

O‘AHU

O‘ahu is the most developed and populated island in the Hawaiian chain. As a result of the pressures of population and economics, native forest is found primarily along mountainous ridges unsuitable for development. These mountain ridges are highly dissected by erosion, resulting in a rich array of habitats (from montane wet forest to lowland dry forest) with localized distributions of many species, particularly of native invertebrates. O‘ahu contains several wetlands important to waterbirds and migratory shorebirds, including the Kawai Nui and Hāmākua Marsh complex. Thanks to grassroots support and community involvement, the Kawai Nui and Hāmākua Marsh complex was designated a Wetland of International Importance under the Ramsar Convention of Wetlands in 2005, the 22nd such designation in the United States and the first in Hawai‘i. Several offshore islands and several protected and managed coastal sites support seabird colonies. O‘ahu also has a number of large estuaries and bays and one of only two barrier reef complexes in the State. Many areas managed for wildlife conservation are accessible to the public, giving residents and visitors the opportunity to view and appreciate examples of the native wildlife of the State.

OVERVIEW

Geology and Hydrology

The island of O‘ahu was created by two large shield volcanoes, the younger Ko‘olau volcano to the east and the older Wai‘anae volcano to the west. Subsequent extensive erosion has since fashioned these volcanoes into long, narrow, ridge-like mountain ranges, connected by the Schofield Plateau. Nearly half (45%) of the island is below 150 meters (500 feet) in elevation, and for the most part, the island is surrounded by coastal plain and sandy beaches, rather than steep sea cliffs. Just under five percent of the island is over 610 meters (2,000 feet) in elevation; Mt. Ka‘ala in the Wai‘anae range, is the highest point on the island at 1,220 meters high (4,003 feet) high. The island has 57 perennial streams, 29 of which are continuous. Kahana and Waikele streams have the largest discharges, 35 and 27 million gallons per day (mgd), respectively. Wahiawā Reservoir (including Lake Wilson) and Nu‘uanu Reservoir are significant freshwater lakes on the island.

Climate

The Wai‘anae and Ko‘olau mountain ranges combine to produce distinctive windward and leeward climates. Average annual rainfall exceeds 635 centimeters (250 inches) per year on the crest of the Ko‘olau Range. In contrast, some areas on the leeward coast, located in the rain shadow of the Ko‘olau, receive less than 50 centimeters (20 inches) per year. The Ko‘olau Mountains form the primary watershed for the island, providing approximately 133 mgd of recharge to the Pearl Harbor aquifer.

Land and Water Use

O‘ahu is the third largest island at 156,284 hectares (386,188 acres). The island’s land area is almost evenly divided between the Conservation District (41%; 63,381 hectares or 156,619 acres), Agricultural District (33%; 52,139 hectares or 128,839 acres), and the Urban District (26%; 40,764 hectares or 100,730 acres). The Conservation District encompasses most of the Ko‘olau and Wai‘anae mountain ranges. About 13,853 hectares (34,232 acres), primarily in the Conservation District, are managed by the DLNR Division of Forestry and Wildlife (DOFAW)

(9% of the total land area). Approximately 35,942 hectares (88,817 acres) of conservation-zoned forest land is under private ownership or management. The Agricultural District covers primarily the plateau between the two mountain ranges. The Urban District covers the primary urban center of Honolulu, extending west along the leeward coast, east to include the developed areas of Kāneʻohe and Kailua, and north to include the developments along the H-2 Highway, such as Mililani.

Approximately 36,853 hectares (91,066 acres, 24% of the total land area) is under the control (through ownership or lease) of the military. The largest private landowners are Kamehameha Schools, Dole Food Company, Damon Estate, Campbell Estate, and Amfac.

Thirty-one streams are diverted and 31 have altered channels. The largest altered stream is Waikele, and the Waiāhole Ditch system is the largest man-made stream system. Oʻahu has 34 impaired streams under Environmental Protection Agency Clean Water Act standards.

