



### Tropical Coastal Communities

Relationships to other tropical forest systems — specialized swamp forests:

**Mangrove and beach forests**

- confined to tropical and subtropical zones at the interface of terrestrial and saltwater






### Mangrove Forests

- confined to tropical and subtropical ocean tidal zones
- water temperature must exceed 75° F or 24° C in warmest month
- unique adaptations to harsh environment - convergent






Queensland, Australia

### Mangrove Forests

- stilt roots - support

*Rhizophora mangle* - red mangrove

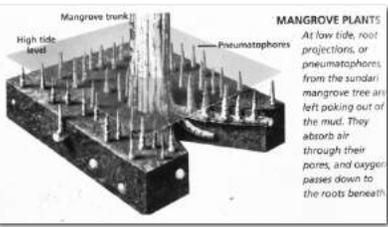





### Mangrove Forests

- stilt roots - support
- pneumatophores - erect roots for O<sub>2</sub> exchange
- salt glands - excretion

*Rhizophora mangle* - red mangrove



**MANGROVE PLANTS**  
At low tide, root projections, or pneumatophores, from the sundari mangrove tree are left poking out of the mud. They absorb air through their pores, and oxygen passes down to the roots beneath.




### Mangrove Forests

- stilt roots - support
- pneumatophores - erect roots for O<sub>2</sub> exchange
- salt glands - excretion
- viviparous seedlings



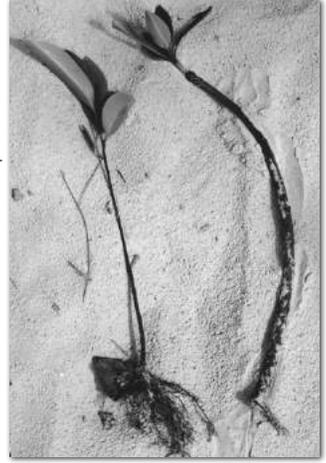

*Rhizophora mangle* - red mangrove

*Xylocarpus* (Meliaceae) & *Rhizophora*

### Mangrove Forests

- 80 species in 30 genera (20 families)
- 60 species OW & 20 NW

(Rhizophoraceae - red mangrove - most common in Neotropics)

*Rhizophora mangle* - red mangrove

*Xylocarpus* (Meliaceae) & *Rhizophora*

### Mangrove Forests

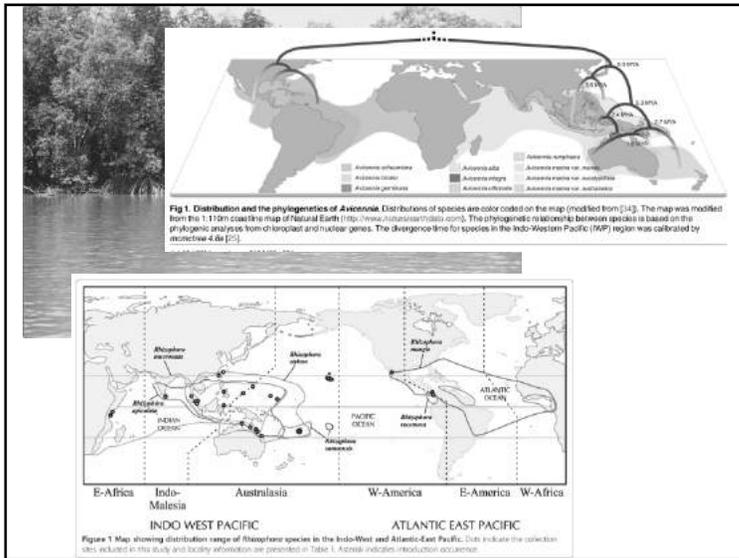
- 80 species in 30 genera (20 families)
- 60 species OW & 20 NW



*Avicennia* - black mangrove; inner boundary of red mangrove, better drained

*Avicennia nitida* (black mangrove, Acanthaceae)



### Mangrove Forests

- 80 species in 30 genera (20 families)
- 60 species OW & 20 NW

Four mangrove families in one Neotropical mangrove community

- Avicennia* - Acanthaceae
- Rhizophora* - Rhizophoraceae
- Laguncularia* - Combretaceae
- Maytenus* - Celastraceae



