

11552

North American Warm Desert Riparian Systems -- Stringers

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
Louis Provencher	lprovencher@tnc.org	None	None
None	None	None	None
None	None	None	None

Vegetation Type

Woody Wetland

Map Zones

13, 14, 15

Model Splits or Lumps

This biophysical setting (BpS) is split into multiple models. BpS 1311550 was split between 1311551, which is dominated by mid to large perennial rivers where Native American use was possible, and 1311552, which represents smaller riparian stringers with either intermittent water or subsurface groundwater flow (washes, canyon corridors, small streams) **imbedded in the creosote and blackbrush matrix vegetation.**

Geographic Range

Found in the warm deserts of the southwestern United States. Intermittent to dry warm desert (Mojave and Sonoran deserts) drainages with mostly subsurface flow in southern California, Nevada, Arizona, and southwest Utah.

Biophysical Site Description

Narrow riparian systems occur primarily along low-elevation shrublands (creosote, blackbrush, and paloverde matrix vegetation) and in canyons or washes, or as spring brooks. Elevation is typically <4,000ft. Examples of intermittent streams can be found in the Amargosa Gorge, Whitewater River, Andreas Canyon, Paiute Creek, and Palm Canyon. Oasis woodlands occur in isolated stands such as the Palm Canyon, Thousand Palms, and Twentynine Palms oases.

Vegetation Description

The vegetation is a mix of riparian shrublands dotted with tree species *Salix gooddingii*, *Populus fremontii*, and *Fraxinus velutina* where water surfaces. Patches of grassland and forbs (*Distichlis spicata*, *Sporobolus airoides*, *Carex* spp., and *Pluchea sericea*) are present but not extensive. Dominant shrubs include *Acacia* spp., *Salix exigua*, *Prosopis* spp., and *Washingtonia filifera* (in oases primarily). Mesquite occurs as dispersed shrubs, not bosque. Halophytic shrub-dominated patches occur on drier sediment deposits or saltier surfaces. Vegetation is dependent upon periodic flash flooding. Native Americans had a minor effect on these riparian systems compared to larger floodplains.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ACACI	<i>Acacia</i>	Acacia
SAEX	<i>Salix exigua</i>	Narrowleaf willow

PROSO	<i>Prosopis</i>	Mesquite
PLSE	<i>Pluchea sericea</i>	Arrowweed
DISP	<i>Distichlis spicata</i>	Inland saltgrass
SPAI	<i>Sporobolus airoides</i>	Alkali sacaton
POFR2	<i>Populus fremontii</i>	Fremont cottonwood
FRVE2	<i>Fraxinus velutina</i>	Velvet ash

Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

This BpS is a flash flood-dependent ecosystem. The entire range of flood magnitude contributes to ecological processes such as nutrient cycling, recruitment, and species composition. Two- to 10-yr events primarily impact herbaceous vegetation, 7-50yr events result in patchy removal of shrubs and saplings, 50-yr+ events remove stands of larger trees. Cottonwood, if present, return to pole size within 10yrs of disturbance. Cottonwood is considered mature around 60yrs.

In general, fuel is typically continuous and fuel loads are high, but fuel moisture content is also often high. Wildfires may not carry except under extreme fire-weather conditions. The average fire return interval (FRI) for replacement fire is 500-1,000yrs. Native American burning of desert washes was assumed to be rare. Willow and mesquite resprout after fire.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	733	100	500	1000
Moderate (Mixed)				
Low (Surface)				
All Fires	733	100		

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. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

These systems exist as small, linear features <60m wide in the landscape. Flash flooding disturbs miles of riparian vegetation, whereas fires may burn <100ac in long, linear patches.

Adjacency or Identification Concerns

Creosote (BpS 131087) and blackbrush (BpS 131082) are immediately adjacent to BpS 1311552, and the transition is sharp to riparian vegetation.

Water diversion and groundwater pumping have greatly modified hydrologic regimes and water levels, perhaps permanently.

Livestock grazing can be a major influence in the alteration of structure, composition, and function of the community.

Exotic trees of *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands.

