

ECONOMIC BENEFITS OF HYDROLOGIC SERVICES FROM WATERSHED PROTECTION AND RESTORATION

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KEY MESSAGE:

Watershed protection and restoration provide a range of benefits including clean and ample water supplies, biodiversity, cultural connection to place, carbon sequestration, and a suite of other ecosystem services. Research by UHERO's Environmental Policy and Planning Group demonstrates the economic benefits of native forest protection and restoration for groundwater recharge, pointing to the value of strategic investments in watersheds to protect water for people and ecosystems.

UHERO STUDIES*:

• Native Forest Protection

- *Hawai'i Island preserves*¹: Every dollar invested protects 392 gallons of water (both groundwater recharge and surface flow) over 50 years. Conservation costs are front loaded (building fences), whereas benefits accrued into the future, emphasizing the importance of a long-view.
- *Waikamoi preserve, Maui*²: Every dollar invested protects 156 to 1,153 gallons of groundwater recharge over 100 years based on a range of projected conservation costs, invasive species spread rates, population growth rates, and discount rate assumptions. Watershed protection activities protect 13.4 to 32.3 billion gallons of groundwater recharge, saving the water utility between \$2.7 and \$137.6 million.
- *Hawai'i County Department of Water Supply priority areas*³: Every dollar invested protects from 50–800 gallons of recharge per dollar (low priority areas) to 7,600–14,500 gallons of recharge (high priority areas) over 50 years. Watershed protection in the highest priority areas protects over 5.2 million gallons per acre over 50 years.
- *Pearl Harbor aquifer*⁴: Full forest protection (~20,000 acres) saves the water utility \$26 to \$39 million per year (after 50 years) in replacement costs. Protecting a subset of this area currently targeted by the Ko'olau Watershed partnerships (~5930 acres) saves \$6 to \$10 million per year.

• Native Forest Restoration

- Restoration of native forest in high elevation areas with fog interception has been found to increase groundwater recharge, but decreases can occur in lower elevation areas.
- *Pu'u Wa'awa'a*: The most cost-effective areas to restore native forest in Pu'u Wa'awa'a were above 1000 meters. Decreases were also found in areas with no fog interception.⁵
- *Hawai'i County Department of Water Supply priority areas*³: Forest restoration increased recharge by over 9.5 million gallons per acre over 50 years in high elevation areas with substantial fog interception, but decreases were also seen in lower elevation areas without fog interception.

*UHERO studies utilize best available data. As with all modeling, these estimates are subject to a number of uncertainties. The hydrologic analyses are largely based on statistical models derived from spatial data on evapotranspiration, which are based on limited field data of representative species: 'ōhi'a lehua (*Metrosideros polymorpha*) for native forest and strawberry guava (*Psidium cattleianum*) for non-native forest⁶. Ongoing research by the University of Hawai'i at Mānoa Ecohydrology lab and the United States Geological Survey will help to fine tune the parameters of spatial modeling. Economic analyses also have uncertainties regarding estimations of conservation costs and assumptions of future water demand and water supply costs. See our [website](#) for more details or contact us at Leah Bremer (lbremer@hawaii.edu), Kimberly Burnett (kburnett@hawaii.edu), and Christopher Wada (cawada@hawaii.edu).

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