### Beach Forests

- salt and sand - species often seen in mangrove community



### Beach Forests

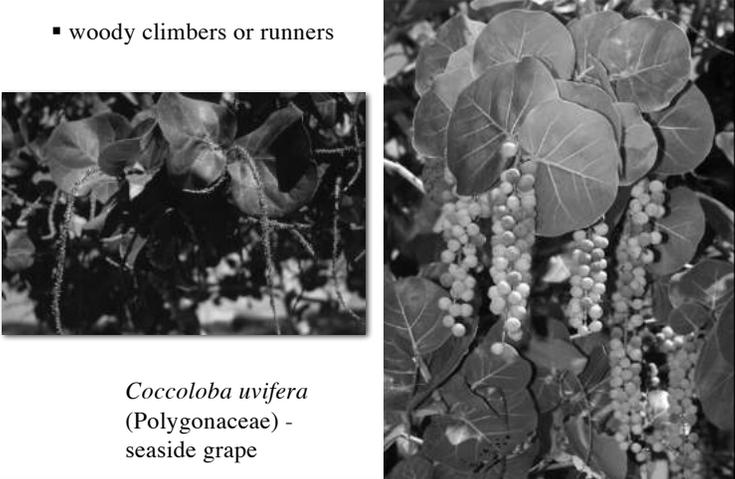
- salt and sand - species often seen in mangrove community

*Hippomane* (Euphorbiaceae) - machaneel



**Beach Forests**

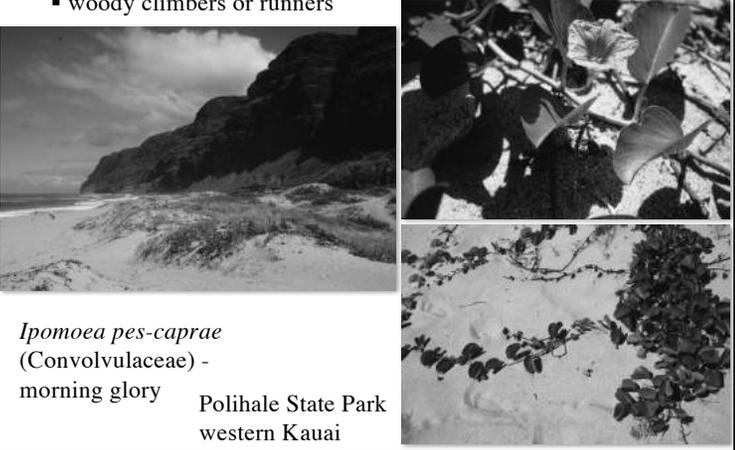
- woody climbers or runners



*Cocoloba uvifera*  
(Polygonaceae) -  
seaside grape

**Beach Forests**

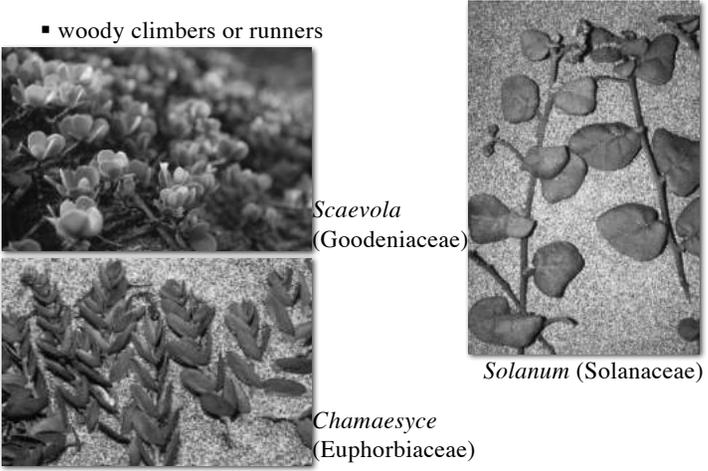
- woody climbers or runners



*Ipomoea pes-caprae*  
(Convolvulaceae) -  
morning glory      Polihale State Park  
western Kauai

