

Wahikuli-Honokowai Watershed Management Plan

Vol.2: Executive Summary

Healthy coral reefs are vital to our culture, way of life, and economy. Long-term coral reef monitoring has shown that coral reefs in northern Kā'anapali have declined by as much as 50 percent. The West Maui Region is currently targeted by Federal, State, and private entities for watershed planning efforts with the goals of reducing stressors to and improving the overall health of coral reefs, nearshore waters, and watersheds. The Honolulu District of the U.S. Army Corps of Engineers (USACE) and Hawai'i Department of Land and Natural Resources Division of Aquatic Resources (DLNR-DAR) are the lead government agencies for the West Maui Ridge to Reef (R2R) Initiative, covering five watersheds from Wahikuli to Honolua.

Over the past century, land use in this region has resulted in export of land-based pollutants that have impaired the water quality of nearshore ocean waters and adversely impacted the marine ecosystem. Land-based pollutants generated across large areas and from diffuse sources are commonly referred to as non-point source (NPS) pollutants. NPS pollutants are transported off the watersheds in both surface water and groundwater and delivered into the ocean at various rates and total loads. Two of the most problematic land-based pollutants identified by scientists are sediment and nutrients (Nitrogen and Phosphorus).

To address the issue, the National Oceanic and Atmospheric Administration (NOAA) Coral Program has sponsored a Watershed Management Plan (WMP) for two watersheds, Wahikuli and Honokōwai, as part of the West Maui R2R Initiative. The *Wahikuli-Honokōwai Watershed Management Plan* (WHWMP) is composed of two volumes: *Volume 1: Watershed Characterization*, and *Volume 2: Strategies and Implementation*. The WHWMP will provide a template for WMPs to be developed for other West Maui watersheds. It adheres to the Environmental Protection Agency (EPA) Clean Water Act (CWA) Section 319 guidelines for watershed plan development. These guidelines require use of a holistic, watershed based approach to identify sources and sinks of NPS pollutants, and the remedial actions necessary to reduce their loads to receiving waters. The complete WHWMP characterizes the project watersheds (Volume 1); and recommends pollution control strategies, outlines implementation strategies, provides evaluation and monitoring protocols, and describes education and outreach approaches (Volume 2).

Volume 2 of the WHWMP discusses strategies for management of NPS pollutants in Wahikuli and Honokōwai Watersheds. These NPS pollutants adversely impact water quality and the coral reef ecosystem, diminishing habitat for plants and animals and resource use by people. The management strategies target pollutants and their sources identified in Volume 1. Major NPS pollutant sources within the watersheds are those land uses, activities, and inputs that have the greatest overall adverse impact to the coral reef ecosystem. Several of these sources cover a significant areal extent within the project area, and may have specific sections or regions that require immediate attention. To refine the discussion of pollutants and their control strategies, the watersheds were delineated into management units (Conservation, Agricultural, and Urban) based on the State-designated Land Use Districts and their corresponding dominant land uses and types.

Section 1 *Introduction*, identifies a vision and goals, defines key terms and summarizes main pollutants and hotspots in the Agricultural and Urban Management Units as characterized in

Volume 1. A clear vision and set of goals are supported by management strategies, implementation of which will help achieve reduction of NPS pollutants from the targeted management units. The vision is aligned with the overarching goal of the West Maui R2R Initiative. Sediment inputs have been determined to be the key issue with respect to pollution generated in the Agricultural Management Unit. Pollutants contained in the Lahaina Wastewater Reclamation Facility (WWRF) effluent that are entering the coral reef environment have been determined to be the key issue with respect to the Urban Management Unit.

Section 2, *Implementation Strategies*, discusses elements required to implement a WMP, financial considerations, and necessary technical resources. Adaptive management is necessary to improve management by learning from the outcomes of past activities. It is highly recommended that all solutions be implemented as soon as possible, however it is recognized that this is likely not feasible due to financial and labor constraints. Landowner interest and participation is necessary for successful implementation. The priorities for implementation should not be considered rigid. If a landowner or entity responsible for a particular parcel has resources to implement a solution that is lower priority, the opportunity should be taken. Any installation of a management practice is a positive gain towards reducing NPS pollution, regardless of order or whether it is preventive or treatment based.

