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Fire Regime Condition Class (FRCC) Interagency Guidebook Reference Conditions

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Potential Natural Vegetation (PNV) Name: Kenai Mountain Hemlock

Fire regime group: V: Infrequent, stand-replacement regime
Geographic Area: Kenai Mountains and southern Chugach Mountains in Southcentral Alaska

Physical Stetting Description:
The Kenai Mountain Hemlock PNV occupies sites at high elevations on upper mountain slopes in the maritime climate of the eastern and southern coasts of the Kenai Peninsula (Ager 1999, DeVelice et al 1999) and in the southern portions of the Chugach Mountains. This PNV group may also be found in isolated frost pockets or on steep north-facing slopes at lower elevations (Viereck et al 1992). Typical elevations range from 400 to 500 meters. Slope gradients are steep - 45 to 60 percent. The Kenai Mountains rise to approximately 2000 m and occupy the transitional zone between the boreal-like conditions and vegetation of the western Kenai Lowlands and the northwestern Kenai Mountains and the wet and more temperate coastal areas to the east and south (Ager 1999). Average annual precipitation ranges from 1,720 mm/yr in Seward on the southern coast to 1,963 at Portage in the northeast section of this PNV range (Leslie 1989). Soils are shallow and often poorly drained, and may be weakly to well, developed. Soils may be either predominantly mineral or organic (Viereck et al 1992).

Biophysical Classification:
The Mountain Hemlock PNV type occurs in the following ecoregions described by Nowacki et al (2001):

- Coastal Rainforests – Chugach-St. Elias Mountains (M6)

The following level IV community types described by Viereck et al (1992) are included in the Mountain Hemlock PNV group:

IA1f – Closed Mountain Hemlock Forest
IA2c – Open Mountain Hemlock Forest

Identification of Key Characteristics of the PNV and Confuser PNVs:
The Kenai Mountain Hemlock PNV zone occurs at elevation above the Coastal Boreal Transition PNV zone and below the alder thickets and tundra zones.

Common tree and shrub species include mountain hemlock (*Tsuga mertensiana*), Lutz spruce (*Picea lutzii*), Sitka alder (*Alnus crispa* spp. *sinuata*), rusty menziesia (*Menziesia feruginea),* early blueberry (*Vaccinium ovalifolium*), salmonberry (*R. spectabilis*), and devil's club (*Echinopanax horridum*). Rusty menziesia (*Menziesia feruginea)* is the most common tall shrub. Lowbush cranberry (*V. vitis-idaea),* fiveleaf bramble (*Rubus pedatus*), bunchberry (*Cornus canadensis*), heartleaf twayblade (*Listea cordata*), and oak fern (*Gymnocarpium dryopteris*) are common in the understory, as are feathermosses (DeVelice et al 1999).

The forests in this PNV are a diverse mosaic of primarily hemlock-dominated stands. Sitka (*Picea sitchensis*) and Lutz spruce may also be present clustered within the hemlock stands but occupy < 33% of the overstory (Viereck et al 1992). Spruce are more dominant on the lower slopes occupied by this PNV.

This PNV is similar to the Coastal Boreal Transition Forest PNV which occurs in the Kenai Mountains area but at lower elevations, and which grades into the Mountain Hemlock PNV at mid-elevations. These two PNVs may be confused because mountain hemlock may be present on Coastal Boreal Transition Forest sites, but as a lower overall percentage of the overstory species. The Mountain Hemlock forest PNV is also similar to the Coastal Forests PNV which includes mountain hemlock stands but occurs in Southeast Alaska at lower elevations.

Natural Fire Regime Description:
Although lightning strikes and natural fires are rare in the region, wild fires play an important role in disturbance regime of the Mountain Hemlock PNV (Potkin 1997) and other similar coastal temperate rainforest types (Agee 1993, Franklin and Hemstrom 1981). Radiocarbon dates of five charcoal samples from soils at various locations in the Kenai Mountains ranged from 3,010 to 570 years before present with an average of 600 years between dates (Potkin 1997). Charcoal has been reported as present in most soil pits within the forest zone in the Kenai Mountains; this anecdotal evidence suggests the occurrence of widespread, infrequent fires in this PNV (USDA Forest Service 2002). Mountain hemlock, the climax species, is a fire "avoider"; the infrequent fires tend to be large and stand-replacing (Agee 1993). In the Kenai Mountains fires travel from the valley bottom Lutz spruce stands, but often stop at the lower boundary of mountain hemlock dominated forests (Potkin 1987).

Estimates of fire return intervals include:

- 570-3010 yrs (600 yr average) (Potkin 1997) (for Kenai Mountains)
- 1000 yrs (personal communication, FRCC expert's workshop, March 2004)
- 1500 yrs + (Lertzman and Krebs 1991) (Cascades and Olympic Mountains)

Other Natural Disturbance Description:
Other natural disturbances include wind, avalanche, landslides and flooding. Windthrow gap disturbances are important in both spruce and hemlock recruitment in these forests (Potkin 1997).

