DOGAMI Fact Sheet: Geologic Mapping in Eastern Oregon







" Is my house built in an area that is susceptible to landslides? "

" Could earthquakes possibly occur in my area in the future? "

" Are there any mineral resources where I live? "

" What rocks in my area may host groundwater? "

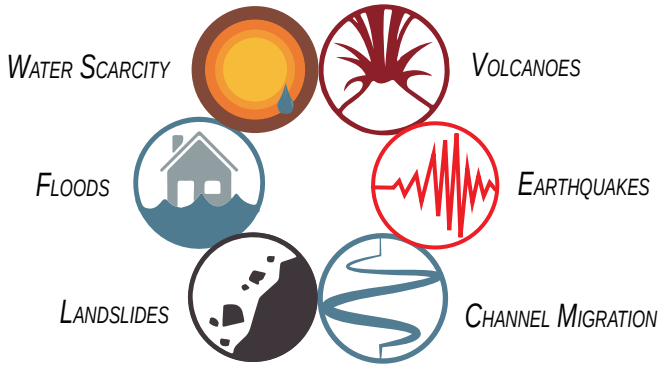
Have you ever asked questions like these?

When a concern, issue, need, or question arises, community members, interested parties, and policy makers may reach out to representatives from a relavant agency or organization for information. For example...

If you have a question about hazards like landslides or earthquakes or about resources like minerals and water, they may contact the Oregon Department of Geology and Mineral Industries (DOGAMI) or the United States Geologic Survey (USGS).

If you have a concern regarding groundwater rights, policies, and resources, they may reach out to the Oregon Water Resources Department (OWRD) or a local watershed council.

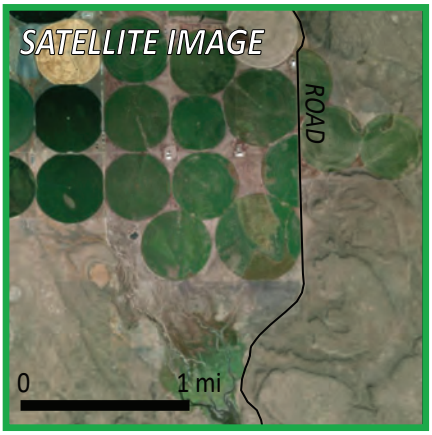
MOST NATURAL HAZARDS IN EASTERN OREGON ARE GEOLOGIC HAZARDS.



In order for policy makers, interested parties, and specialized agencies to keep the public safe, provide answers, and make informed decisions, **they must understand the regional geology.**

Geologists at DOGAMI work with partners like OWRD, USGS, and local governments to develop plans that address the current needs or issues. With funding from agencies like the Federal Emergency Management Agency (FEMA) and the USGS, geologists are able to conduct field-work and study the regional geology.

What do mapping geologists do?





Interpreting the regional geology requires developing a detailed geologic map, and that is the job of the mapping geologists at DOGAMI.

Geologists gather various types of data in order to make a map and project what the rocks look like in the subsurface (underground).

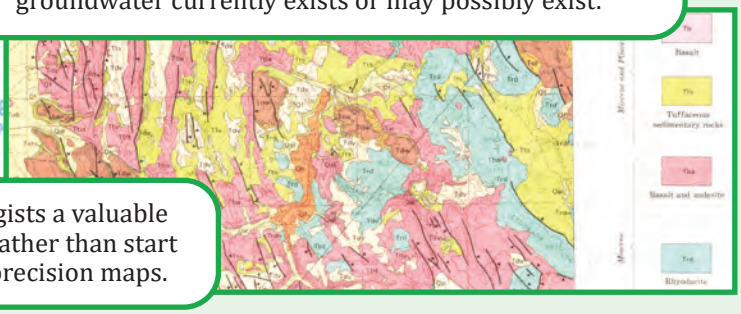
A **geologic map** shows the different types and ages of rocks exposed at Earth's surface, with each rock type assigned a unique color.

Collecting the data

1. PRELIMINARY RESEARCH



Documenting well data from previously drilled wells provides firsthand descriptions of the rocks underground in an area of interest, and it informs geologists where groundwater currently exists or may possibly exist.



Studying older geologic maps gives current geologists a valuable starting point, allowing them to build on past work rather than start from scratch when creating more accurate, higher-precision maps.

2. FIELDWORK



Recording landscape-scale and outcrop-scale observations of stratigraphic relationships, structures, and textures of rocks.



Describing hand samples to note any differences in minerals and textures that can be seen with the naked eye or with a hand lens.



Collecting rock samples for analyses to determine their chemical compositions and ages.



