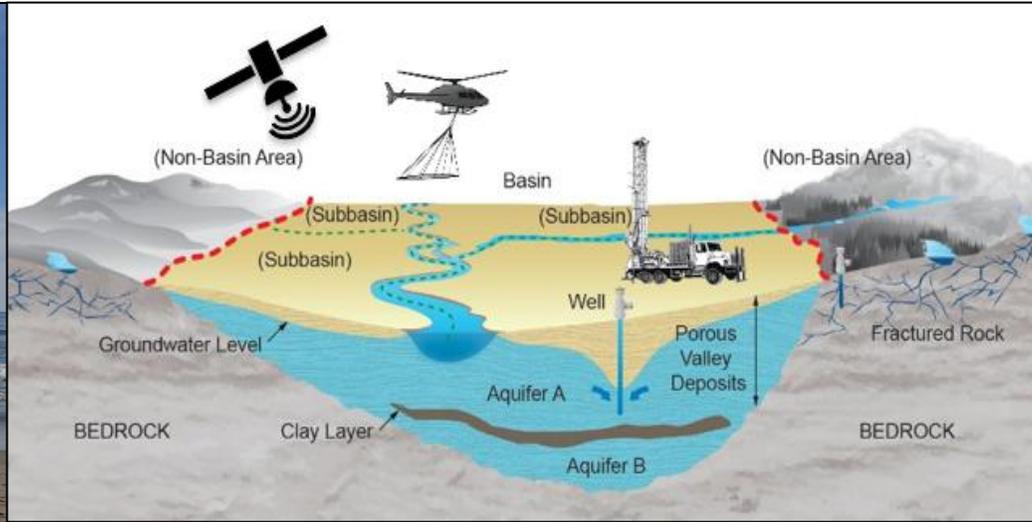




DWR's Groundwater Basin Characterization Program

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

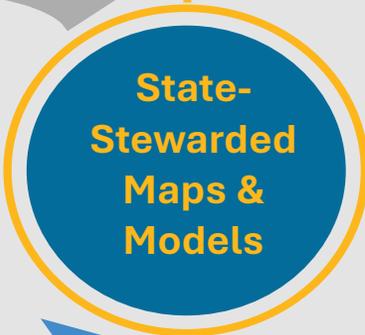
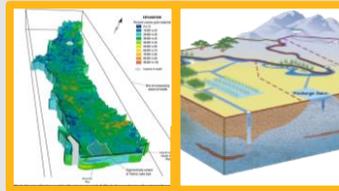
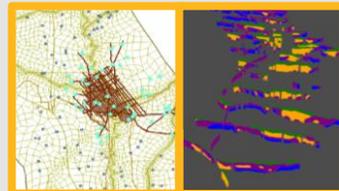




BASIN CHARACTERIZATION PROGRAM – OVERVIEW

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

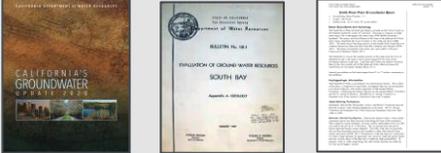
Groundwater Evaluations: Statewide, Regional, & Local



Data Access & Visualization



Data Archive | California’s Groundwater



2025!

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)

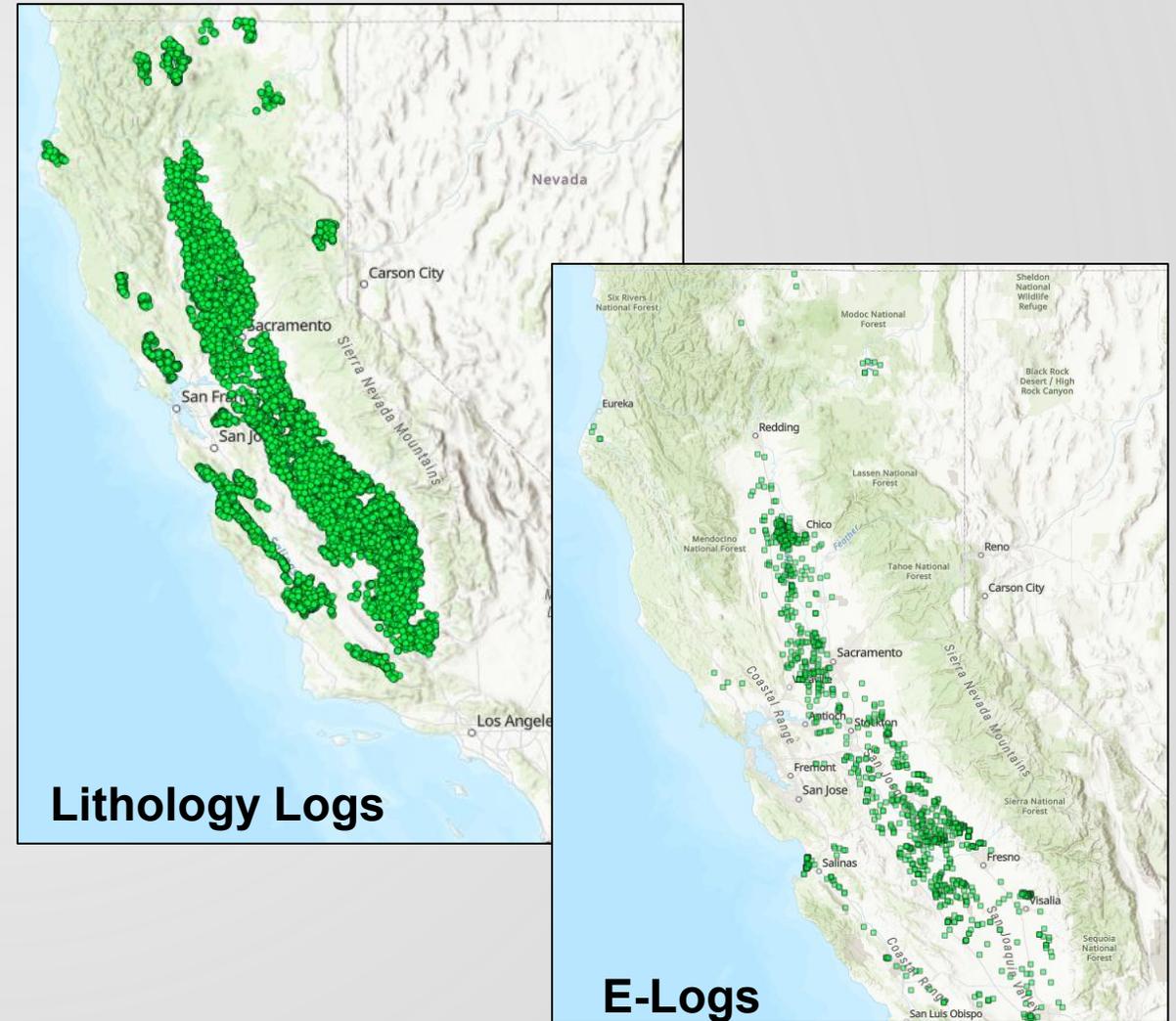
- Community of Practice
- Local, State, & Federal Agencies
- NGOs, Academia & Private Sector

