



# The Status and Management of *Colubrina asiatica* (L.) Brongn. (Lather Leaf) in Everglades National Park

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## *Abstract*

Native to the Old World tropics, *Colubrina asiatica* (L.) Brongn. or lather leaf, is becoming increasingly widespread in the coastal areas of Everglades National Park, especially along the northern fringe of Florida Bay and on the Florida Bay keys. By virtue of its climbing habit, lather leaf forms pure stands and overwhelms native plants by growing over them, forming a thick mat of entangled stems which can eventually obliterate the underlying vegetation. Like Australian pine, melaleuca, and Brazilian pepper, lather leaf offers a severe threat of expanding populations and diminished biological diversity and function in the habitats it invades. Lather leaf is currently listed as a Category I exotic pest plant by the Florida Exotic Pest Plant Council. This species was only casually noted in the park until the 1970s when stands of up to 1 ha were observed along Florida Bay; its areal extent increased to over 230 ha by 1987 (by the mid 1990s, that area doubled). In the park, lather leaf occurs in coastal tropical hardwood and buttonwood hammocks, and mangrove swamps, often in association with storm deposited ridges. Its occurrence in hardwood hammocks is of particular concern due to the presence of a large number of state-listed threatened and endangered plant species. Control of *C. asiatica* in the park, using standard mechanical (hand-pulling) and chemical (Garlon 4 herbicide), has been sporadic. The inaccessibility of treatment sites and the lack of funds to carry out the needed control work are the major obstacles to managing this serious invasive species.

## **Introduction**

Everglades National Park, a World Heritage Site and Biosphere Reserve, encompasses more than 600 000 ha and is the only subtropical wilderness in the conti-

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mental United States. The park, established in 1947 to preserve the unique biological resources of the area, is the third largest wilderness park in the contiguous United States — over 95% of the park is designated wilderness. The principal habitats found within the park include shallow-water marine habitat (240 000 ha), saltwater wetland forests and marshes (192 000 ha), freshwater marshes and prairies (162 000 ha), and upland pine and tropical hardwood forests (6000 ha).

In many natural areas throughout the United States, exotic pest plants threaten ecosystem function and are causing landscape-level changes to natural systems and processes. Loope (1992) considers the park among the top U.S. national parks worst affected by exotic plants. Of the 850 plant species reported in the park, 221 (26%) are nonindigenous in origin (Whiteaker and Doren 1989). Natural disturbances that are part of the southern Florida environment have provided increased opportunities for exotic species to become established, an effect amplified by human activities. Some of these species are considered to be the most serious long-term threat to the Everglades ecosystem, capable of altering native plant populations and communities as well as ecosystem level properties of areas they invade. The most successful non-indigenous plants are so well adapted to an altered habitat that they out-compete native species.

Management of exotic pest plants in the park has developed in response to several laws, general directives, and policies. Under the National Park Service (NPS) Organic Act of 1916, the NPS is charged with management of the parks “to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” NPS policy states that “exotic species will be managed up to and including eradication... whenever such species threaten park resources...[and] high priority will be given to [non-indigenous species] that have a substantial impact on park resources” (National Park Service 1988).

To date, the park has focused its exotic plant management actions on three, widespread and disruptive species: Australian pine (*Casuarina equisetifolia* L., *C. glauca* Spreng., Casuarinaceae), melaleuca (*Melaleuca quinquenervia* (Cav.) S.T. Blake, Myrtaceae), and Brazilian pepper (*Schinus terebinthifolius* Raddi, Anacardiaceae) (Doren and Jones 1997). The control of Australian pine and melaleuca in the East Everglades Acquisition Area is currently the only funded nonindigenous species management priority in the park; this work has been funded since 1987 through compensatory off-site wetland mitigation and contributions from several state agencies. Removal and control of Brazilian pepper occupying a 2000 ha site known as the Hole-in-the-Donut is funded through a Miami-Dade County Department of Environmental Resources Management freshwater wetlands mitigation bank (see M. Norland, this volume). Specific funding for other exotic plant control projects is still lacking.

An exotic species causing considerable alarm among vegetation resource managers in the park is lather leaf *Colubrina asiatica* (L.) Brongn. Native to the Old World tropics, lather leaf is becoming increasingly widespread in coastal areas, especially around parts of Florida Bay and the park's Gulf Coast. By virtue of its climbing habit, lather leaf forms pure stands and overwhelms native plants by growing over them, forming a thick, impenetrable mat of entangled stems which eventually obliterates the underlying vegetation. Like Australian pine, melaleuca, and Brazilian pepper, lather leaf offers a severe threat of burgeoning populations and diminished biological diversity and function in the habitats it invades. Lather leaf is listed as a Category I exotic pest plant by the Florida Exotic Pest Plant Council (Florida Exotic Pest Plant Council 1997).

