Honolua-Mokulēʻia
Marine Life Conservation District

Conservation Action Plan

A guidance document for adaptive management

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Acknowledgments

The Conservation Action Planning project team deeply thanks all those involved in the planning process, including community members, scientists, agency representatives, and conservationists. Without their continued support, valuable input, and feedback, we could not have captured the collaborative vision for the sustainable future of Honolua-Mokulēʻia Marine Life Conservation District presented here.

Mahalo To Our Funders

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Executive Summary

This Conservation Action Plan was developed using The Open Standards for the Practice of Conservation, a science-based approach for planning, implementing, and measuring the impacts of management activities supported by a worldwide network of conservation coaches. It reflects our current best thinking and highest priorities and will be adapted to changing circumstances to improve strategy effectiveness and achieve greater impacts.

Designated as a Marine Life Conservation District (MLCD) in 1978, Honolua and Mokulēʻia Bays are adjacent bays along the northwestern coast of Maui. The MLCD protects 45 acres of nearshore marine habitat where protected species, the beautiful coral reef, and abundant fish attract high levels of human use. Long-term trends at the MLCD suggest that important features and qualities of the area are changing and are cause for concern.

Five conservation targets on which to focus management efforts were identified:

1. Reef habitat
2. Fish
3. Protected species
4. Community relationship with the MLCD
5. Natural and cultural experience

To improve the conservation targets, the four highest rated threats were determined:

1. Increased ocean temperature
2. Legacy in-stream sediment
3. Overcrowding and high human use
4. Overfishing in surrounding areas

Priority conservation objectives and actions were developed to improve targets and address threats laid out in this plan:

IMPROVE REEF HABITAT

Objective 1: Starting now, reduce annual sediment input into Honolua Bay from 2016 levels (91 metric tons/year) by 50% by 2030, and by 90% by 2040.

INCREASE FISH ABUNDANCE, BIOMASS, AND DIVERSITY

Objective 2: Sustain long-term community benefits by increasing the biomass of reef fish outside the MLCD boundary from Makāluapuna Point to Līpoa Point by 300% by 2030.

REDUCE IMPACTS TO PROTECTED SPECIES

Objective 3: Understand and protect conditions needed for protected species (Hawaiian spinner dolphins, reef manta rays, and sea turtles) to engage in optimal behaviors in the MLCD by 2025.

IMPROVE COMMUNITY MLCD ENGAGEMENT

Objective 4: Increase and maintain community involvement in MLCD management by 2022.

IMPROVE NATURAL AND CULTURAL EXPERIENCE

Objective 5: Reduce the number of people within the MLCD and surrounding areas at peak times to a sustainable level (to be determined by carrying capacity study) by 2025 in order to reduce negative impacts to resources and people.

Vision

The development of this Conservation Action Plan was guided by this vision:

"We want to see a future MLCD that has clean water flowing from the mountains, is a peaceful place for community to gather and enjoy, and where marine resources are abundant and reflective of a healthy ecosystem benefitting from management."

Guiding Principles

The Honolua-Mokulēʻia MLCD is part of an initiative to effectively manage Hawaiʻi's nearshore waters, including improving the capacity and coverage of enforcement, strengthening the State's marine management infrastructure, supporting community-based marine management, and systematizing marine monitoring. Thus, the development of this CAP was also inspired by the State of Hawaiʻi's Marine 30x30 Guiding Principles to achieve effective management of 30% of Hawaiʻi's nearshore ocean waters by 2030.

STATE OF HAWAIʻI'S MARINE 30X30 GUIDING PRINCIPLES

Economic

Prioritize areas and resources that are important to the livelihoods and food supply of residents • Maintain access to places key to sustainable subsistence and/or livelihood pursuits • Support and develop sustainable and diverse ocean-based economies when consistent with effective management • Minimize conflicts between current and future economic use in the nearshore environment by recognizing and upholding the public trust • Build coastal resilience through natural resource protection

Social

Manage resources guided by Native Hawaiian traditions, beliefs, practices, and values • Ensure equitable access to sustainable marine resource use and enjoyment • Manage natural resources that are important to the cultural heritage of Hawai'i • Promote sustainable use to ensure the long-term enjoyment of ocean recreation for local residents • Manage in a way that promotes social cohesion and resilience • Recognize the diverse intangible benefits that the ocean provides

Ecological

Protect habitats and species with key functional roles • Protect habitats and species likely to be more resilient to climate change • Care for special or unique habitats and areas • Protect areas that are important to focal species during all life stages • Protect a diversity of habitats • Integrate marine managed areas within a broader management framework • Integrate local expertise, traditional knowledge, and understanding of the ecology into planning • Consider ecological and cultural connectivity between mauka and makai • Give special consideration to species that are vulnerable to over-exploitation

Governance

Recognize and consider the interests of all ocean stakeholders • Recognize the needs, values, and interests of the broader society and future generations consistent with the public trust doctrine • Use an open, transparent, consultative process • Manage areas with clear, appropriate, transparent, and consistent rules • Manage adaptively by tracking progress, evaluating results, and refining actions accordingly • Ensure sufficient human, financial, and other resources for management and enforcement • Build in conflict resolution systems • Ensure easy violation reporting and rapid response by enforcement officers • Provide opportunities for direct public involvement in effective management • Promote coordination and knowledge sharing among stakeholders, partners, and sites within the network

Planning Process

The Hawaiʻi Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR) on Maui is the lead agency on this Conservation Action Plan. DAR's mission is to manage, conserve, and restore Hawaiʻi's unique aquatic resources and ecosystems for present and future generations. The planning process was coached by staff from The Nature Conservancy (TNC) and Applied Conservation LLC, with support from the Hawaiʻi Tourism Authority, Office of Economic Development, and the National Oceanic Atmospheric Administration's Coral Reef Conservation Program. This plan was developed by a multidisciplinary project team who convened at three workshops from December 2018 to April 2019 as part of a peer planning and learning process with two other marine sites, Mānele-Hulopoʻe Marine Life Conservation District and a proposed marine management area in Lāhaina, to increase effective management of Hawaiʻi's marine areas.

The project team used the Open Standards for the Practice of Conservation (OS) to develop this Conservation Action Plan (CAP), a powerful process to guide conservation teams to develop focused strategies and measures of success. Utilizing the CAP/OS process provided practitioners with a common approach and language for conservation planning and the opportunity for candid exchange and peer review. It allowed for an objective, consistent, and transparent accounting of conservation actions and the intended and actual outcomes of conservation projects. It will enable project staff to adapt their actions to improve strategy effectiveness and achieve greater conservation impacts.

Photo: TNC (Manuel Mejia)

Honolua-Mokulēʻia MLCD CAP Team Members

The project team members are: Russell Sparks, DAR; Ronald Cahill, Division of Conservation and Resource Enforcement (DOCARE); Paul Sensano, Division of Boating and Ocean Recreation (DOBOR); Tova Callender, West Maui Ridge to Reef Initiative (R2R); Kerrie Littlejohn, University of Hawaiʻi and DAR; Ananda Stone, Save Honolua Coalition; Kainoa Pestana, Puʻu Kukui Watershed Preserve; and Pomaikaʻi Kaniaupio-Crozier, Puʻu Kukui Watershed Preserve. Emily Fielding and Alana Yurkanin of TNC convened the group and provided process coaching and document preparation.

