



Forest Types of Suriname

Mangrove Forests

Based upon the knowledge of Frits van Troon

Manual
#1

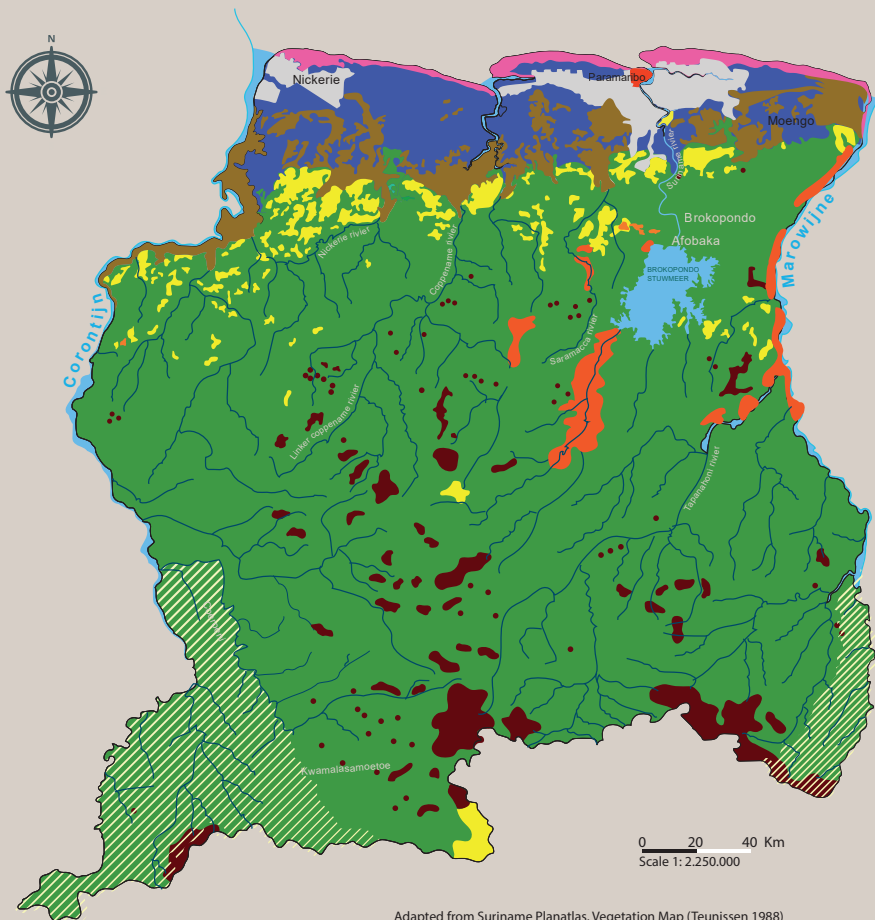


Fieldtrips with Frits van Troon
Learning about forests
and plant species



Frits van Troon





Forest Types of Suriname

Coastal Plain	Mangrove Forest w/ brackish lagoons and herbaceous brackish swamps
Coastal Plain	Swamp Forest w/ herbaceous freshwater swamps
Coastal Plain	Marsh Forest w/ high dryland forest
Savanna-areas	Savanna Forest & Savanna
Guiana Shield	Secondary Forest
Guiana Shield	High Dryland Forest
Guiana Shield	Mountain Forest (> 500 m)
Sipaliwini-savanne	Sipaliwini Savanna (at border with Brazil)
	Urban area, agricultural land and abandoned plantations
	Disputed area

This training manual and map is one of a series in the Forest Types of Suriname project conducted with Mr. Frits van Troon. Please refer to the Introductory Manual of the series for more information.

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A Dynamic Coastal Landscape

Suriname's tidal-influenced coasts and lower rivers, known as the Estuarine Zone, compose a dynamic interface of constantly shifting soils (sand, shell, marine clay, mud), water (seawater, floods, currents, tides), and plant communities.

