Enabling Washington's Clean Energy Future

The Earth Resource Program at the Washington Geological Survey

*Researching **carbon storage**, **groundwater**, and **geothermal resources** to lay the groundwork for science-based solutions to our state's environmental challenges.*

CARBON STORAGE

Greenhouse gases like carbon dioxide (CO_2) can be removed from the atmosphere or extracted from industrial processes and pumped thousands of feet underground for long-term storage. Dissolved elements found in deep groundwater reserves help transform carbon into stable mineral deposits.

GROUNDWATER

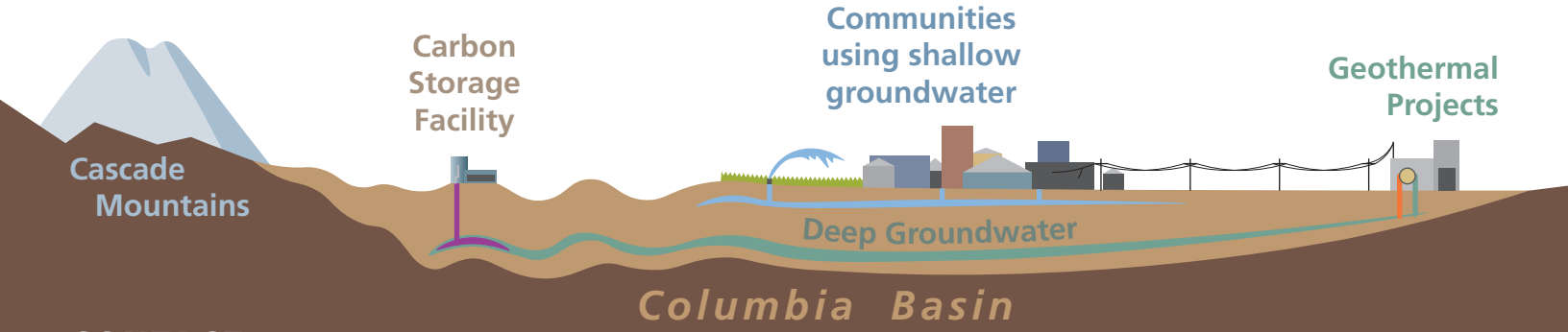
Aquifers are porous layers of rock that contain groundwater. Shallow aquifers are accessed by communities for drinking water and irrigation. Deep aquifers contain water with naturally high concentrations of dissolved elements, making them only suitable for uses such as carbon storage or geothermal projects.

GEOTHERMAL

Natural temperature variations found everywhere within the Earth can be harnessed to power a wide range of clean energy projects. These include direct uses in industrial and agricultural processes, sustainable power generation, and even heating and cooling building interiors using heat pumps.

CONNECTING STAKEHOLDERS TO SCIENCE

The Washington Geological Survey formed the Earth Resource Program in 2021 to strengthen Washington's knowledge of geologic carbon storage, geothermal resources, and groundwater. The program works with a wide range of stakeholders, including government agencies, tribes, industries, and universities. The program publishes maps and data that will enable responsible implementation of carbon storage and geothermal energy projects in Washington State.



