

GROUND WATER ATLAS of the UNITED STATES Alaska, Hawaii, Puerto Rico and the U. S. Virgin Islands HA 730-N

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GROUND-WATER PROBLEMS

The two main ground-water-related problems in the State of Hawaii are contamination by organic or inorganic chemicals associated with both agricultural and non-agricultural activities, and the availability of potable fresh ground water. Both problems are ultimately related to ground-water quality. All of the main islands in the State of Hawaii have large amounts of ground water contained in volcanic-rock aquifers. However, the quality of the ground water may not be suitable for all uses. In particular, not all ground water is potable. Some of the ground water is contaminated by chemicals associated with human activities and some contains high concentrations of salts.

Contamination of ground water by human activities can take place in several ways. In some agricultural areas, crops are irrigated with water that might contain large concentrations of dissolved minerals. If such water percolates downward, an underlying aquifer can be contaminated. In addition, fertilizers and pesticides applied to crops can move downward through the unsaturated zone to an aquifer and affect the quality of the water in the aquifer. Wastes from septic-tank systems, sewers, industry, and storm runoff also can introduce undesirable constituents into the aquifers.

Each of the principal islands has some problems with the degradation of freshwater by saltwater. Smaller islands, such as Kahoolawe, Lanai, and Niihau, are more affected chiefly because they receive lesser quantities of recharge from rainfall.

Ground-water withdrawals induce upward and landward movement of saltwater. Wells completed in the freshwater lens near the coast ([fig. 62](#)) are particularly likely to induce brackish water or saltwater to move into the well as pumping continues. Saltwater-intrusion problems can be minimized by appropriately locating wells and by controlling withdrawal rates.

Monitor wells that are open to the aquifer in the freshwater, transition, and saltwater zones are used in Hawaii to evaluate the ground-water resources ([fig. 63](#)). By periodically obtaining vertical salinity profiles in these deep monitor wells, changes in the freshwater lens thickness can be estimated. Vertical salinity profiles from a deep monitor well located in the Honolulu area indicate that the salinity of water at any particular depth in the aquifer increased from 1970 to 1990. This increase indicates that the transition zone has moved upward between 1970 and 1990.

The chloride concentration in water from a well is a good indicator of saltwater intrusion. From 1926 to 1962, ground-water withdrawals in the Kahuku area increased ([fig. 64](#)) and the water level in a well near the major pumped wells declined from a high of about 15 feet above sea level in 1928 to about 9 feet above sea level in 1962. Chloride concentrations in water samples from a nearby well were less than 250 milligrams per liter before 1930 but slowly started to increase with increased withdrawals. Chloride concentrations had increased to about 400 milligrams per liter by 1939, increased rapidly after 1944, and reached a maximum concentration of 1,500 milligrams per liter in 1959, as water levels continued to decline.

The problem of saltwater intrusion is characteristic of the freshwater lens, but perched water and dike-impounded water bodies also have problems. Perched water bodies commonly are small and can be dewatered quickly. Dike-bounded compartments also can be dewatered quickly, particularly if a shaft dug into the compartment is permitted to drain the impounded water without control ([fig. 65](#)).

Water-availability problems arise locally when demands for water exceed supply. In some areas, water must be imported from other areas by ditches, tunnels, and pipelines to satisfy the demands. As with most areas of the world, when development increases, the demand for fresh surface and ground water increases as does the potential for contamination and depletion of the water resources of the area. To alleviate some of these problems, efforts are being made to reclaim and recycle ground water in the State of Hawaii.