Section 3, *Pollution Control Strategies*, identifies projects and management practices recommended to address identified sources and types of NPS pollutants. Specific practices were selected based on their ability to reduce generation of, capture, or remediate NPS pollutants; cost; logistical aspects of installation; and any link to regulatory or management objectives that either require or promote measures to reduce NPS pollutants. Priority management practices are those deemed most critical for implementation, while secondary practices are recommended for implementation after priority needs have been satisfied or as opportunities arise. Locations for implementation are prioritized based on NPS pollutant load reduction potential, maintenance requirements, number of practices and frequency required for load reduction, and relative cost. In addition, practices that address pollutant control on lands that drain into the ocean at or to the north of Kahekili Beach Park are considered high priority. Corals offshore of Kahekili have been impacted by land based pollutants, causing coral dieback and reducing coral cover. The ocean currents north of Kahekili flow to the south, meaning that pollutants discharged into the ocean to the north can be carried towards Kahekili. Reduction of pollutant loads is a function of both the types and number of management practices installed.

Fallow seed corn, pineapple and sugar cane fields, and access roads within the fields are the primary targets of management efforts within the Agricultural Unit. Fine sediment generated off these areas at accelerated rates of erosion is a significant NPS pollutant in the region. Honokōwai Watershed is the highest priority for road network and field repairs since the streams and gulches draining the watershed enter the ocean near the coral reefs by Kahekili Beach Park. Application of chemicals such as fertilizers and pesticides to maximize crop production and control pest and plant diseases is another source of land-based pollutants. The amount of legacy contaminants in the soil and groundwater is unknown, as is how much is transported to the ocean via surface overland flow

and groundwater discharges.¹ Management practices recommended to reduce generation and treat pollutants from agricultural lands include erosion controls, fertilizer management plans, and post fire rehabilitation plans.

Management efforts in the Urban Unit are primarily associated with the disposal of treated effluent from the Lahaina WWRF into injection wells, transport of pollutants off landscaped and impervious surfaces, and localized areas of erosion. The disposal of treated effluent from the WWRF into injection wells is a water quality issue that has been the focus of several studies, discussions, and working group efforts. The treated effluent is hydrologically connected to ocean waters and transports various chemicals including Nitrogen and Phosphorus to the ocean via groundwater that is discharged along the shoreline. The volume of effluent injected into the ground can be reduced by increasing the volume of R-1 water used for irrigation and other approved applications. To do this, the number of end users of R-1 water needs to be increased, which requires expansion of pipelines and other infrastructure. The expansion is costly and will require numerous years to complete. Although 100 percent reuse is a goal, it is likely that injection wells will be needed in some capacity.

Nutrient and other chemical inputs from fertilizer, pesticides, and irrigation activities on resort, golf course, residential and commercial properties can be conveyed via overland or groundwater flow into the coastal environment. Other land-based pollutants from vehicles, debris disposal, exposed soil surfaces, and other sources that collect on the impervious surfaces are carried in stormwater runoff and routed into the ocean via diffuse flow paths and in the storm sewer systems. These pollutant discharges can be abated using soft management practices such as bioretention cells (rain gardens) or vegetated swales that encourage infiltration of runoff onsite. Hard practices, including retrofits to the separate storm sewer system (S4) such as catch basin filter inserts or baffle boxes can be used to reduce pollutant transport once water enters the conveyance systems. Locations recommended for installation of management practices are shown on Figures 4 and 5.

Major sources of NPS pollution can be remediated through the implementation of management practices. Targeting priority areas and sites, and applying appropriate strategies is expected to decrease generation and transport of land-based pollutants that reach the ocean. Problem areas that are contributing the most sediment should, to the extent possible, be targeted first to reduce sediment transport to the ocean in a timely manner. Table ES-1 illustrates the major NPS pollutant sources in order of priority for remediation. The highest ranking solutions are considered to have the most effective long-term benefit to the coral reef system and coastal waterbodies. Some solutions involve additional studies or designs to target specific management practices.

