

CHAPTER 5: MARINE CONSERVATION NEEDS

Due to the large number and the varied geology of the islands, Hawai‘i has diverse marine habitats, which range from estuaries, tidepools, sandy beaches, and seagrass beds to nearshore deep waters, extensive fringing and atoll reef systems, and smaller barrier reef systems. However, introduced mangroves have altered native habitat in a number of places. Because of Hawaii’s geographical isolation, many of its coastal and marine species are endemic. Approximately 15 to 20 percent of the marine species are endemic, one of the largest proportions of marine endemism for any island chain in the world. Yet because of the isolation, Hawai‘i has relatively low marine species richness, with approximately 580 different shallow reef fish in contrast to areas of the Pacific further west with thousands of species. In total though, Hawai‘i still has over 6,000 marine species.

The distribution of marine ecosystems in Hawai‘i is a result of island age, reef growth, water depth, exposure to wave action, geography, and latitude. The marine habitats found on each island depend on the type of island: large and young, mature, or drowned islands. Large and young islands such as the island of Hawai‘i have recent lava flows and few, living structural coral reefs. Beaches are rocky except around bays, and drowned reefs may be found in deep waters or off parts of the east coast of Maui. Mature islands, such as O‘ahu and Kaua‘i in the Main Hawaiian Islands (MHI) and Nihoa and Necker in the Northwestern Hawaiian Islands (NWHI) are the most diverse, with habitat types ranging from estuaries and sandy beaches to rocky beaches and fringing and barrier reefs to lagoons with patch or pinnacle reefs. Drowned islands, such as atolls in the rest of the NWHI, are the remains of volcanic islands with habitats ranging from coral islets and benches to caves and terraces along the slope of the atoll.

OVERVIEW

Geology

The Hawaiian Archipelago consists of eight large islands and approximately 124 small islands. Many smaller sandy islands in the northwest are intermittent, depending on storms, waves, and currents for their existence and are now threatened by climate change and associated rising sea levels. The MHI are high islands, meaning they are mountainous with rocky headlands, narrow coastal plains, and ringed by beaches or rocky coastline. These high islands are often surrounded by fringing coral reefs with barrier-like reefs off small sections of the coast of O‘ahu and Kaua‘i. The NWHI are low islands, worn down by subsidence and erosion. They remain only as rings of reef that encircle a lagoon. Although the State of Hawai‘i is forty-ninth in size, it has approximately 1,336 kilometers (830 miles) of coastline, giving it the fourth highest length of coastline among all the coastal states in the United States. Coastline length for each of the islands is as follows: Hawai‘i 428 kilometers (266 miles), Maui 193 kilometers (120 miles), Kaho‘olawe 47 kilometers (29 miles), Lāna‘i 76 kilometers (47 miles), Moloka‘i 142 kilometers (88 miles), O‘ahu 180 kilometers (112 miles), Kaua‘i 145 kilometers (90 miles), Ni‘ihau 72 kilometers (45 miles), and NWHI 50 kilometers (30 miles).

Climate and Oceanography

The waters surrounding Hawai‘i are affected by seasonal variations in climate and ocean circulation. The surface temperature of the oceans around Hawai‘i follow a north-south gradient and range from 24 °C (75 °F) in the MHI to 20 °C (68 °F) to 22 °C (72 °F) in the NWHI in winter

and spring to 26 °C (79 °F) to 27 °C (81 °F) throughout all the islands in the late summer and fall. The depth of the thermocline, where water temperature reaches ten degrees Celsius (50 °F), is 450 meters (1,500 feet) northwest of the islands and 300 meters (1,000 feet) off the island of Hawai‘i. Surface currents generally move east to west and increase in strength moving southward. The seas are rougher between islands than in the open ocean, because wind and water are funneled through the channels. Waves are larger in the winter months than in the spring and are generally bigger on the northern shores of the islands than the southern shores. Marine organisms have adapted to these general climatological and oceanographic conditions.

Land and Water Use

Most waters and submerged land from the shore out to at least three miles (five kilometers) are technically owned by the State with some authority exercised by the Federal government. Offshore waters out to 12 to 200 miles (19 to 322 kilometers) are regulated by a variety of Federal agencies. The Hawai‘i Department of Land and Natural Resources (DLNR) Division of Conservation and Resource Enforcement is responsible for enforcing many of the State’s marine laws while Federal enforcement authority is granted to the U. S. Coast Guard, the U. S. Navy, the U. S. Marines, and the National Oceanic and Atmospheric Administration (NOAA) Office for Law Enforcement. The DLNR Division of Boating and Ocean Recreation regulates boating and commercial tourism activity.

