11590

Rocky Mountain Montane Riparian Systems

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| John Simons | john\_simons@blm.gov | Chris Baker | clbaker@fs.fed.us |
| anonymous | None | Jim Ozenberger | jozenberger@fs.fed.us |
| None | None | Andy Norman | anorman@fs.fed.us |

Vegetation Type

Woody Wetland

Map Zone

21

Geographic Range

This system is found throughout the Rocky Mountains and Colorado Plateau regions. In map zone (MZ) 21, it occurs throughout and is more common than biophysical setting (BpS) 1154 (black cottonwood) on rivers.

Biophysical Site Description

This system occurs within a broad elevation range, from approximately 900m-2,800m (3,000ft-9,200ft), within the flood zone of rivers, on islands, and on sand or cobble bars and streambanks. Typically, this system exists in large, wide occurrences on mid-channel islands in larger rivers or narrow, linear bands on small, rocky canyon tributaries and well drained-benches and hillslopes below seeps/springs. May also include overflow channels, backwater sloughs, floodplain swales, and irrigation ditches. Surface water is generally high for variable periods. Soils are typically alluvial deposits of sand, clay, silt, and cobble that are highly stratified with depth due to flood scour and deposition.

Vegetation Description

This ecological system occurs as a mosaic of multiple communities that are tree dominated with a diverse shrub component. Deciduous woody trees dominate, including *Populus angustifolia*, *P. balsamifera*, and *P. tremuloides*. Dominant shrubs include *Acer glabrum*, *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Prunus virginiana*, and numerous tall willow species: *Salix lutea*, *S. geyeriana*, *S. boothii*, *S. drummondiana*, *S. lasiandra*, *S. bebbiana*, *S. wolfii*, and *S. exigua*. Generally, the adjacent upland vegetation surrounding this riparian system includes grasslands to forests.

Forbs and graminoids include *Carex* spp., especially *Carex utriculata* and *Carex aaquatilis*, which occur in nearly pure stands, and *Geum macrophyllum*, *Mertensia ciliatus*, and *Equisetum arvense*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| POPUL | *Populus* | Cottonwood |
| SALIX | *Salix* | Willow |
| COSE16 | *Cornus sericea* | Redosier dogwood |
| CAREX | *Carex* | Sedge |
| CRRI | *Crataegus rivularis* | River hawthorn |
| BEOC2 | *Betula occidentalis* | Water birch |
| EQAR | *Equisetum arvense* | Field horsetail |

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

Disturbance Description

This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Flood events of increasing magnitude cause maintenance to stand-replacing disturbances. Beaver (*Castor canadensis*) crop younger cottonwoods (*Populus* spp.) and willows (*Salix* spp.), and frequently influence the hydrologic regime through construction of dams. Beaver show considerable movement along rivers as available trees are felled. Fire occurs mostly as a result of spread from surrounding uplands.

Fire disturbances, flooding events, and beaver herbivory are modeled at much longer intervals in MZ21 than in MZs 10 and 19. The fire return intervals (FRIs) in MZ21 for this BpS are approximately the same as those for 211154.

Outside reviewer commented, after models already delivered, that FRIs for this system should be mixed-severity fire at approximately 75yrs.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 182 | 100 | 75 | 275 |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 182 | 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 can exist as small to large linear features in the landscape. In larger, low-elevation riverine systems, this system may exist as mid-large patches, as a function of valley bottom width and gradient.

Adjacency or Identification Concerns

This BpS encompasses the mid- and lower elevation riparian systems in the northern Rocky Mountains. Higher elevation riparian systems are covered in BpS 1160.

The absence of fire as a structuring agent, coupled with shade-tolerant conifer establishment can lead to loss of shade-intolerant deciduous woody species. In addition, grazing and trampling by domestic and wild ungulates can shift the composition toward weedy and/or non-riparian species. Associated bank damage, which results in head cutting and incision, can result when bank-stabilizing vegetation is removed and/or damaged by ungulate activity. In addition, loss of beaver can, coupled with heavy ungulate use, shift dominance in these systems to herbaceous species.

Exotic trees of *Elaeagnus angustifolia* are common in some stands. Herbaceous noxious weeds, including leafy spurge, tansy, and spotted knapweed, invade readily and persist in these systems today.

In MZ21, FRIs should be about the same as in 211154 (black cottonwood).

Issues or Problems

Tamarisk not a concern currently, but potential exists. Grazing disturbance could be a disturbance, as well, in certain locales. Trapping of beaver affects beaver presence, thus disturbance. Perennial pepperweed may be an issue as well.

Native Uncharacteristic Conditions

Comments

Wind/weather/stress is used to represent flooding in this model.

This model for MZ21 is based on the LANDFIRE model for the same BpS 1159 for MZ10 created by Don Major (dmajor@tnc.org) and Mary Manning (mmanning@fs.fed.us), and reviewed by Carly Gibson (cgibson@fs.fed.us), Cathy Stewart (cstewart@fs.fed.us), and John DiBari (jndibari@yahoo.com). Many quantitative changes were made to the model for MZ21 so that fire and other disturbance intervals match those in 211154 (black cottonwood). The disturbance model should be identical to that in 1154 (black cottonwood). Additional reviewers for MZ21 were Sarah Canham (scanham@fs.fed.us) and Brenda Fiddick (bfiddick@fs.fed.us). Although this MZ21 model varied from other MZ models in terms of FRI, LANDFIRE leadership guidance (to modify intervals based on majority literature) and expert opinion were not applied here because no experts raised issue with this model or FRI. Also, riparian system modeling has varied between MZs.

