

DRAFT

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
First Draft Date: March 3, 2004 **Most Recent Edit:** December 14, 2006
Status: In development **PNV Code:** RISHK

Potential Natural Vegetation (PNV) Name: Riparian Spruce Hardwood - Kenai

Fire regime group: III

Geographic Area: Kenai Peninsula in southcentral Alaska

Physical Stetting Description:

Riparian Spruce Hardwood Kenai PNV sites are widespread and common on young alluvial deposits and terraces adjacent to major rivers in 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 Kenai PNV type occurs in the following ecoregions described by Nowacki et al (2001):

- Alaska Range Transition

The following forested community types described by Viereck et al (1992) are included in the various successional stages of the Riparian Spruce Hardwood Kenai 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*), 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 Riparian Spruce Hardwood PNV that occurs in interior Alaska and in the Matanuska and Susitna Valleys and in the Copper River Basin. The principal difference between Alaska's two riparian PNVs is the mean fire return interval (MFI), which, due to climate, is estimated to be longer on the Kenai Peninsula than elsewhere in southcentral and interior Alaska. This PNV is also similar to the Coastal Boreal Transition PNV that occurs on uplands in the Kenai Peninsula. On older river terraces this PNV may be confused with the Black Spruce Southcentral PNV because black and white spruces often mix, especially on sites with transitional moisture and thermal conditions.

Natural Fire Regime Description:

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 Kenai PNV than in typically adjacent PNVs.

Estimates of mean fire return interval (MFI) in riparian spruce hardwood communities in interior Alaska 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)

Estimates of MFI for other PNVs on the Kenai Peninsula include:

- ❑ Coastal Boreal Transition PNV: 625 years
- ❑ Coastal Forests PNV: 910 years
- ❑ Kenai Mountains Hemlock PNV: 910 years
- ❑ Black Spruce Southcentral PNV: 165 years

Due to the climate on the Kenai Peninsula, the MFI for the Riparian Spruce Hardwood Kenai PNV is estimated at 650 years.

Other Natural Disturbance Description:

Stochastic flood events are the primary disturbance in the Riparian Spruce Hardwood Kenai 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 Kenai PNV may be several km wide along larger rivers and 100 m or less along small streams and at higher elevations (Vioreck 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 (After: Vioreck et al 1986, Walker et al 1986, Van Cleve & Vioreck 1981, Van Cleve et al 1980, Vioreck 1975, Vioreck 1970)
A: 0 -5 years 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. <i>Equisetum spp.</i> and <i>Salix spp.</i> colonize in the first year. Within 5 years <i>Salix spp</i> 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: 5-30 years Mid-development: closed shrub-sapling	15%	Tall shrubs (<i>Salix spp.</i> , <i>Alnus spp.</i>) 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). Saplings overtop shrubs at 20-40 years, when shade-intolerant pioneer shrub species decline and shade-tolerant shrubs (<i>Rosa acicularis(prickly rose)</i> , <i>Viburnum edule (high bush cranberry)</i>) become more common and have a canopy cover of 10%.
C: 300 –150 years Mid-development closed balsam poplar	30%	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: 125-400 years Late-development open white spruce	35%	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		This class contains closed stands of white (or Lutz) spruce.

Mid -late-development, open or closed white or Lutz spruce	15%	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. <i>Rosa acicularis</i> , <i>Viburnum edule</i> , and <i>Alnus spp.</i> 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	0.0002	5,000	Based on literature and expert input
Mosaic fire	0.0013	770	Based on literature and expert input
All Fire	0.0015	665	Based on literature and expert input
Flood events	0.0148	70	

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:

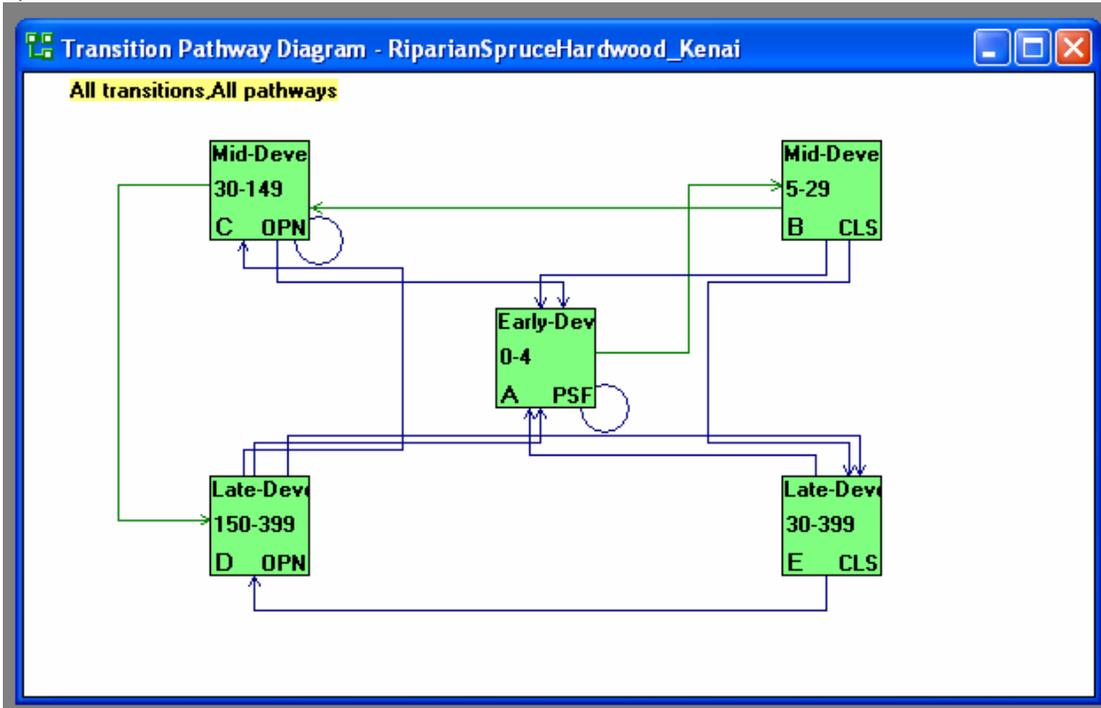
References

- Barney, R.J. 1971. Wildfires in Alaska – some historical and projected effects and aspects. In: Fire in the Northern Environment – a symposium [Fairbanks, Alaska]. P. 51-59.
- Duchesne L.C. and B.C.Hawkes. 2000. Fire in northern ecosystems. In: Brown, J.K. and J.K Smith (eds.) Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol 2. Ogdon, UT: USDA Forest Service, Rocky Mountain Research Station. 257 p.
- Dyrness, C.T., K. Van Cleve, and M.J Foote. 1983. Vegetation, soils, and forest productivity in selected forest types in interior Alaska. Can J For Res. Vol 13: 703-720.
- Foote, J.M.. 1983. Classification, description, and dynamics of plant communities after fire in the tundra of interior Alaska. Res. Pap. PNW-307. Portland, OR. U.S. Department of Agriculture, Forest Service. Pacific Northwest Research Station. 108 p.
- Heinselman, M.L. 1981. Fire and succession in the conifer forests of northern North America. In:

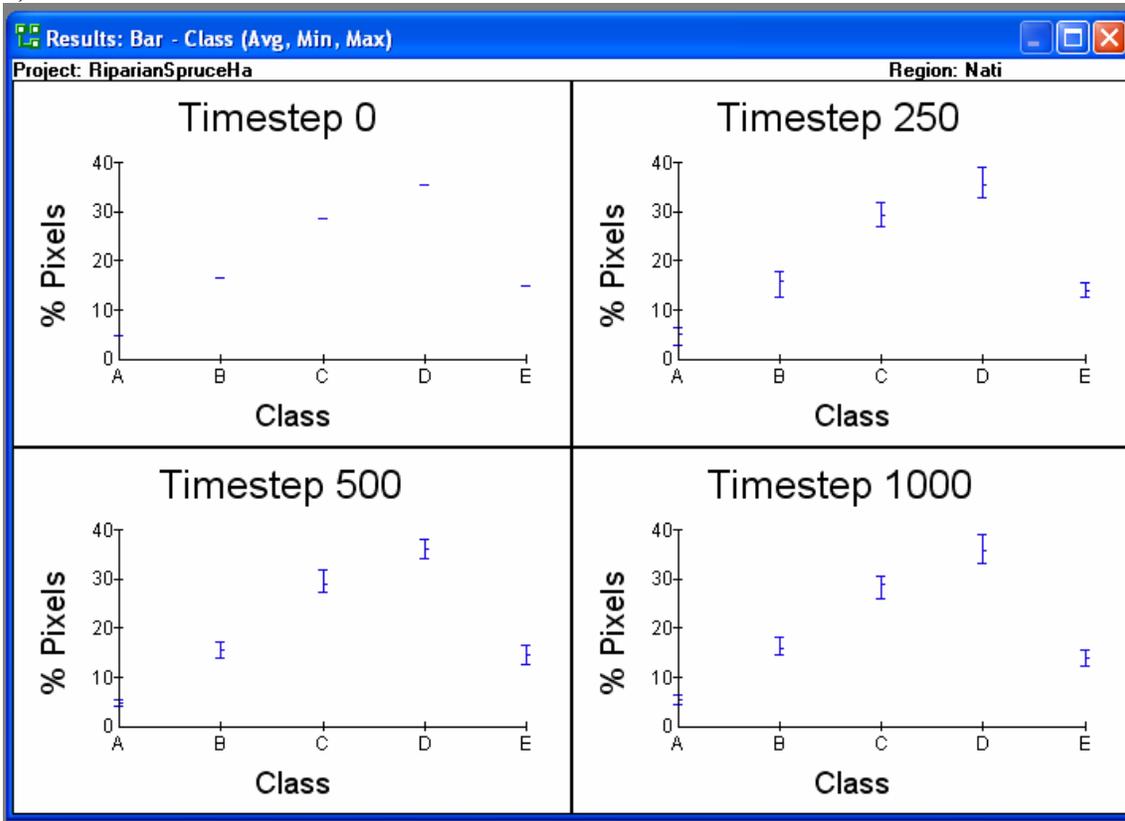
- West, D.C., H.H. Shugart, and D.B. Botkin. Forest succession: concepts and application. Springer-Verlag, New York. Chapter 23.
- Nowacki, G., Spencer, P., Brock, T., Fleming, M., and Jorgenson, R. 2001. Narrative Descriptions for the Ecoregions of Alaska and Neighboring Territories. National Park Service. Anchorage, AK. 17 p.
- Personal communication experts' workshop, March 2-4 2004. Fire Regime Condition Class (FRCC) interagency experts' workshop to develop and review Potential Natural Vegetation (PNV) groups for Alaska. Anchorage, AK.
- Rowe, J.S., Bergsteinsson, J. L. , Padbury, G. A., and R. Hermesh. 1974. Fire studies in the Mackenzie Valley. ALUR Report 73-74-61. Arctic Land Use Research Program, Department of Indian Affairs and Human Development, Ottawa, Canada. 123 p.
- Van Cleve, K. and L.A Viereck. 1981. Forest succession in relation to nutrient cycling in Boreal Forest of Alaska. In: D.C. West, H.H. Shugart and D.B. Botkin eds. Forest succession: concepts and application. Springer-Verlag. New York.
- Van Cleve, K, T. Dyrness, and L.A. Viereck. 1980. Nutrient cycling in interior Alaska floodplains and its relationship to regeneration and subsequent forest development. Pp 11-18. In M. Murray; R.M VanVedhuizen, M. Robert, (eds.), Forest regeneration at high latitudes: Proceedings of an international workshop; 1979; Fairbanks, AK. Gen. Tech. Rep. PNW-107. Portland, OR: USDA Forest Service, Pacific Northwest Experiment Station. 11-18 p.
- Viereck, L.A., Dyrness, C.T., Batten, A.R., and K. J. Wenzlick,. 1992. The Alaska Vegetation Classification. Gen. Tech. Rep. PNW-GTR-286. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 278 p.
- Viereck L.A., K. Van Cleve, and C.T. Dyrness.1986. Forest ecosystem distribution in the taiga environment. In: Van Cleve, K.; Chapin, F.S., III; Flanagan, P.W. [and others], eds. Forest ecosystems in the Alaska taiga: a synthesis of structure and function. New York: Springer Verlag: 22-43. Chapter 3.
- Viereck, L.A. 1975. Forest ecology of the Alaska t?aiga. In: Proceedings of the circumpolar conference on northern ecology; 1975 September; Ottawa, ON. National Research Council of Canada: I-1 to I-22.
- Viereck, L. A. 1973. Ecological effects of river flooding and forest fires on permafrost in the taiga of Alaska. In: Permafrost - - The North American Contribution to the Second International Conference. National Academy of Sciences, Washington, DC. 60-67 p.
- Viereck, L.A. 1970. Forest succession and soil development adjacent to the Chena River in interior Alaska. Arctic and Alpine Research 2: 1-26.
- Walker L.R, J.C. Zasada and F.S. Chapin III. 1986. The role of life history processes in primary succession on an Alaskan floodplain. Ecology: 67(5) 1243-1253.

VDDT Model Diagrams:

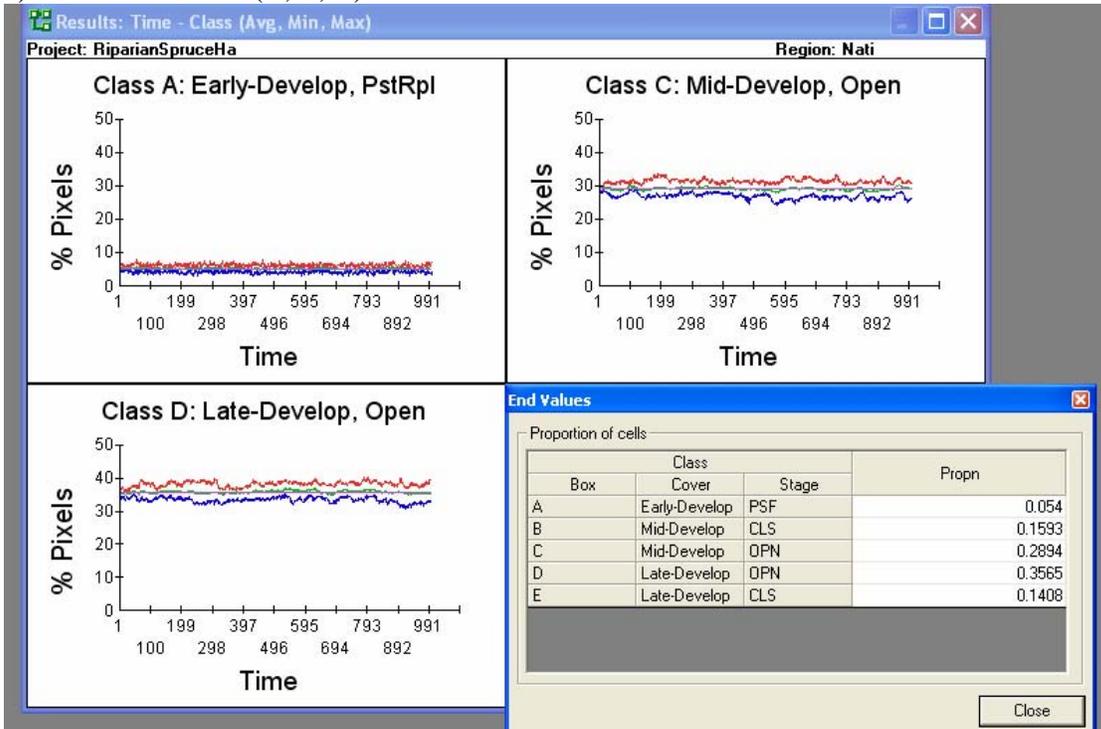
1) Box Model:



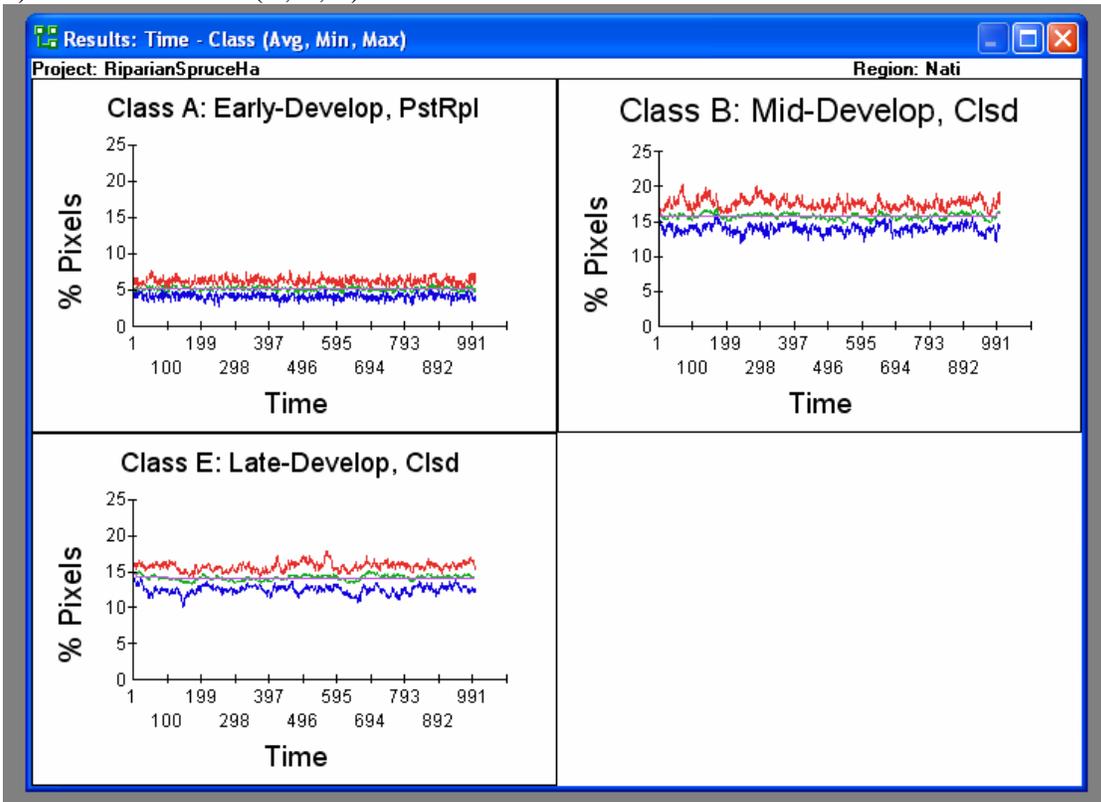
2) Class Distribution:



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



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



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

