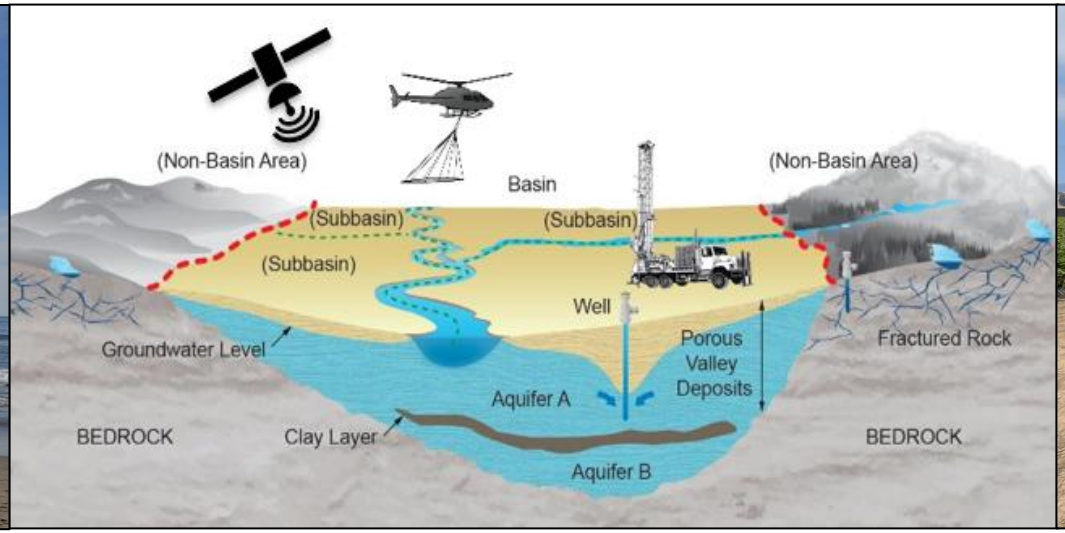
DWR's Groundwater Basin Characterization Program

CWEMF Annual Meeting

May 13, 2025



Katherine Dlubac, Steven Springhorn, Ben Brezing, Tim Godwin, and Craig Altare

Sustainable Groundwater Management Office

California Department of Water Resources

CALIFORNIA DEPARTMENT OF WATER RESOURCES
SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

RAMBOLL · Woodard & Curran · SKYTEM · Sinton Helicopters · RAS REALtime Aquifer Services · AECOM · S.S. Papadopulos & Associates, Inc. · Eclogite Consulting · HydroGeophysics Group AARHUS UNIVERSITY · GEI Consultants

BASIN CHARACTERIZATION PROGRAM – OVERVIEW

DWR is required to provide assistance, characterize groundwater basins, and update California's Groundwater (Bulletin 118).

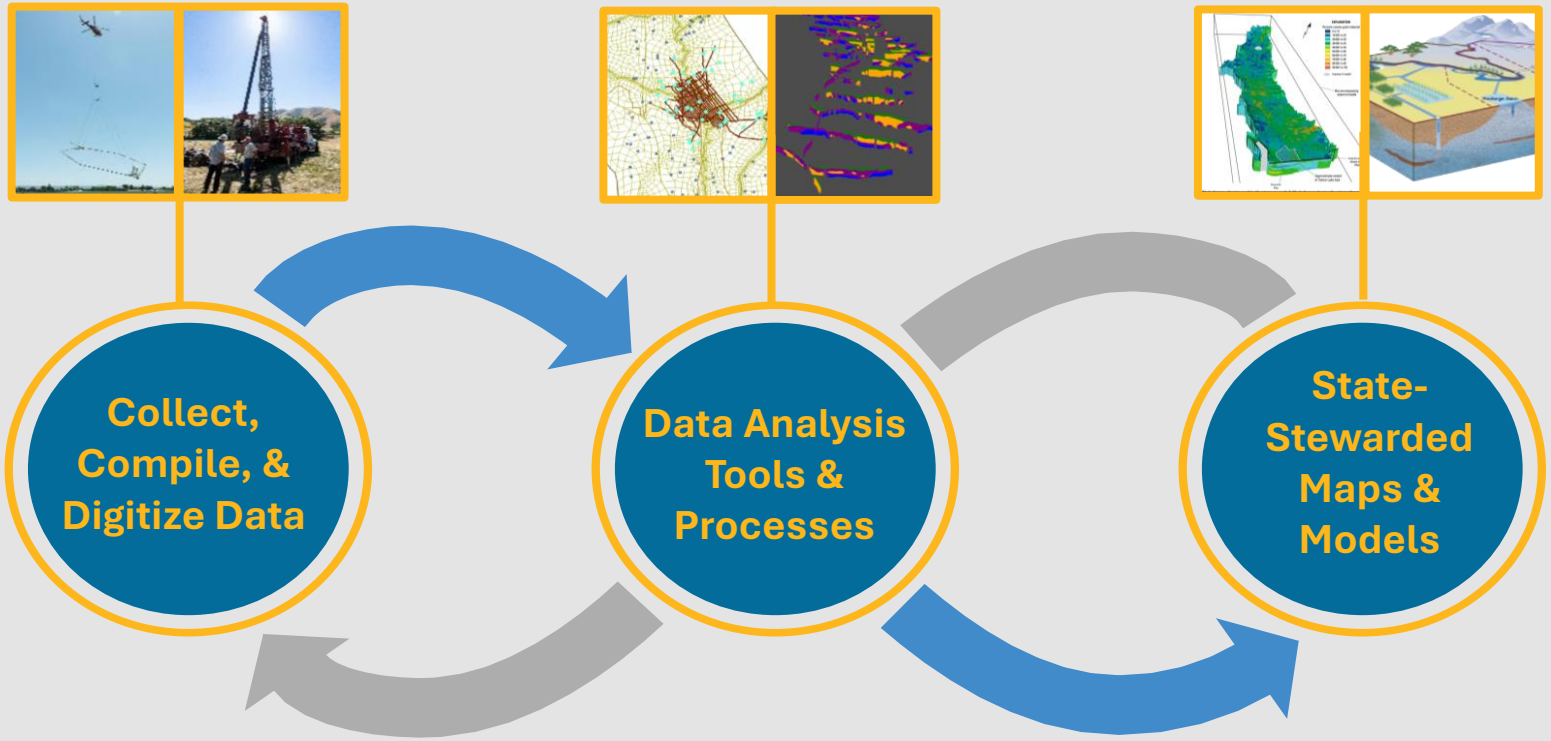
Goals for State-Stewarded Maps and Models

- Aquifer Recharge Potential
- Texture Model
- Aquifer Storage
- Hydrostratigraphic Model
- Important Aquifers
- Extent of Corcoran Clay
- Depth to Basement
- Base of Fresh Water

Basin Characterization Exchange (BCX)

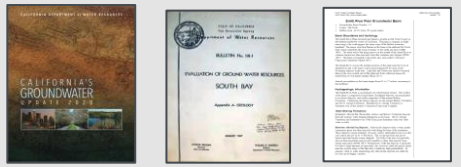
- Community of Practice
- Local, State, & Federal Agencies
- NGOs, Academia & Private Sector

