Appendix 4

Analysis Process for Forested Vegetation

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1. Introduction

Forested vegetation types were modeled using the Vegetation Dynamics Development Tool (VDDT) developed by ESSA Technologies, Ltd., of Vancouver, British Columbia. The VDDT is a user-friendly computer tool that provides a modeling framework for examining the role of succession, various disturbance agents, and management actions in vegetation changes (Beukema and Kurz 2000). VDDT models were constructed to answer the following analysis questions:

1. What effects do the alternatives have on vegetative conditions?
2. What effects do natural disturbances (wildfire and insects) have on vegetative conditions?
3. How well do the alternatives achieve their desired conditions?
4. What level of timber harvest is sustainable for this alternative?

2. Analysis Units

Analysis units were made up of forested vegetation with distinctly different characteristics that could be estimated, modeled, and then projected through time to analyze conditions and trends. Acres by analysis units were developed by combining information to represent vegetation in a manner that was meaningful for addressing the analysis questions. The information used to develop analysis units included the following:

1. Wildland-Urban Interface Analysis Area (described in Fire Management)
2. Management Prescription Categories (MPCs)
3. Potential Vegetation Groups (PVGs)
4. Macrovegetation (combinations of tree size class and canopy cover class)

2.1 Tentatively Suited Timberland Acres

Tentatively suited timberlands were not reassessed as part of the Forest Plan amendment. See the Timberland Resources section for additional information. The treatment of Riparian Conservation Areas and landslide-prone, high risk areas was the same for all alternatives and did not change from the modeling conducted for the 2003 Forest Plan (USDA Forest Service 2003). The analysis process for these areas is described in the *Southwest Idaho Ecogroup Land and Resource Management Plans FEIS*, Volume 2, Appendix B (Analysis Process) (USDA Forest Service 2003b).

2.2. Wildland-Urban Interface Analysis Area

The Wildland-urban Interface (WUI) Analysis Area was developed from the Community Protection Zone layer used in the Roadless Area Conservation, National Forest System Lands in Idaho Final Environmental Impact Statement (FEIS) (USDA Forest Service 2008). The WUI Analysis Area included approximately 146,800 acres of forested vegetation (PVGs 1–11) (Table 1). The number of forested acres outside the WUI Analysis Area was approximately 892,960 which includes the Sawtooth Wilderness. The distribution of some PVGs in and out of the WUI Analysis Area is similar to the Forest-wide distribution; for example, PVG 2 and

PVG 3 are equally distributed relative to the total acres in each grouping. PVGs 1 and 7 are also relatively similar. However, PVGs 4, 10, and 11 are skewed in and out of the WUI Analysis Area. For PVGs 4 and 10, much more exists in the WUI Analysis Area relative to the distribution Forest-wide; conversely, much less PVG 11 exists in the WUI Analysis Area than is found Forest-wide.

Table 1. Acres by Potential Vegetation Groups and in and out of the Wildland-Urban Interface (WUI) Analysis Area for the Sawtooth National Forest

PVG	Forest-Wide Acres	Percent of Total Forest-wide Acres (%)	Acres in WUI Analysis Area	Percent of Total WUI Analysis Area Acres (%)	Acres out of WUI Analysis Area	Percent of Total non-WUI Analysis Area Acres (%)
1	38,610	4	1,680	1	36,930	4
2	10,980	1	2,110	1	8,870	1
3	37,390	4	5430	4	31,960	4
4	208,410	20	42,500	29	165,910	19
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	330,120	32	43,800	30	286,320	32
8/9	0	0	0	0	0	0
10	203,140	20	41,500	28	161,640	18
11	211,110	20	9,780	7	201,330	23
Total	**1,039,760**	**100**	**146,800**	**100**	**892,960**	**100**

2.3 Management Prescription Categories

Each alternative has a different set of MPCs. MPCs were used in the modeling as a platform for assigning treatment types and rates. Treatment types were developed based on assumptions about the intent of the MPC. For example, treatments in some MPCs are primarily fire while other MPCs have combinations of mechanical and fire. The MPCs are as follows:

- MPC 1.1—Sawtooth Wilderness
- MPC 1.2—Recommended Wilderness
- MPC 2.1—Wild and Scenic Rivers
- MPC 2.2—Research Natural Areas
- MPC 3.1—Passive Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources
- MPC 3.2—Active Restoration and Maintenance of Aquatic, Terrestrial, and Hydrologic Resources
- MPC 4.1—Undeveloped Recreation Emphasis
- MPC 4.2—Roaded Recreation Emphasis
- MPC 4.3—Concentrated Recreation Emphasis
- MPC 5.1—Restoration and Maintenance within Forested Landscapes
- MPC 6.1—Restoration and Maintenance within Shrubland and Grassland Landscapes

MPCs that have mechanical treatments and provide for a sustainable level of outputs were labeled as suited for timber production, and volume from tentatively suited acres in these MPCs accrued toward the Allowable Sale Quantity (ASQ) (Table 2). Mechanical treatments within unsuitable MPCs accrued volume from timber harvest toward the Total Sale Program Quantity (TSPQ).

Table 2. Management Prescription Category Areas that Accrue Volume toward Allowable Sale Quantity versus Total Sale Program Quantity

MPCs Where Tentatively Suited Acres Accrue Toward Allowable Sale Quantity	MPCs that Accrue Toward Total Sale Program Quantity
4.2 4.3 5.1 6.1	3.1 3.2 4.1c

The individual MPCs were combined into groups to simplify the modeling process and reduce the number of analysis units. MPCs were grouped as follows:

1. MPC Group 1—MPCs 1.2, 2.0, and 2.2
2. MPC Group 2—MPCs 4.1c
3. MPC Group 3—MPC 3.1
4. MPC Group 4—MPC 3.2
5. MPC Group 5—MPCs 4.2, 4.3, 5.1, and 6.1
7. MPC Group 7—MPC 1.1

2.4 Potential Vegetation Groups

Vegetation composition is influenced by environmental (site) characteristics. Using habitat types to classify the landscape provides a logical framework for assessing succession, or vegetation changes, over time. Habitat types were grouped into PVGs based on the Ecosystem Diversity Matrix (Haufler et al. 1996). PVGs were mapped using a modeling process. The Sawtooth National Forest (Forest) was divided into 5th field Hydrologic Unit groupings that shared similar larger-scale environmental characteristics such as climate and geology. Models for each group were based primarily on slope, aspect, elevation, and land type associations but could also include forest inventory and cover type information, existing habitat type mapping, and cold air drainage models. Draft products were reviewed by ranger district personnel with some field verification. PVGs were combined with the Landsat coverages to create a product that reflected size class and canopy cover by PVG. This information was used to determine acres of macrovegetation within PVGs. Macrovegetation was used as the basic unit to assess vegetation.

The following are the PVGs on the Forest:

- PVG 1—Dry Ponderosa Pine (*Pinus ponderosa),* Xeric Douglas-Fir (*Pseudotsuga menziesii)*
- PVG 2—Warm Dry Douglas-fir, Moist Ponderosa Pine
- PVG 3—Cool Moist Douglas-fir
- PVG 4—Cool Dry Douglas-fir
- PVG 7—Warm Dry Subalpine Fir (*Abies lasiocarpa)*
- PVG 10—Persistent Lodgepole Pine (*Pinus contorta)*

- PVG 11—High-Elevation Subalpine Fir

2.5 Tree Size Class

The Ecosystem Diversity Matrix (Haufler et al. 1996) was used as the basis for determining the size class combinations for the modeling. Size class information was determined from satellite imagery (Landsat) classification developed by the University of Montana (Redmond et al. 1997). Current cover types, tree size class, and canopy cover class were determined from satellite imagery taken from 1991 to 1995. The two primary scenes for the Forest P40/R30 and P41/R29 were 1995 satellite images recorded in mid-July to early August. Accuracy for size class on the two primary scenes was 49 percent (perfect) and 71 percent (acceptable) for scene P40/R30 and 44 percent (perfect) and 83 percent (acceptable) for P41/R29.

