RINCON'S BIO WEAVER TOOL:
From Disparate Data to Actionable Analysis

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Dr. Kelly Caylor

Client:
RINCON CONSULTANTS

MEDS Public Presentation
Bren School of Environmental
Science & Resource Management
May 29th, 2026

The Rising Issues

Urban Development

Habitat Fragmentation

Accelerating Climate Change



Photo Credit: Ivan Bandura and Matt Palmer on Unsplash, Matt Perko (UCSB)



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How do we balance development with species and habitat conservation in a changing climate?

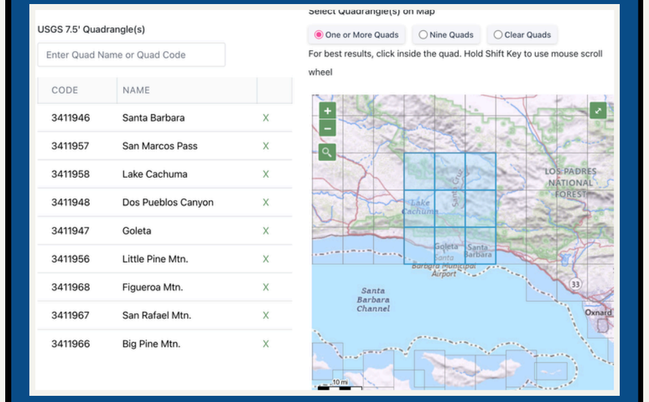


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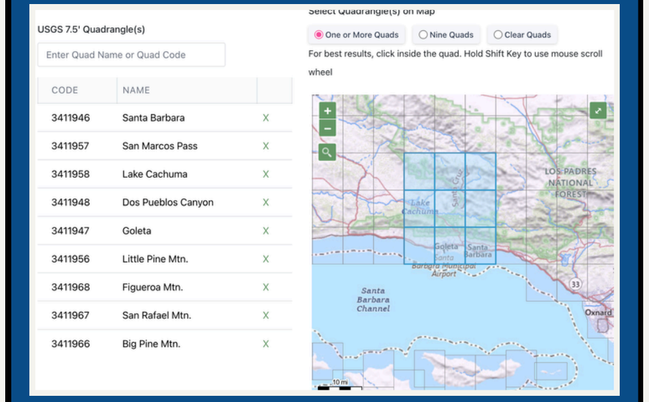


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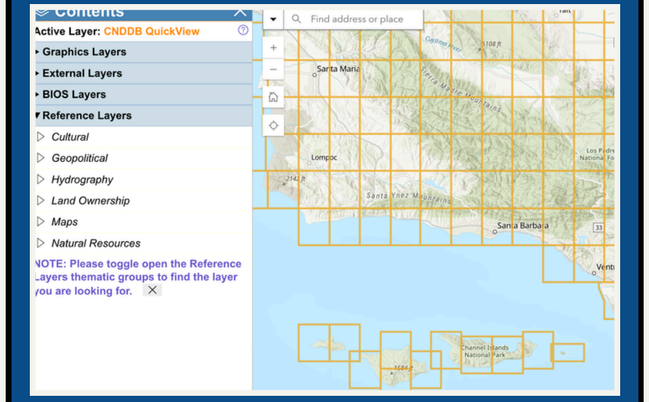
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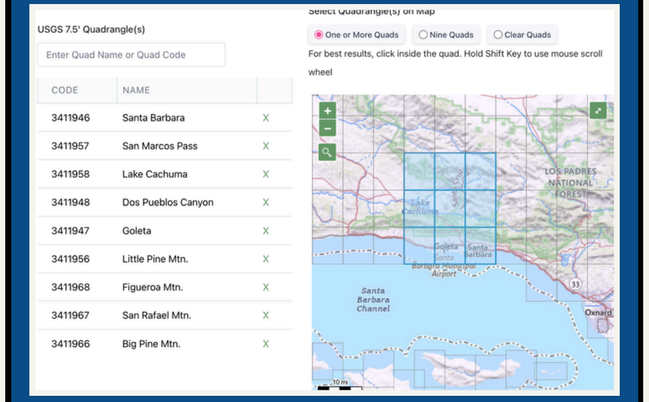
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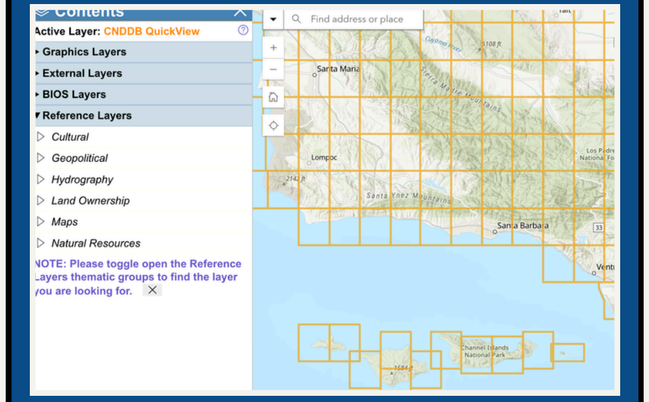
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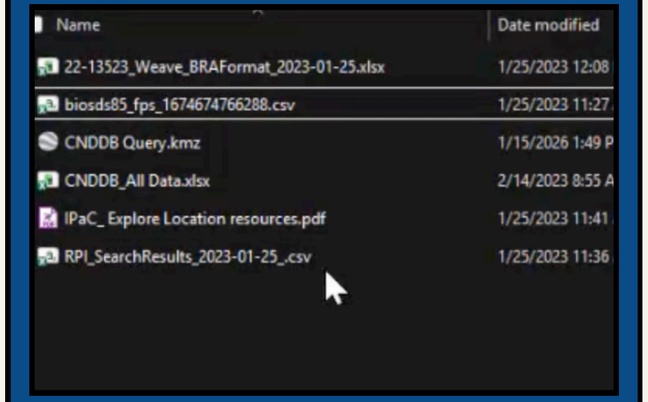
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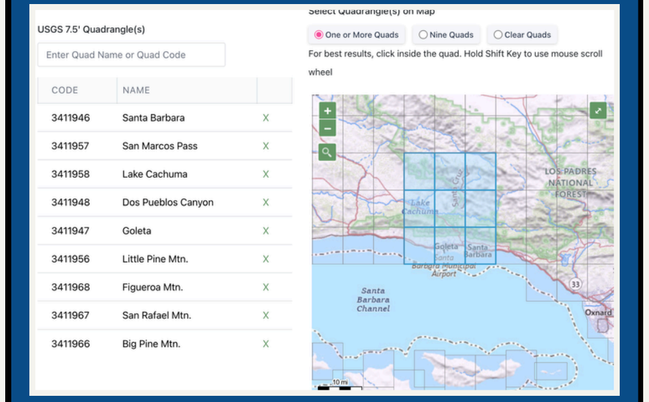
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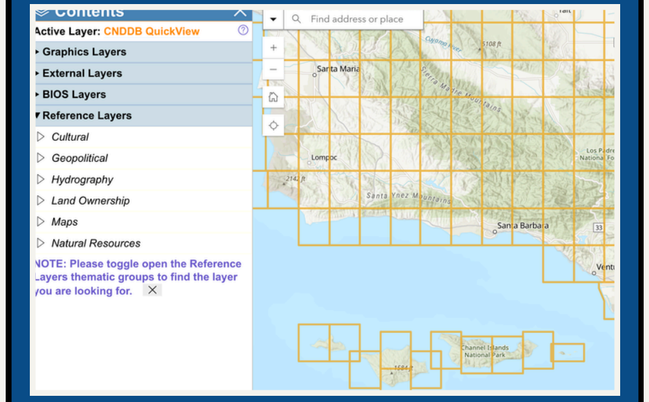
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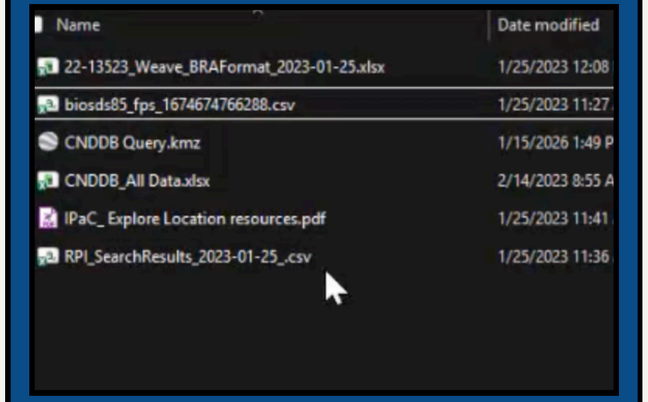
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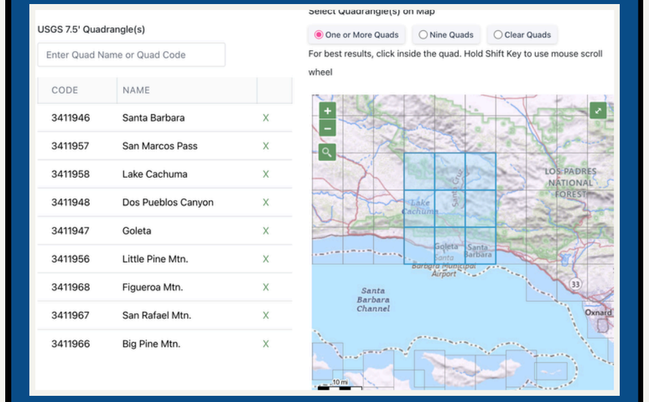
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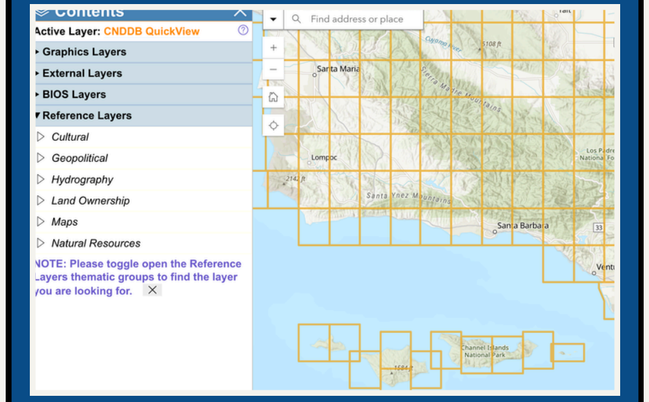
Cross Validation

