

MAUI

Maui is the second largest island in the State of Hawai‘i and is known as the Valley Isle. Thirty percent of the island is dominated by native vegetation with most of this habitat in east Maui. The upper elevation slopes and summits of both east and west Maui are typically native dominated, with coastal and lower elevation areas dominated by non-native vegetation. Three notable areas contain continuous native vegetation spanning a range of habitats, forming a landscape with a high diversity of total species: summit and leeward west Maui (wet forests and bogs transitioning to lowland mesic communities), windward east Maui (subalpine shrubland transitioning to wet forest), and leeward east Maui (subalpine community transitioning to remnant montane mesic then lowland and coastal dry communities). In addition, large tracts of intact native-dominated montane forests remain, with a canopy composed primarily of ‘ōhi‘a (*Metrosideros polymorpha*) and koa (*Acacia koa*) and a well-developed sub-canopy layer of mixed native understory trees and shrubs. Habitat types are highly diverse, including coastal and wetland habitats, lava tube caves, aeolian habitats, and bogs. Maui also has ten offshore islets that are significant habitats for seabirds. Anchialine ponds, which host a unique fauna of amphipods and shrimp, are found in young lava fields. As a result of the range of habitats, a diversity of species can be found including cave insects, endangered forest birds, marine mammals, and endemic freshwater fishes.

OVERVIEW

Geology and Hydrology

At 186,163 hectares (465,408 acres), Maui was formed between 750,000 and 1.3 million years ago, as first west Maui then east Maui emerged from two large shield volcanoes (West Maui and Haleakalā). Haleakalā is the tallest peak at 3,055 meters (10,023 feet), with Pu‘u Kukui in West Maui coming in second at 1,764 meters (5,788 feet). Maui is the only island (other than Hawai‘i) containing alpine and subalpine communities. Approximately 25 percent of the island is below 150 meters (500 feet) in elevation; just over 40 percent is above 610 meters (2,000 feet) in elevation. Major streams include Palikea (the second largest perennial stream in the State), Kalialinui-waiālae gulch (the State’s second longest stream), Honokohau stream (the longest stream channel in west Maui), and ‘Īao stream. Maui has 90 perennial streams, 56 of which are continuous. Waihe‘e and ‘Īao streams have the largest discharges - 60 and 43 million gallons per day (mgd) respectively. Many streams are diverted; Maui has the highest diversion of natural stream flows in the State. Kanahā Pond, historically a natural freshwater lake, is approximately one meter (three feet) in depth and 16 hectares (41 acres) in size and is located wholly within the Kahului Airport boundary area. Maui has ten offshore islets.

Climate

Because of the size and elevation range of Haleakalā, climate and vegetation communities vary dramatically. Warm trade winds meet the windward side of the volcano and leave most of their moisture behind as rain or cloud drip on the windward side. At high elevations and on the leeward slopes of Haleakalā, dry conditions predominate. The geologically older West Maui mountains receive an average rainfall of 1,016 centimeters (400 inches) per year, making it the second wettest spot in the State.

Land and Water Use

Land use designations according to the State Land Use Commission are 53 percent Agricultural District, 42 percent Conservation District, five percent Urban District, and less than one percent Rural District. Major land owners in West Maui include the State of Hawai‘i, Maui Land and Pineapple, Inc., C. Brewer, Inc., AMFAC/JMB Hawai‘i, Kamehameha Schools, and Maui County (Department of Water Supply). In East Maui, major land owners are the State of Hawai‘i (including the Department of Hawaiian Home Lands), the National Park Service, Alexander and Baldwin, and Haleakalā Ranch. Fifty-seven streams are diverted and seven have altered channels. ‘Īao is the largest altered stream. Maui has ten impaired streams under EPA Clean Water Act standards. The East Maui canal system in Central Maui is the largest man-made stream system at 164 million gallons per day.

Human Landscape

Estimated human population for the island is 117,000 with most of the island’s population located in central, south, and west Maui in areas such as Kahului and Wailuku, Kīhei, and Lahaina and Ka’anapali. The average daily visitor population is approximately 44,000. Major industries are tourism, agriculture, ranching, and flower cultivation.