In some riparian woodlands, the invasives saltcedar (*Tamarix* spp.) and, less frequently, giant reed (*Arundo donax*) can create ladder fuel that allows fire to spread from the surface fuel of willow (*Salix* spp.), saltbush (*Atriplex* spp.), sedge (*Carex* spp.), reed (*Juncus* spp.) and

arrowweed (*Pluchea sericea*) into the crowns of overstory Fremont cottonwood trees, top-killing them. After an initial fire, these invasives recover quickly and surpass their pre-fire dominance, promoting increasingly more frequent and intense fires that can eventually displace most native plants.

In palm oases, Washington fan palms depend on surface fire to clear understory species and facilitate recruitment. However, these sites can be pre-empted by saltcedar because it recovers rapidly after fire. The ladder fuel saltcedar creates can also carry fire into the crown of Washington fan palms, increasing the incidence of crown fires lethal to other species.

Issues or Problems

Native Uncharacteristic Conditions

Canopy cover can reach 100% in classes B and C.

Comments

During LANDFIRE National, BpS 1311552 was split from 1311550 by Louis Provencher (lprovencher@tnc.org) at the request of the Missoula Fire Lab. This version of the model is restricted to stringers; therefore, the Native American influence on fire regimes, farming, and wood collection was removed. A longer FRI of 500-1,000yrs was retained. The system is nearly entirely dependent on flash flooding.

BpS 1311550, now 1311551, was originally created by Matt Brooks (matt_brooks@usgs.gov) and Louis Provencher (lprovencher@tnc.org), and was revised substantially with the input of several reviewers: Kay Fowler (csfowler@scs.unr.edu), Amadeo M. Rea (San Diego SU), Janet Grove (jgrove@fs.fed.us), Holly Richter (hrichter@tnc.org), Jony Cockman (jcockman@blm.gov), Julie Stromberg (jstrom@asu.edu), and Brooke Gebow (bgebow@tnc.org). All reviewers, except Kay Fowler, Amadeo Rea, and Julie Stromberg, participated in modeling at TNC's Ramsey Canyon Preserve, Arizona, on 18 September 2005.

Following further discussions with Jeri Kruger (jkruger@fws.edu) and Julie Stromberg, and literature reviews, Louis Provencher (lprovencher@tnc.org) modified the model by adding a fifth class resulting from stand-replacement fire that does not cause cottonwood and willow germination because this case is not associated with flooding. Many changes were done to the original model by M. Brooks. Floods causing stand-replacing events were more frequent (5-50yrs and 50yrs+ for, respectively, Mid- and Late-Development classes). Classes C and D in 131155a were merged into new Class D (mature cottonwood and willow; still accounting for Native American influences). Class E was added for mesquite bosque, which is the last successional phase in the floodplain, with 500-yr flood events and replacement fire every 250yrs on average; and, although Native American influences were maintained, the importance of mixed-severity fire was reduced implicitly by removing time-since-disturbance from the original BpS. In the original model, and its revision from 18 September 2005, replacement fire was assumed to cause a return to Class A, which is impossible. Class A is only the result of stand-replacing flood events when only cottonwood and willow germination is possible. Replacement fire does not change the elevation of a terrace or create a seedbed for willow and cottonwood, but allows resprouting and seed establishment by mesquite and other shrubs (e.g., *Salix gooddingii*). Therefore, Class C is the recipient of all replacement fire and eventually succeeds to mesquite

bosque unless a 50-yr flood event scours the more fragile soils of Class C. To accommodate the LANDFIRE limit for one early S-class, Class C starts at age one and is considered Mid-Development. In reality, Class C behaves as an alternative Early-Development class.

One LANDFIRE National reviewer suggested several changes to clarify the geographic location of the BpS, its elevation, and species/patch composition. The reviewer indicated that pre-settlement warm desert riparian systems were very patchy (Jeri Krueger from Fish and Wildlife Service in Nevada forwarded accounts from early explorers of the Virgin River that support the patchy nature of the vegetation and importance of mesquite) and probably contained more grasslands and shrub patches than we find today, and, therefore, may have supported a greater amount of fine fuel and fire. These issues were addressed, although the fire frequency was not changed because it is frequent enough in the current version. The reviewer also recommended adding references on southwestern riparian systems by Busch, Ellis, and Davis, which was done.

