

MOLOKA‘I

Moloka‘i is the fifth largest of the Main Hawaiian Islands. While fairly small in geographic size, the island supports a wide-range of native habitats and a diversity of native wildlife. The mountains of eastern Moloka‘i are cut into deep valleys by perennial streams, and due largely to their inaccessibility, these valleys contain high-quality native habitat for stream fauna, forest birds, and native snails and insects. The coastal strand along the island’s northwest coast contains one of the State’s last intact dune systems and is important to nesting seabirds and marine animals. Habitat community types found on Moloka‘i include lava tube caves, montane bogs, and wet forests. Important geographic features include the State’s third largest perennial stream, and the highest sea cliffs in the world.

OVERVIEW

Geology and Hydrology

Moloka‘i is approximately 1.8 million years old and 68,000 hectares (170,240 acres) in size. Three shield volcanoes comprise most of the island, with the East Moloka‘i Mountains making up half of the island area. The highest point on the island is 1,515 meters (4,970 feet), and steep cliffs characterize the northern windward coast with inaccessible deep valleys dissecting the coastal area. The leeward slopes descend to a narrow coastal plain fronting an extensive shallow offshore reef flat. The terrain of western Moloka‘i was formed by an older volcano, and has a maximum elevation of 421 meters (1,351 feet). This side of the island is typically dry and windy. The Kalaupapa peninsula, formed by the third volcano, extends from the north-central coast, below the steep sea cliffs of eastern Moloka‘i. Approximately 37 percent of the island is below 150 meters (500 feet) in elevation, and about 18 percent of the island is above 610 meters (2,000 feet) in elevation. Moloka‘i has 36 perennial streams, 16 of which are continuous. Wailau-Pulena and Pelekunu have the largest discharges, 27 and 25 million gallons per day (mgd), respectively. Moloka‘i has nine offshore islets.

Climate

Annual rainfall ranges from 406 centimeters (160 inches) at the top of the East Moloka‘i Mountains, to 38 centimeters (15 inches) along the coasts of the leeward side of the island.

Land and Water Use

The majority of land on the island is in the State Agricultural District (67% or 44,651 hectares/111,627 acres). Approximately 30 percent (or 19,907 hectares/49,768 acres) is in the State Conservation District, primarily covering the East Moloka‘i Mountains and the coastlines. The remaining land is either in the Urban (2% or 1,016 hectares/2,539 acres) or Rural (1% or 746 hectares/1,866 acres) Districts. Ten percent of the island (6,412 hectares/16,030 acres) is in Forest Reserve. There are also 10,308 hectares (25,769 acres) of Department of Hawaiian Home Lands (16% of the island). Within native dominated landscapes, major landowners include the State of Hawai‘i and private entities such as The Nature Conservancy of Hawai‘i, Kamehameha Schools, Pu‘u O Hoku Ranch, and Moloka‘i Ranch. One stream (Kamalo) has an altered channel. The Waikolu canal in the northeast is the largest man-made stream system at five mgd. Kualapu‘u Reservoir is a significant man-made lake at 15 meters (50 feet) deep and 40 hectares (100 acres) in area.

Human Landscape

Total resident population on the island is estimated at 7,500, with an average daily visitor count of 955. A majority of the population is centered in the Kaunakakai and Ho‘olehua areas in central Moloka‘i. Moloka‘i has the second highest percentage of Native Hawaiians in the State, and many of these residents engage in traditional practices of subsistence gathering. In 1999, the island was named an “Enterprise Community” through the USDA Empowerment Zone program, a designation which provides Federal funds to support economic growth and community development. The major industries are agriculture, ranching, and flower cultivation.

SPECIES AND HABITATS OF IMPORTANCE

Moloka‘i is home to a variety of habitats. Major habitat types include montane wet forests and shrublands, coastal system (including dunes and grasslands), perennial streams, lava tubes and caves, cliffs, bog communities, and nine offshore islets. Moloka‘i contains recovery habitat identified by the USFWS for the Maui parrotbill (*Pseudonestor xanthophrys*) and ‘ākohekohe (*Palmeria dolei* [crested honeycreeper]). Additionally, 1,242 hectares (3,105 acres) in East Moloka‘i has been designated by the USFWS as critical habitat for the Blackburn’s sphinx moth (*Manduca blackburni*), which partially overlaps with 9,733 hectares (24,333 acres) designated as critical habitat for 41 endangered plants on Moloka‘i.