Management authority for the nearshore marine waters is the responsibility of a variety of State and Federal agencies including the Hawai‘i DLNR, the Hawai‘i Department of Transportation (DOT), the Hawai‘i Department of Health (DOH), NOAA’s National Marine Sanctuaries Program, U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), and the U. S. Military. Much of the water surrounding Maui County and smaller areas off Kīlauea Point National Wildlife Refuge on Kaua‘i, parts of the north and southeast coast of O‘ahu, and the northwest coast of the island of Hawai‘i are protected as a part of the Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS). The Hawaiian Islands National Wildlife Refuge protects marine species generally out to ten fathoms (18 meters) of depth off the NWHI. The USFWS helps manage hawksbill sea turtle nesting off the Keālia Pond National Wildlife Refuge (NWR) on Maui. The NPS manages marine habitats off Kalaupapa National Historic Park (NHP), Kaloko-Honokōhau NHP, and Hawai‘i Volcanoes National Park. The U.S. Navy is responsible for Pearl Harbor and waters near Kāne‘ohe Marine Corps Base on O‘ahu, the Pacific Missile Range Facility off Kaua‘i, and other smaller training areas. Waters under military jurisdiction provide de-facto protection of species and habitats, because public access is often restricted. The DLNR Division of Aquatic Resources (DAR) manages 11 Marine Life Conservation Districts, 19 Fish Management Areas, nine Fish Replenishment Areas, two Wildlife Sanctuaries, 18 Bottomfish restricted areas, and the South Kona ‘Ōpelu fishing area in addition to implementing general, statewide fishing regulations. The DLNR Division of Forestry and Wildlife (DOFAW) manages the waters of ‘Āhihi Kīna‘u Natural Area Reserve (NAR) on Maui. The Kaho‘olawe Island Reserve Commission manages waters from the shores of Kaho‘olawe out to two miles (three kilometers). The DOT-Harbors Division controls access to the ten commercial harbors in the State and numerous recreational harbors.

Human Landscape

Much of the State's economy is based on the island's coastal and marine resources. Tourism accounts for the majority of the State's economy, with a significant portion of the tourist activities associated with beaches and marine wildlife. Coastal development and land values have both increased with the growth in tourism. In 2002, the Coral Reef Initiative funded a study regarding the economic valuation of the coral reefs of Hawai'i, where the value of coral reefs to the Hawai'i economy was estimated to be \$380 million dollars a year. Fishing also contributes to the State's economy and commercial landings increased greatly in the 1990s.

The military has a significant presence in Hawai'i with large Naval installations located on estuarine and coastal areas such as Pearl Harbor and Kāne'ōhe Bay on O'ahu and the Pacific Missile Range Facility on the south shore of Kaua'i. Point source pollution in the marine environment originates from a variety of sites including: Pearl Harbor, Hickam Air Force Base, ten oil refineries and terminals, 25 power plants, 1,860 storm drain wells, and 100,000 cesspools. Discharges from cruise ships and tour boats are of current public concern. Hawaii's DOH lowered their permit standards for injection wells, contributing to nutrient increases and algal blooms in some areas. Non-point source pollution from the agricultural sector has decreased as agriculture has declined; however, domestic non-point source pollution has increased.

SPECIES AND HABITATS OF IMPORTANCE

All marine habitats in Hawai'i are considered important for conservation, because each habitat has characteristic fish and invertebrate assemblages unique to that habitat. The marine habitats that are represented in Hawai'i include: tidepools, rocky beaches, sandy beaches, estuaries where fresh and salt waters mix, seagrass beds, fringing reefs, barrier reefs, atolls, deep reefs, sand, pelagic (open near-surface water), mesopelagic (middle depths with some light and vertical migration of organisms living there), bathypelagic (deeper waters with no light), and deep bottom. A more detailed classification of habitats can be found in Maragos and Gulko (2002). Although outside the marine habitat, adjacent terrestrial habitats along the coast or within *ahupua'a* (watersheds) impact the ocean and play a large role in the health of marine habitats and species.

Appendices A and B provides information on the marine fauna and flora Species of Greatest Conservation Need (SGCN), with more specific taxa information found in Chapter 7. Marine species in Hawai'i include over 1,200 species of fishes, with around 500 species adapted to live on coral reefs, and the rest adapted to the pelagic open surface waters, mesopelagic or bathypelagic zones (middle or deep waters), estuaries, or sandy bottoms. At the top of the food chain are the apex predators such as the many sharks of Hawai'i. The SGCN list includes 154 marine fishes. Over 5,000 marine invertebrates are known from Hawai'i and include over 100 species of hard, soft, and precious corals as well as hundreds of types of snails, crabs, shrimps and small numbers of worms, jellyfish, sponges, starfish, and tunicates. One-hundred and ninety seven species of marine invertebrates are listed in the SGCN list. Six marine reptiles occur in Hawai'i. Two sea turtles are common residents that nest here and three others are more occasional visitors. All sea turtles are listed as threatened or endangered under the Endangered Species Act and are listed on the SGCN list. Approximately 26 species of marine mammals are resident or occasional visitors to Hawai'i. All are protected by the Marine Mammal Protection Act and are on the SGCN list. These include the migratory humpback whales or koholā (*Megaptera novaeangliae*) that breed and give birth during the few months each year they spend