Section 4, *Evaluation and Monitoring*, provides programmatic evaluation criteria and describes four types of monitoring necessary to track management practices: trend, implementation, baseline, and effectiveness. Qualitative and quantitative information about the management practices and the condition of the coral reef ecosystem helps determine their effectiveness and apply the findings to other watersheds. Milestones should be set to track implementation on a programmatic level as well as the pollutant reductions being achieved and the affected change in the health of the coral reef ecosystem. The WHWMP includes recommendations for monitoring and identifies site-based

¹ Pollutants associated with the plantation era, and now the former seed corn cultivation, are referred to as legacy pollutants.

effectiveness monitoring for the management practices. Long-term trend monitoring of the health of the coral reef ecosystem will also provide information that can be correlated to implementing solutions to reduce land-based NPS pollutants. Baseline monitoring of corals using toxicologic analysis to determine what chemicals have and are contributing to coral decline is recommended.

Success of the WHWMP is dependent on stakeholder awareness and involvement. Section 5, *Education and Outreach*, provides details on recommended current and planned activities to engage the local community in efforts to reduce NPS pollution. These strategies, some of which are already underway, are aligned with the larger West Maui R2R Initiative. Future iterations of the WHWMP should incorporate elements of Hawaiian culture (e.g. traditional Hawaiian land divisions and place names, pre-Western contact land use management practices, and traditional ecological knowledge) into the planning framework. The WHWMP would benefit from incorporation of this information in future updates or addendums. Planning processes that use the WHWMP as a template should consider including this information from the beginning.

Watershed management planning is inherently adaptive, with managers continually reassessing both the implementation process and the effectiveness of the chosen strategies in order to ensure progress is being made toward desired future conditions. The WHWMP should be evaluated annually to document accomplishments and prioritize upcoming actions based on current knowledge. Implementation of the solutions recommended in the WHWMP, per the identified priorities, is crucial to reducing the generation and transport of sediments and other NPS pollutants. This will result in improved water quality and ecosystem health within the watersheds and the nearshore coastal waters. A comprehensive monitoring program should be implemented to measure the progress towards improved water quality and coral reef health over time. The WHWMP can also be used as a template for other watersheds in the West Maui area to create a broader regional approach to NPS pollution control aimed at improving coral reef health.

Table ES-1. Priority Projects and Management Practices to Address NPS Pollution in Wahikuli and Honokōwai Watersheds

(in order of implementation priority, from top to bottom)

NPS Pollutant Source and Associated Projects and Management Practices	Responsible Entity for Implementation and Maintenance	Implementation Cost (estimates)	Desired Implementation Timeframe	WHWMP Reference Section and Related Information Sources
Agricultural Access Roads				
Road and Trail Inventory Assessment and Proposed Practices <ul style="list-style-type: none"> - Road Drainage Improvements - Road Realignment and Rebuilding - Sediment Retention Basin 	<ul style="list-style-type: none"> • Land Owner (ML&P, KLMC, GFG, and DHHL) • NRCS/SWCD (technical assistance when requested) 	For all subwatersheds: <ul style="list-style-type: none"> • Inventory / Assessment: \$49k • Installation: \$268k 	<ul style="list-style-type: none"> • Phased inventory assessment (2012-2014) • Phased implementation (2013-2017) 	<ul style="list-style-type: none"> • Section 3.1 • Road Drainage Improvements (App B.3) • Road Realignment and Rebuilding (App B.4) • Sediment Retention Basin (App B.5)
Fallow Agricultural Fields				
Agricultural Field Inventory Assessment and Proposed Practices <ul style="list-style-type: none"> - Conservation Cover - Sediment Retention Basin - Vegetated Filter Strip 	<ul style="list-style-type: none"> • Land Owner (ML&P, KLMC, GFG, and DHHL) • NRCS/SWCD (technical assistance when requested) 	For all subwatersheds: <ul style="list-style-type: none"> • Inventory / Assessment: \$43k • Installation: variable 	<ul style="list-style-type: none"> • Phased inventory assessment complete by end of 2014 	<ul style="list-style-type: none"> • Section 3.2 • Conservation Cover • Sediment Retention Basin (App B.5) • Vegetated Filter Strip (App B.6)
WWRF				
WWRF Alternate Disposal: Increase Production and Reuse of R-1 Water	<ul style="list-style-type: none"> • County of Maui and/or potential users (resorts) • Coral Reef Alliance is working with resorts on R-1 use (NFWF funding) 	<ul style="list-style-type: none"> • Tens of millions of dollars, depending on expansion phase 	<ul style="list-style-type: none"> • Initial Phase: 2014 • Subsequent Phases: 2020 	<ul style="list-style-type: none"> • County of Maui plan • Section Error! Reference source not found.
Dam and Gulch Conveyance				
Engineering Analysis and Development of Retrofit Designs: Honokowai Structure #8 <ul style="list-style-type: none"> - Dam Debris Retrofit - Baffle Box - Natural/Native/Drought Resistant Vegetation - Riprap 	<ul style="list-style-type: none"> • County of Maui Department of Public Works • NRCS (design concurrence) 	<ul style="list-style-type: none"> • Design: \$85k • Construction: To be determined 	<ul style="list-style-type: none"> • Design complete by 2015 	<ul style="list-style-type: none"> • Section 3.4 • Dam Debris Retrofit • Baffle Box (App B.1) • Natural/Native/Drought Resistant Vegetation (App C.8) • Riprap (App C.11)