Appendix A provides information on what wildlife Species of Greatest Conservation Need are present on Moloka‘i and its associated offshore islands. Most of Molokai’s endemic forest birds are likely extinct; however ‘i‘iwi (*Vestiaria coccinea*), ‘amakihi (*Hemignathus virens*), and ‘apapane (*Himatione sanguinea*) still persist at low numbers. In addition, Moloka‘i supports populations of several endangered and threatened species, such as ‘ōpe‘ape‘a (*Lasiurus cinereus semotus* [Hawaiian hoary bat]), the nēnē (*Branta sandvicensis* [Hawaiian goose]), ae‘o (*Himantopus mexicanus knudseni* [Hawaiian stilt]), ‘alae ke‘oke‘o (*Fulica alai* [Hawaiian coot]), ‘ua‘u (*Pterodroma sandwichensis* [Hawaiian petrel]), ‘a‘o (*Puffinus auricularis newelli* [Newell’s shearwater]), and the Blackburn’s sphinx moth. Other species groupings that can be found on Moloka‘i are terrestrial invertebrates, freshwater fishes, freshwater invertebrates, seabirds, 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 Moloka‘i are listed below.

- Large numbers of goats (*Capra hircus*) occur at mid-elevations on the south slope of east Moloka‘i, denuding vegetation, pushing back the forest line, and contributing to soil erosion and runoff onto the nearshore reefs, thereby affecting both forest and marine species;
- Range expansion by invasive plants threatens the native-dominated core of east Moloka‘i;
- The presence of pigs (*Sus scrofa*) and axis deer (*Axis axis*) in areas of pristine, high-quality native forest degrades important habitat for the remaining arthropods, forest birds, and snails;
- The relative isolation and small size of forest bird populations makes these species extremely vulnerable to disturbances and unexpected disasters such as hurricanes or

wildfires that could lead to their extinction. The degree to which this is also true for arthropods and snails is unknown;

- Development of formerly undeveloped areas (especially along the southeastern coast) 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);
- Introduced predators (vertebrate and invertebrate) in native landscapes that prey on native birds, snails, and other invertebrates either directly, or indirectly, through competition for food and other resources;
- Nest burrow usurpation, or trampling by ungulate and human traffic, and disease by arthropod vectors for seabirds;
- Wildfire;
- Lack of enforcement for existing rules and regulations;
- Expanding eco-tourism activities that disrupt animal behaviors and habitats.

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 Moloka‘i 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 Moloka‘i;
 - Increase active management in, or acquisition of, extremely rare habitats on Moloka‘i;
 - Increase DOFAW capacity to support on-site management and coordination with Moloka‘i partners;
 - Implement fire suppression measures and protocols for post-fire restoration;
 - Increase the total acreage of ungulate-free and predator-free areas;
 - Assess potential reintroduction of native birds historically found on Moloka‘i;
 - 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;
 - Develop management plans for all Marine Managed Areas;
 - Support Local Action Strategies project to deal with non-point source pollution off the south coast 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 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 Moloka‘i (e.g., *Tibouchina herbacea* and *Miconia calvescens*);

- Increase efforts to prevent establishment of priority invasive plants in pristine areas and to eradicate from areas with recovery potential;
 - 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;
 - Increase bat surveys to better assess bat distribution;
 - Assess impact of eco-tourism activities on terrestrial and aquatic native wildlife and associated habitats.
- Strengthen existing and create new partnerships and cooperative efforts.
 - Support ongoing and future projects to deal with Non-Point Source Pollution;
 - Support community based management of terrestrial and aquatic habitats;
 - 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.
- 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;
 - Improve integration of policies to address linkages between terrestrial and marine habitats and their shared conservation threats and needs.

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), and the Recovery Plan for the Hawaiian Hoary Bat (1998), the Draft Recovery Plan for the Blackburn’s sphinx moth (2003);
- Critical habitat designations by the USFWS for the Blackburn’s sphinx moth and for threatened and endangered plants on Moloka‘i;
- Management Plans for the State Natural Area Reserves (NAR): Olokui NAR (1991), Pu‘u Ali‘i NAR (1991);

- Long-Range Management Plans for Natural Area Partnership Preserves (NAPP): Mo‘omomi NAPP (2000); Kamakou NAPP (2000); Pelekunu NAPP (2003);
- 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;
- 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 Moloka‘i. The discussion of future management needs is highlighted within each current managed area. Some areas on Moloka‘i are already under active management or protection through designation as a State Natural Area Reserve (NAR), Natural Area Partnership Preserve, National Park, or National Wildlife Refuge (NWR). The East Molokla‘i Watershed Partnership (EMoWP) extends similar management over private lands, resulting in the protection of a contiguous 760 hectare (19,000 acre) block of the most intact portion of the native-dominated landscape. The Moloka‘i subcommittee of the Maui Invasive Species Committee (MoMISC) addresses high priority invasive species on an island-wide basis. Additional conservation management benefiting native wildlife occurs on a more localized basis, based on funding availability and landowner or community support. Examples include nēnē re-introduction on private lands and Mo‘omomi coastal strand restoration. Finally, DOFAW working with USFWS has a programmatic Safe Harbor Agreement for nēnē on Moloka‘i, allowing the agency to enroll individual landowners who enhance, restore, or maintain habitat to benefit nēnē, protecting them from Endangered Species Act requirements if nēnē numbers increase due to their conservation actions.

