LIMU AND NITROGEN POLLUTION

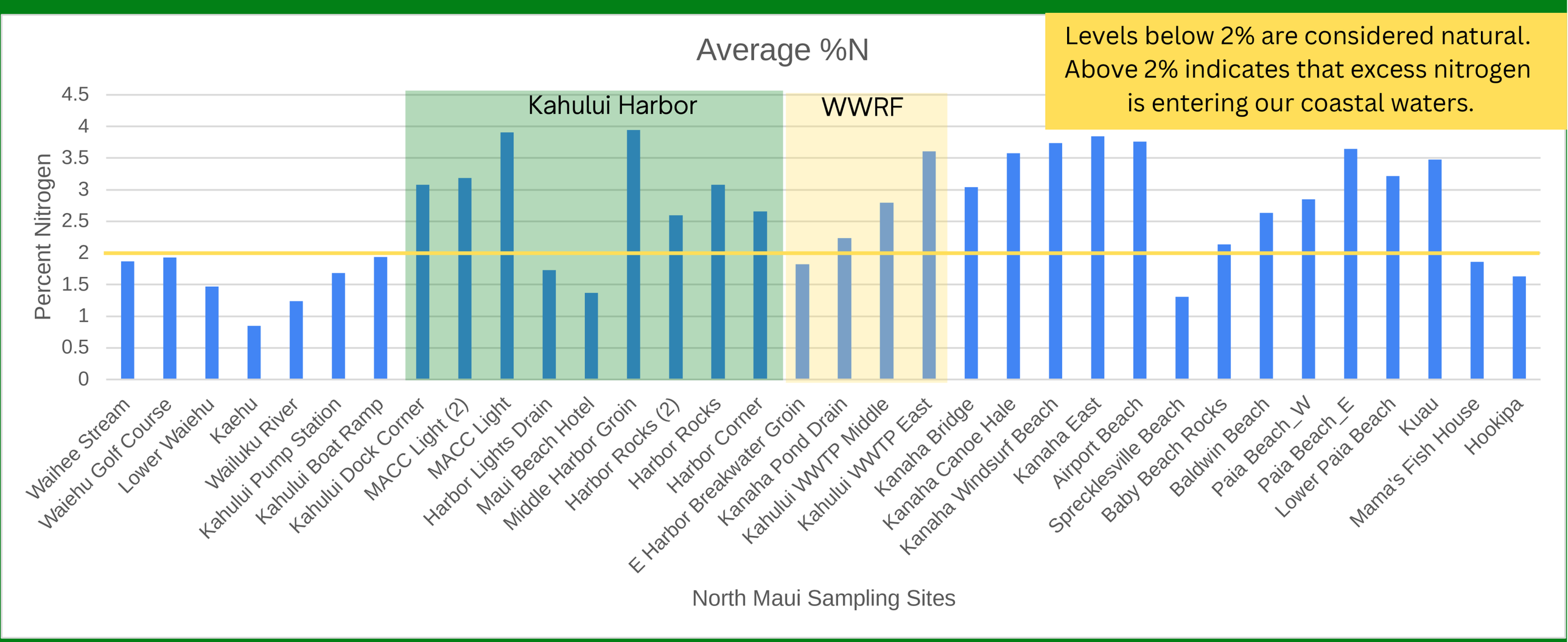
North Maui

KEY FACTS

- Elevated nitrogen levels in marine algae (*limu*) show that nutrient pollution is associated with the presence of development in North Maui.
- Previously documented nitrogen enrichment from wastewater persists in the area next to the Kahului Wastewater Reclamation Facility injection wells.
- Nitrogen values in Kahului Harbor suggest the presence of wastewater.
- Results at Kanaha, Sprecklesville and Paia suggest fertilizer as a nitrogen source.

NITROGEN LEVELS

Nitrogen is an essential nutrient for limu, which can absorb and store it when concentrations are high. However, excess nitrogen - often from fertilizers, wastewater, or a combination of both - can disrupt coastal ecosystems.



Kanaha Beach, Sprecklesville and **Paia** show high nitrogen levels, possibly linked to commercial fertilizer sources. Nitrogen levels at the Kahului Harbor and next to Kahului WWRF are variable but when considered alongside isotope data (see next graph), they indicate wastewater as a potential nitrogen source.