in Hawaiian waters, as well as the popular spinner dolphins (*Stenella longirostris*) and bottlenose dolphins (*Tursiops truncatus*). Koholā (humpback whales) and Hawaiian monk seals (*Monachus schauinslandi*) are the only common marine mammals in Hawai‘i listed as endangered by the USFWS. Many of the resident whales and dolphins feed on fishes and squids that occur in the moderately deep waters off Hawaii’s coasts. There are 78 species of endemic marine algae, 24 species of endemic freshwater algae, and two aquatic plants on the flora SGCN list.

SUMMARY OF KEY THREATS TO SPECIES AND HABITATS

Many general threats to native wildlife and habitats are discussed in Chapter 4 (Statewide Conservation Needs) including a discussion on threats common to both the terrestrial and marine environment. Threats that are more acute or specific to the marine environment are listed below.

- Localized excessive extractive use: technical “overfishing” (i.e., too much fishing effort in the fishery) has been declared for bottomfishes by the Federal government. Data to meet technical determination of overfishing is lacking for most other species, but there are concerns about aquarium species, ‘opihi (limpets), uhu (parrotfishes), and other species. Extraction for research purposes may also lead to localized excessive extractive use;
- Fisheries bycatch, including reef fishes, sea turtles, Hawaiian monk seals (*M. schauinslandi*), other marine mammals, and seabirds caused by actively fished lay (gill) nets, ulua slide-bait fishing, and ghost nets, lines, and traps;
- Urbanization and coastal alteration including harbors, seawalls and other structures, land reclamation, and commercial and residential development too close to streams and beaches;
- Recreational overuse including trampling, anchor damage, watercraft disturbance, and SCUBA;
- Alien species including algae, fishes, and invertebrates as outlined in Hawaii’s Aquatic Invasive Species Management Plan;
- Hull fouling of recreational boats and ballast water in commercial vessels that acts as a source of alien species;
- Pollution from upstream sources, as well as oil spills, nearshore sewage, cruise ship wastes, tour boat discharge, and other marine users;
- Sedimentation and eutrophication (water pollution due to too many nutrients) from upstream or coastal land use;
- Noise from boats, sonars, drilling, experiments such as the Acoustic Thermometry of Ocean Climate (ATOC) experiment, and other sources that may disturb or harm marine mammals and other wildlife;
- Light pollution from coastal developments can cause disorientation and fatality for both nesting sea birds (birds fall out of nests) and sea turtles (newly hatched turtles make their way toward light sources, often roadways, instead of to the ocean);
- Marine debris such as nets and plastics that can entangle and harm animals as well as be ingested by them;
- Dolphin and sea turtle watching that may alter species’ behavior or habitat use. Shark watching in federal waters may alter gamefish or shark behavior and distribution;
- Feeding wildlife that may sicken or alter behavior of native wildlife;
- Offshore aquaculture that may harm marine organisms through entanglement, habitat loss, pollution, and escape of genetically modified organisms. Includes deep water

species that may be threatened by new Federal proposal to lease areas in U.S. territorial waters;

- Increased interactions with monk seals which are more abundant and now birth on all the MHI;
- Ship strikes that may kill or injure marine mammals or sea turtles;
- Ship groundings that can harm or destroy corals and can result in oil or toxic spills;
- Lack of enforcement of existing regulations and appropriate penalties for violations;
- Lack of adequate funding for conservation and research.

MARINE STRATEGIES

In addition to the statewide strategies identified in association with the seven conservation objectives in Chapter 4 (Statewide Conservation Needs) (main bullet below) and throughout Chapter 6 (Island Conservation Needs), additional strategies for marine species and habitats include the following (sub-bullet):

- Maintain, protect, manage, and restore native species and habitats in sufficient quantity and quality to allow native species to thrive.
 - Support existing conservation management and implement future needs as identified below in ‘Management Needs’ section;
 - Develop and implement conservation programs for federally protected marine species in coordination with NOAA and USFWS;
 - Obtain and implement the plans of an Incidental Take Permit for sea turtles and monk seals;
 - Ensure marine noise, ocean-user disturbance, and fish feeding are adequately managed;
 - Review the status of all Marine Managed Areas (MMAs) and consider altering boundaries or adding new MMAs;
 - Develop access and monitoring plans for MMAs;
 - Expand current capability to respond to protected species strandings;
 - Increase efforts to remove marine debris in the MHI;
 - Support development of an expanded CWCS that fully integrates aquatic algae and plants;
 - Collaborate to better manage development and coastal alteration; oil, boat, and land-based sewage and pollution; light pollution; aquarium fish and invertebrate exports; offshore aquaculture; shark watching; and ship groundings and strikes.
- Combat invasive species through a three-tiered approach combining prevention and interdiction, early detection and rapid response, and ongoing control or eradication.
 - Support implementation of Hawaii’s Aquatic Invasive Species Management Plan and other identified actions;
 - Increase inspection and other “prevention” measures to prevent high-risk invasive species and diseases from entry into the State, or to islands where they are not currently found;
 - Implement rapid response teams to detect and eradicate invasive species;
 - Monitor for non-native marine algae and respond if detected;
 - Decrease the number of invasive species or the total area of invasive species coverage in aquatic and marine ecosystems;