East Moloka‘i Watershed Partnership (EMoWP) (19,000 acres), Public-Private Partnership (NPS, TNC, DOFAW, Kamehameha Schools, Kapualei Ranch, Kawela Plantation, Ke Aupuni Lōkahi Enterprise Community Governance Board, individual private landowners, Hawai‘i Department of Health, Maui County, Maui County Department of Water Supply,

Moloka‘i-Lāna‘i Soil and Water Conservation District, USDA, USGS, U.S. Environmental Protection Agency)

Species: All species found on partner lands listed below.

Habitats: Montane wet communities, lowland communities, coastal communities, marine systems.

Current Management: Management plan exists. Phase I fencing along the south slope of the East Moloka‘i Mountains.

Future Needs: Continue fencing excluding ungulates and predators from upper south slope of East Moloka‘i mountains in cooperation with private landowners, maintain fences.

Kalaupapa National Historic Park (10,779 acres, in addition 2 offshore islets), NPS

Species: ‘Amakihi, ‘apapane, ‘i‘iwi, ‘ua‘u (Hawaiian petrel), ‘a‘o (Newell’s shearwater), koa‘e kea (white-tailed tropicbird), koa‘e ‘ula (red-tailed tropicbird), ‘ā (brown bobby), ‘ou (Bulwer’s petrel), ‘ua‘u kani (wedge-tailed shearwater), cave invertebrates, Hawaiian monk seal, hōnu (green and hawkbill), five native diadromous fish (goby) species, native snails, shrimp.

Habitats: Montane wet communities, lowland communities, coastal communities. Kauhakō Crater contains only known low elevation dryland forest known in the State.

Current Management: Management plan exists. One-time inventories for bats, herptofauna, vascular plants, anchialine pond fauna, and marine fishes. Invasive plant control, fencing, ungulate control, water quality monitoring. 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). ‘Opihi and reef monitoring and research, monk seal monitoring and protecting, and coral recruitment project.

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

Kamakou Preserve (2,774 acres), TNC

Species: ‘Amakihi, ‘apapane, ‘i‘iwi, five rare native land snails, native insects.

Habitats: Montane wet communities, lowland mesic communities.

Current Management: Management plan exists. Fence maintenance, ungulate control through trapping, invasive plant control and eradication, fire prevention, monitoring, rare species outplanting, community outreach.

Future Needs: Continue existing management.

Pelekunu Preserve (5,714 acres), TNC

Species: ‘I‘iwi, ‘apapane, ‘amakihi, ‘auku‘u (black-crowned night-heron), ‘ūlili (wandering tattler), koa‘e kea (white-tailed tropicbird), *Partulina mighelsiana*, *P. tessellata*, *Megalagrion santhomelas*, *M. pacificum*, beetles, five native freshwater fishes, freshwater snail, hihiwai, two native crustaceans, ‘opae kala‘ole, ‘opae‘ohea‘a, rare aquatic insects, *Campsicnemus ridiculus*.

Habitats: Montane wet communities, lowland communities, coastal communities. Free-flowing streams.

Current Management: Management plan exists. Ungulate control, invasive plant monitoring and control, natural resource and water quality monitoring.

Future Needs: Continue existing management.

Oloku‘i NAR (1,620 acres), DOFAW

Species: ‘Apapane, ‘amakihi, ‘i‘iwi, koa‘e kea (white-tailed tropicbird), ‘a‘o (Newell’s shearwater), ‘ua‘u (Hawaiian petrel), native insects (crickets, katydid, flies, spiders), rare tree snails (*Achatinella* spp., *Partulina mighelsiana*, *P. tessellata*, *P. dwightii*, *Newcombia cinnamomea*).

Habitats: Montane wet communities, montane mesic communities, lowland wet communities, coastal communities, perennial streams.

Current Management: Management plan exists. Aerial and ground monitoring for feral ungulates and invasive plants.

Future Needs: Continuation of existing efforts to maintain Olokui in pristine condition.

Pu‘u Ali‘i NAR (1,330 acres), DOFAW

Species: Oloma‘o, ‘i‘iwi, pueo, ‘apapane, ‘amakihi, ‘a‘o (Newell’s shearwater), ‘ua‘u (Hawaiian petrel), native invertebrates (crickets, drosophilid flies, happyface spiders, Tornatellinid snails, Succinid snails, four species of *Achatinella* land snails, *Partulina tessellata*, *P. redfieldii*, *P. proxima*, *P. mighelsiana*).