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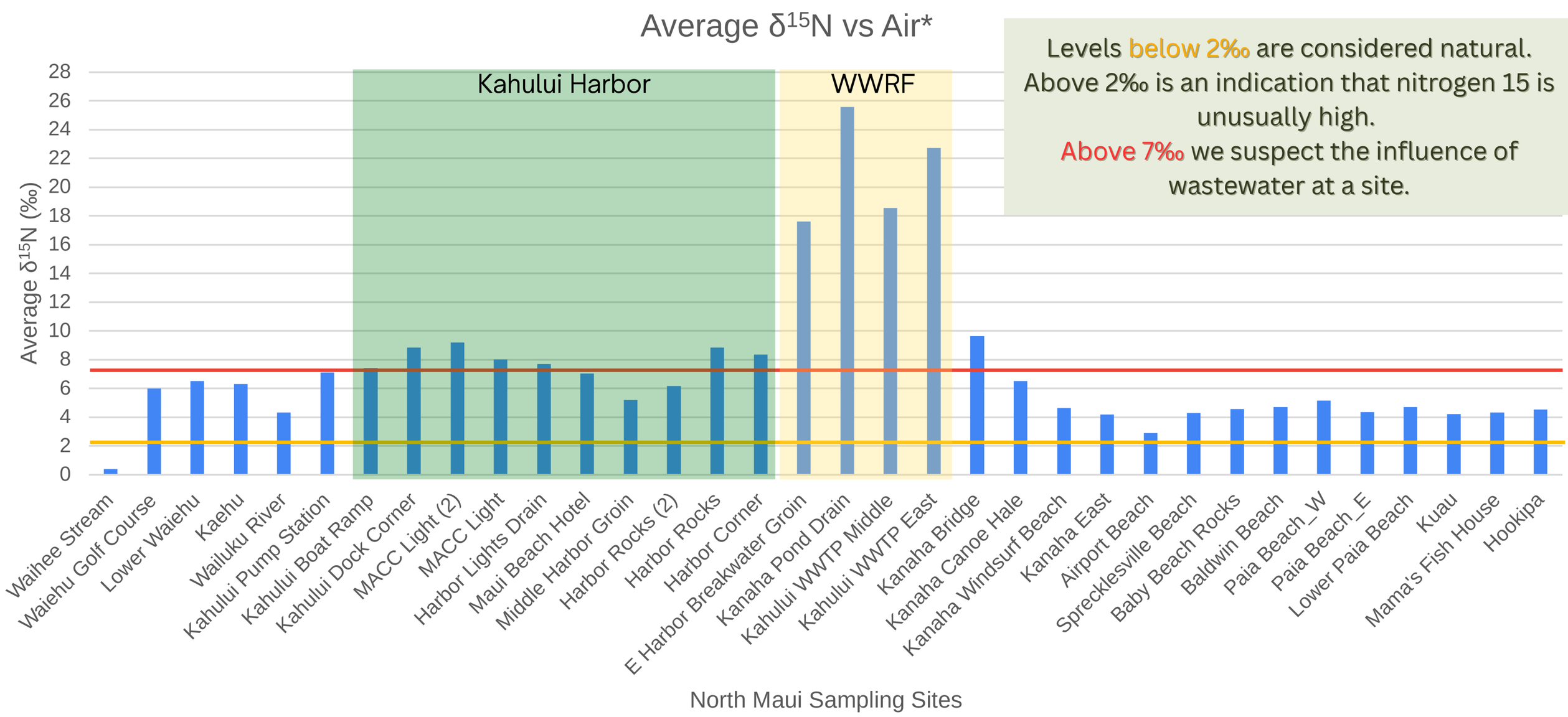
Nitrogen Ratios: Isotopes ^{14}N vs ^{15}N