SPECIES AND HABITATS OF IMPORTANCE

Given the five elevation zones present on Maui, the island has a diversity of habitats for native wildlife. Particular habitats associated with native wildlife include alpine deserts, subalpine and montane forests and bogs, lowland forests, coastal communities, anchialine pools, and lava tube caves. Additionally, parts of East Maui have healthy freshwater aquatic systems on the slopes of ridges, in the streams of lower Hanawī, and the streams of the Kipahulu and Kaupō area. These habitats support a diversity of native species including forest birds, invertebrates, ‘ōpe‘ape‘a (*Lasiurus cinereus semotus* [Hawaiian hoary bat]), pueo (*Asio flammeus sandwichensis* [Hawaiian short-eared owl]), waterbirds, freshwater species, and seabirds. Plant endemism for Maui is estimated at 20 percent. Beaches provide habitat for a few nesting sea turtles. Offshore islets provide important habitats for seabirds, migratory birds, raptors, invertebrates, and marine fauna. Approximately 9,398 hectares (23,496 acres) of critical habitat has been designated by the USFWS for Blackburn’s sphinx moth (*Manduca blackburni*) and 50,612 hectares (126,531 acres) for 59 endangered plants on Maui. Recovery habitats for the Maui parrotbill and ‘ākohekohe have also been identified by the USFWS.

Appendix A provides information on what wildlife Species of Greatest Conservation Need are present on Maui and its associated offshore islands. Maui is important habitat for several native forest birds, including the following Maui endemic species: ‘ākohekohe (crested honey creeper), Maui ‘alauahio (creeper), po‘ouli, and Maui parrotbill. Maui is also home to the second largest population of nēnē (Hawaiian goose) in the State. Other federally listed species include the ‘alae ke‘oke‘o (Hawaiian coot), ae‘o (Hawaiian stilt), koloa maoli (Hawaiian duck), ‘ua‘u (Hawaiian petrel), ‘ōpe‘ape‘a (Hawaiian hoary bat), Hawaiian monk seal, hawksbill turtle, and green sea turtle. For invertebrates, in general, Maui is characterized by high levels of endemism and diversity representing many orders. For example, along with the federally endangered Blackburn’s sphinx moth, Maui also hosts several endemic native bees (*Hylaeus* spp.), tree snails, and high levels of diversity within most families of beetles (Coleoptera). Maui also has endemic anchialine amphipods. Other species groupings that can be found on Maui are freshwater fishes, freshwater invertebrates, migratory birds, and raptors.

SUMMARY OF KEY THREATS TO SPECIES AND HABITATS

Many general threats to native wildlife and habitats are discussed in Chapter 4 (Statewide Conservation Needs) and Chapter 5 (Marine Conservation Needs). Threats that are more acute or specific to Maui are listed below.

- The population of axis deer is slowly spreading across east Maui into west Maui, causing habitat degradation and loss;
- High pig densities in upper remote watershed degrade sensitive bog communities and wet forest, habitat for endemic birds and invertebrates;
- Presence of habitat-modifying invasive plants, including miconia;
- Introduction of invasive species at airports, ports, and harbors;
- Invasive algae in Lahaina and Kīhei areas;
- Introduced reptiles and amphibians, such as coqui frog and veiled chameleons, prey on native invertebrates and likely compete with native birds for food resources;
- Populations of feral cats and cat colonies kill waterbirds and seabirds across the island;
- Avian disease transmitted by mosquitoes restricts forest birds to habitat located above the mosquito-line;
- Wildfire, particularly for low elevation dry habitats and exacerbated by non-native invasive plants that increase fuel loads;
- Hybridization between koloa maoli (Hawaiian duck) and introduced mallards;
- Development of formerly undeveloped areas and increased urbanization leading to loss and degradation of terrestrial, freshwater, and marine habitat (e.g., increased nutrients in coastal areas leads to non-native algal blooms which affect fish populations and coral habitats, sedimentation from development near stream corridors);
- Stream diversions, dams, or channelizations;
- Insufficient in-stream flows to insure the biological integrity of many stream systems;
- Localized point source pollution originating from recreational boats and cruise ships;
- Fisheries bycatch of green sea turtles and seabirds;
- Human disturbance of sensitive ecosystems such as lava tube caves or anchialine pools;
- Localized excessive recreational use at places like ‘Āhihi Kīna‘u Natural Area Reserve, Honolua Bay, and Molokini Shoal;
- Human and boat interactions with marine mammals and sea turtles along the leeward coast.

