Today's Schedule (in EST!)

11:00-11:20 Introduction to CartograPlant - Dr. Jill Wegrzyn

11:20-11:40 Introduction to Data Submission with TPPS/TPPSc - Emily Grau

11:40-12:00 Introduction to Data Collection/Mobile Phenotyping with TreeSnap - Dr. Margaret Staton

12:00-12:15 Break

12:15-12:35 Behind the Scenes of CartograPlant - Environmental Layers and Data - Risharde Ramnath

12:35-12:55 Analytics with CartograPlant (GWAS and GEA). Part 1 - Gabriel Barrett

12:55-1:15 Analytics with CartograPlant (GWAS and GEA). Part 2 – Dr. Irene Cobo-Simon

1:15-1:30 Q&A

Behind the Scenes of CartograPlant Environmental Layers and Data

Risharde Ramnath – Lead Developer – TreeGenesDB/CartograPlant

Team!

- Irene Cobo-Simon – Postdoctoral Scholar
- Rish Ramnath - Lead Developer
- Vlad Savitsky– TPPS/TPPSc Developer
- Emily Grau – Lead Database Administrator of TreeGenes
- Gabe Barrett – Analytic workflow developer
- Sean Buehler – Tripal Developer
- Shay Muhonen – TreeGenes/CartograPlant Coordinator
- Meg Staton Lab (UTK) – TreeSnap! Noah Caldwell

Biocuration Team Lead (UConn): Meghan Myles

- Curation Team: Victoria Burton, Maddie Gadomski, Isabella Harding, Jeff Gamer, and Rachel Wolther

- Nic Herndon Lab (ECU)!

CartograPlant

Funded by USDA-NIFA #2018-09223
Funded by AG2PI

@JillWegrzyn
@TreeGenes

CartograPlant

Summary of today's presentation

01

What are layers

- A layer is exactly what it says! It's an overlay or visual representation of data on a map. The map itself is usually called the base layer.

02

Types of layers

- Layers come in many different formats – each format has it's own strengths

03

How we work with layers

- We'll talk briefly about some of the tools we use

04

How we serve the layers

- We'll get a brief understanding of how layers work in CartograTree / CartograPlant

05

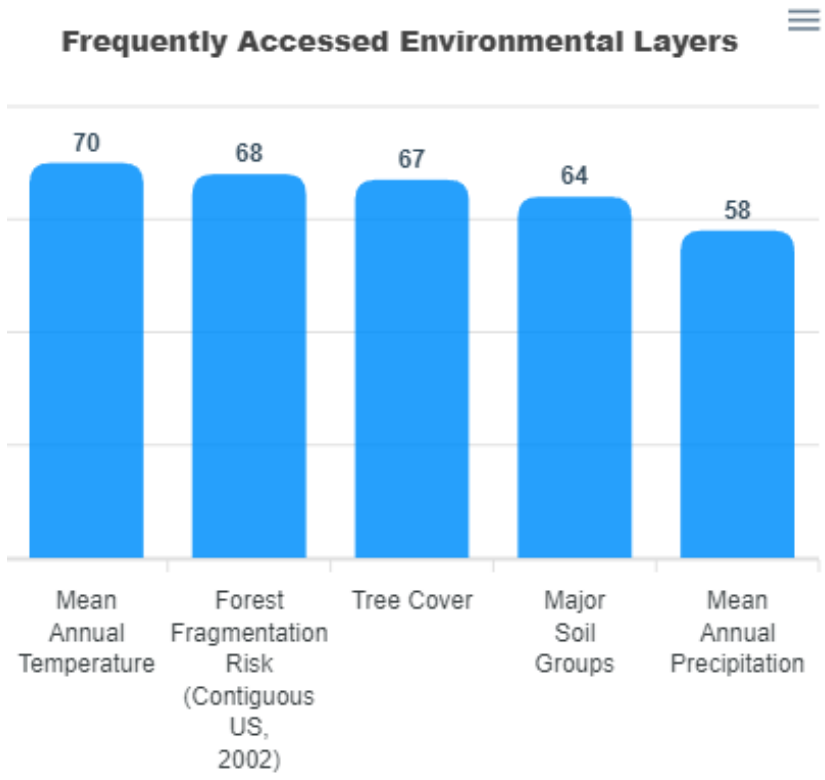
Ask your questions

- You'll have the opportunity at the end to ask any questions and hopefully I can answer them!

CartograPlant Layers Statistics

- Forest Fragmentation (North America, ESRI)
- Biotic Damage (North America)
- Density population (USGS)
- Climatic variables (World, WorldClim v.2)
- Intact Forest Landscape (World, IntactForests)
- NEON Field Sites (USA)
- Terrestrial Ecoregions 2013 (Worldwide, WWF)
- Climatic variables (World, ClimateWNA)
- Major Soil Types (World, Conservation Biology Institute)
- Species Range Maps (USFS, EUFORGEN & BIEN)
- Land Cover (Worldwide, USGS)
- PET and Aridity (Worldwide, CGIARCSI)
- Seed Zones (Eastern North America)
- Canopy height (Worldwide)
- Vegetation development
- National Forests (North America, USFS)

OVER 900 Layers and counting!

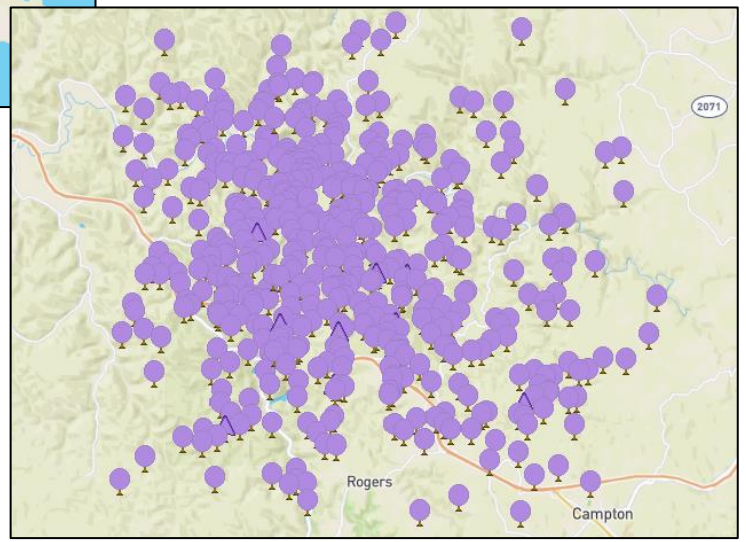


CartograPlant

What are layers?

