

2 **16.13 Taxon Summary: *Flueggea neowawraea***



4 Photographer: Hawaii Natural Heritage Program

6 **Scientific name:** *Flueggea neowawraea* W. Hayden

**Hawaiian name:** *Mehamehame*

8 **Family:** Euphorbiaceae (Spurge family)

**Federal status:** Listed endangered

10 **Description and biology:** *Flueggea neowawraea* is a tree growing up to 30 m (98 ft) tall, with a  
 12 trunk up to 2 m (6.6 ft) in diameter. The trees are often multi-trunked. The species' bark is  
 rough and reddish-brown, and its wood is brown and often has a wavy grain. The leaves are 4-  
 14 14 cm (1.6-5.5 in) long, and are arranged alternately along the stems. The flowers of an  
 individual plant are usually all female or all male. They are borne in axillary clusters of 2-6.  
 16 The fruits are globose, measure 3-6 mm (0.12-0.24 in) in diameter, are juicy, usually contain 6  
 seeds, and are reddish brown to black when ripe.

18 According to the literature on *F. neowawraea*, the species is dioecious, bearing either all male  
 20 flowers or all female flowers. However, the species apparently is not completely dioecious, as a  
 cultivated plant isolated from others has been observed to produce viable seeds (Chung pers.  
 22 comm. 2000). Flowering occurs over a brief period sometime in the late summer through the

24 fall. The timing of the flowering in a given area is apparently dependent on the area's weather  
26 patterns and the distribution of rainfall in the particular year. The flowering of the different trees  
28 in a given area is normally well synchronized (Lau pers. comm. 2000). The pollination biology  
of *F. neowawraea* has not been studied, but insects presumably pollinate the flowers, as with  
most species with small, inconspicuous flowers. The species' juicy fruits are suggestive of seed  
dispersal by fruit-eating birds.

30 Little is known of *F. neowawraea*'s growth rate and age of maturation in the wild. In  
32 cultivation, however, the species grows rapidly and matures early. Within three years of  
germination, an individual can attain a height of over 2 m (6.6 ft) and be mature enough to  
flower and fruit (Lau pers. comm. 2000).

34 *Flueggea neowawraea* are often the most massive trees in the forests in which they are found.  
36 Many of the remaining live trees are partially dead, with a strip or strips of bark extending up the  
trunks to crowns that have died back. The remaining living branches are often relatively healthy  
38 (Lau pers. comm. 2000). For this species, dying back may be a means of coping with  
environmental stresses. *Flueggea neowawraea*'s wood is very hard and lasts a long time after  
40 the death of the tree. It rots in a very distinctive fashion, and as a result, the decayed trunks and  
limbs of the species are readily identified. Old logs on the ground and pieces of wood in gulch  
42 bottoms and in streambeds document the former occurrence of the species throughout the  
Waianae Mountains.

44 **Known distribution:** *Flueggea neowawraea* has been documented from Kauai, the Waianae  
46 Mountains of Oahu, Molokai, East Maui, and the leeward side of the island of Hawaii. In the  
Waianae Mountains it has been found throughout the mountain range. The species has been  
48 recorded from 305-732 m (1,000-2,400 ft) in elevation.

50 **Population trends:** The remaining living trees and the dead remains of *F. neowawraea* indicate  
that the species was formerly not uncommon in at least some parts of the Hawaiian Islands (Lau  
52 pers. comm. 2000). The recorded history of *F. neowawraea* is relatively short for a native  
Hawaiian tree, as it was not discovered until 1912. Reports of the species in the first half of the  
54 1900's indicate that it had already been declining in numbers and health for a considerable time  
prior to its discovery. There were many reports of large mature trees, portions of which were  
56 already long dead; and there were no reports of younger trees and immature plants. The only  
record of immature plants to date is the report of a pair of plants in Pahole Gulch in the 1970's  
58 (Nagata 1980). One plant was reportedly a tree 6.1 m (20 ft) tall, with a main trunk measuring  
5.1 cm (2 in) in diameter; and the other plant a sapling about 1.5 m (5 ft) tall with a trunk  
60 measuring 2.5 cm (1 in) in diameter.