ISLAND STRATEGIES

In addition to the statewide strategies identified in association with the seven conservation objectives in Chapter 4 (Statewide Conservation Needs) (main bullet), additional island-specific strategies for Maui 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;
 - Implement conservation actions identified in the ‘Potential Areas for Enhanced Conservation Management’ subsection;
 - Develop and/or implement recovery plans for threatened and endangered species on Maui;

- Increase active management in, or acquisition of, extremely rare habitats on Maui;
- Protect remaining intact native forest, wetland habitat, and coastal areas from development through a combination of acquisition, conservation easements, or cooperative agreements with landowners;
- Implement fire suppression measures and protocols for post-fire restoration;
- Increase the total acreage of ungulate-free and predator-free areas;
- Decrease in number of stream diversions and channelized streams;
- Work with Commission on Water Resource Management to ensure net increase in number of streams with biological integrity and Instream Flow Standards sufficient to sustain viable native fish and invertebrate populations;
- Protect remaining anchialine ponds and lava tube and cave habitats;
- Collaborate in efforts to reduce pollution threats from recreational boats and cruise ships;
- Support ongoing projects to deal with non-point source pollution like those in the watershed partnerships and Honolua Bay and support expansion of successful methods to other areas;
- Develop management plans for all Marine Managed Areas.
- Combat invasive species through a three-tiered approach combining prevention and interdiction, early detection and rapid response, and ongoing control or eradication.
 - Improve prevention capacity through increased airport inspection and containment barriers around cargo unloading areas;
 - Improve early detection and rapid response capacity for species not yet established in the islands (e.g., brown treesnake, West Nile virus, Argentine fire ant) or present in the MHI but not yet established on Maui;
 - Increase efforts to prevent establishment of priority invasive plants in pristine areas (e.g., miconia) and to eradicate from areas with recovery potential;
 - Revive and fund the Maui Axis Deer Group or similar partnership to address the need to fence existing populations of axis deer and to control deer outside of fenced areas;
 - Expand control of mammalian predators (e.g., feral cats, rats) in waterbird and seabird habitat;
 - Decrease in the overall number of streams negatively impacted by invasive species;
 - Support efforts to strengthen marine alien species prevention and control.
- Develop and implement programs to obtain, manage, and disseminate information needed to guide conservation management and recovery programs.
 - Improve dissemination of research and data regarding native species populations and habitat condition;
 - Conduct surveys and inventories for invertebrates in currently managed areas;
 - Assess impact of eco-tourism activities on terrestrial and aquatic native wildlife and associated habitats;
 - Expand surveys to monitor population status and trends of under-researched species groups such as seabirds, pueo (Hawaiian short-eared owl), ‘ōpe‘ape‘a (Hawaiian Hoary bat), Blackburn’s sphinx moth, Maui *Partulinid* spp. and other native invertebrates;
 - Survey native wildlife community in koa-dominated forests in East Maui;

