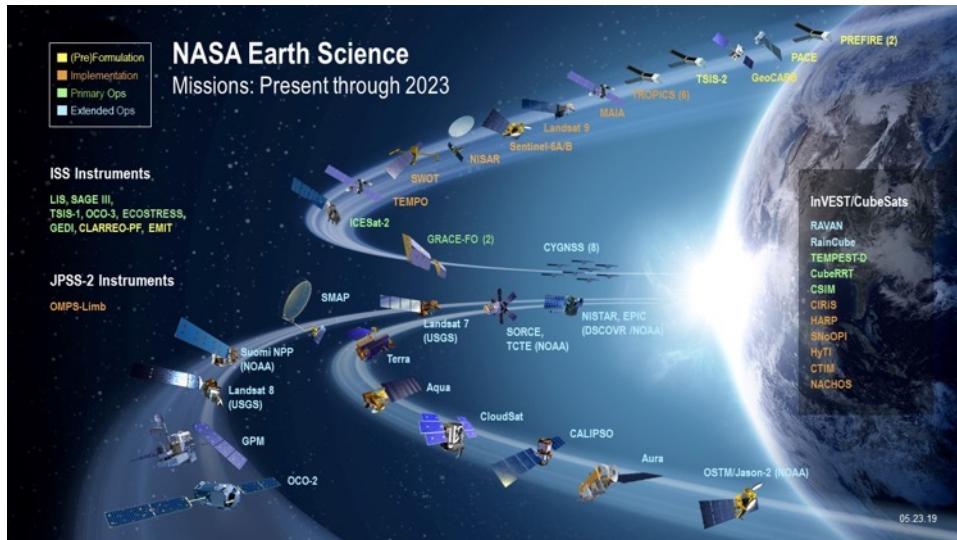
- RMBL PI or grad Listserv
- Other listserv
- RMBL Website
- Word of mouth
- Other...

<https://forms.gle/LW9F1Dq3wgc75eWN6>

Why Spatial Data Science?

Observations are abundant

Great free tools are available:



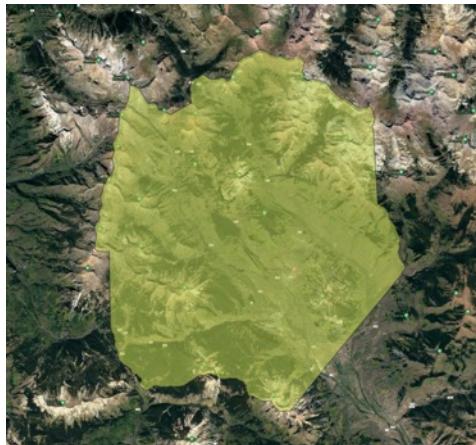
<https://www1.grc.nasa.gov/>



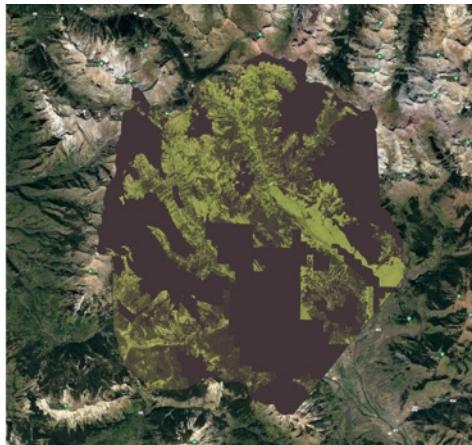
Why Spatial Data Science?

It can make our field studies more rigorous

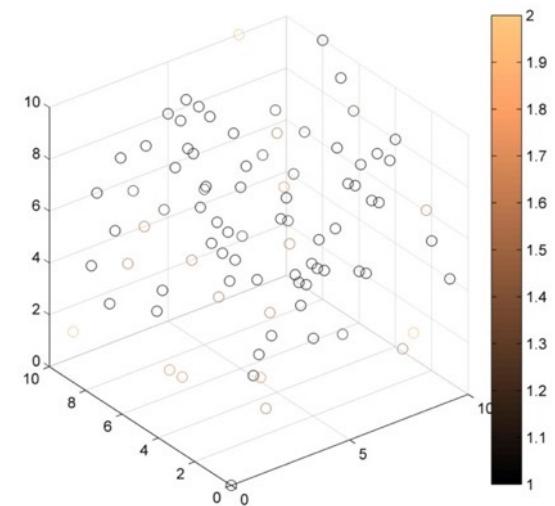
Study Area



Sampling Frame

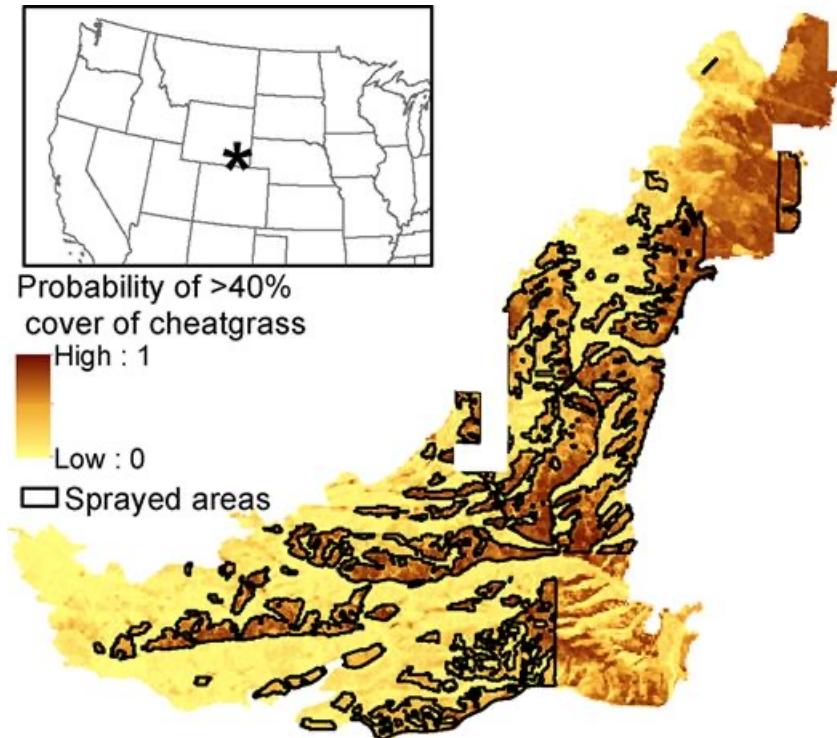
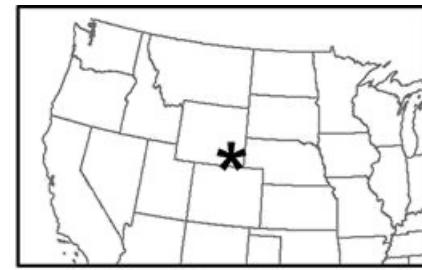


