CHAPTER 8
MONITORING, IMPLEMENTATION, AND ADAPTIVE MANAGEMENT

The need for monitoring is a consistent theme throughout Hawaii's Statewide Aquatic Wildlife Conservation Strategy (SAWCS) and is referenced in several previous chapters. 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 SAWCS and the Comprehensive Wildlife Conservation Strategy (CWCS). In doing so, this Chapter addresses U.S. Fish and Wildlife Service required elements 5 through 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.

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. 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, 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. 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 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 challenges facing implementation of effective monitoring are similar to those challenges faced in implementing conservation actions as discussed in Chapter 3: 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.

Current Taxon and Habitat Monitoring

Most monitoring in the State consists of counting individuals or biomass or monitor for area coverage and quality of habitat. 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 and identifies gaps.

Plants and algae

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) monitors some taxa and habitat variables in streams and lakes across Hawai‘i. The State Department of Health and the U.S. Environmental Protection Agency monitor water quality. 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. 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. 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. NOAA monitors coral reefs in the Northwestern Hawaiian Islands and collaborates with DAR to monitor less accessible areas of 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. Reefcheck and other volunteer organizations gather data on reef fishes. However, no systematic monitoring exists for non-commercially regulated marine invertebrates, deep water species, estuaries, sandy bottom habitats, and pelagic habitats.

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 ecosystem level in Chapters 4, 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 and Habitats
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. Coordinated efforts are needed to develop and implement plans to increase inventory and monitoring statewide. Taxa requiring these efforts include anchialine pond species, non-coral and non-regulated marine invertebrates, pelagic, sandy habitat, and deep water species. For the freshwater fishes and invertebrates, systematic monitoring needs to be expanded to all important watersheds and areas. All important coral reef areas should be systematically monitored. 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 migratory species such as marine mammals and reptiles, 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.

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, El Niños, etc. Similarly, the use of remote sensing and indicators of ecosystem properties needs to be better utilized. Collaboration with the earth Observing Systems projects and the proposed National Ecological Observatory Network may be helpful in this area.

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 relevant geographic scales, and monitoring at the island and statewide levels is inadequate. 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.

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 SAWCS

Implementation of certain elements of Hawaii's SAWCS has already begun. As outlined in Chapters 4, 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. These efforts will be continued and enhanced where possible during implementation of the SAWCS using a variety of funding sources. Hawaii's SAWCS will be incorporated into overall DAR management as part of implementation. Additionally, in evaluating potential DAR funded projects outside of SWG, Hawaii's SAWCS will be incorporated as an evaluation criteria (e.g., will this project accomplish one or more objectives as outlined by the SAWCS?) to further enable effective implementation of the strategy.

Adaptive Management

Evaluation of Hawaii's SAWCS 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, DAR will conduct annual reviews to assess Hawaii's SAWCS 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 SAWCS. This annual review will also include the annual process of determining priorities for utilizing SWG funding. The CWCS and SAWCS 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 SAWCS.

The Ten-year Revision

Part of measuring the success of and adaptively managing Hawaii's SAWCS and 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 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 SAWCS and 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 ʻāina* (protecting the land) for future generations.

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