- Encourage compliance with upcoming ballast water regulations and support development of similar regulations for hull fouling;
- Research and employ methods to mitigate threats from invasive species;
- Support a coordinated statewide invasive species public outreach program with shared resources and responsibilities among cooperating entities.
- Develop and implement programs to obtain, manage, and disseminate information needed to guide conservation management and recovery programs.
 - Develop database of all aquatic species in order to track information on biology, ecology, threats, monitoring and conservation actions;
 - Continue the MHI RAMP (Research and Monitoring Program) cruise and other collaborations between NOAA and DAR to monitor windward MHI reefs;
 - Complete Marine Gap Analysis Program (GAP) analysis and integrate into decision-making process of Federal, State, and local agencies, and non-governmental organizations that manage Hawaii's waters;
 - Improve information sharing among agencies, non-governmental organizations, and academia through support of programs such as the Hawai'i Marine GAP, the Western Pacific Fisheries Information Network, the Pacific Basin Information Node, and the Bishop Museum Hawai'i Biological Survey;
 - Seek to expand funding for monitoring of other habitats (e.g., deep waters, sandy habitats, shallow water, and tidepools, etc.).
- Strengthen existing and create new partnerships and cooperative efforts.
 - Expand and strengthen existing partnerships and cooperative efforts by formalizing partnerships or by adding new partners;
 - Collaborate with the U.S. government to implement coordinated protections for marine species in a marine protected area in the NWHI and resolve fishing issues there;
 - Enhance partnerships with federal enforcement agencies including the U.S. Marine Corps, U.S. Coast Guard, and NOAA Office for Law Enforcement;
 - Support the Local Action Strategies projects in Honolua Bay, Maui; Kawela to Kapualei, Moloka'i; and Hanalei Bay, Kaua'i and other watershed management partnerships and groups that seek to decrease non-point source pollution;
 - Increase the scope of community involvement in local conservation efforts by consulting with *kupuna*;
 - Support community based management programs like the West Hawai'i Regional Fisheries Management Council;
 - Collaborate with other land managers to utilize the *ahupua'a* approach to better manage freshwater and marine systems in recognition of their connectedness;
 - Collaborate with DOH to protect other sensitive marine ecosystems by improving water quality;
 - Collaborate to decrease the number of coastal stations listed as impaired for water quality by DOH;
 - Continue and enhance partnership among DLNR, HIHWNMS, National Marine Fisheries Service (NMFS) Pacific Island Regional Office and Pacific Islands Fisheries Science Center for marine wildlife conservation.
- Expand and strengthen outreach and educational efforts to improve understanding of our native wildlife resources among the people of Hawai'i.

- Seek to expand current educational programs to provide the public a sense of individual stewardship responsibility through ocean user's workshops, newsletters, brochures, posters, school and community group visits, and public service announcements;
- Include issues of incidental take of marine protected species in educational and outreach programs;
- Encourage public participation and stewardship by expanding volunteer opportunities to contribute to native wildlife conservation;
- Encourage and support business sector-led initiatives to effectively incorporate native wildlife considerations into their business models, with a focus on aquaculture, fisheries, and tourism industries;
- Improve conservation education of visitors and the tourism industry on the appropriate use of natural areas, particularly sensitive habitats and areas;
- Collaborate to increase compliance with existing laws through outreach and educational programs and support for increased enforcement capacity.
- Support policy changes aimed at improving and protecting native species and habitats.
 - Increase the number of species protected in the HIHWNMS by collaborating with NOAA in the ongoing review process;
 - Review fishing regulations to insure they adequately protect game and non-game species;
 - Encourage regulation requiring permits for take of all marine species;
 - Encourage regulation for blanket extractive limits for non-game species extracted for research, recreation, and commerce purposes;
 - Improve management of lay (gill) nets in State waters;
 - Implement new or revised MMA rules and/or boundaries;
 - Collaborate to revise and implement policies on anchor damage and use, watercraft disturbance, recreational overuse, marine debris, use of biodiesel fuels, and boat pump-out stations;
 - Support development and implementation of a comprehensive coastal policy;
 - Increase conservation enforcement efforts on all State-owned waters through increased funding for trained enforcement officers;
 - Strengthen regulations for import and export of aquatic, non-native species that rely on the precautionary principal.
- Enhance funding opportunities to implement needed conservation actions.
 - Develop new sources of State funding to support and expand conservation management in State waters including identified management actions;
 - Support increased funding for enforcement.

