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Fire Regime Condition Class (FRCC) Interagency Guidebook Reference Conditions

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Potential Natural Vegetation (PNV) Name: Coastal Forests

Fire regime group: V: Infrequent, stand-replacement regime
Geographic Area: Southeast Alaska, Chugach and St. Elias Ranges, Kodiak Island, Alaska Peninsula

Physical Stetting Description:
The Coastal Forests PNV occurs along a relatively narrow band sandwiched between the coast and mountain peaks throughout southeast Alaska and extending north through the Chugach and St. Elias Mountains and southwest to Kodiak Island and the northern reach of the Alaska Peninsula. This is a mountainous region with thousands of small islands, glacially carved fjords, long river valleys, and estuaries, tidal flats and outburst floodplains that create an irregular and intricate coastline. The PNV is typified by cool summers with abundant precipitation, frequent fog and low clouds, and mild winters; snow is usually transient at lower elevations to the south, but accumulates along the northern coast. Deep accumulations of heavy, wet snow are common at high elevations throughout the region. Summer temperatures typically range from 4o C to 27 C. Annual precipitation is heavy (500 cm/yr in parts of the Alexander Archipelago) throughout the region but is highly variable locally due to differences in terrain. Soils in this PNV region are young (0-15,000 years) and vary from shallow and poorly developed to deeply weathered (McNab & Bailey 1994). Complex interactions between climate, geomorphology and species interactions cause great variation in plant species diversity across the region (Alaback 1993) and thus within this PNV. Climate, a disturbance regime driven primarily by wind, and rarity of fire unify this region into one PNV.

Biophysical Classification:
The Coastal Forests PNV occurs in the following ecoregions described by Nowacki et al (2001):
- Coastal Rainforests – Boundary Ranges (M2), Kodiak Island (M3), Alexander Archipelago (M4), Gulf of Alaska Coast (M5), Chugach-St. Elias Mountians (M6).
- Aleutian Meadows – Alaska Peninsula (M7)

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

IA1a – Closed Sitka Spruce Forest
IA1b – Closed Western Hemlock Forest
IA1c – Closed Sitka Spruce-Western Hemlock Forest
IA1d – Closed Western Hemlock-Sitka Spruce – (Western Redcedar) Forest
IA1e – Closed Western Hemlock- Alaska Cedar Forest
IA1f – Closed Mountain Hemlock Forest
IA1g – Closed Western Hemlock – Western Redcedar Forest
IA1h – Closed Silver Fir-Western Hemlock Forest
IA1i – Closed Subalpine Fir Forest
IA2a – Open Sitka Spruce Forest

IA1b – Open Western Hemlock-Sitka Spruce Forest
IA2 c – Open Mountain Hemlock Forest
IA2d – Open Mixed Conifer Forest
IA3a – Lodgepole Pine Woodland
IA3b – Sitka Spruce Woodland
IB1a – Closed Red Alder Forest
IB1b – Closed Black Cottonwood Forest

Identification of Key Characteristics of the PNV and Confuser PNVs:
Complex interactions between climate, geomorphology and species interactions result in great variation in plant species diversity across the region (Alaback 1993). The US Forest Service identified twenty one ecological provinces in southeast Alaska (USDA Forest Service 1991) and DeMeo et al (1993) described seven vegetation series and forty-one plant associations in the Ketchikan area alone. Western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*) dominate uplands and mix with shore pine (*Pinus contorta*), mountain hemlock (*T. mertensiana*), western redcedar (*Thuja plicata*), and Alaska-cedar (*Chamaecyparis nootkatensis*) on wetlands (Pojar & MacKinnon 1994). Mountain hemlock representation generally increases with elevation. Pacific yew (*Taxus brevifolia*) is present in mixed conifer stands and Pacific silver fir (*Abies amabilis*) is present in mixed stands with western hemlock at the southern end of Southeast Alaska. Subalpine fir (*A. lasiocarpa*) dominates isolated mixed stands on upper slopes and ridges at a few localities in southeastern Alaska. Riparian forests within the Coastal Forests PNV consist primarily of black cottonwood (*Populus trichocarpa*), paper birch (*Betula papyrifera*) and red alder (*Alnus rubra*).

Species richness declines with increasing latitude; in the northern and western sections of the coast western redcedar and Alaska-cedar do not grow, and western hemlock becomes less important. Sitka spruce is the dominant conifer of the northern and western coast.

