

# PUAKŌ hawai'i

## WHAT'S IN OUR WATER?

Meandering underground streams flowing beneath Puakō and entering the ocean through springs and seeps once nourished an abundant fishery and vibrant coral reefs. So, when residents began noticing declines in fish and corals, they enlisted partners to help them understand why these changes were occurring.

Today, Cornell University, the University of Hawai'i at Hilo Marine Science Department (UH Hilo), The Nature Conservancy (TNC), and the Hawai'i Institute of Marine Biology (HIMB) are working with the Puakō Community Association to identify causes of the declines and solutions for restoring coral reef health at Puakō.

Domestic wastewater (sewage) was suspected as one of the threats to the reef. Research found outdated cesspools leaching untreated sewage through permeable rock to beaches, tide pools, and the reef, impacting nearshore water quality.

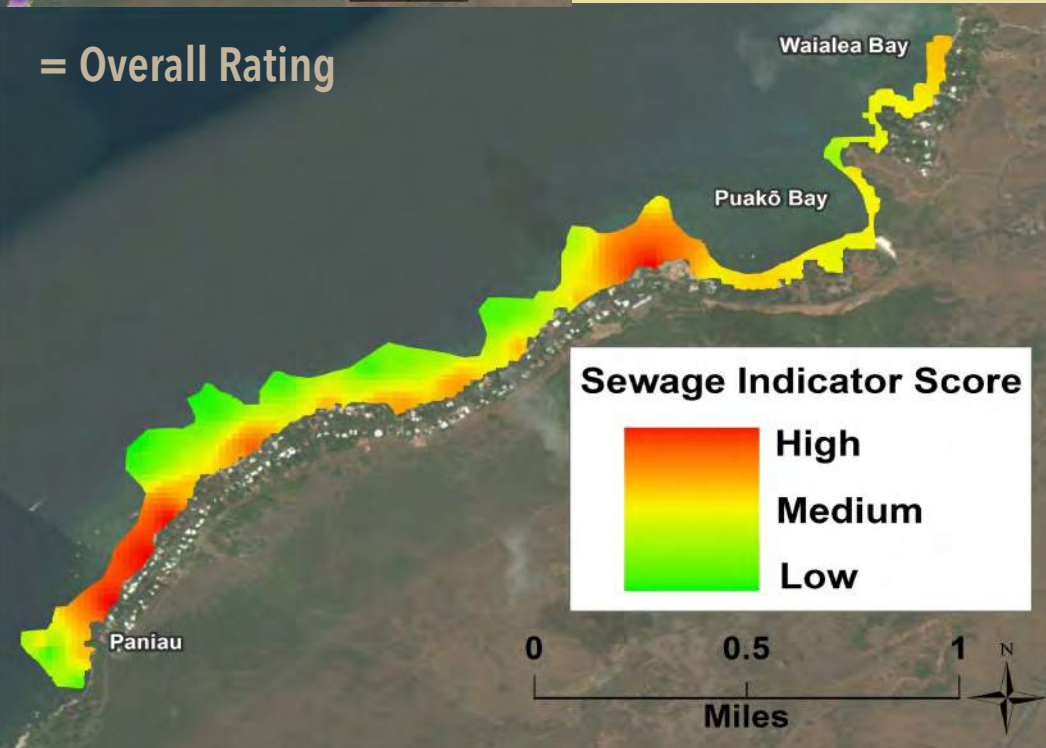
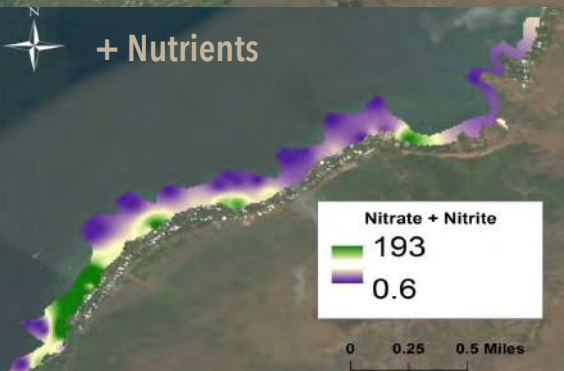
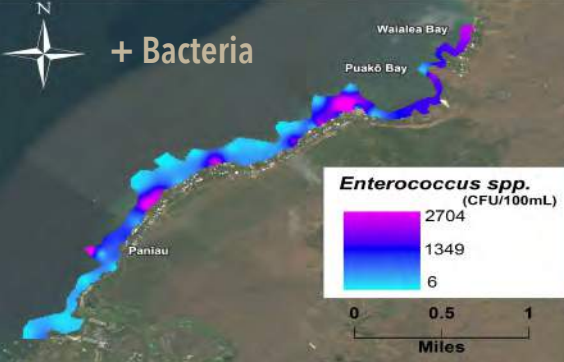
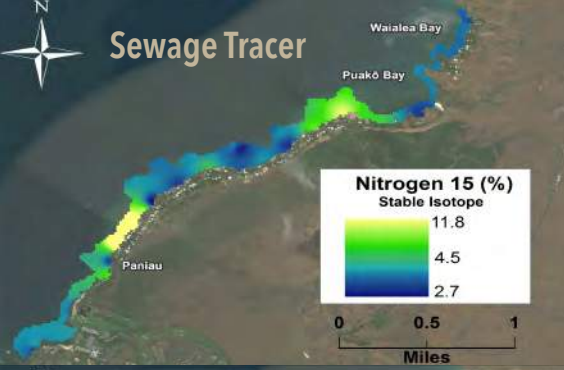
How far offshore does the sewage travel from the nearshore seeps? How quickly does sewage from cesspools enter nearshore waters? What are the impacts of sewage to the reef ecosystem? These are the questions currently being addressed by research groups.

