

APPENDIX C
Physical Flow Examples
Summary of VRU Attributes

Appendix C1

Physical Flow Examples
(from Leavell, 2000)

WARM, DRY HABITAT GROUPS

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PSEUDOTSUGA MENZIESII/PINUS PONDEROSA FOREST
AND WOODLAND ALLIANCES

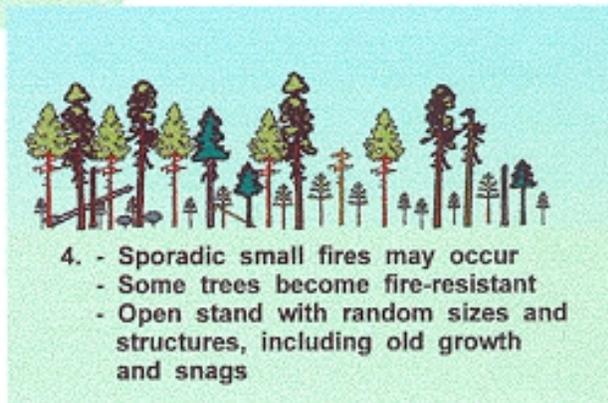
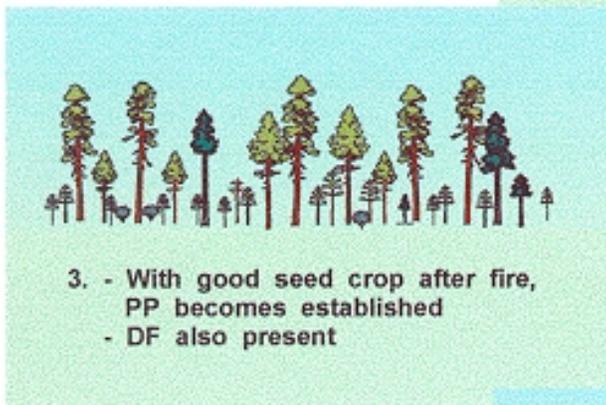
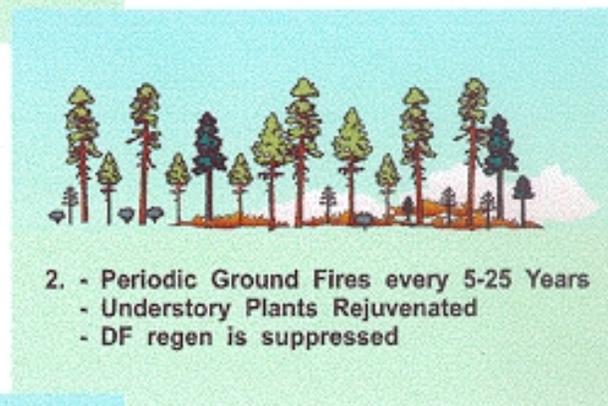
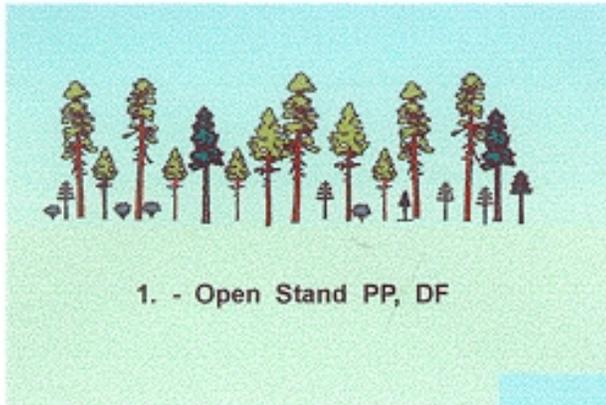
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VEGETATIVE RESPONSE UNITS 1, 2 AND 3

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PA20, PA20_SPA14, PA20_SPA15,
PA20_SPA16, PA21, PA21_SPA11, PA25