Photo: TNC (Manuel Mejia)

Site Description

Honolua-Mokulēʻia MLCD General Area Description

Honolua and Mokulēʻia Bays are adjacent bays along the northwestern coast of Maui. The area was designated as a Marine Life Conservation District in 1978 and protects 45 acres of nearshore marine habitat. The MLCD is located in the Honolua Ahupuaʻa which is part of the Kāʻanapali Moku (**Figure 1**).

Coral Reef Ecosystem

Within Honolua Bay, fringing reefs extend along the northern and southern shorelines between depths of 10-40ft (3-13m). Lobe corals (*Porites* spp.) are abundant along the northern shoreline, and rice corals (*Montipora* spp.) are more commonly found along the southern shoreline. A gradually sloping sand channel sits in the middle of the bay between the fringing reefs, reaching a depth of about 60ft (20m) at the mouth of the bay. An area of silt, sand, and boulders extends across the shoreline and shallow waters. There is surface freshwater discharge from the perennial Honolua Stream and from Papua Gulch, which is dry except during periods of high rainfall. There is normally a continuous ground water discharge near the edges of the fringing reefs on both sides of the bay (Sparks et al., 2015).

Mokulēʻia Bay is southwest and adjacent to Honolua Bay and the bottom is mostly sand with submerged boulders and fingers of lava rock occurring on both points. The shoreline alternates between a sandy beach with a shallow sand bar extending well out into the bay and a rock beach with a rocky substrate, the latter state being the result of winter storms which wash away the sand that collects within the bay during the summer.

Photo: TNC (Chad Wiggins)

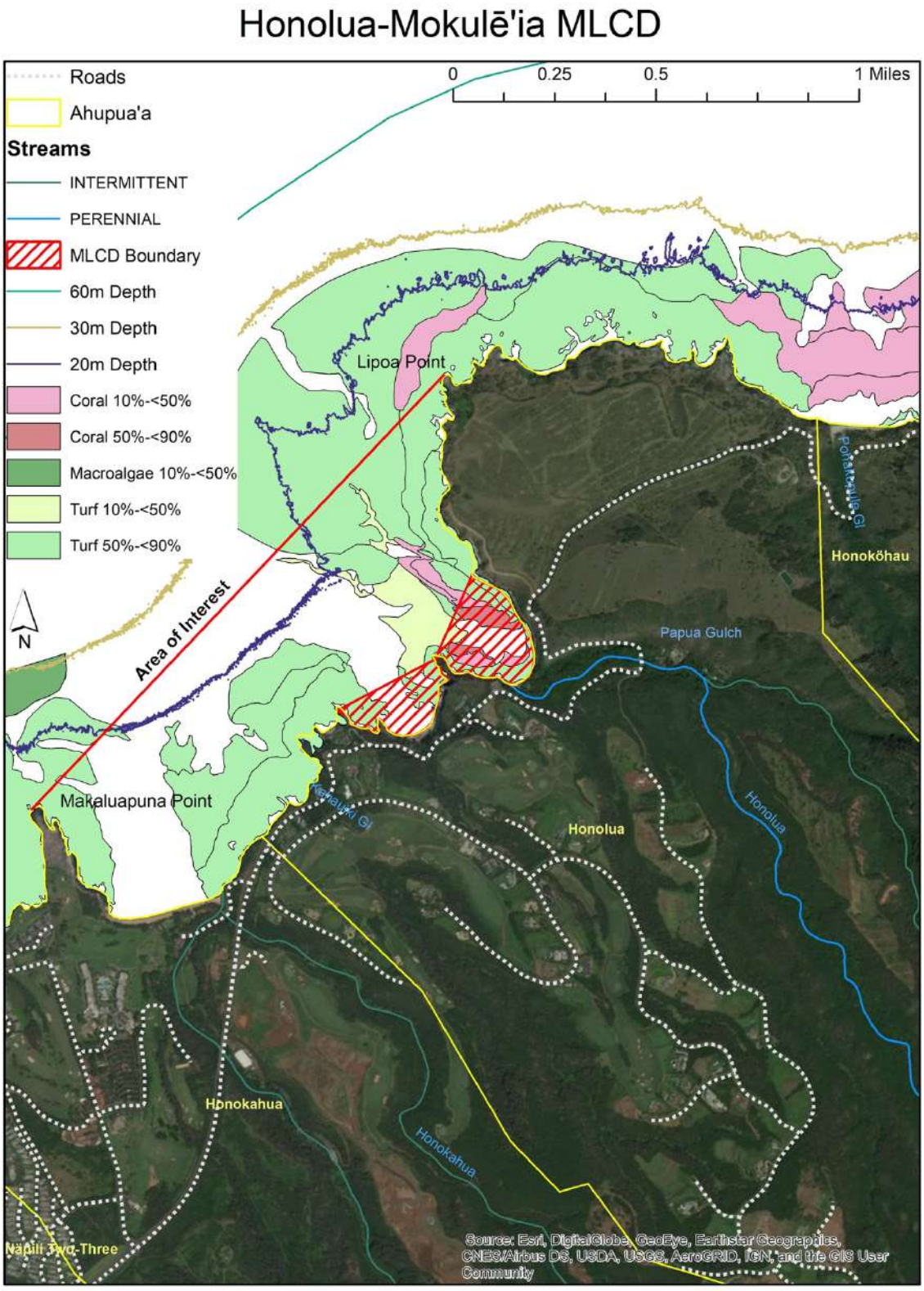
Shoreline Uses

The protected species, beautiful coral reef, and abundant fish attract high levels of human use within and around the MLCD. Surveys conducted in 2005-2006 found that visitors to Honolua Bay by land are mostly (93.5 percent) non-residents from the mainland U.S. and a few from other countries, not counting surfers. Visitors engage in commercial and non-commercial recreational activities, accessing the bay by land and sea (Courtney, 2007).

Highly dependent on weather and sea conditions, the primary recreational activities at Honolua Bay are snorkeling, SCUBA diving, and surfing, with minimal kayaking and sailboat activity. Whereas snorkelers and beach goers prefer visiting in summer months, surfers frequent Honolua in the winter and typically access the surf from Līpoa Point (Courtney, 2007). Commercial tour boats regularly visit and moor at Honolua Bay. The bays are an important gathering place for Native Hawaiian lineal descendants of the area and local families. There are no public restroom facilities, freshwater, electricity, or public telephone. Access to the bay is limited due to a lack of legal parking.

Fishing is fully prohibited within the Honolua-Mokulēʻia MLCD. Poaching is likely to occur, but there are no data regarding how often it occurs and whether or not it is a significant threat to the fish resources in the area. Fishing is a legal and a common activity along Līpoa Point just north of the MLCD boundary and that could have impacts on some of the fish within the MLCD which likely move back and forth across this boundary.