Base layer (World Map)

Picea Glauca Range Map



Treesnap Trees

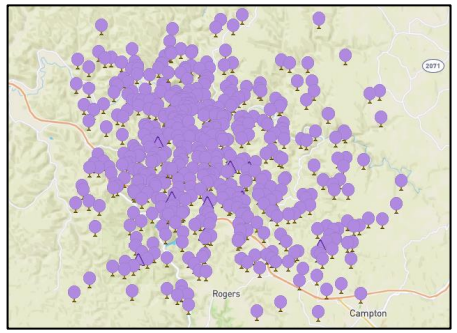
CartograPlant

Two popular types of layers

VECTOR

Vector data is ***not*** made up of a grid of pixels. Instead, vector graphics are comprised of **vertices and paths**.

They are calculated mathematically and can usually expand or contract based on these mathematical formulae.



RASTER

Raster data is made up of a grid of pixels.

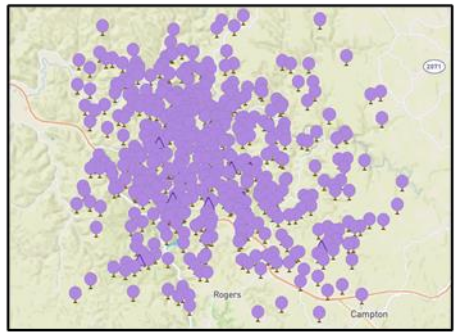
Thus they are usually premade images.

Why two types of layers?

VECTOR

Advantage
- Usually smaller in size

Disadvantage
- Because they are usually mathematically generated, vector layers may suffer from performance issues during rendering.



RASTER

Advantage
- Much faster render times on maps since they are already “rendered” for the most part

Disadvantage
- Much larger in data size

Popular layer formats for CartograTree

VECTOR

- GeoJSON (easy to create and partially human readable)
- Shape files (shp)*
- PostGis tables (supported by our Postgres Database)

RASTER

GeoTIFF*
TIFF images with corresponding georeferenced data (coordinate based). Can contain embedded data.

MBTiles* (recommended by Mapbox)

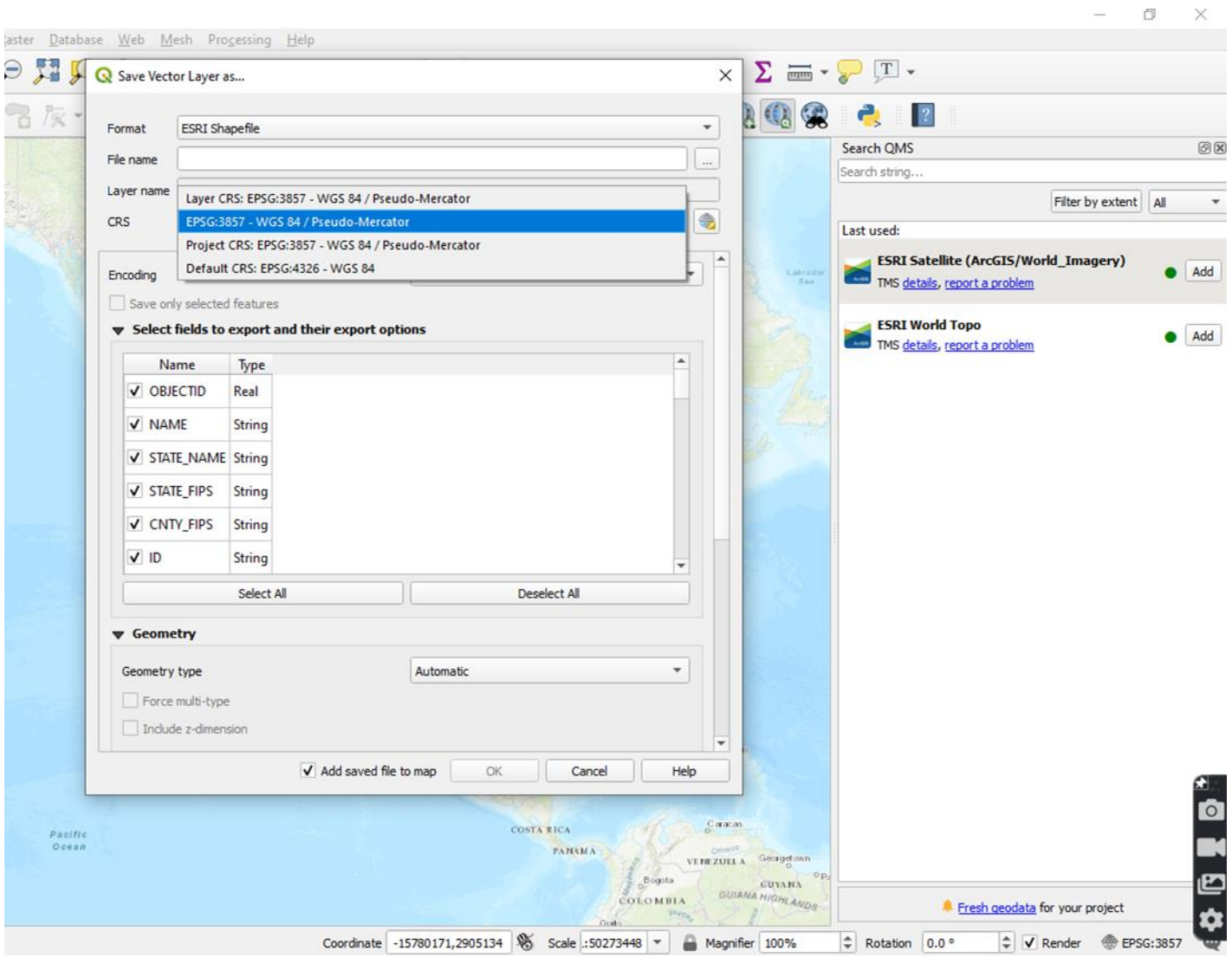
* Serves easily from 

How do we work with layers?