Digging trenches across a known fault zone to document its age, orientation, and precise location. Depending on the type of fault, trenches can also show the amount of offset (how much one side of the fault moved relative to the other).

3. LABORATORY WORK & ANALYSIS



Aquiring whole-rock chemical compositions using analytical techniques like X-ray fluorescence (XRF) analysis.



Identifying minerals through microscopic analysis. A rock is sliced so thin that geologists can observe the way light passes through it under a petrographic microscope.

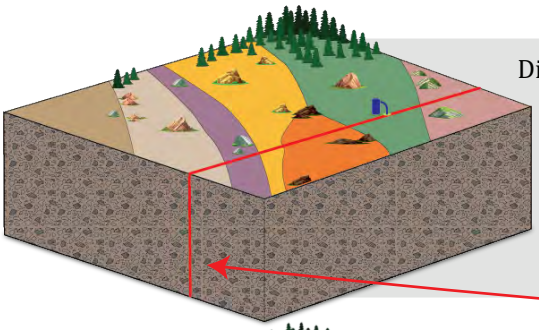
Putting it all together to make a geologic map



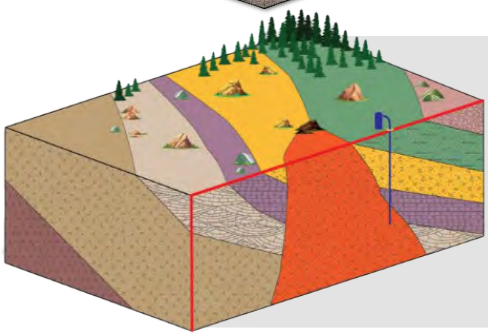
Geologists combine all the observations and data collected at the surface to differentiate rock types, or **rock units**. The boundaries between rock units, or **contacts**, are drawn as they would be exposed at the surface, under the topsoil and vegetation. A map that includes contacts, geologic formations, well locations, and other data, is called a geologic map.



Think of the Earth like a cake. A cross section shows what the layers of a slice would look like!



Different rock units are assigned different colors. Geologists use all available data, including data from drilled wells, to project what the rocks look like at depth. These projections into the ground along any chosen line are called **cross sections**.



With an understanding of the geology on the surface and at depth, geologists determine how rocks formed over time, where **faults** project below the surface, where **groundwater, critical minerals,** and **energy resources** may exist, and potential areas for **geologic carbon storage**.

Why is geologic mapping important?

DOGAMI shares these data with the public, policy makers, and interested parties so that they can be used to help make informed decisions. Mapping projects have resulted in many success stories.

Locating groundwater in Prineville, central Oregon

The Prineville community needed more fresh water. Drillers were perplexed when new wells were dry.





Geologic mapping revealed ancient lavas that had flowed into old canyons, creating structures that control how groundwater moves and resides in the rocks today. Planners can use this information to determine where to access groundwater, and agencies like OWRD can use it to help manage the resources.