**Beach Forests**

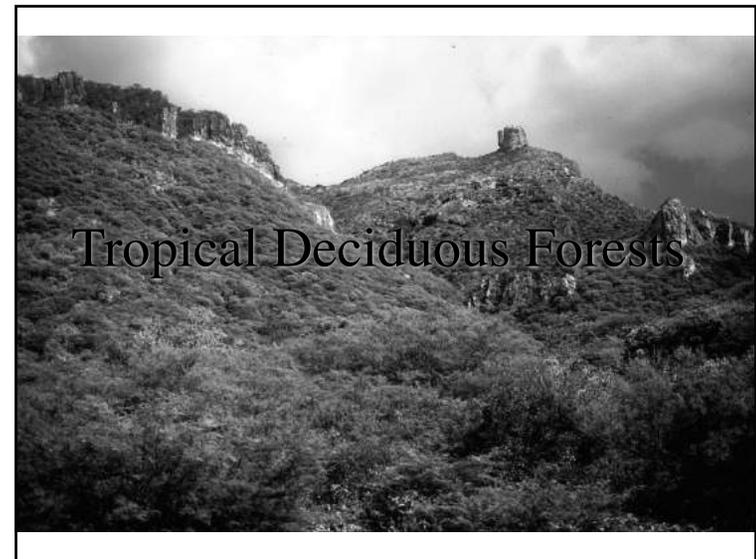
- woody climbers or runners



*Scaevola*  
(Goodeniaceae)

*Solanum* (Solanaceae)

*Chamaesyce*  
(Euphorbiaceae)



### Tropical Deciduous Forests

or Rain/Summer Green Forests

Climate . . .

- wet-dry seasonal alternation
- equatorial trough OR subtropical high climate

Moisture surplus

Temperature curve

Moisture deficit

Months

Annual total  
163 cm  
(64 in.)

FIGURE 8.11 Wet-dry tropical climate (3). Timbo, Guinea, at lat. 10½° N, is in West Africa. A long wet season at time of high sun alternates with an almost rainless dry season at time of low sun.

### Tropical Deciduous Forests

or Rain/Summer Green Forests

Climate . . . find this moving away from tropics

23°N

0°

23°S

- Equatorial forest
- Savanna woodland
- Deciduous forest, summer rain
- Savannah
- Desert
- Mediterranean woodland, winter rain
- Warm temperate forest, deficit

Nowhere is change in vegetation more readily associated with latitude than in Africa. Vegetation zones form a series of parallel bands across Africa that correspond to rainfall patterns. Equatorial forests occur only in a narrow belt along the southern coast of West Africa and in the Congo basin of central Africa. Much larger portions of the continent are covered with deciduous forests and savannah.

### Tropical Deciduous Forests

or Rain/Summer Green Forests

Climate . . . find this moving away from tropics

- Gradient evident in dry winter season from tropics to subtropics
- Also found in leeward sides of mountains - west Madagascar . . .
- and monsoon climate areas

### Tropical Deciduous Forests

or Rain/Summer Green Forests

Locations . . .

- South America - N & S of Amazon, Central America & W. Indies

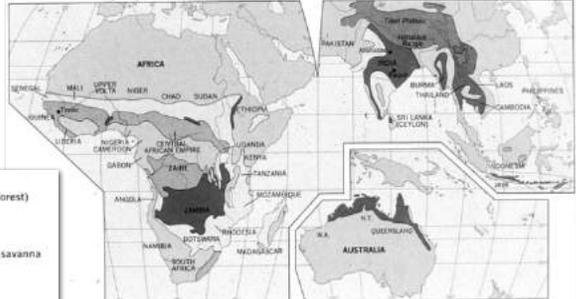
- Monsoon forest (tropical deciduous forest)
- Savanna woodland
- Thorn-tree-fall grass savanna
- High mountains

### Tropical Deciduous Forests

or Rain/Summer Green Forests

Locations . . .

- W Africa & W Madagascar
- India, Indochina,
- Southern Africa
- Australia



### Tropical Deciduous Forests

Vegetation

- Canopy closed in wet summer, but more open than tropical rainforest
- Canopy opens up in dry winter as some or many deciduous trees drop leaves - adaptation to xeric conditions



Santa Rosa, Costa Rica dry forest, summer



. . . and winter

### Tropical Deciduous Forests

Vegetation

- Canopy closed in wet summer, but more open than tropical rainforest
- Canopy often has same families or genera of evergreen tropical forests – but different species



Santa Rosa, Costa Rica dry forest, summer



*Enterlobium* (Fabaceae) canopy

### Tropical Deciduous Forests

Vegetation

- Forests closer to Tropics of Cancer and Capricorn have more pronounced dry winter season - and more pronounced deciduousness





Alamos, Mexico (27° N)  
Summer green, winter dry

### Tropical Deciduous Forests

Vegetation

- Understory more developed - better light
- Green (photosynthetic) stems common - no leaves during winter



