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# Fire Regime Condition Class (FRCC) Interagency Guidebook Reference Conditions

**Author/Modeler(s):** Karen A. Murphy and Evie Witten
**Lead Author Phone:** (907) 786-3501 **E-mail:** karen_a_murphy@fws.gov
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**Potential Natural Vegetation (PNV) Name:** Riparian Spruce Hardwood

**Fire regime group:** III
**Geographic Area:** Interior and western Alaska; Susitna & Matanuska Valleys, Copper River Basin in Southcentral Alaska

**Physical Stetting Description:**
Riparian Spruce Hardwood PNV sites are widespread and common on young alluvial deposits and terraces adjacent to major rivers in interior, western and southcentral Alaska. Frequent river channel migration and associated flooding and fluvial processes constitute the major disturbance in this PNV type (Viereck et al 1986, Walker et al 1986). The type is characterized by young successional stages dominated by willow and alder and extensive stands of balsam poplar and/or white spruce. This band may be several km wide along larger rivers and 100 m or less along small streams and at higher elevations (Viereck et al 1986). Soils are alluvial, well drained, and poorly developed. Permafrost is usually absent.

**Biophysical Classification:**
The Riparian Spruce Hardwood PNV type occurs in the following ecoregions described by Nowacki et al (2001):
- Intermontane Boreal
- Alaska Range Transition
- Bering Taiga

The following forested community types described by Viereck et al (1992) are included in the various successional stages of the Riparian Spruce Hardwood PNV:

IA1j – Closed White Spruce Forest
IA2e – Open White Spruce Forest
IB1b – Closed Black Cottonwood Forest (SC, SW and Interior AK)
IB1c – Closed Balsam Poplar Forest (floodplain)
IB1g – Closed Quaking Aspen-Balsam Poplar Forest
IB2c – Open Balsam Poplar (Black cottonwood) Forest (floodplain sites)
IB3b – Balsam Poplar woodland (floodplain sites)
IC1a – Closed Spruce-Paper Birch Forest (white spruce sites)
IC1b – Closed White Spruce-Paper Birch-Balsam Poplar (Black cottonwood)
IC1e – Closed Balsam Poplar-White Spruce Forest
IC2c – Open Paper Birch – Balsam Poplar-Spruce Forest

**Identification of Key Characteristics of the PNV and Confuser PNVs:**
Site indicator species include white spruce (*Picea glauca*) or Lutz spruce (*P. glauca lutzii*) (on the Kenai Peninsula), balsam poplar (*Populus balsamifera*), willow (*Salix spp*.), and Alder (*Alnus spp*.) (Dyrness et al 1983, Van Cleve and Viereck 1981). Meadow horsetail *(Equisetum pratense)*

is commonly present in early successional stages and in the understory in older seres (Van Cleve et al 1980). Prickly rose *(Rosa acicularis)*, highbush cranberry *(Viburnum edule)*, and mountain cranberry *(Vaccinium vitis-idaea)* characterize the understory of older seres (Van Cleve and Viereck 1981).

This PNV is similar to the Upland White Spruce Interior and Upland Spruce Hardwood Southcentral PNVs, which occur on uplands in interior and southcentral Alaska, respectively. On older river terraces this PNV may be confused with the Black Spruce Interior and Black Spruce Southcentral PNVs because black and white spruce often mix, especially on sites with transitional moisture and thermal conditions.

**Natural Fire Regime Description:**
Estimates of mean fire return intervals include:
- 200+ years (200-300 year range) (Viereck 1973, Barney 1971)
- 300 years (Rowe et al 1974) (for alluvial white spruce MacKenzie River Valley)
- 300 years (Heinselman 1981)
- 300 years (Duchesne and Hawkes 2000)
- 300 years (personal communication experts' workshop March 2004)

Small, relatively infrequent, mixed severity fires characterize this PNV due to the sites' proximity to rivers, which act as fire breaks (Viereck 1973, Barney 1971, Foote 1983). High moisture content of the vegetation, high percentage of deciduous species, and high relative humidity also contribute to making fires less frequent in the Riparian Spruce Hardwood PNV than in typically adjacent PNVs. In interior Alaska the oldest white spruce stands (350+ yrs) are commonly found on islands of floodplains where they are protected from fire (Viereck 1973).