Latin Cube Samples

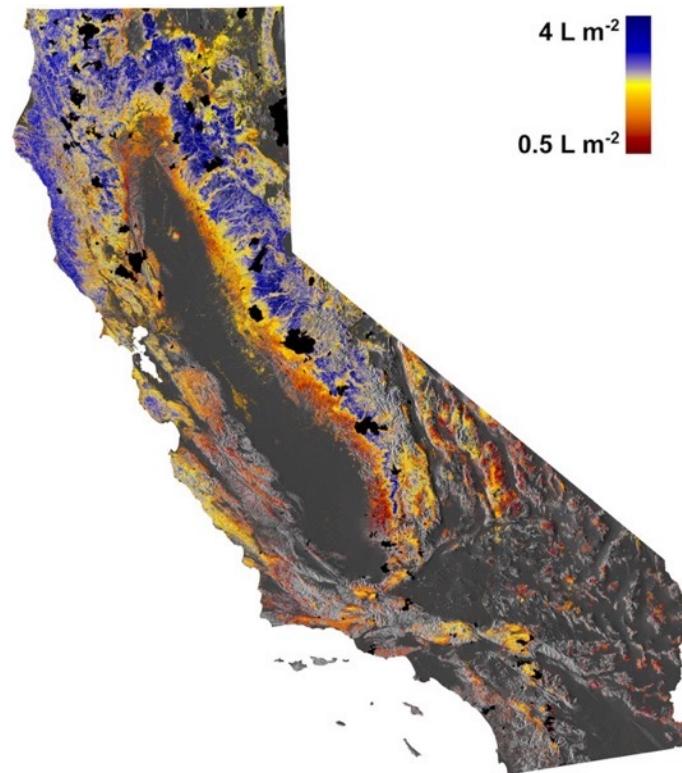


Why Spatial Data Science?

It can enable scaling our science up to what matters



Images: Sofaer et al. 2019, CSU



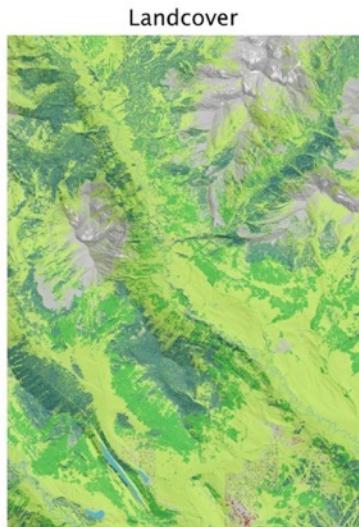
Figures: Asner et al. 2016



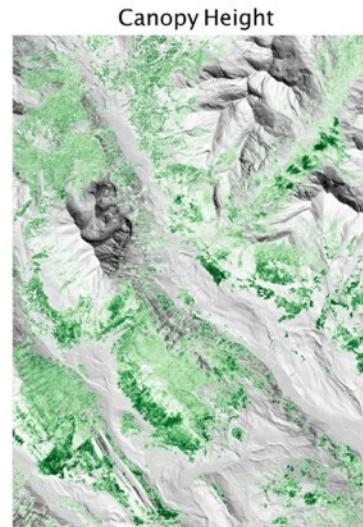
Spatial Data Platform

Gridded environmental data for the RMBL Domain

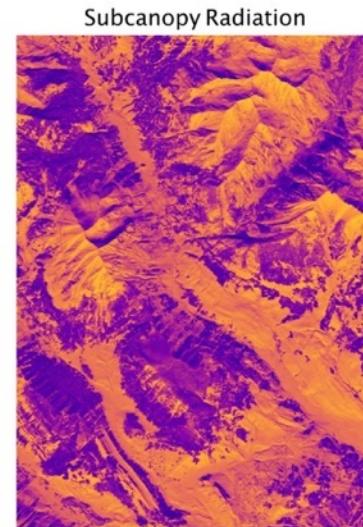
High Fidelity



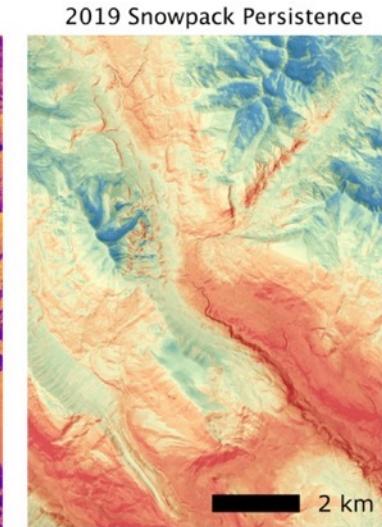
High Resolution



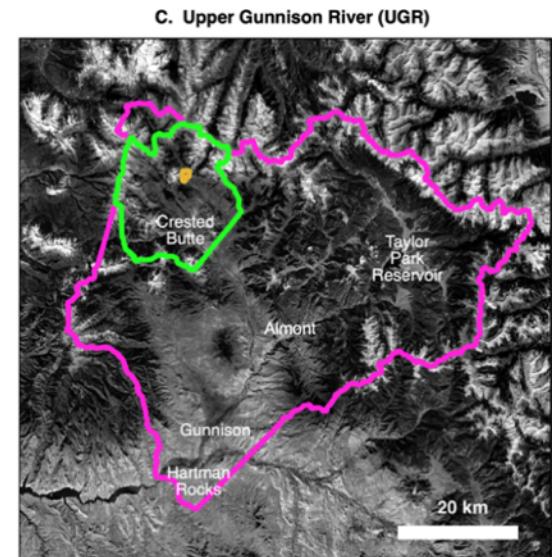
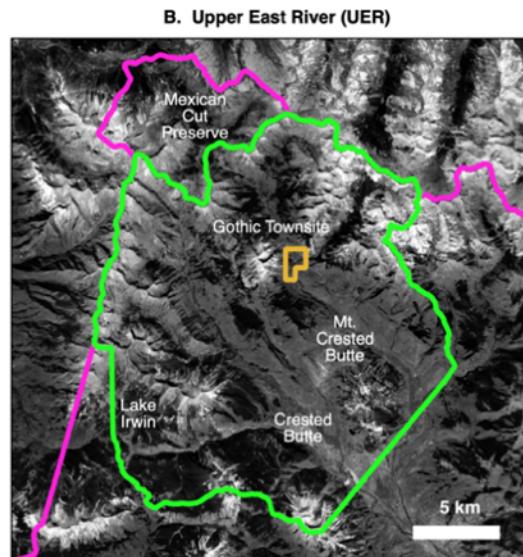
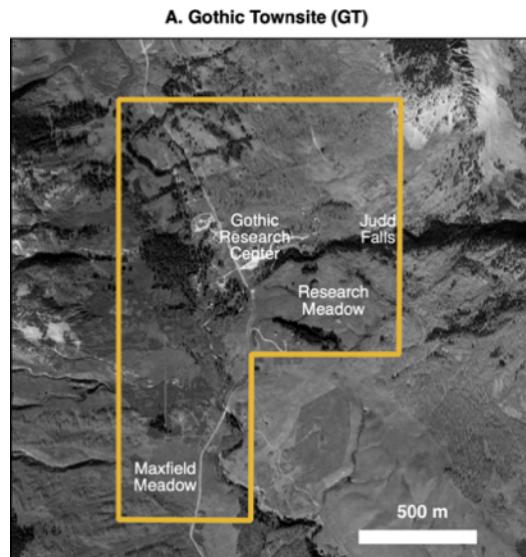
Open



