Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R9SFPM **South Florida Coastal Prairie Mangrove Swamp**

General Information

Contributors *(additional contributors may be listed under "Model Evolution and Comments")*

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Vegetation Type

Forested

Dominant Species*

AVGE	DISP
AVICE	CLJA
SPART	LARA2
JURO	RHMA2

General Model Sources

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

LANDFIRE Mapping Zones

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Rapid Assessment Model Zones

- [ ] California
- [ ] Great Basin
- [ ] Great Lakes
- [ ] Northeast
- [ ] Northern Plains
- [ ] N-Cent.Rockies
- [ ] Pacific Northwest
- [ ] South Central
- [x] Southeast
- [ ] S. Appalachians
- [ ] Southwest

Geographic Range

This PNVG occurs primarily along the subtropical south Florida coast. Although very limited in spatial extent, black mangrove shrub communities persist by root sprouting further north in frost-prone reaches along the Gulf coast to Texas. It corresponds to Kuchler 105.

Biophysical Site Description

Coastal prairie-mangrove swamp is typically located on depositional (unstable) tidal flats of the marine-terrestrial interface with anaerobic sediments and low wave-energy. It may also occur as a belt along tidal rivers, in lagoons behind barrier islands and beaches, and in a natural mosaic of coastal prairie (saltmarsh) and closed mangrove forest.

Vegetation Description

Mangrove vegetation is easily displaced by freshwater aquatic vascular plants, suggesting that under pre-settlement conditions, fire and plant competition from inland areas restricted the mangrove coastal prairie complex location to saline-brackish zones. Principal species dominating the coastal prairie component of the mosaic include: cordgrass (Spartina spartinae and S. bakeri); black needle-rush (Juncus roemerianus); saltgrass (Distichlis spicata); or sawgrass (Cladium jamaicense). Coastal prairie margins are often fringed by white mangrove (Laguncularia racemosa). Principal species dominating the often dense, closed mangrove forests are: red mangrove (Rhizophora mangle) growing in sub-tidal areas subjected to regular, prolonged tidal flooding; black mangrove (Avicennia germinans) in the inter-tidal zone; and still further inland, the shade intolerant white mangrove (Laguncularia racemosa) a possible indicator of recent disturbance, and buttonwood (Conocarpus erectus) an indicator of the freshwater ecotone. All of these essentially tropical species are frost intolerant and fire sensitive, but well adapted to anaerobic and saline (facultative halophytes) soil conditions.

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

Disturbance Description

This PNVG is classified as Fire Regime Group II, < 35 years (frequent) stand replacement, for the coastal prairie portion of the landscape mosaic; with Group IV, 100+ years (rare), stand replacement applying to the mangrove forest portion of the landscape. Fires in the coastal prairie portion (< 30%) of the matrix likely were frequent (every 2-10 years), and stand replacing. These fires periodically killed back mangrove fringes, but would quickly burn themselves out in the sparse, shaded mangrove litter before penetrating more than a few meters into the adjoining closed-canopy mangrove forest. This resulted in a non-replacement natural mosaic burn pattern across the entire landscape. A closed mangrove forest provides an effective natural barrier to fire spread except under the most extreme drought conditions. Tidal creeks, pools, and bare hyper-saline soil areas further limit fire compartment size where mangrove forests dominate. The frequent natural lightning ignitions in coastal prairies were augmented somewhat by anthropogenic fires. However, most First Nation archaeological sites are found inland from the mangrove-coastal prairie community. Intense (Category 4+) hurricanes, occurring about every 30 years, and severe frost events (every 15-30 years) are the main controls over mangrove forest distribution and structure. Less intense (Category 1-3) hurricanes and frost or cold weather occur about every 15 years, and can "open" up portions of the previously dense, closed-canopy mangrove forests, making them more susceptible to stand-replacing fire spread during droughts. Lightning does commonly kill small areas of mangrove (0.1-0.5 acres) creating small canopy gaps. In the absence of fire, mangrove forests tend to invade further inland into open marsh and prairie.