Natural Landscape Vegetation-Fuel Class Composition:
Prior to the settlement period of the late 1800s, the majority of the age structures of the coniferous forest surveyed by Potkin (1997) in the Chugach National Forest, including mountain hemlock communities, were likely in the late successional stages (Langille 1904 in Potkin 1997) and conifers were likely dominant.

Vegetation communities in the Mountain Hemlock PNV are stable over long periods and rarely disturbed; therefore, secondary succession patterns are poorly understood (Viereck et al 1992). The natural vegetation structure is a mosaic of the seral stages described in the table below.

Natural Scale of Landscape Vegetation-Fuel Class Composition and Fire Regime:
The infrequent fires in the subalpine hemlock forests tend to be large and stand-replacing (Agee 1993). The extent of subalpine fires is partly a function of fire weather, but mainly depends on the distribution of the subalpine forests, which is often patchy and grades into shrub, tundra, rock and ice (Agee 1992). In the Mountain hemlock zone in Washington State fires have tended to be

confined to individual slopes (Agee and Smith 1984). In Oregon historic fires >3,200 ha have been located, however the majority of stands found were patches of <500 ha each (Dickman and Cook 1989). On the Kenai Peninsula, drought weather conditions resulting from the 1912 Katmai eruption have been suggested to contribute to large scale fires from 1913-1915, burning approximately 20,000 acres on the Chugach National Forest (note this figure includes fire in all vegetation types present on the landscape).

Uncharacteristic Vegetation-Fuel Classes and Disturbance:
Uncharacteristic sites have disproportionate percentages of seral classes on the landscape relative to those listed below.

PNV Model Classes and Descriptions:

Class	**Modeled Percent of Landscape**	**Description**
A: 0-50 Post-replacement	3%	Herbaceous species may start from seed immediately post-disturbance. Shrubs and tree seedlings become established; after approximately 50 years tree saplings attain height of tall shrubs.
B: 50-200 years Mid-development closed	7%	Conifers share dominance with tall shrubs and have > 60% canopy closure.
C: 50-200 years Mid-development open	3%	Conifers share dominance with tall shrubs and have < 60% canopy closure.
D: 170-600+ years Late-development open	35%	Conifers gain dominance over tall shrubs and have < 60% canopy closure
E: 170-600+ years Late-development closed	52%	Conifers gain dominance over tall shrubs and have > 60% canopy closure.
Total:	100%	

Modeled Fire Frequency and Severity:

	Mean Probability	Mean Disturbance Frequency (years) (inverse of probability)	Description
Replacement fire	.0007	1,430	Based on literature and expert input
Mosaic fire	.0002	5,000	Based on literature and expert input

All Fire	.0009	1110 yrs	Based on literature and expert input
Wind	.0002	5000 years	Based on literature and expert input

Modeled Fire Severity Composition:

	Percent All Fires	Description
Replacement fire	80%	Based on literature and expert input
Non-replacement fire	20%	Based on literature and expert input
All Fire	100%	

Further Analysis:

- What are uncharacteristic veg fuel classes and disturbances?
- Need more info/confirmation on class descriptions.