**Other Natural Disturbance Description:**
Stochastic flood events are the primary disturbance in the Riparian Spruce Hardwood PNV group. Floods are most frequent close to active river channels, and annual flooding associated with spring ice break-up, midsummer glacial melt and severe storms can maintain young vegetation communities perpetually along river margins. The channels of Alaska's large rivers move across the broad floodplains over the course of multiple decades to centuries. Relative to flooding, fire plays a minor role in driving succession and ecosystem processes in this PNV.

**Natural Landscape Vegetation-Fuel Class Composition:**
The natural vegetation structure is a mosaic of the seral stages described in the table below. White or Lutz spruce is the climax indicator species (Viereck et al 1986). These sites may transition to black spruce PNV sites if the river channel migrates away over time, allowing a moss layer to build up, permafrost to develop, and the soil to become relatively colder (Viereck 1975, Foote 1983, Viereck et al 1986, Walker et al 1986).

**Natural Scale of Landscape Vegetation-Fuel Class Composition and Fire Regime:**
The distribution of this PNV on the landscape is typically linear, flanking rivers and cutting through a mosaic of relatively colder and wetter black spruce sites on older river terraces. Swaths of the Riparian Spruce Hardwood PNV may be several km wide along larger rivers and 100 m or less along small streams and at higher elevations (Viereck et al 1986).

**Uncharacteristic Vegetation-Fuel Classes and Disturbance:**
Uncharacteristic vegetation-fuel classes and disturbances result in different percentages of seral classes than those listed below for the Riparian Spruce Hardwood model.

**PNV Model Classes and Descriptions:**

| **Class** | **Modeled Percent of Landscape** | **Description**<br>(After: Viereck et al 1986, Walker et al 1986, Van Cleve & Viereck 1981, Van Cleve et al 1980, Viereck 1975, Viereck 1970) |
|---|---|---|
| A:<br>0 -5 years<br>Post disturbance regeneration: herbs, shrub regeneration, seedlings | 5% | Silt is deposited on the inside of river meanders following flood events. Flooding deposits seeds which germinate and take root. *Equisetum spp.* and *Salix spp.* colonize in the first year. Within 5 years *Salix spp* and balsam poplar seedlings are abundant. Plant cover is 1-2% first year. Shrub cover increases up to 40% by the fifth year, with a diverse herbaceous layer underneath. Occasionally white (or Lutz) spruce will germinate in large numbers on mineral soil after flooding, resulting in a dense, even-aged stand (succession is to Class E, otherwise to Class B). |
| B:<br>5-30 years<br>Mid-development: closed shrub-sapling | 20% | Tall shrubs (*Salix spp.*, *Alnus spp.*) and saplings with a closed canopy (>60%). Saplings may consist of balsam poplar with white (or lutz) spruce in the understory (succession to Class C), or saplings may consist of pure, even-aged spruce (succession to Class E).<br><br>Saplings overtop shrubs at 20-40 years, when shade-intolerant pioneer shrub species decline and shade-tolerant shrubs (*Rosa acicularis(prickly rose), Viburnum edule (high bush cranberry)*) become more common and have a canopy cover of 10%. |
| C:<br>30 –150 years<br>Mid-development closed balsam poplar | 40% | Balsam poplar is the dominant overstory species. White spruce is commonly in the understory. Shade-tolerant shrub species persist in the understory. If spruce is present, at approximately 100-150 years the transition from balsam poplar to white spruce dominance begins (succession to Class D). If white spruce is not present poplar persists, the stand ages and individual trees are lost to wind, disease or rot. Shrub cover commonly increases as the overstory canopy declines. |
| D:<br>125-400 years<br>Late-development open white spruce | 25% | Spruce gains dominance over poplar and a mixed age, open stand develops. If enough young spruce establishes as poplar declines, the canopy closes again (succession to Class E). Alternatively, the stand may remain open with shrubs in the understory. |
| E: 30-400 years<br>Mid -late-development, open or closed white or Lutz spruce | 10% | This class contains closed stands of white (or lutz) spruce. These stands may be even-aged (resulting from spruce establishment on mineral soil after a flood event (succession from Class A) or mixed age (succession from Class D). If succession is from Class D, occasional |

| | | |
|---|---|---|
| | | mature balsam poplar may persist in the overstory. As the spruce canopy closes feathermoss becomes dominant on the forest floor, reaching 80% cover. *Rosa acicularis, Viburnum edule*, and *Alnus spp*. may be scattered in the stand. A low shrub and herb layer may also occupy the forest floor. |
| Total: | 100% | |