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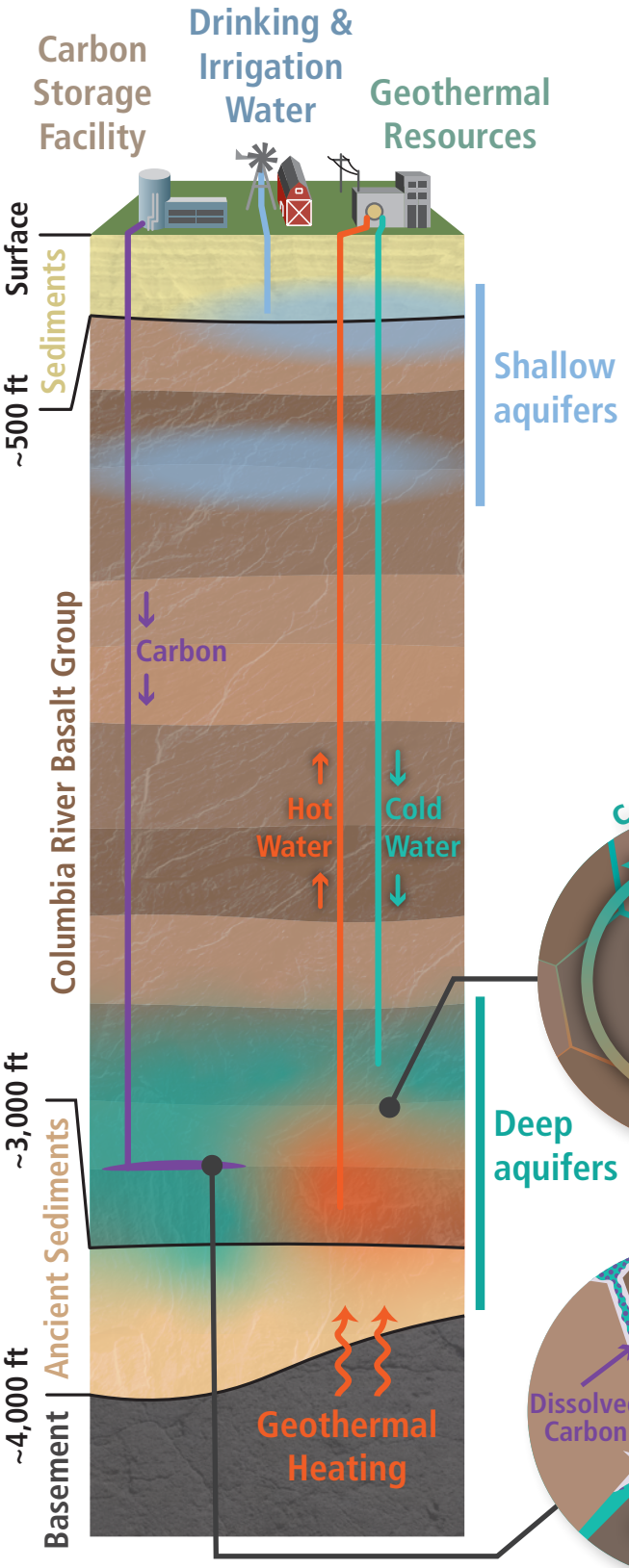
WASHINGTON STATE DEPT OF NATURAL RESOURCES
WASHINGTON GEOLOGICAL SURVEY

STUDY AREA
THE COLUMBIA BASIN

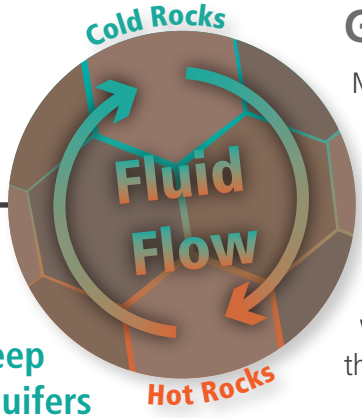
Approximately 15 million years ago, more than 300 eruptions filled the Columbia Basin with hundreds of cubic miles of lava. These layers cooled into thick layers of basalt rock collectively known as the **Columbia River Basalt Group (CRBG)**.

Distinctive layers and columns of the CRBG are visible in road cuts and bluffs across eastern Washington.



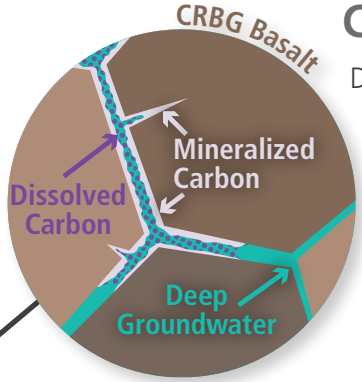
OUR RESEARCH

Aquifers are vast reserves of useable groundwater stored in porous layers within rocks. The Columbia Basin has shallow and deep aquifers. Deep aquifers contain high concentrations of naturally occurring dissolved elements that make them unsuitable for uses such as drinking water, irrigation, or industry, but ideal for geothermal and carbon storage applications.



Geothermal

Most geothermal projects harness natural heating of groundwater within the Earth. The chemistry of deep groundwater and the properties of the surrounding rock, including its porosity and permeability, affect how efficiently hot water circulates through deep aquifers. The Earth Resource Program is working to understand Washington State's aquifers and map out areas that are best suited for future geothermal projects.



Carbon Storage

Dissolved CO_2 can be pumped deep into the lowest layers of the CRBG for long-term storage. Multiple factors make the Columbia Basin ideal for carbon storage: The layered structure of the CRBG prevents deep groundwater from migrating to the surface. High pressure and abundant dissolved elements at depth act to stabilize dissolved CO_2 in fluids and in minerals.