

## **CHAPTER 8: MONITORING, IMPLEMENTATION, AND ADAPTIVE MANAGEMENT**

The need for monitoring is a consistent theme throughout Hawaii's Comprehensive Wildlife Conservation Strategy (CWCS) and is referenced in several previous chapters (Chapters 4, 5, 6, and 7). Chapter 8 addresses monitoring specifically in the following ways: it provides a summary of current monitoring efforts at both the taxa and habitat levels; it outlines monitoring needs and recommendations; it discusses the implementation, monitoring, and evaluation of statewide conservation objectives as defined in Chapter 4, including adaptive management; and it outlines processes for the ten year revision of the CWCS. In doing so, this Chapter addresses required elements 5, 6, and 7.

### **PURPOSE AND VALUE OF MONITORING**

A well planned and executed monitoring program is key to the success of conservation efforts, especially in light of the scarcity of personnel and funds needed to protect and recover native wildlife resources in Hawai'i. Monitoring programs are essential to guide plans and implement adaptive changes to those plans, and for management and recovery programs to be most cost-effective and achieve their goals. Monitoring does this by providing ways to track population trends, to assess threats and limiting factors, and to evaluate progress of actions to improve native wildlife status. Monitoring programs are also tools with which to communicate conservation achievements, helping to develop support for conservation actions with decision-makers such as legislators, funding organizations, non-profit organizations, and the general public.

### **CURRENT ASSESSMENT OF MONITORING**

Monitoring is integral to most existing conservation programs and partnerships in Hawai'i. Monitoring protocols are varied and depend upon the nature of the resource being monitored, set objectives and goals, and staff and funding capabilities and commitments. This assessment distinguishes between taxa-based programs and habitat-based programs and identifies the current monitoring programs and plans that are in place.

### **SUMMARY OF MONITORING EFFORTS AND CHALLENGES IN THE STATE**

Monitoring in Hawai'i is conducted at multiple scales by various entities and at differing levels of frequency and quality. Monitoring, both at the taxa and habitat levels, is conducted by State and Federal agencies. Examples include monitoring of State and Federal fisheries, the statewide waterbird surveys, and the Forest Bird Surveys. Monitoring of taxa and habitats by State and Federal agencies also occurs on a program or area specific level and often as part of the management plan for managed areas. Examples include monitoring in Natural Area Reserves, State Wildlife Sanctuaries, National Parks, National Wildlife Refuges, military lands, marine managed areas, the National Marine Sanctuary, and the Coral Reef Ecosystem Reserve. Private landowners involved with conservation also conduct monitoring on their lands. Examples include private preserves managed by the Nature Conservancy of Hawai'i and Maui Land and Pineapple, Inc. and private landowners involved in conservation programs such as the State's Landowner Incentive Program and Federal programs managed by the Natural Resources

Conservation Service and the U.S. Fish and Wildlife Service (USFWS). Public-private partnerships such as the watershed partnerships also conduct monitoring. All of these areas are considered managed lands. Additionally, monitoring is conducted by academic researchers as well as organizations such as the island invasive species committees.

Species-specific monitoring in the State generally takes place as a part of implementing USFWS and National Marine Fisheries Service recovery plans for endangered species or as part of management plans for both listed and non-listed species (usually for State, Federal, private, and public-private partnership lands and waters mentioned previously). Often, these plans are developed for five to ten year cycles, with mid-term evaluation points for assessments and adaptive management purposes.

Finally, there are also citizen monitoring programs. Examples include the Hawai'i Audubon Society, which has conducted annual Christmas bird counts on O'ahu, Kaua'i, Maui, Hawai'i, Midway, Laysan and French Frigate Shoals, the yearly whale counts conducted by the Hawaiian Islands Humpback Whale National Marine Sanctuary and the Pacific Whale Foundation during the months of January-March, and the monitoring of reef fishes by Reefcheck.