IE	FAMILY	LIFEFORM	BLOOMING PERIOD	FED LIST	STATE LIST	GLOBAL RANK	STA RA
ush	Amaranthaceae	perennial herb	Mar-Oct	None	None	G3	S2
	Amaranthaceae	annual herb	Apr-Oct	None	None	G5T1	S1
	Asteraceae	perennial deciduous shrub	May-Oct	None	None	G3T3	S3
	Liliaceae	perennial bulbiferous herb	Jun-Aug	None	None	G3	S3
	Convolvulaceae	perennial rhizomatous herb	Aug	None	None	G5TXQ	SX
in-	Rosaceae	perennial evergreen shrub	Feb-May	None	None	G5T4	S4

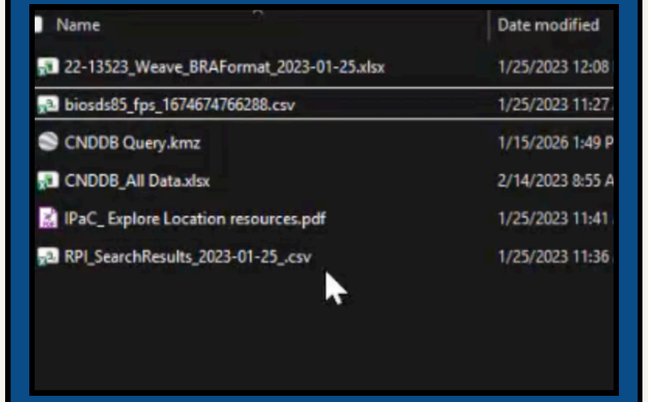
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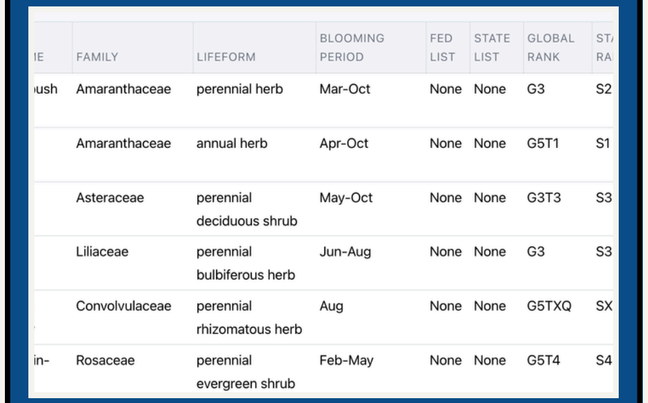
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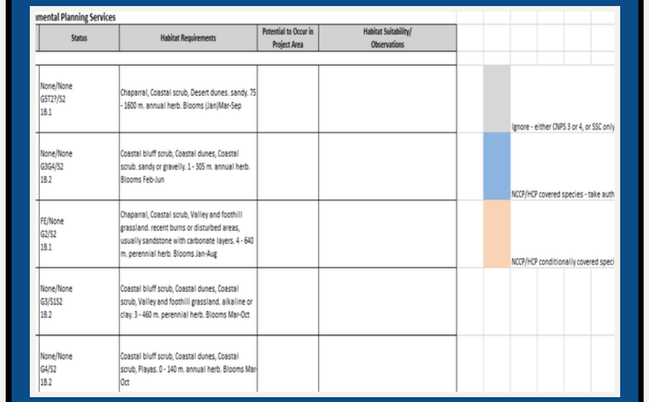


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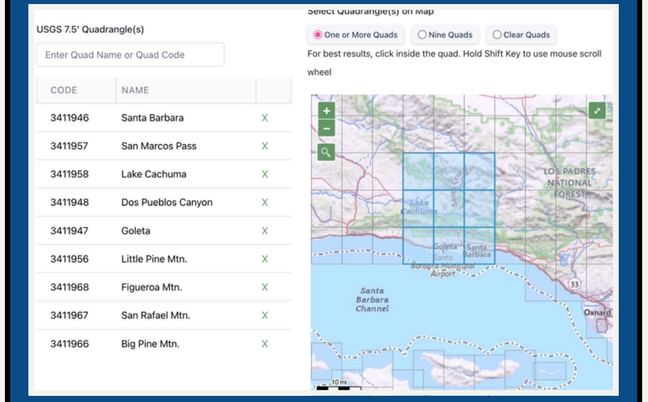


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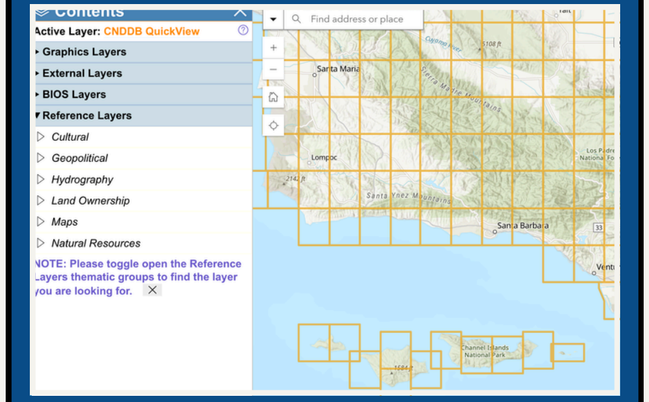
Manual Data Cleaning



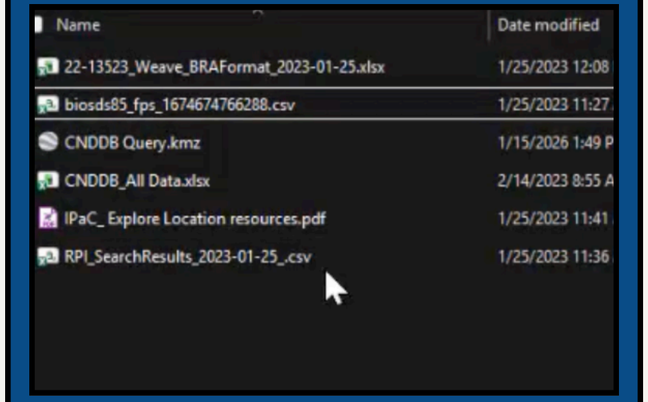
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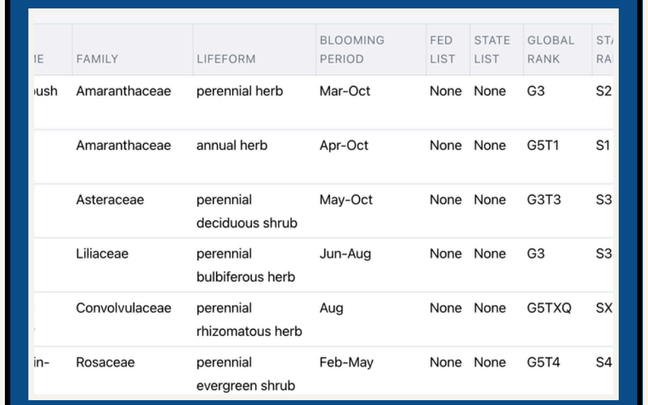
Search Database



