



NONPOINT SOURCE SUCCESS STORY

Commonwealth of Northern Mariana Islands

Implementing Best Management Practices and a Conservation Action Plan Helps Restore the LaoLao Watershed

Waterbody Improved

The LaoLao watershed is on the island of Saipan within the Commonwealth of the Northern Mariana Islands (CNMI)

archipelago. LaoLao was first included on the Clean Water Act (CWA) section 303(d) list of impaired waters for failing to support the Recreational and Aquatic Life use designations (UD) in 2004 due to water quality standard (WQS) exceedances for bacteria. Sedimentation was also noted as a potential problem in the CNMI 1998 CWA sections 305(b) and 303(d) Water Quality Assessment Integrated Report (IR). Implementing roadway best management practices (BMPs), along with community-based restoration activities and outreach has improved water quality in the LaoLao watershed. For this reason, LaoLao was removed from the list of impaired waters for the Recreational UD in the 2016 IR.

Problem

The 1,043-acre LaoLao watershed includes 4.6 miles of ephemeral streams that merge and then flow into LaoLao Bay (Figure 1). The watershed has 1.2 miles of beach and 2.1 miles of shoreline. In the mid-1990s, man-made and natural brush fires in the upper badlands led to significant erosion and consequent sedimentation in LaoLao Bay (Figure 2). Concerns about the Bay's diminished water visibility and coral conditions were reported to CNMI natural resource agencies by divers and fishermen.

The CNMI Bureau of Environmental and Coastal Quality (BECQ) monitors two LaoLao Bay sites and six additional reef flat sites for Enterococci, salinity, pH, temperature, dissolved oxygen (DO) and turbidity. These data are used to evaluate water quality and effectiveness of the restoration activities called for in the LaoLao Bay Conservation Action Plan (CAP). The CAP was developed in 2009 as a cooperative effort between community members, organizations and CNMI resource agencies. A CAP is an alternative restoration approach in CNMI to foster community stewardship to improve water quality when total maximum daily loads (TMDLs) have not been developed.

LaoLao was first included on the CWA section 303(d) list of impaired waters in 2004 for failing to support the Recreational and Aquatic Life UD due to WQS exceedances for the fecal indicator bacteria,



Figure 1. The LaoLao Watershed is on the island of Saipan.

Enterococci. Over 10 percent of the samples taken from the two beach monitoring sites per annum resulted in public beach advisories due to high bacteria levels. However, the six reef flat sites that are within walking distance of the beach sites rarely exceed the WQS. As the area is not densely populated and has no sewer system, the source of the exceedances was theorized to be due to sediment from eroding badland soils and the secondary cross-island coral road that contains naturally occurring Enterococci that are known to survive in tropical soils, rather than actual fecal contamination.

Photo courtesy of Tim Lang



Figure 2. Sedimentation occurring at LaoLao Bay stream outfalls in 2004.

Story Highlights

Cross Island Road traverses four of Saipan's impaired watersheds (LaoLao, Kagman, Talofoto and West Takpochao) and was identified in the LaoLao CAP as a priority source of pollutants. In 2009 the Department of Public Works (DPW) began a multimillion-dollar Cross Island Roadway Reconstruction Project (CIRRP), with a key goal to reduce stormwater runoff. Watershed partners implemented more BMPs in 2012 to reduce erosion and sediment, including paving the upper half of LaoLao Bay Drive (a secondary road leading down to the Bay), and constructing culverts, concrete stream crossings and sediment chambers.

BECQ has also been conducting long-term revegetation efforts in the upper badland areas to reduce sediment loads from the historically burned areas. Planting events continue to be coordinated between BECQ, the Department of Lands and Natural Resources' Division of Agriculture, and the nonprofit Micronesia Island Nature Alliance (MINA). Shrubs and grasses are being replaced with more fire-resistant native plants and trees to build soil resiliency and reduce erosion. BECQ's outreach staff use these planting events to educate students and community residents about the impacts that inappropriate hunting practices and brush fires have on coastal resources.

Results

The CIRRP and improvements to LaoLao Bay Drive, along with other sediment-reduction BMPs have reduced erosion in the watershed, thus significantly

reducing the volume of sediment and bacteria discharging to LaoLao's coastal waters. Since completion, the percentage of Enterococci bacteria violations has remained under 10 percent per year. BECQ records show that 7 cubic yards of sediment were removed in 2013, compared to 3 cubic yards removed during the 2015-2016 clean-up efforts, indicating that BMPs are decreasing the upland erosion and sediment loading into the Bay.

A linear regression of the percent of Beach Advisories (WQS violations) over a five-year period from fiscal year 2012 to 2016 shows a significant decrease at LaoLao beach monitoring sites (North LaoLao R2 = 0.90 and South LaoLao R2 = 0.23). Based on these data, LaoLao was removed from the CWA section 303(d) list of impaired water for the Recreational UD in the 2016 CNMI IR.

Partners and Funding

BECQ engineers and technical staff partner with the Department of Public Lands and DPW to plan large land use improvements and to protect water quality. BECQ also trains road crews to promote proper grading techniques for unpaved coral roads as recommended in the 2006 CNMI and Guam Stormwater Management Manual that was developed with funding from U.S. Environmental Protection Agency (EPA). The CIRRP was supported by Federal Highway Administration funding. Phase I began in October 2009 and crossed almost the entire LaoLao watershed, costing \$6.1 million at its completion in September 2012. Phase IIa, a four-year, \$3.7 million project, was completed in 2014.

Additional restoration activities identified in the LaoLao CAP were financed with \$2,604,164 in funding from the American Restoration and Recovery Act and National Oceanic and Atmospheric Administration, as well as \$65,926 in EPA CWA section 319 grant funding. The LaoLao Bay CAP was implemented by BECQ's Planning Division, Outreach and Education Coordinator, and the Watershed Coordinator, in collaboration with MINA, schools and other government agencies. Staff from BECQ, DPW, and Saipan Mayor's Office, and volunteers from MINA maintain the culverts and sediment basins by removing collected litter and sediment at least annually.



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