Figure 1. Map of the Honolua-Mokulēʻia MLCD, the area of interest covered in this CAP, and surrounding area including benthic marine habitat and stream types.



Citations: Maui County, DLNR Division of Aquatic Resources & Division of Forestry and Wildlife, Office of Hawaiian Affairs, NOAA 2007, USGS
Map by Roxie Sylva (Feb. 2020)

Honolua-Mokulēiʻa MLCD Rules

Permitted activities:

- To possess aboard any boat or watercraft any legal fishing gear and fish or other aquatic life taken outside of the District.
- To possess in the water any knife and any shark billy, bang stick, powerhead or carbon dioxide injector.
- With a permit, to bag and remove akule netted outside of the District, provided the net is moved only over the sandy bottom areas of the District, and to engage in activities otherwise prohibited by law for scientific, propagation, or other purposes.

Prohibited activities:

- To fish for, take or injure any marine life (including eggs), or possess in the water any device that may be used for the taking of marine life, except as indicated in permitted activities above.
- To take or alter any sand, coral, or other geological feature or specimen, or possess in the water any device that may be used for that purpose.

History

Honolua, meaning "two bays," is an area of significant cultural and historical importance. Archaeological artifacts and structural remains from both early Hawaiian habitation and plantation use have been extensively studied and mapped out by the Bishop Museum in 1974 and re-surveyed in 2006 (Komoto, 2009). Thirteen sites have been identified in Honolua including the Honuaʻula Heiau in Honolua, boulders with grinding surfaces, house platforms/burial mounds, agricultural terraces/house platforms, and midden deposits containing evidence of human settlement. Findings indicate that the early Hawaiian inhabitants of Honolua Valley conducted dry-land agriculture and harvested the productive inshore marine resources of the area during a time when ahupuaʻa management sustained the livelihoods of Hawaiian families. The plateau overlooking Honolua Bay was called "Kulaokaʻeʻa" meaning "plain of dust". This area was once a hill with a hōlua slide until it was graded for growing pineapple (DLNR-DOSP, 2018).

By the early 1900s, the Honolua Plantation camp was established within Honolua Valley, and people there farmed crops such as coffee beans, aloe, mango, and taro. During this time the bay was heavily used as a port for Honolua Ranch, which operated a slaughterhouse and pig farm on the hill between Honolua and Mokulēʻia Bays. By 1920, the ranch and plantation were renamed Baldwin Packers, establishing themselves as the largest private label producer of pineapples and pineapple juice in the United States with over 9,000 acres of pineapple in cultivation (Kapalua Land Company, 2017). In three short years, Baldwin Packers came to own and manage over 22,000 acres in west Maui. In 1969, Maui Land and Pineapple Company was created after Baldwin Packers merged with Maui Pineapple Company.

Photo: TNC (Alana Yurkanin)

1976 was a historic year for Honolua Bay as the location where the voyaging canoe, Hōkūleʻa, set sail on her maiden journey for Tahiti with master navigator Mau Pialiug and crew using traditional voyaging techniques to cross over 2,500 miles of ocean in 31 days. Hōkūleʻa was welcomed in Papeete by a crowd of 17,000 Tahitians celebrating their long-distance journey, and the revitalization of a 600-year dormant voyaging heritage (PVS, 2020).

Photo: TNC (Alana Yurkanin)

In 1978, 45 acres of Honolua and Mokulēiʻa Bays were designated as a Marine Life Conservation District. The same year, Kapalua Resort was established. Ten years later, 8,304 acres of land including Puʻu Kukui, the highest point of Mauna Kahālāwai (West Maui Mountains), were placed into conservation by Maui Land and Pineapple Company who granted a permanent conservation easement to The Nature Conservancy, creating Hawaiʻi's largest privately-owned nature preserve.

Prior to 1978, Honolua and Mokulēiʻa Bays were an important fishing ground for local residents and Native Hawaiians. A thriving commercial akule fishing operation was also successfully run out of Honolua Bay for several years in the mid-1900s (DLNR-DOSP, 2018).

Photo: Russell Sparks

Beloved by residents and visitors alike, in 2007, the local community formed Save Honolua Coalition to protect lands at Honolua and Līpoa Point from the threat of the development of 40 luxury homes and a golf course. Over the next seven years, the community worked alongside Hawaiian Islands Land Trust, Surfrider Foundation, ʻAha Moku o Kāʻanapali, the County of Maui, and several politicians to pass a bill authorizing the purchase of the area (DLNR-DOSP, 2018).

In 2014, the State of Hawaiʻi purchased the 244-acre Līpoa Point property from Maui Land and Pineapple Company for $19.5 million (HILT, 2014). DLNR, with leadership from the Division of State Parks and a private consulting firm, is in the process of developing a Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa (DLNR-DOSP, 2018). A stakeholder working group and DLNR Divisions were convened in four working group meetings between June and August 2019. Next steps include reviewing a draft plan with the stakeholder working group and DLNR Divisions, followed by a public open house and comment period. The plan will assist DLNR in establishing management objectives and policies and in identifying appropriate agencies and organizations to consult with in the implementation of management. Since the scope of the planning process does not include the MLCD, this CAP and the Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa are expected to complement one another.

Purpose and Need

Long-term trends at Honolua-Mokulēi'a MLCD suggest that important qualities of the area are changing and are cause for concern. For instance, on reefs monitored in west Maui, there have been declines in coral cover of approximately 30-75% over the past 30 years and associated increases in macroalgal and turf algal cover (Chaston & Oberding 2007; Jokiel et al., 2004), the greatest surveyed decline being in Honolua Bay. According to the Coral Reef Assessment and Monitoring Program (CRAMP) and DLNR-DAR (1999-2007), between 1995 and 2005, coral cover decreased from 42% to 9% within the Honolua-Mokulēi'a MLCD.

Photo: Don McLeish

Photo: David L. Moore

Photo: TNC (Chad Wiggins)

High turbidity and sedimentation in the bay has been observed consistently since 1974 (Chaston & Oberding, 2007), diminishing water quality, which in turn is believed to contribute to several negative long-term impacts, such as the decrease in coral cover and the diminished success of larval recruitment (Brown, 2004; PIFSC, 2017).

When the Bays are not turbid, up to 800 visitors a day have been observed recreating in the waters, raising concerns over crowding, overuse, and the detrimental effect that has on the experiences of both residents and visitors, the cultural and natural landscape of the area, and the MLCD's ability to withstand natural and anthropogenic stressors (PIFSC, 2017), including impacts from climate change.

Fish abundance and biomass, while high in the MLCD, is poor in surrounding areas of interest, which negatively affects fishing catch (Minton et al., 2020).

Within the Honolua-Mokulē'ia MLCD, the largest management challenges are associated with climate change, sedimentation, overcrowding, and resource extraction, which contribute to reductions in water quality, marine resource abundance, the quality of a peaceful place-based experience, and overall coral reef health (Friedlander et al., 2018). This plan seeks to revisit and revitalize management efforts to reduce the decline in the vitality of the coral reef ecosystem and cultural landscape that make the Honolua- Mokulē'ia MLCD so unique and special.

