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)

R9LLBS **Longleaf Pine/Bluestem**

General Information

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

Modelers

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Reviewers

Vegetation Type

Woodland

Dominant Species*

PIPA2 ANVI2
SCHIZ
SCSCS
ANDR

General Model Sources

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

LANDFIRE Mapping Zones

60 55 37
58 46 59
54 48

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 longleaf pine/bluestem PNVG occurs from southeast Virginia to Georgia, and west to Texas in portions of the coastal plain and fall zone, excluding the Mississippi River alluvial plain region.

Biophysical Site Description

Longleaf pine/bluestem occurs in dry to mesic woodland/savannas in portions of the coastal plain and fall zone where Aristida beyrichiana is naturally absent.

This group is distinguished from other coastal plain longleaf pine vegetation groups by occurring outside of the range of Aristida beyrichiana and having Schizachyrium/Andropogon-dominated herb layers.

Vegetation Description

This PNVG occurs as dry to mesic woodland/savannas in portions of the coastal plain and fall zone where Aristida beyrichiana is naturally absent. The range could be characterized as patchy, including a band along the fall zone, areas in southeast Virginia and adjacent North Carolina, and sizeable patches in southern South Carolina, south Mississippi, west-central Louisiana and east Texas. The canopy is dominated by Longleaf Pine (Pinus palustris) or by a mixture of Pinus palustris with other pines and minority oaks. Sites are characterized by a low density of shrubs or mid-story hardwoods with minimal percent cover under natural fire regimes. The ground cover is dominated by dense grasses, primarily Schizachyrium spp. and Andropogon spp., generally with a diversity of legumes, composites, and other grasses.

Canopy trees are patchy in distribution, with regeneration in canopy gaps of ¼ acre or less in size. Mid-successional clumps occur in similar size patches, and the oldest trees occur as isolated individuals. The reference condition classes are aggregates of numerous patches well dispersed over the landscape. Canopy gaps are created by fire mortality, lightning, and wind throw at the scale of individual trees or several trees.

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

Disturbance Description

The longleaf pine/bluestem PNVG experiences frequent surface fires, every 1-5 years, and is classified in Fire Regime Group I. Fires are usually low in intensity overall, consuming only shrubs and herbs, but it will occasionally kill patches of young pine regeneration and rarely kill individual older trees. Individual fires cover extensive areas. Replacement fires are local patches of mortality within the context of these extensive low-intensity fires. Mosaic fire in the model represents the probability of a series of surface fires sufficient to move closed vegetation to open. Effects of single fires are minimal, but are cumulative over time.

Replacement fires are found in each structural stage of the model. Early and late-open structural stages have replacement fire frequencies of 200 years, while mid-open and mid-closed structural stage replacement fires occur on the order of every 100 years. Open structural stages are characterized by surface fire disturbances of 3 years while closed structural stages are characterized by mixed fire regimes occurring every 100 years. Structural stage B also contains surface fire frequencies of once every 25 years which would not be sufficient to change the vegetative structure from a closed to a more open mid-story layer as does a mixed fire within the same stage.

Wind/Weather/Stress disturbances are characterized by hurricane and tornado occurrences every 200 years except for the closed-late stage where weather could influence transition every 100 years. Ice storms are also a weather factor but to what degree is unknown.

Adjacency or Identification Concerns

Uncharacteristic vegetation types include even-aged canopy stands in which age structure has been homogenized by logging or clearing. Examples are found where loblolly pine (Pinus taeda), shortleaf pine (P. echinata), slash pine (P. elliottii), or oaks (Quercus spp.) have replaced some or all of the longleaf pine, and where the grass dominated ground cover has been lost due to soil disturbance or past canopy closure. Full restoration to reference condition may take a number of burns, and may take many years if older trees are not present, but fire produces substantial ecological benefits before full restoration.

In the absence of fire, shrub or mid-story hardwood densities increase. If fire remains absent in structural stage E and following 367 time steps the system transitions out of the Longleaf pine/bluestem PNVG since remaining longleaf are old mature pines and pine regeneration is greatly reduced. The system becomes dominated by oaks (oak xeric hammock).

Scale Description

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

The dominant longleaf pine canopy is patchy in distribution as represented by the open structural stages. Canopy gaps are created by fire mortality, lightning, and wind throw at the scale of individual trees or several trees. These "gaps" are represented under structural stage A of the model. Palik and Pederson (1996) report patch disturbances removed 550-1300 square meters (0.14-0.32 acres) of exposed crown area to form openings 1000-2000 square meters (0.25-0.5 acres); but occur only once per 1000 ha in 5 years.