QGIS

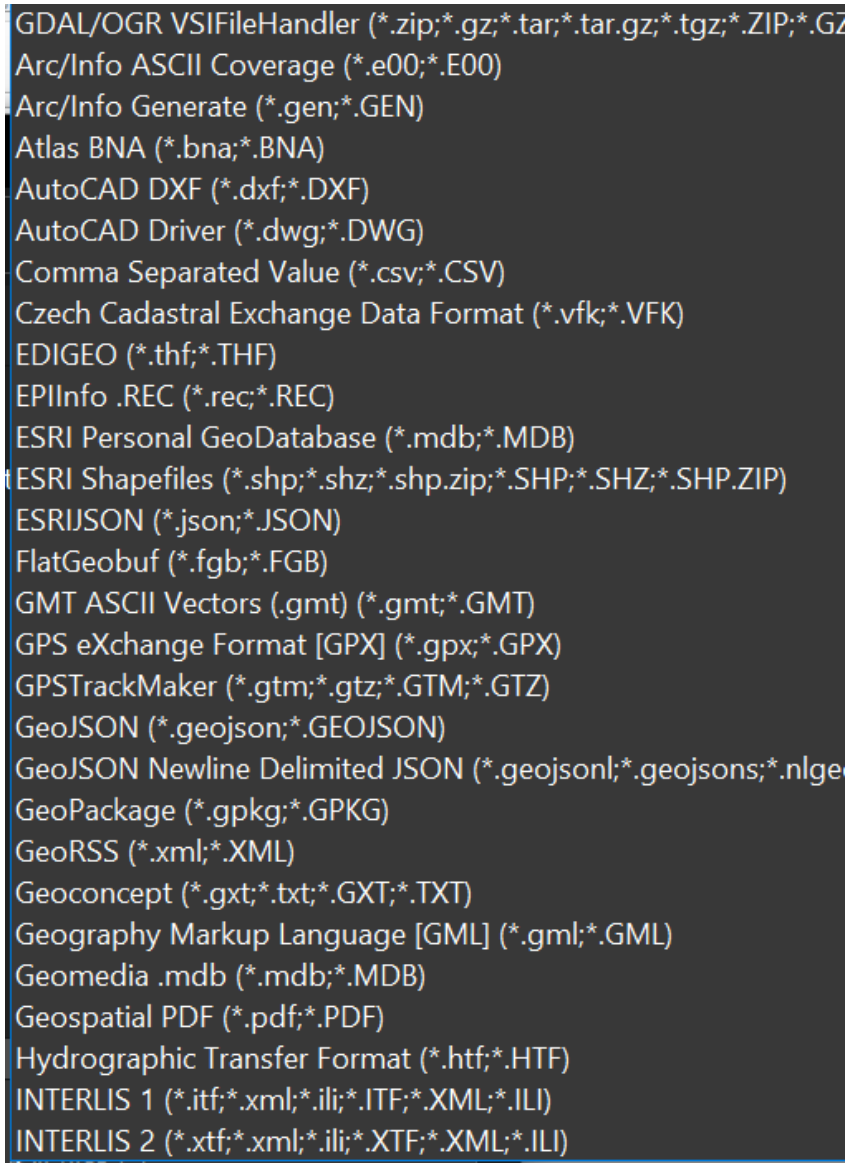
OPEN SOURCE / FREE

AWESOME STYLING TOOLS
MULTIPLE FORMATS
USER FRIENDLY

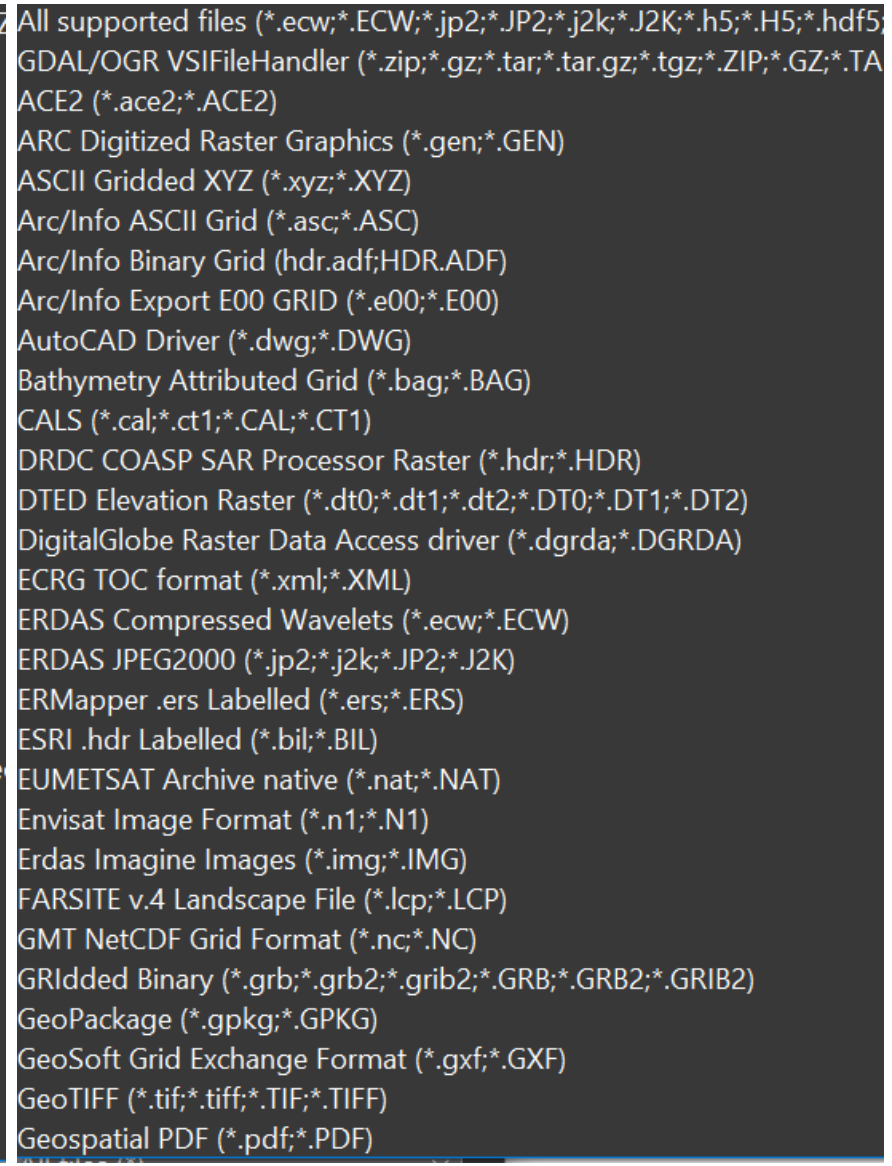


QGIS supports many formats

- Add Vector Layer...
- Add Raster Layer...
- Add Mesh Layer...
- Add Delimited Text Layer...
- Add PostGIS Layers...
- Add SpatiaLite Layer...
- Add MSSQL Spatial Layer...
- Add DB2 Spatial Layer...
- Add Oracle Spatial Layer...
- Add/Edit Virtual Layer...
- Add WMS/WMTS Layer...
- Add XYZ Layer...
- Add ArcGIS Map Service Layer...
- Add ArcGIS ImageServer Layer..
- Add WCS Layer...
- Add WFS Layer...
- Add ArcGIS Feature Service Layer...
- Add Vector Tile Layer...



Vector file formats



Raster file formats

GEOSERVER TileServer – Middleware

GEOSERVER TILESET / GRID

Example GeoJSON in CartograPlant (Vector type format)

[{"type":"Feature","properties":{"id":"TGDR001-10072","icon_type":0},"geometry":{"type":"point","coordinates":[-123.45,46.267]}}]

FROM CT API: https://treegenesdb.org/cartogratree/api/v2/trees

PULLED DIRECTLY FROM OUR CT_TREES VIEW

CartograPlant

CARTOGRAPLANT TRIPAL MODULE - CUSTOM API

TPPS SUBMITTED STUDY DATA

uniquename	genus	species	subkingdom	family	latitude	longitude
TGDR022-451c-1031	Corymbia	Corymbia citriodora	angiosperm	Myrtaceae	-25.78	152.63
TGDR022-451c-1	Corymbia	Corymbia citriodora	angiosperm	Myrtaceae	-25.78	152.63
TGDR022-451c-10	Corymbia	Corymbia citriodora	angiosperm	Myrtaceae	-25.78	152.63
TGDR022-451c-100	Corymbia	Corymbia citriodora	angiosperm	Myrtaceae	-25.78	152.63
TGDR022-451c-1000	Corymbia	Corymbia citriodora	angiosperm	Myrtaceae	-25.78	152.63
TGDR022-451c-1001	Corymbia	Corymbia citriodora	angiosperm	Myrtaceae	-25.78	152.63