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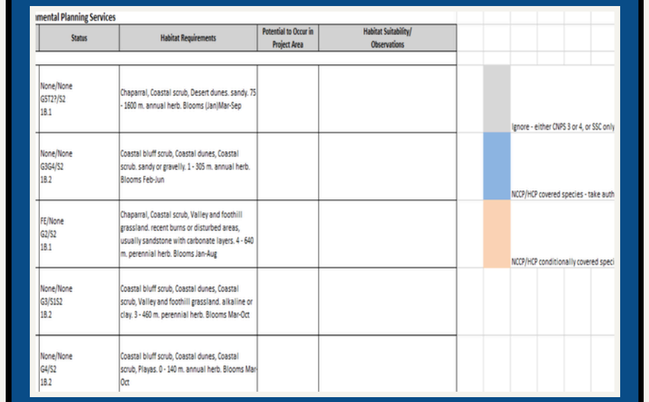


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in-	Rosaceae	perennial evergreen shrub	Feb-May	None	None	G5T4	S4

Manual Data Cleaning



Obtain Spatial Layers



Search Database

Search Database

Download Files

Generate Project Map



Generate Project Report

Scientific Name Common Name	Status (Fed/State/Other)	Habitat Requirements
ichens		
ɔute): ME, CNAME) ientificName, CommonName)	Source (attribute): CNDDB (FEDLIST, CALLIST, RPLANTRANK, CDFWSTATUS, OthrStatus) CNPS/RPI (CRPR, OtherStatus, CESA, FESA)	Rincon to provide, but in the meantime Source (attribute): CNPS/RPI (BloomingPeriod, Habitat MicrohabitatDetails, Microhabitat, ElevationLow_ft, ElevationHigh_ft)
ludicola wort	FE/SCE 1B.1	Perennial stoloniferous herb. Marsl swamps. Openings, sandy. Elevatio 560ft. (3-170m.) Blooms May-Aug.
Scientific Name **Common Name**	**Status (Fed/State/Other)**	**Habitat Requirements**
es		
ɔute): ME, CNAME) ientificName, CommonName)	Source (attribute): CNDDB (FEDLIST, CALLIST, CDFWSTATUS, OthrStatus)	Rincon to provide, but in the meantime Source (attribute): CNDDB Element Details (GeneralHabita Microhabitat)
tchii ble bee	None/SCE	Coastal California east to the Sierra crest and south into Mexico. Food genera include Antirrhinum, Phacel Dendromecon, Eschscholzia, and Er
lifornicus	FE/None SSC	Semi-arid regions near washes or intermittent streams, including valle and desert riparian, desert wash, gr with sandy banks, willows, cottonw sycamores; loose, gravelly areas of drier parts of range.

Cross Valida

IE	FAMILY	LIFEFORM	BLOOMING PERIOD				
ush	Amaranthaceae	perennial herb	Mar-Oct				
	Amaranthaceae	annual herb	Apr-Oct	None	None	G5T1	S1
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in-	Rosaceae	perennial evergreen shrub	Feb-May	None	None	G5T4	S4

l Data Clea

patial Layers

Search Database

Search Database

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Generate Project

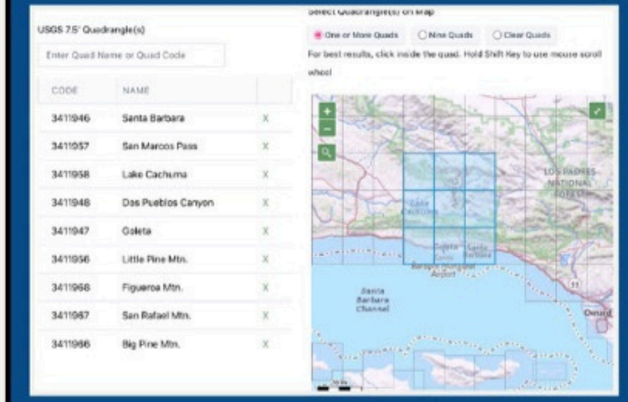
Generate Project Report

Cross Validation

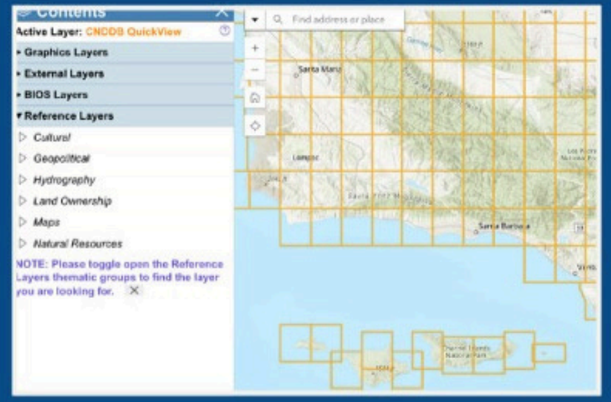
Obtain Spatial Layers



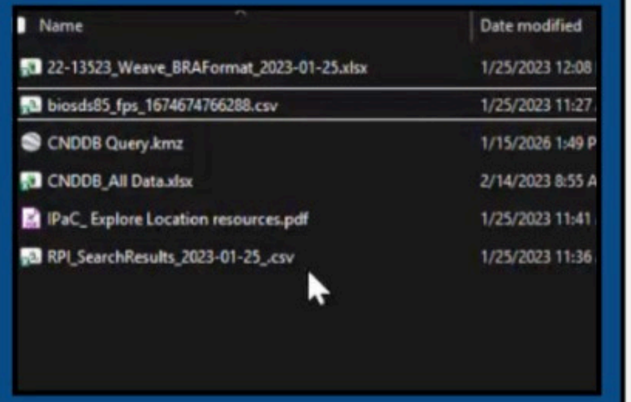
Search Database



Search Database



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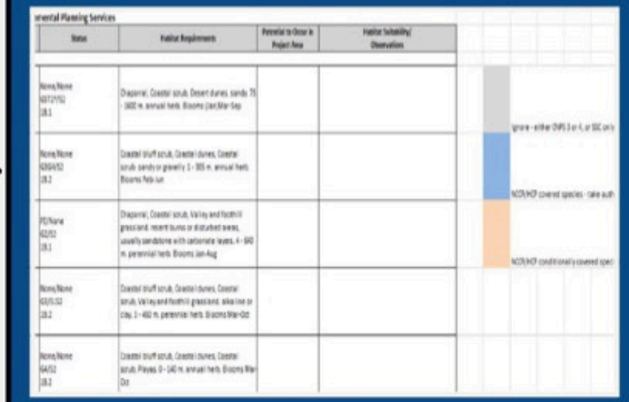


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Manual Data Cleaning



Obtain Spatial Layers



A Gap in the Process

Lacking a cohesive application to automate a consistent data processing workflow



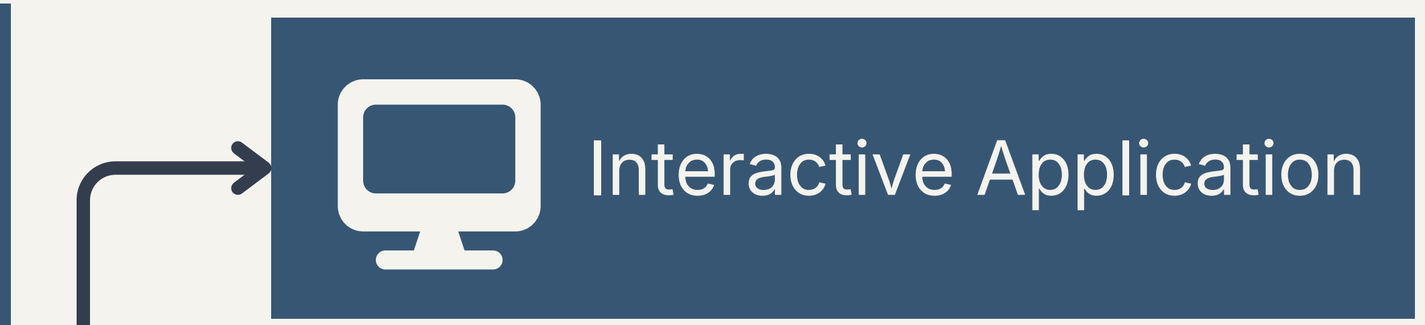
Photo Credit: Matt Perko (UCSB)

Objective

Provide Rincon with a **scalable**, **efficient system** that empowers Rincon’s biologists to focus on ecological interpretation rather than data wrangling