HISTORIC SUCCESSIONAL DEVELOPMENT



SUCCESSIONAL DEVELOPMENT WITH FIRE SUPPRESSION



ECOSYSTEM MANAGEMENT OBJECTIVES



1. As fire suppression continues...
 - Open, park-like PP habitat is converted to dense DF



2. Under an EM objective:
 - Mature PP is maintained
 - Commercial-size DF is harvested



3. - Overstory PP remains
 - DF is commercially thinned every 20-30 years

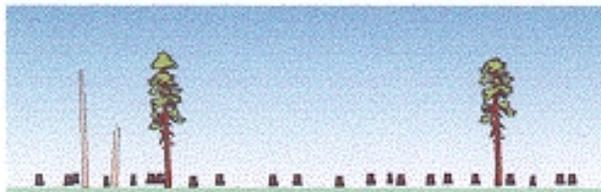


4. - Prescribe burn every 5-25 years
 - Understory grass, forbs & shrubs rejuvenated



5. - With good seed crop after fire, PP becomes established
 - DF also present
 - Habitat is restored

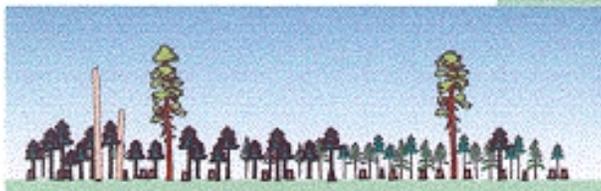
MAXIMIZE GROWTH AND YIELD



1. - Clearcut Stand
- Few Seedtrees Left Standing



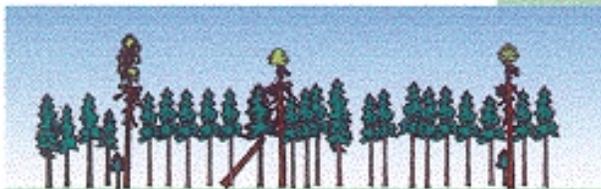
2. - A simple structure regenerates
- DF, PP and other dry-site species
- Larch, LP and GF may be present



3. - PP and snags left for cavity nesting



4. - At 12' tall, stand is
Precommercially thinned
- Optimal timber production



5. - At 40-60 years, PP suffer
from crown competition
- DF keep 40% live crown ratios
- The stand may be commercially
thinned



6. - At rotation's end (CMAI 100-110 yrs),
some of the DF are only in fair vigor
- PP extremely weak due to closed
canopy
- The stand is regenerated



7. - Only DF has vigor to be reserve tree
for seed and/or long-term site benefits
- PP snags left for cavity nesting

WARM, MOIST HABITAT GROUPS

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ABIES GRANDIS FOREST ALLIANCE
TSUGA HETEROPHYLLA/THUJA PLICATA FOREST ALLIANCE

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VEGETATIVE RESPONSE UNITS 4 AND 5