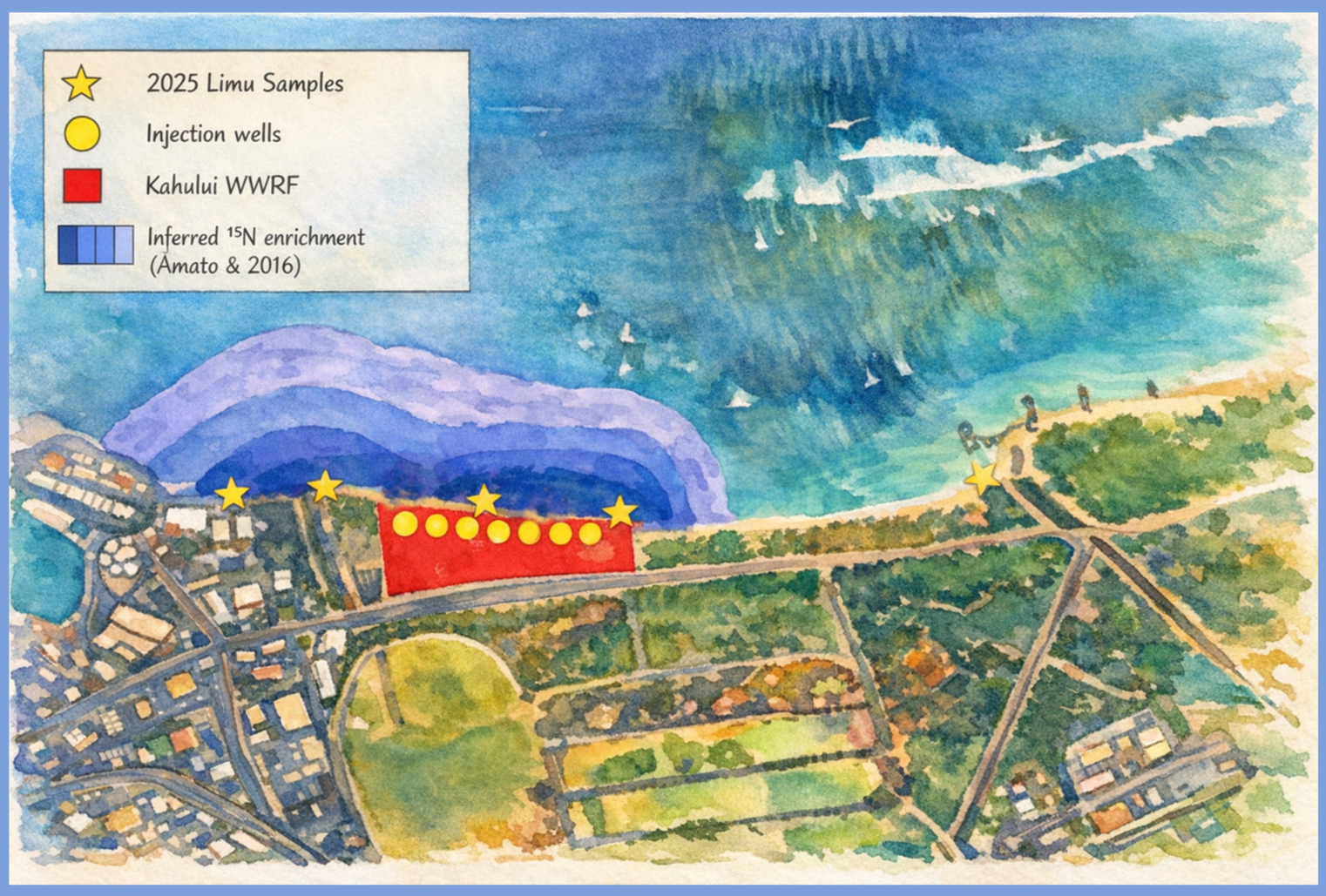
Bacteria remove lighter nitrogen 14 (^{14}N) from the environment and leave more nitrogen 15 (^{15}N).
As ^{15}N isotope levels increase, we suspect wastewater as the source of nitrogen at a site.
In **Kanaha**, the nitrogen signature next to **Kahului WWRF** is from that facility's injected wastewater, confirming that injection wells continue to pollute this area. At **Kahului Harbor**, a clear source of wastewater is currently unknown.



Levels below 2‰ are considered natural. Above 2‰ is an indication that nitrogen 15 is unusually high.
Above 7‰ we suspect the influence of wastewater at a site.

WASTEWATER PLUMES

Wastewater from treatment plants is injected into the ground and eventually reaches the ocean, creating a plume of polluted water that is detectable in limu. Maui County is working to upgrade treatment processes to remove excessive nutrients and eliminate pathogens before injection, as well as increasing reuse of treated water.



NEXT STEPS

We are left with many North Maui sites where we cannot identify a definitive source of nitrogen: Kanaha Beach, Sprecklesville and Paia. We are working with local partners and community members to gain a better understanding of the history and environment to better identify sources of excess nutrients.
In 2026, we will retest many of these sites to build upon data, detect trends in nutrient pollution, and identify sites that need mitigation.

We greatly appreciate the support of the County of Maui's Environmental Protection & Sustainability Division, which made this work possible and will enable continued progess in 2026.

Environmental Protection & Sustainability Division

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