Replacement fires always yield Class A. They are frequent (10-15 years) in coastal prairies (<30% of landscape) and moderately frequent (25-50 years) in open mangrove classes (Classes C/D). Infrequent (250 years) severe fires during extreme drought may burn through the root zone in closed mangrove classes (B/E). Non-replacement fires occur in Classes C and D only. Mosaic fires trigger class maintenance (25 years).

Adjacency or Identification Concerns

Coastal prairie and mangrove swamp occurs adjacent to Marl Prairies (R9MAPR), maybe Everglades Sawgrass (R9EGSG), and cypress savannahs (e.g., Big Cypress National Preserve).

The boundaries of this ecosystem are dynamic and have moved substantially in the last 50 years. This is a function both of sea level change and changes in the freshwater outflow of the Everglades due to anthropogenic alterations of the hydrology.

Scale Description

Sources of Scale Data ☐ Literature ☐ Local Data ☑ Expert Estimate

Gaps in the mangroves can be smaller than 1 hectare. Unbroken mangrove patches can be hundreds of hectares. Fires in the prairie can be less than a hectare to thousands of hectares. Mangrove fires are usually small since mangroves burn poorly.

Issues/Problems

Model Evolution and Comments

There is an existing FRCC - SFPM. There are existing ecosystem descriptions for the mangrove component - CES411.289, CES411.540. Some of this vegetation group may fall within CES203.539, although this is uncertain. We were uncertain if the coastal prairies just inland of mangroves are within this ecosystem class.

A number of changes were necessary to the model during the editorial review to make it match the Modeltracker database entry. The changes were as follows:
1. In Class A the relative age for the replacement fire disturbance was changed from -7 to -8 to match the number of time steps in Class A (8).

2. In all classes the probability for the 15 year hurricane event was changed from 0.075 to 0.067 to match the database description of 1 Category 1-3 hurricane per 15 years.
3. In Class B there were two wind/weather disturbances leading to Class C. Per the database description, the disturbance pathway for the one with a probability of .033 was changed to A to model the effects of a Category 4+ hurricane.
4. In Class C a relative age was included for the mixed fire disturbance. This was set to 0.
5. In Class D, per the database description, a wind/weather disturbance leading to Class A with a probability of 0.033 was added to model a Category 4+ hurricane occurring 1 per 30 years.
6. In Class E, per the database description, the path for the wind/weather disturbance with a probability of 0.033 was changed from D to A to model a Category 4+ hurricane returning E to the early post-replacement condition.
7. Per the database description, a wind/weather disturbance with a probability of 0.067 (Category 1-3 hurricane 1 per 15 years) was added.

These changes had a significant effect on the percentages of each class on projected to occur on the landscape within the historic range of variation. Class A changed from 15% to 25%, Class B changed from 14% to 29%, Class C changed from 25% to 35%, Class D remained the same, and Class E changed from 44% to 10%. A shift in fire intervals also resulted from the changes. The frequency of replacement fire shifted from 38 years to 25 years, and the frequency of mixed fire shifted from 52 to 80 years. However, the all fire frequency only changed by 4 years (from 22 down to 18).

Succession Classes

Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 25 %

Early1 All Structures

Description

Class A includes post replacement, 0-7 years, bare tidal flats (seaward) or coastal herbaceous prairie (saline marsh) with only widely scattered (<25% canopy cover) mangrove or other woody stems.

Indicator Species* and Canopy Position

SPART	Lower
JURO	Lower
CLJA	Low-Mid
LARA2	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	no data	Shrub Medium 1.0-2.9m
Tree Size Class	no data	

☑ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Bare ground or herbaceous prairie (0-75% cover) are the dominant lifeforms.