Human Landscape

In 2004, the total resident population of Oʻahu was estimated at 899,593, accounting for 72 percent of the State's population. This number is supplemented by an average daily visitor population of 82,121. The population is spread around the island, with most residents living on the south side, east of Pearl Harbor on the coastal plain, valleys, and lower mountain ridges. Oʻahu is the State's governmental, service, commercial, and transportation center, and accounts for about 80 percent of the State's economic output. The large visitor industry, military activities, and to a lesser extent, agriculture contribute to this output. Oʻahu's sugar industry closed in 1996, and many former sugar lands have been converted to residential communities. The recent decision to base one of the six U.S. Army Stryker Brigades in Hawai'i will likely result in increased military activity on Oʻahu, involving purchase of additional land, construction of range complexes, and improvement of roads.

SPECIES AND HABITATS OF IMPORTANCE

Habitats on Oʻahu are composed of montane wet communities, lowland wet communities, lowland mesic communities, lowland dry communities, and coastal communities. The island has a network of perennial and intermittent streams, many of which have been altered. Habitat types include 'aki'aki (*Sporobolus virginicus*) coastal dry grassland, naupaka (*Scaevola sericea*) mixed coastal dry shrubland, 'uki (*Cladium jamaicense*) lowland wet sedgeland, 'ōhi'a (*Metrosideros polymorpha*) lowland wet and mesic forest, and wet cliffs. The dry to mesic habitats located in the Wai'anae mountains are considered to contain high concentrations of federally endangered plant species, including both species that are naturally rare as well as species exhibiting human-induced rarity. A system of wetlands situated along the windward coast south to Pearl Harbor provide important habitat for endemic waterbirds and migratory shorebirds and waterfowl. Many of the seventeen offshore islands are important for nesting seabirds, with Moku Manu and Mānana supporting the greatest diversity of species and the highest number of individuals. Ulupa'u Wildlife Management Area (at Kāneʻohe Marine Corps Base) supports one of the two colonies of 'ā (*Sula sula* [red-footed booby]) in the Main Hawaiian Islands. Approximately 22,274 hectares (55,040 acres) have been designated as critical habitat for 99 endangered plants on Oʻahu, which partially overlaps with the 26,661 hectares (65,879 acres) designated as critical

habitat for the O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*). Habitat essential for the recovery of the O‘ahu tree snails (*Achatinella* spp.) has also been identified.

Appendix A provides information on what wildlife Species of Greatest Conservation Need are present on O‘ahu and its associated offshore islands. Known taxa endemic to O‘ahu include the O‘ahu ‘elepaio (endemic at the subspecies level), O‘ahu ‘alauahio (*Paroemyza maculata* [O‘ahu creeper], potentially extinct), O‘ahu ‘amakihi (*Hemignathus flavus*), the damselfly *Megalagrion leptodemas*, several endemic bees (*Hylaeus* spp.), and the O‘ahu tree snails (*Achatinella* spp.). The endangered ‘ōpe‘ape‘a (*Lasiurus cinereus semotus* [Hawaiian hoary bat]) occurs on the island, as do the following birds: ‘apapane (*Himatione sanguinea*), ‘i‘iwi (*Vestiaria coccinea*) (State listed as endangered on O‘ahu), and pueo (*Asio flammeus sandwichensis* [Hawaiian short-eared owl]) (State listed as endangered on O‘ahu). Significant populations of endangered waterbirds occur on O‘ahu, including the ae‘o (*Himantopus mexicanus knudseni* [Hawaiian stilt]), ‘alae ke‘oke‘o (*Fulica alai* [Hawaiian coot]), ‘alae ‘ula (*Gallinula chloropus sandvicensis* [Hawaiian moorhen]), and the koloa maoli (*Anas wyvilliana* [Hawaiian duck]). The seabird, ‘a‘o (*Puffinus auricularis newelli* [Newell’s shearwater]), is believed to nest in the Ko‘olau mountains, mōlī (*Phoebastria immutabilis* [Laysan albatross]) nest at Ka‘ena Point Natural Area Reserve, and eight species of seabirds nest on the offshore islands. O‘ahu is also home to a diverse number of terrestrial invertebrates, most of which have been poorly studied. Several species of land snails from the genera *Auriculella*, *Leptachatina*, and *Amastra* have been observed, while diversity within most families of beetles (Coleoptera) is among the highest in the State. ‘Ōpae‘ula (*Holocaridina rubra*) occur in natural and man-made anchialine and aquaculture ponds. Native freshwater fishes, including several species of ‘o‘opu, native freshwater invertebrates, including *Oahuhawaiian kazukolinda*, and several species of crustaceans, are found within several stream systems. Finally, honu (*Chelonia mydas agassizi* [green sea turtles]) are regularly observed around the island.