Targets: What We Are Protecting

Within the Honolua-Mokulēʻia MLCD and surrounding areas of interest (**Figure 1**), five conservation targets (the features, ecosystems, species, and processes of the area that are the primary focus of management) were identified: reef habitat, fish, protected species, community relationship with the MLCD, and natural and cultural experience. Nested targets are the species and other entities that would benefit from protecting the conservation targets. The status of each conservation target was assessed according to key ecological attributes (KEAs) that are essential for long-term viability and health (**Appendix A**). Viability was assessed by assigning values along a three-part scale: poor, fair, and good. Each target is assigned a current ranking as well as a future ranking with and without effective action (**Table 1**). This CAP focuses on actions to move the target from its present state to a preferred future state.

Table 1. The five priority conservation targets, nested targets, and current and projected future status with and without action. This CAP focuses on changing the current status of these targets to the future health with effective action.

Targets	Nested Targets	Current Status	Future Health Without Action	Future Health With Action
Reef Habitat	Coral, sandy bottom, rock, boulder, punawai, and muliwai habitat	Fair/Poor	Poor	Good/Fair
Fish	Inside MLCD reef fish and nearshore pelagic fish assemblages	Good	Fair	Good
	Outside MLCD reef fish and nearshore pelagic fish assemblages	Poor	Poor	Good/Fair
Protected Species	Spinner dolphins, reef manta rays, and green and hawksbill sea turtles	Good/Fair	Fair	Good
Community Relationship with MLCD	Governance	Good/Fair	Good/Fair	Good
Natural and Cultural Experience	Calm, quiet enjoyment of natural and cultural landscape (place names, archaeology, natural process, physical sites, historical events), resident access, cultural practice, and voyaging canoe use	Fair/Poor	Poor	Good/Fair

Target 1: Reef Habitat

This conservation target extends from the shore to between 60-90ft (20-30m) in depth. Nested targets include coral reef, sandy bottom, rock, boulder, punawai (springs), and muliwai (estuary) habitats. The MLCD reef environment is considered to be extremely diverse and productive and has been hailed as an excellent example of coral reef development on the northwestern side of the island. A study by Friedlander et al. (2006) found that 12% of the submerged land in the MLCD is covered in coral, equating to nearly 5.4 acres – one of the highest coral coverage sites on the island of Maui. The other predominant benthic habitats are categorized as 41% turf algae, 35% sand/silt, and 6% macroalgae. The study also found total coral cover was higher in the MLCD than in the surveyed open area by 4%, due to higher percent cover of *Porites lobata* in the MLCD (Friedlander et al., 2006). Honolua Bay may also be a sink for coral larvae originating from Olowalu (Storlazzi & Field, 2008) during favorable conditions and seasons, given the bay's orientation. However, Honolua has experienced a dramatic (~75%) decline in live coral cover since 1990, appearing to be a gradual drop in health due to consistent stressors, as opposed to the result of a single event (Chaston & Oberding, 2007; Dollar & Grigg, 2004; PIFSC, 2017).

Photo: TNC (Chad Wiggins)

Target 2: Fish

Fish live throughout the MLCD and surrounding areas. Nested targets include reef fish and nearshore pelagic fish like akule. The area's extensive and complex coral reef habitat serves as important recruitment grounds for reef fish, growing in abundance and size within the MLCD and "spilling-over" to surrounding areas open to fishing. The Honolua-Mokulēiʻa MLCD is considered to have one of the highest measures of fish biomass compared to other areas surveyed in west Maui (Minton et al., 2020). Herbivores, like parrot fish and surgeon fish, account for 61% of fish biomass, followed by 36% carnivorous and omnivorous species, and 3% apex predators like jacks and sharks, the latter being ten times greater within the MLCD than open areas. Species richness, biomass, and diversity was found to be higher within the MLCD compared to surrounding areas open to fishing across all habitat types, with biomass being almost twice as high in the MLCD, especially over colonized hardbottom areas (Friedlander et al., 2006).

Photo: TNC (Chad Wiggins)

Photo: Russell Sparks

Photo: Trilogy Excursions

Photo: Dan Dennison

Photo: Hawaiian Paddle Sports

Target 3: Protected Species
Spinner dolphins, reef manta rays, and green and hawksbill sea turtles are protected species that frequent the MLCD. Hawaiian spinner dolphins (*Stenella longirostris*) spend their nights feeding offshore and their days in coastal waters and sheltered bays to rest and recuperate, nurture their young, and socialize behaviors that support population health. This behavior makes them one of the most easily encountered cetaceans in Hawaiian waters, consequently making them vulnerable to disturbance and harassment (NOAA, 2016). Hawai'i's threatened green sea turtles (*Chelonia mydas*) rest in several areas along the north and south reefs, with most observed along the northwestern section of Honolua Bay on the reef crest just inside the MLCD boundary (DLNR-DOSP, 2018). Reef manta rays (*Mobula alfredi*) are another protected species that may be vulnerable to human disturbance and precautionary management is recommended in areas with growing tourism and human use (Venables et al., 2016).

Target 4: Community Relationship with the MLCD
Community involvement is essential to conservation success. Thus, this target is focused on active and meaningful engagement of the community in stewardship of the MLCD, including families with ancestral connections. One of the ways the community can be involved in resource management is through an active, diverse, and organized stakeholder advisory group.

Target 5: Natural and Cultural Experience
What are people's natural and cultural experience at the MLCD - Do they experience calm, quiet enjoyment? Are residents able to access the area in addition to visitors? Do residents and visitors appreciate the cultural landscape (e.g. history of the area, place names, archaeological sites)? Do they have basic knowledge of key ecosytem processes, species, Hawaiian place names, and cultural heritage? Because of the high levels of human use in the MLCD, it is imperitive to maintain opportunities for quiet, calm access by Hawaiian cultural practitioners and for local familial practices of passing on knowledge of the place to the next generation, as well as accessibility for Hawaiian/Polynesian voyaging canoes. The natural and cultural experience is a target focusing on revitalizing and protecting the conditions that once made Honolua and Mokulē'ia Bays places where traditional and customary practices were respected, and where all people experience calm, quiet enjoyment and learning, benefitting both people and place.

Threats to Our Targets

Each conservation target is impacted by specific threats. Twelve threats were identified and ranked using specific criteria (**Table 2**). The four highest rated threats were: increased ocean temperature, legacy in-stream sediment, overcrowding and high human use, and overfishing in surrounding areas. Strategies to address local stressors are designed to also increase the area's resilience to climate change. We used in depth threat analyses to help identify priorities for developing conservation strategies.

Table 2. Threat Ranking for the twelve threats identified across priority conservation targets.