Habitats: Perennial streams, montane wet shrublands and forests, upper half has most intact communities.

Current Management: Management plan exists. Ungulate control, fence maintenance, invasive plant control.

Future Needs: Fencing to restrict ungulate movement in a larger portion of the NAR, ungulate removal, continuation of existing efforts.

Kakahai‘a NWR (45 acres), USFWS

Species: Ae‘o (Hawaiian stilt), ‘Alae ke‘oke‘o (Hawaiian coot), migratory shorebirds.

Habitats: Contains 15-acre freshwater pond, seven-acre impoundment, and marshy thicket of bulrushes.

Current Management: Environmental education, habitat restoration, invasive species removal.

Future Needs: Continue existing management.

Mo‘omomi Preserve (921 acres), TNC

Species: Pueo, hunakai (sanderling), kōlea (Pacific golden plover), ‘iwa (great frigatebird), mōlī (Laysan albatross), Hawaiian monk seal, honu (green sea turtle).

Habitats: Coastal communities.

Current Management: Management plan exists. Nonnative species control, weed control, resource monitoring and research, community outreach, and rare species protection.

Future Needs: Continue existing management.

State Seabird Sanctuary (Seven offshore islands), DOFAW

Species: ‘Auku‘u (black-crowned night-heron), ‘ua‘u kani (wedge-tailed shearwater), ‘ou (Bulwer’s petrel), koa‘e kea (white-tailed tropicbird), koa‘e ‘ula (red-tailed tropicbird), ‘ā (brown booby), kōlea (Pacific golden plover), ‘ūlili (wandering tattler), ‘akekeke (ruddy turnstone), yellow-faced bees (*Hylaeas* spp.).

Habitats: Coastal communities.

Current Management: Monitoring, surveys.

Future Needs: Removal of small mammalian predators and native vegetation habitat restoration.

Moloka‘i 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: Continued support to identify, control, and eradicate high priority invasive species, increase prevention surveillance.

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.

One Fishery Management Area (FMA), DAR: Kaunakakai Harbor

Species: Some or all regulated fish species.

Habitats: Marine and estuary systems.

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

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

One Bottomfish Restricted Area (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 Molokai's 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.

Moloka'i Forest Reserve (16,030 acres), DOFAW

Species: Forest birds, terrestrial invertebrates.

Basis for Priority Designation: Good quality native forest, lowland mesic shrubland, part of EMoWP adjacent to core forested areas, little active management for native wildlife conservation.

Potential Conservation Actions: Control of invasive plants (biocontrol was introduced to halt spread of *Clidemia* to pristine areas), more intensive management for conservation in upper Waimanu and Mokomoko sections, review management policies to bring in line with quality of habitat.

Watershed area east of Kapualei

Species: Forest birds, terrestrial invertebrates.

Basis for Priority Designation: Relatively intact native habitat, protection against browsing by feral goats would reduce vegetation loss and soil erosion, thereby reducing sedimentation onto nearshore reefs.

Potential Conservation Actions: Assess future partnership opportunities and create incentives for conservation management.

Stream corridors (Wailau)

Species: Freshwater fishes, freshwater invertebrates, terrestrial invertebrates.

Basis for Priority Designation: One of the major stream corridors on the island not impacted by ungulates and invasive plants.

Potential Conservation Actions: Monitor stream health, assess for future management needs.

Cave Ecosystems (Kalaupapa and montane rain forest on the slopes of Kawela)

Species: Invertebrates.

Basis for Priority Designation: Unique ecosystems – only habitat for certain endemic invertebrates.

Potential Conservation Actions: Protection from human intrusion, invasive alien species, invasive microorganisms, wild fires, and ungulates.

Coastal Wetlands (Paialoa Pond, Pālaau wetlands, Kaunakakai Sewage Treatment Plant, 'Ōhi'apilo Playa, coastal fishponds, Kualapu'u Reservoir, Ho'olehua wetlands)

Species: Waterbirds, migratory birds.

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

Potential Conservation Actions: Restoration and management: increase and create open water surface, establish permanent water sources, control weeds, and restore native vegetation, conduct predator control.

North and West Shore Coastal Strand

Species: Seabirds, Hawaiian monk seal, honu (sea turtle).

Basis for Priority Designation: Important, heavily used habitat for seabirds and marine animals.

Potential Conservation Actions: Restoration of native vegetation, limit human disturbance, predator control.

‘Īlio Point, State Land

Species: Seabirds.

Basis for Priority Designation: Lithified sand dunes support quality intact mixed coastal shrubland. Used by nesting seabirds. Threatened by axis deer, invasive plants, feral cats, and pigeons. High restoration potential for coastal strand ecosystem and seabird habitat.

Potential Conservation Actions: Presence of unexploded ordnance limits conservation activities. Deer-proof fencing and predator control needed.

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