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 O‘ahu are listed below.

- Primary entry point for new invasive species into the State;
- Insufficient acreage of managed wetland habitat to support expansion of waterbird populations;
- Wildfire, especially in drier leeward areas, due to humans and exacerbated by invasive non-native plants (increasing fuel loads);
- Recreational use of offshore islets, deterring seabird nesting or destroying existing nests and habitats;
- Predation by introduced animals (e.g., feral cat colonies and mongooses preying on waterbirds, shorebirds, and seabirds; introduced fish preying on native freshwater species and terrestrial invertebrates; introduced snails preying on native land snails);
- Disturbance of forested habitat and rare plants by feral pigs;
- Stream diversions, dams, or channelizations;
- 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);

- Insufficient in-stream flows to insure the biological integrity of many stream systems;
- Human impacts on anchialine ponds;
- Localized excessive recreational use at places like Hanauma Bay and Waikīkī;
- Localized point source pollution originating from recreational boats and cruise ships;
- Fisheries bycatch of green sea turtles and seabirds;
- Introduction of invasive marine species in ports and harbors;
- Human and boat interactions with marine mammals along the Wai‘anae Coast;
- Land-based sources of pollution.

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 O‘ahu 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 O‘ahu;
 - Enhance resources to expand management capacity at existing protected wetland habitat (e.g., Kawai Nui and Hāmākua Marsh);
 - Increase active management in, or acquisition of, extremely rare habitats on O‘ahu;
 - Protect remaining intact native forest, wetland habitat, and coastal areas from development through a combination of acquisition, conservation easements, or cooperative agreements with landowners;
 - 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;
 - Implement fire suppression measures and protocols for post-fire restoration;
 - Protect remaining anchialine ponds;
 - Collaborate in efforts to reduce pollution threats from recreational boats and cruise ships;
 - Develop management plans for all Marine Managed Areas;
 - Support ongoing projects to deal with non-point source pollution in Kāne‘ohe Bay and other watersheds and support expansion of successful methods to other 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 O‘ahu;
- Increase efforts to prevent establishment of priority invasive plants in pristine areas (e.g., miconia) and to eradicate from areas with recovery potential (e.g., mangrove in tidal flats);
- Expand control of mammalian predators (e.g., feral cats, rats) in waterbird, seabird, and ‘elepaio 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.
- Strengthen existing and create new partnerships and cooperative efforts.
 - Formalize partnerships with military agencies to manage areas (including State land) for habitat conservation;
 - Encourage additional landowner participation and involvement in Ko‘olau Mountains Watershed Partnership to facilitate conservation actions on these lands;
 - Develop new partnerships with non-traditional partners such as smart growth initiatives to address loss of habitat through development;
 - Expand partnership with hunting community to reduce ungulate populations;
 - Expand current firefighting capacity through greater interagency cooperation (e.g., sharing equipment, training, and fighting capacity);
 - 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 (e.g., National Wildlife Refuges, Wildlife Sanctuaries);
 - 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;
 - Improve education regarding the destructive impact of nesting seabird disturbance and reef trampling;
 - Develop and provide technical support for the implementation of pilot or demonstration projects by citizen groups, small businesses, or landowners, in areas close to where people live to provide an opportunity to connect residents with O‘ahu’s native wildlife and their needs.
- 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 other species and habitat for inclusion in Hawaiian Islands Humpback Whale National Marine Sanctuary, increase research, education, and enforcement.
- Obtain and implement the plans of an Incidental Take Permit for sea turtle and Hawaiian monk seal bycatch;
- Improved integration of policies to address linkages between terrestrial and marine habitats and their shared conservation threats and needs;
- Develop and implement strategies and policies to encourage proper management of coastal dune system.