*Bursera* -  
Burseraceae,  
Mexico



*Hildegardia barteri* -  
Malvaceae, Africa

### Tropical Deciduous Forests

Vegetation

- Flowering occurs at end of dry season when leafless



*Ipomoea arborea*  
(Convolvulaceae - Mexico)

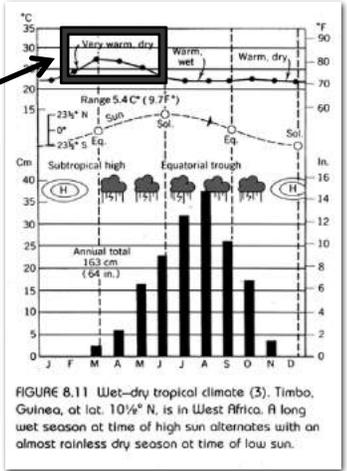


FIGURE 8.11 Wet-dry tropical climate (3). Timbo, Guinea, at lat. 10 1/4° N, is in West Africa. A long wet season at time of high sun alternates with an almost rainless dry season at time of low sun.

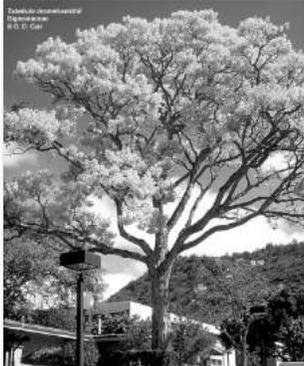
### Tropical Deciduous Forests

Vegetation

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*Tabebuia* (Bignoniaceae)



### Tropical Deciduous Forests

Vegetation

- Flowering occurs at end of dry season when leafless



*Cochlospermum* (Cochlospermaceae - Panama)



### Tropical Deciduous Forests

Vegetation

- Spines (anti-herbivory) common on stems



*Pachira* - Malvaceae, Mexico



*Ceiba* (kapok - Malvaceae), Brazil

### Tropical Deciduous Forests

Same vegetation - different flora

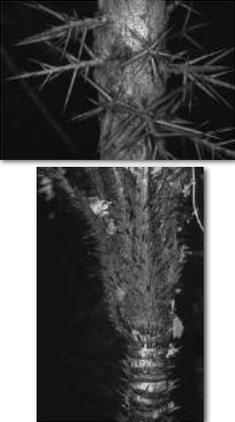
*Flacourtia* (Flacourtiaceae Thailand)



*Acacia* (Fabaceae, Mexico)



*Deccania*, palm cabbage, Seychelles



*Astrocaryum* (palm- Mexico)

### Tropical Deciduous Forests

Vegetation

- "Bottle" trees - water storage

*Adansonia* (Malvaceae) Madagascar & Africa & Australia




### Tropical Deciduous Forests

Vegetation

- "Bottle" trees - water storage: different genera in different areas



*Cola* (silk cotton tree, Malvaceae), Peru



*Brachychiton* (Malvaceae, Australia)

### Tropical Deciduous Forests

Vegetation

- parasites common



*Dendrophthoe recurva*  
Queensland, Australia - G. Gleason



Mistletoe (Loranthaceae - Venezuela)



Mistletoe (Loranthaceae - Mexico)

### Tropical Deciduous Forests

Vegetation

- epiphytes or lianas rare



*Stemona* (Stemonaceae - Thailand)



*Rhipsalis baccifera* (Cactaceae - Africa)

### Thorn Forests/Scrub

- Open forest with small deciduous trees or shrubs heavily protected by thorns

Thorn forest in Venezuela  
(exact same location)

top: rainy season, August

bottom: dry season, May



### Thorn Forests/Scrub

- Location in subtropical latitudes between dry forests and deserts

...

Thorn forest in Venezuela  
(exact same location)

