

population linkages will likely be enhanced if designated habitat occurs in large contiguous blocks or within a matrix of undeveloped habitat (A. Medeiros, pers. comm. 1998; S. Montgomery, pers. comm. 2001; McIntyre and Barrett 1992; Roderick and Gillespie 1997; Van Gelder and Conant 1998). To the extent possible with the limited potential habitat remaining, we have attempted to consider the wide-ranging behavior of the Blackburn's sphinx moth. Since the moth is believed to be a strong flier and able to move many kilometers from one area to another, areas of larval or adult presence and feeding may be separated from similar habitat areas and still serve important functions in maintaining moth populations.

Some small habitat areas are also suitable for Blackburn's sphinx moth larvae (e.g., Units 2, 5, 6, and 9 (see unit descriptions below)) and are critical for the species' conservation since such habitats may facilitate adult moth dispersal and promote genetic exchange between populations located on different islands. These areas also provide nectar resources and sheltering opportunities required by the adult moth. However, geographically isolated populations may be subject to decreased viability caused by inbreeding depression, reductions in effective population size due to random variation in sex ratio, and limited capacity to evolve in response to environmental change (Soule 1987). The adult moth is dependent on its primary constituent element nectar source host plants for dispersal and migrating to and from various habitats. Because the factors threatening the moth's conservation are often not so mobile, providing for access to the moth's adult stage primary constituent elements, and thereby facilitating its ability to disperse, can minimize the effect of the various threats.

Blackburn's sphinx moth populations fluctuate from year to year and season to season, apparently correlated with environmental and climatic variation. The moth is likely sensitive to thermal conditions and habitat changes that disrupt its microclimatic requirements. Therefore, the critical habitat units include dry and mesic habitats containing the primary constituent elements along wide elevational gradients to better ensure adult moth foraging needs, up and downslope, within their range. Furthermore, the boundaries include elevational gradients to better ensure larval host plant availability during periods of drought. Numerous habitat elevations containing the various primary

constituent elements are believed to be necessary for successful conservation of the sphingid species (Ehrlich and Murphy 1987; Shaffer 1987; Murphy and Weiss 1988; Murphy *et al.* 1990) in order to minimize the effects of annual localized drought conditions throughout different areas of the species' host plant range (Murugan and George 1992).

Critical habitat is being designated on those Hawaiian Islands where the Blackburn's sphinx moth's primary constituent elements are known to occur and are considered essential for the conservation of the species. This will allow the species the ability to persist and recolonize areas where it has become extirpated due to catastrophic events or demographic stochasticity (randomness) (Shaffer 1987). For example, on the island of Kauai in 1992, Hurricane Iniki blew over large areas of native forest, leaving open areas where nonnative plants became established, and created paths for further invasion of nonnative animals, both of which have been identified as threats to the survival of the moth.

Natural areas of suitable native, dry-to-mesic habitat containing at least one *Nothocestrum* plant adjacent to or near other *Nothocestrum* populations are included in the critical habitat units. We have included suitable habitat without *Nothocestrum* larval host plants, provided it contained the adult stage primary constituent elements including, but not limited to, *Ipomoea* species, *Capparis sandwichiana*, or *Plumbago zeylanica*. This is especially true for areas lying between or adjacent to large populations of *Nothocestrum* spp. that could serve as a flight corridor to other larger host plant habitat areas. An area may also serve as a corridor when it contains adult native host plants, thereby providing foraging opportunities for adults. Natural areas of primarily native vegetation containing the larval or adult stage primary constituent elements and where habitat could support a moth population and increase the potential for conservation are also designated as critical habitat. The designation and protection of a unit not known to currently contain a moth population (*i.e.*, the unit on Molokai), but which contains the primary constituent elements and lacks some of the serious threats to the species (see Table 1), will enhance population expansion and connectivity, thereby improving the likelihood of the species' conservation.

Mapping

Following publication of the proposed critical habitat rule for Blackburn's sphinx moth (67 FR 40633), we re-

evaluated the proposed critical habitat units and modified the boundaries using additional information from peer review experts and comments on the proposed rule. We excluded areas that do not contain one or more of the primary constituent elements, or that are highly degraded and thus not essential for the conservation of the species. In addition, some areas were excluded under section 4(b)(2) of the Act (*see* Exclusions Under Section 4(b)(2)). The specific modifications are described above in the Summary of Changes from the Proposed Rule section. The boundaries of the final critical habitat units are described by their Universal Transverse Mercators (UTMs).

Within the critical habitat boundaries, section 7 consultation is generally necessary, and adverse modification could occur only if the primary constituent elements are affected. Therefore, not all activities within critical habitat would trigger an adverse modification conclusion. In designating critical habitat, we made an effort to avoid developed areas, such as towns and other similar lands, which are unlikely to contribute to the conservation of the species. However, the minimum mapping unit that we used to approximate our delineation of critical habitat for this species did not allow us to exclude all such developed areas, or other areas unlikely to contain the primary constituent elements from the maps. In addition, existing manmade features and structures within the boundaries of the mapped unit, such as the following, do not contain one or more of the primary constituent elements, and are therefore excluded under the terms of this regulation: buildings; roads; aqueducts and other water system features, including but not limited to pumping stations, irrigation ditches, pipelines, siphons, tunnels, water tanks, gauging stations, intakes, and wells; telecommunications towers and associated structures and equipment; electrical power transmission lines and associated rights-of-way; radars; telemetry antennas; missile launch sites; arboreta and gardens; heiau (indigenous places of worship or shrines); airports; other paved areas; and other rural residential landscaped areas. Federal actions limited to those areas would not trigger a section 7 consultation unless they affect the species or primary constituent elements in adjacent critical habitat.

The lack of scientific data on Blackburn's sphinx moth life history makes it impossible for us to develop a quantitative model (e.g., population viability analysis) to identify the optimal number, size, and location of