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 Hawaiian Endangered Bird Partnership for Captive Propagation Five Year Workplan (2002), the Draft Revised Recovery Plan for Hawaiian waterbirds (1999), the Recovery Plan for the Hawaiian Hoary Bat (1998), and the Recovery Plan for the O‘ahu Tree Snails of the Genus *Achatinella* (1992);
- Critical habitat designations by the USFWS for the O‘ahu ‘elepaio and for threatened and endangered plants on O‘ahu;
- Management Plans for the State Natural Area Reserves (NAR): Ka‘ena Point NAR (1989) and Mt. Ka‘ala NAR (1990);
- Integrated Natural Resources Management Plans have been developed by the U.S. Army, U.S. Marine Corps, and U.S. Navy to cover their respective installations on O‘ahu;
- 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 Ko‘olau Mountains Watershed Partnership Management Plan (2002);
- 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;
- 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 O‘ahu. The discussion of future management needs is highlighted within each current managed area. Some areas on O‘ahu are already under active management or protection through designation as a State Natural Area Reserve (NAR), State Wildlife Sanctuary, National Wildlife Refuge (NWR), or Marine Corps Wildlife Management Area. The Ko‘olau Mountains Watershed Partnership (KMWP) was formed to identify and implement conservation actions needed to preserve the watershed resources of the Ko‘olau mountains, and initial steps are underway to establish a similar partnership in the Wai‘anae mountains. In addition, other partnerships, such as the O‘ahu Invasive Species Committee (OISC) have been formed to address specific species conservation needs.

Ko‘olau Mountains Watershed Partnership (97,760 acres), Public-Private Partnership (DLNR-DOFAW, DLNR-State Parks, Department of Hawaiian Home Lands, U.S. Army, USFWS, Honolulu Board of Water Supply, Agribusiness Development Corporation, Queen Emma Foundation, Kamehameha Schools, Bishop Museum)

Species: Forest birds, pueo, terrestrial invertebrates, including land snails, damselflies, bees, beetles, spiders, freshwater fishes (‘o‘opu), freshwater invertebrates, rare plants.

Habitats: Lowland wet communities, lowland mesic communities.

Current Management: Management plan exists. Fencing, ungulate control, invasive weed control.

Future needs: Funding to implement management plan, fencing, ungulate control, invasive weed control, predator control, outplanting.

O‘ahu Forest NWR (4,525 acres), USFWS

Species: Forest birds, pueo, terrestrial invertebrates, including land snails, rare plants.

Habitats: Lowland wet communities, lowland mesic communities.

Current Management: Invasive weed control, ungulate control, predator control.

Future needs: Continued management including ungulate and predator control, forest restoration.

Pahole Natural Area Reserve (658 acres), DOFAW

Species: Forest birds, terrestrial invertebrates, including land snails, spiders, rare plants.

Habitats: Lowland communities.

Current Management: No management plan exists. Fencing, ungulate removal from fenced areas, predator control, invasive plant removal, outplanting.

Future Needs: Completion of proposed Kapuna fencing, develop management plan, formalize partnership with U.S. Army for habitat and rare plant management, continue existing management.

Mt. Ka‘ala Natural Area Reserve (1,100 acres), DOFAW

Species: Forest birds, terrestrial invertebrates, including land snails, spiders, rare plants.

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

Current Management: Management plan exists. Fencing, invasive plant removal, maintenance of fencing.

Future Needs: Formalize partnership with U.S. Army for habitat and rare plant management, continue existing management, ungulate and predator control.

Honouliuli Preserve (3,582 acres), The Nature Conservancy

Species: Forest birds, terrestrial invertebrates, rare plants.

Habitats: Lowland communities.

Current Management: Fencing, fire prevention, predator (rat) control, invasive weed removal, ungulate control, habitat restoration, monitoring, research.

Future Needs: Continue existing management.

Kawailoa Training Area, U.S. Army

Species: Birds, snails, rare plants.

Habitats: Lowland wet communities, lowland mesic communities.

Current Management: Management plan exists, ungulate control, fencing.

Future Needs: Implement Integrated Natural Resources Management Plan.

Kawai Nui and Hāmākua Marsh Complex (850 acres), DOFAW

Species: Waterbirds, migratory shorebirds, ‘o‘opu, ‘ōpae kala‘ole (shrimp).

Habitats: Lowland communities.

Current Management: Hydrologic studies, habitat restoration, including invasive plant removal and native wetland planting, predator control.

Future Needs: Continue existing management, secure adequate funding to support expanded management (increased predator control, invasive weed removal, habitat restoration, educational opportunities).

