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):

R4NOFP **Great Plains Floodplain**

General Information

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

Modelers

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Vegetation Type

Woodland

Dominant Species*

PODE3	CEOC
SAIN3	ACNE2
SAAM2	FRPE
SANI	CODR

General Model Sources

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

LANDFIRE Mapping Zones

30	39
31	40
38	43

Rapid Assessment Model Zones

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

Geographic Range

Great Plains river systems from eastern Montana east to North Dakota and south through Kansas and Oklahoma, into western Missouri. Such river systems include the Missouri, Platte, Kansas, and the Arkansas Rivers. The major tributaries to these river systems would be in this PNV, such tributaries include the Yellowstone, Little Missouri, and the Cheyenne Rivers.

Biophysical Site Description

Alluvial surfaces, usually bare, within broad floodplains are present as low elevation shorelines and barforms. The slightly higher fluvial landform adjacent to the channel forms the first terrace for fluvial dependent species. Over time, laterally migrating point bars form bench platforms that may become late seral stage floodplain forests.

Vegetation Description

Broadleaf deciduous forest dominated by cottonwood (primarily Populus deltoides, but further west P. angustifolia is present), black willow, or peach leaf willow and sandbar willow. Early seral stage phreatophytic vegetation becomes established on low elevation flood deposits, however, long-term survival is possible only on bare, moist sites on slightly higher elevation (1-3m above lower limit of perennial vegetation) Other species found in the floodplain riparian zone include sandbar willow, box elder, hackberry, green ash, typically associated with late seral stages. Understory species in these later seral stages may include dogwood and poison ivy. Loess bluff terraces situated out of the floodplain riparian zone are composed of bur oak, walnut, and sycamore.

Disturbance Description

The development and maintenance of this system is dependent on fluvial geomorphic processes such as channel meandering, sedimentation, erosion, channel avulsion and barform accretion driven by hydrologic

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

variability. This variability incorporates the features of timing, duration, frequency, magnitude, and intensity. Regeneration of the dominant species (cottonwood and willow) is dependent on flooding and movement of river channels, which creates bare, moist soil needed for seedling establishment. Oxbow and slough development also influence the floodplain system and create variability in plant community composition. Upper terraces have infrequent flooding and scouring events, while the lower terraces nearest the river flood frequently. Early seral stage development stands are produced on point bars via channel meandering, which occurs most often during moderately frequent high flows. Scouring caused by ice jams during the winter, channel meandering, oxbows and slough development greatly influence this system. Changes in hydrology due to the activities of beaver are also an important ecological process in the Great Plains Floodplain, particularly on the tributaries to the Missouri River. Beaver impoundments kill trees (sometimes over large areas) and may create open water habitat, willow stands, or contribute to channel meandering. This model is based on conditions prior to euro American modification of river systems in North American.

Adjacency or Identification Concerns

Beyond the limits of the high terrace of the riparian floodplain exists the Oak-Hickory Forest in southern portion of Nebraska, Iowa and through Missouri. Along the northern portion of Nebraska, Iowa, and southeast South Dakota, the adjacent PNV is Prairie. Throughout the rest of the Dakotas and eastern Montana the surrounding PNV is Plains Grassland.

Scale Description

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

Landscape adequate in size to contain natural variation in vegetation and disturbance regime. This PNV occurred in a linear dimension of millions of acres along the Missouri River floodplain, with smaller areas covered in larger tributary rivers and streams. Wetland complexes covered millions of acres, these included oxbow lakes, slough, and marshes. Fire was a disturbance mechanism within portions of floodplain, however, the frequency and intensity is unknown.

