Stress in Mangrove Forests: Early Detection and Preemptive Rehabilitation Are Essential for Future Successful Worldwide Mangrove Forest Management

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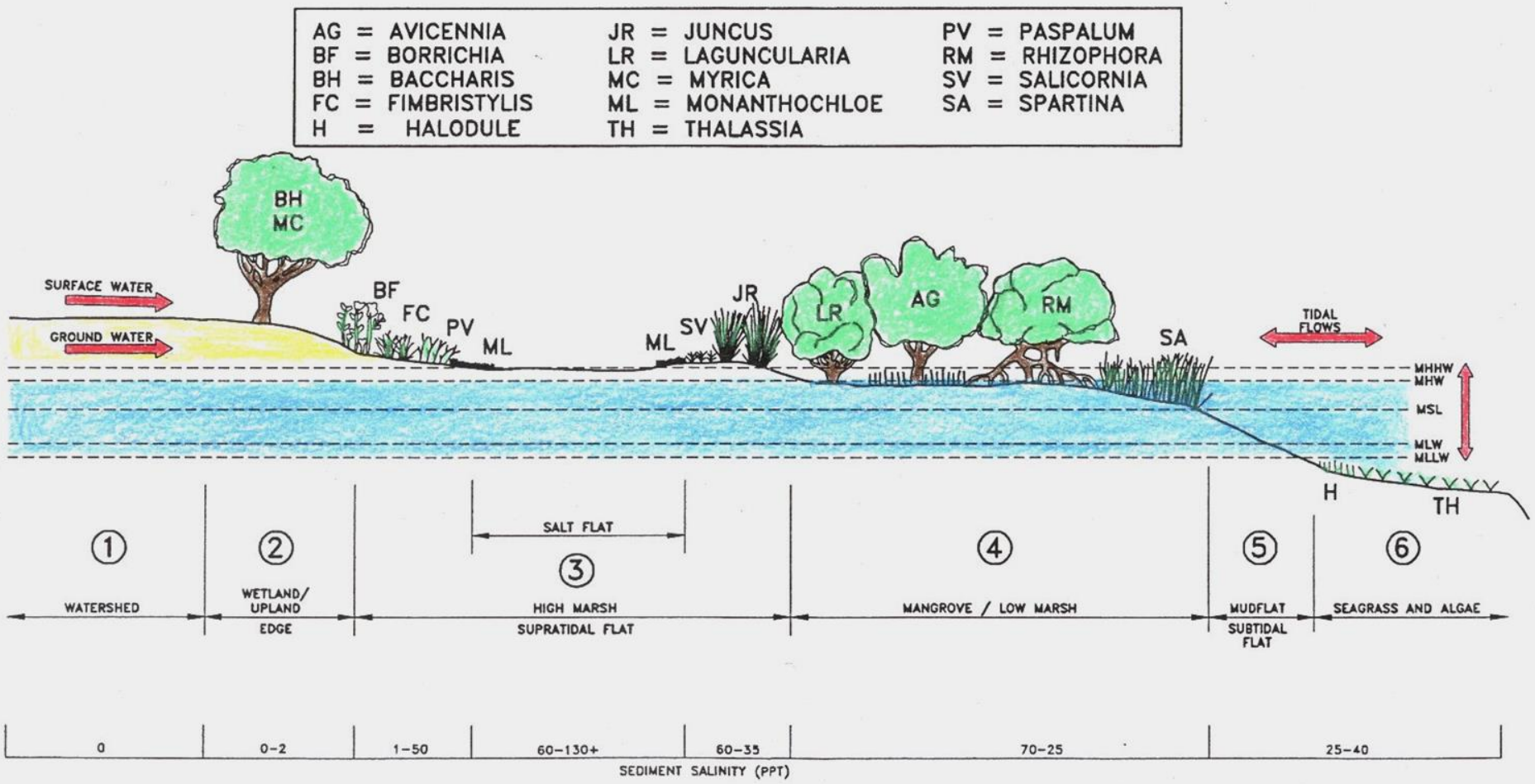


Figure 1. Schematic diagram of the six components of the tropical coastal shelf ecosystem (modified from Crewz and Lewis 1991).