Citeable



SDP Domains and Scales



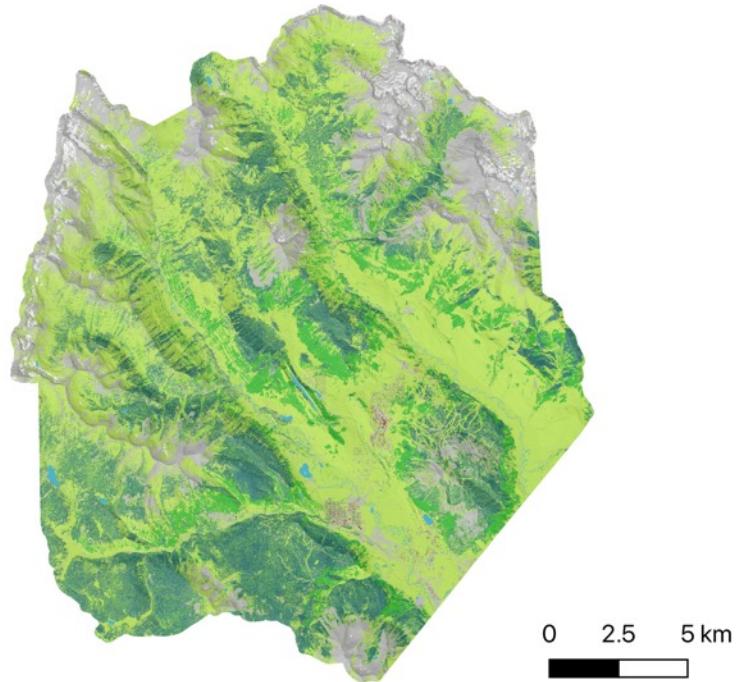
0.33m, 1m

1m, 3m

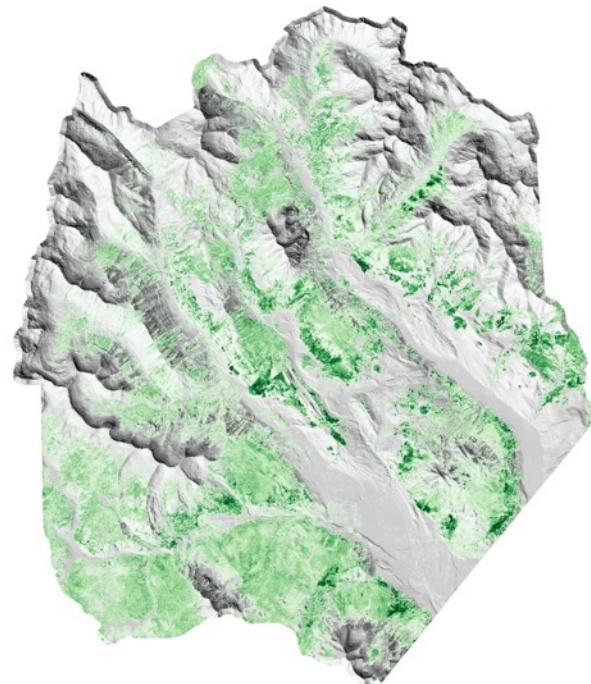
1m, 3m, 9m, 27m

SDP Release 1 – May 2020

Landcover



Canopy Height



0 2.5 5 km

DEM, DSM, Flowlines, Watersheds

SDP Release 2 and 3 – April 2021

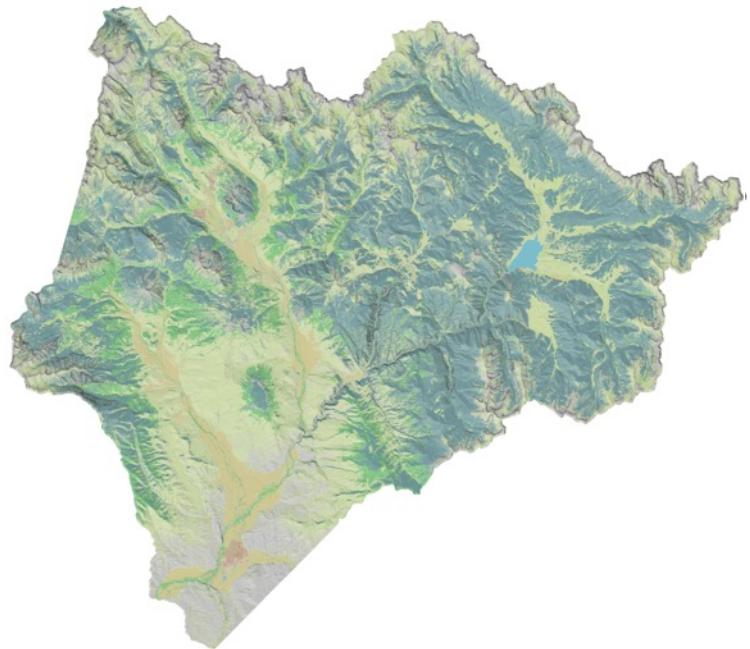
UER Domain