Groundwater Evaluations: Statewide, Regional, & Local



Data Access & Visualization

Data Archive | California's Groundwater

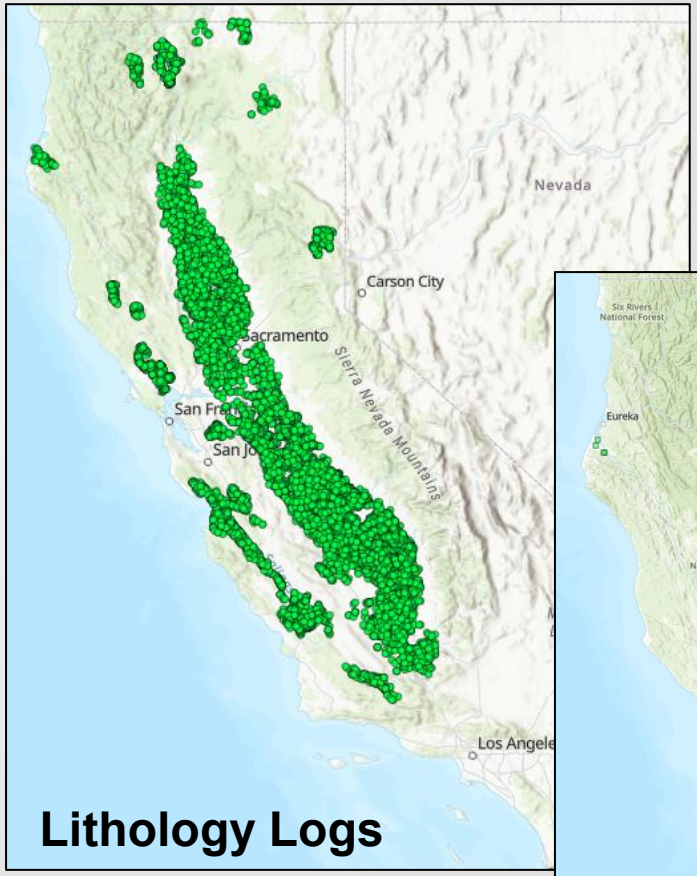


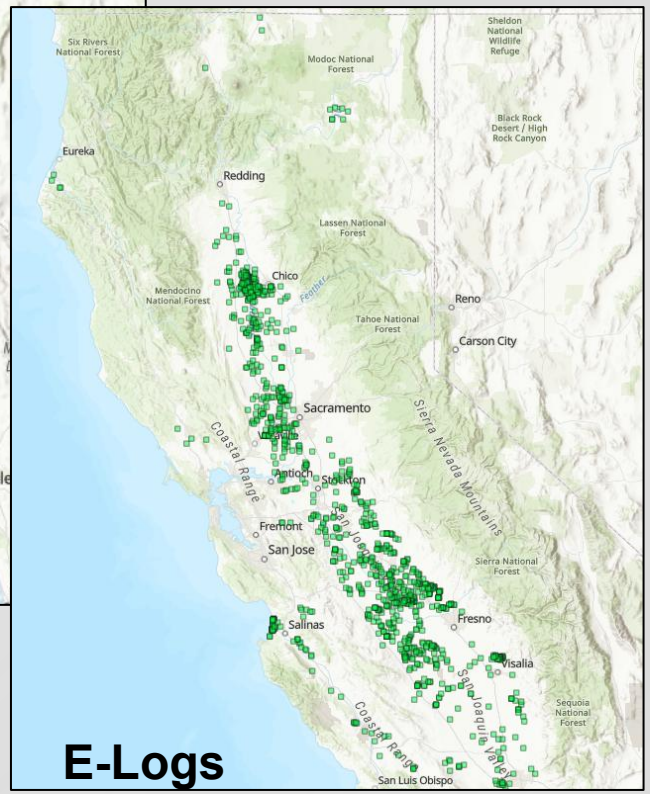
2025!

Collect, Compile, and Digitize Data

Collect Data

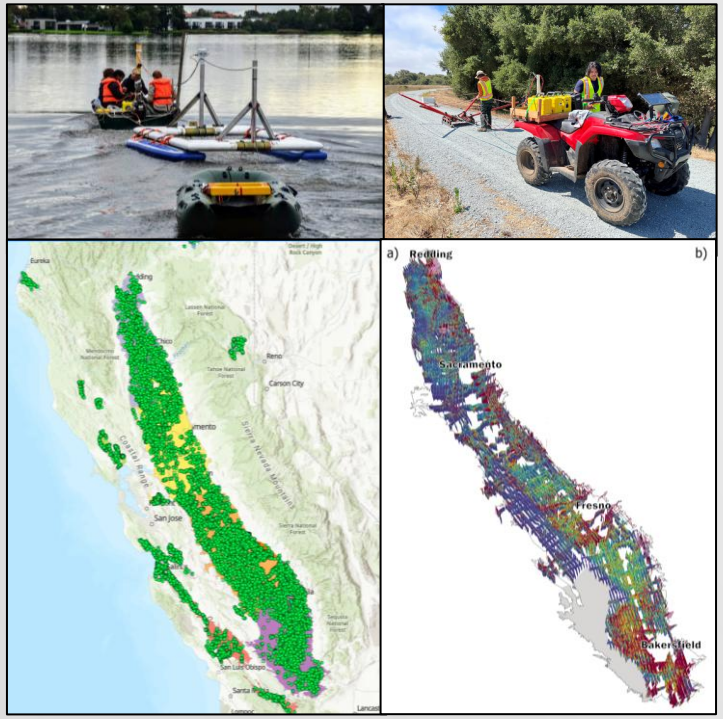
Compile, (QA/QC), & Digitize Data





Data Analysis Tools and Process Documents

Large Datasets



Data Analysis Tools & Processes Documents

Integrates AEM data, lithology & geophysical logs

Advanced computational analyses

Reproducible

State-Stewarded Maps and Models

- Aquifer Flow Parameters
- Hydrostratigraphic Model
- Texture Model
- Aquifer Recharge Potential Maps

Data Analysis Toolbox

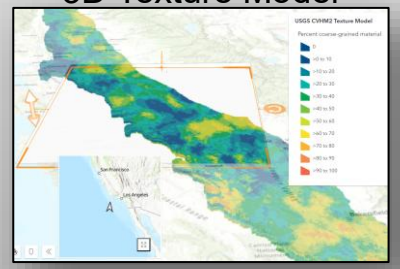
Data2Texture

Input

- Geophysical Data: Statewide AEM, Infill AEM, tTEM/FloaTEM, NMR/e-logs
- Well Data: OSWCR, Local, CalGEMS

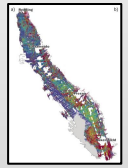
Output

3D Texture Model



Data2HSM

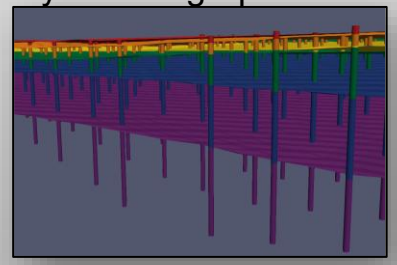
Input



- Data: Geophysics, Lith/e-logs, Water quality, Isotopes

Output

Hydrostratigraphic Model

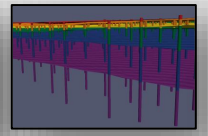


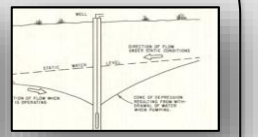
All tools and related guidance will be made available for public use.

Beta Launch – May/June 2025 (presentations through BCX)
Full Launch – Fall 2025 (public workshop/guidance)

Texture2Par V2

Input





Output

Aquifer Parameters

Groundwater Flow Models

C2VSim & Local Models

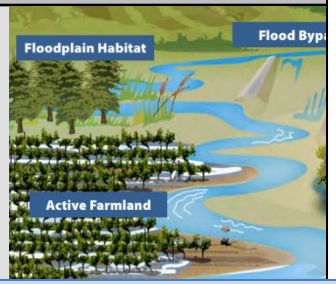
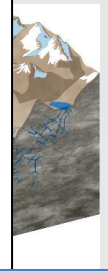
RAMBOLL

Woodard & Curran

$\Sigma^2\Pi$ S.S. Papadopulos & Associates, Inc.

Aquifer Recharge Potential Mapping

Methodology to describe 3D aquifer infiltration pathways as 2D maps to support prioritizing potential recharge locations.