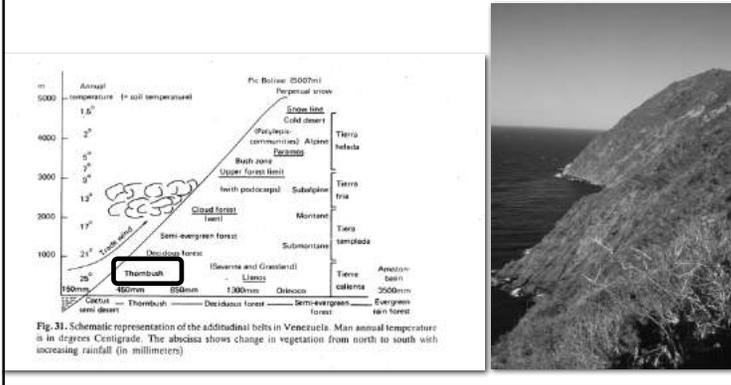
top: rainy season, August

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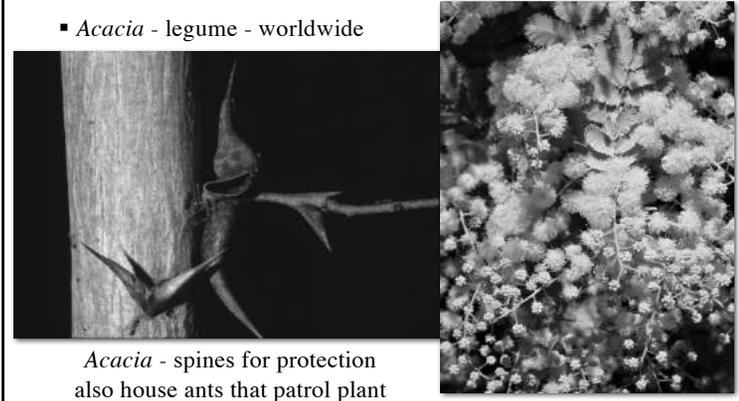
### Thorn Forests/Scrub

- Location in subtropical latitudes between dry forests and deserts . . . or on elevational gradient below tropical deciduous forests



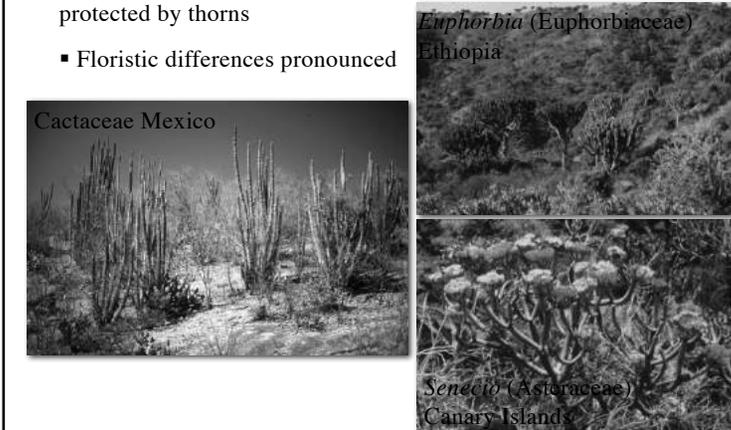
### Thorn Forests/Scrub

- Open forest with small deciduous trees or shrubs heavily protected by thorns
- *Acacia* - legume - worldwide



### Thorn Forests/Scrub

- Open forest with small deciduous trees or shrubs heavily protected by thorns
- Floristic differences pronounced



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### Tropical Savanna Woodland

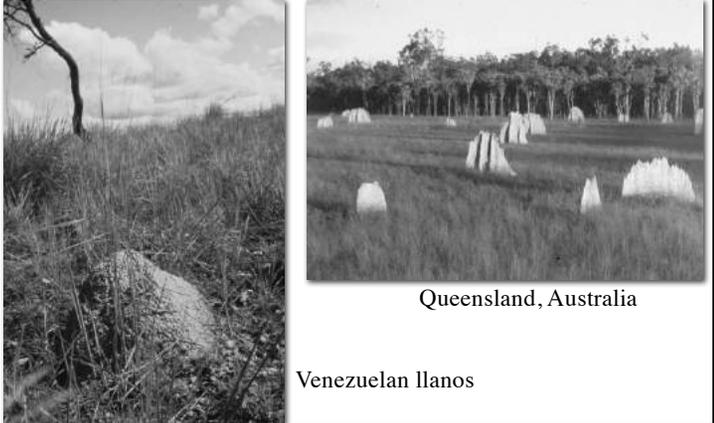
- Tall grasslands with widely scattered trees and shrubs
- Seasonal drought and fire combine to favor perennial grasses and limit tree growth