A different method was used to define tree size class for the Minidoka Ranger District since this area was not included in the University of Montana classification effort. Tree size class and canopy cover class information were derived using the Forest's stand-level database (Rocky Mountain Resource Information [RMRIS]). District personnel delineated stands on aerial photos and orthophoto quadrangles and field collected stand-level data was interpolated from stands from which data had been gathered to stands that appeared to have similar characteristics. This information was summarized and integrated with the data obtained from the Montana Landsat classification.

The tree size class and canopy cover class attributes were updated in 2008 to reflect changes due to wildland fires and insect epidemics that had occurred after classification. Forest-wide, this update resulted primarily in changes to the sapling and small tree size classes; only minor changes occurred to the large tree size class (Figure 1). Cover types were not updated at the time due to ongoing efforts to develop a consistent cover type classification within Region 4. Once completed, forests will tier to this classification for future updates to existing vegetation mapping products.

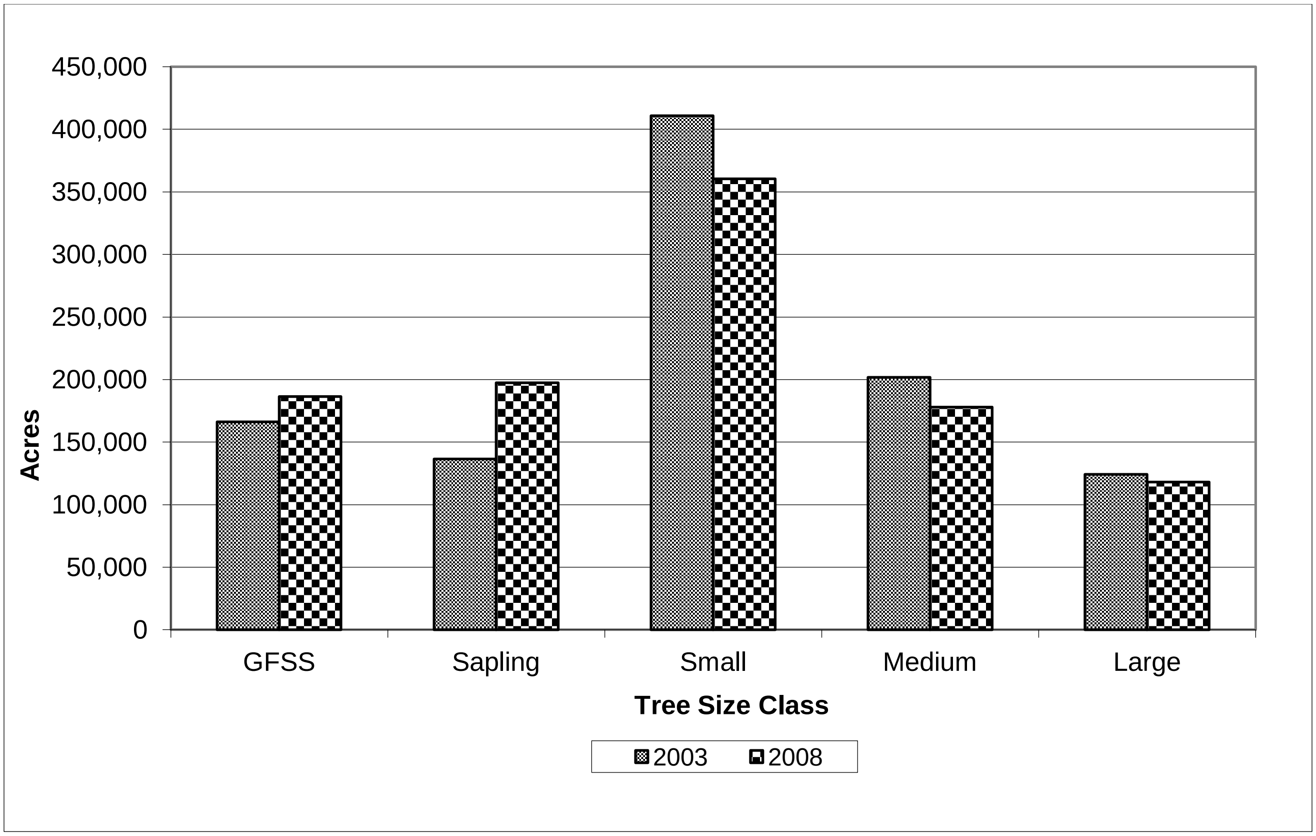

Figure 1. Acres of Tree Size Class Forest-wide in 2003 Compared to 2008 on the Sawtooth National Forest

Tree size classes are defined as follows:

- GFSS—0.0–0.9 inch diameter at breast height (d.b.h.)
- Sapling—1.0–4.9 inches d.b.h.
- Small Tree—5.0–11.9 inches d.b.h.
- Medium Tree—12.0–19.9 inches d.b.h.
- Large Tree—≥20.0 inches d.b.h.

2.6 Canopy Cover Class

The density of the vegetation was categorized into four canopy cover classes. The Landsat classification was also used to determine canopy cover. Accuracy for canopy cover class on the two primary scenes were 38 percent (perfect) and 88 percent (acceptable) for scene P40/R30 and 53 percent (perfect) and 96 percent (acceptable) for P41/R29. As described above in the Tree Size Class section, canopy cover class was adjusted to reflect changes from wildfires and insect epidemics after classification.

Canopy cover classes are defined as follows:

1. Open—0–9 percent
2. Low—10–40 percent

3. Moderate—41–70 percent
4. High—>71 percent

2.7 Vegetation Dynamics Development Tool Acres

Acres of forested vegetation were assigned a PVG, MPC Group, tree size class, canopy cover class, and a designation of in or out of the WUI Analysis Area. This information was developed in an Oracle database. Queries were used to generate the analysis unit labels and number of acres for the VDDT input files. Even though the information used to generate the VDDT acres was based on spatial (geographic information system [GIS] layers), the spatiality of the VDDT analysis units was not maintained once the input files were generated. For example, acres of an analysis unit labeled in the WUI Analysis Area, MPC Group 3, PVG 7, large tree size class, and moderate canopy cover class were combined and therefore represented any location where this combination occurred rather than a specific area on the forest.

The total number of analysis units was 111. In the VDDT model, each simulation pixel represented 10 acres. The VDDT model has a size limit of 50,000 pixels, therefore the largest simulation unit that can be modeled is 500,000 acres. Simulation units were alternatives by MPC Group in or out of the WUI Analysis Area. All simulation units were modeled with a ratio of 1 pixel to 10.00 acres (Table 3).

Table 3. Vegetation Dynamics Development Tool Simulation Units for Analysis of the Forested Vegetation on the Sawtooth National Forest by Management Prescription Category Group in and out of the Wildland-urban Interface Analysis Area

MPC Group	WUI Analysis Area (acres)	
	In	Out
1	2,450	161,860
2	32,610	197,050
3	30,340	147,020
4	59,920	148,900
5	21,480	128,750
7	N/A	109,380
Total	146,800	892,960

3. Modeling Forested Vegetation Process and Function

The modeling effort focused on the ecological process and function of the forested landscape and the interrelationships between successional pathways (how vegetation changes over time) and disturbance processes (wildfire, insects, and treatments). Coordination between silviculturists, fire management specialists, and wildlife biologists on the Forest provided the professional knowledge to refine the scientific information related to ecological process and function (Steele et al. 1981; Crane and Fisher 1986; Steele and Geier-Hayes 1987, 1989).