Collect, Compile, and Digitize Data

Collect Data

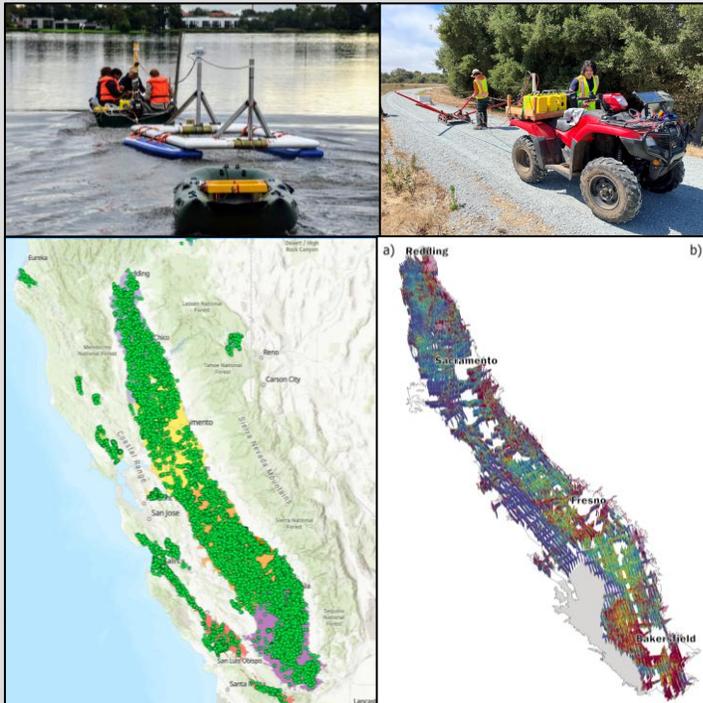


Compile, (QA/QC), & Digitize Data



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

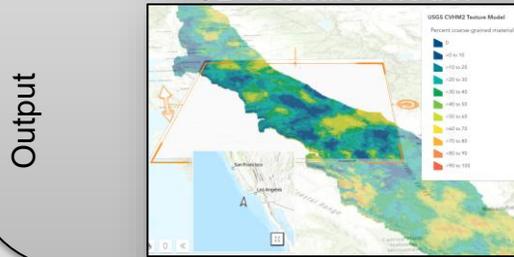
Aquifer Recharge Potential Maps

Data Analysis Toolbox

Data2Texture



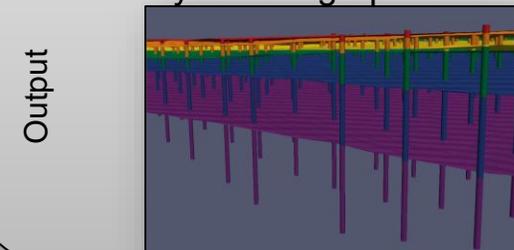
3D Texture Model



Data2HSM



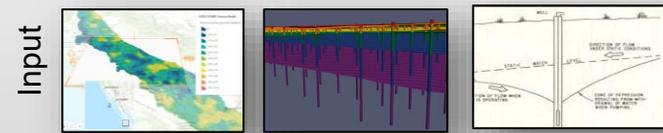
Hydrostratigraphic Model



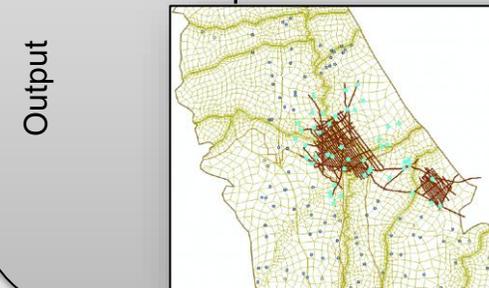
All tools and related guidance will be made available for public use.

