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 and 2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG)

R9MAPR **Everglades Marl Prairie**

General Information

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Vegetation Type

Grassland

Dominant Species*

MUHL
CLJA
SCHO
RHRU
SCRH

General Model Sources

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

LANDFIRE Mapping Zones

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Rapid AssessmentModel Zones

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

Geographic Range

The largest areas of marl prairie occur within Everglades National Park in southern Florida, with smaller areas outside the park and on some Florida keys. To the north, the marl prairies once extended in a long arm to central Broward County (Davis, 1943).

Biophysical Site Description

This system occurs on shallow inorganic soils with bedrock close to the surface (Gunderson and Loftus 1993). Hydrology is a major factor in the distribution and condition of this community. Most areas of the ecosystem are seasonally flooded (3-7 months per year) (Olmsted et al., 1980). Longer hydroperiods push the system towards a sawgrass dominated association where organic soils can build up and change the species composition. Shorter hydroperiods also result in compositional changes (Hilsenbeck et al. 1979). Elevation is a key variable, but the Everglades are so flat that it is difficult to measure elevation with sufficient precision for modeling.

Vegetation Description

Marl prairies are characterized by their plant species diversity rather than the dominance of a few species. Approximately 200 plant species are known to occur in the prairies, although none are strictly endemic to the ecosystem. Researchers often find more than 10 plant species per square meter (Olmstead and Armentano 1997, Ross et al. 2001, Julie Lockwood personal communication). The majority of plant species are short (< 1 m tall) and sparsely distributed. Species include: Muhly grass (Muhlenbergia filipes), Sawgrass (Cladium jamaicense), black bogrush (Schoenus nigricans), beak rushes (Rhynchospora spp.), and Florida bluestem (Schizachyrium rhizomatum).

The prairies are thought to be fire maintained (Craighead, 1971) although there is debate as to the specific mechanisms. Lockwood & LaPuma (2004) found that the prairie did not return to a pre-burn condition for at least 2 years post-fire, although the amount of time necessary for total recovery is still not known. For the purposes of this model, it was assumed that the vegetation recovers after 3 years.

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

Vegetation in the prairies ranges from sparse (<25% cover) to dense (~100% cover). The density of vegetation is thought to be a complex interaction between soil, hydroperiod, and fire frequency. Vegetation height varies, although sawgrass tends to be the tallest species. The system described here does not include the embedded tree islands or hammocks that have a different suite of species.

The most unique vegetational component are small-patch communities found on elevated areas of oolitic rocks referred to as pinnacle rock (Gunderson and Loftus 1993) or table rock (Hilsenbeck et al . 1979). The marl prairie system also includes embedded solution holes (depressions formed from limestone collapse).

Embedded components include cypress domes, tree islands, tree hammocks, and alligator holes. The names of such plant communities are often confused and descriptions overlap.

Much of the ground surface is covered by periphyton, which is a complex community of algal and bacterial species.

Disturbance Description

Everglades marl prairie is classified in Fire Regime Group II, stand replacement, with a 2-15 year fire return interval. The system naturally burns through lightning strike ignition and likely had fires from indigenous people in the past. Studies in Everglades National Park indicate several spatial and temporal cycles of fire activity (Beckage et al., 2003; Gunderson and Snyder, 1994). Smaller fires occur on an annual cycle that corresponds to the transition between the dry and wet seasons (Beckage et al., 2003; Gunderson and Snyder, 1994). Lightning-strike fires are most numerous from March to September, with a peak in July (Curnutt et al. 1998). Most of the acreage burns from April to June during the drier, early lightning season (Gunderson and Snyder, 1994). Fires in wet months tend to leave behind a mosaic of burned and unburned patches, while in the dry season burning is still patchy, but much more complete (Taylor, 1983). Moderate to high intensity fires occur at 6-15 year intervals, and appear associated with El Nino Southern Oscillation influences (Beckage et al., 2003; Gunderson and Snyder, 1994; Beckage and Platt, 2003). Less common (1-2/decade) severe fires associated with drought occur primarily from March-May (Gunderson and Snyder, 1994). To our best understanding, fires were predominately during the wet season (i.e., lightning), and often limited in area because of the associated rain. However, some natural fires were larger (>10,000 ha), especially during drought years.

Taylor (1983) observed that prairie vegetation growing over deep soil recovered after a fire (i.e., attained pre-fire levels of live biomass) in just two years. Shallow soiled prairies did not recover for at least four years. Recent work by Julie Lockwood and LaPuma (2004) found similar results.

