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):

R3RIPAgr **Riparian Deciduous Woodland**

General Information

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

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Vegetation Type

Forested

Dominant Species*

POFR2
PODEW
FOPU2
SALIX

General Model Sources

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

LANDFIRE Mapping Zones

14 24 28
15 25
23 27

Rapid Assessment Model Zones

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

Geographic Range

Widely distributed from the Rocky Mountains to the Midwest, and southward through the southern states to Florida. In the southwest, the model includes the Rio Grande cottonwood (P. deltoides ssp. Wislizeni) that occupies the Rio Grande and San Juan drainages and extends to the Colorado River drainage in northeastern Arizona, eastern Utah, and western Colorado. The plains cottonwood (P. deltoides ssp. Monilifera) occupies the
eastern plains drainage basins of the Canadian and Pecos Rivers in New Mexico and northward through the eastern prairie states to the Great Lakes region (Eckenwalder 1977).

In south-central and southwestern New Mexico over into southern Arizona, the Rio Grande Cottonwood Alliance is replaced by the Fremont Cottonwood Alliance (P. fremontii). NM, AZ Included are the mainstems and major tributaries within the Pecos, upper and middle Rio Grande, Gila, San Francisco, Mimbres, San Juan, Little Colorado, and Canadian drainages. The Middle Rio Grande stretches from Cochiti Dam south to Elephant Butte and Caballo reservoirs, roughly 150 miles. Major tributaries include the Jemez River, the Rio Puerco, Santa Fe and Galisteo Rivers to the north, and the Alamosa, Palomas, and Las Animas Rivers to the south. This reach is intensely managed and hydrologically altered. Nearly every major tributary, with the exception of the Rio Puerco and Rio Salado, contains a reservoir or diversion dam for flood and sediment control, or for irrigation. At Cochiti, significant irrigation diversions occur and extreme channel controls and modifications have been implemented for flood and erosion control, and water delivery. The channel is periodically dredged and straightened, and banks are rip-rapped to prevent erosion. Additionally, river bars have been mowed of their vegetation to maximize water delivery along a 600-foot-wide corridor. Flows are also controlled within a network of flood-control fencing (jetty jacks, levees, and ditches that drain an area of nearly a quarter-million square miles. Despite these major alterations the Rio Grande still overflows its banks within the levees in certain localities (Crawford et al. 1993), and the river supports one of the most extensive and continuous riparian forests or "bosques" in the

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Southwest (Hink and Ohmart 1984.

Biophysical Site Description

Geologically, the Rio Grande and its tributaries in New Mexico traverse varying terrain and two major structural alluvial and bedrock basins. The alluvial basin that comprises much of the Middle Rio Grande is located in a tectonically active region known as the Rio Grande Rift. It is delineated by high heat flow, late Quaternary faults, late Pliocene and younger volcanoes, and deep basins. Highlands are composed of rocks older than the middle Tertiary, and erosion has resulted in the deposition of thick (several thousand feet) middle Tertiary or younger basin fill deposits. Bedrock basins contain many layers of sedimentary rock, ranging from Mississippian to Quaternary in age. The material composing the bedrock was deposited in a wide range of depositional environments ranging from deep water marine to arid continental; consequently, there is a large range of permeability. Climatically, the Middle Rio Grande watershed spans zones from montane to desert.

In the northern mountainous regions, temperatures range from below freezing 32F (0C) in the winter months, to more than 100F (37C) in the summer. Over most of study area a frost-free period of 120 days from June through September can be expected. Precipitation patterns vary widely, with extremes in mean annual precipitation ranging from more than 30 inches (130 cm) at high elevations to less than 8 inches (10 cm) south of Albuquerque to Elephant Butte Reservoir. The majority of the precipitation, 70-80%, falls in summer as “monsoonal” thunderstorms with moisture derived from the Gulf of Mexico or Gulf of California. The winter precipitation comes in the form of snow and frontal rainstorms. The summer storms can contribute significantly to late summer and fall discharges, but peak runoff usually occurs in late spring (May-June) due to snowmelt (Anderholm, Radell and Ritchey 1995).