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

Texture2Par V2



Aquifer Parameters



Groundwater Flow Models

C2VSim & Local Models

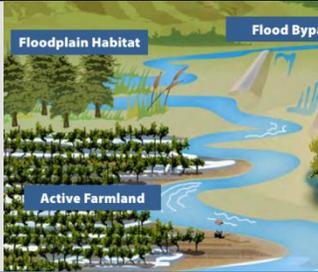
RAMBOLL

Woodard & Curran

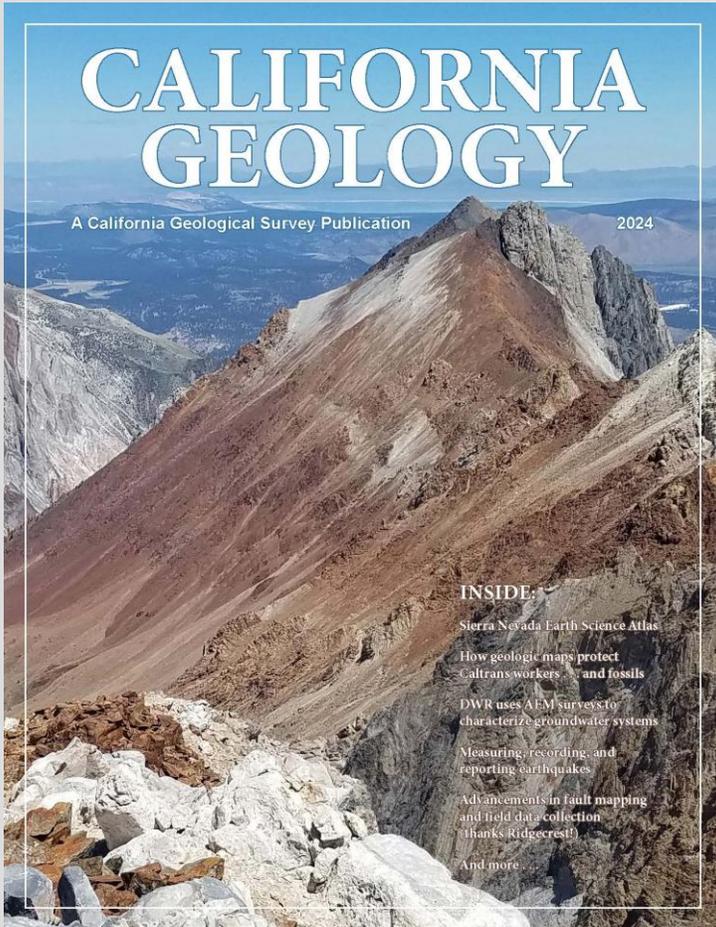
$\Sigma^2\Pi$ S.S. Papadopoulos & Associates, Inc.

Aquifer Recharge Potential Mapping

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

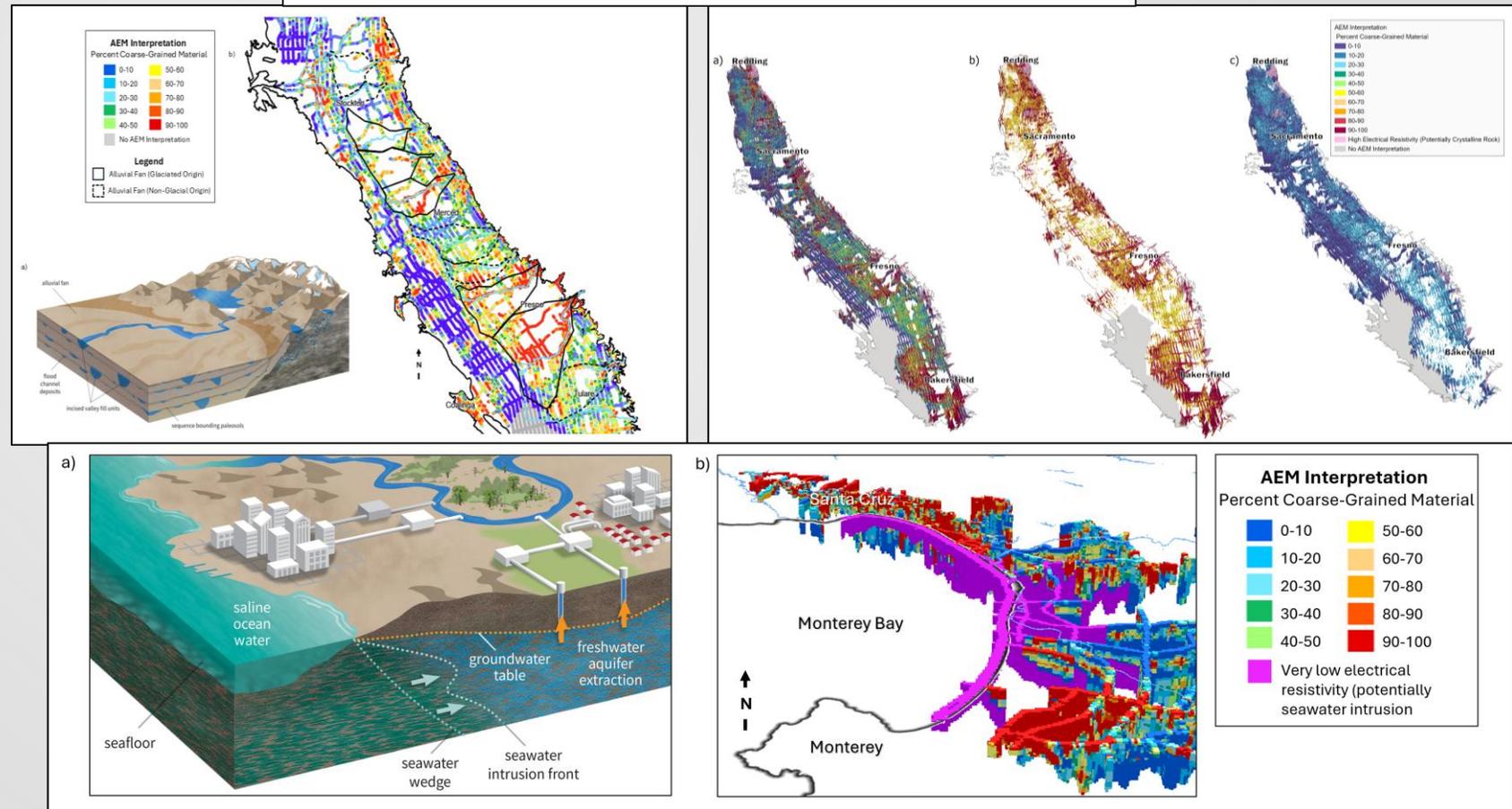
ARP Map	Shallow (Natural)	California Department of Water Resources Sustainable Groundwater Management Office	Potential (Built)	Deep Aquifer Storage
Schematic				<div style="border: 1px solid blue; padding: 5px; display: inline-block;">Coming soon!</div>
Infiltration Type	<div style="border: 1px solid blue; padding: 10px; text-align: center;"> Draft ARP Process Document on CNRA Open Data Portal ARP overview recording available on BCX Hub. </div>			into the deep of the aquifer
Soil Consideration	through soil layer		soil layer	bypassing soil layer
Recharge Methods	Ag-MAR, surface water spreading, managed natural lands	Aquifer Recharge Potential Mapping Process Document November 2024 Draft	ated r recharge dry wells	Aquifer storage and recovery