The State has several tools and resources available to assist with monitoring. Examples include databases and information warehouses such as the Hawai'i Biodiversity and Mapping Program (formerly the Hawai'i Natural Heritage Program) and the Pacific Basin Information Node. There are also inter-agency efforts such as the Western Pacific Fisheries Information Network, Coral Reef Information Service, and the Hawai'i Forest Bird Interagency Database Project, which analyzes information collected during yearly forest bird surveys to determine conservation needs of these species.

The challenges facing implementation of effective monitoring are similar to those challenges faced in implementing conservation actions as discussed in Chapter 4: inadequate funds, lack of trained personnel to carry out monitoring, insufficient tools for monitoring (e.g., practical or standardized monitoring protocols), inability to use the information collected (e.g., survey forms are never entered into a database for later data analysis), and gaps in information sharing. The biggest challenge to monitoring, however, is being able to balance staff effort, cost, and issues of what to monitor in order to best measure the effectiveness of conservation actions and achieve objectives and goals. For example, while monitoring relatively populous species can be fairly straightforward, the cost and difficulty of monitoring rare or highly fluctuating populations presents difficult trade-offs between money applied toward gaining precise knowledge of population status and money needed for species and habitat improvement or restoration.

## **TAXON MONITORING**

Most monitoring in the State consists of counting individuals and nests. For many taxa, appropriate monitoring programs are specified in recovery or management plans. The level of detail of management recommendations provided in the plans varies among taxa. The following outlines existing monitoring efforts and resources for taxa as well as identifies gaps and needs.

### ***Terrestrial Mammal***

The ‘ōpe‘ape‘a (*Lasiurus cinereus semotus* [Hawaiian hoary bat]) is the only land mammal native to the Hawaiian archipelago. The USFWS recovery plan for the bat was developed in 1998 and outlines the monitoring requirements for this species. Specific recommendations center on the need for island-wide surveys and monitoring to determine bat population levels and distribution, as well as associated key habitats and potential threats affecting populations. To date, no systematic surveys of the bat have been conducted. Most monitoring has occurred on island specific areas and at different times of the year. Additionally, its wide range of habitat and the limited technology available to detect bat presence makes monitoring this species difficult. However, efforts are underway by the Hawaiian Bat Research Cooperative and Hawai‘i Volcanoes National Park to improve monitoring of this species.

### ***Forest Birds***

Hawaii’s native forest birds are perhaps the best monitored species in the State. However, monitoring efforts for even these species could be improved, particularly life history monitoring for specific species. Standardized forest bird surveys have been conducted annually since 1976 by agencies and private landowners including the State Division of Forestry and Wildlife (DOFAW), USFWS, National Park Service (NPS) and National Wildlife Refuges (NWR), Kamehameha School, and the Nature Conservancy of Hawai‘i. Additionally, monitoring is guided by the USFWS Draft Revised Recovery Plan for Hawaiian Forest Birds, which also includes five-year implementation plans identifying monitoring needs for identified critical species. Elements of monitoring from these plans are conducted by the USFWS and its partners; however, the full range of monitoring recommendations has yet to be implemented. For non-endangered forest birds such as ‘i‘iwi (*Vestiaria coccinea*), ‘apapane (*Himatione sanguinea*), and ‘amakihi (*Hemignathus virens*), no plans have been developed, though monitoring does occur for these species during the forest bird surveys and monitoring conducted on managed lands. However, their potential dispersal in lower elevations may require different monitoring protocols.

There are no wild populations of ‘alalā (*Corvus hawaiiensis* [Hawaiian crow]) and all existing populations are in captive propagation facilities which are closely monitored by staff. Monitoring protocols for the release of ‘alalā into the wild have been developed. The ‘alalā also has a USFWS Draft Revised Recovery Plan, part of which captive propagation is an element.

### ***Raptors***

There is no systematic island-wide monitoring for pueo (*Asio flammeus sandwichensis* [Hawaiian short-eared owl]) or ‘io (*Buteo solitarius* [Hawaiian hawk]). Population assessments are based on surveys conducted on more opportunistic or piece-meal basis, such as research by graduate students, surveys of species on various managed lands, or during the Hawai‘i Audubon counts.

