11600

Rocky Mountain Subalpine/Upper Montane Riparian Systems

BpS Model/Description Version: Aug. 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Tim Klukas | tim\_klukas@nps.gov | Jim Ozenberger | jozenberger@fs.fed.us |
| John Simons | john\_simons@blm.gov | Andy Norman | anorman@fs.fed.us |
| anonymous | None | Sarah Canham | scanham@fs.fed.us |

Vegetation Type

Woody Wetland

Map Zone

21

Geographic Range

Higher elevations in the zone down to valley river bottoms.

Biophysical Site Description

This ecological system represents the combination of numerous riparian types occurring in the upper montane/subalpine zones. Found at 900-3,000m (3,000-10,000ft). This ecological system typically exists as relatively small linear stringers but can occupy relatively wide and flat valleys. This is a widely dispersed type in map zone (MZ) 21 generally adjacent to live water.

Although reviewers recommended that the descriptions be made less broad so as to adhere more to high elevation, it was decided that this type included both montane to subalpine and alpine elevations, and therefore descriptions were kept broad.

Although reviewers recommended a minimum altitude of 8,000ft, it was decided that the minimum of 3,000ft would be kept in order to adhere to the original ecological system description and to encompass a broader range of elevational types, not only subalpine.

These wetlands typically are in small upper-elevation watersheds that periodically experience high rainfall in short periods from convective thunderstorms.

Vegetation Description

This ecological system encompasses a broad array of riparian species. These systems are highly variable and generally consist of willows and other shrubs, sedges and other herbaceous vegetation, or conifers (primarily spruce and subalpine fir). Shrubs include bog birch, bog blueberry, and willows (e.g., *Salix planifolia*, *S. wolfii*, *S. boothii*, *S. drummondii*, *S. geyeriana*, and *S. bebbiana*), among others. Graminoids include tufted hairgrass, bluejoint reedgrass, beaked sedge, and water sedge, among others.

Other species for MZ21 include *Salix eastwoodiae*, *S. glauca*, *S. tweedyi*, *Carex brunnscens*, *C. canescens*, *C. aurea*, *C. hoodii*, *C. illota*, *C. luzulina*, *C. nigricans*, *C. norvegica*, *C. podocarpa*, *C. praticola*, *C. scopulorum*, *Mertensia ciliata*, and *Saxifraga odontoloma*.

Unlike the lower elevation riparian types (1159, Rocky Mountain Subalpine Lower Montane Riparian Systems), this type does not typically include cottonwood species but may include paper birch and aspen. (On the Bridger-Teton NF, there is no paper birch.)

In MZ21, high-elevation meadows in the Greater Yellowstone Ecosystem also have the spruce-fir component interspersed in the wetlands along with the addition of lodgepole pine. This is primarily in low-gradient, alluvial settings. In the case of Yellowstone National Park, the setting occurs in the Bechler Meadows, Gibbon Meadows, Pelican Valley, Indian Creek, and Thorofare. Habitat in the Bridger Teton is also part of the system.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| SALIX | *Salix* | Willow |
| CAREX | *Carex* | Sedge |

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

Disturbance Description

Flooding events and availability of water during drier periods are the major influences to this system, as a function of slope. Frequent flood events maintain vegetation but do not scour it, whereas larger, infrequent flood events scour and reset succession to early development, depending on vegetation.

Reviewers felt that this Biophysical Setting (BpS) 1160 is more consistently wet with deep root systems, deep bogs, springs, and small streams so that flooding events wouldn't be the major influence. Short growing season, temperature, radiation, avalanches, snow events, ice and scouring, herbivory, and possibly long-interval fire regimes are major disturbances, but more data are still needed (Ozenberger personal communication).

These wetlands typically are in small upper-elevation watersheds that periodically experience high rainfall in short periods from convective thunderstorms, leading to rapid runoff and mobilization of the fine alluvium in willow-dominated areas and even some of the rocks in conifer-dominated riparian on steeper gradients. Floods in willow-dominated alluvium may not show up as rushing streams scouring banks but more as a rising bathtub type of flood. Alluvium does get moved and willows get topkilled by inundation or by deposition or removal of alluvium (anonymous contributor, personal correspondence).

Sites are probably fairly lush, so fires may skip over them. This would be a patchy replacement fire, topkilling all the vegetation.

Fire intervals for MZ21 are modeled at 3x longer than those in MZ10 and MZ19.

Outside reviewer for MZ21 commented that the fire return intervals (FRIs) are modeled at too-long intervals.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 335 | 89 | 100 | 500 |
| Moderate (Mixed) | 2765 | 11 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 299 | 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 are small linear or relatively wide features in the landscape.

Per NatureServe, these are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels.

Adjacency or Identification Concerns

This BpS includes narrow to moderately wide meadows, shrublands, and woodlands of conifers and aspen.

Over-grazing and irrigation use have had major impacts on some of these systems. Exotics in this setting are primarily Kentucky bluegrass, timothy, orchardgrass, and dandelion.

Reviewers for MZ21 felt that the above information did not apply significantly to this MZ21. However, the statements were not removed in order to retain consistency between models.

Issues or Problems

There is a paucity of fire information on this system, and the very heterogeneous nature of the systems is challenging for model-building. However, most of the shrubs and graminoids respond favorably to fire by resprouting from the root crown.