### Biology, Distribution, and Ecology of Lather Leaf

Lather leaf, also referred to as Asiatic colubrina, common colubrina, and shrubby colubrina, is a small scandent shrub with sprawling, twining branches. It is readily recognized by its shiny, green foliage, and small, greenish flowers borne in clusters in the axils of leaves (Fig. 1). The fruits are small, round, brown capsules which



Figure 1. Vegetative and floral morphology of *Colubrina asiatica*. (a) leafy branch (x 2/3); (b) branch with floral buds, flowers, and fruits (x 1); (c) open flower (x 2); (d) mature fruit (x 2) (from Langeland 1990).

split open when mature and forcefully eject the seeds. The leaves are reported to be edible and the fruits are used as a fish poison and are medicinal. The bark, roots, and leaves are used as a soap substitute.

*Colubrina asiatica* is a member of the Rhamnaceae, a cosmopolitan family of about 1000 species. The genus comprises about 24 species centered mainly in the neotropics. Three native species of *Colubrina* occur in southern Florida and inhabit hammocks and/or pine rocklands in the park: *C. arborescens* (Mill.) Sarg. (common snakebark), *C. cubensis* (Jacq.) Brongn. (Cuban snakebark), and *C. elliptica* (Sw.) Brizicky & W.L. Stern (nakedwood). The very hard and heavy wood of *C. arborescens*, also known as West ironwood, is an important source of timber in parts of its natural range.

Lather leaf is found naturally from eastern Africa to India, China(?), Southeast Asia, Australia, and the Pacific Islands, including Hawaii. It typically inhabits coastal areas, occurring as "scattered" plants on sandy and rocky shores, including beaches, dunes and adjacent upland areas. Its widespread (pantropical) distribution is largely due to the dispersal of its buoyant, salt-tolerant seeds by ocean currents. Russell et al. (1982) suggested that lather leaf was brought to the Caribbean Islands, specifically Jamaica, in the 1850s by East Asian immigrants and from there spread to new sites with the aid of ocean currents and hurricane tides. It has been reported from many localities in the West Indies, Mexico (Yucatan Peninsula), and Florida. In Florida, lather leaf appears to be a recent introduction. The earliest known record of its occurrence is a specimen collected on Big Pine Key in 1937; the earliest records from the mainland are specimens collected in the early 1950s in Everglades National Park (Russell et al. 1982). Today, it occurs from Key West north to central Florida, along both coasts.

In southern Florida, flowering occurs in July and fruits reach maturity as early as mid-September. Plants have been observed to flower and fruit within the first year of growth (L. Dye, unpubl. memo). Little is known about seed germination requirements although seeds are believed to retain their viability in the soil "for at least several years" (Russell et al. 1982). In addition to long seed viability and rapid growth, lather leaf's other regenerative capabilities include rooting from branches close to the ground and resprouting from cut or injured stems. Seedlings have only been observed under larger, reproductively mature plants which suggests that long-distance seed dispersal is uncommon and probably effected by storm tides (Russell et al. 1982). Plants appear to require considerable light. Russell et al. (1982) suspected that the plant is able to invade openings in forest canopies caused by wind damage, eventually covering the damaged vegetation and resulting in the "strangled forest" appearance of natural sites often seen today.

#### **Status in Everglades National Park**

Russell et al. (1982) reported that *Colubrina asiatica* was only casually noted in the park until the early 1970s when large monotypic stands up to one ha in area were observed along the coast of Florida Bay. In 1974, park management staff reported 130 ha of lather leaf growing at sites along the coast east of Flamingo from Christian Point to Santini Bight, including some of the keys (H. Werner, unpubl. memo, 1974). It was noted at the time that the sites "appeared to be almost entirely devoid of vegetation with only tall trees persisting." A detailed vegetation and mapping study of the coastal area between Flamingo and Joe Bay (Olmsted et al. 1981) revealed "pure stands" of *Colubrina*, covering less than 50 ha, that appeared "locally to engulf stands of buttonwood." Interpretation of 1987 color infrared aerial photographs (1:10 000 scale) of the eastern half of the park by Rose (1988) indicated that the areal extent of *Colubrina* along the same stretch of coastline had increased to nearly 230 ha. Photointerpretation of 1994-1995 USGS/NAPP color infrared aerial photographs by The University of Georgia's Center for Remote Sensing and Mapping Science (CRMS) (Welch et al. 1995) is providing the latest information on *Colubrina asiatica* distribution in the park. According to their analysis of vegetation patterns along the Florida Bay coastline between Flamingo and Joe Bay, large, dense stands of lather leaf occupy approximately 302 ha; this area increases to 527 ha if smaller patches (less than 1 ha) and hardwood-*Colubrina asiatica* mixtures are included. Based on this information and previous reports of areal extent along Florida Bay, generally since the 1970s, lather leaf has doubled its spatial extent every 8-10 years. Lather leaf also occurs along the western (Gulf) coast of the park from Cape Sable to Ten Thousand Islands. The park's populations of lather leaf range in size from less than 1 ha to over 8 ha, with densities varying from monotypic stands to mixtures with other vegetation types, e.g., tropical hardwoods, buttonwood, mangroves. Total areal extent of lather leaf in the park, based on the CRMS mapping effort, is 430 ha (Fig. 2).

