DRAFT

Fire Regime Condition Class (FRCC) Interagency Guidebook Reference Conditions

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Potential Natural Vegetation (PNV) Name: Dwarf Shrub Tundra

Fire regime group: V
Geographic Area: Interior Alaska, Seward Peninsula and Nulato Hills region of western Alaska, Brooks Range and foothills, arctic coastal plain, Alaska Range transition region, and alpine sites in southeast Alaska.

Physical Stetting Description:
Dwarf Shrub Tundra PNV sites are widespread and common throughout arctic, interior and parts of western Alaska on a variety of sites ranging from windswept alpine sites to well-drained, exposed arctic lowlands. Soils tend to be thin, well drained and stony but may be more poorly drained peat, as in the case of some crowberry dwarf shrub tundra communities. Permafrost is usually present but the active layer is deep - at least 50 cm thick. Mountain heath communities occur on sites that are well protected by snow in winter.

Biophysical Classification:
Dwarf Shrub Tundra PNV type occurs in the following ecoregions described by Nowacki et al (2001):

- Intermontane Boreal
- Alaska Range Transition
- Arctic Tundra
- Bering Tundra
- Bering Taiga – Nulato Hills (P2)
- Coastal Rainforests (alpine sites only)

The following community types described by Viereck et al (1992) are included Dwarf Shrub Tundra PNV group:

IIB2a – Open Tall Willow Shrub (sere on tundra sites)
IIC1b – Closed Low Willow Shrub (topoedaphic climax in depressions in tundra regions only)
IIC1e – Closed Low Alder-Willow Shrub (sere on river terrace sites)
IIC2h – Open Low Willow-Sedge Shrub Tundra
IID1a – Dryas Dwarf Shrub Tundra
IID1b – Dryas-Sedge Dwarf Shrub Tundra
IID1c – Dryas-Lichen Dwarf Shrub Tundra
IID2a – Bearberry Dwarf Shrub Tundra
IID2b – Vaccinium Dwarf Shrub Tundra
IID2c – Crowberry Dwarf Shrub Tundra
IID2d – Mountain-Heath Dwarf Shrub Tundra
IID2e – Cassiope Dwarf Shrub Tundra
IID3a – Willow Dwarf Shrub Tundra
IIIA2h – Sedge-Willow Tundra

Identification of Key Characteristics of the PNV and Confuser PNVs:
The Dwarf Shrub Tundra PNV includes diverse shrub tundra community types (see Viereck et al 1992 list above). Low shrubs occur in association with sedges (*Carex* spp.) and mosses with 25-75% cover of shrubs < 20 cm. Shrub species include willow (*Salix* spp.), ericads (*Vaccinium* spp., *Cassiope* spp., *Empetrum nigrum* (crowberry), *Arctostaphylos* spp.(bearberry), *Phyllodace* spp.(mountain heath), *Betula nana* (dwarf birch), and *Ledum decumbens* (narrow leaf Labrador tea). Shrubs > 20 cm are absent and/or provide < 25% cover. Trees are usually absent and always provide < 10% cover. Grasses and forbs may be common on some sites (e.g., dryas dwarf shrub tundra). Mosses and fruiticose lichens may be a major or minor component depending on the site.

The Dwarf Shrub Tundra PNV is similar to the Tussock Tundra 1 and Tussock Tundra 2 PNVs, which have similar species composition and occur on similar sites,(but that both are dominated by the tussock growth form. This PNV is also similar to some community types within the Persistent Shrub North and Persistent Shrub South PNVs, which may include some of the same shrub species (e.g, *Salix* spp.) but that do not feature the associated tundra vegetation.

Natural Fire Regime Description:
Burns in dwarf shrub tundra ecosystems tend to be moderate intensity surface fires that may kill all aboveground plant parts but seldom underground parts (Bliss & Wein 1973; VanWagner 1983; Viereck and Schandelmeier 1980). Thus, post-fire communities tend to have the same composition as their pre-fire counterparts. Following fire, a greater abundance of graminoids and other fast growing species occupy burned areas, and shrub abundance decreases. Grasses are the first species to recover, followed by shrubs and, 25-30 years post fire, mosses and lichens (Duchesne and Hawkes 2000). In the shrub subzone fire may eliminate any scattered trees present and create treeless tundra.