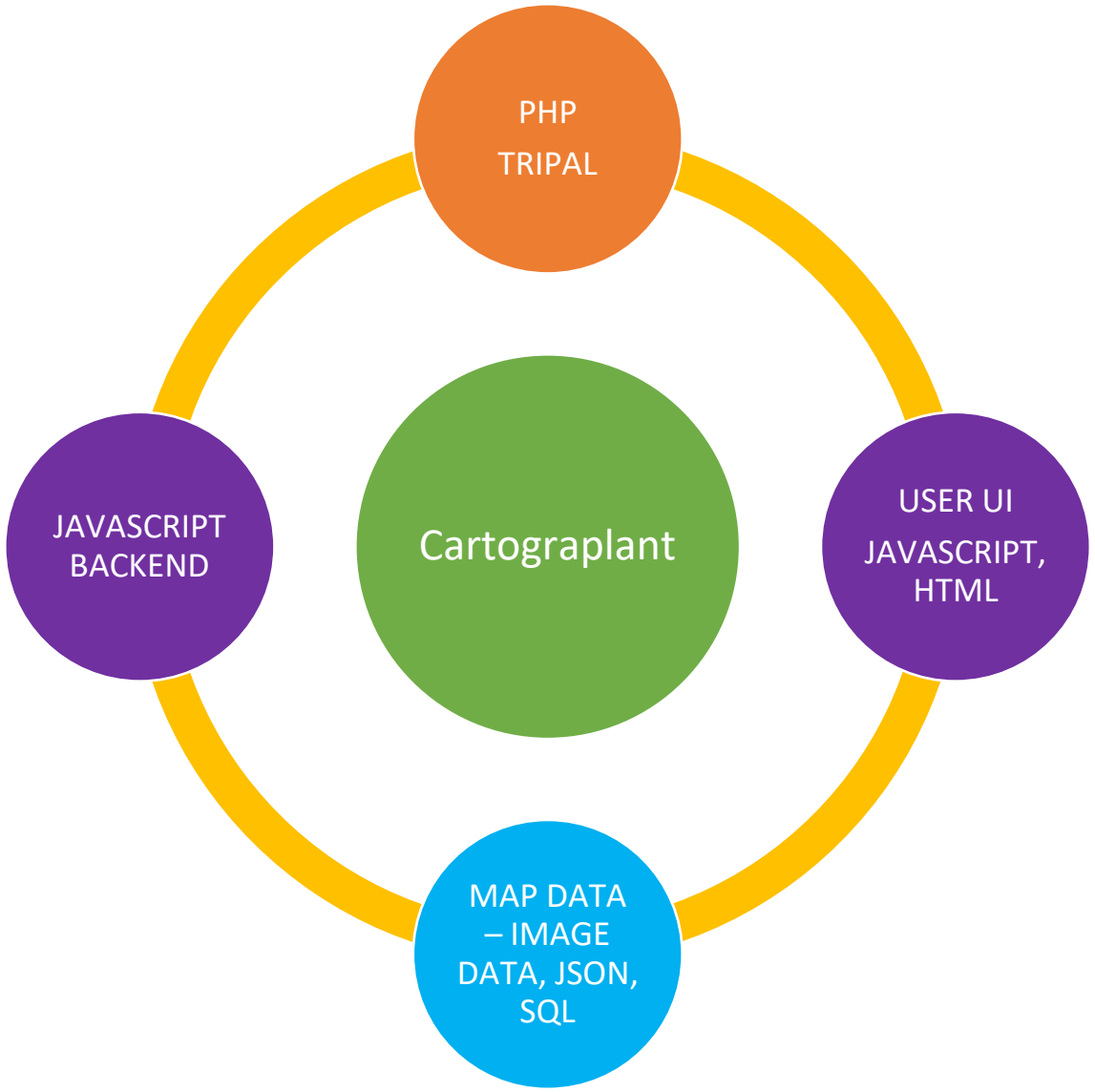
CARTOGRAPLANT MODULE / CODE

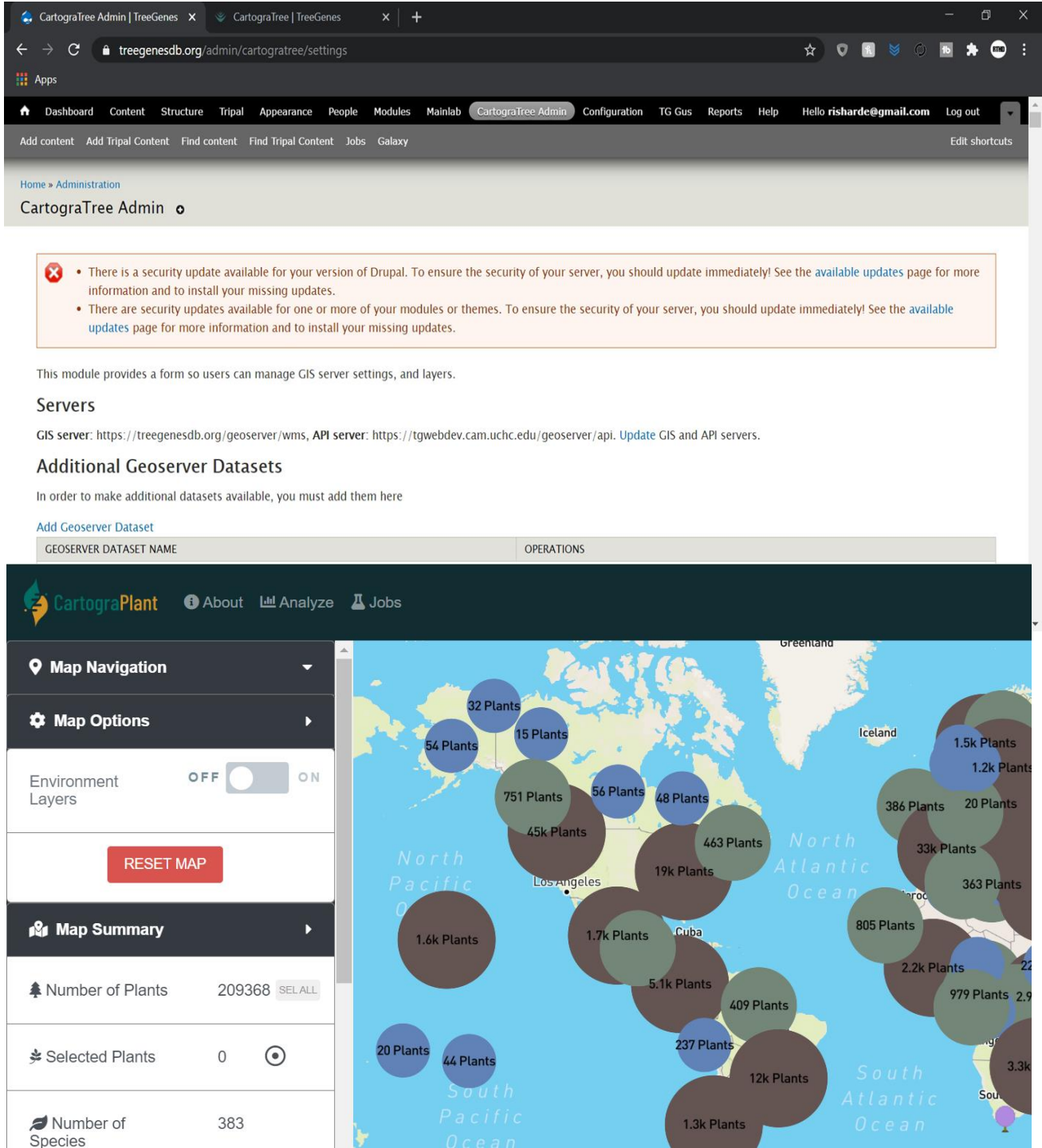
[{"type":"Feature","properties":{"id":" TGDR022-451c-1","icon_type":0},"geometry":{"type":"point