

including one with HDOA and one with DOWFA, expressed concern with the Service's decision not to include tree tobacco (*Nicotiana glauca*) as a primary constituent element because the adult moth often lays eggs on this plant species, and the moth's larval stage appears to feed readily and successfully on it. In addition, *N. glauca* is believed to be the only larval stage host plant that the Kahoolawe island Blackburn's sphinx moth population is utilizing.

Our Response: Although Blackburn's sphinx moth larvae feed on the nonnative *Nicotiana glauca*, we do not consider this plant to be a primary constituent element for the designation of critical habitat. As previously discussed, the native *Nothocestum* spp. are more stable and persistent components of dry-to-mesic forest habitats than *N. glauca*. *Nicotiana glauca* is a short-lived species that may disappear from areas during prolonged drought (A. Medeiros, pers. comm. 1998) or during successional changes in the plant community (F. Howarth, pers. comm. 2001; Simon 1999). Many studies have shown that insects, and particularly lepidopteran larvae, consume more food when the food has a relatively high water content (Murugan and George 1992). Relative consumption rate and growth have been reported to decrease for many sphingids closely related to the Blackburn's sphinx moth when raised on host plants or diets with a relatively low water content (Murugan and George 1992). The vulnerability of *N. glauca* to drought conditions suggests that its water content frequently may not be suitable for optimal growth of Blackburn's sphinx moth larvae.

Numerous conservation and restoration plans for particular areas throughout the State of Hawaii have identified as primary goals the restoration of native plants, including the native host plants for the Blackburn's sphinx moth and other endangered species. Achieving these restoration goals may also require the control or elimination of nonnative vegetation, potentially including *Nicotiana* spp. (See also Comment #22).

Additionally, unlike the *Nothocestum* spp., *Nicotiana glauca* is more likely to occur in habitats less suitable because of their occupation by alien insect predators (D. Hopper, *in litt.* 2000, 2002; Simon 1999). Therefore, in comparison with *N. glauca*, the native *Nothocestum* spp. better fulfill the primary biological needs of the moth larvae. For all of these reasons, we are not considering *N. glauca* as a primary constituent element for the designation of critical habitat.

(6) **Comment:** Several reviewers stated that the native *Nothocestum* spp. host plant populations are currently very rare and most of them are not demonstrating regeneration, so that reviewers questioned the likelihood of the Blackburn's sphinx moth's eventual recovery. Several reviewers also pointed out that the few existing *Nothocestum* populations are highly vulnerable to extirpation by catastrophic events such as large wild fires or hurricanes. Reviewers recommended that *Nothocestum* populations be aggressively managed using techniques that include fencing and weed and feral ungulate control; otherwise, the decline of *Nothocestum* populations would continue. Furthermore, it was suggested that existing *Nothocestum* populations be augmented and new populations be established with techniques including outplanting and propagation.

Our Response: We agree that active management of the remaining *Nothocestum* spp. populations will be necessary to prevent their continued decline and thereby facilitate the moth's long-term conservation. This critical habitat designation and the draft recovery plan, which we are currently preparing, identify these needs.

(7) **Comment:** One peer reviewer questioned whether it was prudent to identify nectar food source plants for the adult Blackburn's sphinx moths as primary constituent elements because these plants, especially *Ipomea* spp., are more widespread than the native larval stage host plants identified as primary constituent elements, and they are found outside of the boundaries of proposed critical habitat. The reviewer noted that some areas proposed as critical habitat, *i.e.*, proposed Unit 2, were selected partly because the areas are known to contain adult moth primary constituent elements, even if currently devoid of native *Nothocestum* spp.

Our Response: We agree that known and likely native nectar food sources for adult Blackburn's sphinx moths are more widespread and abundant than known native food sources for larval moths. We included native nectar food sources as primary constituent elements for the moth to identify the specific habitat components needed for the species to complete its entire life cycle. We determined that identifying critical habitat based solely on the existing locations of larval stage primary constituent elements, *i.e.*, *Nothocestum* spp., would not meet the species' needs essential for its conservation. Some critical habitat areas were selected because they are known to contain adult moth primary constituent elements,

even if currently devoid of native *Nothocestum* spp. We included such areas when we determined that the areas were: (1) Within the moth's current or historic range; and/or (2) known or believed to have been occupied by *Nothocestum* spp. in the past and capable of supporting *Nothocestum* spp. again if properly protected or restored.

(8) **Comment:** One peer reviewer suggested that some areas currently occupied by the Blackburn's sphinx moth and proposed as critical habitat may actually be suboptimal habitat for the species. It was hypothesized that these same areas are occupied currently only because some threats, such as ants or certain *Trichogramma* parasitic wasp species, are either lacking or present in sufficiently low levels to allow the moth to persist there. The same peer reviewer also suggested that soil substrate is an important habitat component that may have been overlooked in the proposed rule. It was noted that the moth has often been found in areas with rocky, cinderlike, and relatively barren substrate. It was hypothesized that the moth may prefer such a loose, uncompacted substrate for the purpose of burrowing to complete pupation. However, it was also noted that moth occurrences in these areas may be due to the fact that such substrates are somewhat comparatively abiotic and sparsely vegetated, and may thus yield lower moth parasite and predator populations.

Our Response: The best available information, both historic and current, was used from a variety of sources (see Methods section) to determine the primary constituent elements for the Blackburn's sphinx moth and its current and former range. As pointed out by reviewers, historic information is extremely scant for the species, but the only information currently available indicates the species is restricted to somewhat dry and leeward areas. While we acknowledge that additional studies are needed to better understand the moth's long-term conservation needs, the designated lands represent, to the best of our current knowledge, the areas essential to the species' conservation. We are currently preparing a draft recovery plan for the moth, and this plan identifies several priority research tasks such as the investigation of substrate preferences and effects of various predators and parasites on the species. We may revise this critical habitat designation in the future if new information indicates revisions are warranted.

(9) **Comment:** One peer reviewer recommended that the Service conduct