Lather leaf's habitat preferences in the park are storm deposited coastal ridges above the zone of prolonged inundation but subject to periodic tides. These conditions are found in tropical hardwood hammocks and buttonwood (*Conocarpus erectus* L.) forests and hammocks situated along the coast of the mainland and islands, as well as on storm ridges (berms) within mangrove forests. In addition, it occurs along elevated road shoulders in the park's coastal areas, e.g., main road between Flamingo and West Lake. There is some concern that lather leaf may invade interior hammocks and other upland sites by this route.

*Colubrina asiatica* has invaded both disturbed sites (openings in forest canopies caused by wind damage) and undisturbed sites (open herbaceous or graminoid patches within a forest). A thick mat of entangled stems (often several feet thick) typically forms on the site and impacts the underlying, native vegetation by growing on it or shading it out. Its rambling branches can be seen high in the canopies of forest trees and shrubs, especially along the advancing edges of the infestation. Infested sites are biologically less diverse than unimpacted sites as very few plants can persist under these conditions, including the seedlings of lather leaf itself. The



Figure 2. Distribution of *Colubrina asiatica* in Everglades National Park, based on interpretation of 1994-1995 aerial photographs.

occurrence of lather leaf in the coastal tropical hardwood hammocks is of particular concern due to the uniqueness and rarity of certain plant species found naturally in them, including a number of state-listed threatened and endangered species (Coile 1998) such as West Indian mahogany (*Swietenia mahagoni* (L.) Jacq.), thatch palm (*Thrinax radiata* Schult. & Schult. f.), wild dilly (*Manilkara jaimiqui* (Griseb.) Dubard), wild cinnamon (*Canella winterana* (L.) Gaertn.), manchineel (*Hippomane mancinella* L.), myrtle-of-the-river (*Calyptranthes zuzygium* (L.) Sw.), Simpson stopper

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(*Myrcianthes fragrans* (Sw.) McVaugh var. *simpsonii* R.W. Long), cacti (*Acanthocereus tetragonus* (L.) Hummelinck, *Harrisia simpsonii* Britton & Rose), bromeliads (*Tillandsia* spp.) and orchids (*Encyclia boothiana* (Lindl.) Dressler, *Oncidium ensatum* Lindl.), among others (Jones 1997).

### Management of Lather Leaf

The control of *Colubrina asiatica* in the park has been hindered not only by the lack of funds and manpower, but also by the inaccessibility of most sites. Lather leaf control efforts have been carried out sporadically by the park's marine districts, i. e., Florida Bay, Flamingo, and Northwest Districts, and the park's Vegetation Resources Program of the South Florida Natural Resources Center (SFNRC-VRP), the program responsible for developing and implementing exotic plant management projects in the park.

In the early 1990s, Sierra Club volunteers assisted Flamingo District rangers treat lather leaf on Rankin Key where uprooting of plants and cutting of stems without the use of herbicides were the methods used. Regrowth from resprouting stems occurred and lather leaf continues to dominate large portions of the upland (hammock) sites on this island. In 1995, foliar application of 8-10% Arsenal and basal bark application of Garlon 4 by Florida Bay District rangers were used to treat a dense stand of lather leaf invading a thatch palm hammock near Davis Cove on the mainland south of Joe Bay. Inspection of the site in 1996 revealed thick regrowth of lather leaf from the soil seed bank and herbicide drift impacts on native vegetation in the surrounding buttonwood and mangrove forest.

In 1997-1998, exotic control efforts initiated by SFNRC-VRP were directed at infestations of a number of small, localized populations of lather leaf along the park's Gulf Coast between Everglades City and Key McLaughlin (a distance of about 50 km), including off-shore islands. Mechanical (manual) removal or cutting of scandent, twining stems was followed in cases where lather leaf was seen to impact desirable vegetation by growing on it or shading it out. Young, shallow-rooted plants were hand pulled. Following Langeland and Stocker (1997), older plants with a main trunk were treated using a basal bark application of 10% Garlon 4 or a cut stump treatment with 50% Garlon 3A; one of the difficulties in treating adult plants is locating trunks under the plant's typically thick mat of entangled stems, sometimes several feet thick.

These methods were successfully used by Miami-Dade County Parks and Recreation Department's Natural Areas Management for controlling lather leaf on Elliott Key, Biscayne National Park, in 1996. Basal bark, cut stump and foliar application methods using Garlon 3A have been used to treat lather leaf on state lands in the Florida Keys (J. Duquesnel, pers. comm.). Observations made by most resource managers on the plant's regenerative capabilities, specifically rooting and sprouting

from cut stems, fruiting in young plants (as early as 1 year old), and long lived seeds, support the need to conduct long-term monitoring and retreatment of lather leaf at previously treated sites to prevent its reestablishment.

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