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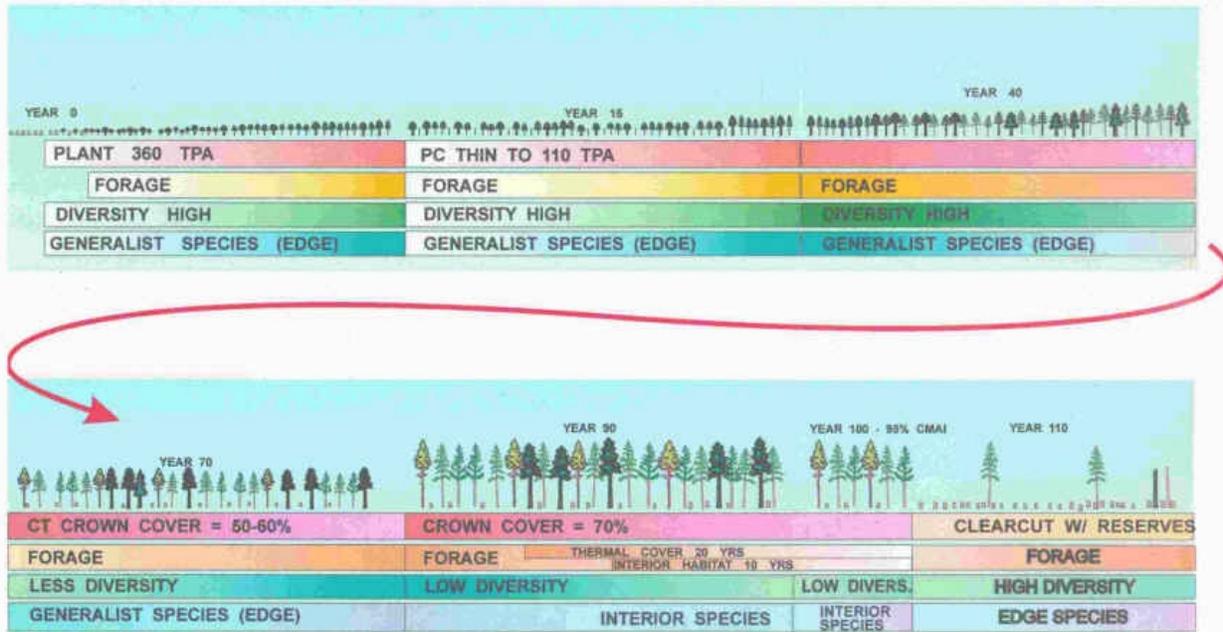
PA2_SPA46, PA2_SPA47,
PA12_SPA32, PA12_SPA33

Refer to text:

Figure 1. Physical Flow for Warm, Moist Habitat Groups – Maximize Growth and Yield

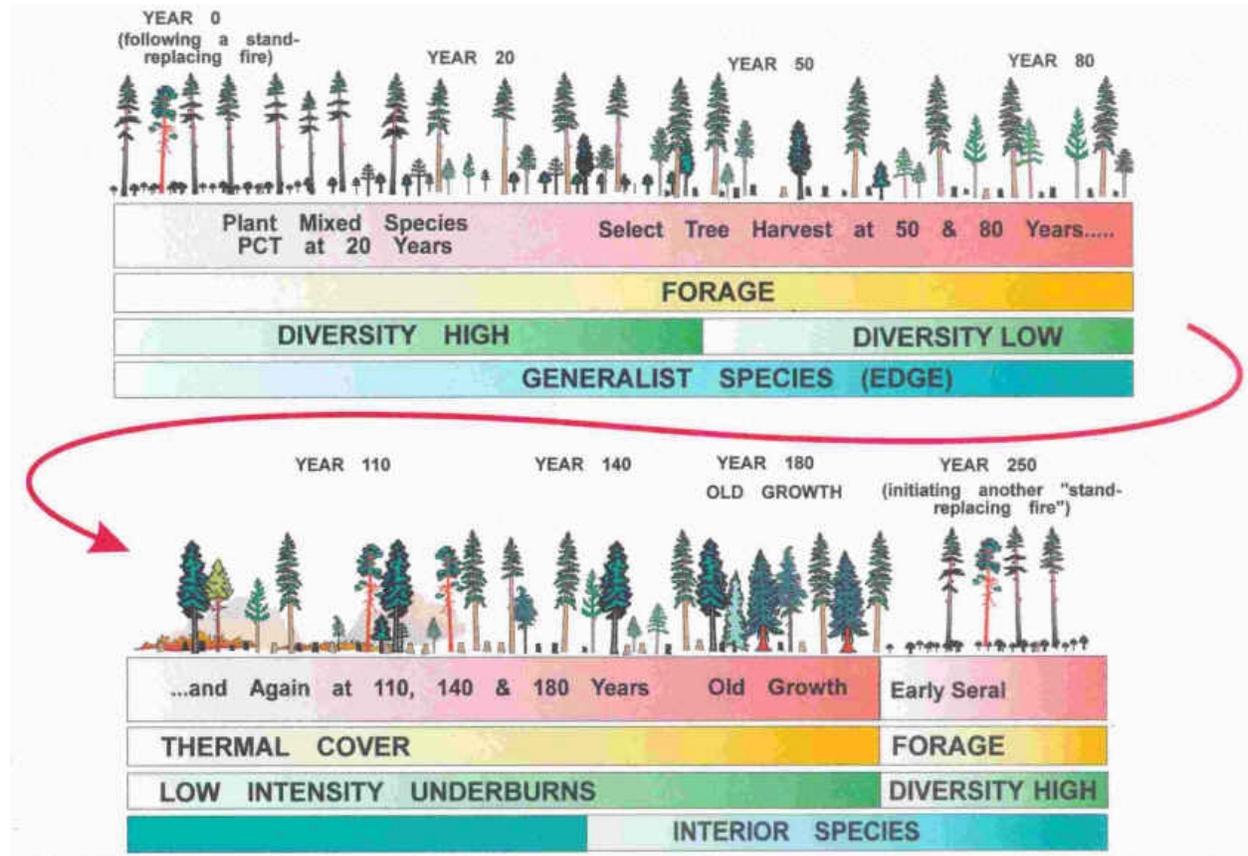
Figure 32. Physical Flow for Warm, Moist Habitat Groups – Ecosystem