**Modeled Fire Frequency and Severity:**

| | Mean Probability | Mean Fire Frequency (years) (inverse of probability) | Description |
|---|---|---|---|
| Replacement fire | .0002 | 5,000 | Based on literature and expert input |
| Mosaic fire | .0032 | 310 | Based on literature and expert input |
| All Fire | .0034 | 300 | Based on literature and expert input |
| Flood events | .0136 | 75 | |

**Modeled Fire Severity Composition:**

| | Percent All Fires | Description |
|---|---|---|
| Replacement fire | 10% | Based on literature and expert input |
| Non-replacement fire | 90% | Based on literature and expert input |
| All Fire | 100% | |

**Further Analysis:**

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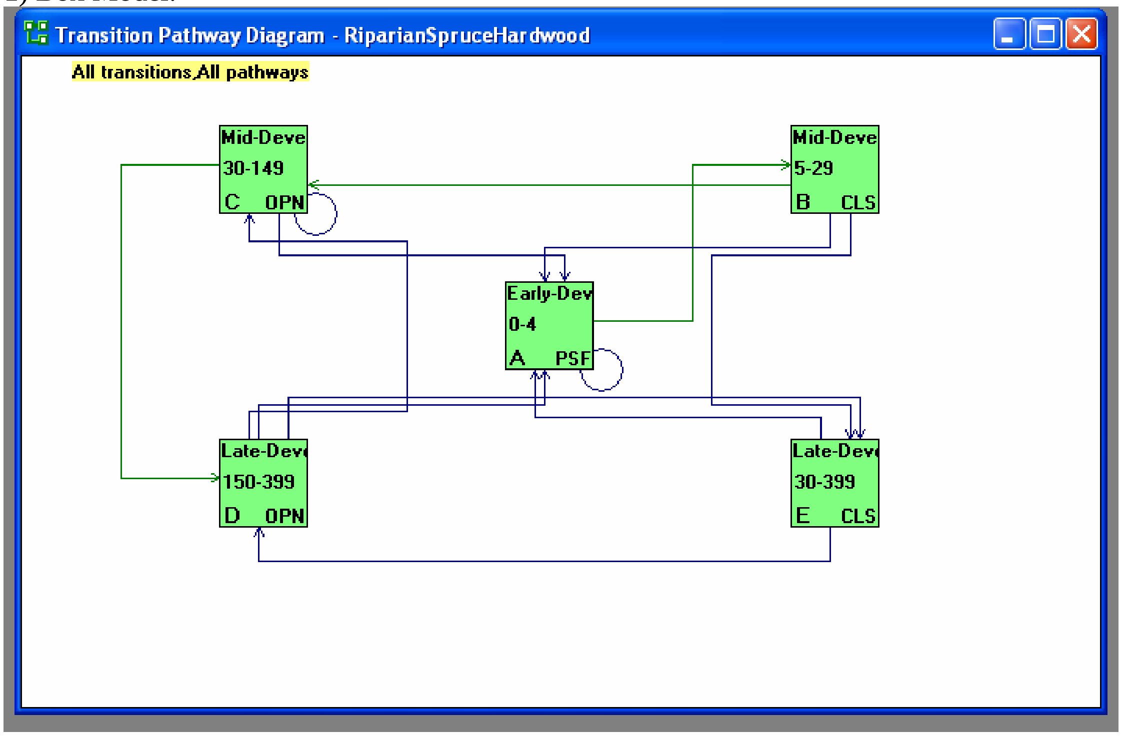
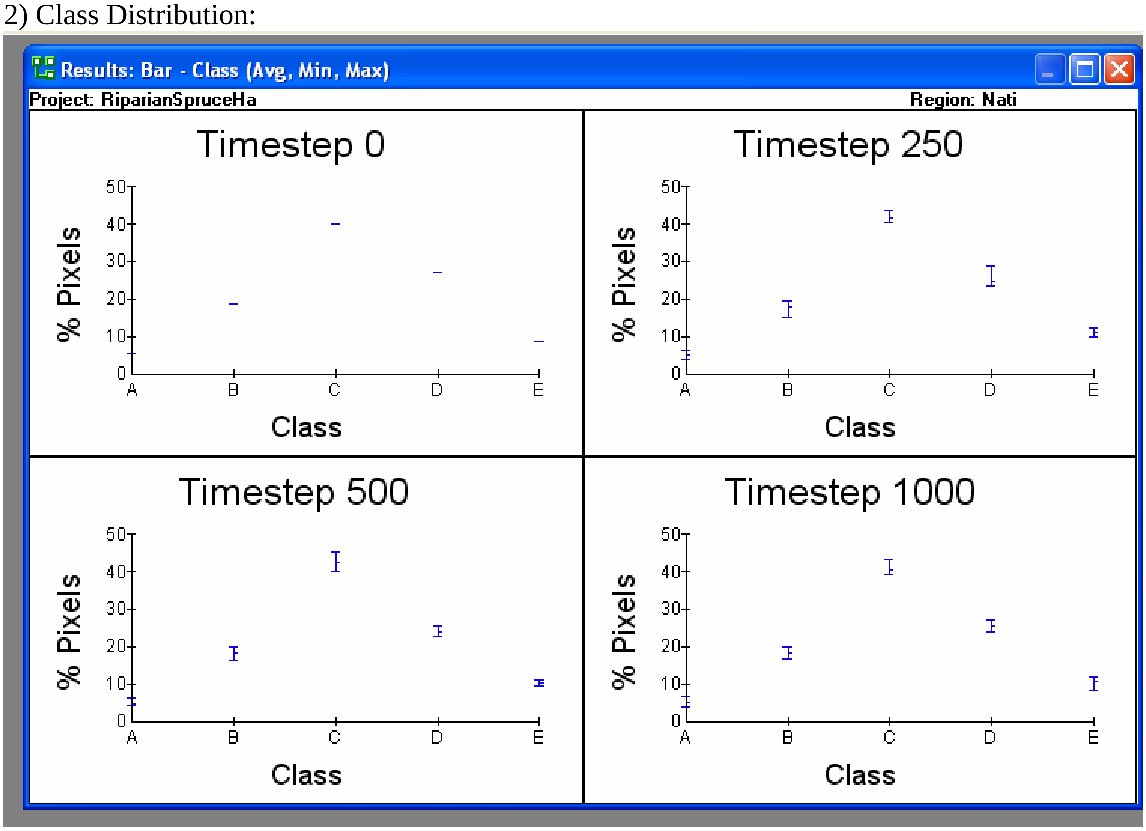
**VDDT Model Diagrams:**