Nu‘upia Pond Wildlife Management Area (482 acres), U.S. Marine Corps Base Hawai‘i

Species: Waterbirds, migratory shorebirds, seabirds, particularly ‘ua‘u kani (wedge-tailed shearwater).

Habitats: Wetlands and ponds.

Current Management: Implementation of Integrated Natural Resources Management Plan (INRMP): predator control, invasive plant (e.g., mangrove) removal, wetland improvements, monitoring.

Future Needs: Continue existing management.

James Campbell NWR (222 acres), USFWS

Species: Waterbirds, migratory birds, terrestrial invertebrates, anchialine pond fauna.

Habitats: Lowland communities, coastal communities.

Current Management: Habitat restoration and endangered species protection: predator control, weed control, monitoring.

Future Needs: Continue existing management. Increase the area protected and managed in order to accommodate growing populations of endangered waterbirds and migratory birds. Restoration of lowland wet and other coastal plant species.

Pearl Harbor NWR (62 acres), USFWS

Species: Waterbirds, migratory birds, terrestrial invertebrates, ‘ōpae‘ula (anchialine pond shrimp).

Habitats: Lowland communities, anchialine pools.

Current Management: Habitat restoration and endangered species protection: predator control, weed control, monitoring.

Future Needs: Continue existing management.

Paikō Lagoon (40 acres), DOFAW

Species: Migratory shorebirds.

Habitats: Coastal communities.

Current Management: Volunteer opportunities to participate in non-native plant (e.g., mangrove) control, trash removal, predator control, outplanting.

Future Needs: Continue existing management.

Pouhala Marsh Wildlife Sanctuary (70 acres), DOFAW

Species: Waterbirds, particularly Hawaiian stilt.

Habitats: Lowland communities.

Current Management: Habitat management: predator control, trash removal, mangrove removal, pond restoration.

Future needs: Continue existing management.

Ka‘ena Point Natural Area Reserve (36 acres), DOFAW

Species: Seabirds, particularly nesting mōlī (Laysan albatross) and ‘ua‘u kani (wedge-tailed shearwater), migratory shorebirds, monk seal, rare plants.

Habitats: Coastal communities.

Current Management: Management of human access and activities, invasive weed removal, predator control, outplanting, monitoring, research.

Future Needs: Continue existing management, increase monitoring and visitor education.

Ulupa‘u Wildlife Management Area (23 acres), U.S. Marine Corps Base Hawai‘i

Species: Seabirds, particularly ‘ā (red-footed booby).

Habitats: Coastal communities.

Current Management: Implementation of INRMP: fire risk reduction, habitat enhancement.

Future Needs: Continue existing management.

State Seabird Sanctuary (13 offshore islets), DOFAW

Species: Seabirds: ‘ua‘u kani (wedge-tailed shearwater), Christmas shearwater, ‘ewa‘ewa (sooty tern), pākakalala (gray-backed tern), noio (black noddy), noio-kōhā (brown noddy), manu-o-Kū (white tern), bonin petrel, ‘iwa (great frigatebird), ‘ā (red-footed booby), ‘ā (brown booby), ‘ā (masked booby), koa‘e ‘ula (red-tailed tropicbird), koa‘e kea (white-tailed tropicbird), mōlī (Laysan albatross), ka‘upu (black-footed albatross), ‘ou (Bulwer’s petrel), migratory shorebirds.

Habitats: Coastal communities, marine ecosystems.

Current Management: Ongoing surveys, predator removal, invasive weed control

Future Needs: Continue existing management, identify priority islands for predator eradication and implement, include offshore waters as part of Marine Managed Area.

O‘ahu Invasive Species Committee, Public-Private Partnership

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

Current Management: Identification of priority invasive species, then implementation of control and/or eradication. Current priority species include: miconia, Caribbean frogs, Himalayan blackberry, fountain grass, fire tree, bushy beardgrass, manuka, Indian rhododendron, smoke bush.

Future Needs: Adequate funding to support priority OISC actions.

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.

Three Marine Life Conservation Districts (MLCD), DAR: Hanauma Bay, Pūpūkea, Waikīkī

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 MLCD include at least some No Take areas, and fish monitoring.

