16.12 Taxon Summary: *Dubautia herbstobatae*

Photographer: Hawaii Natural Heritage Program

Scientific name: *Dubautia herbstobatae* G. Carr
Hawaiian name: *Naenae, kupaoa*
Family: Asteraceae (Sunflower family)
Federal status: Listed endangered

Description and biology: *Dubautia herbstobatae* is shrub that can be either upright or sprawling. It has stems reaching up to 0.5 m (1.6 ft) long. Its leaves are opposite, or are rarely ternate (three per node), and measure 2-5.5 cm (0.8-2.1 in) long. The inflorescences are borne on the stem tips, and contain 5-15 yellowish-orange flower heads. The flower heads contain 4-20 disk florets, and lack ray florets. The achenes (a type of dry, seed-like fruit) are 4-6 mm (ca. 0.2 in) long, and are tipped by feather-like bristles.

Flowering usually occurs in May and June (Carr 1979). The species is almost certainly pollinated by insects, as are most other yellow-flowered members of the sunflower family, along with those *Dubautia*s whose pollination has been studied. The breeding system of *D. herbstobatae* has not been studied. However, with respect to the *Dubautia*s whose breeding systems have been studied, some are obligate out-crossers, and others are capable of self-pollination (Carr 1985).

Bristle-bearing achenes are characteristic of wind-dispersed members of the sunflower family. The bristles may also serve to attach the achenes onto the feathers of birds (Lowrey 1986). The longevity of individuals of the species is also unknown, but since the plant is a small shrub, its longevity is presumed to be less than 10 years, and it is therefore a short-lived taxon for the purposes of the Implementation Plan.

Known distribution: *Dubautia herbstobatae* is endemic to the leeward side of the northern Waianae Mountains on only two ridge systems: the system including Ohikilolo Ridge and the ridges in and around Keaau Valley; and the ridge system of Kamaileunu (including the Kamaileunu and Waianae Kai population units). It has been found at elevations of 580-910 m (1,900-3,000 ft).

Population trends: *Dubautia herbstobatae* was unknown to science until it was discovered in 1971, when botanists first inventoried the flora of Ohikilolo Ridge (Carr 1979). Since its discovery its numbers have declined due to an increase in the goat population on the ridge, but fortunately, many of the plants are on steep cliffs inaccessible to goats, and there is still a relatively large number of plants on the ridge. The number of plants may now be on the increase since the goats on the Makua side of the ridge have been almost totally eradicated.

It was not until 1985 when the first *D. herbstobatae* was found on Kamaileunu Ridge. Since then only six more plants have been found on the ridge system. These six still survive, as they are on sheer cliffs inaccessible to goats, but the plant discovered in 1985, which was easily accessible, was found to have disappeared when the site was revisited for the first time in 1999. The large increase in the goat population on the ridge since 1985 is likely to have been responsible for the plant's death, as the goats have seriously damaged the native vegetation in the area since 1985, and have devastated other rare plant populations on the easily-accessed parts of the ridge (Lau pers. comm. 2000).

Current status: 1,000-2,000 plants of *D. herbstobatae* are thought to grow on Ohikilolo Ridge in the Makua action area. An estimated 70-120 additional plants occur in Keaau Valley, which is also in the action area. Merely six individuals are known outside the Makua action area. These six are all on the Kamaileunu Ridge system, which includes both the Waianae Kai and the Kamaileunu population units. The current population units of *D. herbstobatae* are listed in Table 16.34 and their sites are plotted on Map 16.16. All but one of them are proposed for management for stability. Their sites are characterized in Table 16.35 and threats to the plants at these sites are identified in Table 16.36.

Habitat: *Dubautia herbstobatae* occurs in dry-mesic to mesic areas, and are often found on open rocky slopes and cliff faces. These slopes and cliffs are usually more or less north facing. The vegetation of these habitats is usually rather sparse shrublands and scrubby forests.

Taxonomic background: *Dubautia herbstobatae* belongs to the silversword alliance, which is a diverse complex of species derived from a single ancestral colonizing species. This complex comprises the genera *Dubautia* (the *naenae* or *kupaoa* on all the major islands), *Argyroxiphium* (the silverswords and the greenswords of Maui and Hawaii), and the genus *Wilkesia* (the *iliau* of Kauai). *Dubautia herbstobatae* is a very distinctive species whose closest affinities are difficult to assess (Carr 1979).

Outplanting considerations: Hybrids between members of the silversword alliance are fairly frequently encountered. There are three species of *Dubautia* native to the Waianae Mountains aside from *D. herbstobatae*. They are *D. laxa* and *D. plantaginea*, both of which are common and widespread, and *D. sherffiana*, which is a rare species occurring only in the Waianae

Mountains. *Dubautia sherffiana* and *D. plantaginea* can be found growing next to *D. herbstobatae*, but the occurrence of *D. laxa* near *D. herbstobatae* has not yet been reported (Kawelo pers. comm. 2000). *Dubautia plantaginea* and *D. laxa* have a different number of chromosomes than *D. herbstobatae*, but such a difference is not sufficient to prevent hybridization between two *Dubautia* species (Carr 1985). Outplanting concerns for *D. plantaginea* are minimal since the species occurs naturally at some of *D. herbstobatae*'s wetter sites, and since it is not a rare species.