June 21st

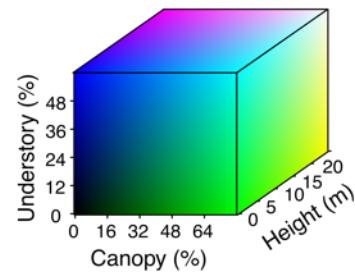
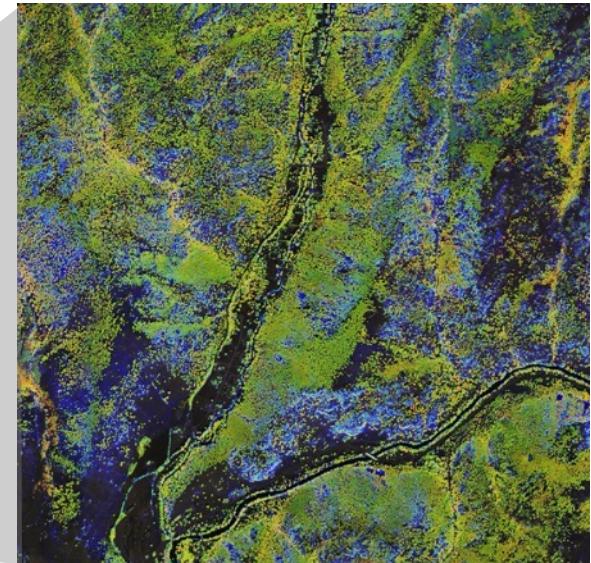
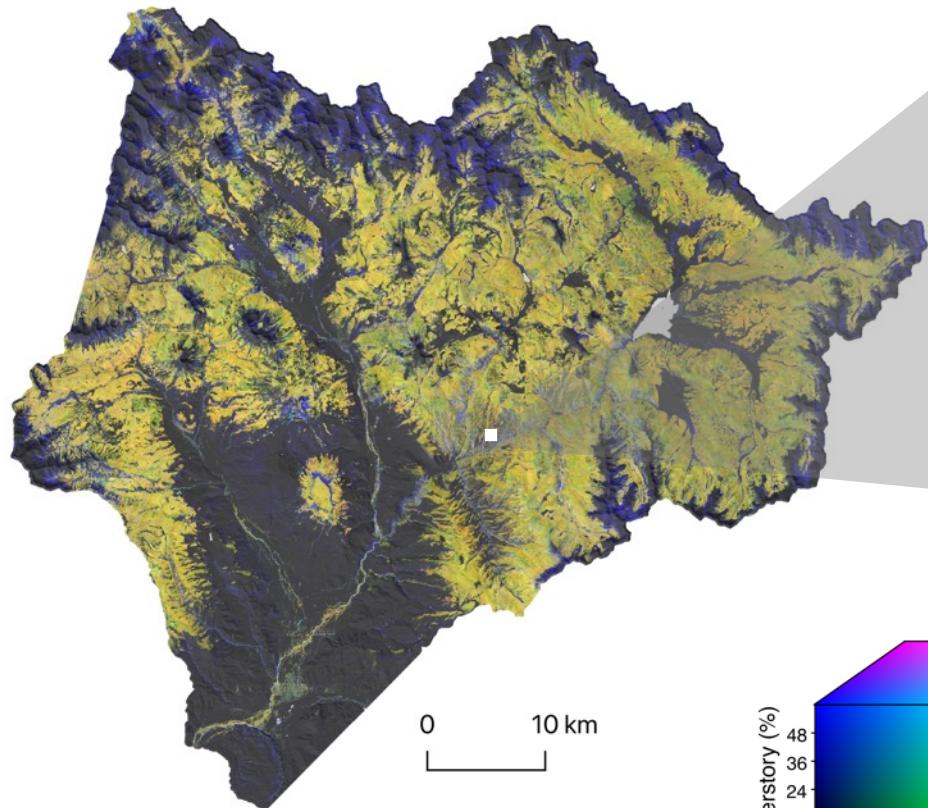
Potential Insolation
Winter and Summer Travel Time
33cm Canopy Height

UG Domain



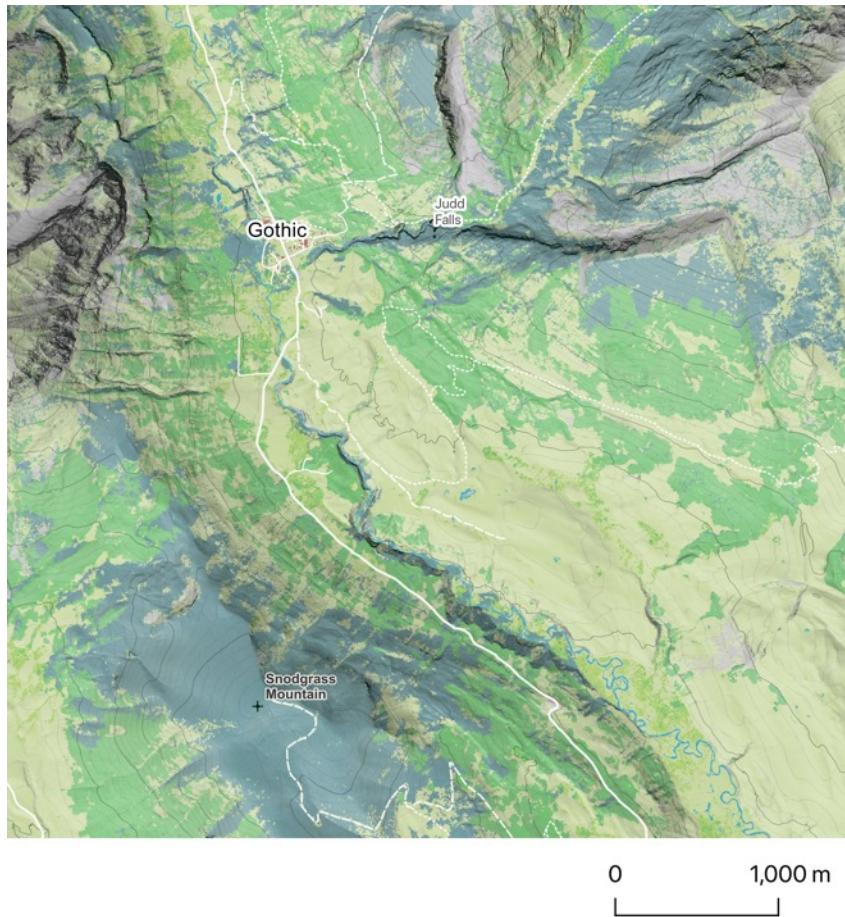
New 1m DEM and derivatives
1m Landcover
1m Imagery, NDVI
3m LiDAR Vegetation Structure