","coordinates":[-123.45,46.267]}}]

GEOSERVER API – Returns JSON

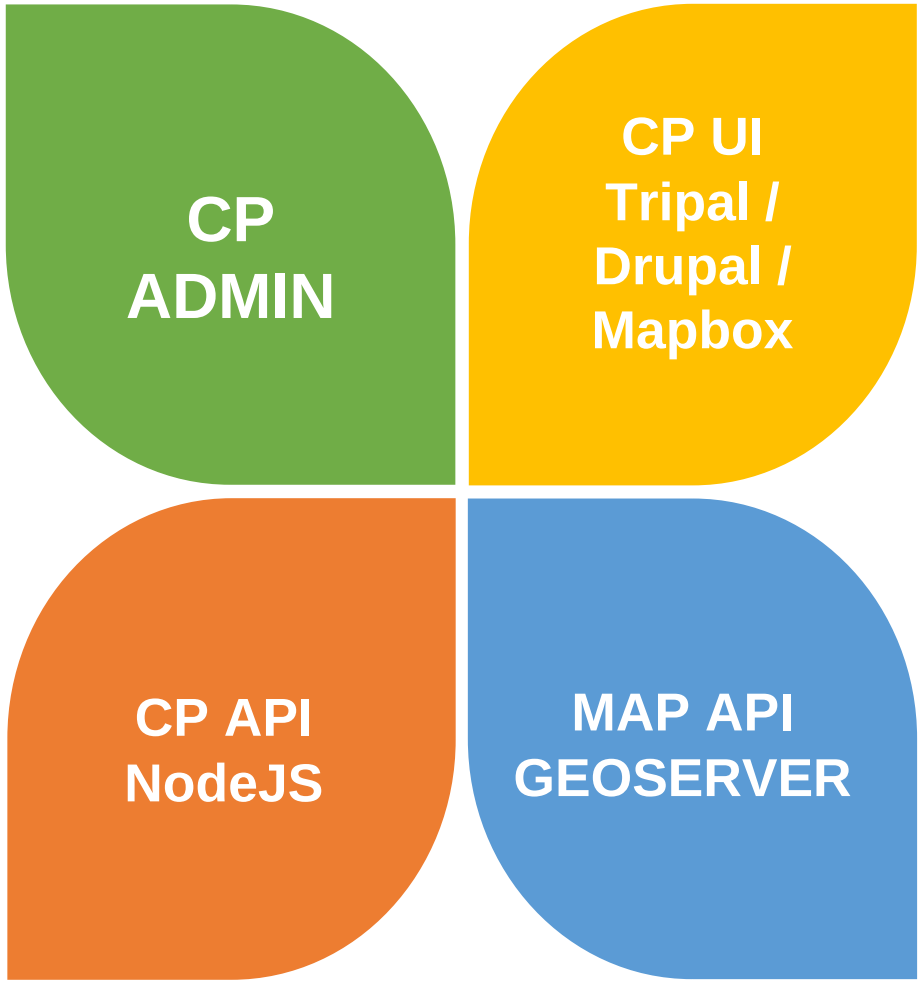
Clicking on an environmental layer queries Geoserver's built in API and also returns JSON!