Racine (1979) found fires were generally more severe in low ericaceous and birch shrub tundra than in wetter tundra types on the Seward Peninsula. He also found that fires in the shrub types removed most of the soil organic layer and that revegetation was much slower. Racine (1979) found much variation in burn intensity on a landscape scale on the Seward Peninsula, from completely unburned to intensely burned. These patterns are related to variations in topography and the composition, moisture content and soil organic accumulations of the plant communities.

Mean fire return interval estimates for the Dwarf Shrub Tundra PNV include:
- 500-1000 years (personal communication, FRCC experts' workshop, March 2004)
- 612 years for Noatak River watershed (all vegetation types) (Racine et al 1983)
- 100 years minimum, "but is usually much longer" (Viereck and Schandelmeier 1980).
- The fire regime of tundra systems are likely quite variable from one region to another making generalizations difficult (Viereck and Schandelmeier 1980)

Other Natural Disturbance Description:
On the Seward Peninsula and western Alaska, frost action which creates polygonal ground and other periglacial features, is a widespread, small-scale and continuous disturbance.

Change in the arctic and subarctic climate is another source of disturbance that is currently affecting tundra ecosystems.

Natural Landscape Vegetation-Fuel Class Composition:
The low, ericaceous shrub component (*Empetrum nigrum*, *Ledum decumbens*, *Vaccinium* spp.), is the most important vegetation in the Dwarf Shrub Tundra PNV in terms of fire susceptibility (Wein and MacLean 1983). This is due to high flammability, low moisture content, low temperature for ignition, high heats of combustion, and continuous complex of fine fuels with upright growth form. The tall shrub component (*Salix* spp., *Alnus* spp.) contributes little to fire susceptibility because they tend to be clumped and have a high fraction of stems over 1 cm in diameter.

The natural vegetation structure is a mosaic of the seral stages described below.

Natural Scale of Landscape Vegetation-Fuel Class Composition and Fire Regime:
In the arctic and Seward Peninsula, typical landscapes include this PNV in a mosaic with other tundra types, including sedge tussock, sedge-shrub tussock, and wet sedge-grass meadow types. Tundra types exist in a more patchy distribution in interior and southcentral Alaska within a mosaic that includes forested types and wetlands.

Wien (1976) reports many tundra fires in the 1 to 100 ha size range and few large (thousands of ha) fires. Racine (1979) reports that in 1977 lightning-caused fires burned 35,480 ha on the Seward Peninsula, with one fire burning 9,440 ha. Jandt and Meyers (2000) report that large fires (>200,000 ha) occur about every 10 years in the Buckland Valley and surrounding highlands of the Seward Peninsula. Racine et al (1983) found that 40 fires burned 100,000 ha (1000 km^2) in the 30,000 km^2 watershed of the Noatak River between 1956 and 1981.

Fourty-three percent of wildland fires occurring in interior Alaska occur in treeless areas, primarily tundra bogs and fens (Viereck 1975).

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 Dwarf Shrub Tundra PNV model.

PNV Model Classes and Descriptions:
Vegetation communities in the Dwarf Shrub Tundra PNV typically follow one of two alternate successional pathways; one which becomes shrub dominated following disturbance, and one which further develops into an open shrub community with a significant lichen component.

Class	**Modeled Percent of Landscape**	**Description** (After: Walker 1996, Duchesne and Hawkes 2000, Wein and MacLean 1983, Racine 1979, Racine et al 1987)
A: 0-10 years Post disturbance herbaceous/shrub	2%	The rate and species involved in post-fire recovery depends on severity of the burn and the substrate. On severely burned sites the first year post fire there is very little resprouting of sedges and shrubs, with some establishment of new vascular plants, mosses and liverworts. On less severly burned sites there is often abundant establishment of sedges, *Eriophorum vaginatum* (cottongrass)and *Calamagrostis* spp (bluejoint grass), *Rubus chamaemorus* (cloudberry) is important on acidic sites on the Seward peninsula; willows (*Salix* spp.) are more important at alkaline sites. On alkaline sites *Potentilla fruticosa* (bush cinquefoil), *Gentiana propinqua*