Issues/Problems

Assumptions: I developed the VDDT model with the recognition that the Great Plains Floodplain forest (cottonwood-willow-elm community) is a seral community. This seral community is most affected by fluvial geomorphic processes such as flooding, avulsion and deposition, and channel movement. I modeled the floodplain valley up to the last high terrace that rarely floods to reset to an early successional seral stage. The model does include shallow wetlands, sloughs or oxbows. Deep water habitat and the wetted width of the active river were not included in the model. I used three flooding regimes in the model: Option 1 – minor to moderate flooding (5-25 year frequency) Option 2 – major flooding/scouring (30-100 year frequency), and a Wind/Weather/Stress Option - rare, intense flooding (>250 yrs). Flood frequency for a class is based on location on the floodplain, with higher terraces being subject to longer flood cycles (up to 500 years). Fire activity was a minor portion, low intensity, surface, infrequent intervals, small in size and low fuel loads.

Ice jams and ice scouring as well as beaver activity was not modeled. The effects of beaver ponds on forest dynamics in this system are also poorly understood at the landscape level, especially in the presettlement context.

Model Evolution and Comments

One anonymous reviewer provided feedback that has been incorporated into the document. The model is most reflective of the more mesic middle Missouri River region and less so farther west. The PNVG may need to be split to reflect differences from east to west: farther west the uplands start to lose the ability to support trees due to lower precipitation.

Succession Classes

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

Class A 20 %

Early1 All Structures

Description

Created by deposition, stream meander changes, point bar formation, and scouring. Option 1: minor flooding/scouring (<5 year frequency) Pioneer tree and shrub species of cottonwoods and willows. Herbaceous understory of sedges in wet areas. In this early stage, most of the area is bare sand. Age 0-4 years. Most of area is seasonally flooded.

Indicator Species* and Canopy Position

PODE3	Upper
SAIN3	Upper
SAAM2	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Tree Regen <5m	Tree Regen <5m
Tree Size Class	Seedling <4.5ft	

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

Class B 25 %

Early2 Open

Description

Dominated by young canopy of tree saplings and shrubs. The understory is highly variable and consists of bare sand, annuals, or perennial hydrophytes. Species would include indigo bush and various grass, sedges, and rushes. Approximate flooding regime would be 10yrs. Age 5-14 years.

Indicator Species* and Canopy Position

PODE3	Upper
SAIN3	Middle
SAAM2	Middle
SANI	Middle

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	15 %	50 %
Height	Tree Regen <5m	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 C 25 %

Mid1 Open

Description

This stage develops as the stand starts to mature. This community tends to be partially opened, with scattered cottonwoods and willows. The shrub layer is poorly developed and often consists of widely scattered patches of dogwood. The understory vegetation is highly variable with wild rye, and muhlys. In wetter, more shaded areas Virginia

Indicator Species* and Canopy Position

PODE3	Upper
SAAM2	Mid-Upper
SANI	Middle
CODR	Middle

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	25 %	75 %
Height	Tree Regen <5m	Tree Short 5-9m
Tree Size Class	Medium 9-21"DBH	

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

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creeper, nettles, and poison ivy would exists. Age is 15-50 yrs.

Class D 20 %

Late1 Closed

Description

This class is a mature, late seral closed canopy cottonwood floodplain forest. Overstory is dominated by cottonwood, box elder, hackberry, and elm. Understory species composed of Virginia creeper, and poison ivy. Age 51-149 years.

Indicator Species* and Canopy Position

PODE3	Upper
CEOC	Low-Mid
ACNE2	Low-Mid
FRPE	Low-Mid

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
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 10 %

Late2 Closed

Description

Found along the upper terrace that has been protected from most flood events, except for rare high intensity flooding. Species composition increases towards south and east within the region. Overstory species include hackberry, green ash, sycamore, black walnut, and elm. Understory species include vines and poison ivy.

Indicator Species* and Canopy Position

FRPE	Middle
CEOC	Middle
ACNE2	Middle
PODE3	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	75 %	100 %
Height	Tree Short 5-9m	Tree Tall 25-49m
Tree Size Class	Medium 9-21"DBH	

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

Disturbances

Non-Fire Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☑ Other: Flooding minor to moderate
- ☑ Other: Flooding major to rare intense

Fire Regime Group: 3

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:
Min:
Max:

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.

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Sources of Fire Regime Data

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

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement					
Mixed	500			0.002	99
Surface					
All Fires	500			0.00202	

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