- Research role of alien bird (cattle egret and barn owl) predation and best control strategies.
- Strengthen existing and create new partnerships and cooperative efforts.
 - Encourage additional landowner participation and involvement in East Maui Watershed Partnership, West Maui Mountains Watershed Partnership, and Leeward Haleakalā Watershed Restoration Partnership;
 - Work with interested communities to address conservation threats and needs and develop appropriate actions;
 - Expand partnership with hunting community to reduce ungulate population;
 - Collaborate in efforts to reduce pollution threats from recreational boats and cruise ships;
 - Collaborate with NOAA to ensure the protection of marine mammal populations.
- Expand and strengthen outreach and education to improve understanding of our native wildlife resources among the people of Hawai‘i.
 - Maintain existing outreach and educational programs at managed conservation areas;
 - Improve conservation education of visitors and the tourism industry on the appropriate use of natural areas, particularly sensitive habitats and areas;
 - Expand and broaden public education and outreach to take advantage of the large science and management community on the island.
- Support policy changes aimed at improving and protecting native species and habitats.
 - Organize an interagency working group to develop vision and policy analysis for stream conservation actions;
 - Assess ways to support increased enforcement capacities, including cross-deputization between agencies;
 - Evaluate all current Marine Managed Areas for purpose and management effectiveness and consider need for new Marine Managed Areas;
 - Review and revise DOFAW management guidelines to better reflect habitat conservation needs, followed by review and revision of game animal hunting regulations;
 - Improve integration of policies to address linkages between terrestrial and marine habitats and their shared conservation threats and needs;
 - Obtain and implement the plans of an Incidental Take Permit for sea turtle and monk seal bycatch.

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 and include the following:

- Species Conservation Plans prepared by the USFWS, including the Regional Seabird Conservation Plan (2005), U.S. Pacific Islands Regional Shorebird Conservation Plan (2004), the Draft Revised Recovery Plan for the Nēnē (Hawaiian goose) (2004), the Draft Revised Recovery Plan for Hawaiian Forest Birds (2003), the Draft Recovery Plan for the Blackburn’s sphinx moth (2003), the Hawaiian Endangered Bird Partnership for Captive Propagation Five Year Workplan (2002), the Draft Revised Recovery Plan for Hawaiian Waterbirds (1999), and the Recovery Plan for the Hawaiian Hoary Bat (1998);

- Critical habitat designations by the USFWS for the Blackburn's sphinx moth (*Manduca blackburni*) and for threatened and endangered plants on Maui;
- Management Plans for the State Natural Area Reserves (NAR): 'Ahihi-Kīna'u NAR (Draft 1992), Kanaio NAR (1993), West Maui NAR (1988), and Hanawī NAR (1989);
- Long-range management plans for Natural Area Partnership Preserves (NAPP): Kapunakea NAPP (2003), Waiakamoi NAPP (2000), Pu'u Kukui NAPP (2005);
- The Division of Forestry and Wildlife's (DOFAW) Draft Management Guidelines, which coarsely rate vegetation quality and provide guidelines for land use (public hunting, recreation, and forest products) for State lands managed by DOFAW;
- The East Maui Watershed Partnership Management Plan and the West Maui Mountains Watershed Partnership Management Plan;
- A summary of research and information on individual offshore islands, prepared by the Offshore Island Restoration Committee, and found at <http://www.botany.hawaii.edu/gradstud/eijzenga/OIRC/>;
- The Interim State Strategic Plan for Invasive Species Prevention, Control, Research, and Public Outreach;
- Coastal Zone Management plans, including Hawai'i Implementation Plan for Polluted Runoff Control (2000), Hawai'i Unified Watershed Assessment (1998);
- Hawaii's Local Action Strategy to Address Land-based Pollution Threats to Coral Reefs (2004);
- Bishop Museum has a comprehensive database of invertebrates;
- The Audubon Society maintains a Sightings database of bird species observed in the State;
- The Pacific Basin Information Node maintains a database of information on species and habitats in Hawai'i;
- Fleming Arboretum is in the process of compiling an electronic database reflecting native dryland forest species that can be found at www.flemingarboretum.org;
- The Hawai'i Biodiversity and Mapping Program (formerly the Hawai'i Natural Heritage Program) maintains a database of rare species and habitats.

MANAGEMENT NEEDS

Current Management of Species and Habitats

The following section addresses the current management actions and future needs of key habitats on Maui. The discussion of future management needs is highlighted within each current managed area. Many areas on Maui are already under active management or protection through designation as State Natural Area Reserves (NAR), a National Wildlife Refuge (NWR), a State Wildlife Sanctuary, a National Park (NP), land trusts, and several public-private partnerships in the form of watershed partnerships, and natural area preserve partnerships. Each of these managed areas receives some level of agency or other support, including field teams composed of staff personnel or specific mission-oriented teams such as the Maui Invasive Species Committee and the Maui Forest Bird Recovery Project. Management of most of these areas is guided by existing management plans. These plans strongly emphasize conservation and restoration with a focus on controlling ungulates, predatory small mammals, and invasive alien species (both flora and fauna). In total, approximately 79,315 hectares (198,288 acres) or 43 percent of the island is under some form of conservation management (e.g., management plan exists) or protection.

