11590

Rocky Mountain Montane Riparian Systems

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
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Vegetation Type

Woody Wetland

Map Zone

20

Geographic Range

This system is found throughout the Rocky Mountains and Colorado Plateau regions. In map zone (MZ) 21, it occurs throughout the zone and is more common than Biophysical Setting (BpS) 1154 (black cottonwood) on rivers. It is associated with the isolated mountain ranges in MZ20.

Biophysical Site Description

This system occurs within a broad elevation range from ~900m (3,000ft) to 2,800m (9,200ft) within the flood zone of rivers, on islands, sand or cobble bars, and streambanks. The upper limit for MZ20 is probably ~2,050m (6,725ft). 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, cut-off meanders, floodplain swales, and irrigation ditches. Surface water is generally high for variable periods. Soils are typically alluvial deposits of sand, clays, silts, and cobbles 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 understory. Deciduous woody trees dominate, including *Populus angustifolia* (east of the Continental Divide) and the tree willow *Salix amyglioides*.

Dominant shrubs include *Acer negundo*, *Alnus incana*, *Cornus sericea*, *Crataegus rivularis*, *Prunus virginiana*, *Sheperdia argentea*, and numerous tall willow species: *Salix lutea*, *S. geyeriana*, *S. boothii*, *S. drummondiana*, *S. lasiandra*, *S. bebbiana*, and *S. exigua*. *Acer glabrum* exists in MZ20, but it isn't a dominant shrub -- *Acer negundo* is more common. *Alnus incana* and *Betula occidentalis* are minor components of MZ20.

Generally the adjacent upland vegetation surrounding this riparian system includes shrublands, grasslands, and forests.

Forbs and graminoids include *Carex* spp., especially *Carex utriculata* and *Carex aaquatilis*, which occur in nearly homogeneous stands, and numerous mesic forbs (e.g., *Geum macrophyllum*, *Mertensia ciliatus*, *Equisetum arvense*, and *Senecio hydrophilus*).

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 |
| 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 will 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 (ponding water and slow release). Beavers show considerable movement along rivers as available trees are felled.

Fire is mostly occurring as a result of spread from surrounding uplands. Many of these species, especially shrubs, respond favorably to fire. They are vigorous sprouters and are also shade-intolerant; the absence of fire and shading by conifers will cause a decrease in these communities. Most fires would ignite and move through upland fuel until they reached a riparian zone, then go out because of high fuel moisture, continue spreading into dry riparian fuel, or leap across damp streams and continue up the hill on the other side. Streams could be a barrier to low-/moderate-intensity fires but would hardly slow down a high-intensity crown fire (Michael Harrington, personal communication, observations on the Bitterroot 2000). It is thought that the lower-elevation forests (ponderosa-pine-dominated) were capable of burning during a large portion of the summer and fall because of the rapid drying of the types of fine fuel that are present, whereas intersecting riparian area fuel had a longer seasonal exposure to soil moisture and high humidity. So this indicates a period, especially in early summer, where it seems uplands were burnable and riparian zones were less so. These two zones generally become more similar as summer deepens (Harrington, personal communication).

Olson (2000) found that riparian Weibull median probability fire return intervals (FRIs) for riparian forests (in Oregon, however) ranged from 10-40yrs. Forest type and slope aspect played a larger role than proximity to a stream when it came to differentiating fire regimes in the study area. Stream channels also did not act as fire barriers during the more extensive fire years (Olson 2000).

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 101 | 53 | 75 | 275 |
| Moderate (Mixed) | 115 | 47 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 54 | 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 within the northern Rocky Mountains. Higher elevation riparian systems are covered in BpS 1160.

Absence of recurrent floods and 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 nonriparian species. Associated bank damage, which results in headcutting and incision, can result when bank-stabilizing vegetation is removed and/or damaged by ungulate activity. In addition, loss of beavers can, coupled with heavy ungulate use, shift dominance in these systems to herbaceous species.

Exotic trees of Russian olive (*Elaeagnus angustifolia*), especially in lower-elevation, wide-valley-bottom systems, are common in some stands. Herbaceous noxious weeds, including leafy spurge, tansy, and spotted knapweed, readily invade and persist in these systems today.

Grazing disturbance could be a disturbance in certain locales. Tamarisk is becoming a concern. Trapping of beaver affects beaver presence and thus the storage of ground water and recharge of the local aquifer. Perennial pepperweed may be an issue as well.