Identifying earthquake-prone areas in the Walla Walla Basin

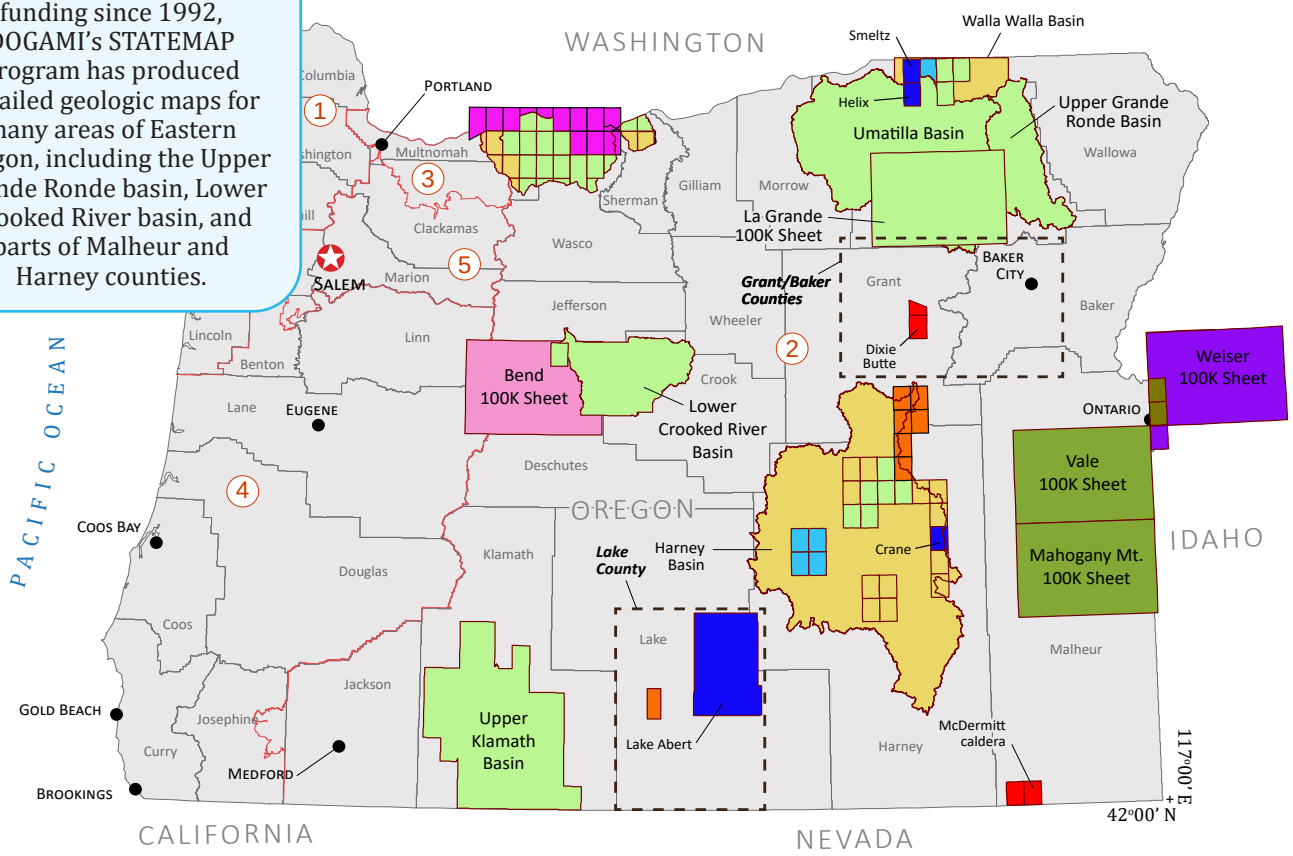
On July 15, 1936, the Walla Walla Valley was violently shaken by a M6 earthquake felt as far north as British Columbia and as southeast as Caldwell, Idaho. Scientists determined that the earthquake started on a crustal fault northwest of Milton-Freewater, in the Walla Walla Basin.



DOGAMI's geologic mapping of the Oregon side of the Walla Walla Basin allows us to better understand local earthquake hazards, as earthquakes occur periodically and can originate from the same fault. This type of mapping informs policy makers and the public where earthquake hazards exist.

What in Eastern Oregon has already been mapped? What is next?

With the support of USGS funding since 1992, DOGAMI's STATEMAP program has produced detailed geologic maps for many areas of Eastern Oregon, including the Upper Grande Ronde basin, Lower Crooked River basin, and parts of Malheur and Harney counties.



1 Congressional Districts

County boundary

Future STATEMAP focus area

0 50 100 mi

0 50 100 km

N

Geology Mapping Project Areas

- STATEMAP focus areas
- STATEMAP project areas FY24 (in progress)
- STATEMAP project areas FY22-23 (in progress)
- EARTH MRI project areas FY23-24 (in progress)
- Cooperative Columbia River Gorge mapping DOGAMI/USGS in progress FY11-present
- STATEMAP project areas completed 1993-2022
- EDMAP project areas FY15-Present
- COGEOMAP project areas completed 1989-1992
- USGS completed 100K mapping
- Idaho Geol. Survey STATEMAP project areas FY23
- Idaho Geol. Survey STATEMAP project areas FY22

DOGAMI is conducting mapping projects in several focus areas, including the Walla Walla Basin, Harney Basin, and Lake County. DOGAMI's mapping priorities are based on the needs of local communities and the state as a whole. DOGAMI takes into account issues like water scarcity and groundwater resources, critical mineral inventories and exploration potential, and mitigating geologic hazards associated with landslides, earthquakes, and volcanoes.
DOGAMI's mission is to provide earth science information and regulation to make Oregon safe and prosperous.

Questions? Want to learn more?

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Website: www.oregon.gov/dogami
LinkedIn: linkedin.com/company/oregondogami

View the interactive Experience Builder site and interactive Oregon geologic hazard maps!
www.oregon.gov/dogami/pubs/Pages/fs/p-FS-17.aspx

Scan the QR code

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1995 3rd Street, Suite 130
Baker City, OR 97814

Want to learn more about groundwater? Check out some of OWRD's resources.
www.oregon.gov/owrd/programs/GWWL