{"type":"FeatureCollection","features":[{"type":"Feature","id":"","geometry":null,"properties":{"MEAN_ANNUAL_TEMP":21.162438110351 56}}],"totalFeatures":"unknown","numberReturned":1,"timeStamp":"2022-08-21T01:56:53.445Z","crs":null}


PHP
TRIPAL
JAVASCRIPT
BACKEND
Cartograplant
USER UI
JAVASCRIPT,
HTML
MAP DATA
– IMAGE
DATA, JSON,
SQL

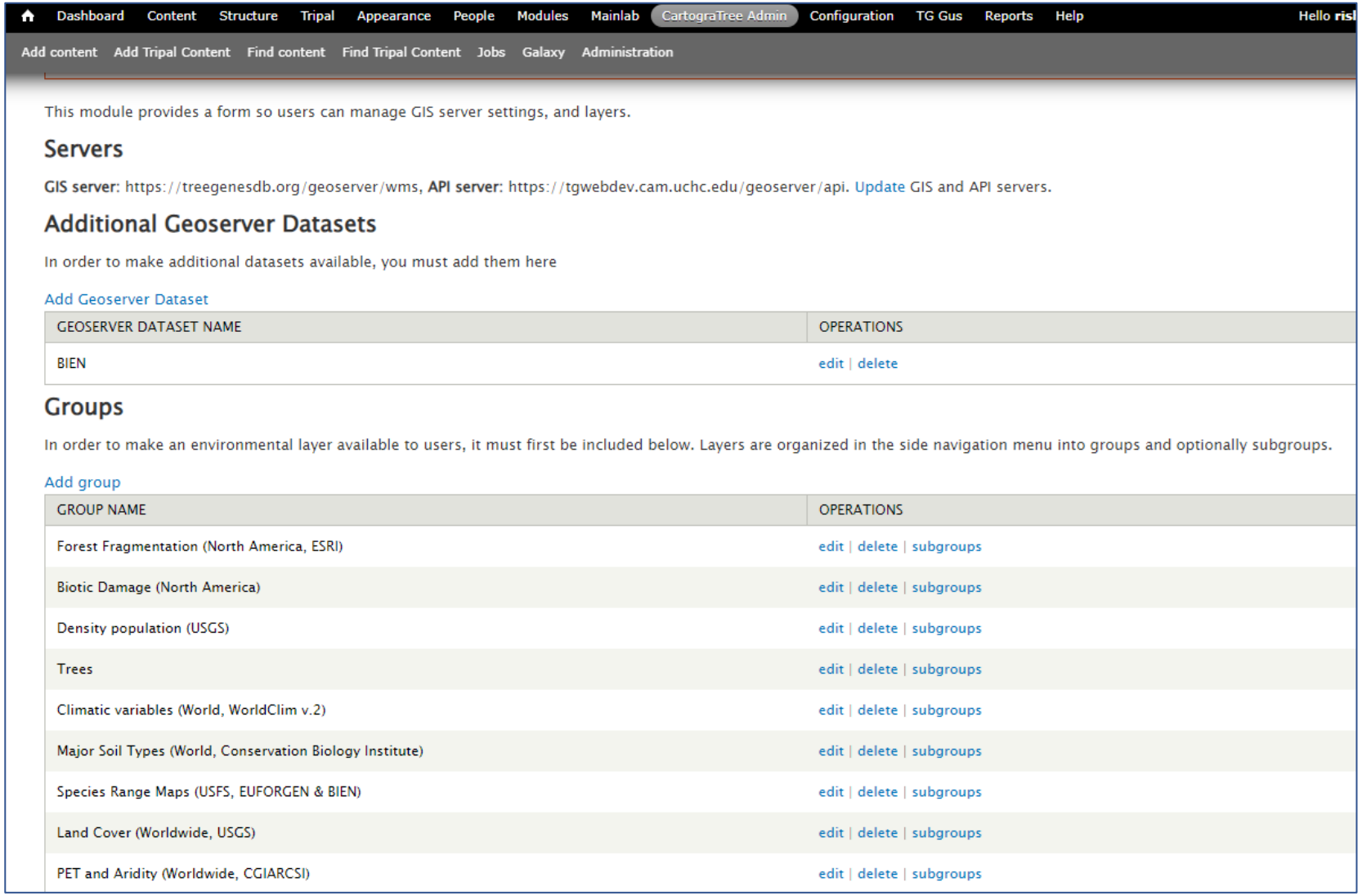

CartograTree Admin | TreeGenes
CartograTree | TreeGenes
treegenesdb.org/admin/cartogratree/settings
Apps
Dashboard Content Structure Tripal Appearance People Modules Mainlab CartograTree Admin Configuration TG Gus Reports Help Hello risharde@gmail.com Log out
Add content Add Tripal Content Find content Find Tripal Content Jobs Galaxy Edit shortcuts
Home » Administration
CartograTree Admin
There is a security update available for your version of Drupal. To ensure the security of your server, you should update immediately! See the available updates page for more information and to install your missing updates.
There are security updates available for one or more of your modules or themes. To ensure the security of your server, you should update immediately! See the available updates page for more information and to install your missing updates.
This module provides a form so users can manage GIS server settings, and layers.
Servers
GIS server: https://treegenesdb.org/geoserver/wms, API server: https://tgwebdev.cam.uchc.edu/geoserver/api. Update GIS and API servers.