Groundwater Evaluations – Statewide Investigations



California's Statewide Airborne Electromagnetic Surveys and Preliminary Hydrogeologic Interpretations

by Katherine Dlubac, Ph.D., PG, Steven Springhorn, PG, Benjamin Brezing, PE, Craig Altare, PG, and Timothy Godwin, PG, CHG
California Department of Water Resources, Sustainable Groundwater Management Office



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)

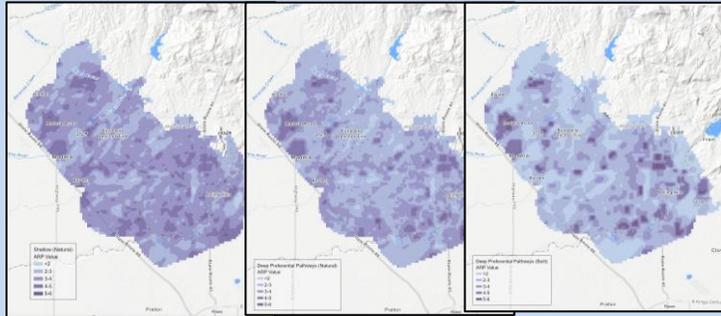
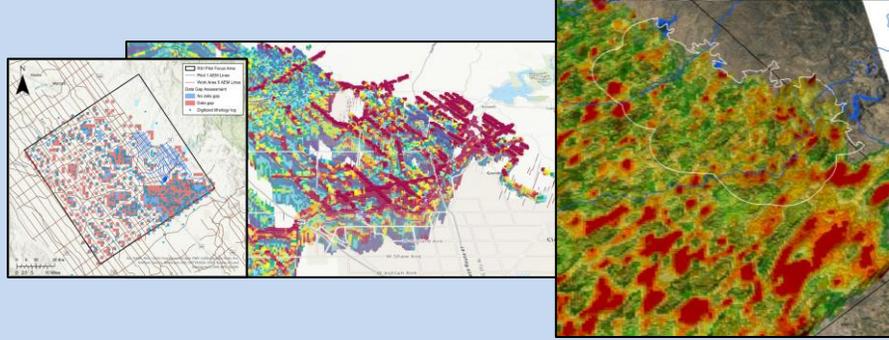
- Infill AEM
- t-TEM
- FloaTEM
- NMR-logs
- E-logs
- Lithology logs
- CPT
- Monitoring Wells
- Aquifer tests



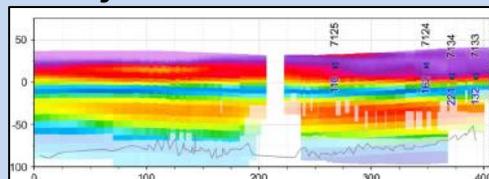
Groundwater Evaluations – Local and Regional Investigations

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

Madera and North Kings



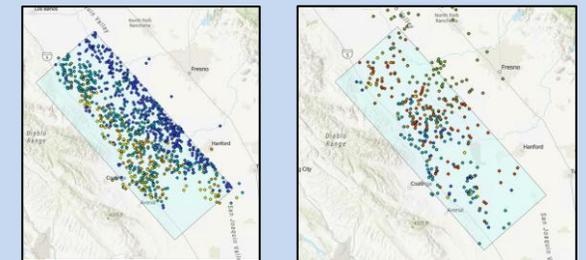
Pajaro – tTEM data



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

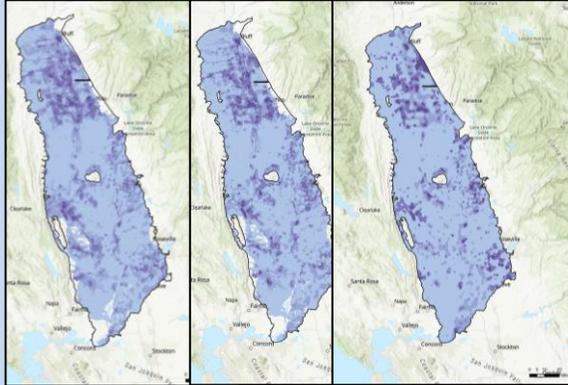
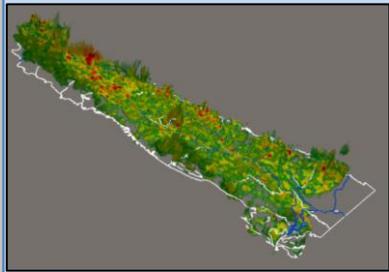
Western San Joaquin