Understory diversity is rich and includes many species of willow (*Salix* spp.), *Vaccinium*, grasses, forbs and ferns. Lichens and mosses are important on the forest floor and as epiphytes (Alaback 1982). Common understory species in closed Sitka spruce stands include devils' club *(Oplopanax horridus)*, pacific reed grass *(Calamagrostis nutkaensis)*, western rattlesnake-root *(Prenanthes alata)*, five-leaf bramble *(Rubus pedatus)*, oak fern *(Gymnocarpium dryopteri)*, and dogwood (*Cornus* spp.) (Viereck et at 1992). The shrub layer in open mixed conifer forests (a common community type in the PNV) includes Alaskan blueberry *(Vaccinium alaskaense*), black huckleberry *(V. ovalifolium)*, false azalea (*Menziesia ferruginea*), and salal (*Gaultheria shallon*). Common understory species include skunk cabbage *(Lysichiton americanum)*, bunchberry *(Cornus canadensis)*, Spleenwort-leaved goldthread *(Coptis aspleniifolia*), lace flower *(Tiarella trifoliata)*, deer cabbage *(Fauria crista-gali)*, *Carex* spp., deer fern *(Blechnum spicant)*, lady fern *(Athyrium filix-femina)*, and common oak fern (*Gymnoarpium dryopteris)* (Viereck et at 1992).

This PNV is similar to the Coastal Boreal Transition Forest PNV which is limited to the western Kenai Peninsula and has a blend of characteristics common to both the Coastal Forests PNV and the more boreal Upland Spruce Hardwood PNV. The Kenai Mountain Hemlock PNV also shares characteristics with the Coastal Forests PNV, but it is limited to the Kenai Mountains.

Natural Fire Regime Description:
Fire is extremely rare but of severe intensity and scope in the Coastal Forest PNV. The occurrence of similar age classes over large, but geographically isolated segments of the region and information from fire history studies suggests that major fire episodes correlate with climatic conditions (Franklin & Hemstrom 1981). Fire return intervals are not well defined for Sitka

spruce (Agee 1993) and other Coastal Forest PNV types. Estimates of mean fire return intervals include:

- 1,000-5,000 years (Personal communication FRCC experts' workshop March 2004)
- 1,146 years for Sitka spruce forests (Fahnestock and Agee 1983)
- 570-3010 years (600 year average) for Kenai Mountains (Potkin 1997)
- 1500 years +/- for mountain hemlock in the Cascade and Olympic Mountains (Lertzman and Krebs 1991)
- 937 years for cedar-spruce-hemlock forests in Washington state (extrapolated from Fahnestock and Agee 1983 in Agee 1993)

Other Natural Disturbance Description:
Wind disturbances at both small and large scales play a fundamental role in shaping forest dynamics in Southeast Alaska (Harris and Farr 1974, Nowacki and Kramer 1998). Wind disturbance characteristics change over a continuum dependent on landscape features (e.g., exposure, position on the landscape, topography). Distinct wind disturbance regimes grade from exposed landscapes where recurrent, large-scale wind events prevail to wind-protected landscapes where small-scale canopy gaps predominate. Blowdowns in southeast Alaska range in size from 1 to 1,000 acres and disproportionately occur as smaller patches (typically < 50 acres) (Nowacki and Kramer 1998).

Some research suggests that frequent, small-scale wind events have a larger impact on these forests than the relatively less frequent, large-scale blowdowns (Harcombe 1986). Stem-snap and resultant canopy gaps are more likely to occur in old growth forests and mean gap size tends to be larger in old growth forests than in mature forests (Nowacki and Kramer 1998). The direction of gap-maker tree falls is significantly aligned with the direction of prevailing winds.

Catastrophic winds commonly cause large-scale blowdown throughout southeast Alaska (Deal et al 1991). Depending on intensity, wind can create single-generation stands with uniform canopies or multi-generation stands with diverse canopy and size structures. Intervals between complete blowdowns tend to be long with forests cycling through stand initiation, stem exclusion, and understory reinitiation stages, eventually reaching the old growth stage (at about 350 years).

Other important disturbances in the Coastal Forest PNV include avalanches, landslides and tectonic movement.

Natural Landscape Vegetation-Fuel Class Composition:
The natural vegetation structure is a mosaic of the seral stages described in the table below.

Fuel loadings are frequently heavy in these forests and wildfires rarely consume much of the wood (Franklin & Hemstrom 1981). Trees die and become snags and downed logs, but several subsequent fires are required to consume a majority of this woody debris. Numerous examples of re-burn suggests that young stands (e.g., 25-75 years) are more susceptible to burning than later forest stages (Franklin and Hemstrom 1981).

Natural Scale of Landscape Vegetation-Fuel Class Composition and Fire Regime:
Forest stands cover large areas along the narrow coastal band of the Coastal Forest PNV.