PLANS AND TOOLS TO AID MANAGEMENT

Management plans and tools exist to address some of the threats listed in the Summary of Key Threats to Species and Habitats section. Many apply to the entire marine ecosystem.

- The Ocean Resources Management Plan was developed by a multi-agency effort in order to guide management of ocean resources. There are plans to update it in the near future. (Hawai'i Department of Business, Economic Development, and Tourism (DBEDT) 1991);

- The Western Pacific Fisheries Management Council has Fisheries Management Plans that guide fishing for Bottomfish and Seamount Fisheries; Precious Corals, Crustaceans, Coral Reef Ecosystems, and Pelagic species. Available at: www.wpcouncil.org;
- The Aquatic Invasive Species Management Plan of DAR addresses prevention and eradication of marine invasive species. Available at: http://www.hawaii.gov/dlnr/dar/pubs/ais_mgmt_plan_final.pdf;
- The Hawaiian Islands Humpback Whale National Marine Sanctuary has a five year management plan. Available at: <http://www.hihwnms.nos.noaa.gov/planreview/hihw/sanctuaryrevised.html>;
- The Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve has an operations plan. Available at: <http://www.hawaiiireef.noaa.gov/documents/welcome.html>;
- The Hawai‘i Biodiversity and Mapping Program (formerly the Hawai‘i Natural Heritage Program) initiated the Marine Gap Analysis Program (Marine GAP) for DAR. This program was originally established to identify key areas for protection based on a variety of variables such as biodiversity. Information available at: <http://www.hinhp.org/mgap/>;
- The Hawaii Biological Survey (HBS) is an ongoing natural history inventory of the Hawaiian Archipelago. It was created to locate, identify, and evaluate all native and non-native fauna and flora within the State, and to maintain the reference collections of that biota for a wide range of uses. It is managed by the Bishop Museum. Information and data available at: <http://hbs.bishopmuseum.org/>;
- The Western Pacific Fishery Information Network (WPacFIN) is a Federal and State partnership for collecting, processing, analyzing, sharing, and managing fisheries data from American island territories and states in the Western Pacific. Information and data available at: <http://www.nmfs.hawaii.edu/wpacfin/>;
- NOAA Coastwatch uses a variety of satellite remote sensing datasets in an effort to better monitor and analyze the central Pacific Ocean. Information and data available at: <http://coastwatch.nmfs.hawaii.edu/>;
- NOAA's Coral Reef Information System (CoRIS) is designed to be a single point of access to NOAA coral reef information and data products, especially those derived from NOAA's Coral Reef Conservation Program. Information and data available at: <http://www.coris.noaa.gov/>.

MANAGEMENT NEEDS

Current Management of Species and Habitats

Under Hawai‘i Revised Statutes 190-1, all marine waters of the State are a “marine conservation area.” Although this legislation provides no additional protection (beyond authorizing the establishment of MLCDs), it recognizes the importance of marine waters to the well-being of the State and provides DLNR with the authority to manage ocean resources. The following segment addresses the current management actions and future needs of key habitats of Hawaii’s marine environment. The discussion of future management needs is highlighted within each current managed area.

Future activities regarding ocean management are being considered by all agencies with management authority over marine wildlife. Revisions to catch limits, areas, and methods are being considered by DAR. The entire system of State marine managed areas is also being reviewed to ensure consistency in designated use and purpose and to consider additions or

modifications to current marine managed areas. The Hawaiian Islands National Wildlife Refuge in the NWHI is updating their management plan. Hawaii's DLNR is moving forward with plans to manage State waters in the NWHI as a Marine Refuge. The NWHI Coral Reef Ecosystem Reserve is being considered for conversion to a National Marine Sanctuary by NOAA that could include co-management with DLNR in State waters there. A bill in Congress proposes setting aside the entire NWHI area as a new form of federal managed area called a National Marine Refuge. Chapter 4 (Statewide Conservation Needs) and Chapter 6 (Island Conservation Needs) address upstream actions that affect coastal water and habitat quality.

General Fishing Regulations, DAR

Species: Marine fishes and invertebrates including black corals.

Habitats: Marine ecosystems.

Current Management: Limited take, gear, size, season, and area restrictions on some reef, bottom, and pelagic fishes, mollusks, crustaceans, and corals.

Future needs: Reevaluate size limits to ensure species have sufficient reproductive potential to ensure species survival in Hawai'i. Review regulations dealing with non-game species, research, and other commercial uses.

Fishing Regulations in Federal Waters, Western Pacific Fishery Management Council and NOAA

Species: Marine fishes and invertebrates including black and other precious corals.

Habitats: Marine ecosystems.