ARP Map	Shallow (Natural		erential (Built)	Deep Aquifer Storage
Schematic				Coming soon!
Infiltration Type				into the deep of the aquifer
Soil Consideration	through soil laye		soil layer.	Bypassing soil layer
Recharge Methods	Ag-MAR, surface w spreading, manag natural lands		ated r recharge dry wells	Aquifer storage and recovery

California Department of Water Resources
Sustainable Groundwater Management Office

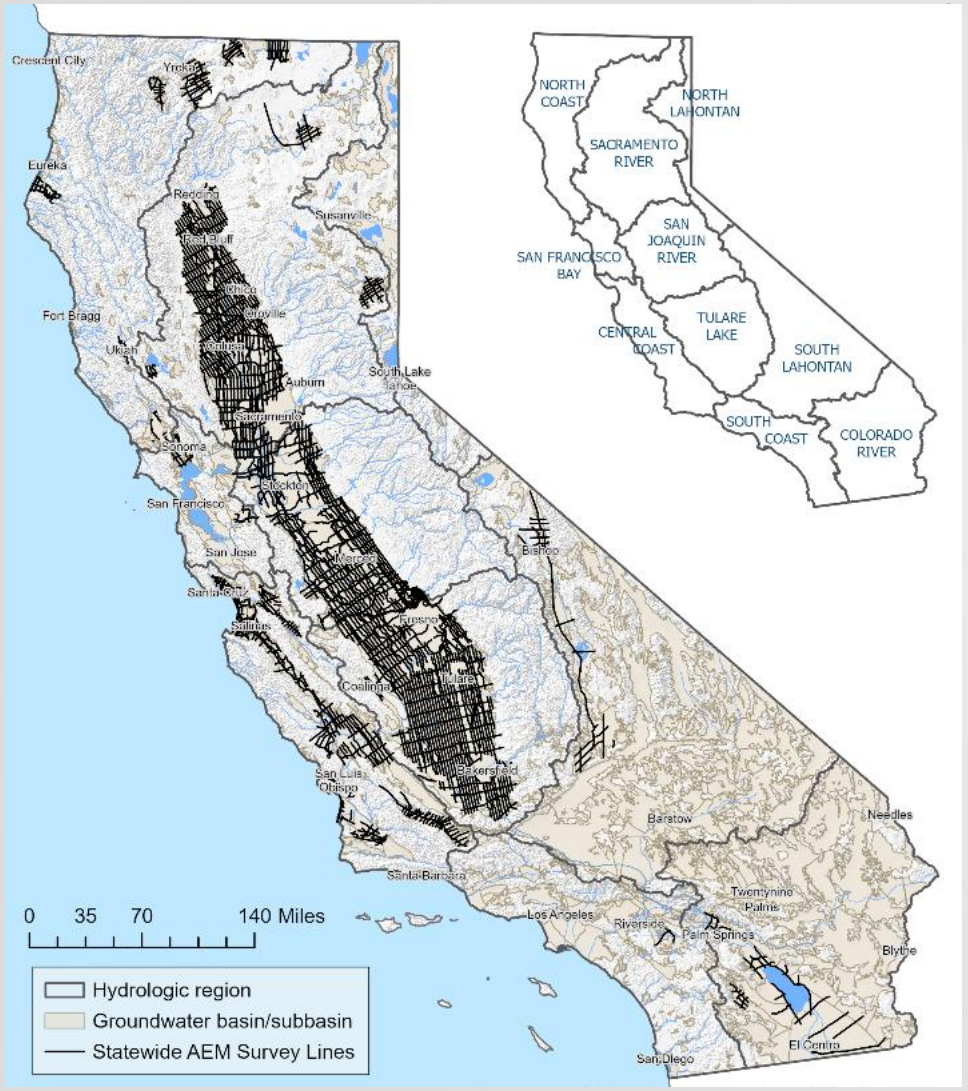
Aquifer Recharge Potential Mapping

Process Document
November 2024
Draft

[Draft ARP Process Document](#) on CNRA Open Data Portal

ARP overview recording available on BCX Hub.

Groundwater Evaluations – Statewide Investigations



Statewide AEM Surveys

Goal: To improve understanding of large-scale aquifer structure and support implementation of the Sustainable Groundwater Management Act (SGMA).

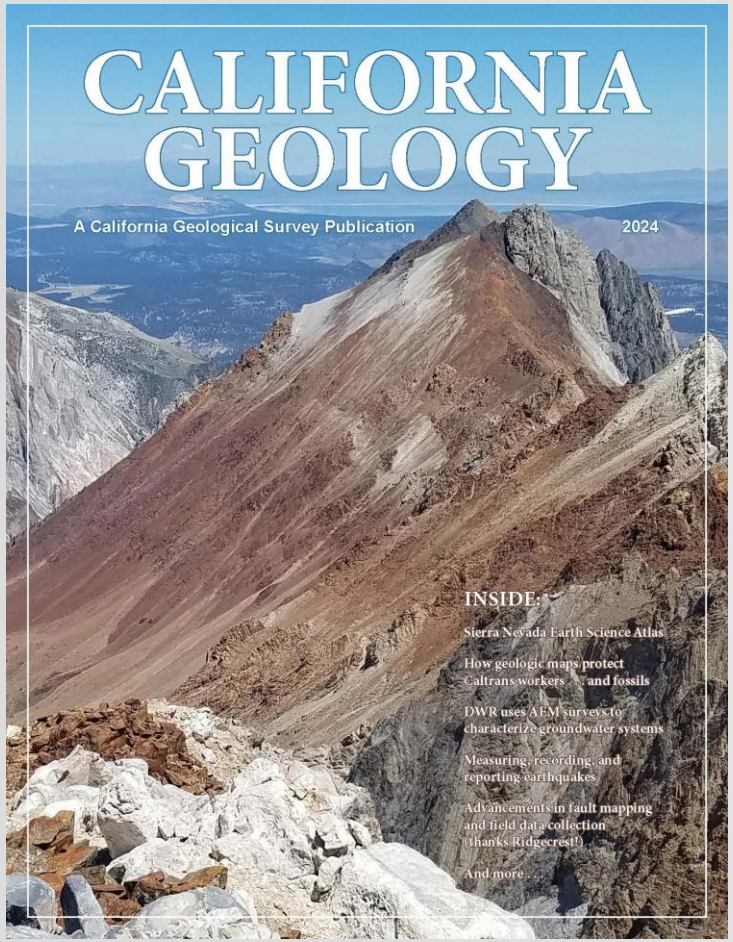
When: Summer 2021 - Fall 2023.

Where: All high- and medium-priority groundwater basins, where data collection was feasible (95 groundwater subbasins partially or fully surveyed).

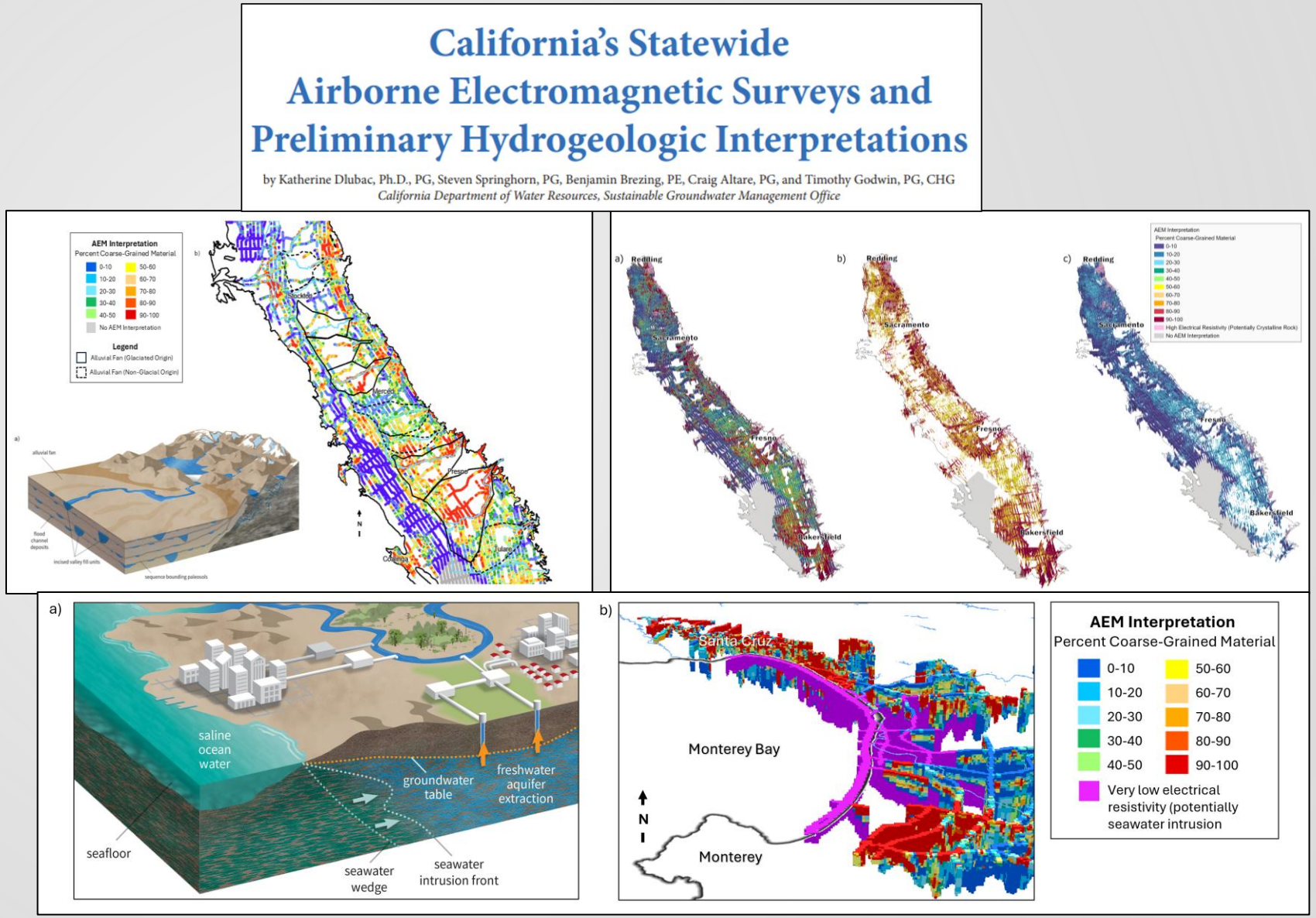
What:

- Information about distribution of fine- and coarse-grained material in aquifers.
- ~16,000 line-miles of data.
- Data collected in reconnaissance grid.