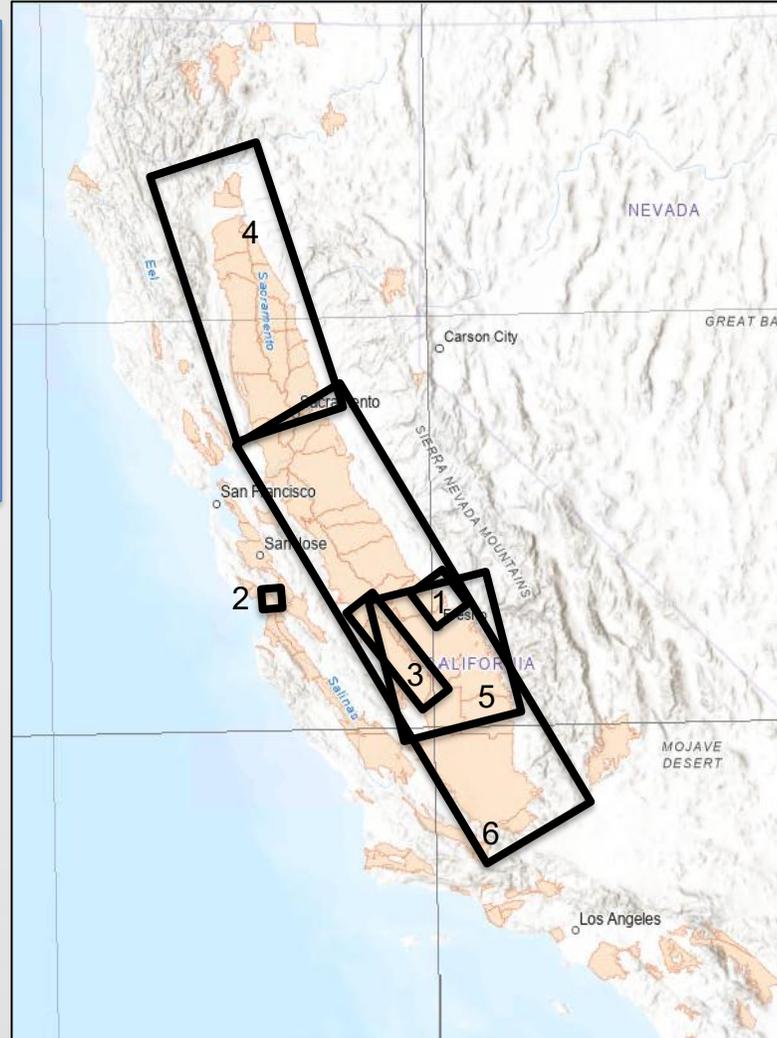
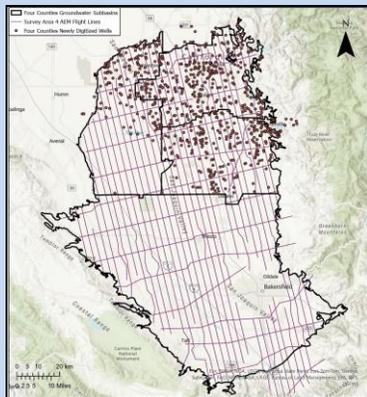
Groundwater Evaluations – Local and Regional Investigations

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



Open Data Organizations Topics Training

Log in Contact

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

Home / 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 understand groundwater 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 or update three-dimensional models. To support this effort, new data analysis tools will be developed to create texture models, hydrostratigraphic models, and 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 models. Existing data will be combined and integrated using the analysis tools described below to develop maps and models to be developed will describe hydrostratigraphic properties, and hydrogeologic conceptual properties of California's aquifers. These maps and models help groundwater managers understand how groundwater is stored and moves within the aquifer. The models will be state-stewarded, meaning that they will be regularly updated, and made available, to ensure that up-to-date information is used for groundwater management activities. The first iterations of the following maps and models will be 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

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.

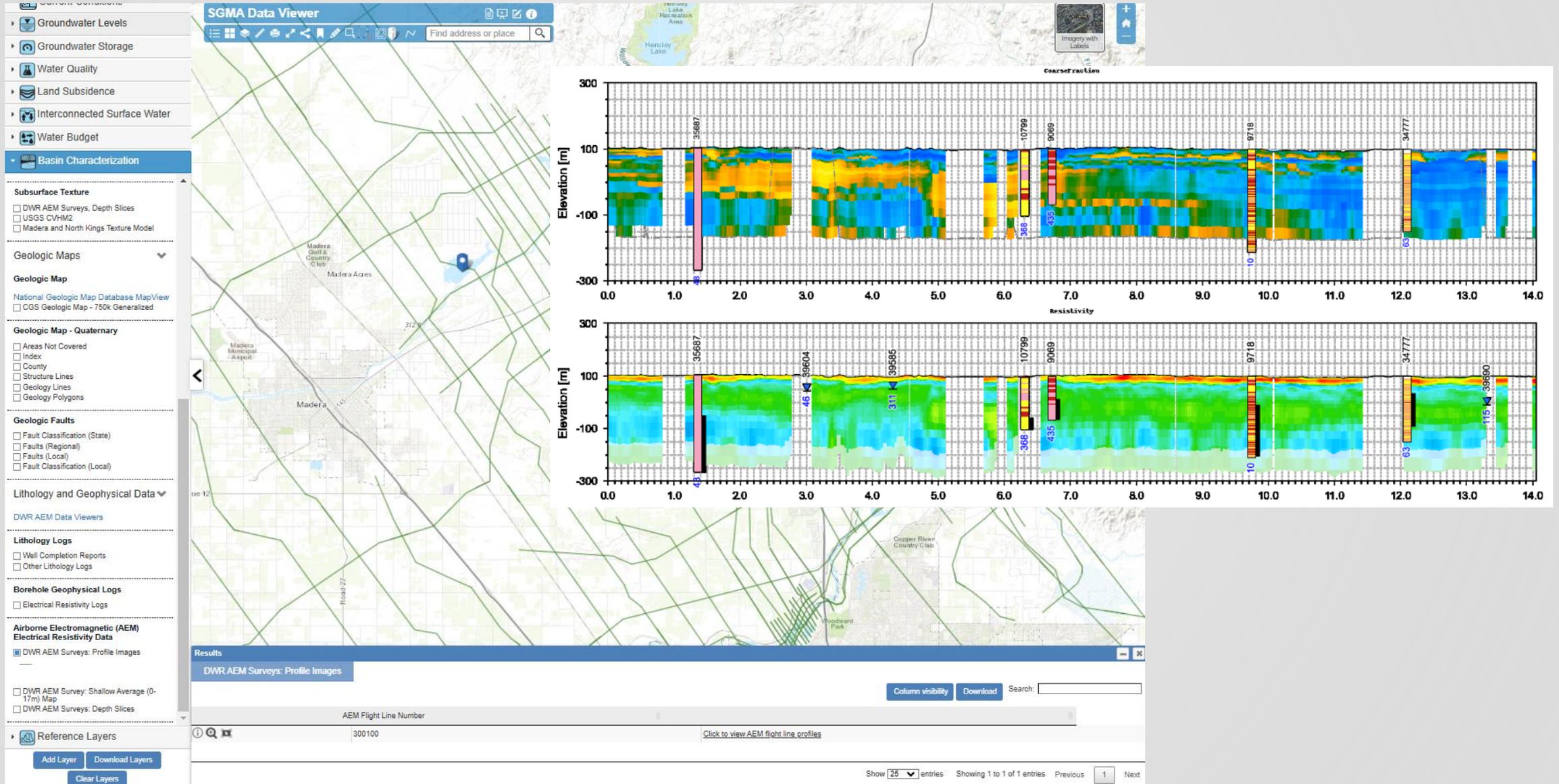
[SGMA Data Viewer: Basin Characterization tab](#): Provides maps, depth slices, and profiles of Basin Characterization maps, models, and datasets, including the following:

- 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

Find address or place

- Groundwater Levels
- Groundwater Storage
- Water Quality
- Land Subsidence
- Interconnected Surface Water
- Water Budget
- Basin Characterization**

DWR's Basin Characterization Program

Hydrogeologic Conceptual Model

Groundwater Recharge Maps

- AEM Surficial Recharge Map
- San Joaquin Basin Fluvial Fans
- UC Davis SAGBI Unmodified
- UC Davis SAGBI Modified
- Soil - Sand (0-80 cm)

Aquifer Recharge Potential Maps

- Shallow (Natural)
- Deep Preferential Pathway (Natural)
- Deep Preferential Pathway (Built)

Stanford Fastpath Maps

- Average Fraction Coarse Dominated
- Normalized Path Length 20 FCD
- Depth to Shallowest No-Flow or Base 20 FCD
- Normalized Path Length 50 FCD
- Depth to Shallowest No-Flow or Base 50 FCD
- Normalized Path Length 80 FCD
- Depth to Shallowest No-Flow or Base 80 FCD

Regional Hydrostratigraphic Units

- USGS Corcoran Clay (Thickness - Feet)
- USGS Corcoran Clay (Extent)
- USGS Corcoran Clay (Depth - Feet)
- USGS Basement (Elevation - Meters)
- USGS Basement (Depth - Meters)