East Maui Watershed Partnership (100,000 acres), Public-Private Partnership (NPS, DOFAW, TNC, Hanā Ranch Partners, LLC, East Maui Irrigation, Haleakalā Ranch, County of Maui Department of Water Supply)

Species: ‘Ōpe‘ape‘a (Hawaiian hoary bat), forest birds, pueo, kōlea (Pacific golden plover), nēnē (Hawaiian goose), ‘ua‘u (Hawaiian petrel), endemic land snails and hundreds of endemic terrestrial, aquatic, and semi aquatic arthropods, rare plants. Outstanding invertebrates include one of only nine species of flightless flies found worldwide, and several species of rare long-horned beetles.

Habitats: Montane wet communities. Largest intact native forest on the island (20%) and recovery habitat for 21 species of rare forest birds.

Current Management: Management plan exists. Continue fencing across East Maui, ungulate control, invasive weed control, monitoring (particularly for stream and water quality), education and outreach.

Future Needs: Secure funding to implement management plan. Expand management into other native-dominated forests within the partnership boundaries (e.g., Makawao Forest Reserve).

Haleakalā NP (30,183 acres), NPS

Species: Highly significant for ‘ua‘u (Hawaiian petrel), nēnē (Hawaiian goose), and cave invertebrates. Forest birds, ‘ōpe‘ape‘a (Hawaiian hoary bat), rare plants.

Habitats: Alpine communities, subalpine communities, montane communities, lowland communities, subterranean communities.

Current Management: Management plan exists. Maintains high level of staff support for predator, ungulate, and alien vegetation control and removal, fencing, vegetation sampling transects, yearly surveys for threatened and endangered species, nest protection and monitoring for nēnē and ‘ua‘u. One-time inventories for bats and herptofauna, marine and terrestrial monitoring protocols are under development (covering fishes, fisheries, marine benthos, freshwater animals, selected birds, bat, terrestrial invertebrates, vegetation, land use changes in and adjacent to park, invasive species, and water quality).

Future Needs: Continue existing management.

Hanawā NAR (7,500 acres), DOFAW

Species: Supports one of the highest number and densities of endangered forest birds in the State. Core populations of po‘ouli, Maui ‘ākepa, Maui parrotbill, ‘ākohekohe, Maui nuku pu‘u, and ‘ō‘ō. Other forest birds, pueo, native invertebrates, rare plants.

Habitats: Subalpine communities, montane wet communities, perennial streams.

Current Management: Management plan exists. Control of pig populations, weed-control activities, fencing, resource monitoring, public education and volunteer program, Maui Forest Bird Recovery Project activities.

Future Needs: Predator control. Continue existing management as this area is critical for native forest birds.

Waiakamoi Preserve (5,230 acres), TNC

Species: ‘Ōpe‘ape‘a (Hawaiian hoary bat), forest birds, native invertebrates, rare plants.

Habitats: Montane wet communities.

Current Management: Management plan exists. Ungulate control, invasive plant species control and eradication, research and monitoring, outreach.

Future Needs: Continue existing management.

Leeward Haleakalā Watershed Restoration Partnership (43,175 acres), Public-Private Partnership (DOFAW, DHHL, NPS, James Campbell, Haleakalā Ranch, Ka‘ono‘ulu Ranch, Kaupō Ranch, ‘Ulupalakua Ranch, Nu‘u Mauka Ranch, Living Indigenous Forest Ecosystems (LIFE), individual private landowners, Hawai‘i Community Foundation, Trust for Public Land (TPL), USFS, USGS, USFWS, NRCS, County of Maui Department of Water Supply)

Species: ‘Ōpe‘ape‘a, forest birds, possibly ‘ua‘u (Hawaiian petrel), terrestrial invertebrates, including Blackburn’s sphinx moth, rare plants.

