



Figure 1. Northwestern Hawaiian Islands

Nihoa rises approximately 274 meters (m) (900 feet (ft)) above sea level and has an area of approximately 69 hectares (ha) (171 acres (ac)). Its steep topography and crater shape reveal its volcanic origin. Necker Island, less than 92 m (300 ft) in elevation and 19 ha (46 ac) in area, consists of thin-layered, weathered lava flows. La Perouse Pinnacles at French Frigate Shoals and Gardner Pinnacles are the last exposed volcanic remnants in the archipelago. French Frigate Shoals is a crescent-shaped atoll nearly 29 km (18 mi) across. More than a dozen small sandy islands dot the fringes of this atoll. Maro Reef is a largely submerged area marked by breakers and a few pieces of coral that intermittently protrude above the waterline. Laysan Island is approximately 405 ha (1,002 ac) in size and fringed by a reef. In the center of the island is a 52 ha (129 ac) hypersaline lagoon. Lisianski Island is 147 ha (364 ac) in size and bounded to the north by an extensive reef system. The central lagoon once found on this island has filled with sand. Pearl and Hermes Reef, an inundated atoll, includes nearly 40,469 ha (100,000 ac) of submerged reef and seven small sandy islets totaling less than 34 ha (85 ac). Midway Atoll is approximately 8 km (5 mi) in diameter and includes three islands: Sand, Eastern, and Spit. Both Sand and Eastern Islands have been highly altered by man. Kure Atoll is the northernmost exposed land in the Hawaiian archipelago. Two islands, Green and Sand, are found on the southern edge of the atoll and are included in the Hawaii State Seabird Sanctuary System. Green

Island was altered considerably in the past and today suffers from enormous nonnative species problems (Elizabeth Flint, Service, pers. comm., 2000).

One of the six listed plants was historically known from Kure Atoll (*Cenchrus agrimonoides* var. *laysanensis*), two were known from Laysan (*C. agrimonoides* var. *laysanensis* and *Mariscus pennatifolius* ssp. *bryanii*), one from Midway (*C. agrimonoides* var. *laysanensis*), four from Nihoa (*Amaranthus brownii*, *Pritchardia remota*, *Schiedea verticillata*, and *Sesbania tomentosa*), and one from Necker (*Sesbania tomentosa*) (see Table 1 above).

Nihoa (209 km (140 mi) from Niihau) and Necker (an additional 290 km (180 mi) northwest of Nihoa) are the islands in the northwestern group that are closest to the main Hawaiian Islands. Both are small, residual fragments of volcanoes that formed approximately 7.2 and 10.3 million years ago, respectively (Service 1986). Although both of these islands were uninhabited at the time of their modern discovery in the late eighteenth century, there is an extensive heiau (indigenous place of worship or shrine) complex on Necker, and agricultural terraces and other Hawaiian archaeological features can be found on Nihoa (Cleghorn 1984; Department of Geography 1998; Service 1986).

In 1892, a guano mining business began operation on Laysan and flourished until 1904. During this time, rabbits were introduced to Laysan for a rabbit canning industry, and the rabbits were allowed to reproduce and roam freely (Morin and Conant 1998; Tomich

1986). This failed as a profitable business, and no attempt was made to control the number of rabbits on the island. The rabbits were finally eradicated from Laysan Island in the early 1920s, although not before the vegetation had been thoroughly devastated. Since then, the vegetation of Laysan has recovered to a remarkable degree, although some species, like the native palms (*Pritchardia* sp.) (lolou), are no longer naturally extant on the island (Tomich 1986; E. Flint, pers. comm., 2000).

Midway Atoll was discovered and named Middlebrook Islands in 1859 by Captain Nick Brooks. The atoll was taken into possession by the United States in 1867, and in 1903, President Theodore Roosevelt placed the atoll under the control of the U.S. Navy. In 1935, Pan American World Airways set up an airbase for the weekly Trans-Pacific Flying Clipper Seaplane service. In 1941, the Japanese attacked Midway Atoll on their return from the attack on Pearl Harbor. In 1942, the United States defeated the Japanese Fleet north of the atoll, turning the tide of World War II in the Pacific. In 1988, the atoll was added to the National Wildlife Refuge (NWR) system, and in 1996, the jurisdiction of Midway Atoll was transferred from the U.S. Navy to the Department of the Interior (Service 2000). Despite this evidence of human use, these islands continue to support an assemblage of endemic plants and animals not found elsewhere in the archipelago (Department of Geography 1998).