3.1 GROWTH MATRIX AND SUCCESSION

Successional pathways and the flow between macrovegetation units (tree size class and canopy cover class) were determined for each PVG. The grand fir PVGs (PVG5 and PVG6) do not occur on the Forest and wetter subalpine fir PVGs (PVG8 and PVG9) rarely occur and were not included. The combination of PVG, macrovegetation and successional pathway was called a Growth Matrix for the 2003 Forest Plan revision (Nass et al. 1998; planning record). The seven PVGs or combinations represented seven Growth Matrices which were reviewed, discussed, and adjusted numerous times by the silviculturists and fire management specialists on the Forest. Individual matrices were developed using a tabular format with the canopy cover class as the columns and tree size class as the rows (Table 4). The basic Growth Matrix consists of 12 cells, but some PVGs are represented by fewer. The full set of 12 cells is used for PVGs 2, 3, 4 and 7. Three PVGs used 9 cells; PVG 1 does not have high canopy cover class, and medium and large tree size classes are combined for PVGs 10 and 11. The length of time macrovegetation would remain in a particular cell of the matrix was assigned, and the movement among cells was indicated. Each cell was defined using trees per acre, basal area, and structure (single- or multistoried). The Growth Matrices were reviewed and revised by the silviculturists to accommodate the VDDT model for the Forest Plan amendment. The Growth Matrices were a foundational component of the VDDT model and defined succession without disturbance.

Table 4. Potential Vegetation Group 2 Growth Matrix for the Vegetation Dynamics Development Tool Modeling

Tree Size Class	Canopy Cover Class			
	None	Low (LO)	Moderate (MO)	High (H)
Grass/Forb/ Shrub/Seedling	0–20 years[a] 1.00 to SP-LO[b]			
Sapling (SP)		21–40 years 0.80 to SP-M 0.20 to SM-LO	41–60 years 1.00 to SM-MO	
Small (SM)		41–70 years 0.90 to SM-MO 0.10 to M-LO	61–90 years 0.05 to SM-H 0.95 to M-MO	91–130 years 1.00 to M-H
Medium (M)		71–100 years 0.95 to M-MO 0.05 to L-LO	91–120 years 0.05 to M-H 0.95 to L-MO	131–170 years 1.00 to L-H
Large (L)		101+ years 1.00 after 30 years to L-MO	121+ years 0.08 after 30 years to L-H 0.92 remains	171+ years 1.00 remains

[a]Range of years in the cell
[b]Proportion of acres assigned to the cell that move to identified cell at the end of the time period identified in the range. For example, all (1.00) of the acres in this cell move to Sapling [Tree Size Class] (SP)-Low (LO) [Canopy Cover Class] after 20 years.

3.2 EFFECTS OF WILDLAND FIRE (WILDFIRE, WILDLAND FIRE USE, AND PRESCRIBED FIRE)

The three types of fire (wildfire, wildland fire use [WFU], and prescribed fire) represented in the model were assumed to produce different results in order to isolate their effects. Prescribed fire and wildfire were assumed to set the low and high boundaries of wildland fire relative to the historic range of variability (HRV) (Figure 2). Prescribed fire was assumed to be primarily a "maintain" effect, WFU a "reset" effect, and wildfire a "replace" effect. That is, maintaining the current cell is generally accomplished with prescribed fire, altering canopy cover class from higher to lower in the same tree size class is generally accomplished with wildland fire use, and replacing the cell with GFSS generally occurs from wildfire.

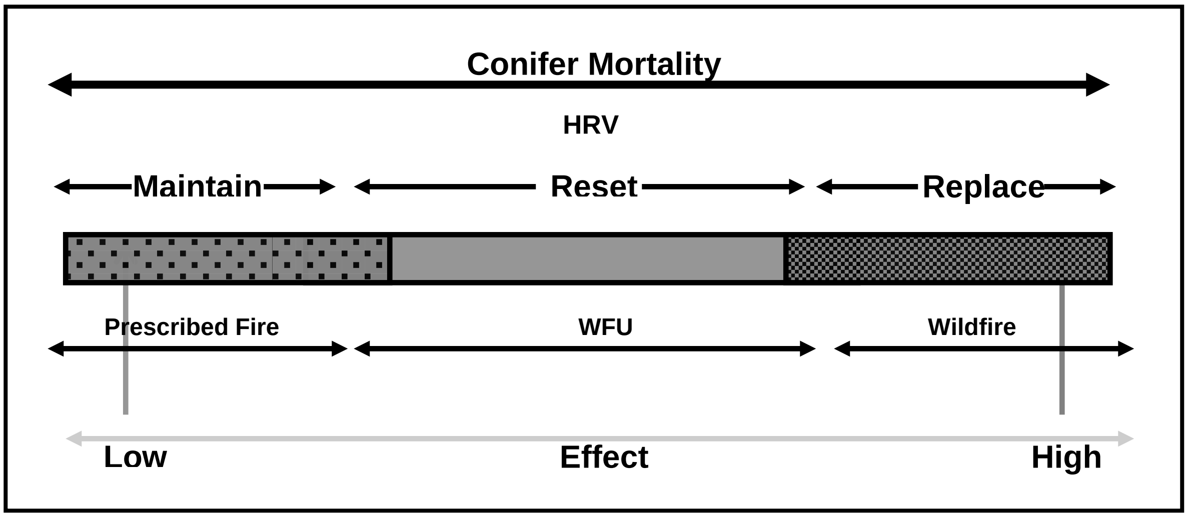

Figure 2. Assumptions about Effects of Wildland Fire Relative to the Historical Range of Variability

Wildfire was used as the starting point to determine nonlethal and lethal fire effects for wildfire and WFU. Wildfire was represented at the PVG level based on the historical macrovegetation and historical fire regimes (Table 5). Nonlethal and lethal effects were assigned to those cells that represented the historical condition and tested to determine if the potential mortality (amount of lethal) was within the range expected for the PVG based on the assigned historical fire regime. Relationships were adjusted until the results were close to the mortality assumptions described in Table 5. Table 6 displays an example for PVG 2. Based on the proportion of time lethal was estimated to occur for a particular cell and the proportion of acres that would be in that cell at HRV, the overall amount of lethal fire for the historical fire regime was 10 percent. Once the HRV lethal rates were established, relationships for non-HRV cells were adjusted using the HRV cells as a reference. The final combination was used to represent wildfire for a PVG (Table 7). The definition of wildfire in the current Forest Plan is an "unwanted wildland fire" categorized as either "uncharacteristic" or "characteristic" (USDA Forest Service 2003a, Volume 2, Glossary, p. GL-41). Using the approach described above, the resulting effects for wildfire are generally greater than historical and vary by fire regime (Table 8). The greatest differences are in the PVGs that were historically nonlethal, and the least differences are in the historically lethal fire regimes. The mixed fire regimes are intermediate. The final proportion of nonlethal to lethal determined the wildfire effects for each cell of a Growth Matrix for the VDDT modeling

(Table 7). This approach treats wildfire as producing the most extreme effects of the three types of fire (i.e., wildfire, wildland fire use, prescribed fire). The assumption for nonlethal fire is that (1) it burns but is suppressed during initial attack and therefore has little effect; or (2) it escapes initial attack and becomes a large fire with lethal effects.