Habitats: Montane mesic communities, montane dry communities. Priority recovery habitat for endangered forest birds.

Current Management: Management plan for resource management from Makawao Forest Reserve to Kaupō above 3,500 feet (1,067 meters) in development, to include monitoring, fencing, ungulate removal, and koa reforestation. Related projects include fencing of Kahikinui Forest Reserve (DOFAW) and adjacent DHHL lands.

Future Needs: Develop and implement partnership management plan for reforestation. Continue fencing. Expand management into other areas within the partnership boundaries (e.g., Kula Forest Reserve).

Kanaio NAR (876 acres), DOFAW

Species: ‘Ōpe‘ape‘a (Hawaiian hoary bat), pueo, kōlea (Pacific golden plover), nēnē (Hawaiian goose), ‘ua‘u (Hawaiian petrel), terrestrial invertebrates, including Blackburn’s sphinx moth, yellow-faced bees, endemic wasps *Odynerus spp.* and *Ectemnius spp.*, potentially cave invertebrates, rare plants.

Habitats: Lowland dry communities. Significant remaining tract of dryland forest and shrubland.

Current Management: Management plan exists. Fencing, invasive plant removal, ungulate control.

Future Needs: Complete proposed addition of adjacent unencumbered land to NAR, complete proposed boundary fencing of upper section. Continue existing management.

West Maui Mountains Watershed Partnership (52,940 acres), Public-Private Partnership (DOFAW, TNC, Maui Land and Pineapple, Inc., Amfac, C. Brewer, Kahoma, Kamehameha Schools, Makila land, County of Maui Department of Water Supply)

Species: ‘Ōpe‘ape‘a, forest birds, pueo, nēnē (Hawaiian goose), koloa maoli (Hawaiian duck), ‘ua‘u (Hawaiian petrel), ‘a‘o (Newell’s shearwater), terrestrial invertebrates, including Blackburn’s sphinx moth, *Megalagrion spp.*, rare achatinellid land snails, freshwater fishes, freshwater invertebrates, rare plants.

Habitats: Montane wet communities, lowland wet communities, lowland mesic communities.

Current Management: Management plan exists. Fencing, ungulate and predator control, reduction of invasive alien weeds. The Hawai‘i Unified Watershed Assessment proposed the West Maui Mountains as a Tier 1 Watershed in Need of Restoration under

the EPA Clean Water Act.

Future Needs: Secure funding to implement management plan. Identification of areas in need of active management and/or fencing to protect quality native forests. Expand management into other native-dominated forests within the partnership boundaries (e.g., West Maui Forest Reserve).

West Maui NARS (6,702 acres-3 parcels), DOFAW

Species: Forest birds, migratory birds, terrestrial invertebrates, including rare land snails, freshwater fishes, freshwater invertebrates, rare plants.

Habitats: Montane wet communities, perennial streams.

Current Management: Management plans exist. Fencing, ungulate control, resource monitoring, non-native plant control, public education, and volunteer recruitment.

Future Needs: Continue existing management.

Pu‘u Kukui Preserve (8,661 acres), Maui Land and Pineapple, Inc.

Species: ‘Ōpe‘ape‘a (Hawaiian hoary bat), forest birds, pueo, nēnē, migratory birds, seabirds, terrestrial invertebrates, including rare land snails, freshwater fishes, freshwater invertebrates, rare plants.

Habitats: Montane wet communities, lowland wet communities, lowland mesic communities.

Current Management: Management plan exists. Fencing, ungulate removal, small mammal and non-native invertebrate control, weed control monitoring, and rare species protection.

Future Needs: Continue existing management.

Kapunakea Preserve (13,000 acres), TNC

Species: Forest birds, pueo, seabirds, terrestrial invertebrates, including rare tree snails.

Habitats: Montane wet communities, lowland mesic communities, lowland dry communities.

Current Management: Management plan exists. Ungulate control, invasive plant control, small mammal control, resource monitoring, community outreach, rare species protection and research.

Future Needs: Continue existing management.

Kanahā Wildlife Sanctuary (235 acres), DOFAW

Species: Seabirds, waterbirds, migratory birds, terrestrial invertebrates.