Groundwater Evaluations – Statewide Investigations



AEM Article in latest Issue of California's Geology Magazine!



Groundwater Evaluations – Local and Regional Investigations

Collect data and explore analyses to develop state-stewarded maps and models to inform **sustainable groundwater management.**

Basin Characteristics

- Texture Model
- Recharge Potential
- Interconnected Surface Water (ISW)
- Hydrostratigraphic Model
- Aquifer Storage
- Extent of Corcoran Clay
- Subsidence
- Depth to Basement
- Base of Fresh Water
- Brackish Waters

Methodologies

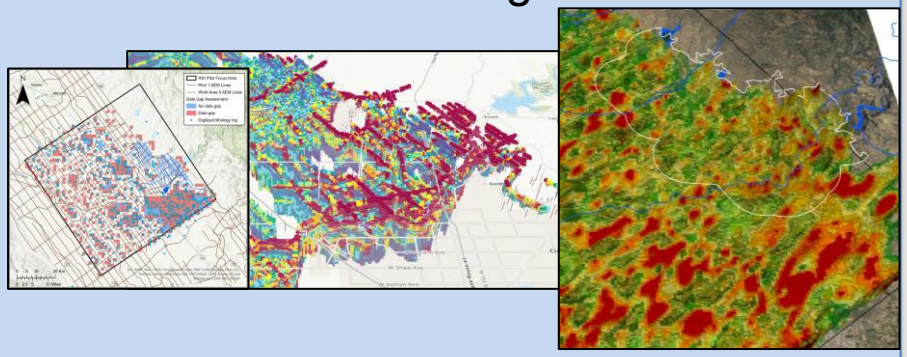
(collection or digitization)

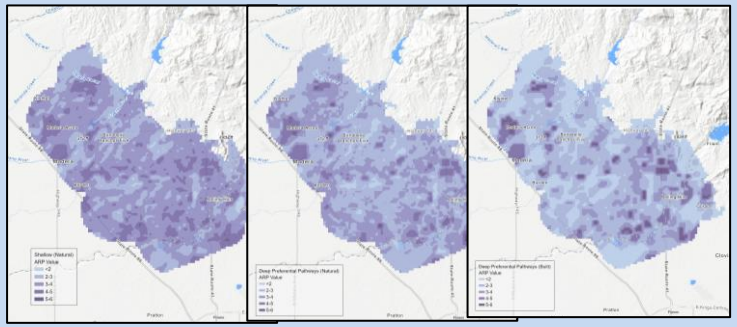
- Infill AEM
- t-TEM
- FloaTEM
- NMR-logs
- E-logs
- Lithology logs
- CPT
- Monitoring Wells
- Aquifer tests

Groundwater Evaluations – Local and Regional Investigations

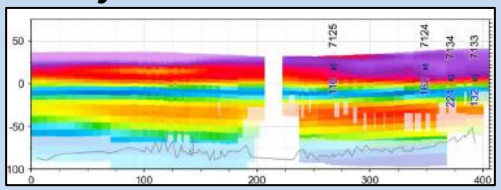
Collect data and explore analyses to develop state-stewarded maps and models to inform **sustainable groundwater management.**

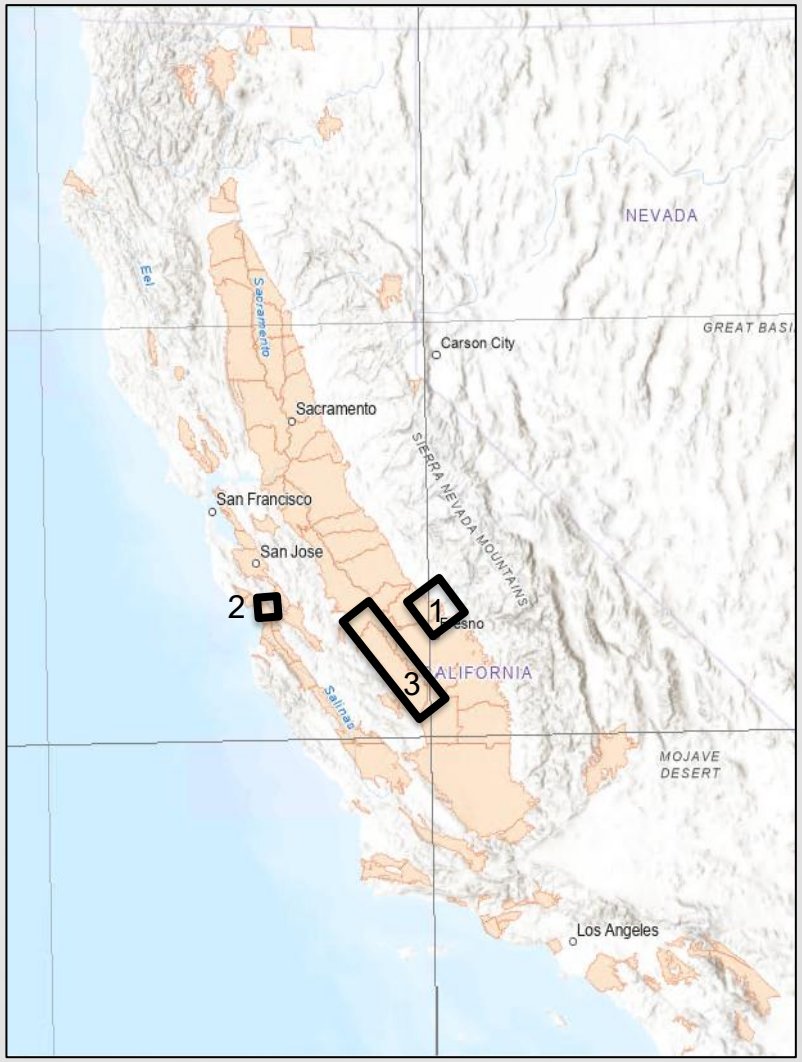
Madera and North Kings





Pajaro – tTEM data

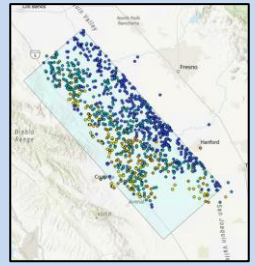


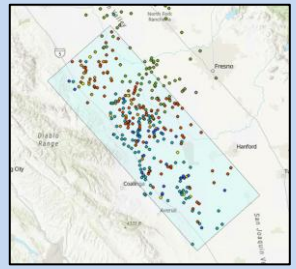


Local Investigations

1. Madera & N. Kings
   - Collect & digitize data
   - Texture model
   - ARP maps
   - ISW
2. Pajaro
   - Collect data
3. Western San Joaquin Valley
   - Digitize data
   - Texture model
   - Deep aquifer HCM
   - ARP maps
   - Subsidence