Vegetation Description

Cottonwoods are established on the lowest alluvial surfaces in the floodplain with the onset and subsidence of early spring floods. As the channel cuts and moves laterally away from these newly established bars, young dense forests quickly grow and take hold, trapping sands, silts and debris from ensuing floods. Early successional communities may be continually knocked back or buried by floods until eventually the bars build higher and higher, becoming stabilized and drier. Mature cottonwood forests may remain stable for many years. Generally, they eventually die from old age, or are removed in a high-energy flood event and replaced by new, young trees (site progression model of Leonard et al. 1992).

Early to mid-successional communities of the alliance typically have sparse or scoured understories, or are codominated by willows (Plains Cottonwood/Scour, Plains Cottonwood/Sparse, Plains Cottonwood/Coyote Willow, and Plains Cottonwood-Goodding Willow). These stands are dominated by young saplings and intermediate-aged cottonwoods, which form dense stands along sidebars and low terraces proximal to the river.

A wide variety of grasses and shrubs, including sideoats gramma (Bouteloua curtipendula), Kentucky bluegrass (Poa
pratensis), alkali sacaton (Sporobolus airoides), New Mexico olive (Forestiera pubescens), rubber rabbitbrush
(Chrysothamnus nauseosus), and oneseed juniper (Juniperus monosperma), codominate the late successional communities of the alliance. These stands are dominated by mature cottonwoods that generally form closed canopies on river terraces.

The alliance is thought to be declining due to several human-induced factors that interrupt the reproductive cycle and change habitat conditions and functions (Howe and Knopf 1991; Crawford et al. 1993; Bogan et

al. 1998). Primary factors include the regulation of rivers, which reduces annual flow volumes, changes seasonal peak flows from spring to summer, and disrupts the annual fluctuation in flow volume by diversions during dry years (Stromberg and Patten 1992). The altering of hydrological regime that reduces flooding and minimum flows can have a particular impact on the reproduction and long-term viability of cottonwood-forested wetlands. Scouring
floods are required to create bare substrates for cottonwood seed germination followed by sustained high moisture conditions to insure establishment (Horton, Mounts, and Kraft.1960). These factors, in concert with shrubby exotic invasions (Everitt 1980), increased fire frequency (Stuever 1997), altered litter decomposition rates (Ellis, Molles,
and Crawford 1999), and excessive herbivory by livestock and native animals (Krueper 1996), combine to further
endanger the biological integrity of wetlands of the Plains Cottonwood Alliance.

Community types for the alliance have been described from the Rocky Mountains to the southeastern U.S. (Anderson et al. 1998). With respect to classification in New Mexico, there is some confusion as a result of changing names between P. fremontii and P. deltoides over time. Campbell and Dick-Peddie (1964) described two cottonwood-dominated vegetation communities from the Rio Grande drainage (Class IV and V), which they
ascribed to P. fremontii that we would probably consider P. deltoides var. wislizeni now. Similarly, Szaro (1989) refers to a Populus fremontii Community Type for Arizona and New Mexico which is inclusive of P. deltoides.
Dick-Peddie (1993) recognizes only P. fremontii in New Mexico and identified four series: 1) a Montane Riparian Broadleaf Cottonwood Series; 2) a Montane Riparian Broadleaf Cottonwood-Mixed Deciduous Series; 3) a Floodplains-Plains Riparian Cottonwood Series; and 4) a Floodplains-Plains Riparian Cottonwood-Willow Series.
Only the latter two series contain references to community types that are similar to those found in our Plains Cottonwood Alliance (the other two series are best represented by our Fremont Cottonwood Alliance). Hildebrant
and Ohmart (1982) and Hink and Ohmart (1984) define several cottonwood community types (explicitly specified as P. deltoides var. wislizeni) for the Pecos and Rio Grande, respectively. These are based on structural and compositional characteristics of the canopy for the mapping analysis of bird habitat. In New Mexico 20 community types for this widespread and variable alliance have been identified.

Disturbance Description

Fire regime group III or IV, infrequent mixed to replacement severity. The mean fire interval is about 45 years with high variation due to complex influences of adjacent fire regime, drought, herbivory, and native anthropogenic ignitions. Local fire history show fire return intervals as low as 15 years in stands with salt cedar inclusion Fire years are typically correlated with drought. Grazing of the understory green shrubs, grasses, and forbs during the hot season can open the understory and increase or decrease chance of surface fire depending on amount of residual grassy understory fuels. Fires are typically in patches, small fires usually less than 500 acres, creating a mosaic across the class.