Threats Across Targets	Reef Habitat	Fish	Protected Species	Natural and Cultural Experiences	Community Relationship with MLCD	Overall Threat Rank
Increasing temperature/coral bleaching	Very High		High			High
Legacy in-stream sediment + storms/drought	Very High		High			High
Noise from people/ boats in the water			Medium	Very High		High
Number of boats in the water			Medium	Very High		High
Number of people in the water			Medium	Very High		High
Legal fishing within a mile of the MLCD		Very High				High
Overcrowding/high human use		Low	High	High		High
Continued loss of reef habitat		High	Medium			Medium
Increasing pH	High					Medium
Nearshore sediment resuspension	High					Medium
More people diving at cleaning stations			High			Medium
Ungulate-induced sediment	Medium					Low

*The stress is rated in terms of the severity (the level of damage the resource could reasonably expect within 10 years under the current circumstance), and the scope (very widespread to very localized that would be expected within 10 years under the current circumstance). The source of the stress was rated in terms of contribution (is the source acting alone to cause the stress or is it a low contributor to the particular stress?), and irreversibility (the degree to which the effects of a source of stress can be restored). Each of the criteria (severity, scope, contribution, and irreversibility) was ranked on a four-point scale: low, medium, high, and very high.

Threat 1: Increased Ocean Temperature

One of the major characteristics of climate change that can impact the marine resources within the MLCD is increasing sea surface temperature (SST). Increasing SSTs due to climate change have increased the frequency and severity of coral bleaching events in Hawaiʻi and globally. In Hawaiʻi, SSTs have increased 0.22 °F per decade, and this number is likely to rise (SOEST, 2008). When coral is under severe stress, it turns white from the loss of its symbiotic, photosynthetic algae called zooxanthellae, a condition referred to as "bleaching" (Hoegh-Guldberg, 1999). Zooxanthellae provide corals with over 90% of their energy and loss of symbionts can result in reduced growth and reproduction, and potentially death (NOAA, 2020). Peak SSTs in 2015 resulted in significant coral bleaching and mortality, reducing coral cover by over 30%, and surveys conducted in 2019, another summer that experienced elevated SSTs, found ~10% of corals were bleached (Oliver et al., unpublished data; Winston et al., 2020). By mitigating the threats of sediment, high human use, and overharvest, we help the MLCD increase resiliency to withstand and persist through globally driven climate changes.

Threat 2: Legacy In-Stream Sediment

Since 1974, consistent high turbidity and sediment deposits in Honolua's inner bay have been observed and recorded (Chaston & Oberding, 2007). Honolua Bay is a sink for storm runoff and sediment eroded from upland areas deposited by Honolua Stream, its tributaries, and Papua Gulch.

Photo: Bill Rathfon

While Honolua Stream is considered perennial with continuous flow, Papua Gulch is an intermittent tributary that drains into Honolua Stream about 50% of the year (DLNR-DOSP, 2018). A recent Honolua Bay and Līpoa Point Scoping Report (DLNR-DOSP, 2018) reveals that "inferior agricultural soil management practices over the last century have led to significant contributions of sediment into the bay and legacy sediment accumulation in gulches that may still contribute to turbidity and water quality impairment." Former agricultural fields, unimproved roads, and bank erosion from historic terraces are likely the largest source of sediment plumes in west Maui (Stock et al., 2015). With this in mind, Papua Gulch is believed to consist of about five miles of impacted gulch, acting as a major source of loose sediment making its way to Honolua Bay during major rainstorm events.

Based on an assessment using empirical data and understanding of geomorphic processes, the USGS estimates that an annual storm would introduce 91 tons of sediment per year, while a decadal storm would introduce 180 tons of sediment into the bay (Stock, publishing pending review). An additional analysis by Kim Falinski used InVEST modeling to estimate that annual sediment exports were on average 600 tons per year, out of a total of 4,100 tons for west Maui watersheds (K. Falinski, personal communication, May 1, 2020). The model results did not explicitly consider legacy sediments, but did consider historical land use as a predictor for poor current cover conditions.

Hui O Ka Wai Ola, a community-based group that regularly monitors water quality at fixed sites, helped to identify and target sites in west Maui with high levels of turbidity and nutrients. Between 2016 and 2018, their data found Honolua Bay to greatly exceed the Hawaiʻi State standard for turbidity of 0.2 NTU (Nephelometric Turbidity Unit) with a geometric mean of 8.33 NTU (**Figure 2**). Honolua Bay also measured the highest values for west Maui, exceeding 50 NTU five times since 2017, even though samples were not specifically timed to correlate with storm events (Falinski et al., 2020)(**Figure 3**).

Figure 2. Hui O Ka Wai Ola water quality findings for Honolua Bay and other west Maui sites.

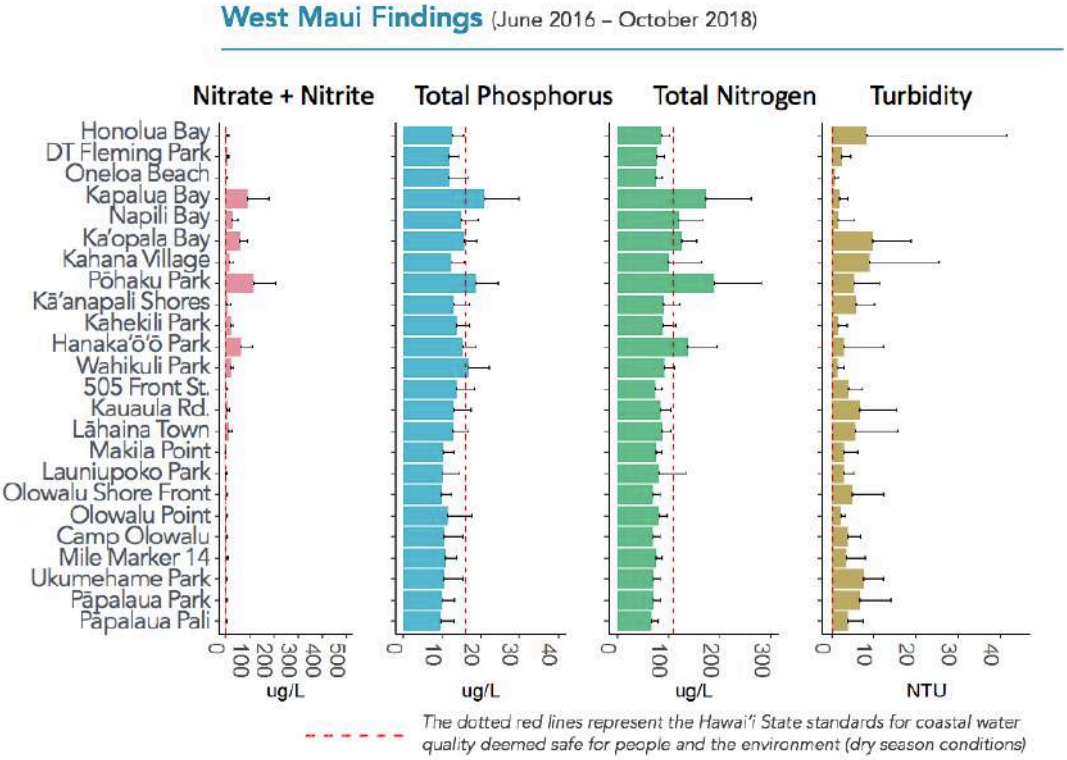
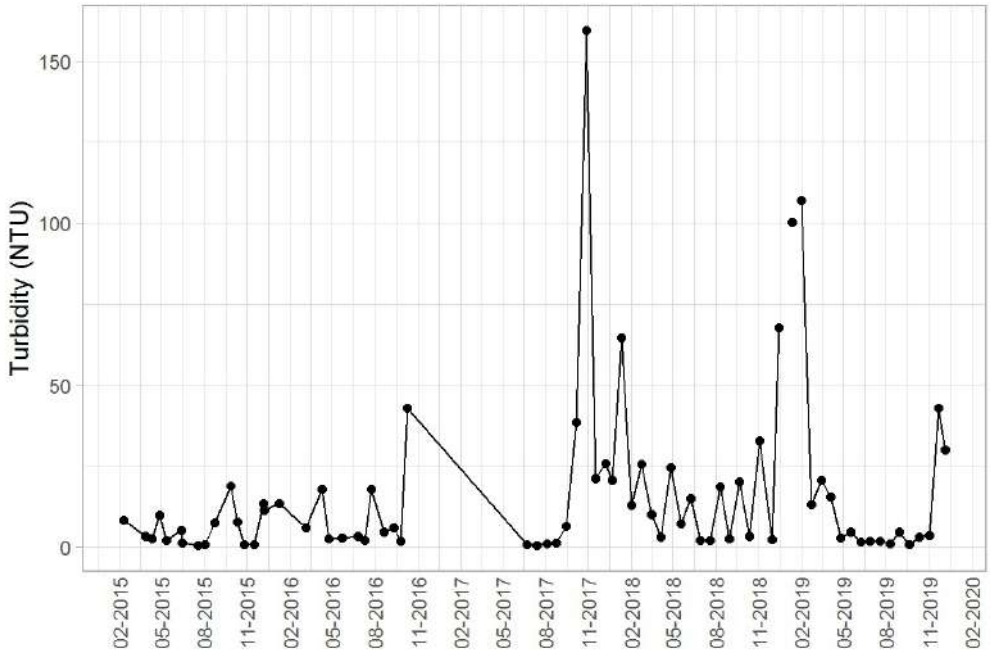