62 The decline of *F. neowawraea* has undoubtedly been greatly accelerated by the introduction of  
the black twig borer (*Xylosandrus compactus*) in 1961. Of the individuals alive 20 years ago,  
64 more than half are now dead (Lau pers. comm. 2000).

66 **Current status:** *Flueggea neowawraea* is still extant throughout its recorded range except on  
Molokai, where only a single tree has ever been found. That individual was documented with a  
68 voucher specimen in 1931 and it died sometime prior to 1939. Only two trees are known to

70 persist on the southern flank of Haleakala, East Maui. Five to nine trees are known on the island  
of Hawaii. The species is most common on Kauai where an estimated 60-80 trees are known.  
72 On Oahu, a total of 30 trees are known to survive, nine of which are in the Makua action area.  
The current population units of *F. neowawraea* are listed in Table 16.37 and their sites are  
74 plotted on Maps 16.17, 16.18, 16.19, 16.20, and 16.21. The sites of the population units  
proposed for management for stability are characterized in Table 16.38 and threats to the plants  
at these sites are identified in Table 16.39.

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**Habitat:** *Flueggea neowawraea*'s center of abundance is in the drier parts of the mesic forests,  
78 which are often dominated by *lama* (*Diospyros sandwicensis*) or dominated by *lama* and *ohia*  
(*Metrosideros polymorpha*). Only a few live trees remain in the dry forests. The species was  
80 formerly more common in the dry forest than today, as evidenced by numerous old logs and  
standing dead trunks. Most trees occur either in gulch bottoms or on north facing lower to mid-  
82 gulch slopes.

84 **Taxonomic background:** *Flueggea neowawraea* is the only member of the genus occurring in  
Hawaii. There are no obvious morphological differences between plants on the different islands  
86 (Lau pers. comm. 2000).

88 **Outplanting considerations:** No outplantings are proposed for *F. neowawraea*. If outplantings  
were to be established there would be no hybridization issues since the species does not have any  
90 close relatives in Hawaii.

92 **Threats:** The primary threat to *F. neowawraea* is the introduced black twig borer (*Xylosandrus*  
*compactus*), which has affected all populations of *F. neowawraea*. The female black twig borer  
94 tunnels into the center of living twigs and lays its eggs in the hollowed twig. Physical damage,  
accompanied by the introduction of pathogens, often contributes to the death of the twig.  
96 Chronic infestation leads to a gradual weakening of the tree, and its eventual premature death  
(Hara and Beardesly 1979).

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Another threat to *F. neowawraea* is the Chinese rose beetle (*Adoretus sinicus*), which arrived in  
100 Hawaii before 1896 (Koebele 1897). This beetle feeds on the leaves of the tree, sometimes  
reducing them to skeletons. Other major threats include feral pigs and goats, alien plant species,  
102 cattle grazing, and fire. On the island of Hawaii much of the species' habitat in Kona and Kau  
has been destroyed or severely degraded by farming, ranching, and residential development. The  
104 species is further endangered by the need for cross-pollination between male and female trees in  
populations whose numbers have decreased greatly and are now comprised of widely separated  
106 trees, which in some cases, may be too far apart to be effectively cross-pollinated.