### ***Waterbirds***

All endemic Hawaiian waterbirds have existing USFWS recovery plans outlining monitoring needs and actions. An updated, revised recovery plan for the nēnē (*Branta sandvicensis* [Hawaiian goose]) is currently being developed by the USFWS and should be available in December 2005. The USFWS has also recently finalized an updated Draft Revised Recovery

plan for Hawaiian waterbirds addressing the monitoring needs of koloa maoli (*Anas wyvilliana* [Hawaiian duck]), ‘alae ‘ula (*Gallinula chloropus sandvicensis* [Hawaiian moorhen]), ‘alae ke‘oke‘o (*Fulica alai* [Hawaiian coot]), and ae‘o (*Himantopus mexicanus knudseni* [Hawaiian stilt]). Elements of monitoring from these plans are conducted by the USFWS and its partners; however, the full range of monitoring recommendations has yet to be implemented. DOFAW also conducts twice annual statewide waterbird surveys, covering both private and public land, that include these species as well as the ‘auku‘u (*Nycticorax nycticorax* [black-crowned night-heron]). Additionally, these species are monitored on various managed lands such as National Wildlife Refuges, military special management areas, and State Wildlife Sanctuaries as part of ongoing management or as part of research.

### ***Seabirds***

The majority of Hawaii’s seabird populations are in the Northwestern Hawaiian Islands and monitoring of these species is conducted by USFWS at Midway, Laysan, and French Frigate Shoals and DOFAW at Kure Atoll. For the Main Hawaiian Islands, seabirds nest mostly on offshore islands and islets, and monitoring of these populations is conducted on some islands by DOFAW as well as by the Offshore Island Restoration Committee, an interagency organization. Seabirds are also monitored in known nesting areas on managed lands and by DOFAW’s twice annual statewide waterbird surveys. Citizen monitoring occurs via the Hawai‘i Audubon counts. Additionally, the USFWS has developed a Pacific Region Seabird Conservation Plan that also details monitoring needs at a larger scale and addresses inter-state and international levels. Elements of monitoring from these plans are currently being developed for implementation; however, the full range of monitoring recommendations has yet to be implemented. DOFAW has been awarded a grant to support future collaboration with other U.S. Pacific Islands for monitoring of shared species such as seabirds.

### ***Migratory shorebirds and waterfowl***

Regular migrants are monitored under existing programs already mentioned for other avian species groups. Examples include DOFAW’s twice annual statewide waterbird surveys, Hawai‘i Audubon counts, and monitoring occurring on various managed lands. Additionally, the USFWS has developed a Pacific Islands Regional Shorebird Conservation Plan that also details monitoring needs at a larger scale that addresses inter-state and international levels. Elements of monitoring from these plans are currently being developed for implementation; however, the full range of monitoring recommendations has yet to be implemented. DOFAW has been awarded a grant to support future collaboration with other U.S. Pacific Islands for monitoring of shared species such as migratory shorebird and waterfowl species.

### ***Northwestern Hawaiian Islands passerines and waterbird***

Given the small population levels and restricted range of these species, monitoring of these species is intensively conducted by the USFWS through the National Wildlife Refuge system. In addition, monitoring associated with translocation programs for several of these species provide further information relating to species distribution, abundance, and condition. A USFWS Draft Revised Recovery Plan for the Laysan duck (*Anas laysanensis*) also exists, from which some monitoring elements are implemented.