Table 5. Characteristics of Historical Fire Regimes Defined for the Sawtooth National Forest

Fire Regime	PVG Assignments	Fire Interval	Fire Intensity	Vegetation Patterns (Agee 1998)
Nonlethal	PVG 1 PVG 2	5–25 years	≤10% mortality	Relatively homogenous with small patches, generally less than 1 acre, of different seral stages, densities, and compositions
Mixed1	PVG 3 PVG 4	5–70 years	>10–50% mortality	Relatively homogenous with patches created from mortality ranging in size from less than 1 to 600 acres of different seral stages, densities, and compositions
Mixed2	PVG 7 PVG 11	70–300 years	>50–90% mortality	Relatively diverse with patches created by mixes of mortality and unburned or underburned areas, ranging in size from less than 1 to 25,000 acres of different seral stages, densities, and compositions
Lethal	PVG 10	100–400 years	>90% mortality	Relatively homogenous with patches sometimes greater than 25,000 acres of similar seral stages, densities, and compositions; small inclusions of different seral stages, densities, and compositions, often resulting from unburned or underburned areas

Table 6. Example of Analysis of Lethal Assumptions for the Historical Fire Regime for Potential Vegetation Group 2

Tree Size Class-Canopy Cover Class	Proportion of Time Lethal	Proportion of Acres at HRV	Acres Used for Analysis	Acres of Lethal	Mortality (%)
Grass/Forb/ Shrub/Seedling	0.00	0.05	500	0	
Sapling-Low	0.20	0.04	400	80	
Small-Low	0.15	0.04	400	60	
Small-Moderate	0.30	0.01	100	30	
Medium-Low	0.10	0.05	500	50	
Medium-Moderate	0.20	0.02	200	50	
Large-Low	0.05	0.56	5,600	280	
Large-Moderate	0.20	0.23	2,300	460	
Totals		1.00	10,000	1,010	10

Table 7. Wildfire Effects for the Potential Vegetation Group 2-Growth Matrix

Tree Size Class	Canopy Cover Class			
	None	**Low (LO)**	**Moderate (MO)**	**High (H)**
GFSS	WFNL[a] 1.00 (GFSS)			
Sapling (SP)		WFNL 0.80 (SP-LO)[b] WFL[c] 0.20 (GFSS)	WFNL 0.65 (SP-MO) WFL 0.35 (GFSS)	
Small (SM)		WFNL 0.85 (SM-LO) WFL 0.15 (GFSS)	WFNL 0.70 (SM-MO) WFL 0.30 (GFSS)	WFNL 0.55 (SM-H) WFL 0.45 (GFSS)
Medium (M)		WFNL 0.90 (M-LO) WFL 0.10 (GFSS)	WFNL 0.75 (M-MO) WFL 0.20 (GFSS)	WFNL 0.60 (M-H) WFL 0.40 (GFSS)
Large (L)		WFNL 0.95 (L-LO) WFL 0.05 (GFSS)	WFNL 0.80 (L-MO) WFL 0.20 (GFSS)	WFNL 0.65 (L-H) WFL 0.20 (GFSS)

[a] WFNL = Wildfire nonlethal
[b]Proportion of acres assigned to the cell that move to identified cell from a nonlethal wildfire. For example, 80% (0.80) of the acres in this cell move to Sapling [Tree Size Class] (SP)-Low (LO) [Canopy Cover Class] from nonlethal wildfire
[c] WFL = Wildfire lethal

Table 8. Relationship of Current Wildfire to Historical Fire by Fire Regime

Fire Regime	PVG	Number of Times Greater Than Historical	Generalized Category
Nonlethal	1	2.14	Uncharacteristic ↕
	2	3.36	
Mixed1-Mixed2	3	1.56	
	4	1.51	
	7	1.84	
	11	1.00	
Lethal	10	0.97	Characteristic

WFU was modeled as representing intermediate effects between wildfire and prescribed fire. The proportion of lethal was less than that used for wildfire, and nonlethal either moved the cell ahead faster if in low canopy cover or moved from a higher to lower canopy cover class in the same tree size class (Table 9).

Table 9. Wildland Fire Use Effects for the Potential Vegetation Group 2-Growth Matrix

Tree Size Class	Canopy Cover Class			
	None	Low (LO)	Moderate (MO)	High (H)
GFSS	WFUNL[a] 1.00 (GFSS)			
Sapling (SP)		WFUNL0.95 (SP-LO + 10)[b] WFUL[c] 0.06 (GFSS)	WFUNL0.91 (SP-LO) WFUL 0.09 (GFSS)	
Small (SM)		WFUNL0.95 (SM-LO + 10) WFUL 0.05 (GFSS)	WFUNL0.92 (SM-LO) WFUL 0.08 (GFSS)	WFUNL0.89 (SM-MO) WFUL 0.11 (GFSS)
Medium (M)		WFUNL0.96 (M-LO + 10) WFUL 0.04 (GFSS)	WFUNL0.93 (M-LO) WFUL 0.20 (GFSS)	WFUNL0.90 (M-MO) WFUL 0.10 (GFSS)
Large (L)		WFUNL0.97 (L-LO + 10) WFUL 0.03 (GFSS)	WFUNL0.94 (L-LO) WFUL 0.06 (GFSS)	WFUNL0.91 (L-MO) WFUL 0.09 (GFSS)

[a] WFUNL = Wildland fire use nonlethal
[b] Proportion of acres assigned to the cell that move to identified cell from a nonlethal wildland fire use. For example, 95% (0.95 of the acres in this cell move to Sapling [Tree Size Class] (SP)-Low (LO) [Canopy Cover Class] from nonlethal wildland fire use[c] WFUL = Wildland fire use lethal

All prescribed fire was modeled as nonlethal and was only applied in those cells that had conditions the Forest's fuel specialists determined were operationally feasible. This determination was based on assumed ability to manage a prescribed fire to meet objectives while at the same time reducing the risk of escape. Table 10 displays an example for PVG 2.

Table 10. Use of Prescribed Fire (Rx) and Effects for the Potential Vegetation Group 2-Growth Matrix

Tree Size Class	Canopy Cover Class			
	None	Low (LO)	Moderate (MO)	High (H)
GFSS	Rx not used			
Sapling (SP)		Rx not used	Rx not used	
Small (SM)		Rx not used	Rx not used	Rx not used
Medium (M)		Rx (M-LO + 10)[a]	Rx (M-MO + 10)	Rx not used
Large (L)		Rx (L-LO + 10)	Rx (L-MO + 10)	Rx not used

[a]Effect of Rx fire. For example, after Rx fire "implemented", stays in Medium [Tree Size Class] (M)-Low [Canopy Cover Class] (LO) but increases age of cell by 10 years (+10)

Prescribed fire was modeled as a management activity used to achieve desired vegetative and natural fuels conditions. Treatments that are defined operationally as activity fuel mitigations were not included since these are not fire treatments per se but are a mechanical treatment using prescribed fire as a mitigation tool. Prescribed fire used as a mitigation tool was assumed to be included with the mechanical treatment. Decadal levels of prescribed fire were assigned to each MPC Group in and out of the WUI Analysis Area, and the average level over the first five decades was used to summarize the alternatives (Table 11). Levels vary slightly between Alternatives due to differences in assumptions about which PVGs would be targeted for treatment. Under Alternative B, nonlethal and mixed1 fire regime PVGs were the emphasis for the modeling based on the interpretation of the alternative, while under Alternative A all PVGs were treated equally.

Table 11. Decadal Levels of Prescribed Fire Averaged over the First Five Decades for Two Alternatives on the Sawtooth National Forest

MPC Group	Total (acres)		Alternative A (acres)		Alternative B (acres)	
	Alt A	Alt B	In[a]	Out	In	Out
1	8,910	8,910	140	8,770	140	8,770
2	17,080	16,010	750	16,330	740	15,270
3	8,980	8,880	770	8,210	770	8,110
4	23,410	23,850	1,550	21,860	1,510	22,340
5	1,220	1,380	140	1,080	180	1,200
7	0	0	0	0	0	0
Total	59,600	59,030	3,350	56,250	3,340	55,690

[a] In or out of the WUI Analysis Area

Wildland fire use was also modeled as a management activity at a rate of about 1 percent per year of the acres (Table 12). The slight differences between alternatives results from differences in treatment assumptions relative to PVGs which subsequently affects WFU outcomes, versus differences in WFU assumptions.