Current Management: Limited take, gear, size, season, and area restrictions on some coral reef organisms, bottomfish, pelagic fishes, crustaceans, and precious corals as outlined in Fishery Management Plans for these groups.

Future needs: Collaborate on management of fisheries in the NWHI; fully comply with Federal regulations and guidelines on developing and implementing Fishery Management Plans; establish workshop to evaluate management needs for precious corals; and respond to the declaration of bottomfish as being in a state of "overfishing."

Hawaiian Islands Humpback Whale National Marine Sanctuary (about 900,000 acres), Co-Managed by NOAA and DLNR

Species: Humpback whale.

Habitats: Marine ecosystems.

Current Management: Management Plan exists. Humpback whale 100 yard (91 meter) approach rule and other regulations protecting humpback whales and their habitat, increased fines for violating provisions of the Endangered Species Act, lead agency for the MHI component of the Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) project to determine population size, volunteer whale counts and other community events, and other educational activities, research support, and enforcement.

Future needs: Review other marine species, including seabirds, and habitats for inclusion in Sanctuary and increase research, education, and enforcement actions.

Hawaiian Islands National Wildlife Refuge (610,000 acres of marine habitat), USFWS

Species: 18 seabirds, Hawaiian monk seals, green sea turtles or hōnu (*Chelonia mydas*), endemic coral reef organisms including some endemic only to NWHI, pelagic fishes, bottomfishes, sandy habitat organisms, spinner dolphins, and other marine mammals.

Habitats: Marine and coastal ecosystems (please refer to Chapter 6 Northwestern Hawaiian Islands for more detail).

Current Management: Limited access, limited take, reef monitoring, and turtle monitoring; collaboration with other marine researchers; and research and education.

Future needs: Update management plan. Coordinate actions with the State and the Coral Reef Reserve or Sanctuary, and additional monitoring.

NWHI Marine Refuge, DAR Proposed

Species: Hawaiian monk seals, green sea turtles, endemic coral reef organisms including some endemic only to NWHI, pelagic fishes, bottomfishes, sandy habitat organisms, spinner dolphins and other marine mammals.

Habitats: Marine ecosystems.

Current Management: Limited access and take; no anchoring or any other activities that can damage coral; and no discharge from boats.

Future needs: Create refuge, develop and implement a management plan.

NWHI Coral Reef Ecosystem Reserve, NOAA

Species: Hawaiian monk seals, green sea turtles, endemic coral reef organisms including some endemic only to NWHI, pelagic fishes, bottomfishes, sandy habitat organisms, spinner dolphins and other marine mammals.

Habitats: Marine ecosystems.

Current Management: Operation plan in place. Limited access and take; no anchoring or any other activities that can damage coral; and no discharge from boats.

Future needs: Potential transition to a National Marine Sanctuary.

Marine Life Conservation Districts, DAR (11 Areas – O‘ahu: Hanauma Bay, Pūpūkea, Waikīkī; Lāna‘i: Mānele-Hulopo‘e; Maui: Honolua-Mokulē‘ia, Molokini Shoal; Hawai‘i: Kealakekua Bay, Lapakahi, Old Kona Airport, Wailea Bay, Wai‘ōpae Tidepools)

Species: Species associated with shallow coral reef, sandy beach, and rocky habitats, Hawaiian monk seals, green sea turtles, spinner dolphins and other marine mammals.

Habitats: Marine ecosystems including shallow coral reef, sandy beach, rocky habitats.

Current Management: Limited access in most MLCDS, eight MLCDS include at least some No Take areas; Mānele, Old Kona Airport, and Waialea Bay all allow fishing throughout the MLCDS; and fish monitoring.

Future needs: Evaluate all MLCDS for purpose and management effectiveness and consider need for new marine protected areas.

Fishery Management Areas, DAR (19 Areas – Kaua‘i: Hanamā‘ulu Bay, Nāwiliwili Harbor, Port Allen, Waimea Bay; O‘ahu: He‘eia Kea Wharf, Honolulu Harbor, Pōka‘i Bay, Waialua Bay; Waikīkī-Diamond Head Shoreline; Moloka‘i: Kaunakakai Harbor; Lāna‘i: Mānele Harbor; Maui: Kahului Harbor; Hawai‘i : Hilo Harbor, Kailua Bay, Kawaihae Harbor, Keauhou Bay, Kīholo Bay, Kona Coast Puakō Bay and Reef)

Species: Some or all regulated fish species.

Habitats: Marine and estuary ecosystems.

Current Management: Waikīkī-Diamond Head Shoreline is no take. Limited take, gear, size, season, and/or area restrictions in other Fishery Management Areas (FMAs).

Future needs: Evaluate the purpose and management effectiveness for all FMAs and consider need for new marine protected areas.