### ***Terrestrial invertebrates***

In contrast to the limited, but relatively consistent monitoring of terrestrial vertebrates, terrestrial invertebrate populations are not adequately monitored. Sixty to 80 percent of Hawaii's invertebrate species have yet to be surveyed. Limited baseline densities have been obtained for some taxa in a few locations. Inventories of some areas have been conducted by the Bishop Museum. Some surveys and monitoring have been conducted for certain threatened and endangered species on U.S. Army lands at Mākuā, at the Nature Conservancy's Honouliuli Preserve, within certain DOFAW Natural Area Reserves and Wildlife Sanctuaries, and on National Park and National Wildlife Refuge lands. Surveys have also been conducted by academic researchers. USFWS draft recovery plans exist for O'ahu tree snails (*Achatinella* spp.), Blackburn's sphinx moth (*Manduca blackburni*), and the Kaua'i cave arthropods (*Adelocosa anops* and *Spelaeorchestia koloana*). The challenge of adequately monitoring terrestrial invertebrates lies in the sheer number of species (over 5,000) that exist in Hawai'i, the fact that these species are quite small (averaging less than five millimeters in size), and the limited number of individuals trained to identify these species. Efforts are currently being discussed as to the best approach for monitoring of these species (e.g., monitoring for species' suites in habitats) along with possible development of a statewide terrestrial invertebrates strategy.

### ***Plants and algae***

There is no systematic monitoring of rare plant populations. Instead, various land managers individually monitor the status of the plants on their lands. In highly managed areas, the existence and condition of rare plants may be well known (e.g., rare plants within fenced enclosures in a Natural Area Reserve or rare plants within Special Ecological Units in a National Park). For more remote or less actively managed areas under protection (e.g., Forest Reserves), there may be historical surveys indicating the previous existence of rare plants, but their current status is unknown. Finally, information regarding rare plant distribution or abundance is not always shared with the Hawai'i Biodiversity and Mapping Program (formerly the Hawai'i Natural Heritage Program) and may remain solely within the control of the land management agency. The USFWS has established a Hawai'i and Pacific Plants Recovery Coordinating Committee which recently completed a third draft of an Integrated Plan for the Conservation of Hawaii's Unique Plants and Their Ecosystems. This Draft Plan recognizes the importance of monitoring for rare plant conservation and identifies areas needing further field surveys to determine the current status of rare plants, totaling approximately 13 percent of the State (202,000 hectares or 500,000 acres). Marine algae are only systematically monitored in the Northwestern Hawaiian Islands by the National Oceanic and Atmospheric Administration (NOAA). There is no monitoring for the two marine plants or freshwater algae.

### ***Freshwater species***

The State Division of Aquatic Resources (DAR) surveys some streams across Hawai'i for monitoring and management purposes. Surveys include information on native and non-native species of fish, crustaceans, mollusks, insects and algae. However, there is no systematic survey of freshwater species.

### ***Anchialine-pond fauna***

Although assessments of many anchialine pond fauna and habitat have occurred over the years, no systematic monitoring takes place.

### ***Marine species***

Sea turtle nesting and monk seal pupping are monitored by NOAA. The Hawaiian Islands Humpback Whale National Marine Sanctuary is responsible for long-term monitoring of humpback whales in Hawai‘i. NOAA and the Western Pacific Fisheries Management Council monitor commercial fisheries species. DAR monitors fishes in Marine Life Conservation Districts and other marine managed areas and surveys people for gamefish catch. Species-specific programs are in place for ulua, bottomfishes, and precious corals. Reefcheck and other volunteer organizations gather data on reef fishes. However, no systematic surveys exist for non-commercially regulated marine invertebrates and deep water species.

### **HABITAT MONITORING**

The underlying philosophy concerning habitat monitoring is to preserve native habitats and monitor for area coverage and quality of intactness. Monitoring of the ten terrestrial habitat types outlined in Chapter 3 is conducted on managed lands through existing management plans for these areas. Most management entities monitor habitat as it relates to native habitat preservation and restoration, rare plant management, threats such as encroachment by invasive species (e.g., plants, mammalian predators, or ungulates), or management actions such as ungulate removal and fencing. Additionally, habitat monitoring related to species specific needs as outlined in USFWS draft recovery plans also exists. For many of these managed areas and species, habitat monitoring centers on threat assessments for invasive plants, ungulates, and wildfires. Managed areas with existing management plans and monitoring efforts are discussed in Chapters 5 and 6 in the Management Needs sections.