ECOHYDROLOGY

Duration of Flooding as a % of the Annual Tide Cycle?

View of the same part of an inner forest at high tide (*top*) and at low tide (*below*). It is assumed that both regular tidal fluctuations and extraordinary flooding events are vital for mangrove habitats as they wash out or dilute excessive salts, organic debris and toxic substances in the upper soil surface. If inundations are absent for long periods the soil gradually dries out. Then the mangrove area may be colonised by other halophytes that find the conditions favourable.

Duration of Drying as a % of the Annual Tide Cycle?

ALTERNATIVE APPROACHES TO ECOLOGICAL MANGROVE RESTORATION (EMR v. GARDENING)

1. Understand the Autecology and Community Ecology of the Local Mangroves
2. Understand the Normal Hydrology of the Local Mangroves
3. Assess Modifications to Hydrology or Added Stress?
4. Select the Restoration Site
5. Restore or Create Normal Hydrology, or Remove or Reduce Stress
6. Plant Mangroves Only As Needed

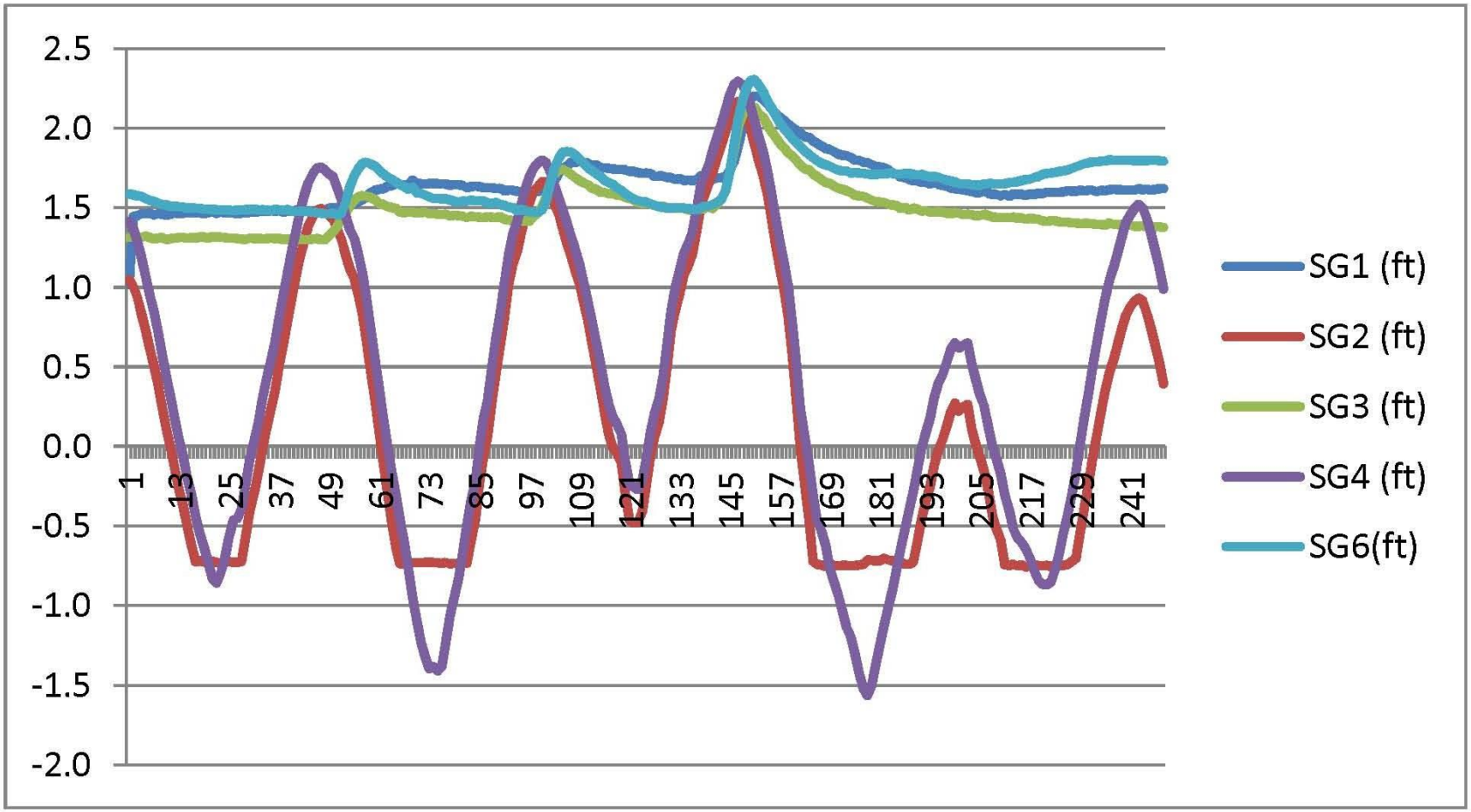
SUCCESS !