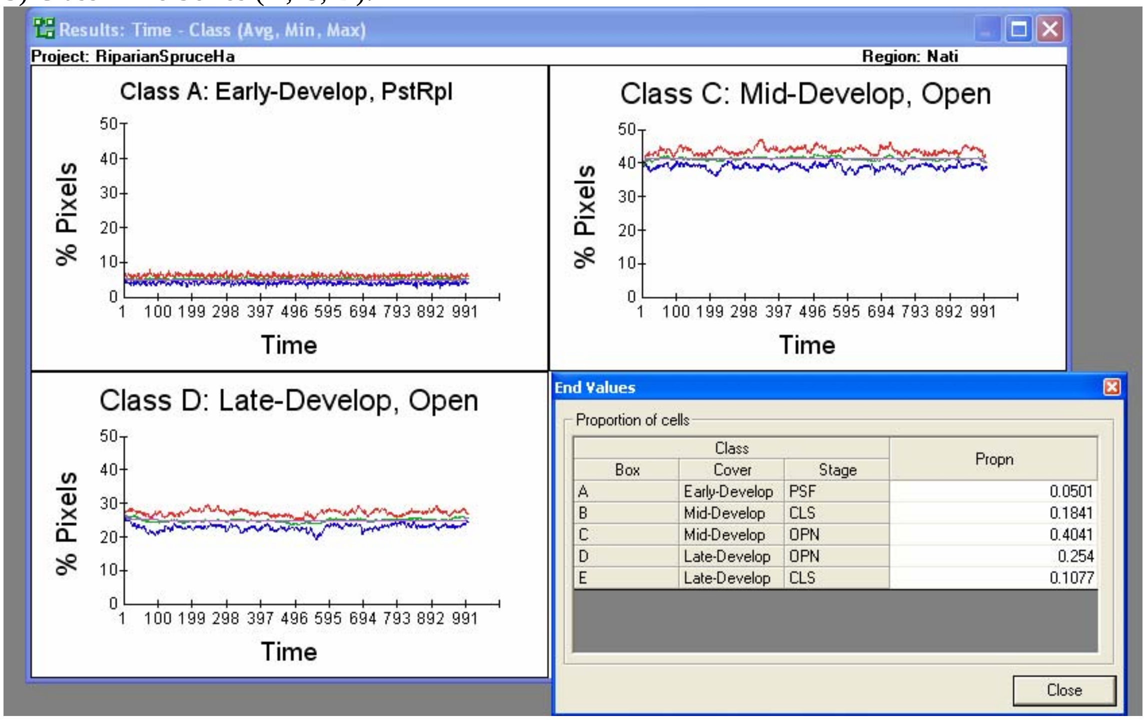
1) Box Model:



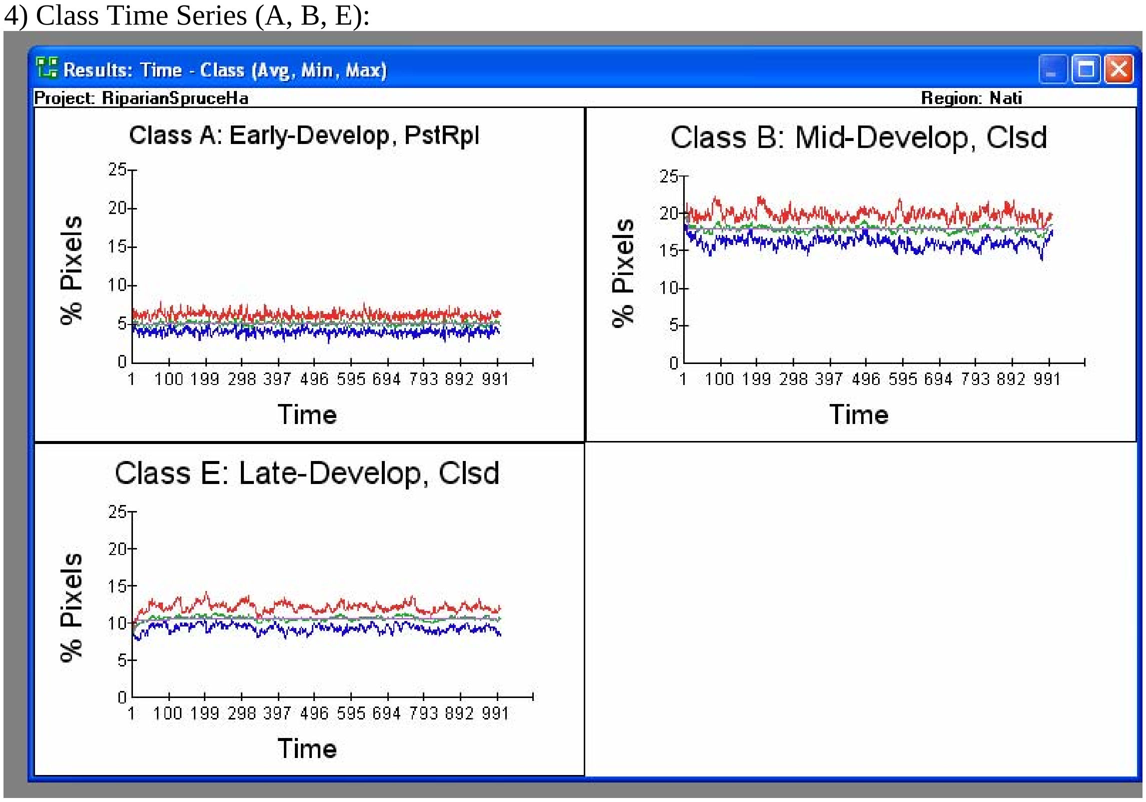

2) Class Distribution:



3) Class Time Series (A, C, D):




4) Class Time Series (A, B, E):



5) Fire Disturbance Time Series (Note – Optional 1 = Flood Disturbance)