Figure 3. Turbidity over time at Honolua Bay.



Threat 3: Overcrowding and High Human Use

Over 90% of people visiting Honolua Bay are likely visitors (Courtney, 2007). Across the board, increased tourism has led to more commercial and recreational use of coral reefs and nearshore waters, threatening enjoyment and traditional use by local residents. Beaches that were once peaceful are now congested with tourists and water activity rental

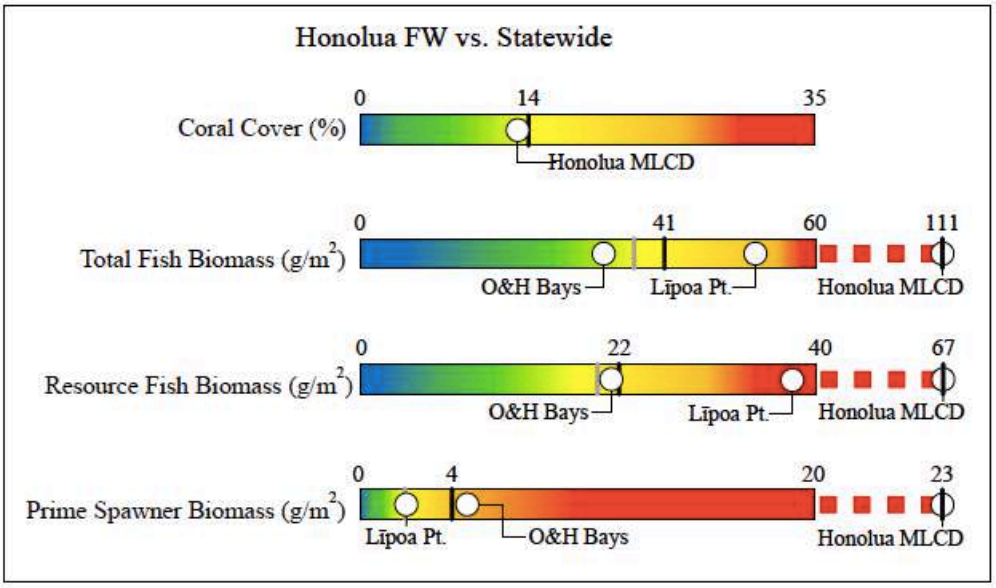
operations, limiting parking and beach access. In addition, recreational and commercial activities such as stand-up paddle boarding, kayaking, snorkeling, diving, and surfing can also result in more direct "strikes" to reefs that damage corals, and can potentially alter marine life behavior (Filous et al., 2017; Gulko et al., 2000; Koike et al., 2018).

Recreational use surveys conducted in the MLCD in 2005 and 2006 found the average number of snorkelers per hour during summer months was 50.7, equaling over 400 snorkelers in an 8-hour day (Komoto, 2009). Records from Honolua Bay naturalists during the summers of 2007-2009 reported 700-800 visitors arriving during six-hour timeframes on numerous occasions (Komoto, 2009). SCUBA divers were observed at 1.6 divers per hour with a maximum of 17 divers observed at one time. Also observed during Courtney's 2005-2006 study were ten 49-passenger commercial tour boats from Kāʻanapali regularly mooring at Honolua Bay, usually visiting between 9am and 2pm for 1.5 to 2 hours. Peak use seasons are February to April, June to July, and November to December. There are 4 legal moorings in the MLCD intended for bow and stern tie ups, but the number of legal and illegal moorings can often double the number of vessels moored in the bays at a time. Studies on displacement effects of human use on coral reef predators (Filous et al., 2017) and Hawaiian spinner dolphins (Courbis & Timmel, 2009) further highlights some negative impacts of tourism.

Threat 4: Overfishing in Surrounding Areas

The West Maui Atlas (Minton et al., 2020) recently pulled together data from surveys conducted by numerous public and private organizations between 1999 and 2018, finding that the Honolua-Mokulēʻia MLCD had the highest total fish biomass - over twice that of the average - for surveyed west Maui sites (**Figure 4**). The effect of the Honolua-Mokulēʻia MLCD on surrounding areas was detectable in the reef fish community, indicating that the harvest regulations within the MLCD are working (Minton et al., 2020). While the MLCD appears to benefit fishes inside the MLCD, and with some resource fish spillover into adjacent reef tracts, fish biomass outside of the MLCD is significantly lower, suggesting overharvest along the border of the MLCD and in surrounding areas.

Figure 4. West Maui Atlas comparison of reef tracts in the Honolua Focus Window (FW) to statewide averages (black vertical line/value) for coral cover and fish biomass. "O&H Bays" stands for Oneloa and Honokahua Bays to the south of Mokulēʻia. (Minton et al., 2020)



Objectives and Strategies

The following five objectives and their subsequent strategies seek to address priority threats and improve the status of reef habitat, fish, protected species, the community relationship with the MLCD, and natural and cultural experience conservation targets.