Reviewers state that sites are probably fairly lush, so fires may skip over them. Domestic sheep may be an issue in the Wyoming and Wind River ranges. Global warming and acid rain may affect vegetation.

Native Uncharacteristic Conditions

Comments

This model for MZ21 was adapted from the LANDFIRE models for the same BpS 1160 from MZ10, MZ19, MZ12, MZ17, and MZ16; models for MZ10 and MZ19 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), John DiBari (jndibari@yahoo.com), and Steve Barrett (sbarrett@mtdig.net). For MZ21, descriptions were modified and fire intervals were changed/increased (less fire). Additional reviewer for MZ21 was Brenda Fiddick (bfiddick@fs.fed.us). Even though this MZ21 model varied from other MZ models in FRI, LANDFIRE leadership guidance to modify intervals based on majority literature and expert opinion was not applied here, as 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 | B | B | B | B | B | B |
| Shrub | 0.5-1.0 | A | A | A | A | B | B | B | B | B | B |
| Shrub | 1.0-3.0 | A | A | A | A | B | B | B | B | B | B |
| Shrub | >3.0 | A | A | A | A | B | B | B | B | B | B |
| Tree | 0-5 | B | B | B | B | B | B | B | B | B | B |
| Tree | 5-10 | B | B | B | B | B | B | B | B | B | B |
| Tree | 10-25 | B | B | B | B | B | B | B | B | B | B |
| Tree | 25-50 | B | B | B | B | B | B | B | B | B | B |
| Tree | >50 | B | B | B | B | B | B | B | B | B | B |

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** |
| SALIX | Salix | Willow | Upper |
| CAREX | Carex | Sedge | Upper |

Description

Immediate post-fire responses in this ecological system are dependent on pre-burn vegetation form. Post-burn condition sensitive to scouring and blowout from floods. This class is shrub- or grass-dominated. Composition varies both within/among reaches.

Flooding disturbances (modeled as weather-related stress) include events that do not scour frequently and events that reset the vegetation to age 0 infrequently (Option 2).

Beaver (Option 1) reset succession by moving along the river with tree depletion. Replacement fire was typically rare, and mixed fire occurs more frequently.

Native grazing occurs very infrequently.

*Maximum Tree Size Class*  
None

Class B 95 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| SALIX | Salix | Willow | Upper |
| CAREX | Carex | Sedge | Upper |

Description

Highly dependent on the hydrologic regime. For example, could include any combination of the five vegetation forms described above. Composition of adjacent uplands is the determining factor for future fire events.

Replacement fire occurs rarely. Major flood events reset vegetation to early class. Beavers and non-scouring flooding occur but have no effect on succession classes.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:CLS | 3 |
| Mid1:CLS | 4 | Mid1: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** |
| Native Grazing | Early1:ALL | Early1:ALL | 0.001 | 1000 | No | 0 |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.0075 | 133 | No | 0 |
| Optional 2 | Early1:ALL | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.1 | 10 | Yes | 0 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.5 | 2 | No | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.003 | 333 | Yes | 0 |
| Optional 2 | Mid1:CLS | Early1:ALL | 0.01 | 100 | Yes | 0 |
| Optional 1 | Mid1:CLS | Mid1:CLS | 0.03 | 33 | No | 0 |
| Wind or Weather or Stress | Mid1:CLS | Mid1:CLS | 0.1 | 10 | No | 0 |

Optional Disturbances

Optional 1: Beaver

Optional 2: 100yr flood events

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.M. 1994. Montane vegetation in relation to elevation and geomorphology along the Cache la Poudre River, Colorado. Unpublished thesis, University of Wyoming, Laramie.

Kittel, G., R. Rondeau and A. McMullen. 1996. A classification of the riparian vegetation of the Lower South Platte and parts of the Upper Arkansas River basins, Colorado. Submitted to Colorado Department of Natural Resources and the Environmental Protection Agency, Region VIII. Prepared by Colorado Natural Heritage Program, Fort Collins. 243 pp.

Kittel, G., E. Van Wie, M. Damm, R. Rondeau, S. Kettler and J. Sanderson. 1999a. A classification of the riparian plant associations of the Rio Grande and Closed Basin watersheds, Colorado. Unpublished report prepared by the Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

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.

Nachlinger, J., K. Sochi, P. Comer, G. Kittel and D. Dorfman. 2001. Great Basin: An ecoregion-based conservation blueprint. The Nature Conservancy, Reno, NV. 160 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. 1988a. Riparian community type classification of Utah and southeastern Idaho. Research Paper R4-ECOL-89-0. USDA Forest Service, Intermountain Region, Ogden, UT.

Padgett, W.G., A.P. Youngblood and A.H. Winward. 1988b. Riparian community type classification of Utah. USDA Forest Service, Intermountain Region Publication R4-ECOL-88-01. Ogden, UT.

Rondeau, R. 2001. Ecological system viability specifications for Southern Rocky Mountain ecoregion. First Edition. Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO. 181 pp.

Szaro, R.C. 1989. Riparian forest and scrubland community types of Arizona and New Mexico. Desert Plants Special Issue 9(3-4): 70-139.

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.