Rhizophora mangle 简体中文 正體中文

System: Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Rhizophorales	Rhizophoraceae

Common name mangle zapatero (Spanish, Puerto Rico), apareiba (Spanish), mangle dulce (Spanish), mangle Colorado (Spanish), mangle rojo (Spanish), mangrove (English, United States), mangle geli (Spanish), red mangrove (English, United States), mangué (Spanish), sapateiro (Spanish), purgua (Spanish), American mangrove (English, United States), togo (English, Samoa), tiri wai (English, Fiji), tapche (Spanish), candelón (Spanish)

Synonym

Similar species *Avicennia germinans, Laguncularia racemosa, Rhizophora racemosa, Rhizophora samoensis, Rhizophora x harrisonii*

Summary Rhizophora mangle (the red mangrove) is a coastal, estauarine species that can tolerate saltwater and extended flooding. It commonly forms monoculture stands in its native range, or is associated with two other common species of mangrove; the black mangrove and the white mangrove. It can flower year-round and the seed remains on the parent plant where it is in constant development until it germinates on the plant and then is released for dispersal. The red mangrove has a large native range and has been introduced to Hawai'i where it is considered an invasive species.

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Species Description

Rhizophora mangle is a small aquatic tree or shrub, that can reach heights between 5-20m and a trunk diameter between 20-50cm. The bark is gray to brown, thin when a sapling, becoming thick and furrowed with maturity (Duke, 1983). The leaves are evergreen, opposite, simple, entire, elliptical, thick and leathery, the tops dark green, glossy to glabrous, with undersides yellow-green with black dots and no visible veination(Gilman, 1999). Leaf width 2.5-6cm and length 6-12cm (Duke, 1983). Prop roots originate from the stem or trunk of the plant about 2-4.5m high (Duke, 1983) and function in stabilizing the plant in the ground and facilitate gas exchange for respiration during periods when it is completelt submersed in standing water (Hill, 2001).

Lifecycle Stages
Flower production is continuous throughout the year, with a peak in flower production during the wet season in equatorial regions (Mehlig, 2006), and during early spring and summer for temperate regions (Gill, 1971). Flower production is not dependent on day-length (Mehlig, 2006). The fruit is a berry, also known as a propagule and is dark brown, ovoid to cylindrical or cigar shaped, 25cm long and 12mm in diameter (Duke, 1983). No dormnacy or seed phase occurs. The embryo is in continuous development and germinates while still on the parent plant, a process called vivipary (Hill, 2001). Embryo development can continue during cold periods, albeit reduced, in temperate regions (Mehlig, 2006). A high rate of propagule production has been observed (Krauss, 2003), making establishment and population levels rise quickly (Chimner, 2006). Propagules are dispersed by release from the mother plant, through physical forces such as severe storm (Proffitt, 2006) or though seasonal flooding patterns or tidal forces (Murray, 2003). The seed can remain viable, afloat in salt water, for up to a year before establishing itself on a suitable substrate (Hill, 2001). Vegetative reproduction through coppicing and suckers is possible but not common for the red mangrove (Proffitt, 2006).

Uses
Rhizophora mangle is used primarily for timber, building materials, fencing, firewood, charcoal, medicines, tannins for staining and leather making, hunting, salt extraction and for habitat for commercial fisheries and aquaculture (Kovacs, 1998). Medicinally red mangrove has been implicated for many different uses, but recent research shows that extracts made from the bark can reduce gastric ulcers, has antimicrobial and antioxidant properties (Berenguer, 2006). Uses also included are for ecological and landscape maintenance and stabilization. Red mangrove is commonly used to stabilize coastal mudlfats and reduce erosion rates (Cox, 1999).

Habitat Description
The red mangrove is found in five different topographical communities in subtropical to tropical coastal regions: fringe, riverine, overwash, basin, and supra-tidal flats (Murray, 2003). The differences amongst these classifications is due to elevation and its respect to the rise and fall of the water-level and its approximatey to the ocean. The red magrove can survive under permanent submersion, resulting from flooding, due to its unique anatomy and physiology (Hill, 2001). However, the red mangrove cannot tolerate arid conditions during seedling establishment, so often communities develop around spatial and temporal water patterns (Elster, 1999). The red magrove can tolerate salinity ranges from 0-90 parts per thousand (Hill, 2001), with higher salinity contents of the sediment impacting red mangrove establishment (Elster, 1999). Temperature ranges are from 21.6 °C - 25.6 °C (Duke, 1983) and sub-freezing temperature is what limits this species' range to below the 28° latitude in both hemispheres (Hill, 2001). Sedimentation type varies widely and pH ranges fall between 5.3-8.5 (Duke, 2006). The red mangrove can tolerate full sun and grows best under these conditions, however, seedlings can survive in the understory until a gap forms in the overtsory (Hill, 2001).