108 **Table 16.37 Current Population Units of *Flueggea neowawraea*.** 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 |
|---------|---------------------------|-----------------------------|------------------------|---------------------|
| Kauai:  | Kalalau                   | 15                          | 0                      | 15                  |
|         | Koaie                     | 25-40                       | 0                      | 25-40               |
|         | Kuia and Mahanaloa        | 1                           | 0                      | 1                   |
|         | Pohakuao                  | 7                           | 0                      | 7                   |
|         | Poomau                    | 10-15                       | 0                      | 10-15               |
| Oahu:   | Central and East Makaleha | 6                           | 0                      | 6                   |
|         | Halona                    | 2                           | 0                      | 2                   |
|         | Kahanahaiki to Kapuna     | 6                           | 0                      | 6                   |
|         | Kauhiuhi                  | 1                           | 0                      | 1                   |
|         | Makaha and Waianae Kai    | 5                           | 0                      | 5                   |
|         | Mikilua                   | 1                           | 0                      | 1                   |
|         | Mohiakea                  | 1                           | 0                      | 1                   |
|         | Mt. Kaala NAR             | 4                           | 1                      | 3                   |
|         | Nanakuli (South Branch)   | 1                           | 0                      | 1                   |
|         | North Kaluaa              | 1                           | 0                      | 1                   |
|         | North West Makaleha       | 1                           | 0                      | 1                   |
|         | Ohikilolo                 | 3                           | 0                      | 3                   |
|         | West Makaleha             | 3                           | 0                      | 3                   |
|         | Maui:                     | Auahi (Auwahi)              | 2                      | 0                   |
| Hawaii: | Honomalino                | 3-7                         | 0                      | 3-7                 |
|         | Manuka NAR                | 1                           | 0                      | 1                   |
|         | Kaupulehu                 | 1                           | 0                      | 1                   |

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**Table 16.38 Site Characteristics for Population Units of *Flueggea neowawraea* Proposed for Management for Stability.**

| Population Unit:          | Site Characteristics:     |                   |                |                |
|---------------------------|---------------------------|-------------------|----------------|----------------|
|                           | Habitat Quality           | Terrain           | Accessibility  | Existing Fence |
| Central and East Makaleha | Medium-Low to High-Medium | Moderate          | Medium to High | None           |
| Kahanahaiki to Kapuna     | Low to High               | Moderate          | High           | None, Large    |
| Kuia and Mahanaloa        | Medium-Low to High-Medium | Moderate          | High           | None           |
| Makaha and Waianae Kai    | Medium-Low to High-Medium | Moderate          | High           | None           |
| Mt. Kaala NAR             | Medium-Low to High-Medium | Moderate          | Medium to High | None           |
| North West Makaleha       | Medium-Low to High-Medium | Moderate to Steep | High           | None           |
| Ohikilolo                 | Low to High               | Moderate to Steep | High           | Large          |
| West Makaleha             | Medium-Low to High-Medium | Moderate          | High           | None           |

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**Table 16.39 Threats to Population Units of *Flueggea neowawraea* Proposed for Management for Stability.**

| Population Unit:          | Threats:    |            |       |           |                  |                  |                  |               |            |         |                   |
|---------------------------|-------------|------------|-------|-----------|------------------|------------------|------------------|---------------|------------|---------|-------------------|
|                           | Pigs        | Goats      | Weeds | Rats      | Black Twig Borer | Slugs and Snails | Other Arthropods | Fire Ignition | Fire Fuels | Erosion | Human Disturbance |
| Central and East Makaleha | High        | High       | High  | Unknown A | High             | Unknown A        | Unknown B        | Low           | Medium     | Low     | Medium            |
| Kahanahaiki to Kapuna     | Low to High | N/A to Low | High  | Unknown A | High             | Unknown A        | Unknown B        | Very high     | Medium     | Low     | Medium            |
| Kuia and Mahanaloa        | High        | Medium     | High  | Unknown A | High             | Unknown A        | Unknown B        | Low           | Medium     | Low     | Medium            |
| Makaha and Waianae Kai    | High        | Medium     | High  | Unknown A | High             | Unknown A        | Unknown B        | Very high     | Medium     | Low     | Medium            |
| Mt. Kaala NAR             | High        | High       | High  | Unknown A | High             | Unknown A        | Unknown B        | Very high     | Medium     | High    | Medium            |
| North West Makaleha       | High        | High       | High  | Unknown A | High             | Unknown A        | Unknown B        | Very high     | Medium     | Low     | Medium            |
| Ohikilolo                 | High        | Low        | High  | Unknown A | High             | Unknown A        | High             | Very high     | Medium     | Low     | Medium            |
| West Makaleha             | High        | Low        | High  | Unknown A | High             | Unknown A        | Unknown B        | Very high     | Medium     | Low     | Medium            |

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