For habitats that are not in managed areas or recovery plans, the land coverage analysis developed by the Hawai‘i Gap Analysis Program (HI-GAP) will be an essential tool for monitoring habitats once completed. However, monitoring gaps will exist for habitats such as streams, lava tube and cave systems, and anchialine ponds that are not identified by HI-GAP due to technological limitations related to mapping of these habitats.

DAR monitors selected stream areas and lakes while the State Department of Health and the U.S. Environmental Protection Agency monitor water quality. NOAA monitors coral reefs in the Northwestern Hawaiian Islands and collaborates with DAR to monitor less accessible areas of the Main Hawaiian Islands. DAR monitors many coral reef areas in the Main Hawaiian Islands. The Coral Reef Assessment and Monitoring Program (CRAMP), a multi-agency and University of Hawai‘i collaboration, monitors other coral reef areas. NOAA and the Western Pacific Fisheries Management Council must ensure areas designated as “Essential Fish Habitat” for managed commercial fisheries are not harmed. Monitoring programs are beginning for this relatively new legislative requirement. Currently, there is no monitoring of estuaries, sandy bottoms, and pelagic habitats.

Additional habitat monitoring efforts include systematic invasive species monitoring conducted by the Invasive Species Committees on each island for targeted species, and project-based monitoring conducted in connection with various work, such as the vegetation monitoring along forest bird transects.

## **MONITORING NEEDS AND RECOMMENDATIONS**

Though Hawai‘i has a foundation for monitoring of species and habitats, this foundation needs to be expanded by strengthening existing efforts and developing new ones. Specific monitoring needs at the taxa level are identified in Chapter 7 and at the habitat level in Chapters 5 and 6 in the Management Needs sections. Additionally, monitoring needs are also outlined in Chapter 4 in the threats and statewide objectives and strategies sections.

However, this section addresses specific monitoring gaps for species groupings as well as statewide initiatives. Where new efforts are required, the approach will be to focus on relevant, realistic, and effective monitoring and evaluation that is cost-effective, sustainable, and has minimal adverse impacts on native ecosystems. The recommendations are as follows:

### **DEVELOP MONITORING WORKING GROUP**

The establishment of a statewide monitoring working group to facilitate the development and implementation of recommended monitoring actions will provide a valuable vehicle to guide monitoring of species and habitats in the State. The statewide monitoring working group would be responsible for identifying monitoring gaps, prioritizing needs, developing strategies and recommended actions to address monitoring issues, and guiding implementation of monitoring actions.

### **IMPROVE MONITORING FOR ALL TAXA**

The following monitoring needs, based on the species' groupings discussed in the taxon monitoring section, are listed in order from those groups with no systematic monitoring to those needing improved monitoring efforts. Most terrestrial invertebrate populations are neither well-characterized nor adequately monitored. Coordinated efforts are needed to develop and implement plans to increase inventory and monitoring statewide. Taxa requiring these efforts include terrestrial arthropods, land snails, anchialine pond species, non-coral and non-regulated marine invertebrates, and deep water species. For host-specific terrestrial invertebrates, rare plant surveys are necessary. For the fishes and aquatic invertebrates, systematic monitoring needs to be expanded to all important watersheds and areas. For plants, coordination of different efforts and development of survey priorities is needed. For anchialine pond fauna, monitoring of populations and distribution in known and likely habitats should continue as well as development of quantitative survey methods and methods to monitor associated interstitial and hypogeal habitats. For the bat, established methods and protocols for larger scale monitoring of bat populations are needed. For avian species, improvements are needed to expand scope, frequency, data management and analysis, and reporting (e.g., demographic data that will allow the construction of population models, reproductive data that will allow the determination of greatest threat to productivity). For migratory species such as shorebirds, marine mammals, marine reptiles, and seabirds, monitoring needs to be coordinated at regional and international levels.