Western San Joaquin

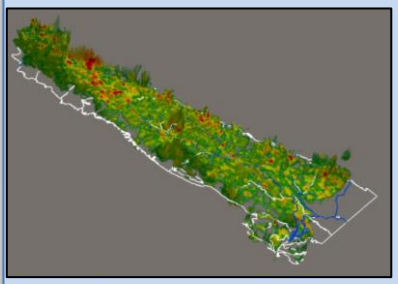


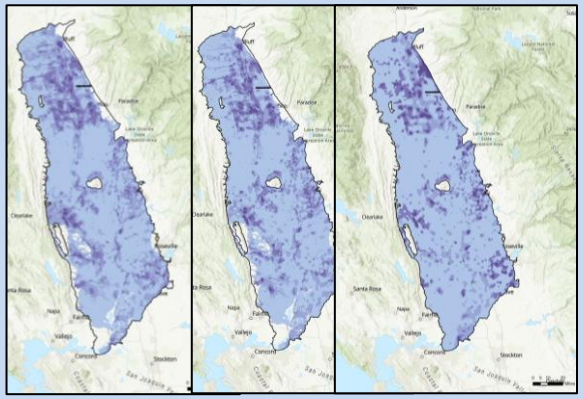


Groundwater Evaluations – Local and Regional Investigations

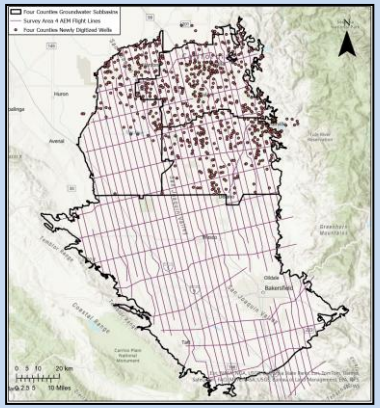
Collect data and explore analyses to develop state-stewarded maps and models to inform **sustainable groundwater management.**

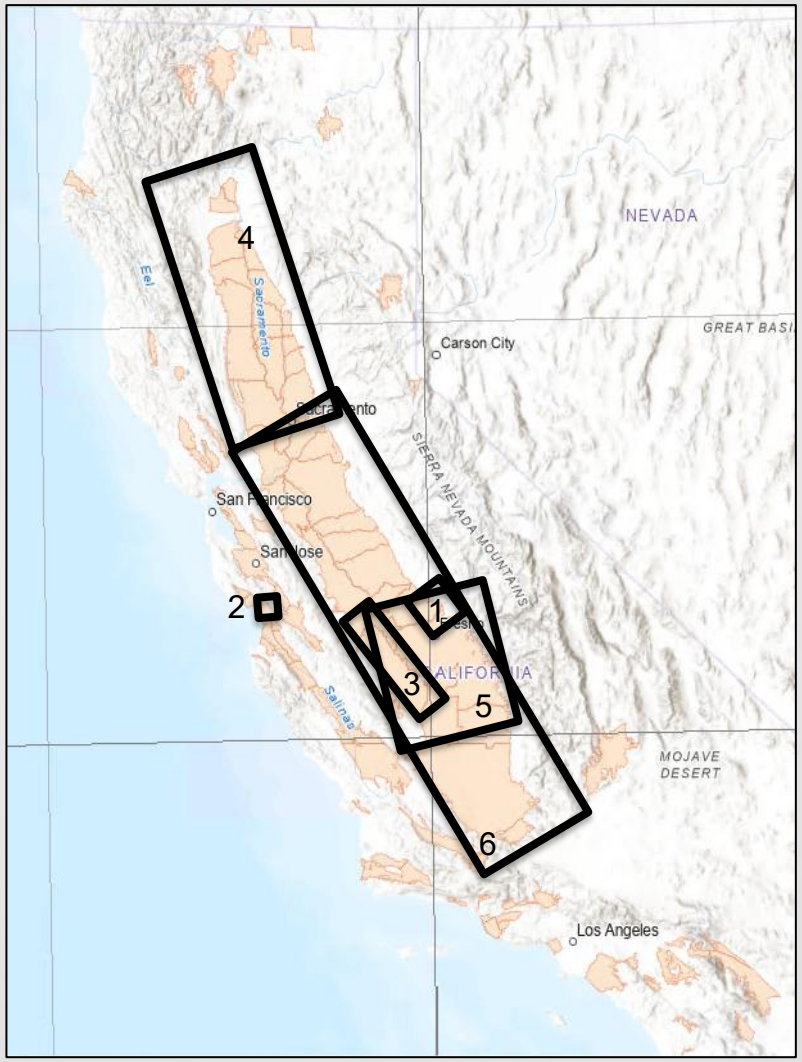
Sacramento Valley





Four County Area





Local Investigations

1. Madera & N. Kings
   - Collect & digitize data
   - Texture model
   - ARP maps
   - ISW
2. Pajaro
   - Collect data
3. Western San Joaquin Valley
   - Digitize data
   - Texture model
   - Deep aquifer HCM
   - ARP maps
   - Subsidence

Regional Investigations

(Digitize data, texture model and ARP maps)

4. Sacramento Valley
5. Four County Area
6. San Joaquin Valley

Groundwater Basin Characterization - Data Access and Visualization

CALIFORNIA NATURAL RESOURCES AGENCY

Open Data Organizations Topics Training Log in Contact

Organizations / California Department of... / **DWR's Basin Characterization Program**

DWR's Basin Characterization Program

DWR has a long history of studying and characterizing California's groundwater aquifers as a part of California's Groundwater (Bulletin 118) Characterization Program provides the latest data and information about California's groundwater basins to help local communities better ur systems and support local and statewide groundwater management.

Under the Basin Characterization Program, new and existing data (AEM, lithology logs, geophysical logs, etc.) will be integrated to create c three-dimensional models. To support this effort, new data analysis tools will be developed to create texture models, hydrostratigraphic mod parameters. Data collection efforts will be expanded to include advanced geologic, hydrogeologic, and geophysical data collection and data control efforts will continue. To continue to support data access and data equity, the Basin Characterization Program will develop new online visualization tools to serve as a central hub for accessing and exploring groundwater related data in California.

Additional information can be found on the Basin Characterization Program webpage.

DWR's Evaluation of Groundwater Resources: Maps and Models

DWR will undertake local and regional investigations to evaluate California's groundwater resources and develop state-stewarded maps and existing data will be combined and integrated using the analysis tools described below to develop maps and models to be developed will de hydrostratigraphic properties, and hydrogeologic conceptual properties of California's aquifers. These maps and models help groundwater m how groundwater is stored and moves within the aquifer. The models will be state-stewarded, meaning that they will be regularly updated, a available, to ensure that up-to-date information is used for groundwater management activities. The first iterations of the following maps and published as they are developed:

- Texture Models
- Hydrostratigraphic Models
- Aquifer Recharge Potential Maps
- Extent of Important Aquifer Units
- Depth to Basement
- Depth to Freshwater

Local Investigations:

- Madera & North Kings
- Pajaro
- Western San Joaquin Valley

Regional Investigations:

- Sacramento Valley
- Four County Area of San Joaquin Valley (Madera, Fresno, Kings, and Tulare)
- San Joaquin Valley

https://data.cnra.ca.gov/dataset/dwr-basin-characterization

Data Collection, Compilation, and Digitization

Data Collection

As a part of the Basin Characterization Program, advanced geologic, hydrogeologic, and geophysical data will be collected to improve our understanding of groundwater basins. Data collected under Basin Characterization are collected at a local, regional, or statewide scale depending on the scope of the study.

Datasets collected under the Basin Characterization Program can be found under the following resource:

- Geophysical, Hydrogeologic, & Geologic Datasets

Digitized Existing Lithology and Geophysical Logs

Lithology and geophysical logging data have been digitized to support the Statewide AEM Survey Project and will continue to be digitized to support Basin Characterization efforts. All digitized lithology logs with Well Completion Report IDs will be imported back into the OSWCR database.

Digitized lithology and geophysical logging can be found under the following resource:

- Digitized Lithology and Geophysical Logs.

Analysis Tools and Process Documents

To develop the state-stewarded maps and models outlined above, new tools and process documents will be created to integrate and analyze a wide range of data, including geologic, geophysical, and hydrogeologic information. By combining and assessing various datasets, these tools will help create a more complete picture of California's groundwater basins. All tools, along with guidance documents, will be made publicly available for local groundwater managers to use to support development of maps and models at a local scale. All tools and guidance will be updated as revisions to tools and process documents are made.

Analysis tools and process documents can be found under the following resource:

- Data Analysis Tools and Process Documents.

Data Visualization

Data access equity is a priority for the Basin Characterization Program. To ensure data access equity, the Basin Characterization Program has developed applications and tools to allow data to be visualized without needing access to expensive data visualization software. This list below provides links and descriptions for the Basin Characterization's suite of data viewers.