		(four-parted gentian), *Equisetum scirpoides*, and *Thalictrum alpinum* (alpine meadow rue) are often first to colonize a site post-fire.
B: 5-1000 years Shrub dominated	81%	Shrub cover is > 60%;sedges, grasses, mosses and lichens may also be present.
C: 20-1000 years Open shrub/lichen	17%	Shrub cover is < 60% and 25-30 years post fire lichens become prominent; 50-80 years post fire lichens develop a continuous cover.
Total:	100%	

Modeled Fire Frequency and Severity:

	Mean Probability	Mean Fire Frequency (years) (inverse of probability)	Description
Replacement fire	.14	715	Based on literature and expert input
Mosaic fire	.02	5000	Based on literature and expert input
All Fire	.16	625	Based on literature and expert input
Other disturbances			

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:

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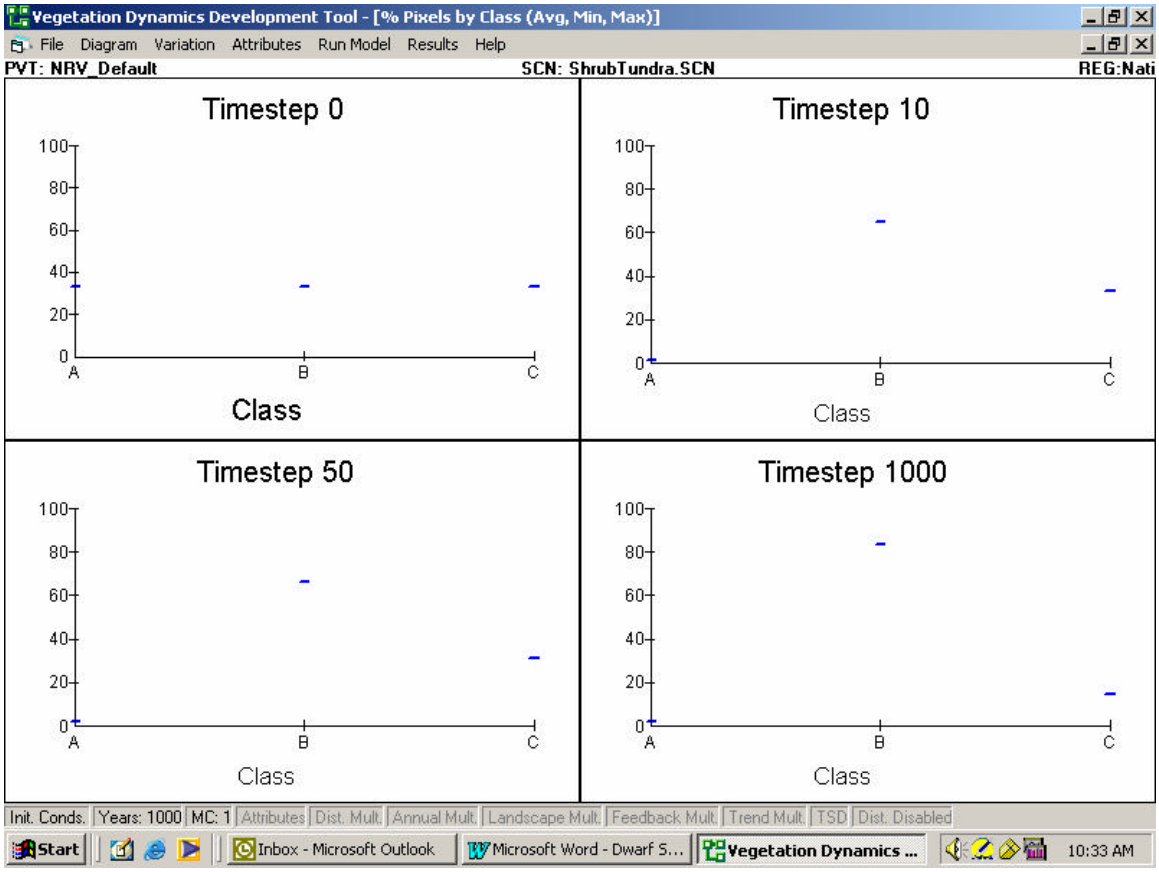
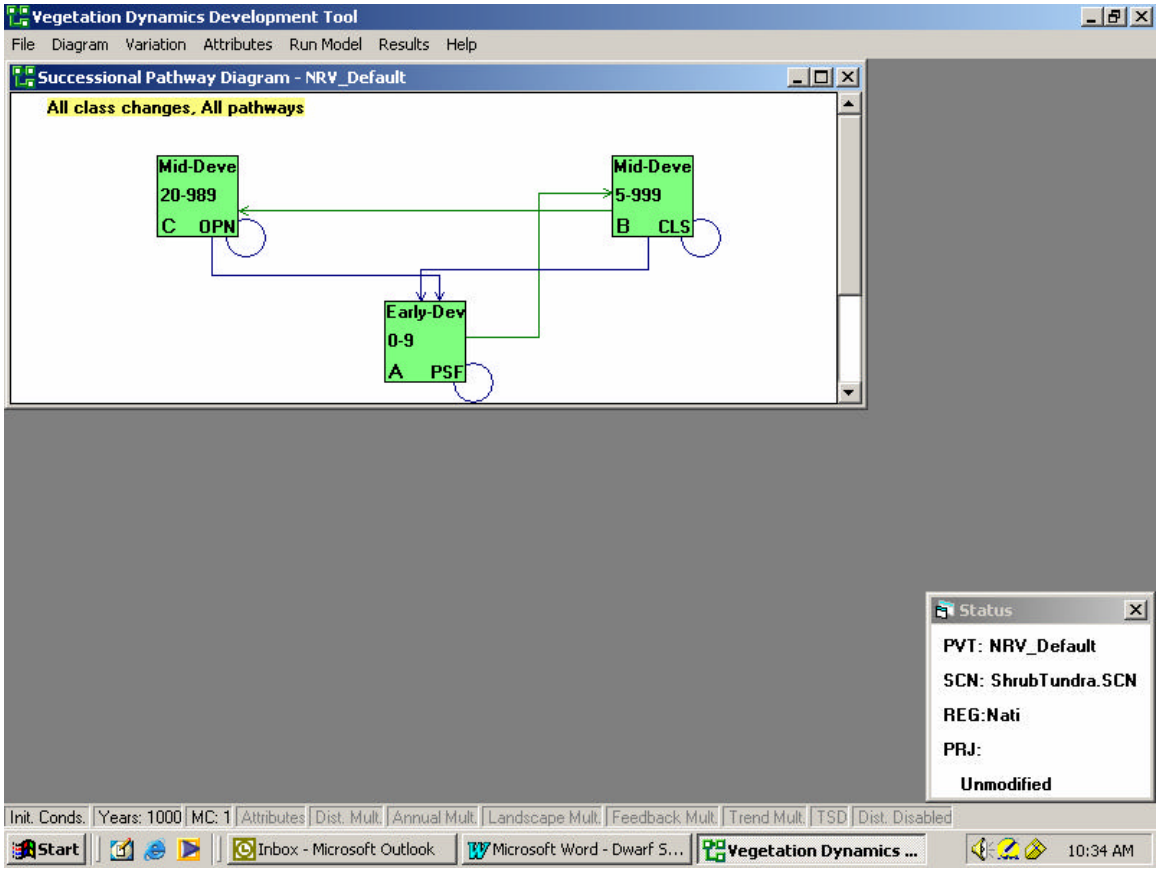
VDDT model diagrams:




Vegetation Dynamics Development Tool
File Diagram Variation Attributes Run Model Results Help
Successional Pathway Diagram - NRV_Default
All class changes, All pathways
Mid-Deve
20-989
C OPN
Mid-Deve
5-999
B CLS
Early-Dev
0-9
A PSF
Status
PVT: NRV_Default
SCN: ShrubTundra.SCN
REG:Nati
PRJ:
Unmodified
Init. Conds.
Years: 1000
MC: 1
Attributes
Dist. Mult.
Annual Mult.
Landscape Mult.
Feedback Mult.
Trend Mult.
TSD
Dist. Disabled
Start
Inbox - Microsoft Outlook
Microsoft Word - Dwarf S...
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