Dubautia sherffiana is the species of most concern because of its rarity. Although it is more widespread than *D. herbstobatae*, its number of known individuals is lower. Its range includes most of the Waianae Mountains outside of *D. herbstobatae*'s range. The ranges of the two species overlap to just a small degree. Unlike *D. plantaginea* and *D. laxa*, *D. sherffiana* has the same number of chromosomes as *D. herbstobatae*, which likely increases the likelihood of hybridization. Naturally occurring hybrids between the two species have not been the subject of intensive search. However, there have been no incidental reports of hybridization in the wild to date.

In the establishment of *D. herbstobatae* outplantings, the welfare of *D. sherffiana* should be kept in mind. If *D. herbstobatae* were to be outplanted further inland than any of its documented locations, *D. sherffiana* will potentially be impacted. Besides the concern about increasing the incidence of hybridization beyond what is natural, there are also ecological concerns. Both species usually grow on steep, rocky, open slopes and ridges, so the establishment of *D. herbstobatae* deeper into *D. sherffiana*'s range than is natural could possibly result in an increase in competitive pressure on *D. sherffiana*. With these concerns in mind, an outplanting line for *D. herbstobatae* was drawn intersecting the ridges of Ohikilolo and Kamaileunu at the *D. herbstobatae* sites furthest inland. On the ridge between Makua Valley and Kahanahaiki Valley, where neither species has been documented, the outplanting line replicates the spatial relationship of the two species on Ohikilolo and Kamaileunu Ridges. On those two ridges, *D. herbstobatae* occupies the drier, seaward portions of the ridges, and *D. sherffiana* occupies the wetter, inland portions of the ridges.

Threats: Feral goats had been the major threat to *D. herbstobatae* for much of the last two decades. Although many plants grow on steep cliffs where they cannot be reached by ungulates, many others are well within their reach, and are thus susceptible to browsing. Furthermore, the animals degrade the plants' habitat by hastening the spread of invasive weeds and by disturbing the substrate above the cliffs, thus increasing the size and frequency of landslides and rock falls, which directly affect even the inaccessible plants and their steep cliff habitat. The threat to *D. herbstobatae* posed by feral goats has been virtually eliminated, as all but a few of the plants on Ohikilolo Ridge are on the protected Makua side of the ridge, where the goats are nearly eradicated. Feral pigs may still pose a threat to some of the lower elevation plants. However, most of the plants are on the upper elevations of the ridge, which are not frequented by pigs, or are growing on steep inaccessible terrain. Alien plants threaten *D. herbstobatae* by altering the species' habitat and competing with it for moisture, nutrients, and growing space. Moreover, the spread of highly flammable alien grasses increases the incidence and destructiveness of wildfires.

Table 16.34 Current Population Units of *Dubautia herbstobatae.* The numbers of individuals include mature and immature plants, and do not include seedlings. Population units proposed for management are shaded.