Figure 1. Prescription for Maximizing Growth and Yield / Physical Flow for Warm and Cool, Moist Habitat Groups



Basal area, trees per acre and quadratic mean diameter are manipulated to prescribe silvicultural treatments to meet certain objectives. The prescription above has an objective of maximizing growth and yield for optimum timber production over time within this mixed conifer stand. Management activities will affect cover and forage for big game, diversity, and interior habitat, even though these are not part of the growth and yield objectives.

Figure 32. Prescription Managing Structure, Composition, Process for Ecologic Integrity and Maintaining Biodiversity Objectives



Basal area, trees per acre and quadratic mean diameter are manipulated to prescribe silvicultural treatments to meet certain objectives. The prescription above has an objective of returning historic disturbance processes to the landscape (here a mixed conifer stand) while maintaining habitat for a range of animal species and producing a sustainable quantity of wood fiber. This prescription manages for ecologic integrity. This is the same community as illustrated in Figure 1

COOL, MOIST HABITAT GROUPS

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ABIES LASIOCARPA FOREST AND WOODLAND ALLIANCES

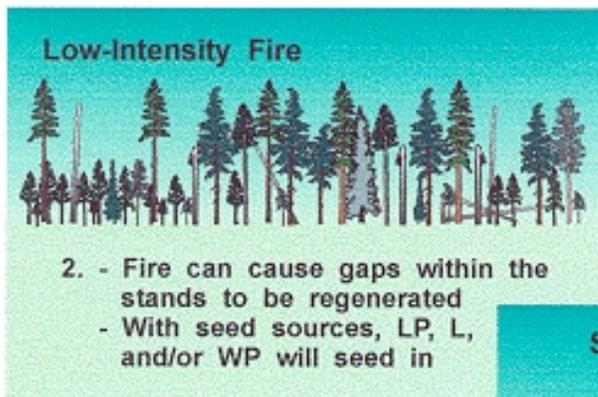
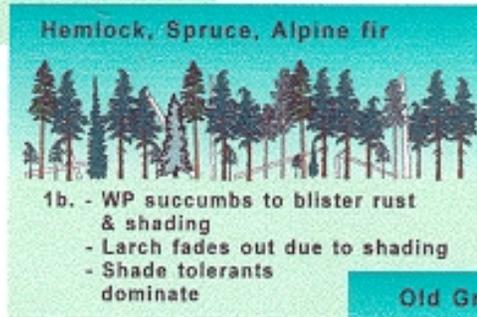
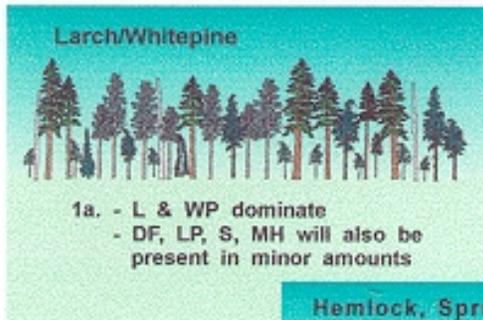
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VEGETATIVE RESPONSE UNITS 6,7,AND 9