Table 12. Decadal Levels of Wildland Fire Use Averaged over the First Five Decades for Two Alternatives on the Sawtooth National Forest

MPC Group	Total (acres)		Alternative A (acres)		Alternative B (acres)	
	Alt A	Alt B	In[a]	Out	In	Out
1	1,610	1,620	20	1,590	20	1,600
2	2,390	2,160	320	2,070	290	1,870
3	1,760	1,790	320	1,440	320	1,470
4	2,040	2,110	580	1,460	570	1,540
5	1,490	1,550	220	1,270	220	1,330
7	1,010	1,010	N/A	1,010	N/A	1,010
Total	10,300	10,240	1,460	8,840	1,420	8,820

[a] In or out of the WUI Analysis Area

Wildfire was treated as a stochastic event that varied year to year. "Wildfire profiles" were developed from the Forest's fire occurrence database that dates from 1926 to 2008. The fire occurrence database summarizes wildfire and wildland fire use events. However, the years used to develop the statistics varied for each area. Statistics for the WUI Analysis Area were based on years ranging from 1946 to 2008, out of the WUI Analysis Area were based on years ranging from 1940 to 2008, and in the Sawtooth Wilderness from 1950 to 2008. Separate profiles were developed for in and out of the WUI Analysis Area and for the Sawtooth Wilderness after a sensing of the data revealed that the statistics varied for the three areas (Table 13). The WUI Analysis Area receives almost double the number of ignitions per acre per year as the WUI Analysis Area and the Sawtooth Wilderness, which are similar to each other. Average number of acres burned per year is greatest out of the WUI Analysis Area followed by the WUI Analysis Area. And though the Sawtooth Wilderness has about the same number of ignitions per acre per year as out of the WUI Analysis Area, the number of acres burned is much lower.

Table 13. Statistics for Sawtooth National Forest Fire Occurrence Database In and Out of the WUI Analysis Area and Sawtooth Wilderness from Various Years through 2008

Parameter	WUI Analysis Area		Sawtooth Wilderness
	In	Out	
Acres of area	146,790	892,960	109,380
Number of years of data	63	69	53
Number of occurrences	622	1,983	200
Average ignitions per year	10	29	4
Number of ignitions per acre per year	0.000067	0.000032	0.000034
Number of Analysis Area acres represented by each yearly ignition	14,868	31,071	28,986
Total acres burned from 1986 through 2008	95,250	187,100	7,330
Average acres burned per year	1,512	2,712	138
Average acres burned per ignition per year	153	94	37
Number of average sized fires it would take per year to burn 100% of the area	959	9,464	2,984

The profiles were developed to represent five different frequencies and sizes of wildfire. The results create a stochastic amount of wildfire for the modeling period that is bounded by the fire occurrence data used to create it (Table 14). The resulting profiles are the same for each analysis area for all alternatives. Figure 3 displays an example of the profile generated by VDDT for the WUI Analysis Area.

Table 14. Analysis Supporting Wildfire Profiles for the Vegetation Dynamics Development Tool Modeling for the Sawtooth National Forest

In WUI Analysis Area						
Class	Very low	Low	Normal	High	Very high	All
Percent of dataset (A)	58.73	19.05	9.52	4.76	7.94	1.0
Average acres per year (B)	2	25	58	257	18,752	
A times B	1	5	5	12	1,488	1,511
Multiplier for VDDT Model	0.0012	0.0167	0.0382	0.1702	12.4029	
Out of WUI Analysis Area						
Class	Very low	Low	Normal	High	Very high	All
Percent of dataset (A)	30.43	17.39	27.54	15.94	8.70	100
Average acres per year (B)	2	56	463	3,792	22,646	
A times B	1	10	127	605	1,969	2,712
Multiplier for VDDT Model	0.0009	0.0206	0.1706	1.3985	8.3516	
Sawtooth Wilderness						
Class	Very low	Low	Normal	High	Very high	All
Percent of dataset (A)	71.70	18.87	5.66	1.89	1.89	100
Average acres per year (B)	1	39	253	2,001	4,132	
A times B	1	7	14	38	78	138
Multiplier for VDDT Model	0.0106	0.2790	1.8296	14.4572	29.8612	
Forest-wide						
Total Average acres per year (B)	5	120	774	6,050	45,530	

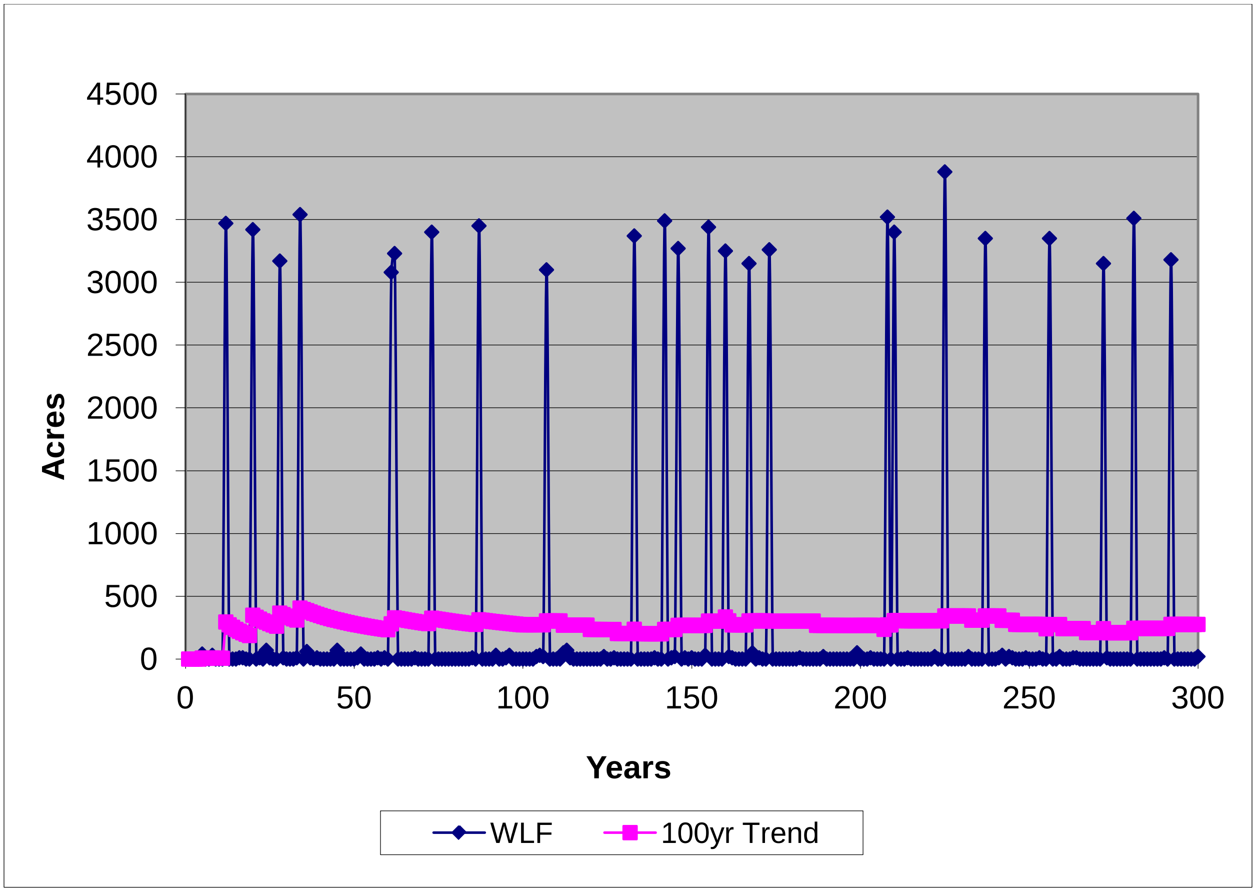

Figure 3. Vegetation Dynamics Development Tool Wildfire Profile for the WUI Analysis Area

Average acres per year affected by wildfire over the first five decades were 18,580 for Alternative A and 18,440 for Alternative B (Table 15). Annual fire sizes ranged from a low of 0 acres for all three analysis areas, to a high of 3,510 acres for the WUI Analysis Area, 11,480 acres outside the WUI Analysis Area, and 51,510 acres in the Sawtooth Wilderness. In combination, the greatest total number of acres burned for any one year was 61,779 acres.