Development of standardized survey methods, particularly for inadequately monitored species, should explore the use of cost-effective partnerships with landowners, volunteers, and citizen monitoring programs, such as the Audubon Christmas bird count, community-based monitoring in marine areas, and educational programs.

### **IMPROVE MONITORING FOR ALL HABITATS**

Priority habitat monitoring needs are to support monitoring efforts already underway, to identify additional informational needs, and to expand resources for increased monitoring at appropriate geographic and spatial levels. Additionally, for habitats in less-managed areas, mechanisms need to be identified to monitor the quantity and quality of these habitats and the importance of these habitats to species' survival. Other habitats that need consistent monitoring include anchialine pools, tidepools, sandy bottom habitats, and deep water habitats. Monitoring of land use adjacent to stream channels is also needed.

### **IMPROVE ECOSYSTEM MONITORING**

One goal for managers is to go beyond post-hoc monitoring towards ecological prediction and forecasting. Though most monitoring is conducted on a species and habitat level, some additional monitoring occurs for abiotic factors and the emergent properties of ecosystems. More attention needs to be focused on these levels, integrating information from different sources to evaluate trends and assess threats or conservation actions. For example, comprehensive habitat monitoring will need to consider integration of indicators of global climate change. Similarly, the use of remote sensing and indicators of ecosystem properties needs to be better utilized. For terrestrial monitoring, a related issue of improving integration of monitoring is encouraging the use of inter-disciplinary teams in fieldwork (e.g., including botanists and entomologists during forest bird surveys).

### **DEVELOP STANDARDIZED MONITORING PROTOCOLS**

Due to insufficient coordination, non-standardized monitoring efforts exist that affect comparisons among sites and the ability to estimate the size and trend of species' abundance. There is a lack of appropriate data management at appropriate geographic scales, and monitoring at the island and statewide levels is typically non-existent and a critical gap. The first step is to develop standardized monitoring protocols that will allow data collected by researchers, managers, and landowners to analyze island and statewide trends. Existing efforts that can assist this process (but need additional coordination) are the recently developed Inventory and Monitoring program developed by the National Park Service, Pacific Basin Information Node, Hawai'i Forest Bird Interagency Database Project, the Hawai'i Biodiversity and Mapping Program (formerly the Hawai'i Natural Heritage Program), and HI-GAP. Nationwide initiatives such as the U.S. Geological Service's (USGS) monitoring locator and protocols library can help provide information on monitoring and inventorying protocols. The establishment of a statewide monitoring working group will facilitate the development of this initiative.

### **FACILITATE INFORMATION SHARING STATEWIDE**

Effective monitoring of species or habitats often requires cooperation between adjacent landowners to determine what is happening to the population without regard to property boundaries. Support and participation in existing forums, such as the Hawai'i Conservation Conference, the biennial aquatics conference, and the annual Watershed Partnership Symposium, and the development of new forums on specific topics as needed provide opportunities for the sharing of information and enhance the ability for adaptive management.

## **IMPLEMENTATION OF HAWAII'S CWCS**

Implementation of certain elements of Hawaii's CWCS has already begun. As outlined in Chapters 5 and 6 in the discussion on current management of species and habitats, multiple partners in conservation are already taking actions that protect Hawaii's Species of Greatest Conservation Need and implement the CWCS. These efforts will be continued and enhanced where possible during implementation of the CWCS using a variety of funding sources.