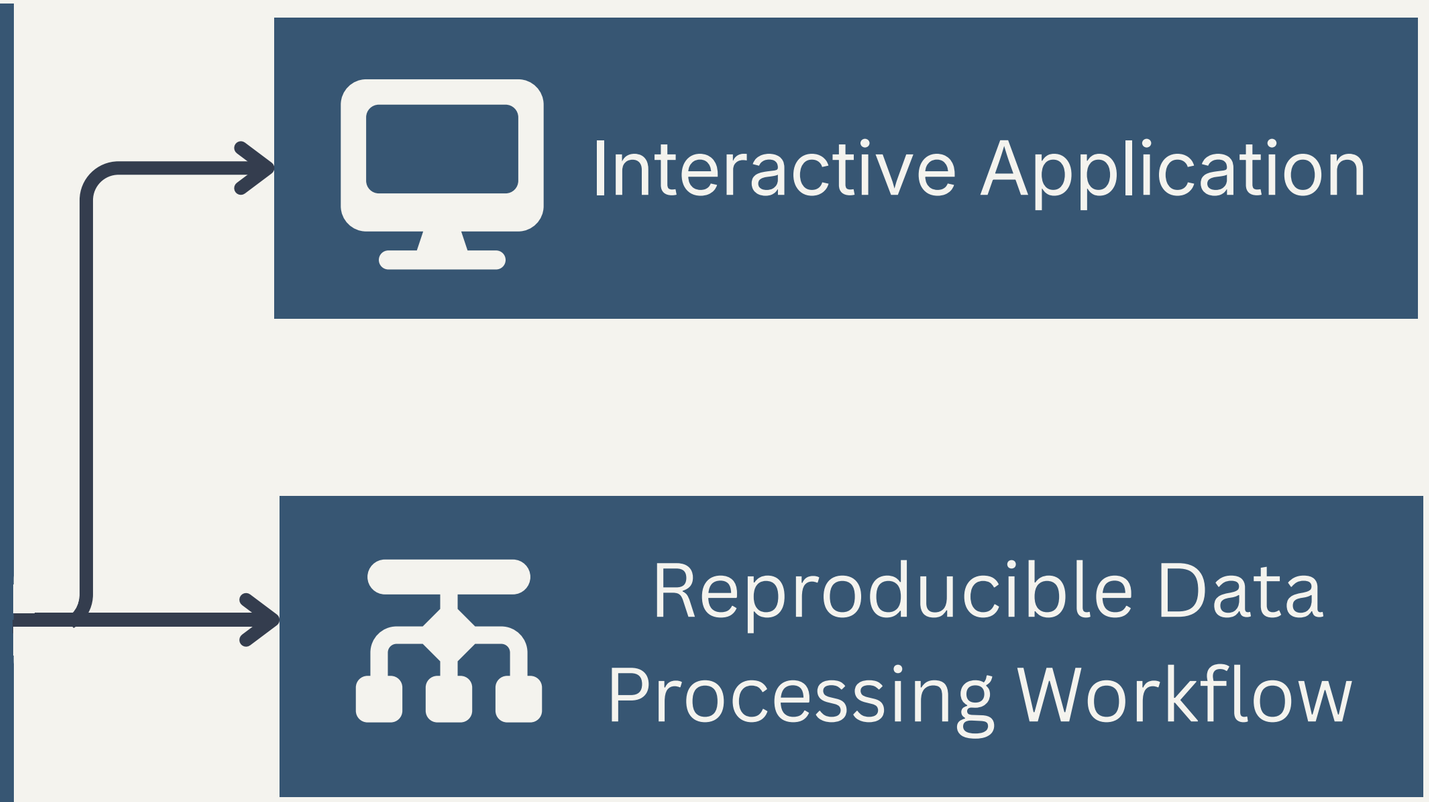
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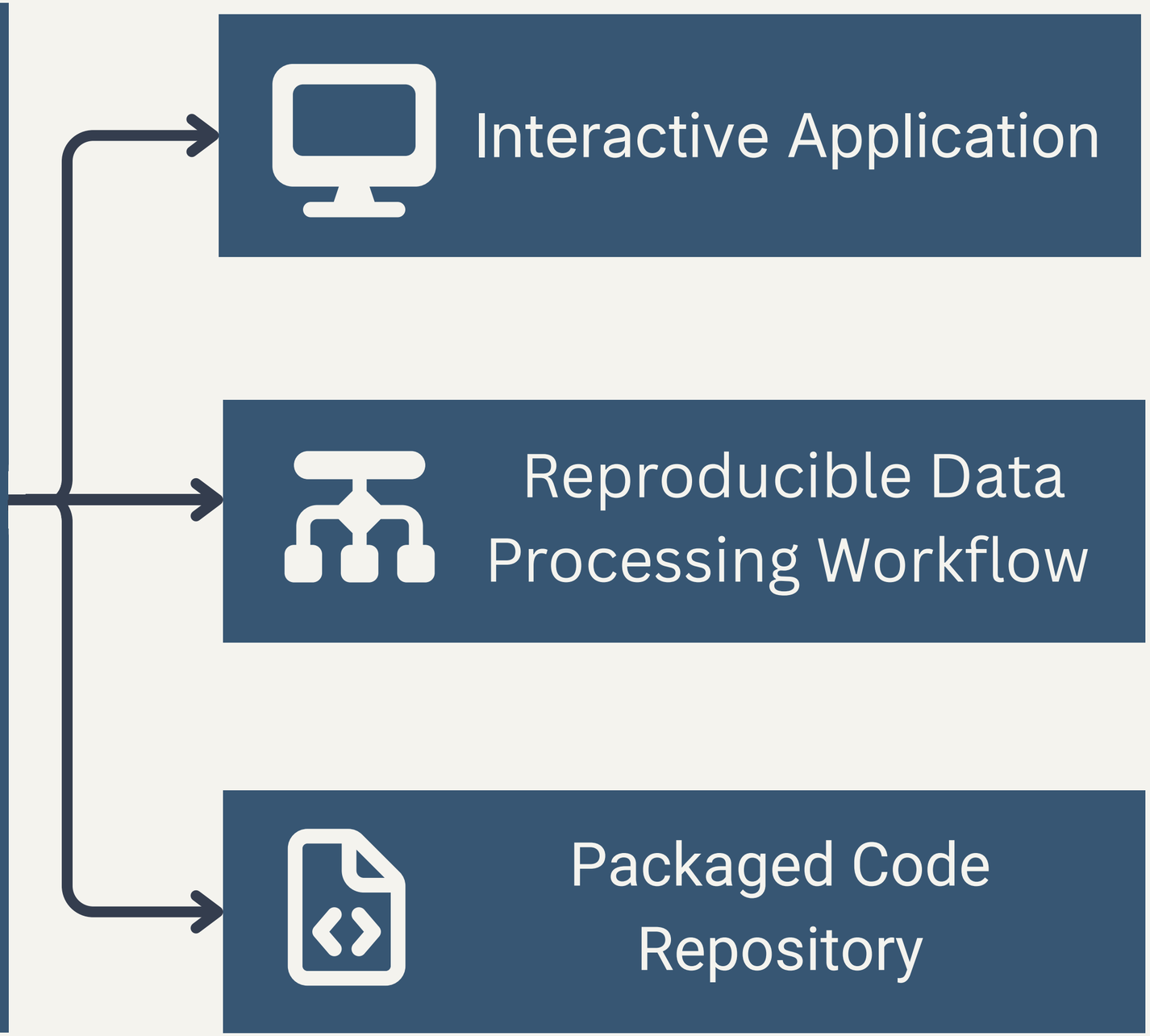
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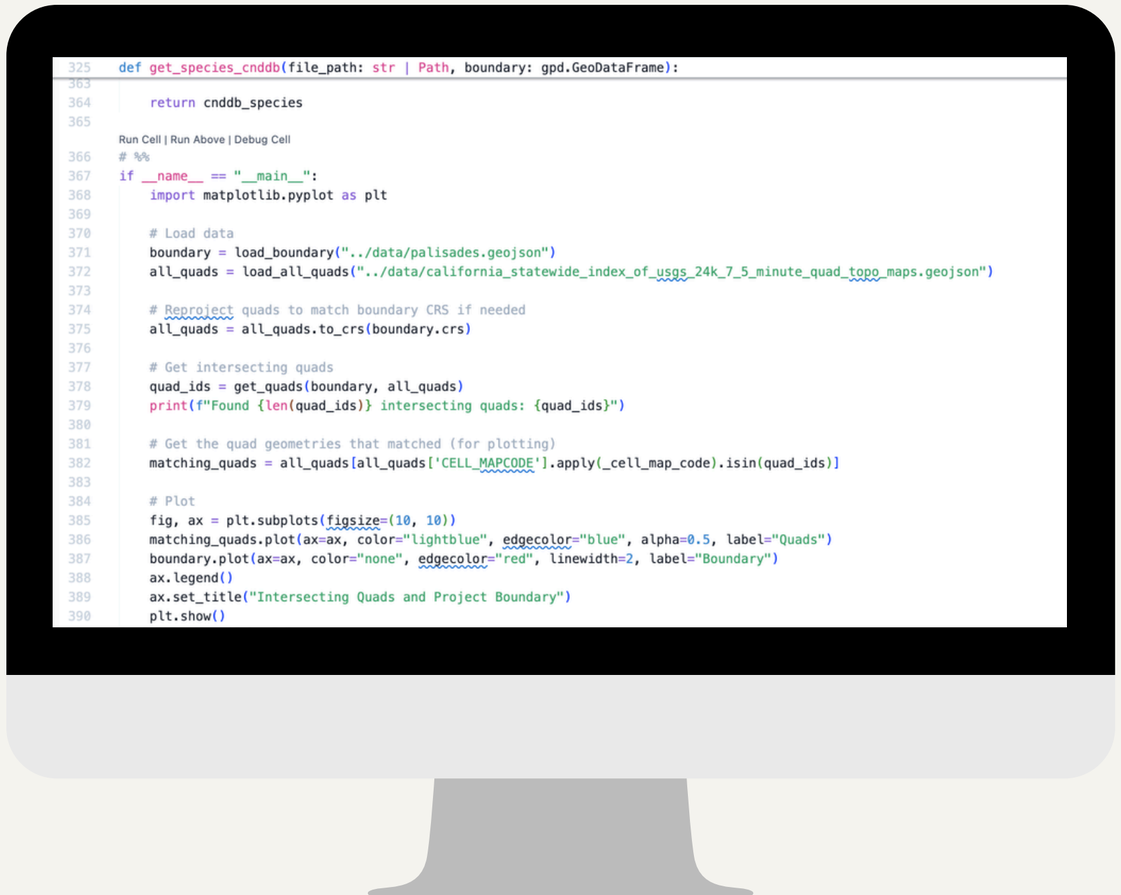