This manual is focused upon the northern edge of the Young Coastal Plain (YCP), which was formed in the Holocene Epoch (<10,000 years ago) and has soils primarily of marine clay, shell, and sand, along with mud transported by ocean currents from the Amazon River mouth. The landscape of this low-lying area includes sandy beaches, mud flats, extensive mangrove stands lining the coast and lower rivers, open brackish swamps and lagoons with grasses and sedges and cross-cutting shell or sand ridges. Plant diversity is low in this region compared to the rest of Suriname.

Moving inland, away from the ocean and mangroves, swamp forest (Manual 2) and marsh forest (Manual 3) ecosystems become prominent within the Young Coastal Plain (YCP) and the Old Coastal Plain (OCP) to the south.

Low sand or shell ridges in these areas support the growth of 'ridge forests' - which can include tree species typically seen in other, drier forest zones. Mangro (red mangrove) groves can occur many kilometers from the ocean on inland river banks. With the notable exception of palm swamps and mangroves, forest types typically transition gradually from one into another in Suriname.



Plant communities of the coastal plain have been greatly impacted by human activity. Through traditional land use practices such as fire, soil enhancement, creation of shell-mounds, and earth-works, indigenous peoples have altered coastal ecosystems for thousands of years. Some of these practices continue today.

Obviously, the practices of European colonial settlements (e.g, polders) and then modern 'development' have greatly accelerated and expanded this impact to the point that it has become a cultural as much as a natural landscape.

Depending upon local conditions, degraded mangrove and other forests may regenerate as forests or be replaced by other vegetation (e.g., grass swamps, lagoons, liana forest).





Table 1. Forest Types of Coastal Plain

Main Forest Types	Ecosystem/Forest Type Details
Manual 1. <i>Salty to Brackish Mangrove Forest (tidal-Influenced) adjoining Lagoons, Herbaceous Swamps</i>	Coast 1) Beaches, Low ridges, Muddy flats 2) Parwa (black mangrove) stands, east-west coastal belt 3) Extensive lagoons - with or without dead parwa trees. - Deep water - <i>Ruppia maritima</i> occurs. - Shallow water – halophyte (salt-loving) vegetation with <i>Batis maritima</i>, <i>Blutaparon vermiculare</i> and <i>Sesuvium portulacastrum</i> 4) Short-grass swamps & lagoons (brackish) - <i>Elaecharis mutata</i> - sedge - Biesbisi - <i>Cyperus articulatus</i> - sedge (this species also occurs in freshwater swamps) 5) Long-grass swamps & fern swamps (brackish to freshwater) - Langagrasi - <i>Typha domingensis</i> - cattail - Papajagras - <i>Cyperus giganteus</i> - sedge - <i>Acrostichum aureum</i> - fern (often close to Parwa stands) 6) Low ridges w/ vegetation of scrub, wood or forest (Ridge forest) - <i>Mixed tree species</i> Tidal Riverbanks and Creek Banks (Estuary) 7) Red Mangrove (Mangro) stands dominant along banks;

What are Mangrove Forests?

Forest ecosystems adapted to conditions of salty or brackish water on coasts and estuaries

Along the coast of Suriname, ocean wave impacts, tides and trade winds drive the constant deposit and erosion of mud banks and sand in a north-westerly direction. Mangrove forests are plant communities up to 25 m tall, uniquely capable of colonizing and stabilizing these shifting coastal beaches, mudflats and river and creek banks - wherever there is tidal influence.

In the world, there are approximately 55 species of mangroves in 20 genera. Suriname's mangrove forests are dominated by 1-3 unrelated tree species, with a variety of smaller plant and animal associates.

In Suriname, mangrove forests occur in an west-east coastal belt (from the Corentijne to the Marowijne river borders) from 0.4 to 10 kilometers wide. These forests cover approximately 100,000 ha - less than 1% of Suriname's land area.



Ecology

How do mangrove species survive in the harsh and unpredictable conditions – open sun, saltwater, wind, waves, tides, and mud – of beaches, swamps and estuaries?