Bottomfish Restricted Areas, DAR (18 Areas – Ni‘ihau (1), Kaua‘i (2), O‘ahu (4), Penguin Banks (2), Moloka‘i (1), Maui (2), Maui Nui (1), Hawai‘i (5)). See references for resource listing exact coordinates)

Species: Seven bottomfish species.

Habitats: Marine ecosystems.

Current Management: No take of bottomfish.

Future needs: Evaluate the purpose and management effectiveness for all Bottomfish Restricted Areas and consider need for new or revised protected areas.

Wildlife Sanctuaries, DAR (2 Areas – O‘ahu: Coconut Island, Paikō Lagoon)

Species: Species associated with shallow coral reef, sandy beach, and rocky habitats.

Habitats: Marine ecosystems including shallow coral reef, sandy beach, and rocky habitats.

Current Management: Limited access and no take.

Future needs: Evaluate the purpose and management effectiveness for all Sanctuaries and consider need for new marine protected areas.

Ke‘ehi Lagoon, State Department of Health

Species: All resident aquatics.

Habitats: Estuary.

Current Management: Phytoremediation (a plant based clean-up method) to remove nutrients and pollutants.

Future needs: Additional monitoring and expansion to other areas if successful.

Kalaupapa National Historic Park (10,779 acres), NPS

Species: Invertebrates and fishes associated with shallow coral reef and rocky habitats, monk seals, and sea turtles.

Habitats: Shallow coral reefs, sandy beaches, and rocky habitats.

Current Management: ‘Opihi and reef monitoring and research, marine fish inventory, monk seal monitoring and protection, and coral recruitment project. Planning underway for expanded marine biological monitoring (of benthic invertebrates, fish, and fisheries) and water quality monitoring.

Future needs: Establish monitoring program for nesting sea turtles, establish program to study oceanographic currents and marine water quality, and continue monitoring coral reef fishes and benthic fishes and invertebrates.

Keālia Pond National Wildlife Refuge (700 acres), USFWS

Species: Hawksbill sea turtle.

Habitats: Sandy beach (used for nesting by sea turtle).

Current Management: Support monitoring and protection for nesting hawksbill turtles on Sugar Beach; fencing to prevent turtles from moving onto major roadway; and dune restoration.

Future needs: Maintain existing management.

‘Āhihi-Kīna‘u Natural Area Reserve (2,045 acres), DOFAW

Species: Species associated with shallow coral reef, sandy beach, and rocky habitats, spinner dolphins, and green sea turtles.

Habitats: Marine ecosystems including shallow coral reef, sandy beach, and rocky habitats.

Current Management: Limited access and no take.

Future needs: Additional enforcement capacity, additional research and monitoring, evaluate purpose and management effectiveness and consider need to integrate aquatic components with other DAR marine protected areas.

Kaho‘olawe Island Reserve, Kaho‘olawe Island Reserve Commission

Species: Species associated with shallow coral reef, sandy beach, and rocky habitats, pelagic fishes, Hawaiian monk seals, green sea turtles.

Habitats: Marine ecosystems including shallow and deep coral reef, sandy beach, and rocky habitats.

Current Management: Limited access and take, no commercial activity, monitoring, and water quality improvements.

Future needs: Additional monitoring, marine debris removal.

Fishery Replenishment Areas, DAR (9 Areas - all on the Kona Coast of Hawai‘i and part of the West Hawai‘i Regional Fishery Management Area)

Species: Species associated with shallow coral reef, sandy beach, and rocky habitats.

Habitats: Marine ecosystems including shallow coral reef, sandy beach, and rocky habitats.

Current Management: No aquarium fish fishing or fish feeding.

Future needs: Evaluate the purpose and management effectiveness for all Fishery Replenishment Areas and consider need for new marine protected areas.

South Kona ‘Ōpelu Fishing Area, DAR

Species: ‘Ōpelu.

Habitats: Marine ecosystems.

Current Management: No take of ‘ōpelu.

Future needs: Evaluate purpose and management effectiveness and consider need for new marine protected areas.

Koloko-Honokōhau National Historic Park (1,161 acres), NPS

Species: Species associated with shallow coral reef and rocky habitat species, green sea turtle.

Habitats: Shallow coral reef and rocky habitats and sandy beach (used for basking by turtles).

Current Management: Reef and sea turtle monitoring and research; underwater sounds inventory.

Future needs: Continue existing management, implement biological and water quality monitoring.

Hawai'i Volcanoes National Park (323,431 acres), NPS

Species: Species associated with shallow coral reef and rocky habitat, hawksbill sea turtle.

Habitats: Shallow coral reef and rocky habitats and sandy beach (used for nesting hawksbill sea turtle).

Current Management: Sea turtle research, monitoring, education, and protection.

Future needs: Continue existing management, secure stable funding for sea turtle work, increase understanding of adjacent nearshore marine habitat to better evaluate impacts occurring adjacent to the park on the park.