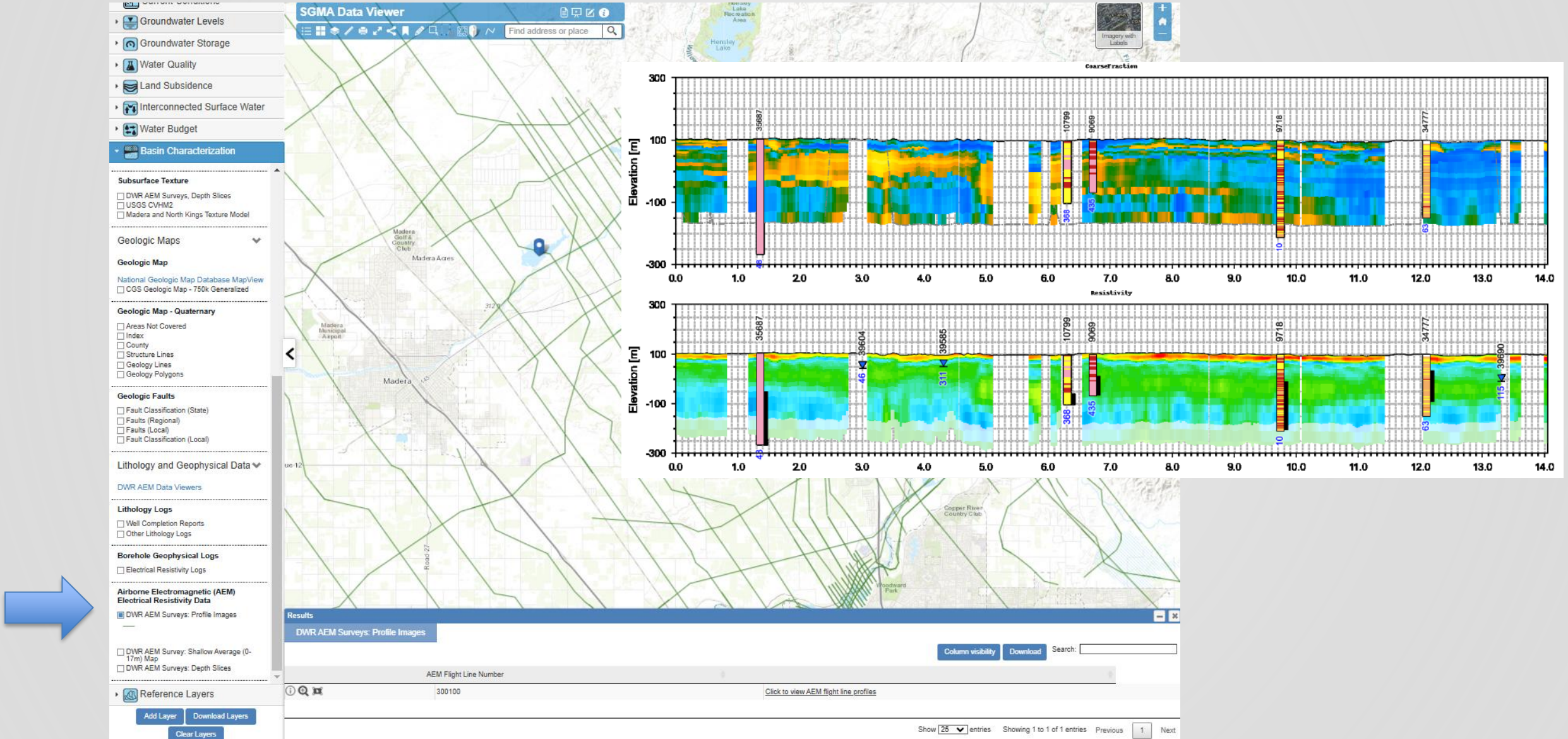
SGMA Data Viewer: Basin Characterization tab: Provides maps, depth slices, and profiles of Basin Characterization maps, models, and datasets, including the following:

- Aquifer Recharge Potential Maps
- Subsurface Texture Model Depth Slices
- Statewide AEM Survey Texture Depth Slices
- Lithology Log Location Maps
- Geophysical Logs Location Maps
- Statewide AEM Survey Profile Images

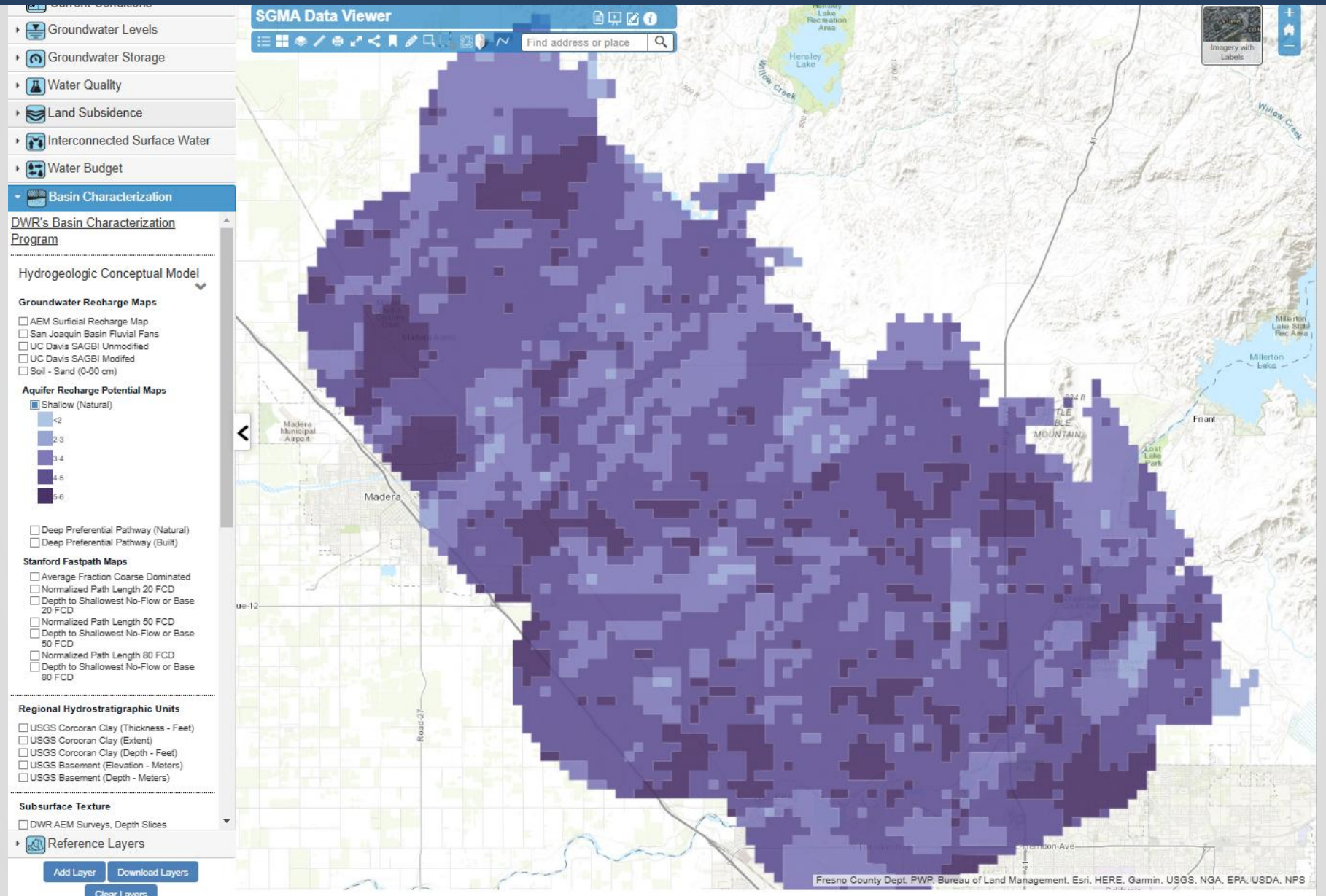
3D AEM Data Viewer: Displays the Statewide AEM Survey electrical resistivity and coarse fraction data, along with lithology logs, in a three-dimensional space.

DWR's Subsurface Viewer: Provides a map view and profile view of the Statewide AEM Survey electrical resistivity and coarse fraction data, along with lithology logs. The map view dynamically shows the exact location of AEM data displayed.