Table 15. Decadal Levels of Wildfire Averaged over the First Five Decades for Two Alternatives on the Sawtooth National Forest

MPC Group	Total (Acres)		Alternative A (Acres)		Alternative B (Acres)	
	Alt A	Alt B	In[a]	Out	In	Out
1	3,370	3,260	30	3,340	30	3,230
2	4,540	4,540	630	3,910	620	3,920
3	3,570	3,460	590	2,980	590	2,870
4	4,120	4,060	1,140	2,980	1,090	2,970
5	2,980	3,120	400	2,580	380	2,740
7	12,480	12,480	N/A	12,480	N/A	12,480
Total	31,060	30,920	2,790	28,270	2,710	28,210

[a] In or out of the WUI Analysis Area

The modeled average per year (4,436 acres for Alternative A and 4,116 acres for Alternative B) over the first five decades for wildland fire (wildfire and wildland fire use) (Table 16) is close to the Forest's "normal" annual average of 4,362 acres of wildfire based on the fire occurrence data (Table 13). The largest fires modeled in VDDT occur between the range of the High and Very High fire size averages based on the fire occurrence database with the exception of the Sawtooth Wilderness, which had occasional fire sizes above the Very High. However, the average and the high end of the range from the fire occurrence database for the Wilderness is the result of one unusually large fire that originated on the Boise National Forest and burned into the Wilderness area. For the areas outside of the Wilderness, the modeled average and ranges are not as extreme as reflected by a few unusual years. However, the modeled average is slightly greater than the average for the "normal" years which may be more indicative of the sizes of "normal" year fires that could occur in the future as a result of a warming climate.

Table 16. Decadal Levels of Wildfire and Wildland Fire Use Averaged over the First Five Decades for Two Alternatives on the Sawtooth National Forest

MPC Group	Total (Acres)		Alternative A (Acres)		Alternative B (Acres)	
	Alt A	Alt B	In[a]	Out	In	Out
1	4,980	4,880	50	4,930	50	4,830
2	6,930	6,700	950	5,980	910	5,790
3	5,330	5,250	910	4,420	910	4,340
4	6,160	6,170	1,720	4,440	1,660	4,510
5	4,470	4,670	620	3,850	600	4,070
7	13,490	13,490	N/A	13,490	N/A	13,490
Total	41,360	41,160	4,250	37,110	4,130	37,030

[a] In or out of the WUI Analysis Area

3.3 Effects of Insects

Bark beetles (*Scolytidae* sp.) and defoliators were used to represent insect effects. Forest Health Protection aerial detection surveys for the past several years were used to calibrate the number of acres affected by insects Forest-wide. Insect effects were assigned to Growth Matrices based on assumptions about how the insects would impact species composition, size class, or canopy cover (used to assume density). Table 17 displays an example of the large tree size class low canopy cover for PVG 2. Insect activity was represented in the VDDT as bark beetle moderate and high (BB-MO, BB-HI) and defoliator moderate and high (DEF-MO, DEF-HI). Average annual acres affected by insects for the first 50 years were 2,270 for Alternative A and 2,260 for Alternative B.

Table 17. Insect Effects for the PVG 2 Large Tree Size Class, Low Canopy Cover Class Growth Matrix Cell

PVG 2 — **Large >20"**

Total Loss in 10 years (Med Large / SS/ Small)	**Dependency**	**Expected % loss over 10 years**		**Low 10-39% Canopy Cover**
				Pine 75-85%
PP < 9% **PP 20-50%**	Drought Dependent, Mistletoe may contribute to susceptibility	20-50%	Western Pine Beetle	**Primary Agent**
	Once every 30- 50 years	10-40%	Pine Butterfly (*Neophasia menapia*)	**Primary Agent**
	Multi-story. If there is no current mistletoe infection, the % = 0. Dwarf mistletoe (*Arceuthobium* spp.) ratings of >=3 may die within 10 years. May be killed by Western Pine Beetle (*Dendroctonus brevicomis*)	SS/Small:<9% of small trees for Dwarf Mistletoe ratings < 3 after 10 years. Med/Large: 10-37% for Dwarf Mistletoe ratings>=3 after 10 years	Western Dwarf Mistletoe	**Secondary Agent**
DF 1-30% **DF 6-30%**				**DF 15-25%**
	Drought Dependent, Mistletoe & Budworm (*Choristoneura fumiferana*) may contribute to susceptibility	10-30%	Douglas-fir Beetle (*Dendroctonus pseudotsugae)*	**Primary Agent**
	Multi-story, PP dom, DF understory	5-30% small trees	Western Spruce Budworm	**Secondary Agent**
	Multi-story, PP dom, DF understory.Dwarf mistletoe ratings of >=3 may die within 10 years May be killed by Douglas-fir beetle. If there is no current mistletoe infection, the % = 0	SS/small: <5% for Dwarf Mistletoe ratings < 3 after 10 years Med/Large 6-25% for Dwarf Mistletoe ratings>=3 after 10 years	Douglas-fir Dwarf Mistletoe	**Secondary Agent**

4. Modeling Forested Vegetation Mechanical Activities

As described for effects of wildland fire, mechanical treatments were categorized into broad management actions of maintain, reset, or replace. Seven mechanical activities were developed (Table 18) and assigned to PVGs, MPC Groups, and alternatives in order to capture inherent differences assumed to occur for each of these categories. Management activities were assigned first to PVGs to represent the biological screen for the different types of effects associated with the activities (i.e., some management activities are assumed to be biologically appropriate in some PVGs but not others).

Table 18. Description of Management Activities

Management Activity	Management Action (Effect on Growth Cell)	Synopsis
Precommercial thin (PCT)	Maintains or Resets	Mechanically thinning the stand when trees are generally less than 5 inches d.b.h. Does not regenerate
Commercial thinning from below (CTFB)	Maintains or Resets	Mechanically thinning the stand when trees are generally greater than 8 inches d.b.h. and focusing on taking the smaller, weaker, and poorest form trees to restore resilience. Does not regenerate.
Commercial thinning (CT)	Maintains or Resets	Mechanically thinning the stand when trees are generally greater than 10 inches d.b.h. and focusing on generating increased growth rates and leaving higher-quality trees. Does not regenerate.
Irregular shelterwood (IRSW)	Maintains or Resets or Replaces	Mechanically treating the stand to create space for regeneration of seral species while maintaining large-tree structure on the site. Overstory trees remain on-site and are not removed at a later date.
Shelterwood with overstory removal (SWOR)	Replaces	Mechanically treating the stand to create space for regeneration of seral species while maintaining large-tree structure on the site. A portion of the trees remaining on-site are removed later to favor the regenerated young trees.
Selection (SEL)	Maintains	Mechanically removing a portion of the trees of the various size classes to provide an uneven-aged or uneven-aged grouped structure. Also used to restore/maintain the desired structure and species composition. Regenerates.
Reserve tree clearcut (RTCC)	Replaces	Mechanically treating the stand to create space for regeneration of seral species. A few trees may remain on-site but not enough to maintain the initial treatment size class.