Additional Geoserver Datasets
In order to make additional datasets available, you must add them here
Add Geoserver Dataset
GEOSERVER DATASET NAME
OPERATIONS
CartograPlant
About
Analyze
Jobs
Map Navigation
Map Options
Environment Layers
OFF
ON
RESET MAP
Map Summary
Number of Plants
209368
SEL ALL
Selected Plants
0
Number of Species
383
Greenland
Iceland
Los Angeles
Cuba
North Pacific Ocean
North Atlantic Ocean
South Pacific Ocean
South Atlantic Ocean
32 Plants
54 Plants
15 Plants
751 Plants
56 Plants
48 Plants
45k Plants
463 Plants
19k Plants
1.6k Plants
1.7k Plants
5.1k Plants
409 Plants
237 Plants
12k Plants
1.3k Plants
20 Plants
44 Plants
1.5k Plants
1.2k Plants
386 Plants
20 Plants
33k Plants
363 Plants
805 Plants
2.2k Plants
979 Plants

Summary of CartograPlant components

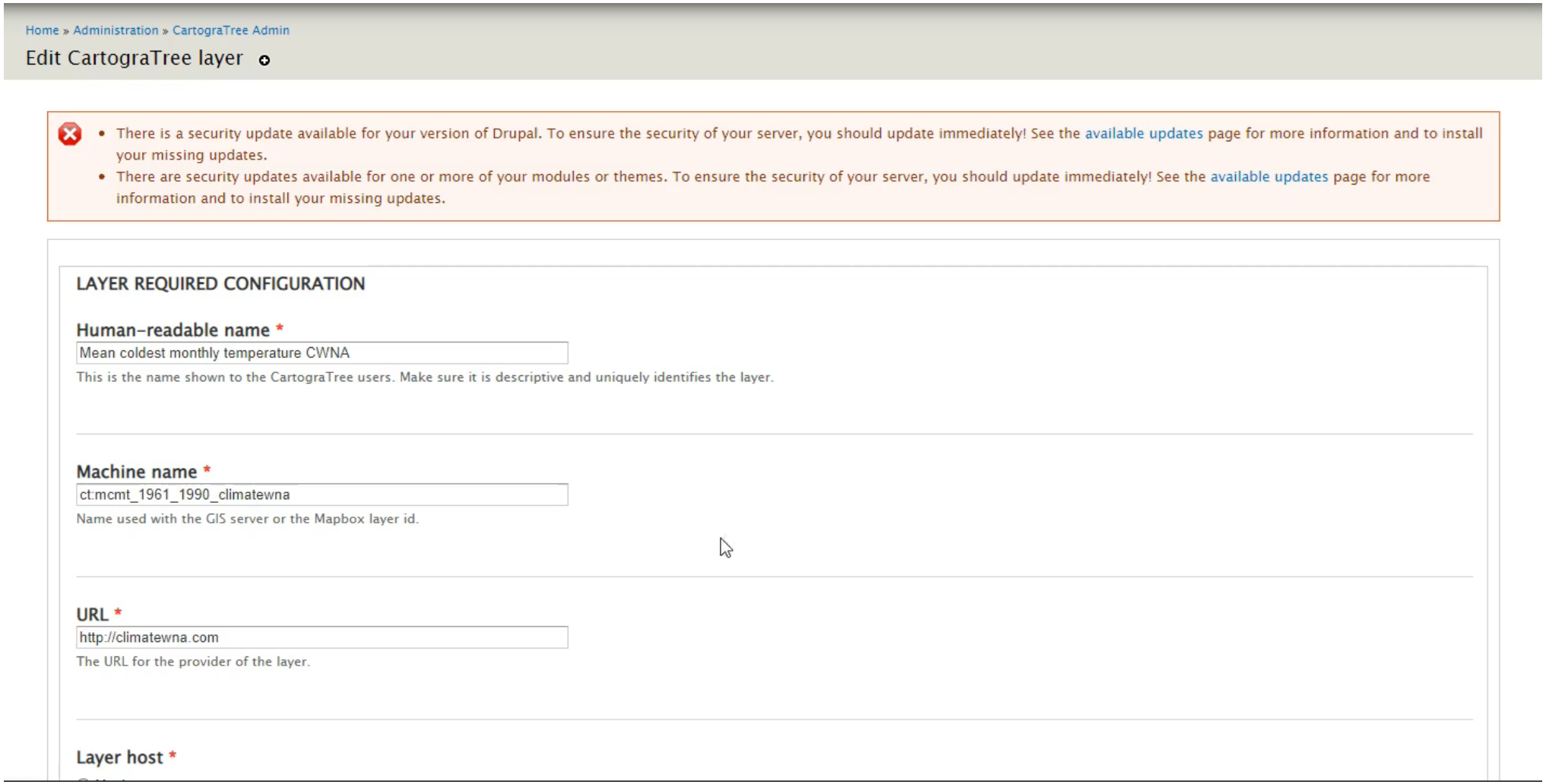


- CP ADMIN interfaces with layers especially those with embedded data (filter out data, rename variables)
- CP UI (the map) retrieves data from the MAP API and displays the layers to the user + generating environmental data by pulling directly from MAP API.
- MAP API is GEOSERVER which answers the CP UI whenever the user loads the map or clicks to change position
- CP API pulls data from the MAP API when a layer may contain embedded data. Mostly used to store data in the database (example biomes)