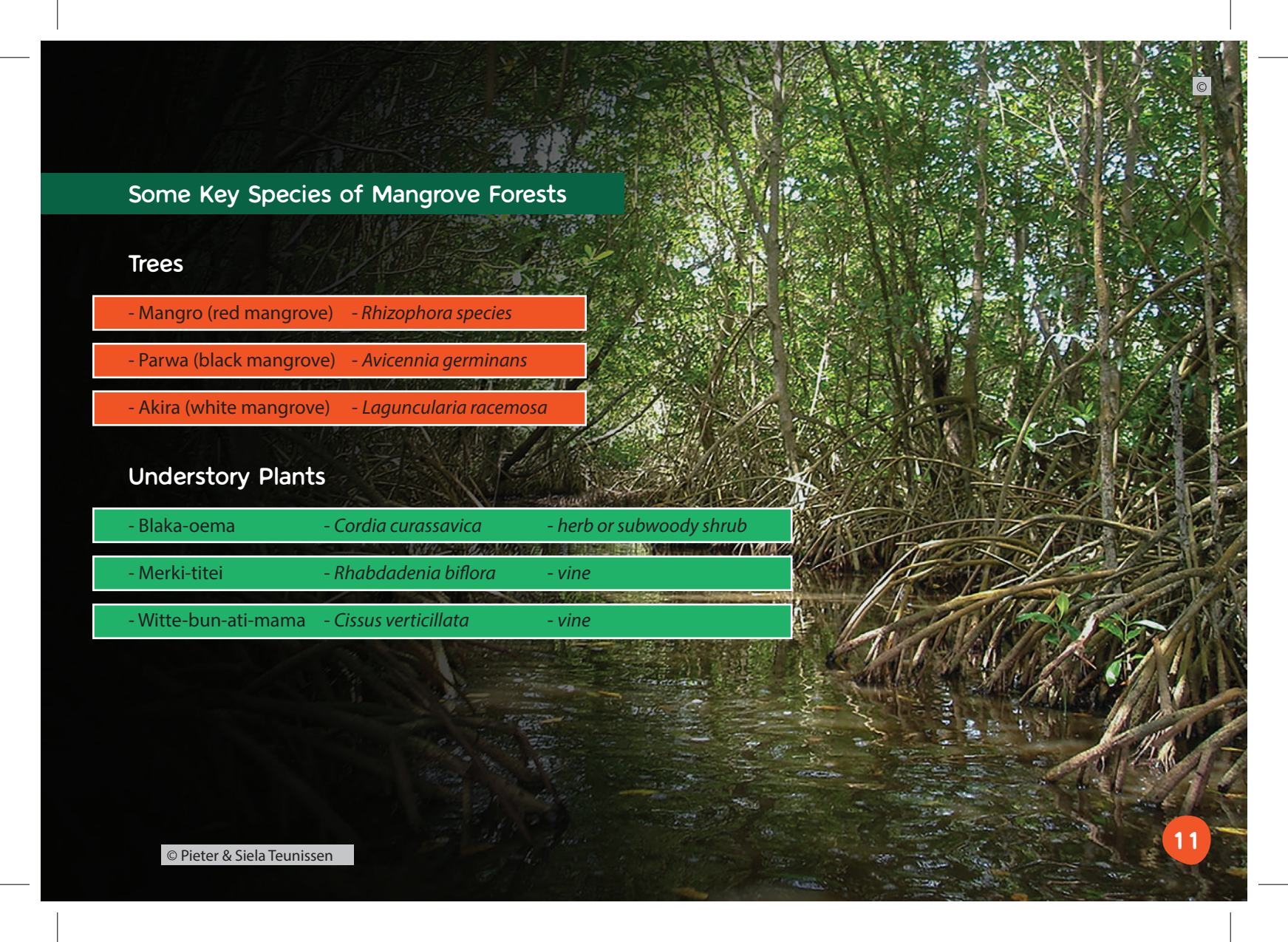
Mangroves species have adapted to their environment in unique ways:

- **Salt Management.** They survive saltwater immersion that would kill other plants by actively moving salt out of their leaves, roots or other parts. Parwa species excrete salt from their leaves (and taste salty). Exposure to high concentrations of salt for long periods can cause mangrove dieoff when water management projects or droughts reduce the flow and availability of freshwater.
- **Specialized roots.** 'Pneumatophores' or 'breathing roots' allow the trees to take in or excrete gases in low oxygen conditions. The breathing roots may extend downwards from the canopy top or extend up and out of the mud from the tree base. In one species, 'stiltroots' provide physical support in muddy soils and also gas exchange.
- **Vivipary.** Several mangrove species produce fruits with seeds (propagules) that germinate and grow while still on the mother plant. Known as "vivipary", this strategy increases the chance of survival for a juvenile plant when it is released into an unpredictable environment. A similar strategy can be observed amongst humans when parents allow thier children to continuing living at home for an extended period..





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Some Key Species of Mangrove Forests

Trees

- Mangro (red mangrove) - *Rhizophora species*
- Parwa (black mangrove) - *Avicennia germinans*
- Akira (white mangrove) - *Laguncularia racemosa*

Understory Plants

- Blaka-oema - *Cordia curassavica* - herb or subwoody shrub
- Merki-titei - *Rhabdadenia biflora* - vine
- Witte-bun-ati-mama - *Cissus verticillata* - vine

Comparing the three key mangrove species in Suriname

1

Mangro (Sr);
Rode mangrove (Ne);
Red Mangrove (En);
Rhizophora spp.
(mostly R. mangle)
Rhizophoraceae

Trees to 25 m tall. Growing in greatest abundance along rivers of the Coastal Plain. Mangro species are distinguished by stilt or prop roots at the base and aerial roots hanging down from the tree tops (see photos). Leaves are opposite (paired on branchlets), simple, long, thick, without leaf stalk glands. Mangro seeds sprout on the mother plant and grow downwards into long and narrow 'self-planting' propagules. This habit is known as vivipary.

2

Parwa (Sr);
Zwarte mangrove (Ne);
Black mangrove (En);
Avicennia germinans
Acanthaceae

Trees to 25 m tall. A pioneer species that is most abundant along the coast, but also grows on mudflats and along rivers of the Coastal Plain. Parwa is distinguished by large mats of finger-like breathing roots at the base - pointing upwards out of the mud or water. Leaves are opposite (paired on branchlets), simple, long, thick, without leaf stalk glands. Parwa seeds sprout and grow into juveniles on the mother plant (vivipary), like Mangro, but they are smaller, rounded and not long and pointed.

3

Akira (Sr);
Witte mangrove (Ne);
White mangrove (En);
Laguncularia racemosa
Combretaceae

Smaller trees, 12-18 m tall, or shrubs, often growing among Mangro or Parwa stands. Most common on river and creekbanks. Akira produces mats of upward-pointing finger-like breathing roots at the base - but these roots are shorter and less spread out than Parwa breathing roots. Leaves are opposite (paired on branchlets), small and oval (spoon-shaped vs. long and pointed in Mangro and Parwa), with 2 swellings or glands on the leaf stalks. Fruits are greenish-white, flattened, to 2 cm long, without juveniles sprouting on the mother plant.