Objective

Provide Rincon with a **scalable**, **efficient system** that empowers Rincon's biologists to focus on ecological interpretation rather than data wrangling



Technical Approach



```python
def get_species_cnddb(file_path: str | Path, boundary: gpd.GeoDataFrame):

    return cnddb_species

Run Cell | Run Above | Debug Cell
# %%
if __name__ == "__main__":
    import matplotlib.pyplot as plt

    # Load data
    boundary = load_boundary("../data/palisades.geojson")
    all_quads = load_all_quads("../data/california_statewide_index_of_usgs_24k_7_5_minute_quad_topo_maps.geojson")

    # Reproject quads to match boundary CRS if needed
    all_quads = all_quads.to_crs(boundary.crs)

    # Get intersecting quads
    quad_ids = get_quads(boundary, all_quads)
    print(f"Found {len(quad_ids)} intersecting quads: {quad_ids}")

    # Get the quad geometries that matched (for plotting)
    matching_quads = all_quads[all_quads['CELL_MAPCODE'].apply(_cell_map_code).isin(quad_ids)]

    # Plot
    fig, ax = plt.subplots(figsize=(10, 10))
    matching_quads.plot(ax=ax, color="lightblue", edgecolor="blue", alpha=0.5, label="Quads")
    boundary.plot(ax=ax, color="none", edgecolor="red", linewidth=2, label="Boundary")
    ax.legend()
    ax.set_title("Intersecting Quads and Project Boundary")
    plt.show()
```

01. Python Processing Workflow

02. Streamlit Application Experience

Data Sources

California Native Plant Society

- Species Name
- Status
- Location
- Habitat

Photo Credit (left to right): Shaula Hedwall (USFWS), zorotoo's Images (Canva), pixabay (Canva), Jay Kim (UCSB), Ayla Mills (CNPS), Jason Dart (CNPS), Mike Knibbs (Canva), Chris F (Canva)