Hydrological conditions during and immediately after a fire are key. Fires during wet periods may only burn surface vegetation, causing little permanent damage, and the plants can immediately resprout. However, if plants are inundated by water immediately after a fire many species will die, and recovery will be much slower. The species that die varies, and recovery depends on their ability to quickly send sprouts through the periphyton mats and above the water level. During particularly dry periods, fires may burn intensively enough to kill plants and also burn any organic material present. This is thought to lead to a slower recovery and sparser vegetation during that recovery.

Adjacency or Identification Concerns

Everglades Sawgrass (R9EGSG), South Florida Coastal Prairie - Mangrove (R9SFPM), and Salt Marsh (R9SMAR) occur adjacent to this system.

Brazilian pepper (Schinus terebinthifolius) has invaded substantial areas near the Daniel Beard Research Center, but extensive restoration is underway to remove this (as of 2005). Brazilian pepper typically only invades severely disturbed areas.

Melaleuca quinquenervia and Casuarina have invaded some areas along the northeastern border of Everglades National Park. However, most of these were killed as of 2004. Funding to maintain this condition is uncertain.

Some areas east of Everglades National Park may have historically been prairie, but are now suburban development or agricultural areas.

Scale Description

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

Fires range in size from 1 hectare to 100,000 hectares (fire maps from Everglades National Park Fire Cache, Bob Panko personal communication). Historically they were larger, but now there is some fragmentation of the system and active suppression of some fires to protect people (Bob Panko personal communication).

Flooding can be localized if resulting from individual storms. The most significant flooding comes from the onset of the wet season and the overflow of Lake Okeechobee. Water from Lake Okeechobee flows through the Everglades very slowly, naturally exiting the system through the outflows of Shark Slough and Taylor Slough, although that flow pattern is significantly altered today.

Issues/Problems

The specific dynamics of prairie succession, and the interaction of floods and fires, is still uncertain. There is evidence that fires are necessary to prevent the encroachment of woody vegetation into prairies. There is also evidence that woody vegetation does not invade prairies that have not burned for decades. It is an active area of research where there is still debate, although consensus might come within a few years through currently active studies.

Model Evolution and Comments

There is an ecological systems description of "South Florida Wet Marl Prairie" (CES411.370).

The estimates of natural fire frequency and intensity are very uncertain. This also means the estimates of the 'natural' area within each class is uncertain. It is a best guess and is open to review.

Perhaps contact Sonny Bass (sonny_bass@nps.gov, Everglades National Park), Bob Panko (Bob_Panko@nps.gov, ENP Fire Cache), Julie Lockwood (lockwood@aesop.rutgers.edu, Rutgers University), Stuart Pimm (StuartPimm@aol.com, Duke University), or experts at Florida International University.

Succession Classes**

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

Class A 10 %

Early1 Open

Description

Class A is characterized by bare ground to low density prairie. This is the condition immediately or soon after a fire. Vegetation is sparse but recovering to pre-fire densities. I am unsure of any dominant species, although sawgrass is likely present and the tallest species. Muhlenbergia is

Dominant Species* and Canopy Position

MUHL Middle
CLJA Upper

Upper Layer Lifeform

☑ Herbaceous
☐ Shrub
☐ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	25 %
Height	no data	Herb Short <0.5m
Tree Size Class	no data	

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

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

also likely present, but the percentage cover of any individual species varies substantially.

Class B **35 %**

Mid1 All Structu

Description

Class B is identified as a medium density prairie. This is the condition a few years after a fire. The exact time to reach this class will vary depending on soil depth and hydrology. Vegetation is getting denser and mostly recovered to pre-fire densities. I am unsure of any dominant species, although sawgrass is likely present and the tallest species. Muhlenbergia is also likely present, but the percentage cover of any individual species varies substantially.

Dominant Species* and Canopy Position

MUHL Middle
CLJA Upper

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	25 %	75 %
Height	Herb Short <0.5m	Herb Tall > 1m
Tree Size Class	no data	

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C **15 %**

Late2 All Structu

Description

One possible line of succession is thought to include woody plant invasion in the absence of fire. The general thought is that without fires to kill woody plants, they will gradually grow tall enough to survive most future fires and begin to increase in dominance. The evidence for this is mixed at best. Some areas with fire have certainly increased in woody vegetation, while some areas without fire for 15+ years show no evidence of woody plants. This is an active area of research by Clinton Jenkins and others and we should have a better understanding by late 2005.