Reproduction
The red mangrove is hemaphroditic, containing both male and female sex organs . The main dispersal mechanism for the pollen is through the wind (Mehlig, 2006), which results in the mangrove self-pollinating quite readily, leading to inbreeding depressions within the population (Proffitt, 2006). The flowers are 2cm long, on forked stalks 4-7cm long originating from the leaf axils. The hypanthium is 5mm long, bell shaped with four pale yellow leathery sepals and four white to brown petals with a cottony textured surface. Eight stalkelss stamens, with a slender style and two-lobed stigma (Duke, 1983).

Nutrition
The red mangrove is a member of the kingdom Plantae and produces the energy it needs through photosynthesis. The limiting nutrients in its environment are nitrogen and phosphorous. Red mangrove communities form a source sink for these two macronutrients in its environment (Davis III, 2003). The red mangrove is a facultative halophyte, making it tolerant of high salinity in both water and sediment; however salinity is not a requirement for development (Hill, 2001).

General Impacts
Rhizophora mangle is an important species in coastal and wetland ecosystems and provides numerous ecological benefits to the environment. The species creates crucial habitat needed for marine and estuarine invertabrates and fish, as well as nesting grounds and food sources for wading birds (Linares, 2006). The mangrove is a source sink for nutrient recycling of limited elements like nitrogen and phosphorous, through leaf litter fall, thus conserving nutrients in the ecosystem for specialized decomposers (Davis III, 2003). The mangrove reduces erosion rates of coastal flats by buffering the effects of severe weather, like monsoons and hurricanes, and from repeated tidal forces (Linares, 2006). The red mangrove can survive under a wide range of environmental pressures, and therefore colonizes rapidly forming near monospecific stands that allows it outcompete native species (Krauss, 2003).

Management Info
Integrated management: To know the extent of the population of the red mangrove in a given region mapping techniques are recommended to quantify the severity of the problem. This information not only could be used classifying forest communities but also attmept to further explain the distribution pattern of the species (Murray, 2003). This may lead to local involvement in either a restoration project in areas where mangrove forests are being dessimated (Murray, 2003) or in locales like Hawai'i where management options focus on eradication (Rauzon, undated).
Physical: Physical control options are expensive, timely and moderately to highly effective (Allen, 1998). Cutting back vegetation with machinery, hand tools, and dredging canals and pools where it grows are all an effective means of reducing the population pool and allowing native species to return (Allen, 1998). If cutback to 10cm above the ground it is not likely to resprout, and if young mangroves in standing water are cutback to the waterline, they too are not likely to resprout (Rauzon, undated).
Chemical: The chemical Garlon 4 (TM) has been shown to be successful at eradicating the red mangrove with basal treatments (Rauzon, undated).
Please follow this link for Detailed Instructions for Application of Habitat Herbicide to Kill Red Mangrove compiled by Ann Kobsa (Invasive Species Coordinator, Malama O Puna)
Biological: A possible biological control is a species of fungus *Cystospora rhizophorae* which enters the red mangrove through wounded tissue and forms cankers on stem tissue. The fungus has been reported to cause a 33% mortality rate in seedlings when inoculated in the field (Wier, 2000).

Pathway
Rhizophora mangle has been planted to improve coastal beach habitats for native fauna and reduce the effects of erosion from severe weather or tidal forces (Linares, 2006).*Rhizophora mangle* has been planted to improve coastal beach habitats for native fauna and reduce the effects of erosion from severe weather or tidal forces (Linares, 2006). The red mangrove is an important species for developing habitat structure and resources for tropical and subtropical marine and freshwater fauna. It has been planted by the aquaculture industry to improve coastal habitat for fisheries and shellfish harvest (Kovacs, 1998).

Principal source: Duke, N.C., and J.A. Allen. 2006. *Rhizophora mangle*, *R. samoensis*, *R. racemosa*, *R.* × *harrisonii* (Atlantic–East Pacific red mangroves), ver. 2.1. In: Elevitch, C.R. (ed.). Species Profiles for Pacific Island Agroforestry. Permanent Agriculture Resources (PAR), Holualoa, Hawai'i.
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ALIEN RANGE

[1] AUSTRALIA

[10] UNITED STATES

Red List assessed species 1: VU = 1;

Fulica alai **VU**

BIBLIOGRAPHY

24 references found for **Rhizophora mangle**