LiDAR Vegetation Structure

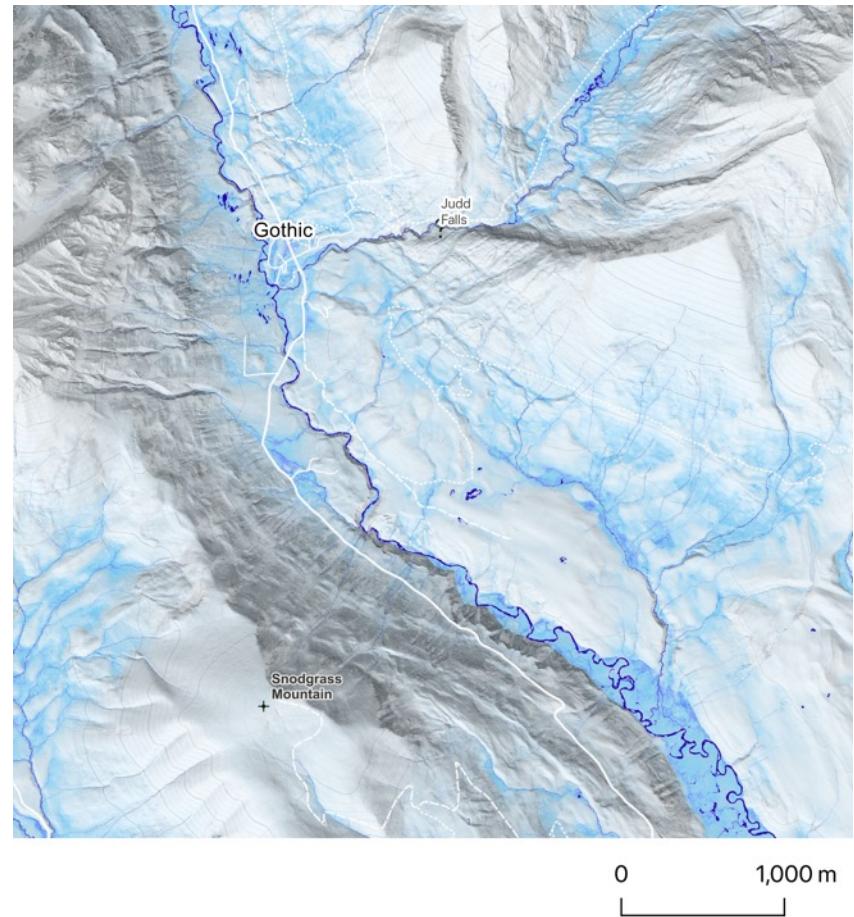


Thematic Basemaps

Landcover Theme

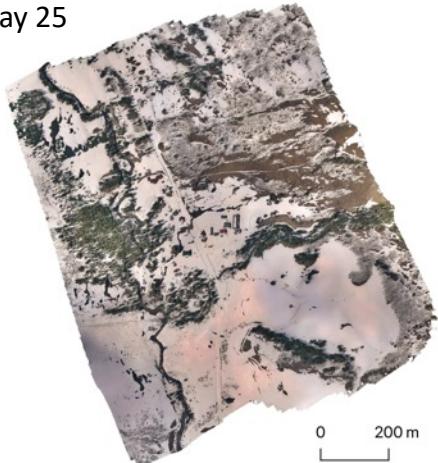


Hydro Theme

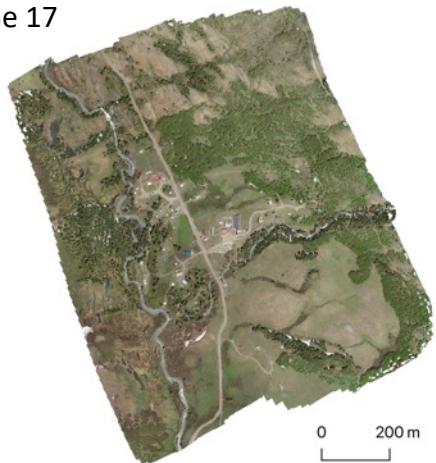


Imagery Basemaps

May 25



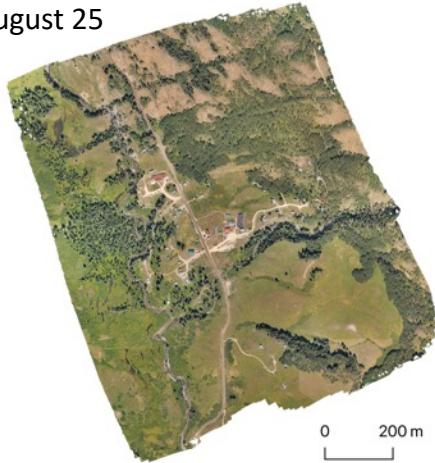
June 17



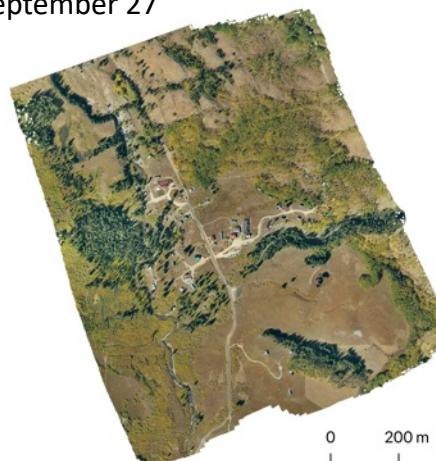
July 22