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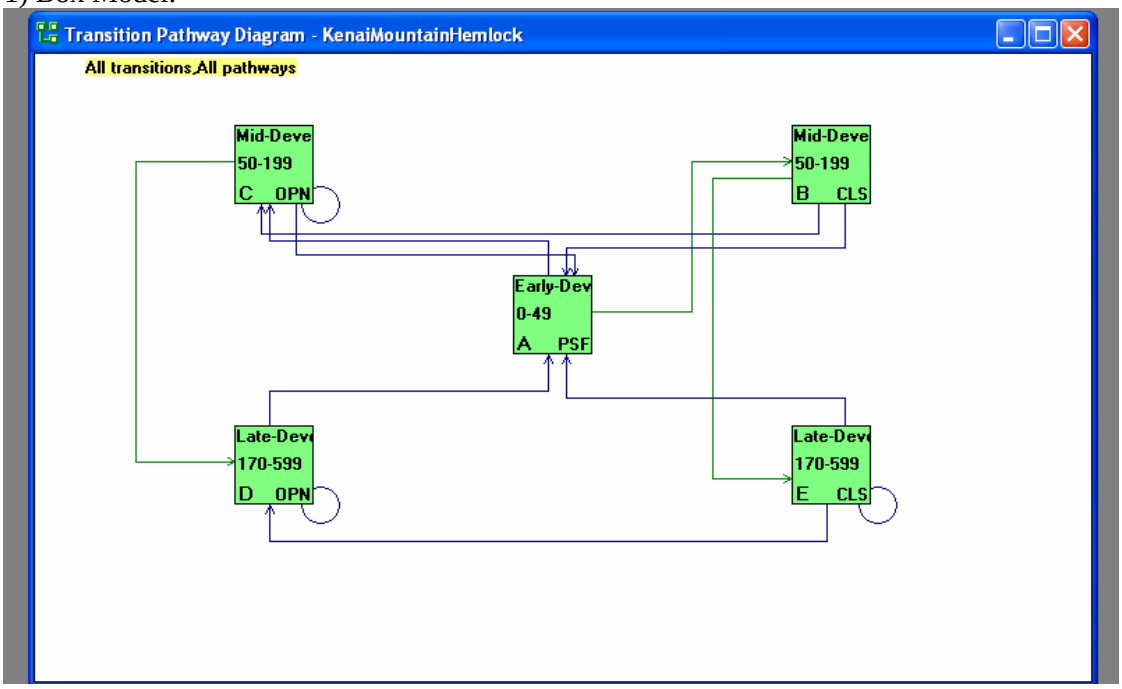
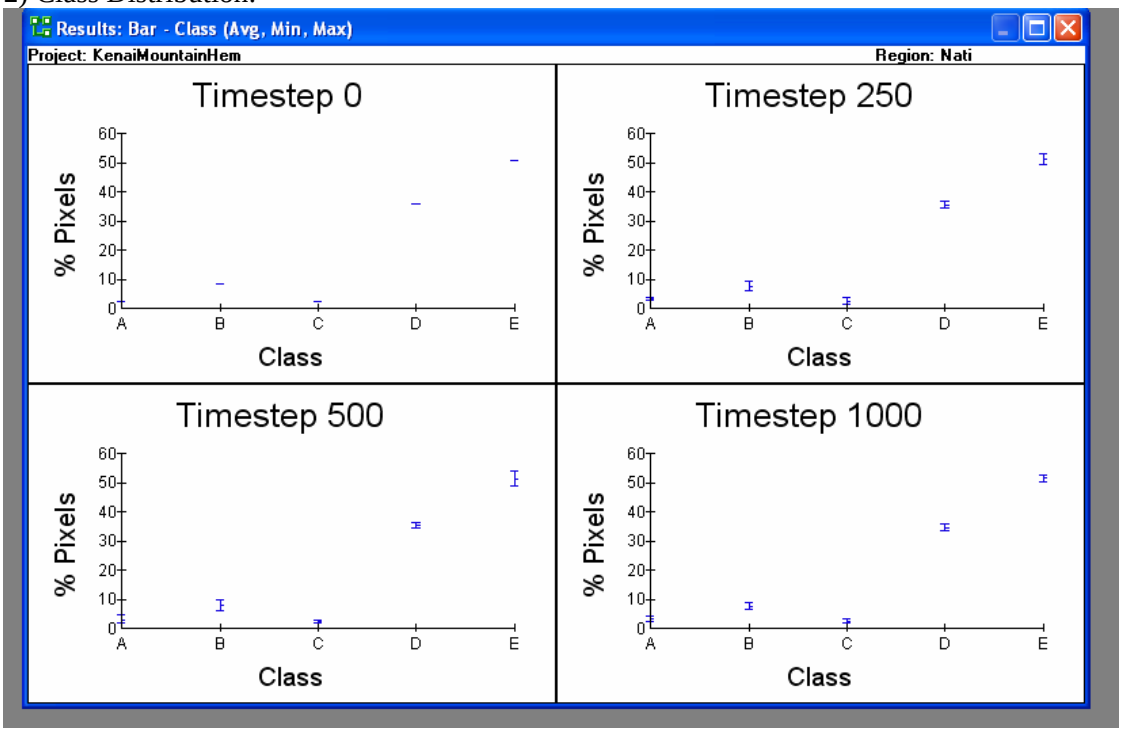
VDDT Model Diagrams:

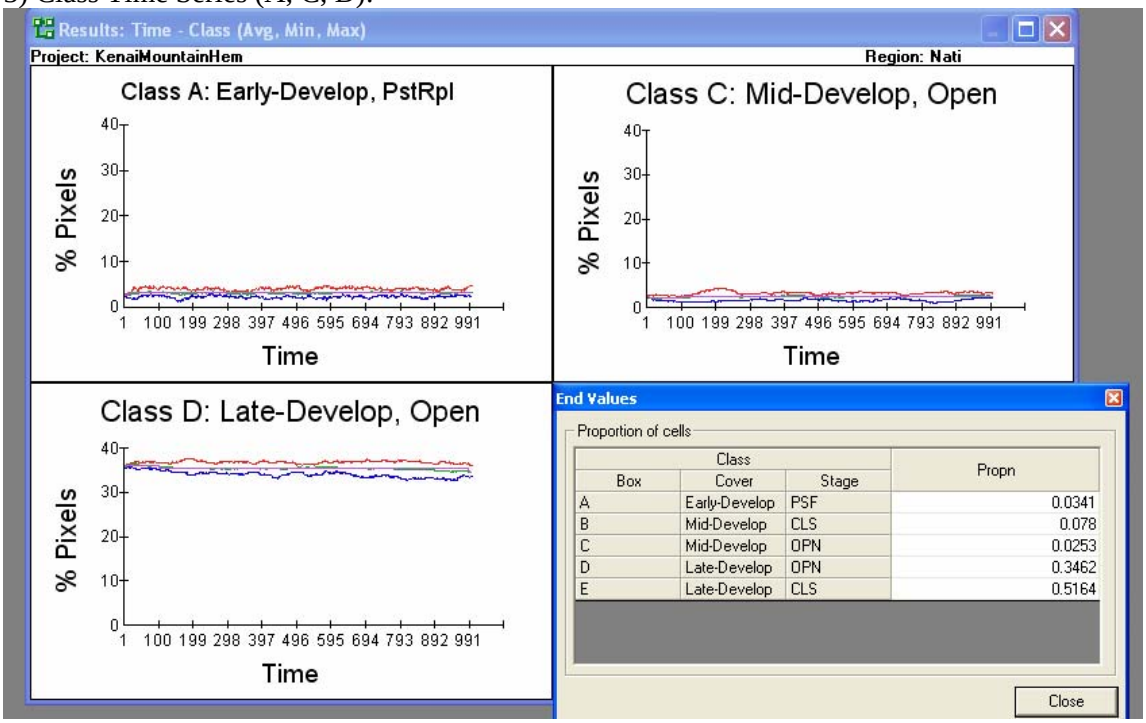
1) Box Model:



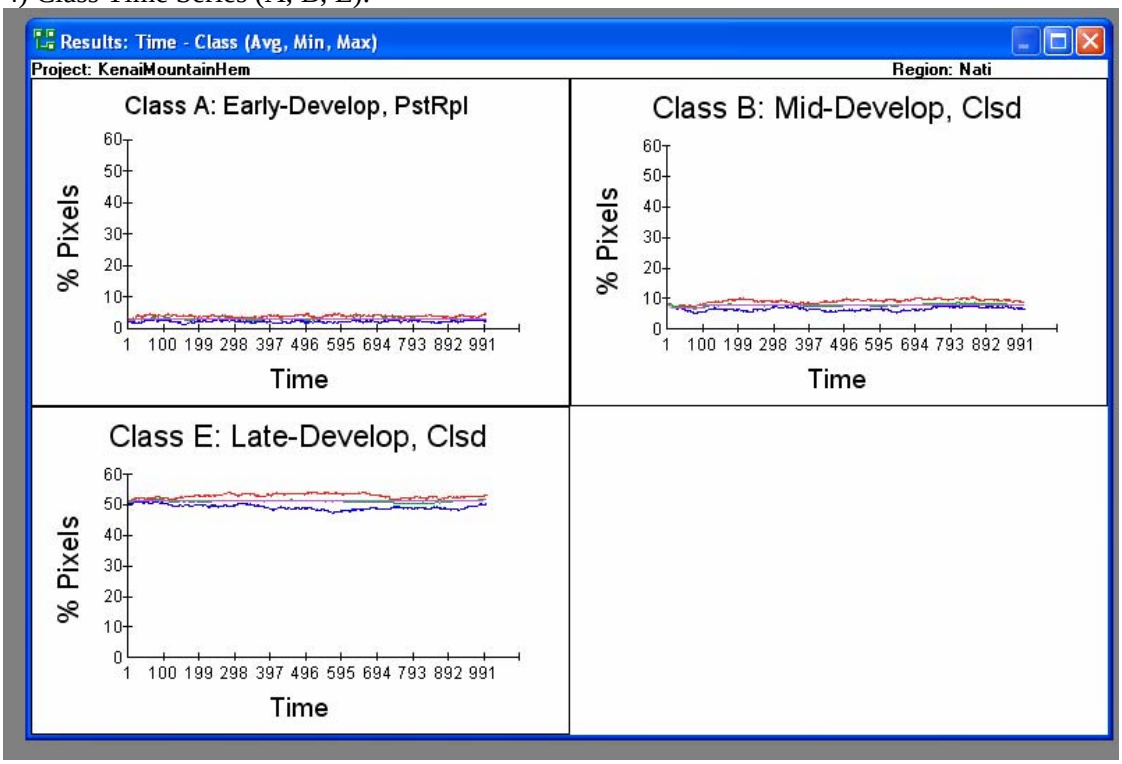
2) Class Distribution:



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



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



5) Fire Disturbance Time Series