1. Build a Nursery, Grow Mangroves and Plant Mangroves

(GARDENING)

FAILURE#!!***

TIDE (FT NAVD 88) vs TIME (HOURS)



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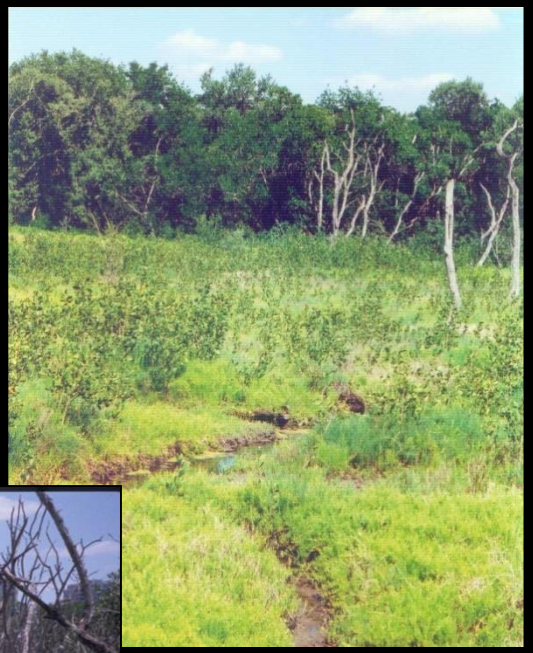
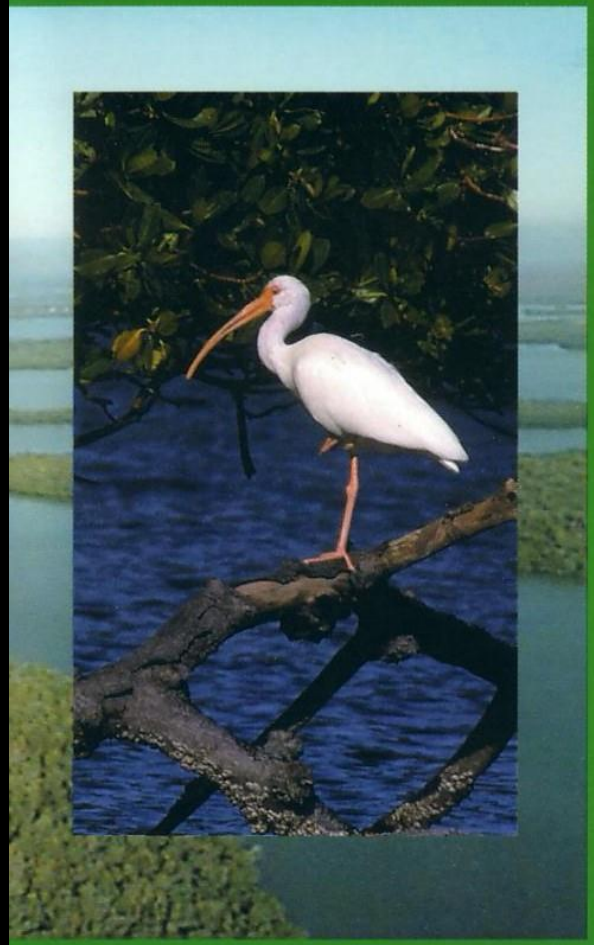


2003

January 11, 2007

National
Estuarine
Research
Reserve



Rookery Bay

May 28, 2012

Rookery Bay Fruit Farm Creek Proposed Restoration Site – January 21, 2011

This is the result of another "mangrove heart attack" !

