

Other Observations

The focus of this inventory was vascular plants, but a few observations of birds and mammals were made during the two survey trips. For more information on the distribution and abundance of native forest birds in the `Ōla`a Forest, see Scott *et al.* 1986.

Birds

Few birds were seen within the trench feature, and native birds were almost entirely absent. Alien-bird species most apparent were Japanese White-eye (*Zosterops japonicus*) and Northern Cardinal (*Cardinalis cardinalis*). The only native birds noted were `Apapane (*Himatione sanguinea*) heard occasionally and seen at flowering `ōhi`a trees.

Bats

A bat was seen at dusk flying over the main crater during an informal visit in March 2001; this was almost certainly an individual of the endangered Hawaiian hoary bat, *Lasiurus cinereus semotus*. No bats were observed during the July visit.

SUMMARY AND RECOMMENDATIONS

One important conservation action that park managers could undertake at the `Ōla`a Trench would be fencing to exclude feral pigs from the crater interior. Most of the main crater perimeter appears too steep for pigs to enter, except for the eastern end where the trench walls are shorter. Approximately 500 m of fencing would probably be sufficient to block access, although the site should be evaluated by fencing experts. Removal of remaining pigs from the trench and implementation of a weed control regime would be needed to prevent an increase of weedy alien plant species. The current density of weeds is low, but large areas of ground have been disturbed by pig uprooting. Weeds are likely to increase in cover and density in the first few years following pig removal, and this may interfere with native plant recovery (Loh and Tunison 1999). Pig removal and weed control would contribute to protection of the existing *Cyrtandra tintinnabula* population and allow its numbers to increase. Currently, pig activity makes much of the trench unsuitable as rare plant habitat. Pig removal would also benefit other vulnerable native plants such as pala fern and koli`i. If managed, the site might be a potential out-planting site for rare and endangered species currently found only in the western half of the `Ōla`a Tract, such as `ānunu (*Sicyos alba*), `akū (*Cyanea tritomantha*), and the mint *Phyllostegia floribunda*.

A much more ambitious project may increase habitat for native birds by fencing the unprotected northeastern quarter of `Ōla`a Tract. The eastern half of the `Ōla`a Tract is not currently slated for fencing and pig removal because of the severity of the weed problem (T. Tunison, pers. comm. 2005). The cost to control all highly invasive weeds in this large area would likely be prohibitively high. The major weeds of eastern `Ōla`a are strawberry guava and yellow Himalayan raspberry in the subcanopy, and palmgrass in

the ground layer. A forest dominated by these disruptive alien species would be of little value for preserving rare native understory plants. However, one of the consequences of leaving the area unfenced is the continued presence of feral pigs, which hollow out tree fern trunks and create mosquito breeding habitat. Mosquitoes (*Culex quinquefasciatus*) spread avian malaria fatal to many native birds (van Riper *et al.* 1986; Atkinson *et al.* 1995). Even though the upper canopy of the forest around the trench is dominated by the most important food species for the native `apapane (*Himatione sanguinea*) and `i`iwi (*Vestiaria coccinea*), the populations of native birds seem relatively low. What might otherwise be good native bird habitat is currently little used by native forest birds.

The `Ōla`a Trench is a unique geological feature within HAVO and supports the only known population of a critically endangered plant species within the Park. While *in situ* protection of the endangered *Cyrtandra tintinnabula* population is desirable, it is also prudent to propagate the species and establish it elsewhere (U. S. Fish and Wildlife Service 1996). It is possible that more accessible areas within managed units of `Ōla`a Forest may be suitable as out-planting sites. Basic monitoring of *Cyrtandra tintinnabula* at the trench is warranted to indicate the status of the population and to identify the reproductive phenology of the species. Managers of Hawai`i Volcanoes National Park have an opportunity to play an important role in the conservation and recovery of this endangered species.

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