NPS Pollutant Source and Associated Projects and Management Practices	Responsible Entity for Implementation and Maintenance	Implementation Cost (estimates)	Desired Implementation Timeframe	WHWMP Reference Section and Related Information Sources
Engineering Analysis and Development of Stabilization Designs: Wahikuli Gulch <ul style="list-style-type: none"> - Erosion Control Blanket / Turf Reinforcement Mat - Riprap 	<ul style="list-style-type: none"> • County of Maui Department of Public Works Highways and Engineering Division and Planning Department • KOA 	<ul style="list-style-type: none"> • Design: \$96k • Construction: \$238k 	<ul style="list-style-type: none"> • Design complete by 2016 	<ul style="list-style-type: none"> • Section 3.5 • Erosion Control Blanket / Turf Reinforcement Mat (App C.3) • Riprap (App C.11)
Vegetation Management				
Fertilizer Management Plan	<ul style="list-style-type: none"> • KLMC, Kaanapali Coffee Company (Coffee Farm) • KOA (Ka'anapali Resorts) • Property owners and neighborhood associations 	<ul style="list-style-type: none"> • \$3k (10 acre resort) 	<ul style="list-style-type: none"> • Plans for Agricultural Areas complete by 2015 • Plans for Urban Areas complete by 2016 	<ul style="list-style-type: none"> • Section 3.6 • This is a separate plan
Wildfire (Potential)				
Burn Area Emergency Response Plan	<ul style="list-style-type: none"> • Land owners in the Agricultural and Conservation Management Units (ML&P, KLMC, DHHL, GFG, State) • WMMWP • West Maui Fire Task Force • Hawaii Wildfire Organization 	<ul style="list-style-type: none"> • \$50k 	<ul style="list-style-type: none"> • Plan complete by 2014 	<ul style="list-style-type: none"> • Section 3.7 • This is a separate plan
Urban Pollutants				
Baffle Box	<ul style="list-style-type: none"> • County of Maui Department of Public Works 	<ul style="list-style-type: none"> • \$90k 	<ul style="list-style-type: none"> • Construction complete by end of 2015 	<ul style="list-style-type: none"> • Section 3.8 and Appendix B.1 • Specific location: Honokōwai Beach Park
Bioretention Cell (Rain garden)	<ul style="list-style-type: none"> • County of Maui Department of Parks and Recreation • Resorts 	<ul style="list-style-type: none"> • \$20-30k 	<ul style="list-style-type: none"> • Construction complete by end of 2015 	<ul style="list-style-type: none"> • Section 3.9 and Appendix B.2 • Specific locations: Wahikuli Wayside Beach Park and Pōhaku Beach Park