Flood- 5 year minor, 10 year moderate, 50 year severe, disturbance regime is modified today from dams, jetty jacks and riprap.

Native grazing inclusive of Buffalo, deer, elk

Beaver modeled as Optional2.

Adjacency or Identification Concerns

Large interagency effort in place to treat the fuel bed through the removal of exotics.

This type cross-walks to the following Ecological Systems: CES306.821 Rocky Mountain Lower Montane Riparian Woodland and Shrubland; CES302.753 North American Warm Desert Riparian Woodland and Shrubland.

Today southern stands tend to have higher inclusions of salt cedar giving way to Russian olive moving north. Stands with heavy encroachment of oneseed juniper in the understory are also found. Structure type V when occupied by salt cedar can have a fire return interval as low as 15 years and is primarily stand replacement.

Scale Description

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

Linear

Issues/Problems

Current conditions incorporate widespread invasion of exotic species.

Early seral state (A) may include grassland, mixed forbs, or if salt cedar was present in system prior to disturbance, prolific resprouting may result in an monotypic stand of salt cedar.

Fire return interval is dependant upon understory component, inclusions with salt cedar escalates the FRI.

Insect and disease not well documented in literature, some evidence of increasing influence, may want to incorporate into model as information expands.

Cottonwoods typically do not reach a climax stage. Mature cottonwood occurrences do not often regenerate in place, but regenerate by movement up or down a river reach.

Model Evolution and Comments

One reviewer suggested dropping this type entirely and felt that overall fire frequency in riparian woodlands would never have been more frequent than 200 years. The other reviewer agreed with model parameters. The model was unchanged.

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 PostRep

Description

Las Vegas or grassland dominated by species by region and soil moisture, may be alkali sacaton, salt grass etc. Early seral dominated by forbs also common with representation by Yerba manza (Anca), Horehound (MAVU), sunflowers (Hesp.), mustard (BRsp.) etc..

Indicator Species* and Canopy Position

DIST3
SPAI
SAGO
SAEX

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	1 %	80 %
Height	no data	no data
Tree Size Class	no data	

☐ 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.

Class B 15 %

Mid1 Closed

Description

Pole sized cottonwood or may be a dense shrub (ca. 15'). Develops under moist conditions (post flood) with prolific seeding.

In moist soil profiles a willow (salix sp.) understory may develop.

Indicator Species* and Canopy Position

PODEW
SAEX
FOPU2
AMFR

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	100 %
Height	no data	no data
Tree Size Class	no data	

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

Class C 40 %

Mid1 Open

Description

Resprouted cottonwood, or in moist soil conditions reseeded cottonwood scattered, often interspersed with New Mexico olive.
Drier sites tend to stay more open often with Apache plume (FAPA), rabbitbrush (CHsp.) and other shrubs widely scattered.

The Plains cottonwood/coyote willow CT described in Muldavin et. Al, 2000 is a representative.

Indicator Species* and Canopy Position

BASA
PODEW
SPAI
MUAS

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	40 %
Height	no data	no data
Tree Size Class	no data	

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

Class D 20 %

Late1 Open

Description

Scattered cottonwood, understory may be represented by grassland, mixed forb, shrub, or leaf-litter. The Plains cottonwood/Alkali sacaton CT described in Muldavin et al. 2000 is a good example.

Indicator Species* and Canopy Position

PODEW
MUAS
SPCR
BAEM

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	40 %
Height	no data	no data
Tree Size Class	no data	

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

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Class E **5 %**

Late1 Closed

Description

Bosque, closed canopy Cottonwood gallery. Structure type I - Tall trees (ca. 60') with dense understory of saplings and shrubs. Structure type II - Tall trees with little or no sapling or shrub understory.
Structure type V- Dense shrubs to 15'

Indicator Species* and Canopy Position

PODEW
FOPU2
RHTR
SAGO

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	100 %
Height	no data	no data
Tree Size Class	no data	

☐ 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:
- ☑ Other: Beaver

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.

Sources of Fire Regime Data

- ☐ Literature
- ☑ Local Data
- ☐ Expert Estimate

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	110	15	200	0.00909	50
Mixed	275			0.00364	20
Surface	180			0.00556	30
All Fires	55			0.01828	

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