Metrosideros polymorpha Gaudich.

JAMES A. ALLEN
Paul Smiths College,
Paul Smiths, NY

MYRTACEAE (MYRTLE FAMILY)

Metrosideros collina (J.R. and G. Forst.) *A. Gray subsp. polymorpha* (Gaud.) Rock.
(Little and Skolmen 1989). See also the extensive list of synonyms in Wagner and others (1990)

Lehua, ‘ohi’a

Metrosideros is a genus of about 50 species. With the exception of one species found in South Africa, all grow in the Pacific from the Philippines, through Papua New Guinea, to New Zealand and on high volcanic islands (Wagner and others 1990). Five species occur in the Hawaiian Islands (Wagner and others 1990). *Metrosideros polymorpha* is native to Hawaii, where it grows on all the main islands except Niihau and Kahoolawe. It is the most abundant and widespread native tree in Hawaii (Adee and Conrad 1990) and grows in association with numerous species in both wet and relatively dry forests.

Metrosideros polymorpha is a slow-growing, evergreen species capable of reaching 24 to 30 m in height and about 1 m d.b.h. It is highly variable in form, however, and on exposed ridges, shallow soils, or poorly drained sites it may grow as a small erect or prostrate shrub (Adee and Conrad 1990, Corn 1979). Its trunk may range in form from straight to twisted and crooked. Because the species can germinate on the trunks of tree ferns and put out numerous roots that reach the ground, it may also have a lower trunk consisting of compact, stilt-like roots. It grows in a wide range of soil types, over a rainfall range from 500 to 11400 mm, and over an elevation range from near sea level to about 2600 m. It is the first tree species to establish on most new lava flows in Hawaii and is also a common component of forests on very old, deep soils. *Metrosideros polymorpha* reaches its best development on relatively level, well-drained sites.

Metrosideros polymorpha is currently treated as a single species, despite its wide morphological and ecological range (Wagner and others 1990). Wagner and others (1990), however, recognize eight varieties with varying geographic distributions, and several other varieties have been described in previous works (Rock 1917, St. John 1979). The extent of hybridization and genetic polymorphism is unknown (Wagner and others 1990).

The heartwood is reddish brown, heavy (specific gravity of about 0.70), of fine and even texture, very hard, and strong. Native Hawaiians used the wood extensively for construction, household implements, and carvings. Principal modern uses include flooring, marine construction, pallets, fenceposts, and fuelwood. The wood’s limitations include excessive shrinkage in drying, density, and the difficulty and expense of harvesting in low-volume stands (Adee and Conrad 1990, Little and Skolmen 1989). Today, *M. polymorpha* is perhaps most highly valued in Hawaii for uses in watershed protection, aesthetics, and habitat for native birds, including several endangered species. *Metrosideros polymorpha* is featured in many Hawaiian songs and legends, and leis are made from the attractive flowers (Neal 1965).

The flowers are borne in a dense, terminal cymose corymb; flowers are most often red, but may be salmon, orange, pink, or yellow. The inflorescence normally has 18 to 24 flowers in different stages of development. Flowering generally peaks in late spring or summer, but some varieties or populations peak in fall or winter, and individual trees or branches may produce flowers at any time during the year (Adee and Conrad 1990). Flowering typically begins first at low elevations, usually in March or early April, and may not peak until July at higher elevations.

Fruits mature approximately 70 to 90 days after flowering (Goo 1997). Fruits are capsules 6 to 10 mm long containing numerous minute seeds (mean fresh weight 57 µg), many of which may be infertile (Dawson 1970, Drake 1993). Seeds should be collected after maturity but before the capsules open; mature capsules have a noticeably swollen appearance and lines are evident where the capsule will dehisce. Although

some seed is dispersed throughout the year, on the island of Hawaii (at 700-m elevation) 75 percent of the seeds were dispersed in December and January (Drake 1992a).

Capsules are generally collected directly from trees by hand or with pruning poles. Collected capsules should be air-dried until they begin to open, which typically takes several days to 4 weeks. Capsules should be air-dried in a protected setting, such as in a cardboard box or paper bag, to prevent loss of the minute seeds. Seeds average approximately 1,754,400 per kg. Seeds readily fall out of the capsule after drying. They rapidly lose viability and are best sowed within 1 month after the capsules dehisce. Seeds can be stored in a dry, cool location or under refrigeration, but percent germination may be reduced from the 50- to 60-percent range typical of fresh seeds to less than 10 percent within 1 year (Goo 1997) and nearly 0 percent within 3 years (Corn 1979). No pretreatment of the seeds is necessary.

Seeds are spread onto germination trays filled with commercial potting media, sterile compost, or cinder, and left either uncovered or covered with only a very thin layer of soil. Germination takes approximately 5 to 10 days if the seeds are fresh but may take 4 to 6 weeks for 1-year-old seeds (Corn 1979). Seedlings develop slowly, and it may be several months before seedlings are ready to be transplanted into containers. Seedlings reach an outplanting size of approximately 25 to 30 cm in height in about 1 year. One source reports that seedlings can reach 60 cm tall in 1 year (Bornhorst 1996).

Outplanted seedlings are initially very vulnerable to drought and may require frequent watering (Bornhorst 1996, Corn 1979). *Metrosideros polymorpha* seedlings grow best on well-drained, loose substrates, and often perform poorly on sites with impeded soil drainage, because they are highly susceptible to damping-off fungi (Corn 1979). Because ecotypic variation is great within the species, seed sources should be locations with climatic and soil conditions similar to those of the planting site.


2cm