Succession Classes

**Mapping Rules**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Upper Layer Lifeform** | **Height (m)** | **Canopy Cover (%)** | | | | | | | | | |
| **0-10** | **11-20** | **21-30** | **31-40** | **41 - 50** | **51-60** | **61-70** | **71-80** | **81-90** | **91-100** |
| Herb | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Herb | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Herb | >1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0-0.5 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 0.5-1.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | 1.0-3.0 | A | A | A | A | A | A | A | A | A | A |
| Shrub | >3.0 | B | B | B | B | B | B | B | B | B | B |
| Tree | 0-5 | C | C | C | C | C | C | C | C | C | C |
| 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 5 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POPUL | Populus | Cottonwood | Upper |
| SALIX | Salix | Willow | Upper |
| ALNUS | Alnus | Alder | Upper |
| CAREX | Carex | Sedge | Lower |

Description

Immediate post-disturbance responses are dependent on pre-burn vegetation composition. This class is dominated by sprouting shrubs that respond favorably to fire. Species composition is highly variable. Silt, gravel, cobble, and woody debris may be common.

Generally, this class is expected to occur post-disturbance. Replacement fire, mixed-severity fire, beaver, and flooding maintain this class.

*Maximum Tree Size Class*  
None

Class B 27 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POPUL | Populus | Cottonwood | Upper |
| SALIX | Salix | Willow | Mid-Upper |

Description

Highly dependent on the hydrologic regime. Vegetation composition includes tall shrubs and small trees (cottonwood, aspen, and conifer).

*Maximum Tree Size Class*  
Sapling >4.5ft; <5" DBH

Class C 68 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POPUL | Populus | Cottonwood | Upper |
| PINUS | Pinus | Pine | Upper |
| SALIX | Salix | Willow | Mid-Upper |

Description

This class represents mature, large cottonwood, conifer, etc., woodlands. Ice scour occurs often but rarely kills large patches of trees. Replacement fire is caused by importation from surrounding systems. Beaver activity is very infrequent and causes a thinning disturbance.

*Maximum Tree Size Class*  
Large 21-33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:OPN | 4 |
| Mid1:OPN | 5 | Late1:CLS | 24 |
| Late1:CLS | 25 | 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 | 0.005 | 200 | Yes | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Mid1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Optional 1 | Mid1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.0058 | 172 | Yes | 0 |
| Optional 1 | Mid1:OPN | Mid1:OPN | 0.025 | 40 | No | 0 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:OPN | 0.2 | 5 | No | 0 |
| Optional 1 | Late1:CLS | Mid1:OPN | 0.001 | 1000 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Mid1:OPN | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.0058 | 172 | Yes | 0 |
| Optional 2 | Late1:CLS | Late1:CLS | 0.13 | 8 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:CLS | 0.2 | 5 | No | 0 |

Optional Disturbances

Optional 1: Beaver

Optional 2: Ice Scour

References

Baker, W.L. 1988. Size-class structure of contiguous riparian woodlands along a Rocky Mountain river. Physical Geography 9(1): 1-14.

Baker, W.L. 1989. Classification of the riparian vegetation of the montane and subalpine zones in western Colorado. Great Basin Naturalist 49(2): 214-228.

Baker, W.L. 1990. Climatic and hydrologic effects on the regeneration of Populus angustifolia James along the Animas River, Colorado. Journal of Biogeography 17: 59-73.

Dwire, K.A., S.E. Ryan, L.J. Shirley, D. Lytjen and N. Otting. 2004. Recovery of riparian shrubs following wildfire: Influence of herbivory. In Riparian Ecoystems and Buffers: Multi-scale structure, function, and management. AWRA Summer Specialty Conference, Olympic Valley, California. 28-30 June 2004.

Kittel, G., E. Van Wie, M. Damm, R. Rondeau, S. Kettler, A. McMullen and J. Sanderson. 1999b. A classification of riparian and wetland plant associations of Colorado: A user's guide to the classification project. Colorado Natural Heritage Program, Colorado State University, Fort Collins CO. 70 pp. plus appendices.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Neely, B., P. Comer, C. Moritz, M. Lammerts, R. Rondeau, C. Prague, G. Bell, H. Copeland, J. Jumke, S. Spakeman, T. Schulz, D. Theobald and L. Valutis. 2001. Southern Rocky Mountains: An ecoregional assessment and conservation blueprint. Prepared by The Nature Conservancy with support form the USDA Forest Service, Rocky Mountain Region, Colorado Division of Wildlife, and Bureau of Land Management.

Padgett, W.G., A.P. Youngblood and A.H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. USDA Forest Service, Intermountain Region. Report R4-ECOL-89-01. Ogden, UT. 191 pp.

Tuhy, J., P. Comer, D. Dorfman, M. Lammert, B. Neely, L. Whitham, S. Silbert, G. Bell, J. Humke, B. Baker and B. Cholvin. 2002. An ecoregional assessment of the Colorado Plateau. The Nature Conservancy, Moab Project Office. 112 pp. plus maps and appendices.

Walford, G.M. 1996. Statewide classification of riparian and wetland dominance types and plant communities - Bighorn Basin segment. Report submitted to the Wyoming Department of Environmental Quality, Land Quality Division by the Wyoming Natural Diversity Database. 185 pp.

Walford, G., G. Jones, W. Fertig, S. Mellman-Brown and K. Houston. 2001. Riparian and wetland plant community types of the Shoshone National Forest. General Technical Report RMRS-GTR-85. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 122 pp.

Walford, G., G. Jones, W. Fertig and K. Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Unpublished report. Wyoming Natural Diversity Database for The Nature Conservancy, and the USDA Forest Service. Wyoming Natural Diversity Database, Laramie. 227 pp.