Habitats: Lowland wet community including saline wetland.

Current Management: Currently developing a management plan. Habitat restoration through invasive weed removal, predator control, surveys and monitoring.

Future Needs: Continue existing management, install perimeter predator-proof fencing and eradicate predators within.

Old Waihe‘e Dairy (277 acres), Maui Coastal Land Trust

Species: Migratory birds, terrestrial invertebrates.

Habitats: Coastal communities.

Current Management: Developing management plan.

Future Needs: Implement management plan.

Mū‘olea Point (70 acres), Trust for Public Land

Species: Seabirds, migratory birds, invertebrates, marine fauna, raptors.

Habitats: Coastal communities.

Current Management: Recent acquisition for permanent protection.

Future Needs: Develop and implement management plan.

Keālia National Wildlife Refuge (700 acres), USFWS

Species: Waterbirds, migratory birds, turtles.

Habitats: Coastal communities including saline wetland habitat.

Current Management: Beach patrol, dune restoration, environmental education, fencing to keep turtles away from road, nest monitoring and protection.

Future Needs: Continue existing management.

Maluaka and Paniaka Wetlands, State Parks

Species: Endangered waterbirds, migratory birds.

Habitats: Coastal communities.

Current Management: Maluaka wetland is being fenced for predator control management and revegetated with native vegetation after alien plant removal. However, Paniaka remains unmanaged.

Future Needs: Fence Paniaka ponds with predator-proof fencing, enhance native vegetation, continue collaboration with State Parks on species management and support DOFAW’s yearly waterbird counts and breeding season monitoring of the waterbirds.

‘Āhihi Kīna‘u NAR (2,045 acres including marine), DOFAW

Species: Migratory birds, waterbirds, terrestrial invertebrates, anchialine pond fauna, marine mammals, marine fishes, marine invertebrates.

Habitats: Coastal communities, marine systems, includes unusual communities associated with recent lava flows including anchialine pools, subterranean lava tubes, and aeolian systems on the surface of the flows.

Current Management: Management plan exists. Resource monitoring (particularly for any illegal takings), rangers hired for enforcement and education, public education and sign postings, restricting certain areas from public over use. Fencing of anchialine pools has been proposed but not implemented. No Take of terrestrial or marine resources.

Future Needs: Management of human activity, monitoring, education, and outreach.

State Seabird Sanctuary (8 offshore islands), DOFAW

Species: Seabirds, migratory birds.

Habitats: Coastal communities.

Current Management: Removal of small mammalian predators and native vegetation habitat restoration.

Future Needs: Increase surveys and monitoring.

Maui Invasive Species Committee, Public-Private Partnership

Species/Habitats: All species and habitats affected by invasive species.

Current Management: Invasive species prevention and control.

Future Needs: Increased invasive plant and animal prevention capacity, improved detection and rapid response capacity, and additional resources to address established threats to native habitats.

Maui Forest Bird Recovery Project, USFWS, DOFAW, UH

Species/Habitats: Endemic forest birds, particularly endangered and critically endangered species and their habitats.

Current Management: Research and conservation management implementation of Draft Revised Recovery Plan for Hawaiian Forest Birds, development and implementation of five-year implementation plans.

Future Needs: Adequate funding to implement recovery plan and implementation plans.

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.

Two Marine Life Conservation Districts (MLCD), DAR: Honolua-Mokuleia, Molokini Shoal

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.

Current Management: Limited access in most MLCDs, eight MLCD include at least some No Take area, fish monitoring.

Future needs: Evaluate all MLCD's for purpose and management effectiveness and consider need for new Marine Managed Areas.

One Fishery Management Areas (FMA), DAR: Kahului Harbor

Species: Some or all regulated fish species.

Habitats: Marine and estuary ecosystems.

Current Management: Limited take, gear, size, season, and/or area restrictions.

Future needs: Evaluate all FMA's for purpose and management effectiveness and consider need for new Marine Managed Areas.

Three Bottomfish Restricted Areas (BRA), DAR

Species: Seven bottomfish species.

Habitats: Marine ecosystems.

Current Management: No Take of bottomfish.