CartograPlant Admin UI

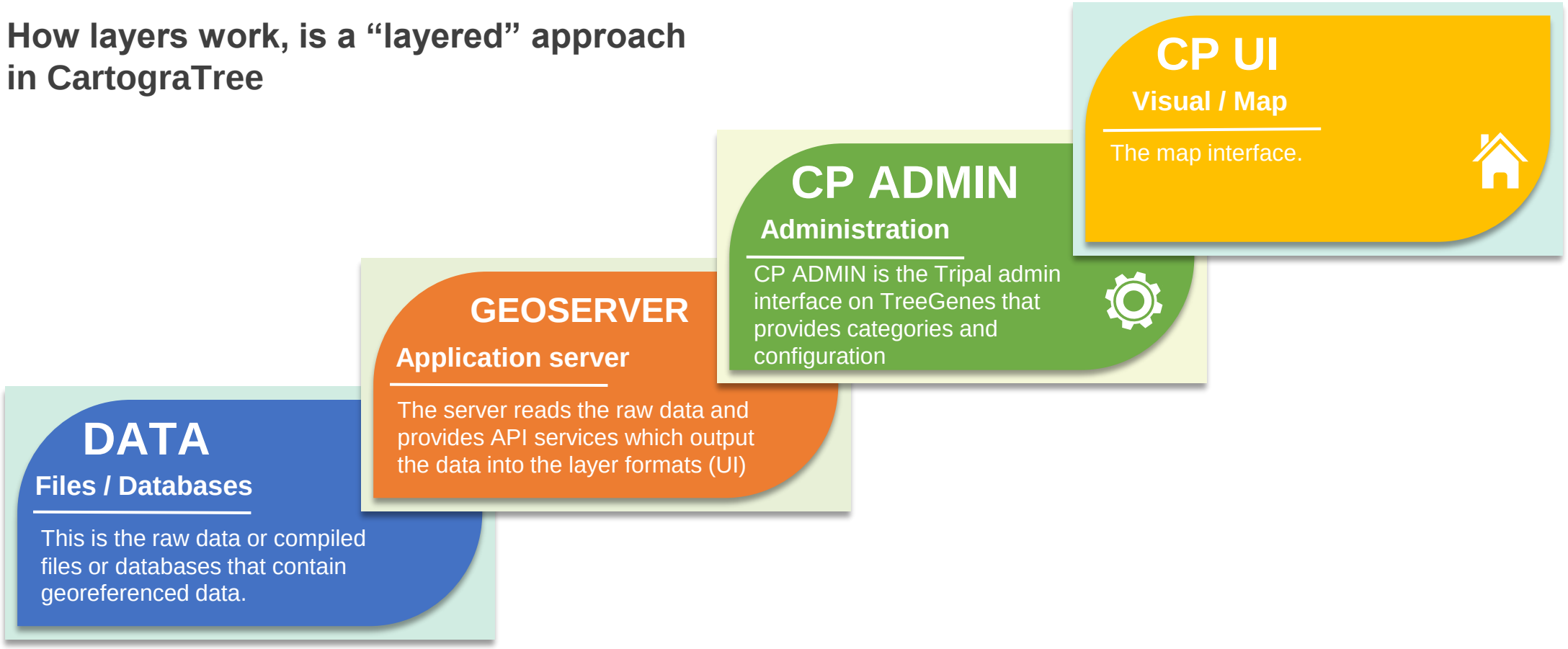


CartograPlant Admin UI

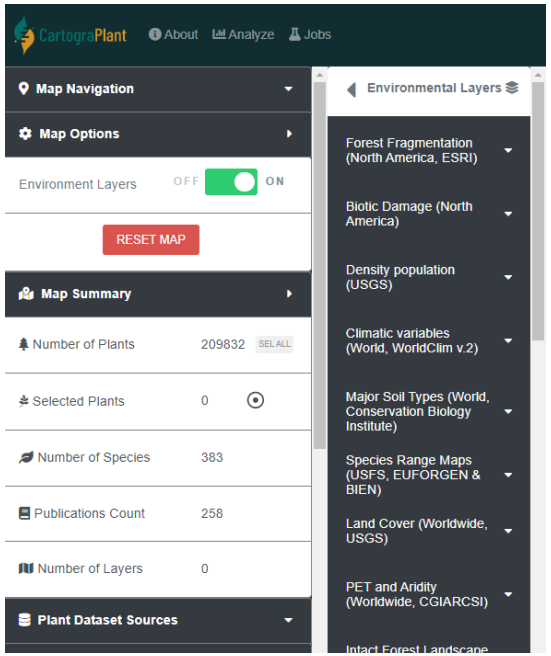


How we serve layers

How layers work, is a “layered” approach in CartograTree



How we serve layers



2

1

3

CP UI

Visual / Map (multi layers)

The map interface

CP ADMIN

Administration

CT ADMIN is the Tripal admin interface on TreeGenes that provides categories and configuration

5

GEOSERVER

Application server

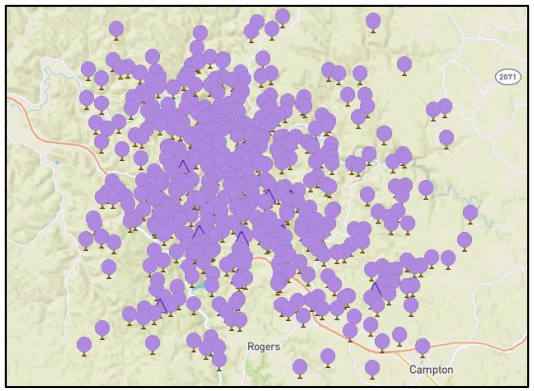
The server reads the raw data and provides API services which output the data into the layer formats (UI)

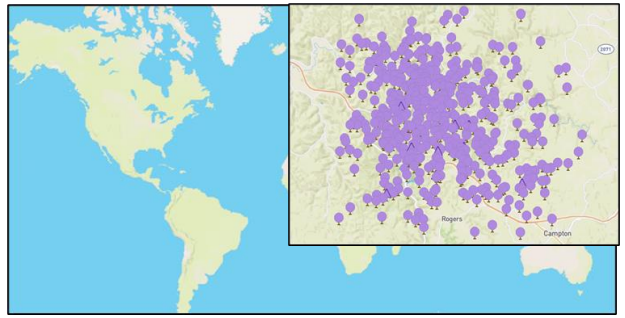
DATA

Files / Databases

This is the raw data or compiled files or databases that contain georeferenced data.

4





Behind the Scenes of CartograPlant

THANK YOU!!!

Any questions?

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