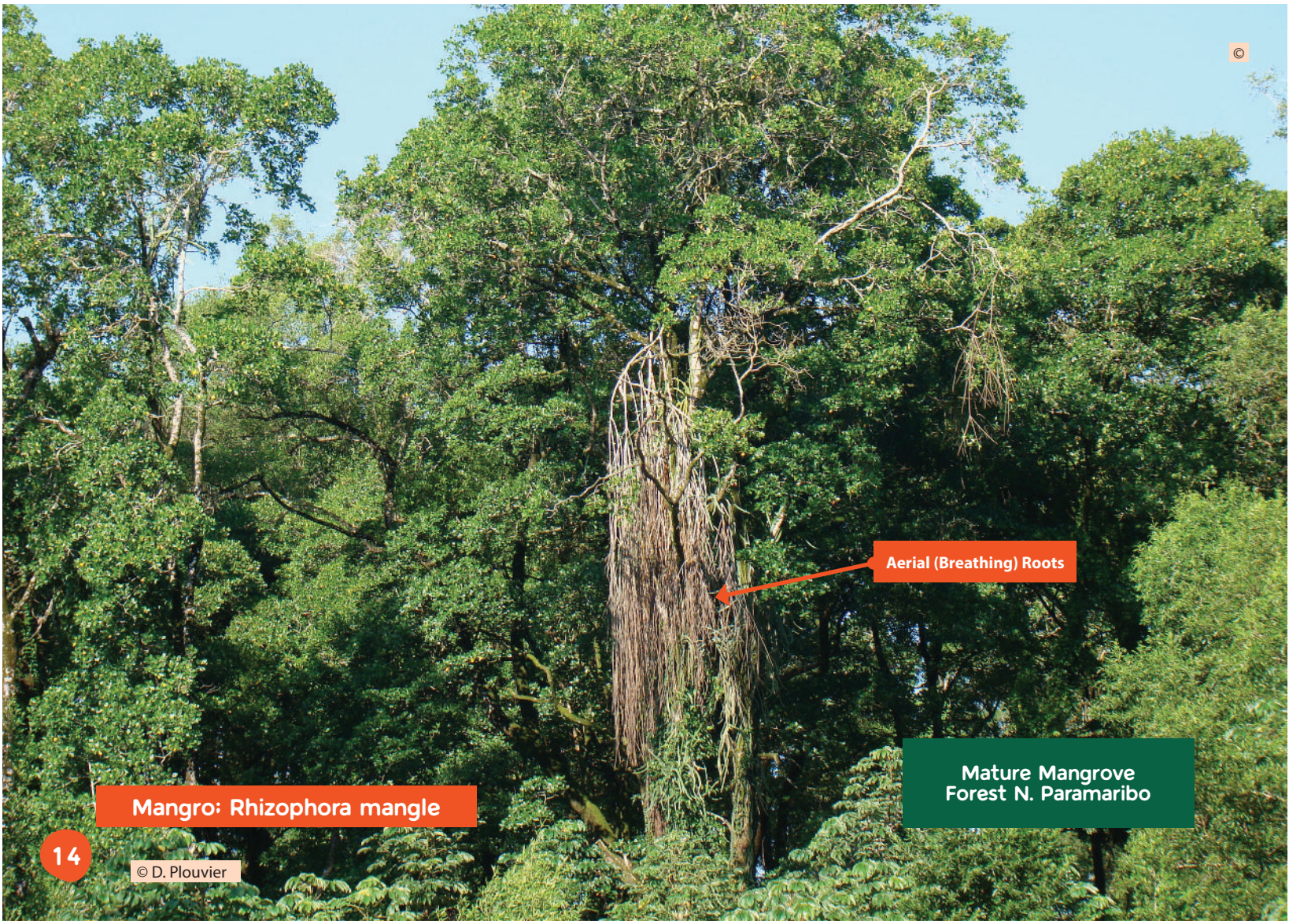
Mangro (Sr) *Rhizophora* spp. Rhizophoraceae

- 1 'Mangro' tree in coastal mudflat
- 2 Aerial (breathing) roots
- 3 Stiltroots
- 4 Stiltroots

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A photograph of a mature mangrove forest. The central focus is a large tree with a thick trunk and a dense canopy of green leaves. From the trunk, numerous long, thin, light-colored roots hang down, resembling a curtain. An orange arrow points from a text box to these roots. The background is filled with other mangrove trees and a clear blue sky.