The second screen was the alternatives. Alternative A was assumed to allow for the full range of management activities described in Table 18 if appropriate for the PVG. Due to the standards for retention of old-forest habitat or large tree size class in the Forest Plan amendment, Alternative B was assumed to limit the use of management activities that replace in all PVGs except PVG10. The direction does not apply to PVG10 because this PVG does not develop large tree size class, or conditions described as old forest habitat. Management activities were developed for the two alternatives using the Growth Matrix. In total three scenarios were developed: Alternative A, Alternative B in the WUI Analysis Area, and Alternative B outside the WUI Analysis Area (Table 19). These assignments provided the basic information unit for each PVG within each alternative.

Table 19. Description of Management Activities for Three Analysis Scenarios using the PVG 2 Macrovegetation

Tree Size Class	Canopy Cover Class			
	None	Low (LO)	Moderate (MO)	High (H)
Alternative A				
GFSS				
Sapling (SP)		PCT (SP-LO + 10)[a]	PCT (SP-LO)	
Small (SM)		CT (SM-LO + 10) PCT (SM-LO + 10)	CT (SM-LO) CTFB (SM-LO) PCT (SM-MO + 10)	CT (SM-MO) CTFB (SM-MO) PCT (SM-MO)
Medium (M)		CTFB (M-LO + 10)	CT (M-LO) CTFB (M-MO + 10) SEL (M-MO)	CTFB (M-MO)
Large (L)		SWOR (GFSS) RTCC (GFSS) SEL (L-LO) CTFB (L-LO + 10)	IRSW (GFSS) SWOR (GFSS) RTCC (GFSS) SEL (L-MO) CTFB (L-LO)	IRSW (GFSS) SWOR (GFSS) RTCC (GFSS) CTFB (L-MO)
Alternative B in the WUI Analysis Area				
GFSS				
Sapling (SP)		PCT (SP-LO + 10)	PCT (SP-LO)	
Small (SM)		CT (SM-LO + 10) PCT (SM-LO + 10)	CTFB (SM-LO) PCT (SM-MO + 10)	CTFB (SM-MO) PCT (SM-MO)
Medium (M)		CTFB (M-LO + 10)	CTFB (M-MO + 10)	CTFB (M-MO)
Large (L)		CTFB (L-LO + 10)	CTFB (L-LO)	CTFB (L-MO)
Alternative B outside WUI the Analysis Area				
GFSS				
Sapling (SP)		PCT (SP-LO + 10)	PCT (SP-LO)	
Small (SM)		CT (SM-LO + 10) PCT (SM-LO + 10)	CTFB (SM-LO) PCT (SM-MO + 10)	CTFB (SM-MO) PCT (SM-MO)
Medium (M)		CTFB (M-LO + 10) SEL (M-LO)	CT 0.30 (M-LO)[b] CT 0.70 (M-MO + 10) CTFB 0.80 (M-MO + 10) CTFB 0.20 (M-LO) SEL (M-MO) IRSW (M-LO) PCT (M-MO)	CTFB (M-MO) IRSW (M-MO)
Large (L)		SEL (L-LO) CTFB (L-LO + 10)	SEL (L-MO) CTFB (L-LO) PCT (L-MO)	IRSW (L-LO) CTFB (L-MO)

[a]Effect of identified activity. For example, after a PCT is "implemented", stays in Sapling [Tree Size Class] (SP)-Low [Canopy Cover Class] (LO) but increases age of cell by 10 years (+10)
[b]Treatment that can have more than one effect. For example, after a CT "implemented", 30% (0.30) of the acres move to Medium [Tree Size Class] (M)-Low [Canopy Cover Class] (LO) and 70% (0.70) move to Medium [Tree Size Class] (M)-Moderate [Canopy Cover Class] (MO) with a 10 year (+10) increase in age in the cell for those acres that move.

Table 19 demonstrates the differences represented by the various screens. In this example, all management activities were deemed biologically appropriate for PVG 2 and the full suite of these activities were available in Alternative A. In Alternatives B outside the WUI Analysis Area, RTCC and SWOR were not made available since both are "replace" management actions and the IRSW was converted from replace to reset.

The last screen was the MPC Groups. Management intent, direction, standards, and guidelines vary between the MPC Groups, affecting the ability to use some management activities but not others. Some MPC Groups do not allow mechanical activities or contain direction that limits the use of some types of mechanical treatments but allows others depending on the effects. Some MPC Groups have no limitations. Table 20 displays an example of the MPC Group screens for PVG 2.

Table 20. Allowable Management Activities for Potential Vegetation Group 2 by Management Prescription Category Groups

Management Activity	MPC Group 1	MPC Group 2	MPC Group 3	MPC Group 4	MPC Group 5
PCT	No	No	No	Yes	Yes
CT	No	No	No	No	Yes
CTFB	No	Yes	No	Yes	Yes
IRSW	No	No	No	Yes	No
SWOR	No	No	No	No	Yes
SEL	No	No	No	Yes	Yes
RTCC	No	No	No	No	Yes

4.1 Management Activity Budgetary Costs

A cost was developed for each management activity in order to develop treatment costs for alternatives (Table 21). These costs relate to the amount of funding the Forest Service has used in the past to accomplish an acre of that activity and is referred to as a budgetary cost. The costs for each activity are held constant and therefore provide consistency across alternatives.

Table 21. Management Activity Costs

Activity[a]	Cost ($/acre)
Plant (PLT) (for whitebark pine restoration in PVG 11)	600.00
PCT	200.00
CT	820.00
CTFB	820.00
IRSW/REGEN (PLT or natural regeneration)	1,210.00
SWOR/REGEN (PLT or natural regeneration)	2,030.00
SEL/REGEN (PLT or natural regeneration)	1,210.00
RTCC/REGEN (PLT or natural regeneration)	2,030.00
WFU	156.00
Prescribed fire	50.00

[a]All mechanical treatment costs include activity fuel treatments

4.2 OPENINGS

Certain mechanical management activities can create openings as defined by the National Forest Management Act (NFMA). Such activities would be those that have a “replace” management action (Table 18). Whether or not the activity creates an opening varies based on the activity’s intensity, which can be different for the same activity in one MPC or PVG compared to another. Management-created openings were assumed to be 40 acres or less for the VDDT analysis process as specified under NFMA. An additional assumption was that an adjacent opening was not created until the treated area no longer qualified as an opening.

4.3 YIELDS

Yield tables were developed using the Forest Vegetation Simulator [Wykoff et al. 1982]) that is maintained by the Inventory and Monitoring Institute of the Forest Service in Fort Collins, Colorado. The PVGs were used as the basis for the yields. Yields were calculated in board feet and converted to cubic feet using a conversion factor. Two sets of yields were developed—one set for Alternative A and a second set for Alternative B—based on interpretations of management direction. Yields for each management activity were developed for tree size class and canopy cover class combinations (i.e., macrovegetation) (Table 22).

Table 22. Example of Board Foot Yields for Two Alternatives for PVG 2 Macrovegetation

Tree Size Class	Management Activity	Canopy Cover Class (board feet)		
		Low	Moderate	High
Alternative A				
Small				
	CT	1,581	2,961	4,250
	CTFB	N/A	2,612	3,750
	IRSW	N/A	N/A	N/A
	SEL	N/A	N/A	N/A
Medium				
	CT	N/A	4,250	N/A
	CTFB	3,201	3,750	5,152
	IRSW	N/A	N/A	N/A
	SEL	5,441	6,376	N/A
Large				
	CT	N/A	N/A	N/A
	CTFB	5,152	5,401	5,532
	SWOR	14,281	14,875	15,136
	RTCC	16,315	17,102	17,518
	IRSW	N/A	13,772	14,107
	SEL	8,759	9,181	N/A
Alternative B				
Small				
	CT	1,442	2,699	3,875
	CTFB	N/A	2,438	3,500
	IRSW	N/A	N/A	N/A
	SEL	N/A	N/A	N/A
Medium				
	CT	N/A	3,875	N/A
	CTFB	2,987	3,500	4,809
	IRSW	N/A	8,719	11,979
	SEL	4,961	5,813	N/A
Large				
	CT	N/A	N/A	N/A
	CTFB	4,809	5,041	5,163
	IRSW	N/A	N/A	12,862
	SEL	7,986	8,371	N/A

Note: Yields from the management activities were used to calculate TSPQ and ASQ.