Uncharacteristic Vegetation-Fuel Classes and Disturbance:
Timber harvest has been the primary agent producing uncharacteristic vegetation-fuel classes in the Coastal Forest PNV, creating large areas of early successional forest and shrub communities.

PNV Model Classes and Descriptions:

Class	**Modeled Percent of Landscape**	**Description** (After: Oliver and Larson 1996, Alaback 1982)
A: 0-35 years Post disturbance stand initiation	6%	Herbs, shrubs and tree seedlings grow from seeds, sprouts and advance regeneration.
B: 25-100 years Stem exclusion	13%	Tree canopy closes and shade in-tolerant species in the understory are lost. Forest structure becomes stratified, with slower-growing, shade tolerant conifer species forming lower canopy strata. Some trees are thinned from the stand due to lack of resources (e.g., light, growing space, nutrients, etc.).
C: 100-225 years Understory re-initiation, shrub stage	22%	As the overstory ages, new species of shade-tolerant forbs and shrubs appear in the forest floor.
D: 225- 350 years Understory re-initiation, conifer regeneration stage	22%	Larger tree-fall gaps, which are not subject to closure by lateral extension, begin to appear in the overstory, thus allowing for conifer regeneration and the beginning of gap-phase replacement. A two-aged, two-layered stand forms.
E: 350-1000 + years Old growth	37%	Multi-aged, multi-layered stand with continuing gap-phase replacement. Tree mortality is generally balanced with growth from newly established seedlings. Large, decadent trees, standing snags, coarse woody debris, overhead gaps and regeneration patches are all present.
Total:	100%	

Modeled Fire Frequency and Severity:

	Mean Probability	Mean Fire Frequency (years) (inverse of probability)	Description
Replacement fire	.10	1,000	Based on literature and expert input
Mosaic fire	.01	10,000	Based on literature and expert input
All Fire	.11	910	Based on literature and expert input
Flood events			

Modeled Fire Severity Composition:

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

Further Analysis:

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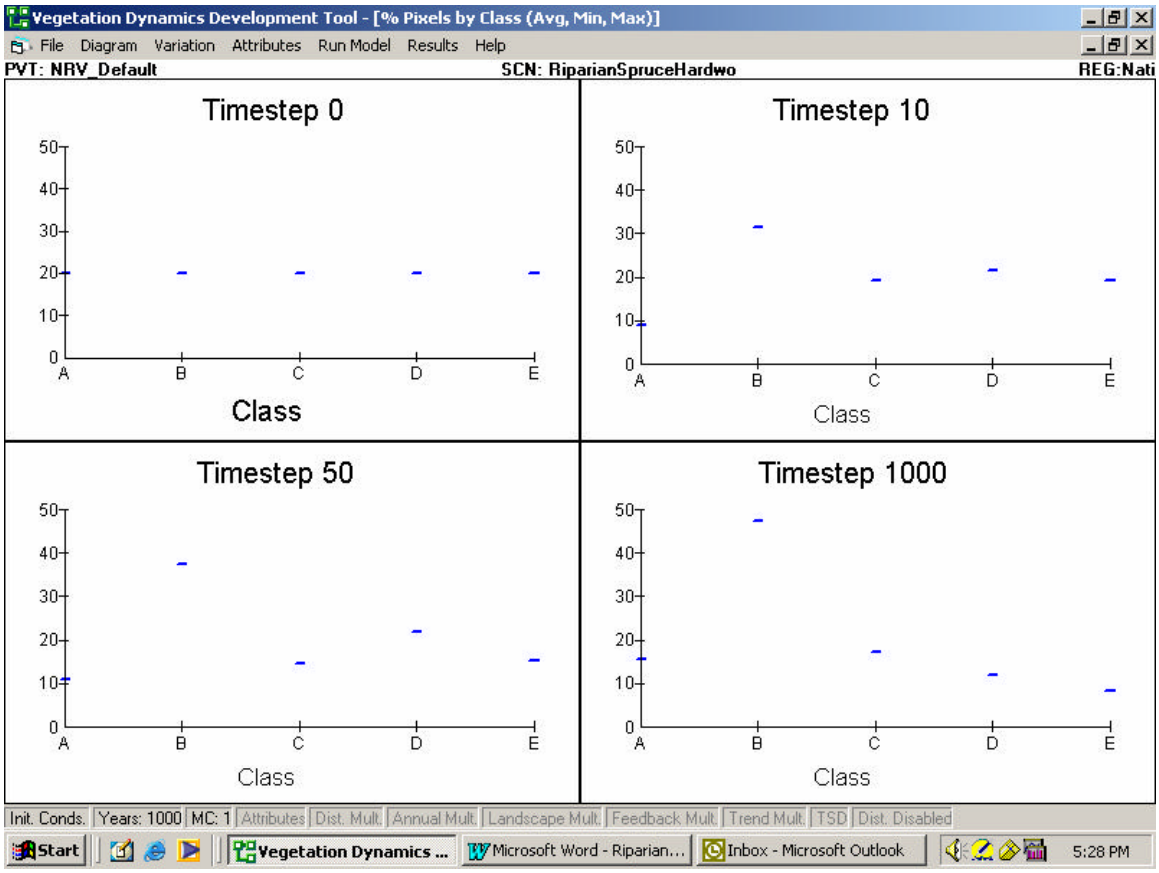
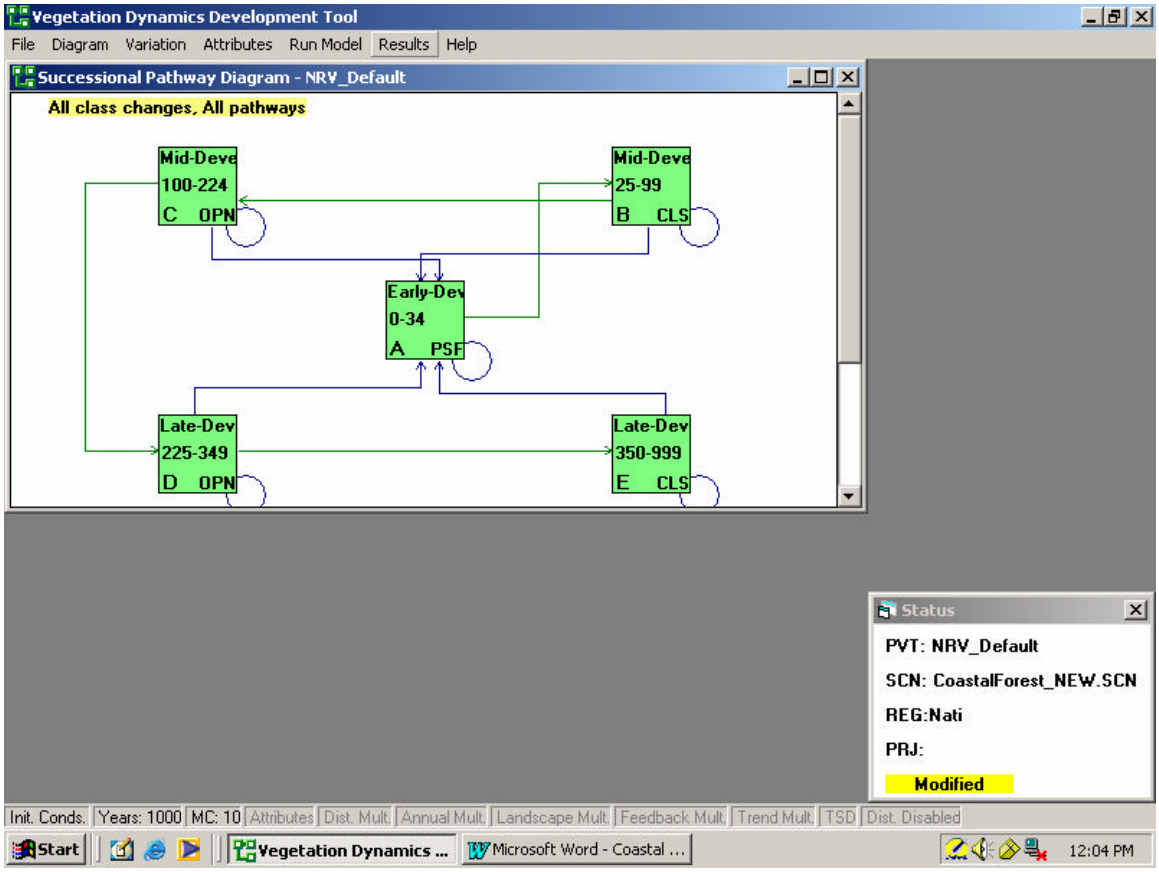
VDDT Model Diagrams:




Vegetation Dynamics Development Tool
File Diagram Variation Attributes Run Model Results Help
Successional Pathway Diagram - NRV_Default
All class changes, All pathways
Mid-Deve
100-224
C OPN
Mid-Deve
25-99
B CLS
Early-Dev
0-34
A PSF
Late-Dev
225-349
D OPN
Late-Dev
350-999
E CLS
Status
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SCN: CoastalForest_NEW.SCN
REG:Nati
PRJ:
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Init. Conds.
Years: 1000
MC: 10
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Annual Mult.
Landscape Mult.
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