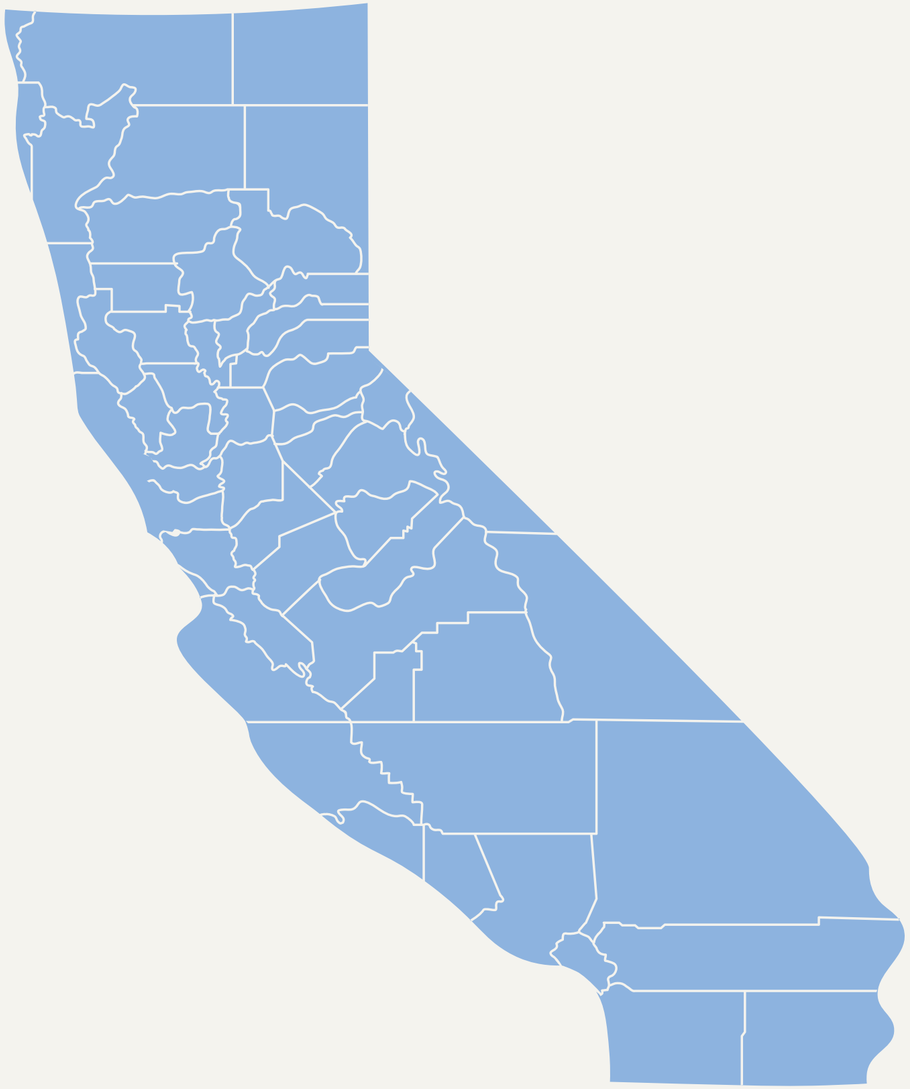
Potential to Occur Table



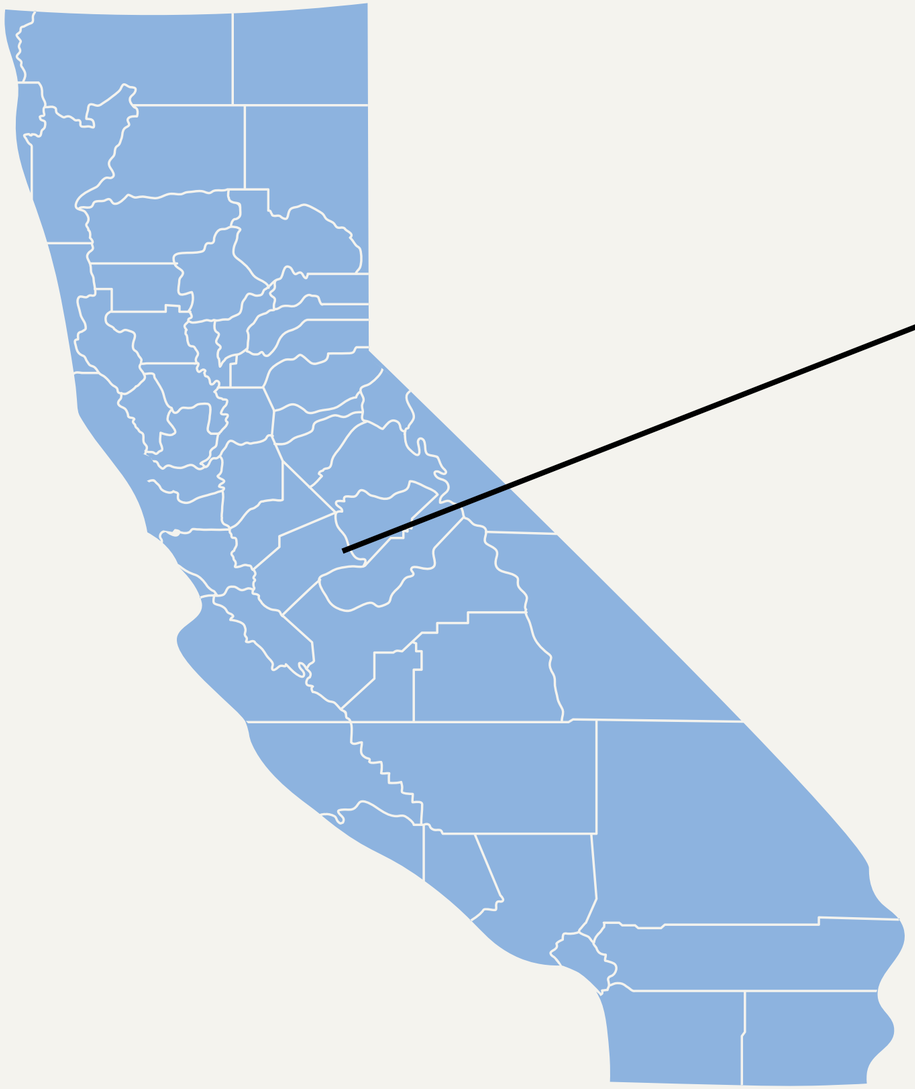
Analysis Tool

Scientific Name Common Name	Status	Habitat Requirements	Potential to Occur in Project Area	Habitat Suitability/ Observations
Plants and Lichens				
Acanthomintha duttonii San Mateo thorn-mint	FE/SE G1/S1 1B.1	Annual herb. Chaparral, valley and foothill grassland. Serpentinite. Elevations: 165-985 ft. (50-300m.) Blooms Apr-Jun.	None	No suitable habitat present. This site is developed and within an urban setting.
Allium peninsulare var. franciscanum Franciscan onion	None/None G3/S3 1B.2	Perennial bulbiferous herb. Cismontane woodland, valley and foothill grassland. Clay, Serpentinite (often), volcanic. Elevations: 170-1000ft. (52-305m.) Blooms (Apr)May-Jun.	None	No suitable habitat present. This site is developed and within an urban setting.
Amsinckia lunaris bent-flowered fiddleneck	None/None G2/S2 1B.2	Annual herb. Cismontane woodland, coastal bluff scrub, valley and foothill grassland. Elevations: 10-1640ft. (3-500m.) Blooms Mar-Jun.	None	No suitable habitat present. This site is developed and within an urban setting.