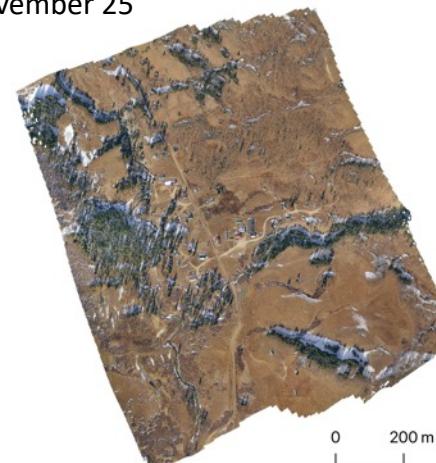
August 25



September 27



November 25



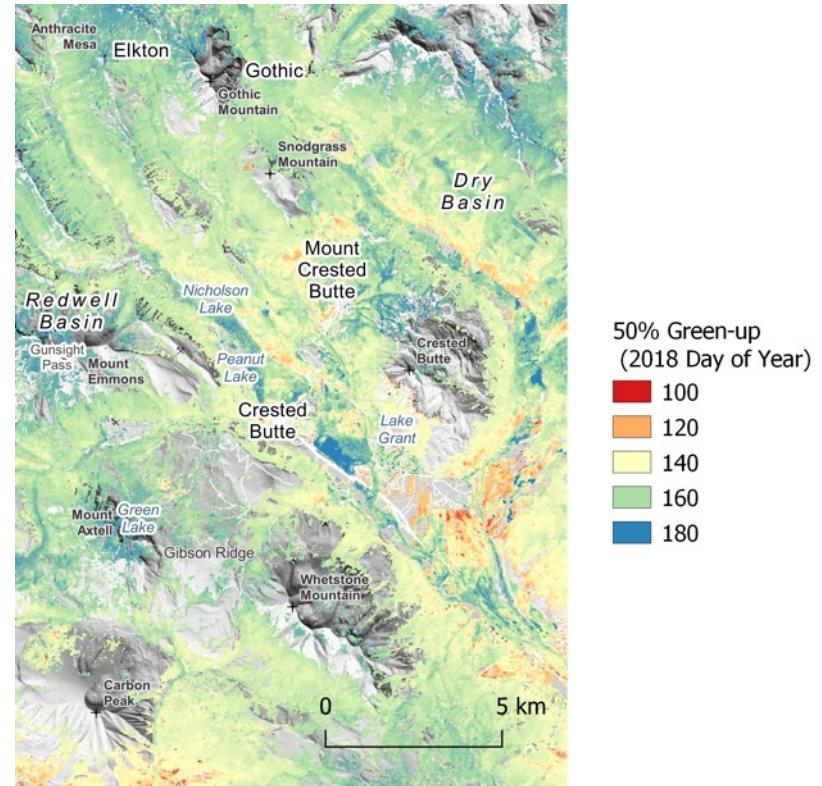
What's Coming in 2021 and 2022

Landsat / Sentinel 2 / UAV-based
Snow and Land Surface Phenology



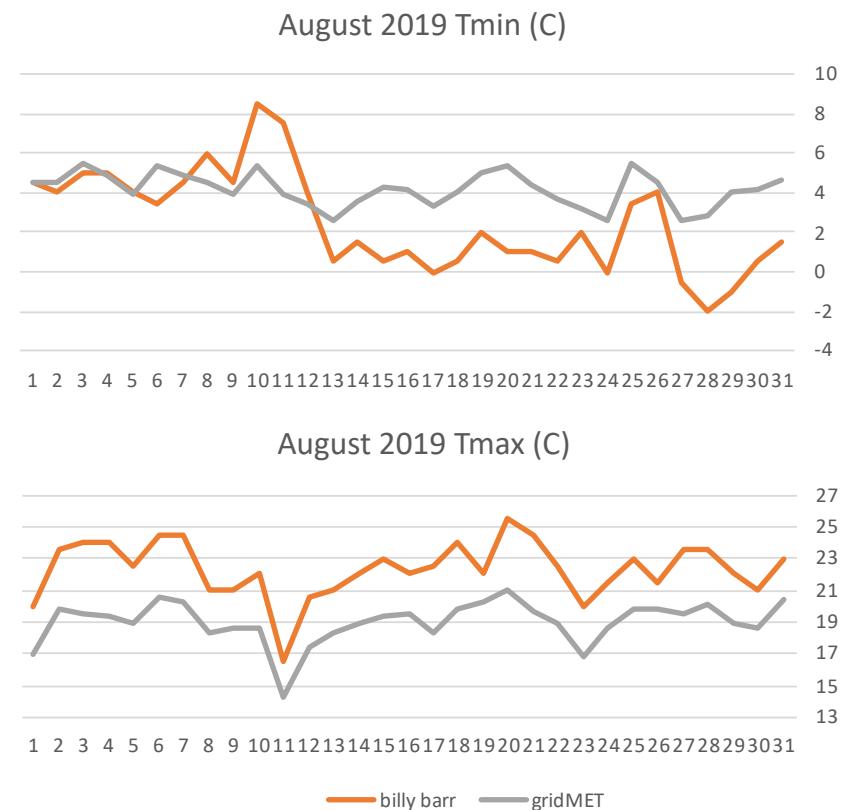
Weekly fractional snow
and leaf area index
~30m resolution
2016 - 2021