IMPROVE REEF HABITAT **Objective 1:** Starting now, reduce annual sediment input into Honolua Bay from 2016 levels (91 metric tons/year) by 50% by 2030, and by 90% by 2040.	***Strategies:*** 1.1 Remove legacy sediments from lower Papua Gulch. a. Map out and model opportunities for mechanical removal of bank sediment in concert with micro-basin or other terraced sediment catchment opportunities in lower Papua Gulch (thereby avoiding the amount of sediment-laden water that would mobilize to the ocean), to determine if this would be an effective strategy. b. If this is determined to be an effective intervention, then implement this strategy with landowners and other partners. 1.2 Conduct sediment reduction activities in Papua Gulch, Honolua Stream, and priority surrounding areas. a. Conduct a small-scale pilot project at lower Papua Gulch using bank stabilization methods already researched for use in west Maui to determine if it is feasible and effective for larger scale implementation. b. Plant native species on seven acres at Field 52, and hydro-mulch and/or plant agriculture push piles and barren land along Papua Gulch and Honolua Stream to prevent more soil from washing into streams and gulches. c. Maintain Puʻu Kukui Watershed Preserve's Honolua boundary fence at 400ft elevation and conduct feral ungulate control within the fenced area to prevent soil erosion from the watershed. d. Continue to work with managers of State lands surrounding the MLCD to reduce and prevent sedimentation (see DLNR's Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa when completed). 1.3 Conduct monitoring to measure changes over time. a. Conduct long-term consistent coral reef monitoring. b. Conduct long-term consistent water quality and turbidity monitoring.

INCREASE FISH ABUNDANCE, BIOMASS, AND DIVERSITY **Objective 2:** Sustain long-term community benefits by increasing the biomass of reef fish outside the MLCD boundary from Makāluapuna Point to Līpoa Point by 300% by 2030.	***Strategies:*** 2.1 Improve reef fish biomass in and around the MLCD. a. Work with community and other stakeholders to establish a potential marine management area adjacent to MLCD from Makāluapuna Point to Līpoa Point (area of interest), emphasizing the role of the MLCD as a beneficial source of spill-over into this area. 2.2 Monitor changes over time to inform management. a. Sustain annual in-water visual survey monitoring efforts of the reef and reef fish both inside and outside the MLCD to measure change over time. b. Conduct fisheries intercept surveys in the areas surrounding the MLCD to inform data-driven management decisions for a potential marine management area.

REDUCE IMPACTS TO PROTECTED SPECIES **Objective 3:** Understand and protect conditions needed for protected species (Hawaiian spinner dolphins, reef manta rays, and sea turtles) to engage in optimal behaviors in the MLCD by 2025.	***Strategies:*** 3.1 Conduct a study to understand behaviors of Hawaiian spinner dolphin pods, reef manta rays, and sea turtles in the MLCD and surrounding areas. 3.2 Understand how human use impacts the behaviors of protected species. 3.3 Incorporate findings into the commercial use permit system, guidance to boaters, educational and outreach guidance for visitors to the MLCD, and other management actions as needed.

IMPROVE COMMUNITY MLCD ENGAGEMENT **Objective 4:** Increase and maintain community involvement in MLCD management by 2022.	***Strategies:*** 4.1 Formalize community involvement in resource management in the MLCD by organizing a stakeholder advisory group to work with DLNR on a regular and ongoing basis (in coordination with DLNR's Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa). 4.2 Provide opportunities for the community to be involved in meaningful resource management within the MLCD and surrounding lands (in coordination with DLNR's Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa).

IMPROVE NATURAL AND CULTURAL EXPERIENCE **Objective 5:** Reduce the number of people within the MLCD and surrounding areas at peak times to a sustainable level (to be determined by carrying capacity study) by 2025 in order to reduce negative impacts to resources and people.	***Strategies:*** 5.1 Conduct studies to determine and establish appropriate levels of use and visitation. a. Conduct a social carrying capacity study for the MLCD, balancing the user perceptions of residents, cultural practitioners, and visitors. b. Conduct a study that measures ecological responses of key species to levels of human use in MLCD. c. Conduct a cultural and historical study of the area (using both primary and secondary sources of information). 5.2 Reduce crowding through management tools aimed at lessening stress to marine life and the people who visit the MLCD. a. Develop and implement a Honolua-Mokulēiʻa MLCD commercial use permit system. i. Set boat size and passenger limits. ii. Set maximum limit for number of boats at any given time. iii. Prohibit anchoring by commercial boat operators. iv. Address the need for dedicated non-commercial day-use moorings. v. Develop a system to give preferential treatment for periodic visits by Polynesian/Hawaiian voyaging canoes. vi. Develop materials to educate and encourage commercial operator compliance with permit system. vii. Regulate activities, noise, and other concerns as appropriate. 5.3 Work to reduce human impacts to natural and cultural experience and resources (in coordination with DLNR's Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa). a. Engage experts and community members to develop and disseminate educational materials and a code of conduct to minimize impact and increase appreciation and awareness of the area and MLCD. b. Explore weekly day(s) of rest for Honolua and Mokulēʻia Bays for all users (e.g. no commercial use on Sundays and holidays following the County's example). c. Explore days where community-engaged stewardship activities take place (e.g. Kuleana Days). d. Explore a community group-State partnership to provide on-site education and management potentially funded by a user fee following a Makai Watch model. e. Explore a limited parking plan.

Monitoring and Evaluation

DLNR-DAR on Maui, the project lead, is supported by the multi-disciplinary CAP team. The CAP team will convene at least once a year through 2025 to develop an annual work plan, oversee implementation activities, review the results of monitoring efforts, and adaptively manage based on the information generated. As needed the team will coordinate with DLNR on the Management Plan for the Makai Lands of Honolua and Honokōhau Ahupuaʻa. The CAP team is committed to both monitoring (assessing progress) and learning (analyzing, adapting, and sharing lessons) to improve conservation in and around the MLCD.

This project seeks to actively monitor changes over time related to both target status and management actions, and to assess whether these changes are achieving our conservation objectives. To this end, the CAP team and partners are collecting and will continue to collect data on a number of indicators that gauge the status of a target, change in a threat, or progress towards an objective. These indicators inform us of the progress made towards accomplishing our objectives over time (**Table 3**). This process enables us to periodically evaluate this CAP and adaptively manage the MLCD by allowing for adjustments to be made based on what we learn from monitoring and implementation. This in turn permits us to capitalize on changing circumstances and crises and contribute new insights and ideas to management.

In five years, the CAP team will review the overall performance of the CAP with respect to stated targets and objectives: identify specific accomplishments, identify failures and shortcomings in the execution of the CAP, assess the validity of the conservation mechanisms and strategies, and formulate recommendations for future action.

Photo: TNC (Manuel Mejia)

Table 3. Monitoring for biophysical and social-cultural indicators.