Future needs: Evaluate all BRAs for purpose and management effectiveness and consider need for new Marine Managed Areas.

Potential Areas for Enhanced Conservation Management

In addition to maintaining and enhancing existing conservation actions, additional efforts are needed for the long-term conservation of Maui's native wildlife. The following section identifies areas where enhanced conservation management would significantly benefit native species or their habitats (previously identified areas of the Makawao Forest Reserve and Kanaio can be found under the future needs discussion in the management needs section). Areas are discussed in habitat order from the mountains to the sea.

Kīpahulu Forest Reserve (Upper portion above 3,500 feet between Kaupō Gap and Kīpahulu Valley), DOFAW

Species: Forest birds, invertebrates, rare plants.

Basis for Priority Designation: Remnant native forests still intact, but high densities of feral goats are rapidly destroying the understory, clearing their way into wet forests. Habitats include, from west to east, drier koa-dominated into wet 'ōhi'a dominated. Mesic koa forest is highly rare on Maui.

Potential Conservation Actions: Fencing of the most-intact areas, removal of feral goats, and developing public hunting access (currently no public hunting access allowed) through adjacent landowners (e.g., the national park Kaupō trail).

Dryland habitats (leeward Haleakalā down to coast of southern Maui)

Species: Wiliwili (*Erythrina sandwichensis*) forests, koa (*Acacia koa*) forests, diverse dryland forests, terrestrial invertebrates, rare plants.

Basis for Priority Designation: Low elevation dryland forest is highly imperiled and significantly reduced from historic range. Tracts of native wiliwili groves remain primarily in undeveloped private parcels in the coastal areas of Makena and the *ahupua'a* of Maluaka, Ka'eo, Papa'anui, Waipao, and Keauhou. Remnant diverse dryland forest remains in the Auwahi area. Threatened by the potential for development. The full impacts of the recent introduction of the *Erythrina* gall wasp are not yet known. Wiliwili are a keystone species in native dryland forest and are host to several species of native terrestrial invertebrates, while in general, the dryland forest hosts many rare plant species.

Potential Conservation Actions: Fencing intact tracts of dryland forest, removal of deer and goats, invasive plant removal, fire suppression, outplanting.

Wetland habitats (Kihei Coast, Ukumehamehe, North Shore, Cape Hanamanioa, Nu'u, Pauwahu Point, Ke'anae Peninsula, East Maui stream, lo'i)

Species: Waterbirds, migratory birds.

Basis for Priority Designation: These areas have been identified by the USFWS and the Pacific Coast Joint Venture as areas for waterbird recovery.

Potential Conservation Actions: Small mammal predator control, invasive species control; where private lands occur, support voluntary and incentive based programs for potential conservation.

Coastal Areas on State Lands in the North and Northwest Portions of West Maui; other intact coastal areas (South, East Maui)

Species: Wetland birds, migratory shorebirds and waterfowl, seabirds, native invertebrates, native plants.

Basis for Priority Designation: Hawai‘i has few native coastal vegetation areas still left intact and these areas have a diverse coastal vegetation system. However, it is being threatened by ungulates (mostly cattle).

Potential Conservation Actions: Identify best intact areas and assess for appropriate conservation measures including fencing, removal and control of ungulates, and redesignation of coastal area for conservation purposes.

Kanahā Beach, Maui County

Species: Native invertebrates, native plants.

Basis for Priority Designation: An area that is rich with native plants and native invertebrates, but is faced with immediate threats by human activities such as off-road vehicles. Existing actions have been removal of invasive plants, restoration of native plants, public education, and construction of a vehicle barrier to protect quality areas. This area could serve as a public education model for the need to protect and restore coastal areas.

Potential Conservation Actions: Continue existing management.

Anchialine Pond Habitat

Species: Anchialine shrimp, endemic anchialine amphipods (*Grandidierella palama*, *Paramoera rua*, *Rotomelita ana*).

Basis for Priority Designation: Anchialine pool habitats are experiencing degradation as a result of invasive species and human disturbance leading to decreasing populations of anchialine species in these habitats.

Potential Conservation Actions: Prevent introduction of non-native fish (tilapia), manage human disturbance.

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