SGMA Data Viewer – Basin Characterization Tab: AEM Profiles

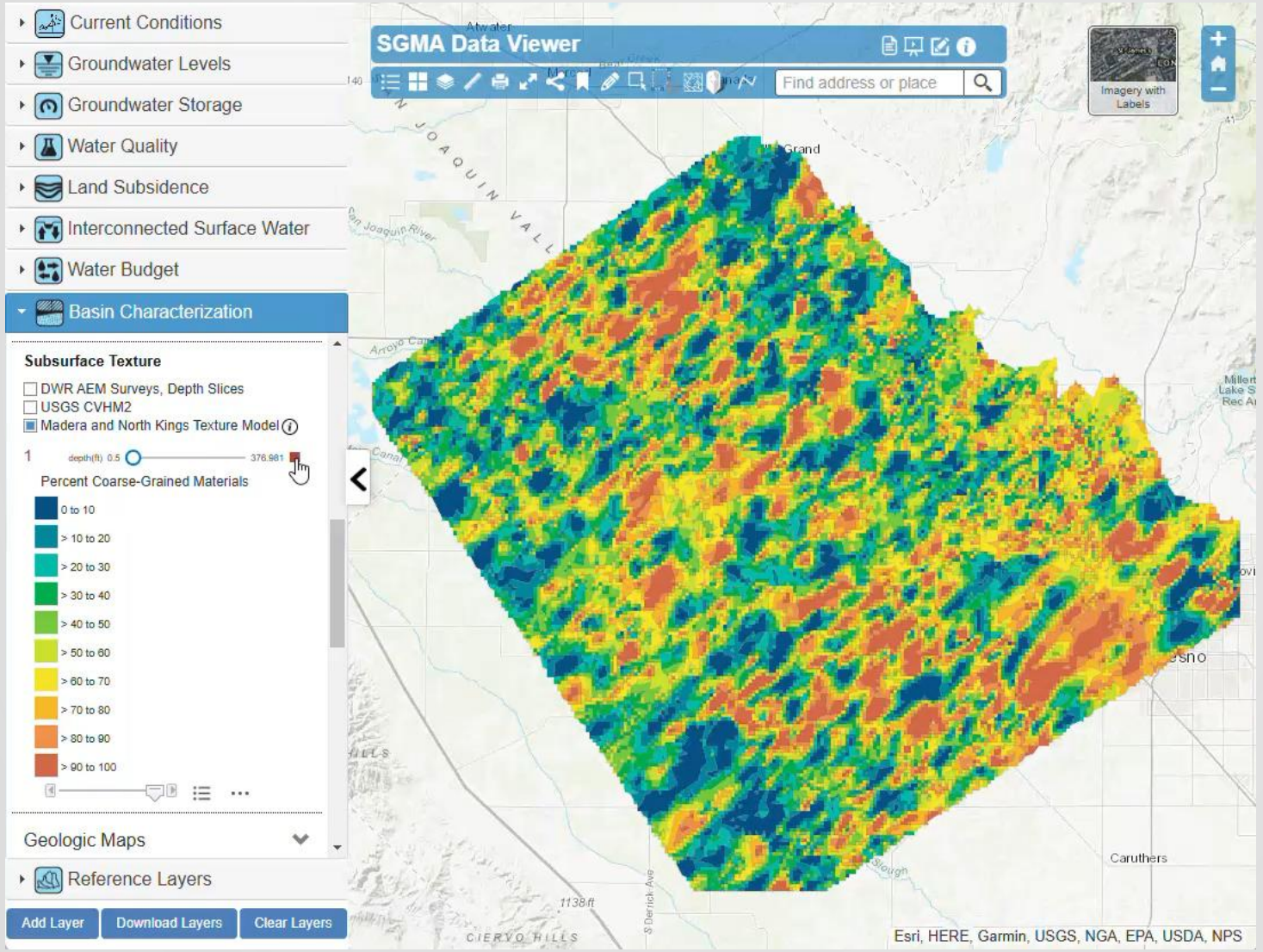


SGMA Data Viewer – Basin Characterization Tab: ARP Maps

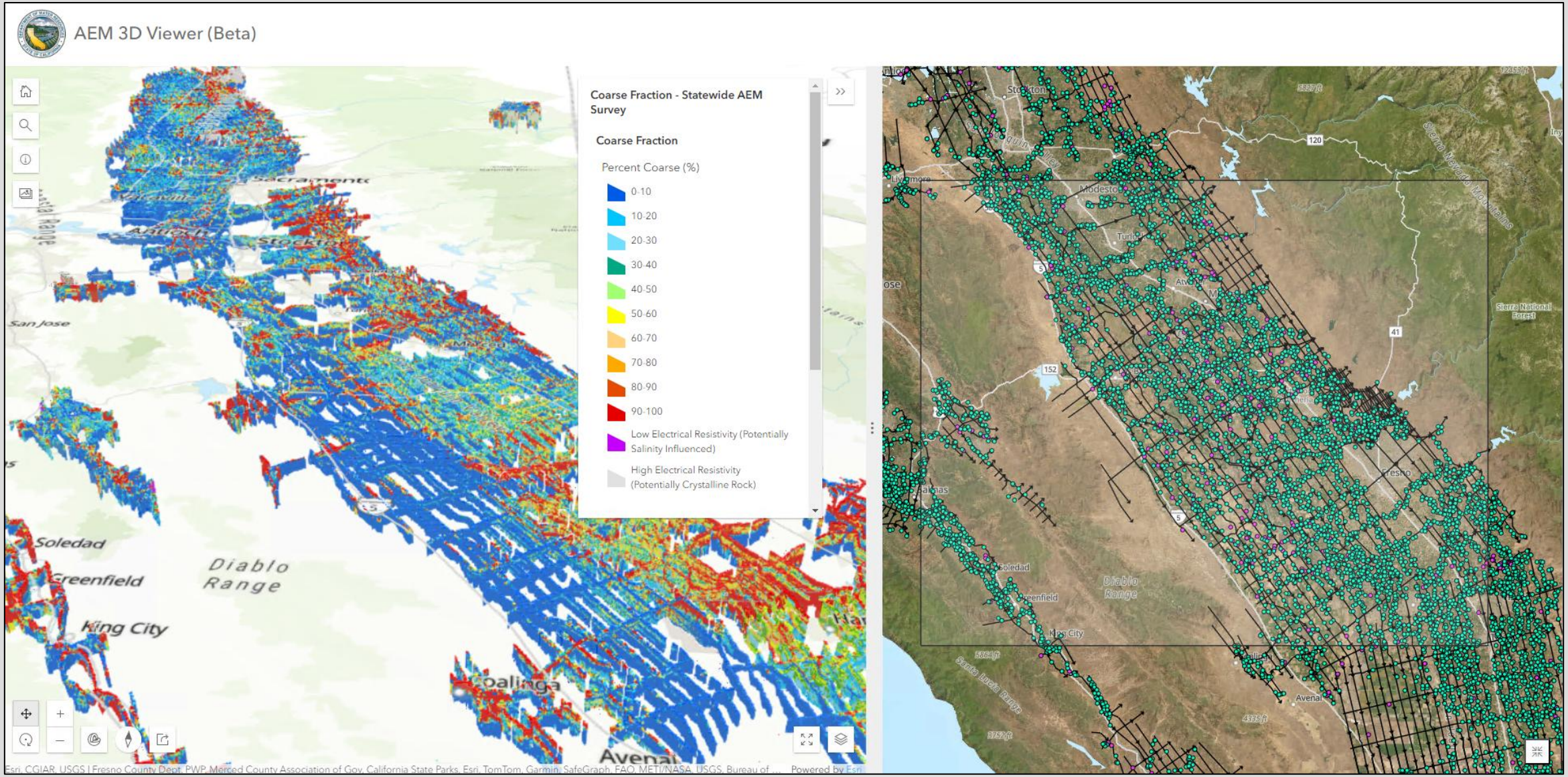


SGMA Data Viewer – Basin Characterization Tab: Texture Models

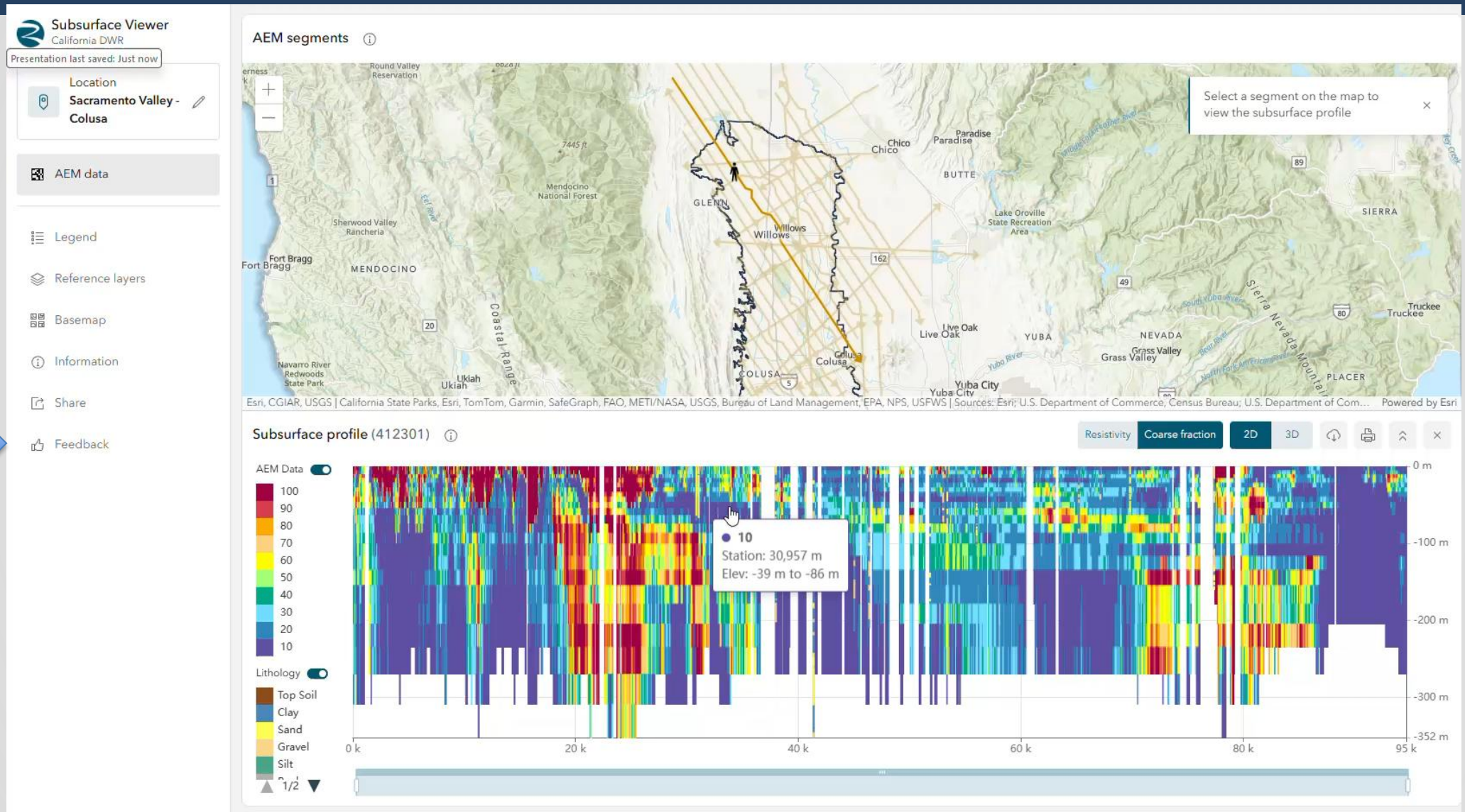
https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer



AEM 3D Viewer



NEW! Subsurface Viewer



https://kind-water-0b502ae1e.4.azurestaticapps.net/

Basin Characterization Exchange (BCX)

BCX Goals

- Enhance collaboration and basin understanding
- Improve tools and research for characterization
- Identify priority areas through input

BCX Webinars

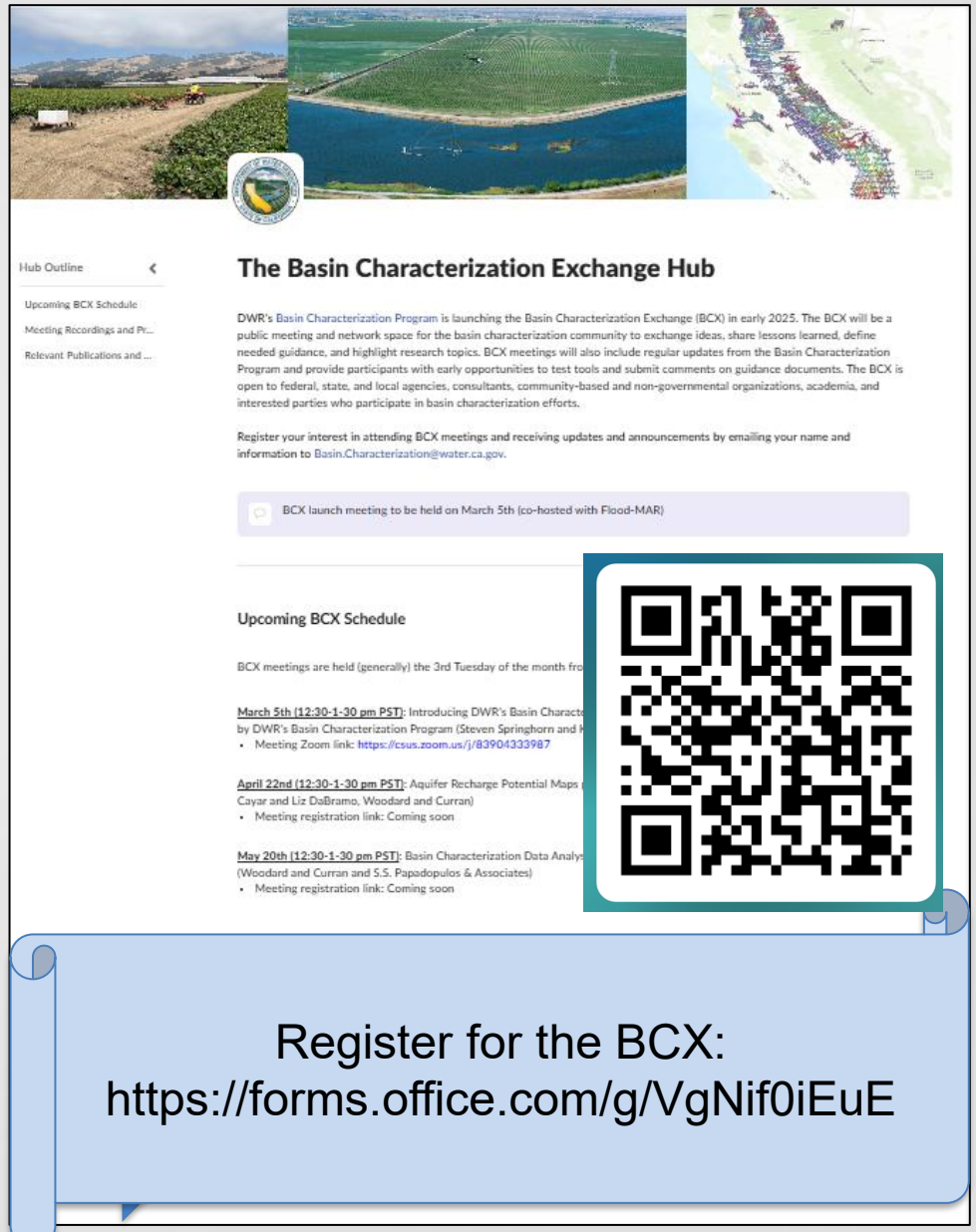
- **April 22nd:**
- Basin Characterization: Aquifer Recharge Potential Maps

- **May 20th (12:30-1-30 pm PST):**
- Basin Characterization: Data2Texture & Texture2Par

- **June 24th (12:30-1:30pm PST)**
- Basin Characterization: Data2HSM

Meetings generally held on 3rd Tuesday of the month from 12:30 -1:30 pm PST.

Meeting registration links sent to BCX listserv.



Register for the BCX:
https://forms.office.com/g/VgNif0iEuE

Thank you!

Basin Characterization Program :

https://water.ca.gov/Programs/Groundwater-Management/Bulletin-118/Basin-Characterization

CNRA Open Data Portal:

https://data.cnra.ca.gov/dataset/dwr-basin-characterization

Email: Basin.Characterization@water.ca.gov

Katherine.Dlubac@water.ca.gov