The best guide for mappers to distinguish between floodplain systems versus riparian systems is the geographic range/ecoregions. The Great Plains Floodplain systems are in the Northwestern Glaciated Plains and the Northern Great Plains; the Rocky Mountain Montane Riparian systems are in the lower elevations (i.e., not alpine) of the Northern and Middle Rockies, some of which occur as isolated mountain ranges in the Great Plains. Broadly generalized, the Great Plains Floodplain systems typically have broader floodplains and more terrace development. Also montane riparian systems of central Montana and probably the Black Hills too will have steeper gradients, narrower floodplains and be dominated by *Populus angustifolia* or *P. alsamifera* as opposed to *P. deltoides* for Great Plains floodplains. Rivers like the Powder, Tongue, and probably Little Missouri start as montane rivers and become Great Plains rivers.

Issues or Problems

Native Uncharacteristic Conditions

Comments

For LANDFIRE National, this model for MZ20 was adapted from the same BpS in MZ21, created by John Simons (john\_simons@blm.gov) and Bill Baker (bakerwl@uwyo.edu) and reviewed by Chris Baker (clbaker@fs.fed.us), Jim Ozenberger (Jozenberger@fs.fed.us), Andy Norman (anorman@fs.fed.us), Sarah Canham (scanham@fs.fed.us), and Brenda Fiddick (bfiddick@fs.fed.us). Quantitative and descriptive changes were made, and the model's FRI for MZ20 more closely resembles that for MZs 10 and 19.

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 12 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POPUL | Populus | Cottonwood | Upper |
| SALIX | Salix | Willow | Upper |
| COSE16 | Cornus sericea | Redosier dogwood | Middle |
| 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.

*Maximum Tree Size Class*  
None

Class B 44 Mid Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POPUL | Populus | Cottonwood | Upper |
| SALIX | Salix | Willow | Mid-Upper |
| COSE16 | Cornus sericea | Redosier dogwood | Middle |

Description

Highly dependent on the hydrologic regime. Vegetation composition includes tall shrubs and small trees (cottonwood, aspen, and conifers). This class persists for ~20-25yrs.

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

Class C 44 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 |
| JUSC2 | Juniperus scopulorum | Rocky mountain juniper | Mid-Upper |

Description

This class represents the mature, large cottonwood, conifer, etc., woodlands. In Montana, these closed late systems can also be dominated by Rocky Mountain juniper or spruce at higher elevations and green ash at lower elevations. Ponderosa pine is only one possible dominant. Red osier dogwood is an indicator in all of these, with a range of 10-60% cover depending on overstory species. Other dominant and indicator species are interior Douglas-fir in the upland areas, PICEA, FRAPEN, and COSE16.

Replacement fire is caused by importation from surrounding systems. Ice scour occurs often but rarely kills large patches of trees.

*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 | 29 |
| Late1:CLS | 30 | 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** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.05 | 20 | No | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.05 | 20 | Yes | 0 |
| Mixed Fire | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Wind or Weather or Stress | Mid1:OPN | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Optional 1 | Mid1:OPN | Mid1:OPN | 0.025 | 40 | No | 0 |
| Optional 1 | Mid1:OPN | Early1:ALL | 0.025 | 40 | Yes | 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 |
| Mixed Fire | Late1:CLS | Late1:CLS | 0.01 | 100 | No | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Optional 2 | Late1:CLS | Late1:CLS | 0.1 | 10 | No | 0 |
| Optional 1 | Late1:CLS | Late1:CLS | 0.1 | 10 | 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.

Hansen, P.L., R.D. Pfister, K. Boggs, B.J. Cook, J. Joy and D.K. Hinckley. 1996. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station. Missoula, Montana. Miscellaneous publication no. 54. 485 pp. plus appendices.

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.

Lesica, P. and S. Miles. 1999. Russian olive invasion into cottonwood forests along a regulated river in north-central Montana. Can. J. Bot. 77: 1077-1083.

Lesica, P. and S. Miles. 2004. Beavers indirectly enhance the growth of Russian olive and tamarisk along eastern Montana rivers. Western North American Naturalist 64(1): 93-100.

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.

Olson, D.L. 2000. Fire in riparian zones: a comparison of historical fire occurrence in riparian and upslope forests in the Blue Mountains and southern Cascades of Oregon. Seattle: university of Washington, M.S. Thesis. 274 pp.

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.