Venezuelan llanos

### Tropical Savanna Woodland

- Termites and fire go together in savanna

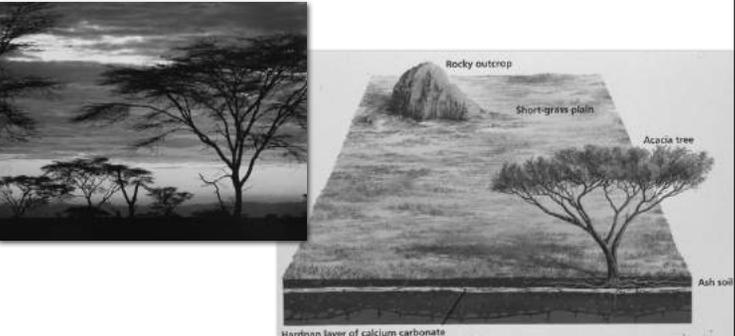


Queensland, Australia

Venezuelan llanos

### Tropical Savanna Woodland

- Specialized soil types can produce tropical savannas
- Calcium carbonate hardpan

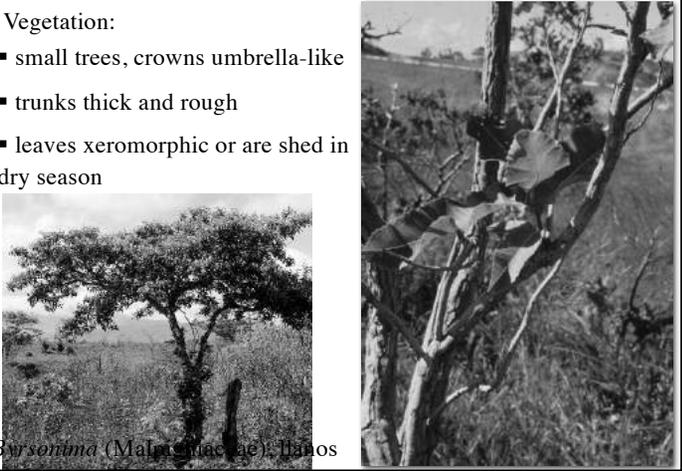


Serengeti hardpan with *Acacia* (Fabaceae)

### Tropical Savanna Woodland

Vegetation:

- small trees, crowns umbrella-like
- trunks thick and rough
- leaves xeromorphic or are shed in dry season



*Bursonima* (Malvaceae), llanos

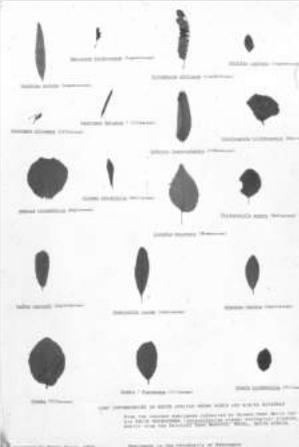
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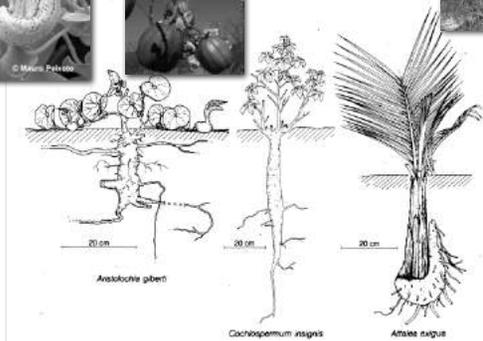


South African savanna leaf convergence (white rhinoceros diet)



### Tropical Savanna Woodland

- xylopodia (“wooden feet”) in Brazilian cerrados

### Tropical Savanna Woodland

- xylopodia (“wooden feet”) in Madagascar savanna



“Dufflepuds” – *Voyage of the Dawn Treader*



Asteraceae – sunflower family

### Tropical “Dry Forest” Flora & Fauna Relationships

**Recent assembly of the Cerrado, a neotropical plant diversity hotspot, by in situ evolution of adaptations to fire** PNAS 2009

Marcelo F. Sincron<sup>1,2</sup>, Rosaura Grether<sup>1</sup>, Luciano P. de Queiroz<sup>1</sup>, Cynthia Skema<sup>1,2</sup>, E. Toby Pennington<sup>1</sup>, and Colin E. Hughes<sup>1</sup>

- When did the Cerrado originate?
- Did the Cerrado species come in via dispersal of dry adapted species? (niche conservatism)
- Did the Cerrado species arise *in situ* from surrounding wet adapted tropical forest species? (adaptive radiation)



Fig. 1. Map of major vegetation types in South America showing the location of the Cerrado surrounded by a diversity of other biomes.