Bolton et al. 2020

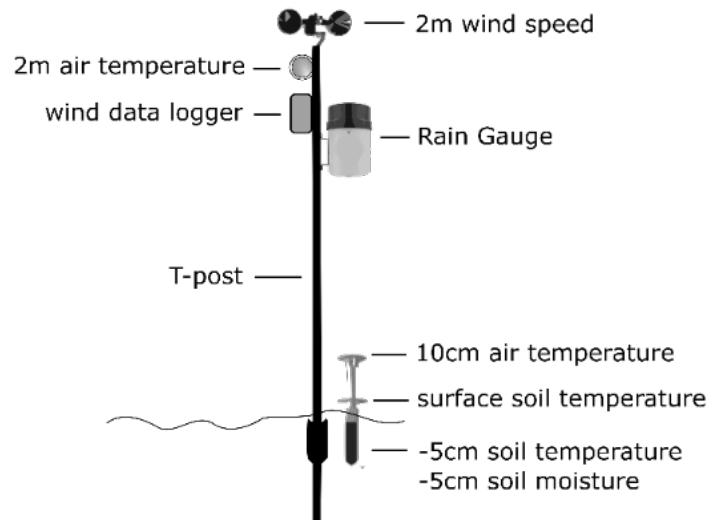


What's Coming in 2021 and 2022

New Microclimate Maps Incorporating Snow, Phenology, and Cold-air Pooling



A Distributed Low-cost Sensor Network

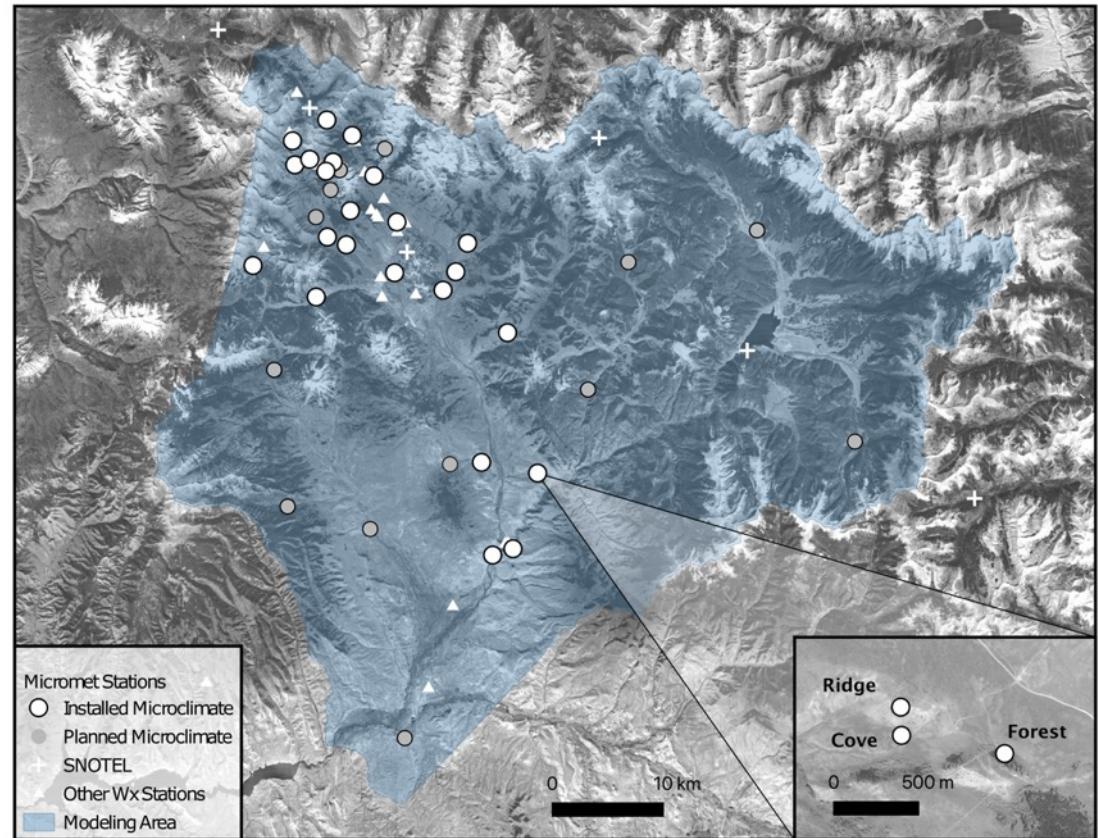


Equipment cost ~\$800 / node



Sensor Network Deployment so-far

- 66 stations instrumented in 2020
- Forest / microtopography balance
- Funding dependent:
 - additional instrumentation
 - Expanded network



Discovering SDP Datasets

RMBL Data Catalog

<https://www.rmbl.org/scientists/resources/data-catalog/?tag-id=84>

Current Product Table

https://www.rmbl.org/wp-content/uploads/2021/04/SDP_product_table_4_26_2021.csv

Long-term Archiving



Data Catalog

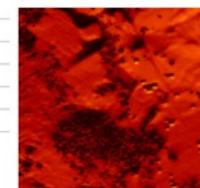
Research Requirements
Running Grants Through RMBL
Grant Opportunities
Scientific Resources
RMBL Publications Database
Data Catalog
Spatial Data Platform
Data Services
Research Plans
Data Use Policy
Featured Research Projects
Invasive Plant Management
GC-MS Course
Scientists
Research Assistant Info
Research Applications
Researcher Application
Visiting Scientist Application
Research Assistant Application

Search or browse RMBL GIS data and other datasets.
If you've got a public dataset that you'd like listed here, please [contact us](#).

Tag: SDP*

Search...

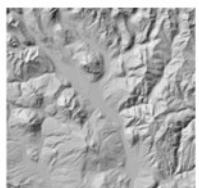
Subcanopy Potential Solar Radiation on Day of Year 355...



1 m Resolution Digital Elevation Model for the Upp...



3 m Resolution Digital Elevation Model for the Upp...



Winter solstice potential understory solar radiation using a subcanopy radiation model and LiDAR-based...

Plants NEON AOP SDP
radiation

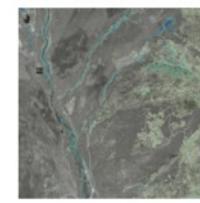
Harmonized high-resolution DEM for the Upper Gunnison River domain

lidar elevation SDP
bare-earth

Harmonized moderate-resolution DEM for the Upper Gunnison River domain

elevation lidar SDP
bare-earth

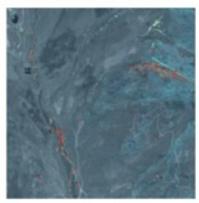
3 m Resolution Understory Cover for the Upper Gunniso...



1 m Resolution Canopy Height Estimates for the Upper...



3 m Resolution 20th Percentile Canopy Height Estimates for...



Upper Gunnison LiDAR vegetation structure metrics: understory density for 0.25 to 2m above the ground.

Plants cover lidar
canopy SDP

Composite high-resolution maximum canopy height from LiDAR

lidar canopy forest
SDP Upper Gunnison
understory

Upper Gunnison LiDAR vegetation structure metrics: 20th percentile height

Plants lidar canopy
SDP understorey

So How Can I Access This Stuff?

All published datasets are in a [public Amazon S3 Bucket](#)

Data Products

Direct Cloud Access (no download):



ArcGIS Pro

Basemaps



ArcGIS Online

Mapping and analysis: location intelligence for everyone



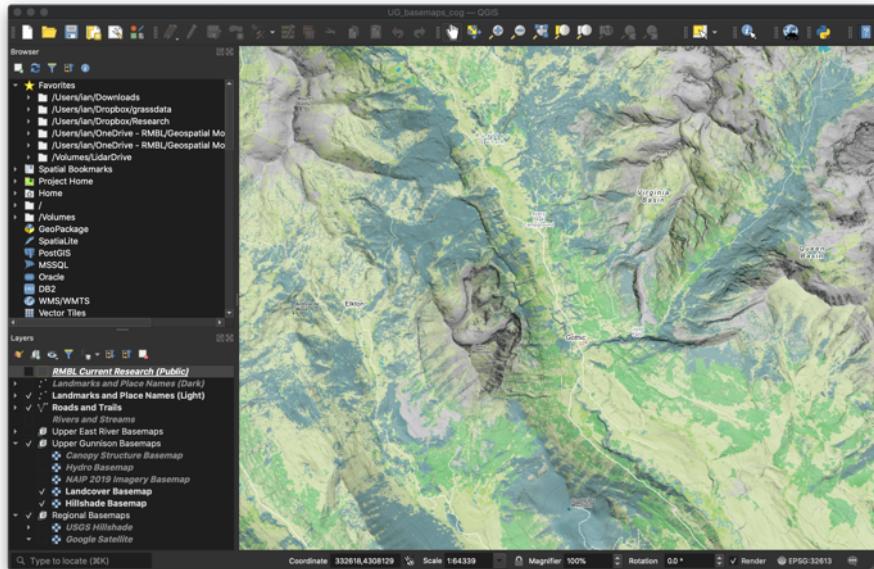
ArcGIS® Field Maps

Programmatic Access (no download):



Any software that
Load a tiled map service.