Native American burning was introduced as a very plausible disturbance. However, no data or expertise were available at the creation of the original model. Reviews by ethnobiologists Kay Fowler and Amadeo Rea resulted in important modifications to the original model and description (Fowler 2003; Rea 1983). The Native American influence was greater than initially thought with farming of mud flats (not in late-development stands as initially modeled), irrigation, massive fuel wood collection, and extensive small-scale burning for willow control, basketry, general access, and hunting. Therefore, very frequent mixed-severity fire was added by Louis Provencher to all Mid-Development and Late-Development classes (except mesquite bosque, Class E), and farming and fuel collection were added, respectively, as model parameters in Early- and Late-Development Open classes. Amadeo Rea explained that warm desert rivers of map zone (MZ) 14 and MZ15 were more heavily farmed by the Pima Indian than those of MZ13 (Mohave and Shoshone Indians) (also suggested by Dr. Fowler). In all cases, he agreed that native people probably modified the vegetation structure and composition of warm desert river floodplains far more than currently understood. Dr. Rea also explained that Native American burning was used to flush rodents, even more than jackrabbits, and that fire was avoided in mesquite bosque, in cultivated fields, and near fences. Burning was especially intense in riparian grasslands dominated by *Sporobolus* spp., marshes, and shrubby areas.

Succession Classes

Mapping Rules

[illegible]

Tree	5-10	C	C	C	C	C	C	C	C	C	C
Tree	10-25	C	C	C	C	C	C	C	C	C	C
Tree	25-50	C	C	C	C	C	C	C	C	C	C
Tree	>50	C	C	C	C	C	C	C	C	C	C

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 18 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SAGO	<i>Salix gooddingii</i>	Goodding's willow	Upper
PROSO	<i>Prosopis</i>	Mesquite	Upper
DISP	<i>Distichlis spicata</i>	Inland saltgrass	Lower
SPAI	<i>Sporobolus airoides</i>	Alkali sacaton	Lower

Description

Immediate post-disturbance responses are dependent on pre-disturbance vegetation composition. *Salix gooddingii* and *Populus fremontii* favored by flooding, whereas *Salix*, mesquite, and graminoids are favored by fire. This class is typically shrub/seedling dominated, but graminoids may co-dominate.

Maximum Tree Size Class

None

Class B 28 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
SAGO	<i>Salix gooddingii</i>	Goodding's willow	Upper
POFR2	<i>Populus fremontii</i>	Fremont cottonwood	Upper
PROSO	<i>Prosopis</i>	Mesquite	Lower
FRVE2	<i>Fraxinus velutina</i>	Velvet ash	Upper

Description

Highly dependent on the hydrologic regime. Vegetation composition includes tall shrubs and small trees (willow, maybe cottonwood if surface water is present) with patches of graminoids and halophytic shrubs.

Maximum Tree Size Class

Pole 5-9" DBH

Class C 54 Late Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PROSO	Prosopis	Mesquite	Middle
SAGO	Salix gooddingii	Goodding's willow	Upper
ACACI	Acacia	Acacia	Middle
FRVE2	Fraxinus velutina	Velvet ash	Upper

Description

This class represents mature cottonwood (if surface water is present), acacia, mesquite, and willow riparian woodlands with patches of graminoids in saturated soils, and halophytic shrubs on drier sediment deposits or saltier surfaces.

Maximum Tree Size Class

Medium 9-21" DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	4
Mid1:CLS	5	Late1:CLS	19
Late1:CLS	20	Late1:CLS	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.18	6	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.001	1000	Yes	0
Wind or Weather or Stress	Mid1:CLS	Early1:ALL	0.05	20	Yes	0
Wind or Weather or Stress	Mid1:CLS	Mid1:CLS	0.13	8	No	0
Replacement Fire	Late1:CLS	Early1:ALL	0.002	500	Yes	0
Wind or Weather or Stress	Late1:CLS	Early1:ALL	0.02	50	Yes	0

Wind or Weather or Stress	Late1:CLS	Late1:CLS	0.05	20	No	0
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