Aerial (Breathing) Roots

Mangro: *Rhizophora mangle*

Mature Mangrove
Forest N. Paramaribo



2-flowered red mangrove – *R. mangle*



Many-flowered red mangrove – *R. racemosa*

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Seedling
(propagule)
grows while
still attached
to mother
plant



Juvenile
(propagule)
plants itself
in sand
or mud

Parwa (Sr)
Avicennia
germinans
Acanthaceae





Parwa - breathing roots (finger-like)

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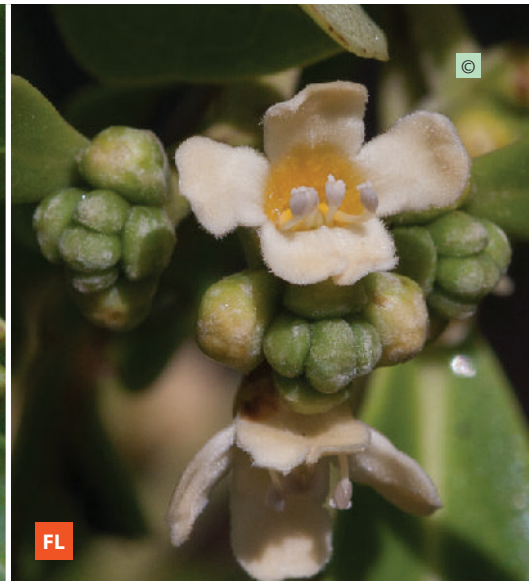
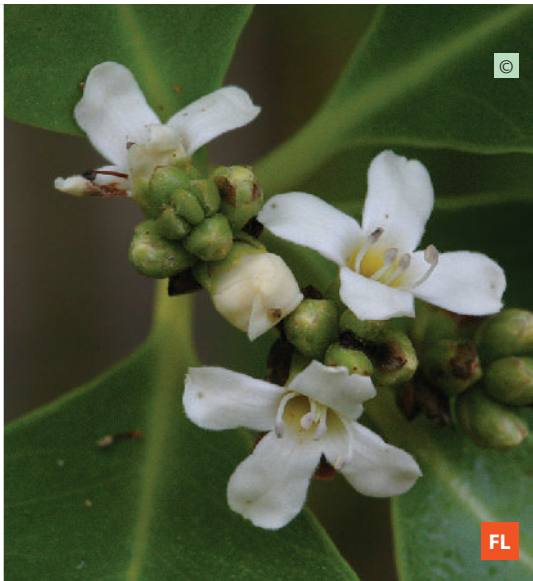