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

Five Fishery Management Areas (FMA), DAR: He‘eia Kea Wharf, Honolulu Harbor, Pōka‘i Bay, Waialua Bay, Waikīkī-Diamond Head Shoreline

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 FMAs.

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

Nearshore waters surrounding Kāneʻohe Marine Corps Base, U.S. Marine Corps Base Hawaiʻi

Species: Marine invertebrates, coral reef fishes, and sea turtles.

Habitats: Marine ecosystems: seagrass bed, coral reef.

Current management: 500 foot (150 meter) safety buffer around Kāneʻohe Marine Corps Base enforced for public safety due to proximity to firing range.

Future needs: None at this time.

Coconut Island Wildlife Sanctuaries, DAR

Species: Marine species.

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

Current Management: Limited access. No Take.

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

Four 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 Oʻahuʻs native wildlife. The following section identifies areas where enhanced conservation management would significantly benefit native species or their habitats. Areas are discussed in habitat order from the mountains to the sea.

Koʻolau Forested Watershed

Species: Forest birds, terrestrial invertebrates, rare plants.

Basis for Priority Designation: Habitat for rare species, significant acreage of intact lowland wet forest, tracts of remnant lowland dry forest, opportunities for partnership with numerous private landowners.

Potential Conservation Actions: Expand participation in KMWP, facilitate conservation on private lands through technical assistance and funding opportunities, increased ungulate management through fencing and control, invasive weed control and removal, rodent control.

Manoa stream riparian corridor

Species: *Oahuhawaiiiana kazukolinda*.

Basis for Priority Designation: Few intact stream corridors remaining statewide.

Potential Conservation Actions: Secure additional protection, fencing, support voluntary and incentive based programs for conservation on private lands.

Wai‘anae Forested Watershed

Species: Forest birds, native invertebrates, rare plant taxa.

Basis for Priority Designation: Habitat for rare species, intact lowland mesic forest, emerging public-private partnership currently encompassing 5,800 acres involving DOFAW, Board of Water Supply, non-governmental organizations, community. Opportunities for expanded partnerships. Multiple planning efforts underway (U.S. Army Mākuā Mitigation Plan; Board of Water Supply watershed plans).

Potential Conservation Actions: Expand and strengthen emerging partnership, integrate existing conservation management, ungulate control, invasive weed control, fire prevention.

Wetland Habitats

Species: Waterbirds, migratory shorebirds and waterfowl, terrestrial invertebrates, freshwater fishes, freshwater invertebrates.

Basis for Priority Designation: Insufficient number of protected and managed wetlands to support growth of endangered waterbird populations.

Potential Conservation Actions: Increase active management of areas currently used by waterbirds using predator control, invasive plant removal, and wetland restoration, identify priority areas for protection and management, secure adequate funding for management and restoration of wetlands, develop emerging partnership of landowners (DLNR, Hawai‘i Community Development Authority, Kamehameha Schools) at He‘eia into model for cooperative management across an *ahupua‘a* (from the mountains to the ocean).

References:

Hawai‘i Department of Business, Economic Development, and Tourism. 2003. State of Hawai‘i data book.

Available at: http://www3.Hawai‘i.gov/DBEDT/index.cfm?section=READ_Databook1075. (accessed 28 March 2005).

Hawai‘i Natural Heritage Program [now known as the Hawai‘i Biodiversity and Mapping Program]. 2005. Hawai‘i GAP Analysis. Personal communication.

Hawaii’s Local Action Strategy to Address Land-Based Pollution Threats to Coral Reefs. 2004. Plan prepared jointly by EPA, USGS, USFWS, NOAA, CZM, DOH, DLNR. Available at: <http://www.hawaii.gov/health/environmental/water/cleanwater/reports/reports.html>.

Hawai‘i Coastal Zone Management Program and Department of Health. 2000. Hawai‘i implementation plan for polluted runoff control. Available at: <http://www.hawaii.gov/health/environmental/water/cleanwater/reports/reports.html>.

Hawai‘i Department of Health, Hawai‘i Coastal Zone Management Program, and U. S. Natural Resources Conservation Service. 1998. Hawai‘i unified watershed assessment. Available at: <http://www.state.hi.us/dbedt/czm/UWAreport.htm>.