References:

Brown E. Personal communication, Marine Ecologist, Kalaupapa National Historic Park.

Cesar H, Beukering P, Pintz S, Dierking J. 2002. Economic valuation of the coral reefs of Hawai'i. Hawai'i Coral Reef Initiative Research Program. Available at: http://www.hawaii.edu/ssri/hcri/rp/cesar/noaa_final_report_01-02/cesar_final_report-01-02.htm.

Hawai'i Department of Business, Economic Development, and Tourism (DBEDT). 1991. Hawai'i ocean resources management plan. Honolulu, (HI): DBEDT. 50 pp.

Hawai'i Department of Business, Economic Development, and Tourism. 2003. State of Hawai'i data book. Available at: http://www3.Hawaii.gov/DBEDT/index.cfm?section=READ_Databook1075. (accessed 28 March 2005).

Hawai'i Department of Land and Natural Resources (DLNR). 2003. Ahihi-Kinau NAR/Keoneo'io plan of action draft for discussion purposes.

Hawai'i Department of Land and Natural Resources and Division of Aquatic Resources (DAR). 2005. Marine protected areas in Hawai'i. Honolulu, (HI): DAR. 14pp. Available at: [http://www.hawaii.gov/dlnr/dar/pubs/M\(PA\)pub.pdf](http://www.hawaii.gov/dlnr/dar/pubs/M(PA)pub.pdf).

Hawai'i Division of Aquatic Resources; Bottomfish fishing regulations. 2002. Available at: <http://www.hawaii.gov/dlnr/dar/bottomfish/index.htm>.

Hawai'i Division of Aquatic Resources. 2004. Fishing regulations. Available at: http://www.hawaii.gov/dlnr/dar/fish_regs/index.htm.

Hawai'i Division of Aquatic Resources. Hawai'i's marine life conservation districts. Available at: <http://www.hawaii.gov/dlnr/dar/mlcd/index.htm>.

Hawai'i Division of Aquatic Resources. 1992. Marine life conservation district plan. Honolulu, (HI): DAR. 18 pp.

Hawai'i Division of Aquatic Resources. 2003. State of Hawai'i aquatic invasive species management plan. Honolulu, (HI): DAR. 205 pp. Available at: http://www.hawaii.gov/dlnr/dar/pubs/ais_mgmt_plan_final.pdf.

Hawai'i Division of Forestry and Wildlife. 1992. 'Ahihi-Kinau NAR management plan. Draft. Honolulu, (HI): DOFAW. 18 pp.

- Hawai'i Division of Forestry and Wildlife. Ahihi-Kinau Natural Area Reserve. Available at: <http://www.dofaw.net/nars/images.php?reserve=010>.
- Juvik JO, Juvik S, editors. 1998. Atlas of Hawai'i Third Edition. Honolulu: University of Hawai'i Press.
- Kaho'olawe Island Reserve Commission. 1997. Ocean resources management plan. Available at: <http://kirc.state.hi.us/public/komp.doc>.
- Maragos J, Gulko D, editors. 2002. Coral reef ecosystems of the Northwestern Hawaiian Islands: interim results emphasizing the 2000 surveys. Honolulu, (HI): U. S. Fish and Wildlife Service and Hawai'i Department of Land and Natural Resources. 46 pp.
- Mundy BC, Everson AR. Marine resources. *In* Status and trends of the nation's biological resources. U.S. Geological Service. Available at: <http://biology.usgs.gov/s+t/SNT/noframe/mr181.htm>.
- National Atlas of the United States. First.gov. Available at: http://nationalatlas.gov/articles/mapping/a_general.html#six accessed 11 July 2005.
- National Oceanic and Atmospheric Administration (US) [NOAA]. 2004. Hawaiian Islands Humpback Whale National Marine Sanctuary. Available at: http://hawaiihumpbackwhale.noaa.gov/about/about_sanctuary.html.
- National Park Service (US) [NPS]. Hawai'i Volcanoes National Park. Available at: <http://www.nps.gov/havo/index.htm>.
- National Park Service (US) [NPS]. Kalaupapa National Historic Park. Available at: <http://www.nps.gov/kala/index.htm>.
- National Park Service (US) [NPS]. Koloko-Honokohau Hawai'i Volcanoes National Historic Park. Available at: <http://www.nps.gov/kaho/index.htm>.
- TenBruggencate J. 2005 July 11. New coastal guidelines sought. Honolulu Advertiser. Available at: <http://www.honoluluadvertiser.com/apps/pbcs.dll/article?AID=/20050711/NEWS11/507110333/1021/NEWS>
- U.S. Fish and Wildlife Service. 1986. Hawaiian Islands National Wildlife Refuge master plan, Environmental Impact Statement. Honolulu, (HI): U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. Kealia Pond National Wildlife Refuge. Available at: <http://refuges.fws.gov/profiles/index.cfm?id=12531>.