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PA5, PA6, PA7, PA6_SPA40, PA6_SPA41,
PA8, PA11, PA9 (EARLY), PA9(OPEN), PA10

HISTORIC SUCCESSIONAL DEVELOPMENT



SUCCESSIONAL DEVELOPMENT WITH FIRE SUPPRESSION



1. - Classic Old Growth



2. - Dense canopy and high fuel loads on the ground make stand fire-prone



3. - Intense fires can occur, killing many overstory trees



4. - Many overstory trees die
- WP seed source is gone
- Site is regenerated to almost pure Larch



5. - Return can occur in unconsumed fuels
- If seed trees are eliminated, the site becomes a brushfield

ECOSYSTEM MANAGEMENT OBJECTIVES



1. - Old Growth Stand
- Interior habitat also



2. - Cut gaps and thin every 30-50 years
- Intermediate entry harvest and prescribe burn to emulate low intensity fire



3. - Low intensity fires regenerate openings



4. - Old growth stand grows back
- Interior habitat also

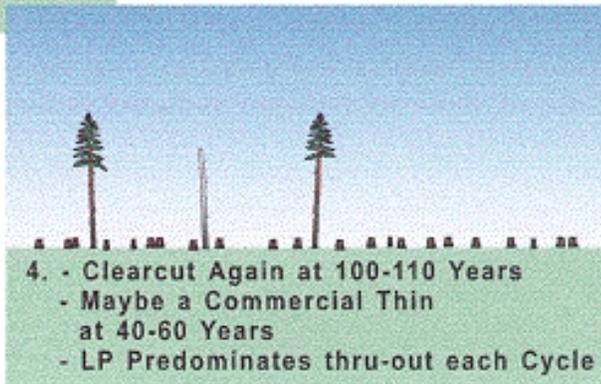
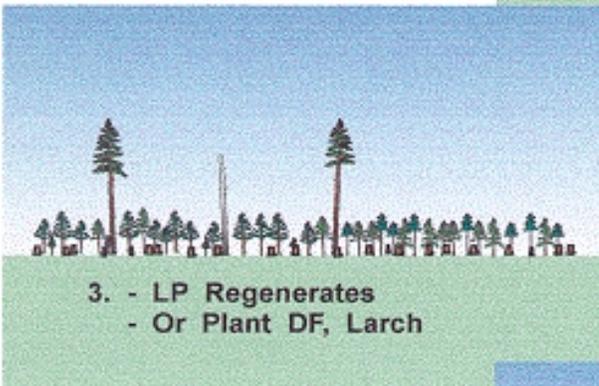
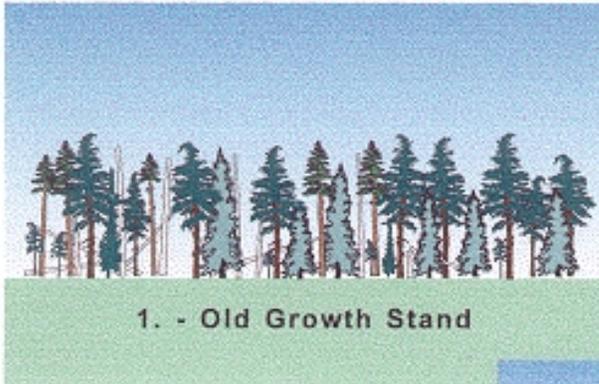


5. - After 300 years, cut to emulate stand replacing fires
- LP will establish
- Plant WP, L, some DF