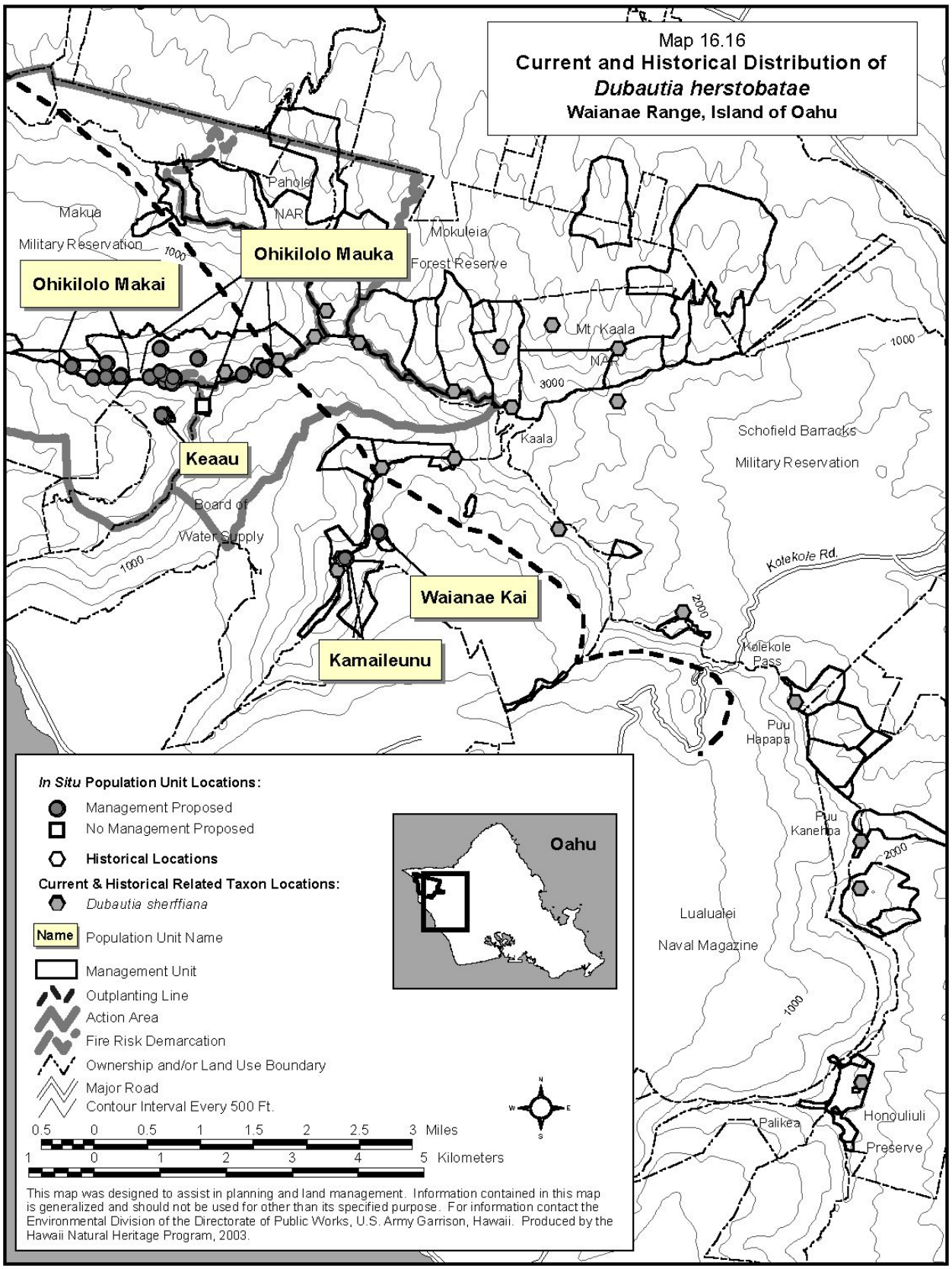
Island	Population Unit Name	Total Number of Individuals	No Management Proposed	Management Proposed
Oahu:	Kamaileunu	1	0	1
	Keaau	70-120	0	70-120
	Ohikilolo Makai	700+	0	700+
	Ohikilolo Mauka	1300+	1	1300+
	Waianae Kai	5	0	5

Table 16.35 Site Characteristics for Population Units of *Dubautia herbstobatae* Proposed for Management for Stability.

Population Unit:	Site Characteristics:			
	Habitat Quality	Terrain	Accessibility	Existing Fence
Kamaileunu	High- Medium	Vertical	Low	None
Keaau	Medium- Low	Vertical	Low	None
Ohikilolo Makai	Medium-Low to High-Medium	Steep to Vertical	Low to Medium	Large
Ohikilolo Mauka	Medium-Low to High-Medium	Steep to Vertical	Low to Medium	Large

Table 16.36 Threats to Population Units of *Dubautia herbstobatae* Proposed for Management for Stability.

Population Unit:	Threats:										
	Pigs	Goats	Weeds	Rats	Black Twig Borer	Slugs and Snails	Other Arthro-pods	Fire ignition	Fire fuels	Erosion	Human Distur-bance
Kamaileunu	Low	High	High	N/A	N/A	N/A	N/A	Low	Medium	Medium	Low
Keaau	Low	Medium	High	N/A	N/A	N/A	N/A	Very high	High	Medium	Low
Ohikilolo Makai	Low	Low	High	N/A	N/A	N/A	N/A	Very high	High	Medium	Low
Ohikilolo Mauka	Low	Low	High	N/A	N/A	N/A	N/A	Very high	High	Medium	Low


Map 16.16
Current and Historical Distribution of
Dubautia herstobatae
Waianae Range, Island of Oahu
Ohikilolo Mauka
Ohikilolo Makai
Keaau
Waianae Kai
Kamaileunu
Makua
Military Reservation
Paheleo
NAR
Mokuleia
Forest Reserve
Mt Kaala
NAR
Kaala
Schofield Barracks
Military Reservation
Board of
Water Supply
Kolekole Rd.
Kolekole
Pass
Puu
Hapapa
Puu
Kanehoa
Lualualei
Naval Magazine
Palikea
Honouliuli
Preserve
1000
2000
3000
In Situ Population Unit Locations:
Management Proposed
No Management Proposed
Historical Locations
Current & Historical Related Taxon Locations:
Dubautia sherffiana
Name Population Unit Name
Management Unit
Outplanting Line
Action Area
Fire Risk Demarcation
Ownership and/or Land Use Boundary
Major Road
Contour Interval Every 500 Ft.
Oahu
0.5 0 0.5 1 1.5 2 2.5 3 Miles
1 0 1 2 3 4 5 Kilometers
This map was designed to assist in planning and land management. Information contained in this map is generalized and should not be used for other than its specified purpose. For information contact the Environmental Division of the Directorate of Public Works, U.S. Army Garrison, Hawaii. Produced by the Hawaii Natural Heritage Program, 2003.