Class B 29 %

Mid1 Closed

Description

Class B is the mid-seral closed condition, 16-35 years old, with greater than 75% canopy cover from mangrove species. Small areas of bare tidal sediments or salt tolerant grasses and other herbs may persist beneath the mangrove canopy, but generally resist fire

Indicator Species* and Canopy Position

AVGE	Upper
LARA2	Upper
RHMA2	Upper
CONOC	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
Height	Shrub Short 0.5-0.9m	Tree Short 5-9m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

spread except under extreme drought conditions. Category 4+ hurricanes (30 years) can eliminate the mangrove canopy and expose bare sediments (Class A). Category 1-3 hurricanes (15 years) can create sizeable openings within the mangrove forest (Class C). Lightning creates small (0.1-0.5 acre) canopy gaps. Fires penetrate ecotones at the mangrove forest fringe adjoining prairies especially following frost or major hurricane damage.

Class C 35 %

Mid1 Open

Description

Class C is characterized as the mid-seral open stage, 8- 15 years old, with less than 50% canopy cover from mangrove species. This is often a result of lower intensity (Category 1-3, 1 per 15 years) storm damage. Salt tolerant grasses and other herbs may invade these canopy openings and foster stand replacing fire spread which returns to Class A. Lightning can create additional small (0.1-0.5 acre) canopy gaps. Prairie fires periodically burn into the mangrove fringe, but typically burn out before going very far into the mangroves. These fires are modeled as a mixed fire.

Indicator Species* and Canopy Position

AVGE	Upper
LARA2	Upper
RHMA2	Upper
CONOC	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	75 %
Height	Shrub Short 0.5-0.9m	Tree Short 5-9m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class D 1 %

Late1 Open

Description

Class D is the late-seral open condition, 36 + years old, with less than 50% canopy cover from mangrove species. This is often a result of lower intensity (Category 1-3, 1 per 15 years) storm damage or decades of cumulative lightning-caused small (0.1-0.5 acre) canopy gaps. Accumulation of coarse woody debris and mangrove "muck" is evident. Salt tolerant grasses and other herbs may invade these canopy openings and foster mosaic fires that maintain an open condition (Class D, 25 years), or stand replacing fires (Class A, 50 years). Category 4+ hurricanes (1 per 30 years) can eliminate the mangrove canopy and expose bare sediments which returns to Class A. Fires penetrate ecotones at the mangrove forest fringe of adjoining prairies especially following frost or major hurricane damage.

Indicator Species* and Canopy Position

AVGE	Upper
LARA2	Upper
RHMA2	Upper
CONOC	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	75 %
Height	Shrub Tall >3.0 m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 10 %

Late1 Closed

Description

Class E is the late-seral closed stage, 36+ years, with greater than 75% canopy cover from mangrove species and little or no understory except in small (0.1-0.5 acre) lightning-caused canopy gaps. Accumulation of coarse woody debris and mangrove "muck" is evident, but generally fires only sustain spread under extreme drought conditions. Category 4+ hurricanes (1 per 30 years) can eliminate the mangrove canopy and expose bare sediments which returns to Class A.

Indicator Species* and Canopy Position

AVGE	Upper
LARA2	Upper
RHMA2	Upper
CONOC	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
Height	Shrub Tall >3.0 m	Tree Short 5-9m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Category 1-3 hurricanes (1 per 15 years) can create sizeable openings within the mangrove forest, returning it to Class D. Fires only penetrate a few meters into the inland ecotone and mangrove forest fringe adjoining prairies.

Disturbances

Non-Fire Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other:
- ☐ Other:

Fire Regime Group: **2**

I: 0-35 year frequency, low and mixed severity
II: 0-35 year frequency, replacement severity
III: 35-200 year frequency, low and mixed severity
IV: 35-200 year frequency, replacement severity
V: 200+ year frequency, replacement severity

Historical Fire Size (acres)

Avg: 500
Min: 1
Max: 10000

Fire Intervals (FI):
Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	25			0.04	76
Mixed	80			0.0125	24
Surface					
All Fires	19			0.05251	

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

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