## KEY FINDINGS

Indicators of domestic wastewater have been found in coastal and marine areas where they are likely impacting people, coral reefs, and other marine life:

- Dye tracer studies found that sewage from cesspools reached seeps along the Puakō coast within six hours to three days.
- At some shoreline locations, often corresponding to those of the dye tracer studies:
  - Levels of two bacteria associated with sewage often exceeded Hawai'i Department of Health standards.
  - Nitrate levels were two times higher than those in mauka groundwater from Waikoloa and Mauna Lani.
  - Nitrogen isotope measurements in seaweed were indicative of sewage pollution.
- Coral growth anomalies—tumor-like growths on coral skeletons—were highest on reefs with evidence of groundwater input and elevated nutrients.
- Studies conducted across the region show Puakō's reefs have especially high levels of red filamentous algae, which overgrow and can kill corals.





## IMPACTS ON PEOPLE AND OCEAN LIFE

Exposure to sewage can cause skin, urinary, blood, and abdominal infections like gastroenteritis, Hepatitis A, conjunctivitis, salmonellosis, and cholera. Children and the elderly are particularly susceptible to these infections.

Sewage also increases disease risk in reef animals and can shift the balance in favor of fast-growing invasive algae, which smother corals and reduce oxygen levels necessary for other animals to survive.

## CONCLUSIONS

The continued use of domestic wastewater systems that do not treat sewage, like cesspools, expose recreational water users, coral reefs, and other marine life to significant health risks. Minimizing the flow of untreated sewage into Puakō's waters is critical to reducing these risks, and making corals more resilient to ocean warming and acidification. Investing in clean, long-term sewage treatment alternatives will not only benefit the coral reef, but all of us who use and care for the ocean.

## FOR ADDITIONAL INFORMATION

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*The sewage indicator score was created by combining multiple water quality metrics to show where the highest sewage inputs are occurring along the Puakō coastline. The water quality metrics used included stable isotope values (Nitrogen 15), bacteria abundance (Clostridium and Enterococcus), and nutrient concentration (nitrate, phosphate, and ammonia).*



*Sewage carries pathogens (bacteria, protozoa, and viruses), pharmaceuticals, nutrients (nitrates and phosphates), cleaning chemicals, and other pollutants into groundwater, onto beaches, and into the ocean. These pollutants have been found in Puakō in areas where people swim, surf, dive, and fish.*