Data Processing



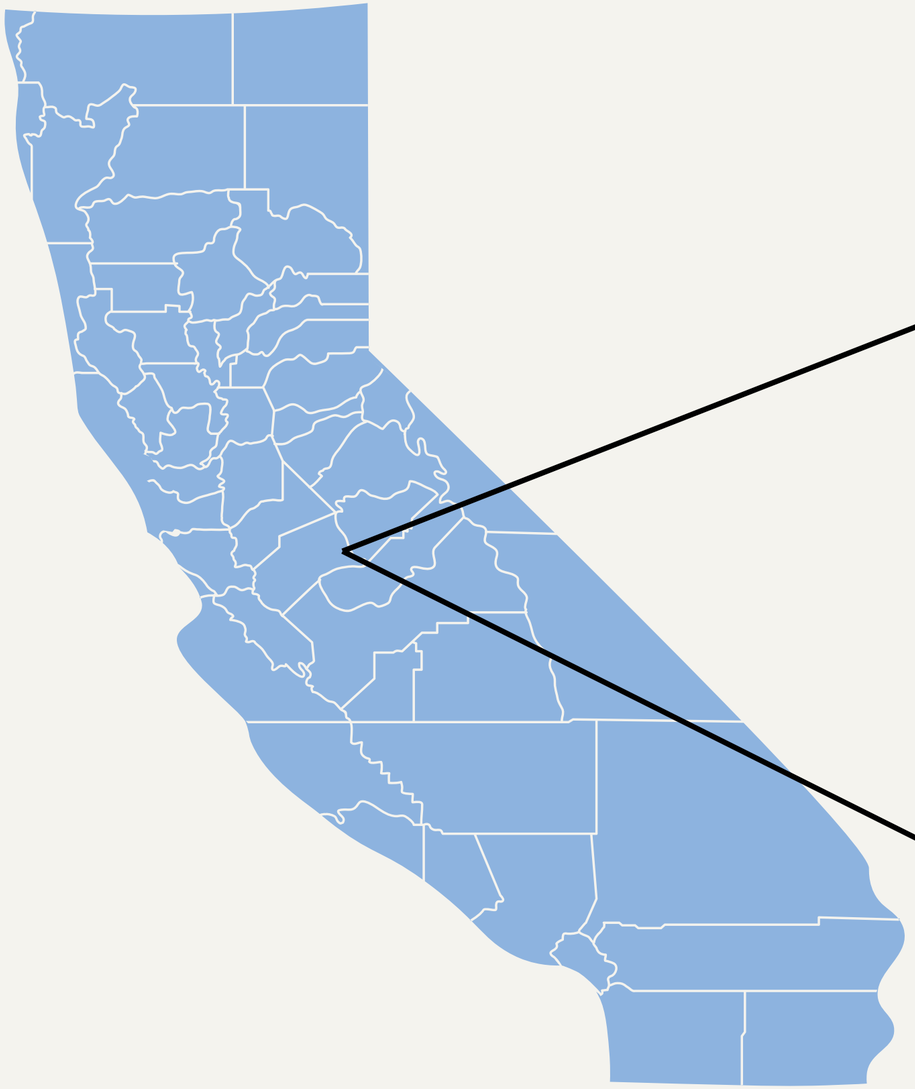
Data Processing



Spatial Setup

- Standardize coordinate system
- Calculate the buffer distances

Data Processing



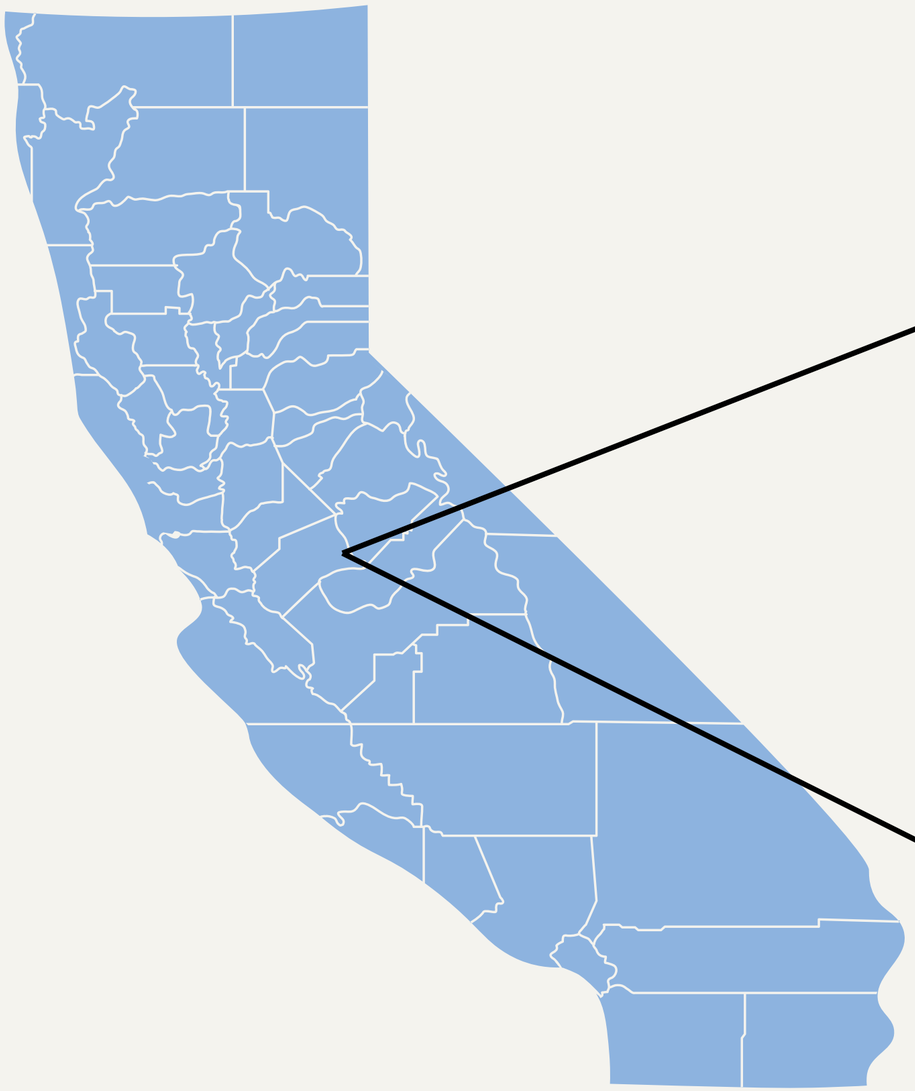
Spatial Setup

- Standardize coordinate system
- Calculate the buffer distances

Species Search

- CNPS: Filter by location ID
- CNDDB: Keep records intersecting the search area

Data Processing



Spatial Setup

- Standardize coordinate system
- Calculate the buffer distances

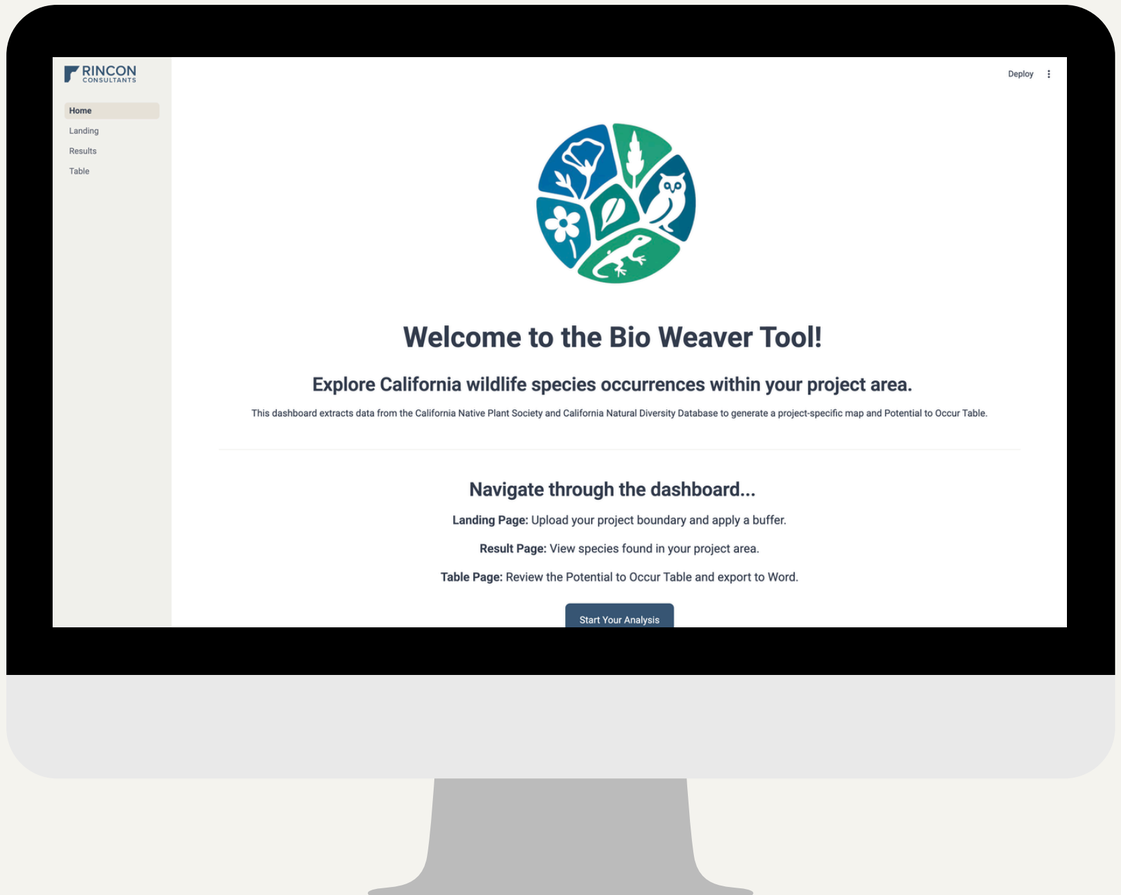
Species Search

- CNPS: Filter by location ID
- CNDDB: Keep records intersecting the search area

Report Automation

- Create a formatted report template
- Organize species data for each respective field

Technical Approach



01.
Python Processing Workflow

02.
Streamlit Application Experience

RINCON CONSULTANTS

- Home
- Landing
- Results
- Table

Deploy

Search Area Setup
Uploading project boundary and selecting buffer

Welcome to the Bio Weaver Tool!

Explore California wildlife species occurrences within your project area.

This dashboard extracts data from the California Native Plant Society and California Natural Diversity Database to generate a project-specific map and Potential to Occur Table.

Navigate through the dashboard...

Landing Page: Upload your project boundary and apply a buffer.

Result Page: View species found in your project area.

Table Page: Review the Potential to Occur Table and export to Word.

Start Your Analysis

RINCON CONSULTANTS

Deploy

- Home
- Landing
- Results
- Table

Map and Table Outputs
Exploring species records within project area

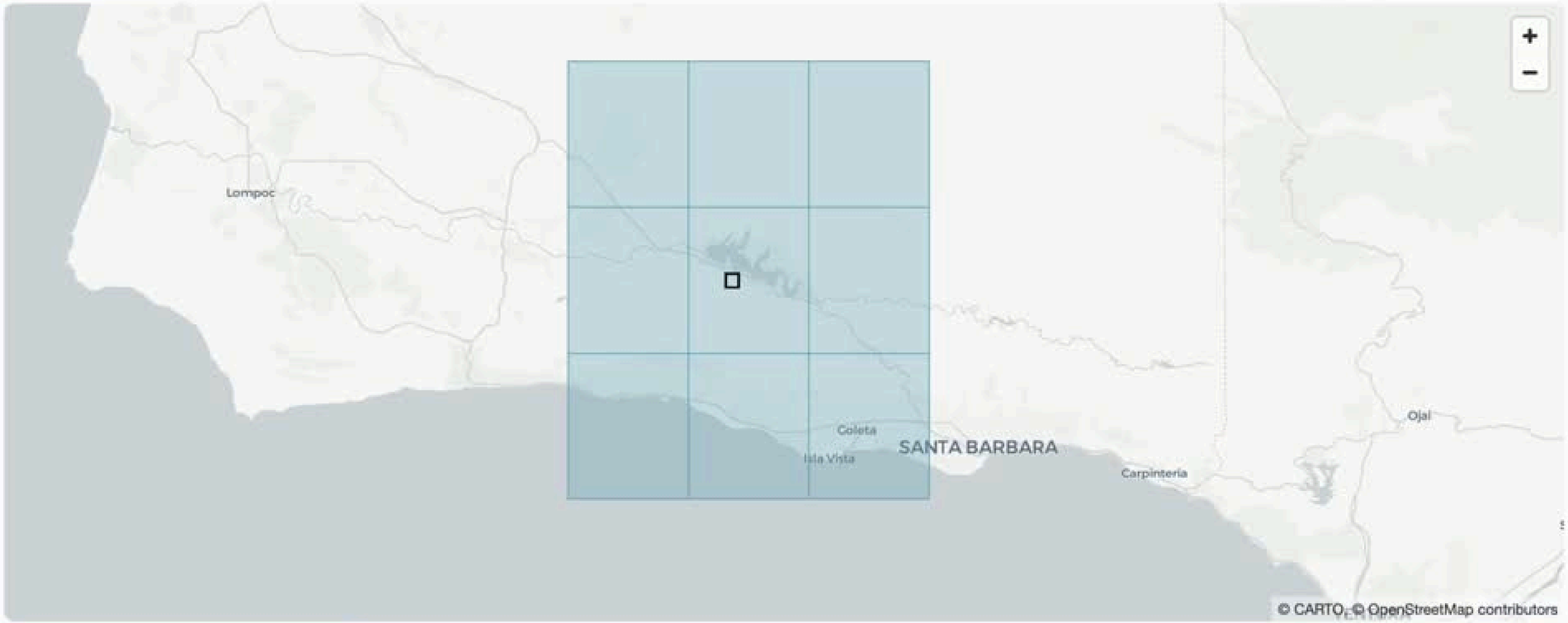


Search Radius Criteria

Select a buffer search option:

- 2-Mile
- 5-Mile
- 10-Mile
- 9-Quad

Apply Buffer



Go to Previous Page: Home Page

Go to Next Page: Results Page

RINCON CONSULTANTS

Deploy

- Home
- Landing
- **Results**
- Table

cnddb_species

Download CSV

California Native Plant Society Species Results

Found 56 species occurrences

		CRPR	GRank	SRank	OtherStatus	CESA	FESA	BloomingPeriod	Habitat
413	ferous herb	1B.2	G3T2	S2	BLM_S; SB_CalBG/RSABG; SB_SBBG; L	None	None	Apr-Jul	Chaparral, Lower montane coniferous forest, Meadows and seeps
440	matous herb	4.3	G4T4	S4	None	None	None	Apr-Jun	Chaparral, Cismontane woodland, Valley and foothill grassland
540		1B.1	G4T2	S2	USFS_S	None	None	May-Jul	Chaparral, Cismontane woodland, Closed-cone coniferous forest
573		1B.1	G3T2	S2	SB_CalBG/RSABG; SB_CRES; SB_SBBG	None	None	May-Nov	Marshes and swamps (margins), Valley and foothill grassland (vernally mes
610		4.2	G4	S4	SB_SBBG	None	None	Apr-Aug	Chaparral, Cismontane woodland, Valley and foothill grassland
694		4.2	G3	S3	None	None	None	Jun-Oct	Chaparral, North Coast coniferous forest
699		4.3	G4	S4	SB_UCSC	None	None	May-Jun	Chaparral, Cismontane woodland
708		4.2	G4	S4	SB_CRES	None	None	Mar-Jul	Chaparral (openings), Coastal scrub, Valley and foothill grassland
717	emiparasitic)	1B.1	G5T2	S2	BLM_S; SB_CalBG/RSABG; SB_SBBG	CE	None	Apr-Oct	Chaparral (maritime), Cismontane woodland, Closed-cone coniferous forest
783		4.2	G4	S4	None	None	None	(Mar)Apr-Nov	Coastal scrub, Valley and foothill grassland, Vernal pools
803		1B.3	G3	S3	BLM_S; SB_CalBG/RSABG; USFS_S	None	None	Apr-Jun	Chaparral, Cismontane woodland