Honolua–Mokulēʻia MLCD Monitoring for Key Indicators				
Objective	Indicators	Methods	Who	Frequency
1. Starting now, reduce annual sediment input into Honolua Bay from 2016 levels (91 metric tons/year) by 50% by 2030, and by 90% by 2040.	Coral cover	Belt transect surveys	DAR	Annual
	Water clarity/turbidity	DOH quality assured coastal water quality methods	Hui O Ka Wai Ola	Every 3 weeks
		Analyze R2R's shoreline camera data	TBD	TBD
2. Sustain long-term community benefits by increasing the biomass of reef fish outside the MLCD boundary from Makāluapuna Point to Līpoa Point by 300% by 2030.	Total reef fish biomass inside/outside MLCD	Belt transect surveys	DAR	Annual
3. Understand and protect conditions needed for protected species (Hawaiian spinner dolphins, reef manta rays, and sea turtles) to engage in optimal behaviors in the MLCD by 2025.	Size of spinner dolphin pod and frequency; number of reef manta rays and frequency	Drone surveys	TBD	Daily
4. Increase and maintain community involvement in MLCD management by 2022.	Existence and continuance of stakeholder advisory group	Presence/absence	DLNR	Annual
	Number of people involved in MLCD management opportunities	Counts per event	TBD	Ongoing
5. Reduce the number of people within the MLCD and surrounding areas at peak times to a sustainable level (to be determined by carrying capacity study) by 2025 in order to reduce negative impacts to resources and people.	Number of people at peak use times	Count number of people from overlook	DLNR	8 randomly selected days per month

Appendix A: Target Viability, Indicators, and Condition

1. Reef Habitat: Key Ecological Attributes, Indicators, and Ranking

Key Attribute	Indicator	Poor Condition	Good Condition	Current Condition
Coral cover	% coral cover on hard bottom at CRAMP sites	0-10%	40-74%	Poor
Coral health	Coral disease/mortality	Lots of coral disease, bleaching, partial colony mortality	Some/low coral disease, bleaching, partial colony mortality	Fair
Coral recruitment	Average density	> 5 baby corals	17-30 baby corals	Poor
Reef builder ratio	Ratio of calcifying species to non-calcifying species	< 1:25	> 1:1	Fair
Structural complexity	Rugosity	1	3 to 4	Good
Water clarity	Water clarity/ turbidity	< 50% of time clear. ≤ 30ft visibility	80% of time clear. 50-80ft visibility	Fair
	% days/year the water is brown	30-100% of the time	5-15% of the time	Poor
	Metric tons of sediment entering Honolua Bay/yr	≥ 90 metric tons of sediment/yr	≤ 22 metric tons of sediment/yr	Poor
Fresh water inputs	Subsurface and Surface Flow	0-10%	Consistently fresh water flowing	Good

2. Fish: Key Ecological Attributes, Indicators, and Ranking

Key Attribute	Indicator	Poor Condition	Good Condition	Current Condition
Total reef fish biomass inside MLCD	Grams/meter^2 inside MLCD	> ~40	~80-120	Good
Total reef fish biomass outside MLCD	Grams/meter^2 outside MLCD	> ~40	~80-120	Poor
Fish size class structure (includes prime spawners)	Grams/meter^2	> 7	~15-25	Good
Herbivore Biomass	Grams/meter^2	≥ 10	30-80	Good
Reef Predator Biomass	Grams/meter^2	0-0.25	0.75-2	Fair
Akule Abundance/Frequency	School size and frequency	Infrequent/small school size	Frequent, large school size	Fair

3. Protected Species: Key Ecological Attributes, Indicators, and Ranking

Key Attribute	Indicator	Poor Condition	Good Condition	Current Condition
Size of dolphin pod, duration and consistency of time in the bay	Observation of pod; size of pod; duration and consistency of time spent in bay	Dolphin pods are rarely or sporadically sighted in bay for short periods	Dolphin pods spotted in the bay much (e.g. 50%) of the year; pod size _____	Fair
Size of reef manta ray group, duration and consistency of time in the bay	Observation of group; size of group; duration and consistency of time spent in bay	Manta rays are rarely or sporadically sighted in bay for short periods	Manta rays spotted in the bay much (e.g. 50%) of the year; group size 12	Good
Size of sea turtle (green and hawksbill) group, duration and consistency of time in the bay and tumor prevalence	Observation of group; size of group; duration and consistency of time spent in bay	Sea turtles are rarely or sporadically sighted in bay for short periods	Sea turtles spotted in the bay much (e.g. 50%) of the year; group size 20	Good
Presence/absence of tumors on sea turtles	Tumor prevalence	Tumors regularly (> 25%) seen on turtles	Tumors sometimes (> 5%) seen on turtles	Good
Presence/Absence of Active Cleaning Station(s)	Presence/Absence of cleaner wrasses	Cleaner wrasses are absent from the bay	Cleaner wrasses present in the bay	Good

4. Community Relationship with MLCD: Key Ecological Attributes, Indicators, and Ranking

Key Attribute	Indicator	Poor Condition	Good Condition	Current Condition
Community involvement and engagement	Active community participation in stewardship	No active community engagement	Community actively and meaningfully engaged, including families with ancestral connections	Good
Community involvement in resource management	Stakeholder advisory group is recognized, organized	No advisory group	Active and diverse stakeholder advisory group working with DLNR	Fair

5. Natural and Cultural Experience: Key Ecological Attributes, Indicators, and Ranking

Key Attribute	Indicator	Poor Condition	Good Condition	Current Condition
Calm, quiet enjoyment	Degree of crowding: # of people (not surfers) in water at any given time at peak use time	Majority of users (> 50%) report crowding conditions	Few users (< 10%) report crowding conditions	Poor
	Degree of crowding: # of commercial tour boats in the water at peak use time	Majority of users (> 50%) report crowding conditions	Few users (< 10%) report crowding conditions	Poor
	Degree of anthropogenic noise at peak use time	Users often don't hear noises of nature (e.g. waves, wind, birds); loud or intrusive noises often present	Users mostly hear sounds of nature (e.g. waves, wind, birds); loud or intrusive noises rarely heard	Fair
Resident public access/condition	Degree of access of Maui residents at peak use time	Majority of users report inability to access the area (parking, moorings, trail)	Majority of users report ability to access the area (parking, moorings, trail)	Fair
User knowledge of natural and cultural history, practices, and protocols	Basic knowledge of key ecosystem processes, species, place names, and cultural heritage	Most users (> 75%) do not have basic knowledge of most factors	Most users (> 75%) have basic knowledge of most factors	Poor
Opportunity for cultural use	Presence/absence of Hawaiian cultural practitioners	Hawaiian cultural practitioners have very limited or no access to area	Hawaiian cultural practitioners have ability to access area	Fair
	Priority access for voyaging canoes	Voyaging canoes do not have access to area	Voyaging canoes have priority access to area	Fair
	Inter-generational learning taking place	Hawaiian families connected to that places don't teach kids bc crowded	Hawaiian families teach kids about place and resources	Fair

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