Issues/Problems

The following is a discussion of alternative models. The initial group model had a fire probability of 0.4 for the prevailing vegetation, based on a probability of 0.5 for the more flammable wet-mesic longleaf/wiregrass type. This frequency seems too high, given that the few literature estimates are a bit longer. Christensen says 3-5 years, Wade, et al. (based on Landers) 1-4 years. But 0.5 is more frequent than the midpoint even of the 1-4 year interval. In addition, the presence of vulnerable life cycle stages, including that of longleaf pine along with the presence of a diverse lepidopteran community that is not resilient to fire, suggests a longer natural fire interval.

The model gave appropriate percentages of successional stage patches using a probability of 0.4 for longleaf pine/bluestem and of 0.5 for wet-mesic longleaf pine. But similarly appropriate percentages can be achieved with a surface fire probability of 0.3 if the time since fire needed to develop the closed path

vegetation is increased from 10 to 15 years. While 10 years is often sufficient to create less flammable closed vegetation under current conditions, it is likely that this stage developed more slowly in fire-dominated landscapes that had not experienced a substantial interval of fire exclusion.

Originators of the original model (PNVG code: LLBS) did not define their usage of Competition/Maintenance.

Also there is a need to address the issue of Southern Pine Beetle or other Ips that may impact Longleaf Pine. According to Gan (2004) the annual average infestation rate of Southern Pine Beetle in southeast pine forests is 0.845%. It should be noted that infestation rate is defined as the proportion of the volume killed by SPB relative to the pine growing stock (Price et al. 1998). The growing stock of pine forests was drawn from forest inventory data.

Please note that I would scrutinize map zone 59. I am not sure whether the range of this vegetation type actually gets into this zone. I am not sure of the exact location of the map zone delineating line.

Model Evolution and Comments

This model replaces the PNVG R7LLBS from the Northeast model zone.

Szell began his general information descriptions by starting with descriptions as reported in the draft FRCC Handbook (PNVG Code: LLBS) by Mike Schafale and Sharon Herman. Expertise was also provided by Kevin Heirs who worked with the original model.

*Succession Classes***

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

Class A 15 %

Early1 All Struct

Description

Class A includes canopy gaps, mostly from a single tree to a quarter acre in size, with pine regeneration up to 15 years old. The ground cover is predominantly native grasses. Tree cover ranges from 0 to 50%.

Dominant Species* and Canopy Position

PIPA2	Upper
ANVI2	Lower
SCSCS	Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	no data	Tree Regen <5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

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

Class B 10 %

Mid1 Closed

Description

Class B is characterized by patches, most ¼ acre or less, of canopy pines 15-75 years old, and a substantial component of hardwoods or other pine species encroaching in the absence of fire. Hardwood and encroaching pine cover is greater than 50%. The pine canopy cover ranges from 25-75%.

Dominant Species* and Canopy Position

PIPA2	Upper
QUFA	Mid-Upper
RHCO	Low-Mid
SAAL5	Low-Mid

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Structure Data (for upper layer lifeform)

	Min	Max
Cover	70 %	90 %
Height	Shrub Tall >3.0 m	Tree Medium 10-24m
Tree Size Class	Medium 9-21"DBH	

☐ 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.

Class C 35 %

Mid1 Open

Description

Class C includes patches, most ¼ acre or less, with canopy pines 15-75 years old, and a minimal hardwood component due to frequent fire. The ground cover is dominated by grasses. The pine canopy cover ranges from 25-75%.

Dominant Species* and Canopy Position

PIPA2 Upper
ANVI2 Lower
SCSCS Lower

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	25 %	70 %
Height	Tree Short 5-9m	Tree Tall 25-49m
Tree Size Class	Large 21-33"DBH	

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

Class D 35 %

Late1 Open

Description

Class D includes patches, most ¼ acre or less, with canopy pines 75 or more years old, and a minimal component of hardwoods. The ground cover is dominated by grasses. The pine canopy cover ranges from 25-75%.

Dominant Species* and Canopy Position

PIPA2 Upper
ANVI2 Lower
SCSCS Lower

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	25 %	70 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Very Large >33"DBH	

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

Class E 5 %

Late1 Closed

Description

Class E is characterized by patches with canopy pines 75 or more years old, and a substantial component of hardwoods or pines other than longleaf in either the overstory or understory. The ground cover is shrubby or sparse. Hardwood and encroaching pine cover is greater than 50%.

Dominant Species* and Canopy Position

PIPA2 Upper
QUFA Mid-Upper
QUNI Mid-Upper
QULA3 Mid-Upper

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 9

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	70 %	90 %
Height	Tree Medium 10-24m	Tree Tall 25-49m
Tree Size Class	Very Large >33"DBH	

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

Disturbances

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

Disturbances Modeled

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

Historical Fire Size (acres)

Avg: 10000
Min: 1
Max: 100000

Sources of Fire Regime Data

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

Fire Regime Group: **1**

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	130			0.00769	3
Mixed	800			0.00125	0
Surface	4	1	5	0.25	97
All Fires	4			0.25894	

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