Rename the CNPS species results CSV file (optional)

cnps_species

Download CSV

Go to Previous Page: Landing Page

Go to Next Page: Potential to Occur Table Page

Report Creation
Results structured into exportable files

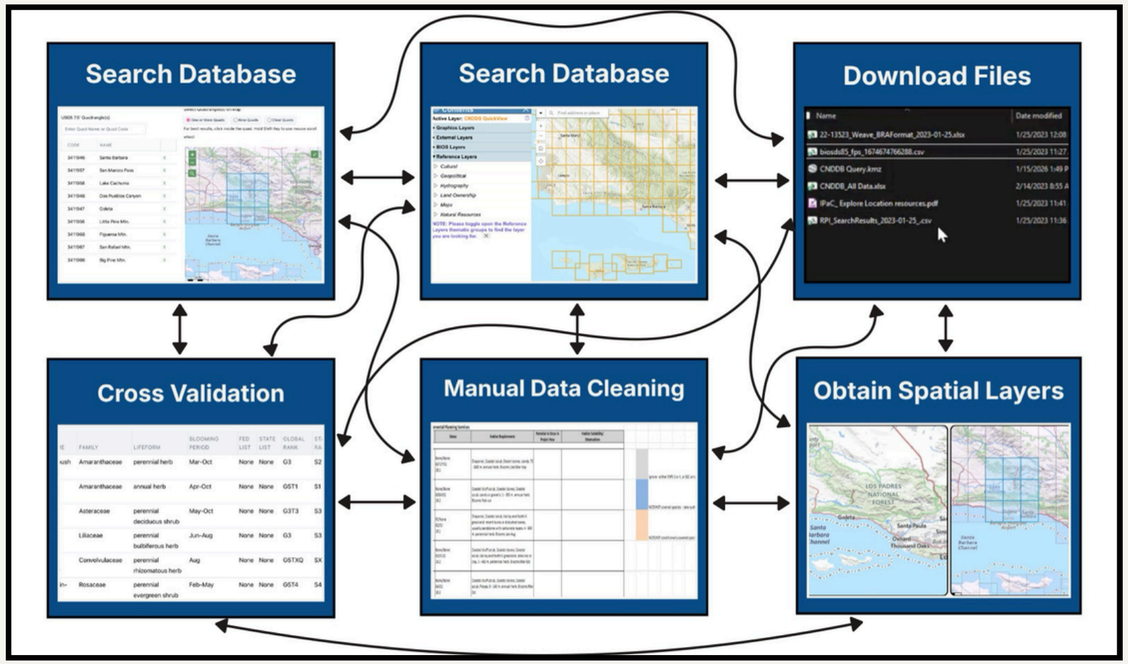
Report Creation
Results structured into exportable files

PTO Assessment Report

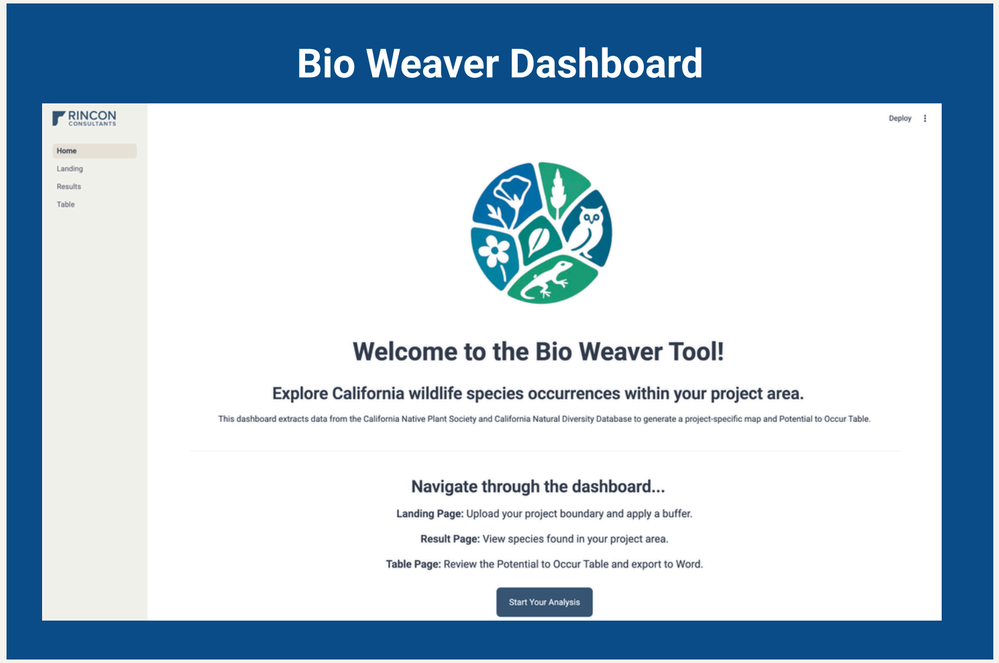
Potential to Occur Determinations

Scientific Name Common Name	Status	Habitat Requirements	Potential to Occur	Habitat Suitability/ Observations
Birds				
Luqui midi windy falcon	Federal: Delisted State: Candidate Threatened CDFW: WL Other: NMFS_SC	Ilzuil (Fara OF1679) Ulweka Nosika;1331 Sihafa Haulxo Miwe Vaxomi & Fato Zupail.	Low	Common
Yafa gien tidal falcon	Federal: Proposed Endangered State: Candidate Threatened CDFW: FP Other: IUCN_EW	Haorto Wewe OF A Kahava Faquira.	Moderate	
Fish				
Haul pafa marsh trout	Federal: Candidate State: Candidate Endangered CDFW: WL Other: IUCN_LC			
Ilal ilpa oak sucker	Federal: Delisted State: Candidate Endangered CDFW: SSC	Nouljo: Raxobe, Alzu, Xocor, Ilul, AND Kaka.		

Workflow Transformation



Biologists spent hours cross-referencing databases manually before a single report could begin.



The Bio Weaver Tool serves as one place to search, review, map, edit, and export.



Photo Credit: Rincon Consultants

Time Saved

What used to require hours now happens within a fraction of the time, getting biologists out into the field.

Features Designed for Project Review



Easy to use for both technical and non-technical staff



Flexible for different biological project needs



Intuitive and customizable interface



Browser-based access with minimal setup required

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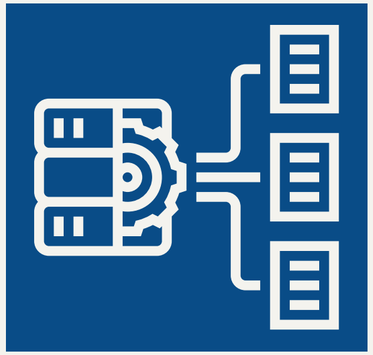


Intuitive and customizable interface



Browser-based access with minimal setup required

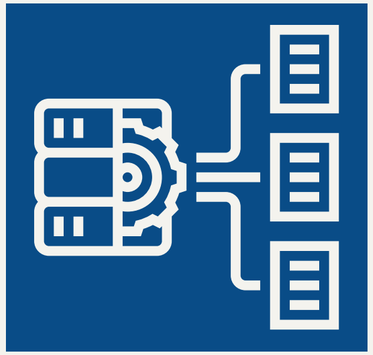
A Foundation for Future Development



Expand species databases

A Foundation for Future Development

A Foundation for Future Development

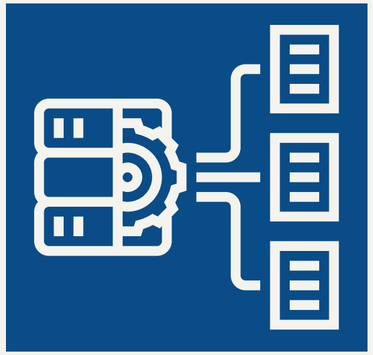


Expand species databases



Enhance map interactivity

A Foundation for Future Development



Expand species databases



Enhance map interactivity



Enable multi-project comparison within the application


Environmental consulting workflows can become more scalable, consistent, and accessible through integrated data tools.
Photo Credit: Matt Perko (UCSB)

Acknowledgements

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Photo Credit: Jessie Ward O'Sullivan (UCSB)