Parwa - trunk, bark, bark slash





Parwa - leaves opposite, simple, narrow and pointed



Parwa

FL Flowers

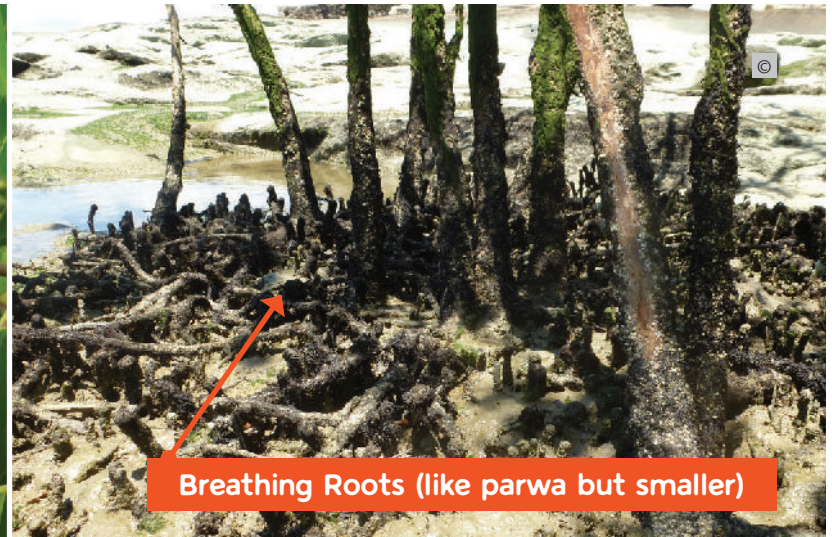
FR Fruit

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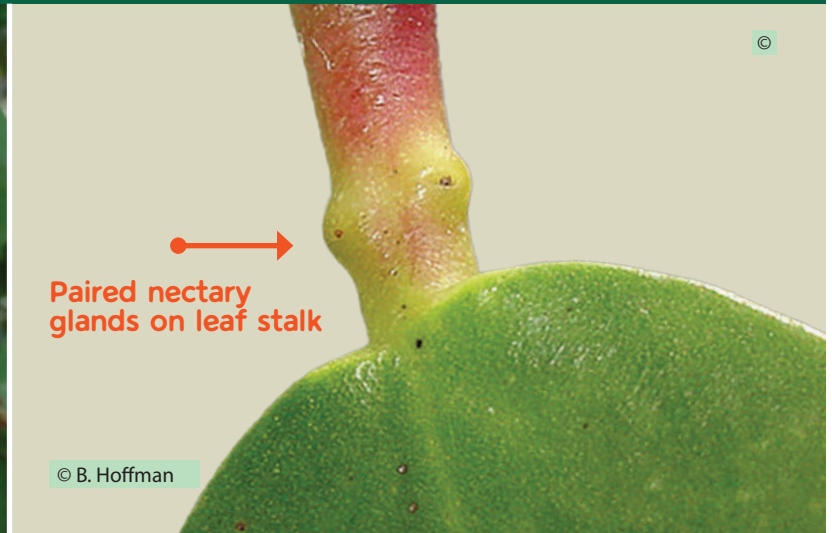
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Akira (Sr)
Laguncularia
racemosa
Combretaceae

Small trees
and shrubs



Akira



Shrubs, vines, herbs

Merkititei
Rhabdadenia biflora
Apocynaceae

Slender woody vine with abundant white milk when cut; leaves opposite, simple; flowers large, white, in form of a clock-wise pin-wheel; fruits long, narrow, pointed, containing seeds with long hairs.



Blaka oema
Cordia curassavica
Boraginaceae



Herb to sub-woody shrub, leaves alternate, simple; flowers white; fruits green to red.

Witte-bun-ati-mama
Cissus verticillata
Vitaceae



Fleshy vine; leaves alternate, simple; inflorescences flat-topped with tiny flowers; fruits green to black, fleshy berries, edible.



Threats to Mangrove Forests

- **Deforestation** of mangrove forests for land conversion, often for housing projects, is common. This breaks up mangrove forests into smaller areas which provides degraded habitat for animals and fish and compromises the protective role of mangroves as buffers to ocean wave erosion and to rising sea levels.
- **Water projects** (dams, diversions) can have a negative impact upon mangroves by changing water flow and salinity. Mangroves require a regular ebb and flow of water to wash sediment away from their breathing roots. When the salt concentration is high for too long, mangrove forests can begin to die-off.
- **Natural processes** - the cycle of land accretion and erosion - on the coast of Suriname can have make some areas inhospitable for mangroves (hopefully while creating new areas for establishment elsewhere). Mangrove establishment and growth can be impacted by natural damming or collapse (subsidence) of mud and soils that muddy the water, suffocate mangrove roots and cause salt concentrations to increase.
- **Pollution:** Excessive use of chemicals in the agricultural sector results in the supply of coastal silt with residues of chemicals and heavy metals. This affects animals and the optimal growth of mangroves.
- **Climate change** threatens mangrove forests directly with extreme weather events and indirectly by increasing vulnerability to ongoing, known threats.

“Kibri a
mangrove
busi lek a
mangrove
busi kibri yu”

Parwa forest burned





European Union

dwb ecology

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for our
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the Amazon Conservation Team
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