

STATUS, RESEARCH, AND MANAGEMENT NEEDS OF
THE NATIVE HAWAIIAN BIOTA: A SUMMARY

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The speakers in this session emphasized the uniqueness of Hawaiian plants, birds, and invertebrates. In each major group, over 95% of the resident native species are endemic to the archipelago. Native species have been heavily impacted by alien influences, first from the Polynesians beginning 1,500 years ago, then from the rest of the world following Cook's landing in 1778. Of the originally present birds, 70% are extinct; of the invertebrates, perhaps 50% are extinct; of the plants, 50% are candidates for the Federal endangered species register. Clearly, the native Hawaiian biota is highly susceptible to alien perturbations. It is most appropriate that impacts, research needs, and management strategies for the alien biota receive emphasis.

Several common themes run through the papers covering native biota. These points articulate the strategies needed to accomplish conservation objectives for different groups of organisms and are as follows:

1. A need for biosystematic studies.
2. A need for conservation status assessment (distribution and abundance).
3. A need for ecological studies (natural history).
4. A need for management action.
5. A need for public education.

These 5 interlocking topics constitute the basis for ensuring the ultimate preservation of native Hawaiian ecosystems.

Biosystematic studies are listed first because a correct understanding of which species we're dealing with is the first essential step towards our goal. This step has been nearly completed for Hawaiian birds; here we have an excellent idea of what the existing species are. For plants we have a great deal of information, but in many genera the knowledge of species limits or subspecific variation needs further and finer

resolution. Presumably the forthcoming Manual of the Flowering Plants of Hawai'i will begin remedying that situation. For invertebrates, particularly insects, species are far less well known; indeed, a complete inventory of the Hawaiian invertebrates is still lacking, despite Zimmerman's efforts that began after World War II and still continue.

Once the taxa have been defined, the conservation status of each taxon can be determined. Before planning further research or management action, we need to know what species are rare, where their ranges lie, and in what habitats they occur. Through the efforts of the U.S. Fish and Wildlife Service, we have fairly good information about the distribution, abundance, and habitat response for forest birds on Hawai'i, Maui, Moloka'i, Lana'i, and Kaua'i, although even here the temporal component needs more sampling for seasonal and long-term trends. The Federal bird survey has also generated vegetation maps for the native montane forests of Hawai'i, Maui, Moloka'i, and Lana'i, but further mapping is needed on those islands for areas lying outside the distribution of native forest birds. Comprehensive mapping is needed for O'ahu and Kaua'i. Distribution data are available for most vascular plant taxa, and the Federal endangered candidate list offers at least a preliminary assessment of their conservation status. Good data on population structure, particularly regeneration, are still lacking for plants, and the recent discoveries of rare plant populations on East Maui and Kaua'i underscore the need for continuing systematic field surveys. When compared to that for birds and plants, our conservation knowledge of Hawaiian invertebrates is rather anecdotal and generalized. For certain well-studied groups there are good data, but most invertebrate species desperately require intensive and extensive study before we have a good understanding of their status.

Ecological studies are needed on all elements of the Hawaiian biota, including alien species, in order to understand and manage their impacts. Ecological studies are needed at 3 levels: the individual organism (autecology), the population (demecology), and the community (synecology). Individual natural history studies show us how the organism relates to its environment, and such studies are essential in identifying and quantifying the relative effects of different limiting factors. Studies of populations are important, first, in the conservation assessment of regeneration or reproduction, and second, in understanding the role of dominant or potentially disruptive species. For example, the concept of cohort senescence developed by Mueller-Dombois and his students, has forced us to re-evaluate the role of the 'ohi'a tree (Metrosideros

polymorpha) in montane forest ecosystems, and the studies of banana poka (Passiflora mollissima) and other alien plant species by Smith and his co-workers have proven essential in developing ecosystem management strategies. Population studies tend to grade into community studies when dealing with key species. The analyses by Jacobi and Scott (this volume) and Wagner, Herbst, and Yee (this volume) show that certain communities are especially rich repositories of native Hawaiian species, and some of these communities have been identified as highly threatened by disturbance. In communities such as the mature dry and mesic forests, some community types exist as single examples less than 25 hectares in extent, and effective conservation depends on understanding the relative role of the different disruptive influences on community stability and reproduction of the component species.

Management actions may be differentiated into 4 basic approaches: legal protection, management of alien (and occasionally indigenous) disruption, restoration of native ecosystems, and intensive management of individual organisms. As Holt and Fox reported in this session, 23% of the land in the Hawaiian Islands is legally dedicated to the conservation of native ecosystems, and 10% is subject to some sort of management program. Nonetheless, important parcels are missing from the dedicated lands, notably mesic montane koa (Acacia koa)-'ohi'a forests and mature low elevation dry woodlands. Moreover, the actual amount of land that is effectively managed to ensure continued reproduction of all key component species is very small--under 1%. Disruption of native ecosystems by alien elements such as feral ungulates, aggressive plants, rodents, invertebrates, and pathogens is nearly pervasive and demands such intense, focused attention to individual problems that generic solutions are still elusive. Protection and restoration are especially important in those communities retaining a high proportion of native components and natural processes. Although perhaps the most costly remedy, intensive management may be the only solution in some instances, such as for the 'alala or Hawaiian crow (Corvus hawaiiensis). Intensive management may be most feasible for certain rare plants, and some degree of success has been achieved by the National Park Service at Kipuka Puaulu in preserving Hibiscadelphus giffardianus and Zanthoxylum dipetalum as native components of the community.

As managers and researchers, we sometimes lack full appreciation for the importance of public education in furthering our conservation objectives. The general public and special interest groups are the ultimate sources of support for large-scale activities in

conservation. Professional biologists need to repack-age their formal findings into formats that lay audiences can readily assimilate. School and civic presentations are an essential component in getting the conservation message across and in elevating the general level of awareness of native ecosystems. Cultivating relationships with media reporters will also help the overall conservation mission, as will open dialogue between conservation agencies and other administrative and legislative bodies. We will be more effective at preserving native Hawaiian ecosystems as more people become interested in and aware of the value of their natural heritage.