6. - Thinning regimes important
- Precommercial thins favor LP, L, DF, WP
- Commercial thins at 40-60 & 90-110 yrs, favor eventual conversion to S, MH, L
- Regen earlier perpetuates LP

MAXIMIZE GROWTH AND YIELD



**Appendix C : Fires 2000 Assessment
Summary of VRU Attributes**

VRU	Climatic Modifier	% on KNF	Primary Fire Groups	Predominant Fire Regime	Historic Patch Size	Species Composition	Historic Stand Structure	Coarse Woody Material
1	Warm and Dry	1	4	* nonlethal low severity 5-25 yr. FRI (see note)	<5 ac small openings, within 20-200 ac patches	PP with lesser amounts of WL and DF	diverse mix, open stand, well spaced trees (5-20 tpa) interspersed with larger openings and dense patches, multi-aged, 1-2 stories. Ave. basal area 50-80 sq.ft/ac	5-9 tons/ac
2S 2N	Moderately Warm and Dry	16	6	* VRU 2S- nonlethal, low severity 15-45 yr. FRI * VRU 2N- nonuniform mixed severity 15-45 yr. FRI * nonuniform lethal stand replacement ave. 225 yr. FRI	variable size small openings (0-5 ac), within 20-200 ac patches created by mixed and lethal fires	PP/DF dry, lower elevations WL/LP with PP moist upland	diverse mix, open stand well spaced trees (15-30 tpa) interspersed with larger openings and dense patches, multi-aged and 1-2 stories. north slopes more even-aged and single storied with some variety in size/age. Ave. basal area 60-100 sq.ft/ac	5-9 tons/ac Psme/Phma 12-25 tons/ac Psme/Caru
3	Moderately Warm and Moderately Dry	9	6,11	* nonlethal, low severity 25-50 yr. FRI * mixed severity, 70-250 yr. FRI on cool, wet sites. 30 yr. FRI on warm, moist sites. 75-80 yrs in LP stands * nonuniform, lethal stand replacement 100-250 yr. FRI	5 to 50 ac 20-200 ac	WL/DF/PP dry, lower elev WL/DF/LP moist, uplands	variable, gaps to large even-aged single storied patches to larger area multi-aged multistoried and single story open grown stands. ave. basal area 80-120 sq ft/ac, more in riparian areas. tpa ranged from 15-60	10-20 tons/ac
4S 4N	Moderately Warm and Moist	9	11	* VRU 4S- nonuniform, mixed severity 30-85 yr. FRI * VRU 4N- nonuniform, lethal stand replacement, ave. 200 yr. FRI	20-75 ac 100-300 ac or more	WL/DF with LP,GF,WP, PP	varies with topography. two storied, even and uneven-aged in lowlands. single and two storied, even-aged in upland areas. basal area ave. 150-200 sq ft/ac and 30-50 overstory tpa in upland areas to over 200 sq ft/ac in valley bottoms	15-30 tons/ac
5S 5N	Moderately Cool and Moist	27	11	* VRU 5N- nonuniform, lethal stand replacement 250+ FRI (110-340 yr. range) * VRU 5S- nonuniform, mixed severity 75 yr. FRI (17-113 yr. range)	100-300 ac potential for larger 100 ac or less	WL/DF with WP, ES,LP,GF,WRC,WH	varies with topography. two storied, even and uneven-aged in lowlands. often two-aged and storied in upland areas. basal area ave. 150-200 sq ft/ac and 30-50 overstory tpa in upland areas to over 200 sq ft/ac in valley bottoms	15-32 tons/ac
6	Moderately Cool and Wet	<1	11	fire is not a significant disturbance agent infrequent, low severity or stand replacement 300-400 yr. FRI	varies with stream channel and disturbances from adjacent stands	WRC,WH,WP,WL, ES	old growth characteristics, multi-aged, fairly dense but multi-storied canopy of large trees with shade tolerant understory	15-32 tons/ac