Demo: Loading basemaps and data products in QGIS



Download and Install [QGIS](#):



Download and Open [Demo Map](#):



Demo: Accessing basemaps in ArcGIS Online and Field Maps

The screenshot shows a web browser displaying an ArcGIS Online item page. The title is "Landcover Basemap with Hillshade". The main content area includes a thumbnail image of the map, a description section stating "Hillshade Basemap with Topo Lines Tile Layer by ikb_rmb1", and details like "Created: Apr 4, 2021" and "Updated: Apr 4, 2021". Below this are sections for "Description", "Layers" (listing "UG_landcover_basemap_v3.tif"), "Terms of Use", "Comments (0)", and "Owner" (ikb_rmb1). On the right side, there are "Details" (Source: Map Service, Size: 301 MB, rating 5 stars), "Share" (link icon), and "Tags" (empty).

Install ArcGIS Field Maps on your mobile device:

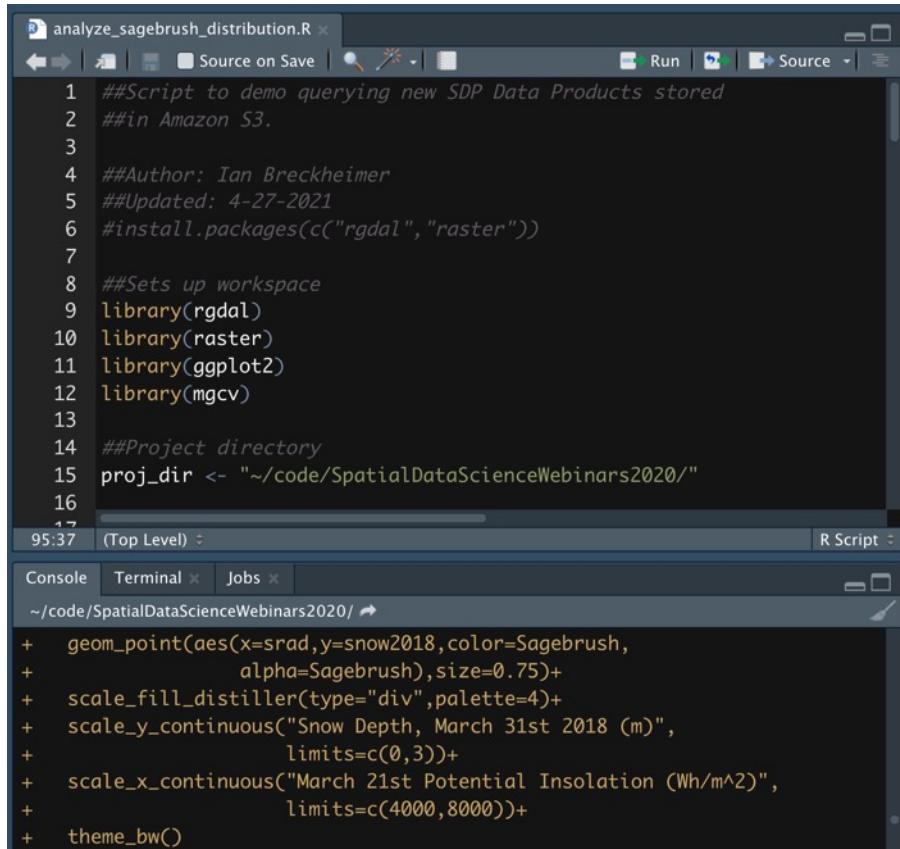
[Google Play](#)

[iOS App Store](#)

Open the app, and search for:
"RMBL Research" (skip sign-in).

Contact us (gis@rmb1.org) to get Offline access, and access to non-public data.

Demo: Accessing SDP datasets programmatically with R



The screenshot shows an RStudio interface. The top panel displays an R script titled "analyze_sagebrush_distribution.R". The script contains code for setting up a workspace, installing packages (rgdal, raster), defining a project directory, and reading a spatial point dataset. The bottom panel shows the R console output, which includes a ggplot2 command for creating a scatter plot with specific styling.

```
##Script to demo querying new SDP Data Products stored
##in Amazon S3.

##Author: Ian Breckheimer
##Updated: 4-27-2021
#install.packages(c("rgdal", "raster"))

##Sets up workspace
library(rgdal)
library(raster)
library(ggplot2)
library(mgcv)

##Project directory
proj_dir <- "~/code/SpatialDataScienceWebinars2020/"

geom_point(aes(x=srad,y=snow2018,color=Sagebrush,
alpha=Sagebrush),size=0.75)+
```

Access to cloud-based datasets via raster, terra, rgdal, gdalUtils packages

Webinar Series Feedback Survey

Spatial Data Science Webinar Series - Feedback
2021

Form description

What is your career stage?

- Undergraduate / Post-undergrad
- Graduate Student
- Post-doc / Research Scientist
- Professor / PI
- Other...

How did you find out about the series?

- RMBL PI or grad Listserv
- Other listserv
- RMBL Website
- Word of mouth
- Other...

<https://forms.gle/LW9F1Dq3wgc75eWN6>

Thanks!

Contact Me:

Ian Breckheimer

ikb@rmbl.org

Twitter, Github: @ibreckhe

References

- Asner, G. P., Brodrick, P. G., Anderson, C. B., Vaughn, N., Knapp, D. E., & Martin, R. E. (2016). Progressive forest canopy water loss during the 2012–2015 California drought. *Proceedings of the National Academy of Sciences*, 113(2), E249-E255.
- Sofaer, H. R., Jarnevich, C. S., Pearse, I. S., Smyth, R. L., Auer, S., Cook, G. L., ... & Hamilton, H. (2019). Development and delivery of species distribution models to inform decision-making. *BioScience*, 69(7), 544-557.
- Bolton, D. K., Gray, J. M., Melaas, E. K., Moon, M., Eklundh, L., & Friedl, M. A. (2020). Continental-scale land surface phenology from harmonized Landsat 8 and Sentinel-2 imagery. *Remote Sensing of Environment*, 240, 111685.