Hawai‘i Department of Health. 2004. List of impaired waters. Available at: <http://www.hawaii.gov/health/environmental/env-planning/wqm/wqm.html>.

- Henry AR. 2005. Pacific coast joint venture Hawai'i: strategic plan for wetland conservation in Hawai'i review draft. Honolulu, (HI): Pacific Coast Joint Venture.
- Juvik JO, Juvik S, editors. 1998. Atlas of Hawai'i Third Edition. Honolulu: University of Hawai'i Press.
- Kaiser B, Krause N, Roumasset J. 1999. Environmental valuation and the Hawaiian economy. Honolulu: University of Hawai'i Economic Research Organization.
- Ko'olau Mountains Watershed Partnership. 2002. Ko'olau Mountains Watershed Partnership management plan. Available at: <http://www.state.hi.us/dlnr/dofaw/wmp/koolau/KMWPMP.PDF> (accessed on April 18, 2005).
- Nature Conservancy of Hawai'i . Hawaiian High Islands Ecoregional Plan.
- Nature Conservancy. Undated. Honouliuli Preserve master plan. Honolulu, (HI).
- Smith D. Wildlife Biologist. Division of Forestry and Wildlife. Personal communication.
- Sustainable Resources Group International, Inc. 2002. Marine Corps Base Hawai'i : invasive species management study: Draft Report. Honolulu, HI.
- Timbol AS, Maciolek JA. 1978. Stream Channel Modifications in Hawaii, Part. A: statewide inventory of streams; habitat factors and associated biota. FWS/OBS-78/16, April 1978. Hawai'i Cooperative Fisheries Unit, University of Hawaii, Contract No. 14-16-0008-1199, U.S. Fish and Wildlife Service, U.S. Department of the Interior.
- U.S. Fish and Wildlife Service. 2003. A blueprint for the future of migratory birds: migratory bird program strategic plan 2004-2014. Portland, (OR): U.S. Fish and Wildlife Service, Region 1. 16 pp.
- U.S. Fish and Wildlife Service. 2003. Draft revised Recovery plan for Hawaiian forest birds. Portland, (OR): U.S. Fish and Wildlife Service. 428 pp.
- U.S. Fish and Wildlife Service. 1998. Recovery plan for the Hawaiian hoary bat. Portland, (OR): U.S. Fish and Wildlife Service. 50 pp.
- U.S. Fish and Wildlife Service. 2004. Draft revised recovery plan for the Nene or Hawaiian Goose (*Branta sandvicensis*). Portland, (OR): U.S. Fish and Wildlife Service. 148 + xi pp.
- U.S. Fish and Wildlife Service. 1999. Draft revised recovery plan for Hawaiian waterbirds, Second Revision. Portland, (OR): U.S. Fish and Wildlife Service. 107 pp.
- U.S. Fish and Wildlife Service. 2005. Regional seabird conservation plan, Pacific Region. U.S. Fish and Wildlife Service, Migratory Birds and Habitat Programs, Pacific Region. Portland, (OR): U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. 1992. Recovery plan for the O'ahu Tree Snails of the genus *Achatinella*. Portland, (OR): U.S. Fish and Wildlife Service. 64 pp. + 64 pp. of Appendices + 5 figures.
- U.S. Fish and Wildlife Service. 2003. Final Rule: final designation or non-designation of Critical Habitat for 101 plant species from the island of O'ahu, Hawai'i. Honolulu, HI. Available at: <http://www.fws.gov/pacific/pacificislands/CHRules/oahufinal.pdf>.
- U.S. Fish and Wildlife Service. 2001. Determination of Critical Habitat for the Oahu Elepaio (*Chasiempis sandwichensis ibidis*): Final Rule. Honolulu, (HI): U.S. Fish and Wildlife Service. Available at: <http://www.fws.gov/pacific/pacificislands/CHRules/elepaiofr.pdf>.

U.S. Marine Corps Base Hawai'i . Natural resources conservation – small installations. FY01-03. Available at:
[https://www.denix.osd.mil/denix/Public/News/OSD/SecDef03/NRC/nrc_Hawai'i .pdf](https://www.denix.osd.mil/denix/Public/News/OSD/SecDef03/NRC/nrc_Hawai'i.pdf).