In the coming years, the State Wildlife Grants (SWG) program will specifically fund projects to implement the following objectives:

- 1) Maintain, protect, manage, and restore native species and habitats in sufficient quantity and quality to allow native species to thrive:
  - Urban wetland restoration on O'ahu;
  - Sanctuary perimeter fencing repair and maintenance on Maui;
  - Seabird habitat management on Lāna'i.
- 2) Combat invasive species through a three-tiered approach combining prevention and interdiction, early detection and rapid response, and ongoing control or eradication:
  - Predator control for O'ahu 'elepaio (*Chasiempis sandwichensis ibidis*) and seabirds on O'ahu.
- 3) Develop and implement programs to obtain, manage, and disseminate information needed to guide conservation management and recovery programs:
  - Analysis of information from statewide forest bird surveys to determine population status and trends;
  - Endangered forest bird research and management on Maui, Kaua'i, O'ahu, and Hawai'i;
  - Surveys for nest colony locations of 'ua'u (*Pterodroma sandwichensis* [Hawaiian petrel]) and 'a'o (*Puffinus auricularis newelli* [Newell's shearwater]);
  - Research on Blackburn's sphinx moth (*Manduca blackburni*) populations.

In addition, other sources of State and Federal funding are being used to address all seven objectives in the next fiscal year. For example, the State Natural Area Reserves fund supports management of existing Natural Area Reserves and watershed management projects, and the State Legislature included a line-item of four million dollars in the State budget for each of Fiscal Years 2005 and 2006 to address invasive species issues. Federal funds through grant programs administered by the USFWS, NOAA, U.S. Environmental Protection Agency, and Natural Resources Conservation Service are used to protect habitat and control invasive species. A variety of funding sources are used to support research and outreach efforts.

Once the Strategy is approved, one of the first steps for implementation will be to identify existing efforts that can be expanded and key partners willing to take the lead on implementing specific strategies and identifying needed conservation actions. Building on this first step, Hawaii's CWCS will be incorporated into overall DOFAW management as part of implementation. Additionally, in evaluating potential DOFAW funded projects outside of SWG, Hawaii's CWCS will be incorporated as an evaluation criteria (e.g., will this project accomplish one or more objectives as outlined by the CWCS?) to further enable effective implementation of the CWCS.

## ADAPTIVE MANAGEMENT AND THE TEN-YEAR REVISION

Evaluation of Hawaii's CWCS is linked to practicing adaptive management. Adaptive management results in effective monitoring and evaluation of the Strategy because it allows for structured learning by doing and altering strategies in response to changing circumstances (e.g., political, environmental, economic, etc.) to ensure success in achieving conservation objectives. It is also important to recognize that there are barriers to implementation that must be accounted for as part of adaptive management. Institutional barriers include the slow nature of changing policy and regulations, difficulties in getting conservation tools approved in a timely manner, and special interests preventing implementation of needed conservation actions.

As a part of the adaptive management process, the State DOFAW and DAR will jointly conduct annual reviews to assess Hawaii's CWCS and determine if any changes need to be made. This review will include consideration of potential additions or removals to the list of Species of Greatest Conservation Need, identification of new or altered threats, review of recent surveys, data, research, evaluation of the effectiveness of conservation actions, and consideration of issues that are preventing implementation of the CWCS. This annual review will also include the annual process of determining priorities for utilizing SWG funding. The CWCS website and partner contact database are tools that will be used to update and continue the engagement of partners in implementing, monitoring, and evaluating Hawaii's CWCS.

Part of measuring the success of and adaptively managing Hawaii's CWCS also includes the formal ten-year revision. The ten-year review and revision will be initiated by the Department of Land and Natural Resources and will involve many of the same steps as the first iteration of the Strategy - comprehensive review of management plans and research, working closely with partners, and engaging the public. In addition, ongoing monitoring and the annual reviews by DOFAW and DAR will assist in identifying necessary revisions. The ten-year revision should begin no later than fall 2013, with one year devoted to a full review of the Strategy, first internally then with partners and interested parties. This review will consist of analyzing the strengths and weaknesses of the initial CWCS, identifying barriers that prevented successful implementation, updating species and habitat information, assessing and updating the primary threats, and evaluating the continued viability of the identified conservation objectives and strategies. The second year should focus on revising the Strategy, again with partners and interested parties. The ten-year revision will provide the opportunity for continued adaptive management to ensure preservation of Hawaii's Species of Greatest Conservation Need and native habitats and to expand the vision of *malama 'āina* (protecting the land) for future generations.

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