ONE YEAR

TWO YEARS

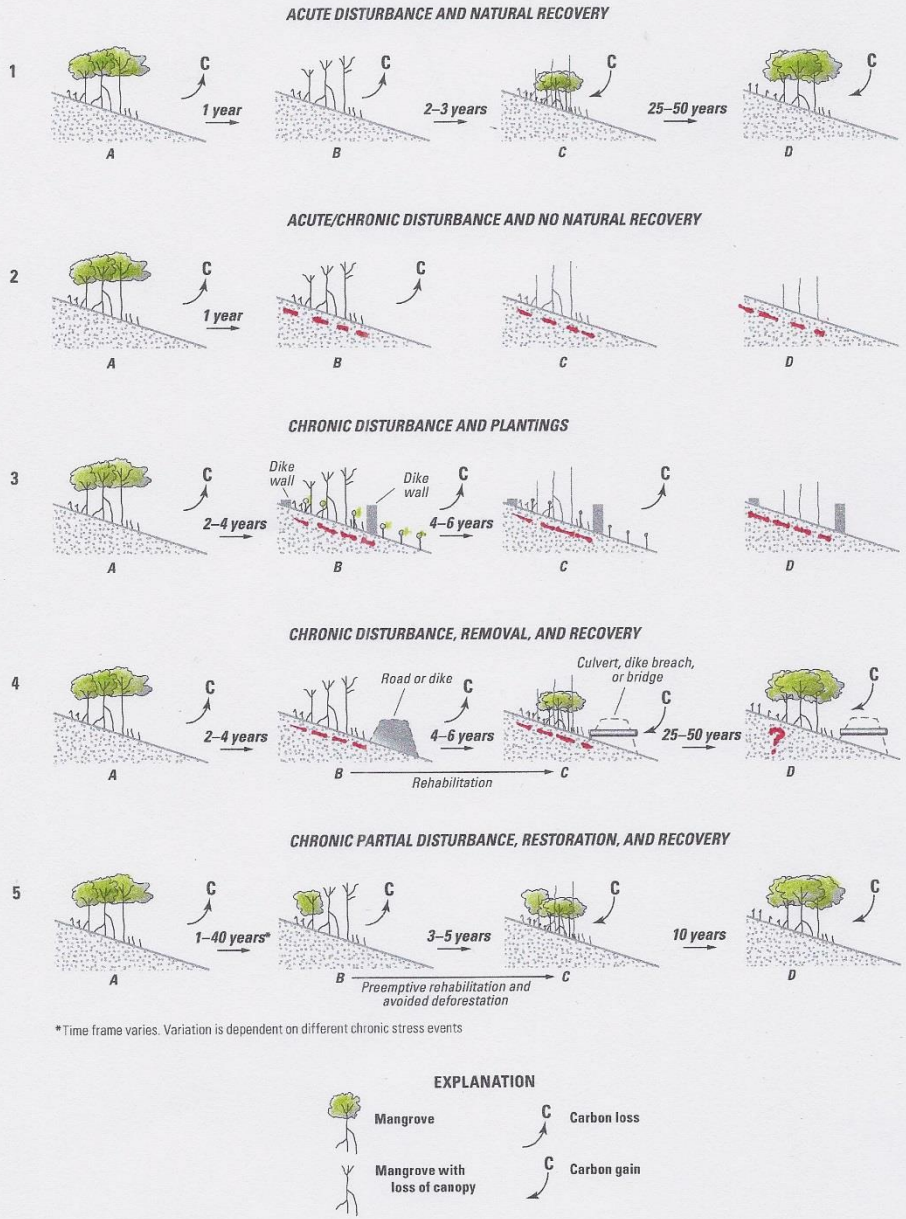


Figure 2. Alternative disturbance and recovery processes in mangrove forests. Preemptive rehabilitation at Scenario 5 can prevent complete deforestation and collapse of organic soils (dashed red line) in the face of rising sea level.