VRU	Climatic Modifier	% on KNF	Primary Fire Groups	Predominant Fire Regime	Historic Patch Size	Species Composition	Historic Stand Structure	Coarse Woody Material
7S 7N	Cool and Moist	20	9	* lethal, stand replacement >100 yr. FRI in LP/DF, 120-268 yr. in L/DF, up to 300 yrs in spruce bottoms * less prevalent nonuniform mixed severity, 50-70 yr. FRI in LP/DF, 38-120 yrs in L/DF, up to 120 yr. in ES	5,000 to 100,000 ac 100 ac or less	WL,LP,WP,ES,DF with GF,SAF	mostly even-aged single storied and two storied, some dense LP stands basal area ave. 80-120 sq ft	12-25 tons/ac
8	Cool and Wet	<1	9	fire is not a dominant disturbance agent infrequent low severity or stand replacement 150-250 yr. FRI (ave. 220 yrs)	varies with stream channel and disturbances from adjacent stands	WRC,WH,WP,WL,ES	old growth characteristics, multi-aged, fairly dense but multi-storied canopy of large trees with shade tolerant understory	12-25 tons/ac
9	Cool and Moderately Dry	10	7,8	* nonuniform stand replacement 100-115 yr. FRI * some mixed severity, nonuniform burns 50-71 yr. FRI	5,000 to 100,000 ac 50-300 ac	LP,SAF in frost pockets LP,SAF,ES,DF,WL on moist upland sites	even-aged LP with scattered relic overstory WL, some stands mixed with DF, SAF basal area ave.. 80-120 sq ft	12-25 Abla/Xete Abla/Libo 7-15 Abla/Vasc
10	Cold and Moderately Dry	2	10	* low -mixed severity 35-300+ years * stand replacement 200+ years	overall 200-30,000 ac, averages 2,400 ac	WBP, ES, LP with SAF,MH	fairly open stands with clustered trees uneven-aged, mosaic	7-15 tons/ac
11	Cold	<1	10	* low-mixed severity 35-300+ yrs * stand replacement 200+ years	overall 200-30,000 ac, averages 2,400 ac	alpine larch, WBP, ES,SAF	mosaic vegetative patterns, open stands with clustered and shrublike trees, uneven-aged	ave.. 11 tons/ac

* **Note:** mgmt. intended to emulate the fire regime in VRU 1 (NL 5-25 yr. FRI) would likely be in the 15-25 yr. return interval in order for a new cohort to become established prior to burning

Glossary

PATCH SIZE. Continuous areas of similar forest structure considered to be the area regenerated, at one time, following a fire.

FIRE SEVERITY. The degree to which a site has been altered or disrupted by fire; a product of fire intensity, fuel consumption, and residence time.

FIRE REGIME. The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, seasonality and extent in an ecosystem. At least three fire regime classes can be described for the forested ecosystems of the project area:

Nonlethal Fire Severity. A low-severity or cool fire with minimal impact on the site. It burns in surface fuels consuming only the litter, herbaceous fuels, foliage and small twigs on woody undergrowth. Little heat travels downward through the duff. nonlethal fires can be expected to result in up to 20% canopy cover loss.

Lethal (Stand Replacing) Fire Severity. A high-severity fire that burns through the overstory and understory consuming large woody surface fuels and potentially the entire

duff layer. Following this type of fire, anywhere from 70-90% of the mature canopy cover is killed, stand development is set back to an initiation stage, and stand replacement begins. Despite the intensity of these disturbances, it is common for scattered islands of unburned vegetation to remain in areas that are protected.

Mixed Fire Severity. A broad category of moderate fires which includes the characteristics of both lethal and nonlethal fires. Mixed severity fires can consume litter, upper duff, understory plants and foliage on understory trees. Individuals and groups of overstory trees may torch out if fuel ladders exist. This fire regime may result in anywhere from 20-70% loss in tree canopy occurring within a mosaic of stand condition