Dominant Species* and Canopy Position

MUHL Middle
CLJA Upper
MYCE Upper
BAHA Upper

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	25 %
Height	Shrub Short 0.5-0.9m	Shrub Medium 1.0-2.9m
Tree Size Class	no data	

- [x] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

The dominant life form remains the herbaceous ground cover. Canopy height ranges from less than 0.5 meters up to 1 meter.

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

Class D **40 %**

Late1 Closed

Description

Class D is characterized as dense prairie. After several years without fire, the prairies get very dense (>75% closure). Biomass does accumulate, although how fast is uncertain. As the fuel load increases, the chances of a more intense fire may increase. It is unknown if the species composition is much different than during other classes. However, some vertebrate species (e.g., Cape Sable Seaside Sparrow), do poorly under these conditions because of difficulty traveling through the vegetation.

Dominant Species* and Canopy Position

MUHL Middle
CLJA Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
Height	Herb Short <0.5m	Herb Tall > 1m
Tree Size Class	no data	

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 3

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E **0 %**

Late1 All Structu

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
Height	no data	no data
Tree Size Class	no data	

Upper Layer Lifeform

- [ ] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model no data

- [ ] Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

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Disturbances Modeled

- [x] Fire
- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other:
- [ ] Other

Historical Fire Size (acres)

Avg: 1000
Min: 1
Max: 100000

Sources of Fire Regime Data

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

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

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 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	16	10	20	0.0625	45
Mixed	13	10	10	0.07692	55
Surface					
All Fires	7			0.13943	

References

Beckage, B. and Platt, W.J. 2003. Predicting severe wildfire years in the Florida Everglades. Frontiers in Ecology and the Environment 1(3):235-239.

Beckage, B., Platt, W.J., Slocum, M.G. and Panko, R. 2003. Influence of the El Nino-Southern Oscillation on fire regimes in Everglades National Park. Ecology 84:3124-3130.

Craighead, F. C., Sr. 1971. The trees of South Florida. Coral Gables, FL: University of Miami Press.

Curnutt, J.L., Mayer, A.L., Brooks, T.M., Manne, L., Bass, 0.L. Jr, Fleming, D.M., Nott, M.P. and Pimm, S.L. 1998. Population dynamics of the endangered Cape Sable seaside sparrow.
Animal Conservation 1:11-21.

Davis, J.H., Jr. 1943. The natural features of southern Florida, especially the vegetation, and the Everglades. Florida Geological Survey Geological Bulletin No. 25.

Gunderson, L.H. and Loftus, W.F. 1993. The Everglades. In Martin, W.H., Boyce, S.G. and Echternacht, A.C., eds. Biodiversity of the southeastern United State: Lowland terrestrial communities. New York, NY: John Wiley and Sons. pp. 199-255.

Gunderson, L.H. and Snyder, J.R. 1994. Fire Patterns in the Southern Everglades. In Davis, S.M. and Ogden, J.C., eds. Everglades: the ecosystem and its restoration. Delray Beach, FL: St. Lucie Press. pp. 291-305.

Hilsenbeck, C.E., Hofstetter, R.H. and Alexander, T.R. 1979. Preliminary synopsis of major plant communities in the east Everglades area, Vegetational Maps Supplement. University of Miami Report. Coral Gables, FL: University of Miami.

Lockwood, J.L. and LaPuma, D.A. 2004. Fire effects on Cape Sable seaside sparrow demography: 2004 final report. A report to the US Fish and Wildlife Service, Vero Beach, FL: 31 December 2004.

Olmsted, I.C., Loope, L.L. and Rintz, R.E. 1980. A survey and baseline analysis of aspects of the vegetation of Taylor Slough, Everglades National Park. South Florida Research Center Technical Report T-586.

Homestead, FL: Everglades National Park.

Olmstead, I., and T. V. Armentano. 1997. Vegetation of Shark Slough, Everglades National Park. USDI National Park Service, South Florida Research Center Technical Report 97-001. Homestead, FL.

Ross, M.S., Ruiz, P.L., Reed, D.L., Jayachandran, K., Coultas, C.L., Sah, J.P. and Lewin, M.T. 2001. Assessment of marsh vegetation responses to hydrological restoration in Shark Slough, Everglades National Park. National Park Service Final Report. Homestead, FL: Everglades National Park.