Subsurface Texture

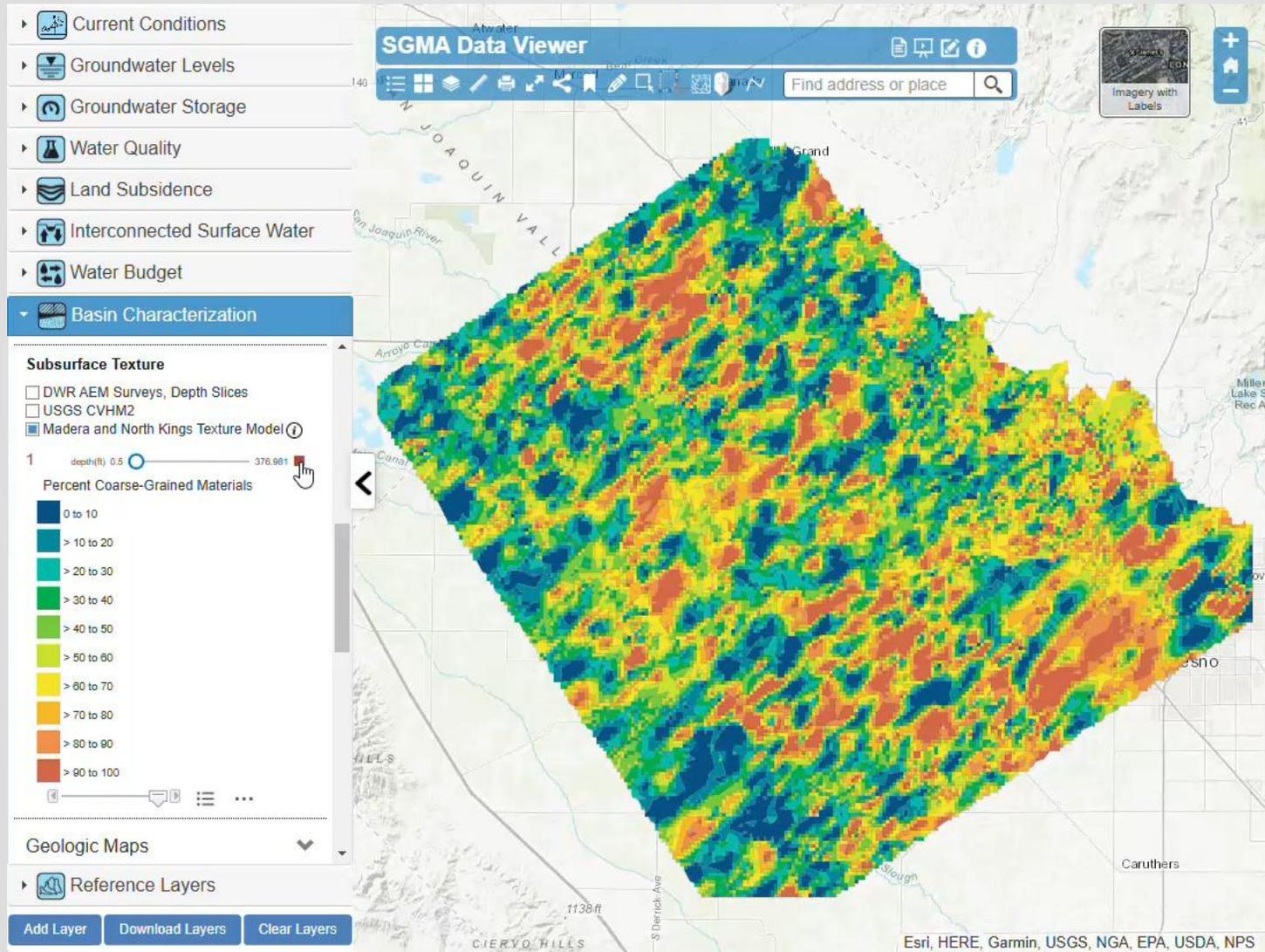
- DWR AEM Surveys, Depth Slices

Reference Layers

Add Layer Download Layers Clear Layers

SGMA Data Viewer – Basin Characterization Tab: Texture Models

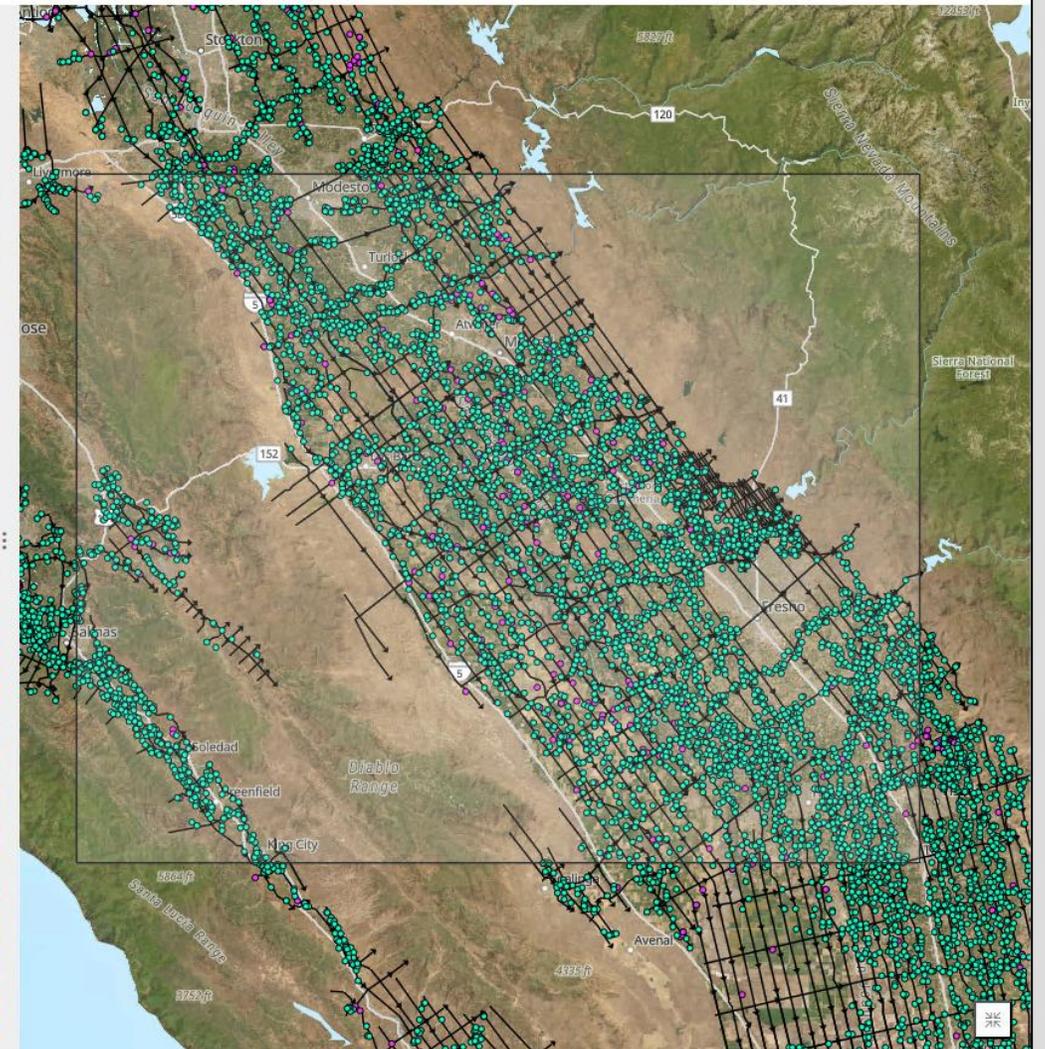
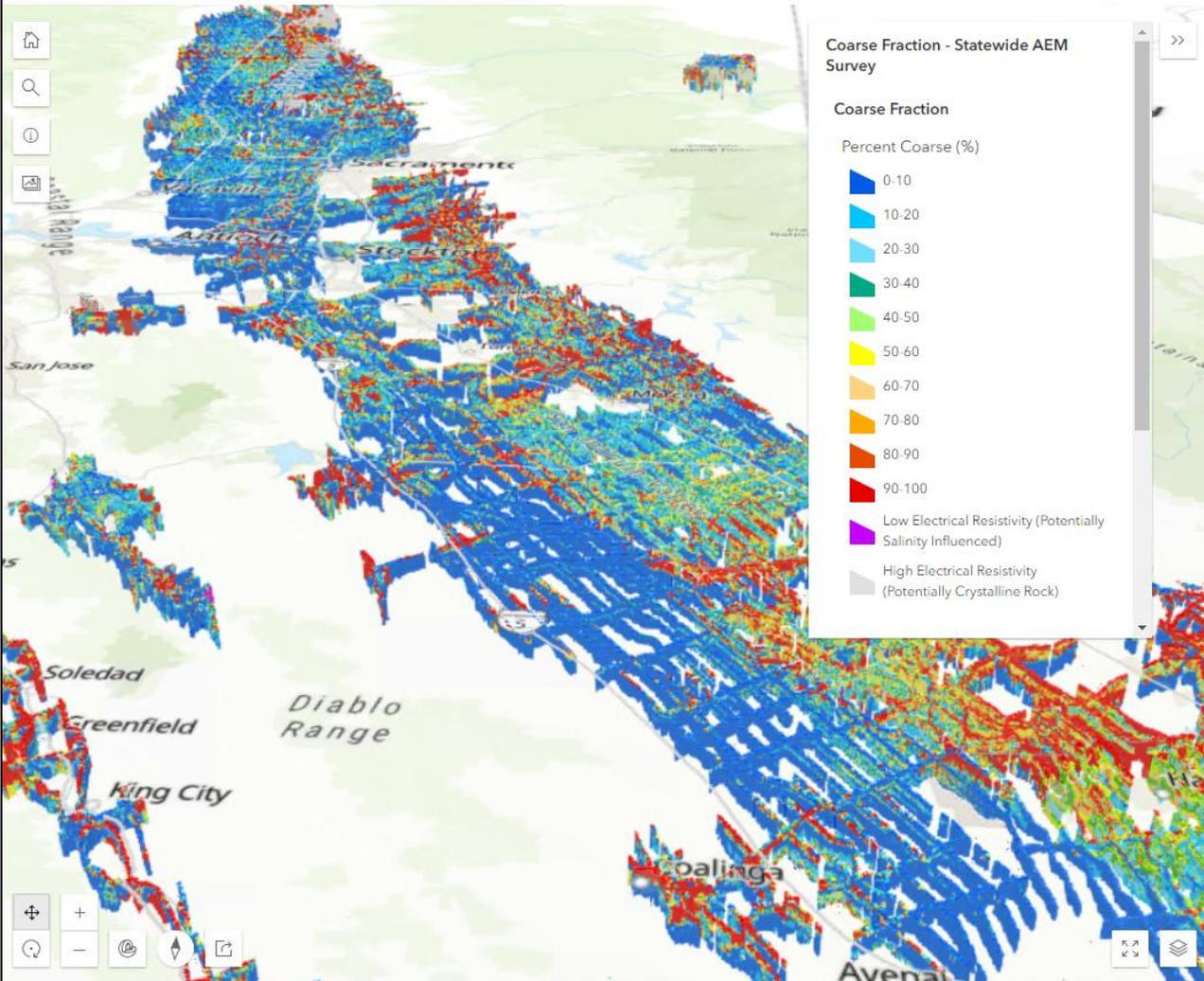
<https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer>



