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USGS Groundwater Resources Program

Hawaii Volcanic-Rock Aquifer Study

As part of an assessment of the Nation's groundwater resources, the U.S. Geological Survey (USGS) Groundwater Resources Program is conducting a four-year study (2012–2016) of groundwater resources in the volcanic-rock aquifers of Hawaii. Hawaii's aquifers supply water to 1.36 million residents, diverse industries, and a large component of the U.S. military in the Pacific. Collectively, the aquifers of Hawaii constitute one of the principal regional aquifers in the United States.

Wells near Lihue, Kauai

Need for Study

Because of its importance, Hawaii's aquifers have been included in periodic national groundwater-resource assessments by the USGS since the early 20th century. The last assessment—the USGS Regional Aquifer System Analysis Program (RASA)—was in the 1980s–90s. Reassessment of Hawaii's groundwater resources is needed because:

Groundwater is a critically important resource in Hawaii—Groundwater supplies much of the freshwater taken for human uses. Groundwater also supplies freshwater that supports fragile ecosystems in streams and near the coast.

Hawaii has limited capacity to store fresh groundwater—The islands and their aquifers are small and isolated from each other by seawater. Seawater also underlies most of the fresh groundwater resource. Hawaii thus has limited capacity to store fresh groundwater and the resource is particularly vulnerable to impacts from human activity and climate change.

The last assessment was limited to Oahu—The RASA program advanced understanding of Hawaii's groundwater resources but was limited to Oahu. Subsequent studies indicate that the Oahu conceptual model for groundwater does not fit all parts of Hawaii.

Factors affecting groundwater have changed—Since the last assessment, groundwater withdrawal has increased in many areas but decreased in some areas. Changes in agriculture and vegetation have altered groundwater recharge in some areas. Effects of climate change have been detected in rainfall and streamflow records.

New information relevant to groundwater in Hawaii has become available—Since the last assessment, additional studies and data collection have advanced knowledge in climate, geology, and hydrology in Hawaii.

Updated information is needed for resource management and protection—Updated information on the current condition of Hawaii's groundwater resources and how they have changed as a result of natural and human factors is essential for resource management and protection.

Objectives

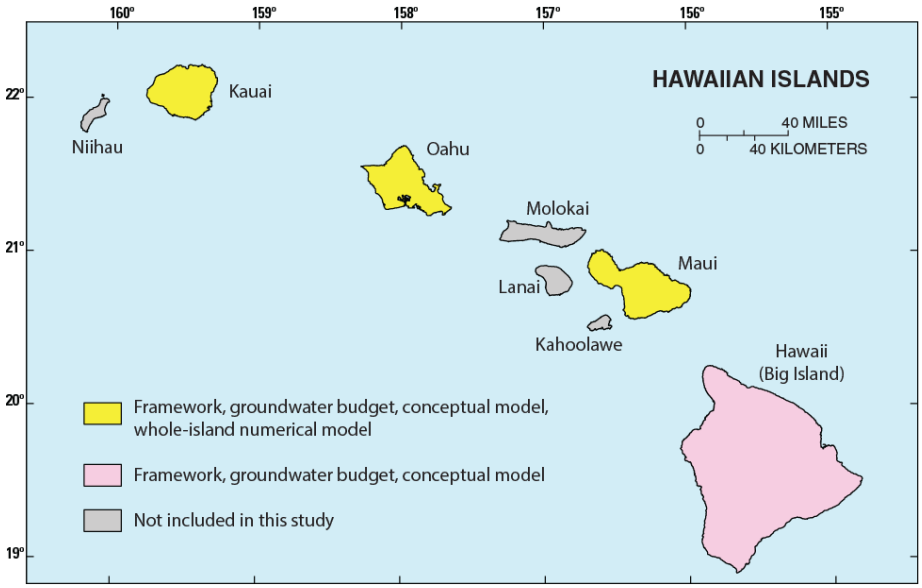
- Assess current groundwater availability in Hawaii.
- Study how groundwater resources have changed as a result of natural and human factors.
- Provide a tool to assess responses to future stresses.
- Evaluate the adequacy of the current data network for assessing groundwater resources in the future.

Plans

Develop hydrogeologic framework, groundwater budgets, and conceptual models for Kauai, Oahu, Maui and the Big Island (Island of Hawaii)—These four islands have more than 99 percent of the population and constitute 92 percent of the land area in Hawaii. The hydrogeologic framework is a description of the properties and structures of the rocks through which groundwater moves and is stored. The groundwater budget is an accounting of inflows to and outflows from the aquifers. The hydrogeologic-framework and groundwater-budget information are used to create conceptual models that describe groundwater flow and occurrence.

Numerical Groundwater Modeling and Assessment of Groundwater Availability—Information from the framework, groundwater-budget, and conceptual-model development described above will be used in the construction of separate whole-island numerical groundwater models. Models will be constructed for Oahu, Maui, and Kauai (a numerical model of the Big Island will not be constructed because of a paucity of hydrologic data for that island). The numerical models will be used to assess changes in groundwater availability. For selected areas, models will be used to investigate effects of future conditions of climate, urbanization, land use, and groundwater withdrawals, and to evaluate data and information needs.

Geographic scope of study



More Information

Study Website
http://hi.water.usgs.gov/studies/GWRP/

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Hydrologic Data and Other Studies in Hawaii
For water-resources data and information on other hydrologic studies in Hawaii, visit the USGS Pacific Islands Water Science Center website at http://hi.water.usgs.gov/