AEM 3D Viewer



AEM 3D Viewer (Beta)



NEW! Subsurface Viewer

Subsurface Viewer
California DWR
Presentation last saved: Just now

Location
Sacramento Valley - Colusa

AEM data

Legend

Reference layers

Basemap

Information

Share

Feedback

AEM segments

Select a segment on the map to view the subsurface profile

Esri, CGIAR, USGS | California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS | Sources: Esri; U.S. Department of Commerce, Census Bureau; U.S. Department of Com... Powered by Esri

Subsurface profile (412301)

Resistivity Coarse fraction 2D 3D

AEM Data

Lithology

- Top Soil
- Clay
- Sand
- Gravel
- Silt

Station: 30,957 m
Elev: -39 m to -86 m

The image shows a web-based application interface for 'Subsurface Viewer' by California DWR. On the left is a sidebar with navigation options: Location (Sacramento Valley - Colusa), AEM data, Legend, Reference layers, Basemap, Information, Share, and Feedback. A blue arrow points to the 'Information' option. The main area features a map of the Sacramento Valley with 'AEM segments' overlaid. A tooltip prompts the user to 'Select a segment on the map to view the subsurface profile'. Below the map is a 'Subsurface profile (412301)' plot. The plot shows resistivity and coarse fraction data for station 30,957 m, with elevation ranging from -39 m to -86 m. The vertical axis represents depth from 0 m to -352 m, and the horizontal axis represents distance from 0 k to 95 k. A lithology legend on the left identifies layers: Top Soil, Clay, Sand, Gravel, and Silt. The plot shows a complex subsurface structure with varying resistivity and coarse fraction values across the depth profile.

<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.



The Basin Characterization Exchange Hub

DWR's Basin Characterization Program is launching the Basin Characterization Exchange (BCX) in early 2025. The BCX will be a public meeting and network space for the basin characterization community to exchange ideas, share lessons learned, define needed guidance, and highlight research topics. BCX meetings will also include regular updates from the Basin Characterization Program and provide participants with early opportunities to test tools and submit comments on guidance documents. The BCX is open to federal, state, and local agencies, consultants, community-based and non-governmental organizations, academia, and interested parties who participate in basin characterization efforts.

Register your interest in attending BCX meetings and receiving updates and announcements by emailing your name and information to Basin.Characterization@water.ca.gov.

BCX launch meeting to be held on March 5th (co-hosted with Flood-MAR)

Upcoming BCX Schedule

BCX meetings are held (generally) the 3rd Tuesday of the month from 12:30-1:30 pm PST.

March 5th (12:30-1-30 pm PST): Introducing DWR's Basin Characterization Program (Steven Springhorn and Liz DaBramo, Woodward and Curran)

- Meeting Zoom link: <https://csus.zoom.us/j/83904333987>

April 22nd (12:30-1-30 pm PST): Aquifer Recharge Potential Maps (Cayser and Liz DaBramo, Woodward and Curran)

- Meeting registration link: Coming soon

May 20th (12:30-1-30 pm PST): Basin Characterization Data Analysis (Woodward and Curran and S.S. Papadopoulos & Associates)

- Meeting registration link: Coming soon



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