5. Desired Conditions

The desired conditions for each alternative are described in the Forested Vegetation Diversity and Fire Regime Condition Class section in Chapter 3 of the EA. Two sets of desired condition goals were developed for the VDDT modeling—one for Alternative A, and a second for Alternative B and the Sawtooth Wilderness (Table 23). Alternatives differ in how well they meet the desired conditions for forested.

Table 23. Modeling Desired Conditions for PVG 2 Macrovegetation for Three Alternatives

Tree Size Class	Canopy Cover Class (proportion of total PVG acres)			
	None	Low	Moderate	High
Alternative A				
GFSS	0.07			
Sapling		0.03	0.03	
Small		0.06	0.08	0.0
Medium		0.08	0.13	0.0
Large		0.21	0.31	0.0
Alternatives B and the Sawtooth Wilderness				
GFSS	0.01			
Sapling		0.005	0.005	
Small		0.06	0.04	0.0
Medium		0.11	0.06	0.0
Large		0.45	0.25	0.0

6. Modeling Alternatives

Modeling was conducted iteratively for all alternatives. A single run for each alternative required setting up and running 10 simulation units (Table 3). Once all simulation units were run for an analysis area (i.e., in or out of the WUI), the results were loaded into a summary spreadsheet and reviewed against some basic criteria, including whether or not the ASQ outcomes met the nondeclining and even-flow requirements. Initial model setup was calibrated using the 2003 Forest Plan Alternative 7 outcomes as the starting point (Table 24). Treatment levels were established for each MPC Group based on the 2003 modeling. Once the skeleton model was framed, Alternative A was simulated. Though Alternative A is not an exact duplicate of the 2003 FEIS Alternative 7 due to some refinements in the interpretation of some treatments and the addition of stochastic wildfire, it was simulated as closely as possible to the original analysis. Once Alternative A was established, relationships within and between the MPC Groups were maintained for Alternative B to the extent possible in order to isolate differences in the alternatives to interpretations of differences in management direction and intent rather than differences in the basic model framework. All analysis areas were simulated one or more times. The maximum number of simulations for a single analysis area was six; however, some simulation units were run multiple times before summarizing the analysis area. Only one scenario was generated for MPC Group 7, the Sawtooth Wilderness, since management of this area is conducted under the area's Wilderness Management Plan and does not change by alternative.

Table 24. Activity Levels Modeled in the 2003 SPECTRUM Analysis for Alternative 7 and Activity Levels Modeled for Two Alternatives on the Sawtooth National Forest

Parameter	2003 SPECTRUM[a]	Total		Alternative A		Alternative B	
		Alt A	Alt B	In[c]	Out	In	Out
MPC Group 1 Acres							
MPC Group	164,400	164,410	164,410	2,450	161,960	2,450	161,960
WFU	14,410	1,610	1,620	20	1,590	20	1,600
Rx Fire	0	8,910	8,910	140	8,770	140	8,770
Total Fire	14,410	10,520	10,530	160	10,360	160	10,370
PCT	0	0	0	0	0	0	0
CT		0	0	0	0	0	0
CTFB	0	0	0	0	0	0	0
IRSW	0	0	0	0	0	0	0
SWOR	0	0	0	0	0	0	0
SEL	0	0	0	0	0	0	0
RTCC [d]		0	0	0	0	0	0
RTCC10	0	0	0	0	0	0	0
MPC Group 2 Acres							
MPC Group	229,820	229,820	229,820	32,690	197,130	32,690	197,130
WFU	10,520	2,360	2,160	320	2,070	290	1,870
Rx Fire	1,150	17,080	16,010	750	16,330	740	15,270
Total Fire	11,670	19,440	18,170	1,070	18,400	1,030	17,140
PCT	0	0	0	0	0	0	0
CT		290	110	20	270	40	70
CTFB	9,550	7,430	2,970	3430	4000	1390	1580
IRSW	0	0	0	0	0	0	0
SWOR	0	0	0	0	0	0	0
SEL	0	0	0	0	0	0	0
RTCC [d]		0	0	0	0	0	0
RTCC10	0	0	0	0	0	0	0
MPC Group 3 Acres							
MPC Group	229,820	177,470	177,470	30,383	147,090	30,380	147,090
WFU	15,390	1,760	1,790	320	1,440	320	1,470
Rx Fire	720	8,980	8,880	770	8,210	770	8,110
Total Fire	16,110	10,740	10,670	1,090	9,650	1,090	9,580
PCT	0	0	0	0	0	0	0
CT	0	0	0	0	0	0	0

CTFB		0	0	0	0	0	0
IRSW	0	0	0	0	0	0	0
SWOR	0	0	0	0	0	0	0
SEL	0	0	0	0	0	0	0
RTCC [d]		0	0	0	0	0	0
RTCC10	0	0	0	0	0	0	0
MPC Group 4 Acres							
MPC Group	208,980	208,980	208,980	60,000	148,980	60,000	148,980
WFU	15,020	2,040	2,110	580	1,460	570	1,540
Rx Fire	1,730	23,410	23,850	1,550	21,860	1,510	22,340
Total Fire	16,750	25,450	25,960	2,130	23,320	2,080	23,880
PCT	0	0	0	0	0	0	0
CT		1,340	3,000	1,050	290	2,270	730
CTFB	1,390	1,190	2,850	750	440	1,510	1,340
IRSW	0	0	0	0	0	0	0
SWOR	0	0	0	0	0	0	0
SEL	0	0	0	0	0	0	0
RTCC [d]		0	0	0	0	0	0
RTCC10	0	0	0	0	0	0	0
MPC Group 5 Acres							
MPC Group	150,280	150,280	150,280	21,510	128,770	21,510	128,770
WFU	0	1,490	1,550	220	1,270	220	1,330
Rx Fire	380	1,220	1,380	140	1,080	180	1,200
Total Fire	380	2,710	2,930	360	2,350	400	2,530
PCT	60	110	10	30	80	0	10
CT		1,730	2,320	290	1,440	550	1,770
CTFB	3,390	1,840	2,900	360	1,480	1,160	1,740
IRSW	600	1,720	1,720	350	1,370	0	1,720
SWOR	1,600	120	0	20	100	0	0
SEL	580	2,370	1,900	710	1,660	0	1,900
RTCC [d]		0	0	0	0	0	0
RTCC10	2,590	1,710	1,940	60	1,650	0	1,940

[a] Averaged over the first two decades; [b] Averaged over the first five decades; [c] In or out of the WUI Analysis Area; [d] Reserve tree clear-cut in PVGs other than PVG 10; RTCC10 is reserve tree clear-cut in PVG 10

7. Sensitivity Analysis

Alternative A was able to achieve the 2003 ASQ outcomes; therefore, it did not appear the wildfires and other changes impacted the macrovegetation such that commercial treatments would not be viable on the same number of acres as represented in the 2003 Forest Plan. The amount of change that occurred on the suited timberlands was much less than occurred on the tentatively suited timberlands, particularly in the small and medium tree size classes (Figure 1). Most of this change was decreases in the small and medium tree size class, moderate canopy cover class and increases in the sapling tree size class, low canopy cover class (Figure 4). However, most of the change was in the mixed2 and lethal fire regime PVGs (PVGs 7, 10 and 11) rather than the nonlethal and mixed1 fire regime PVGs (PVGs 1, 2, 3 and 4) (Figure 5).

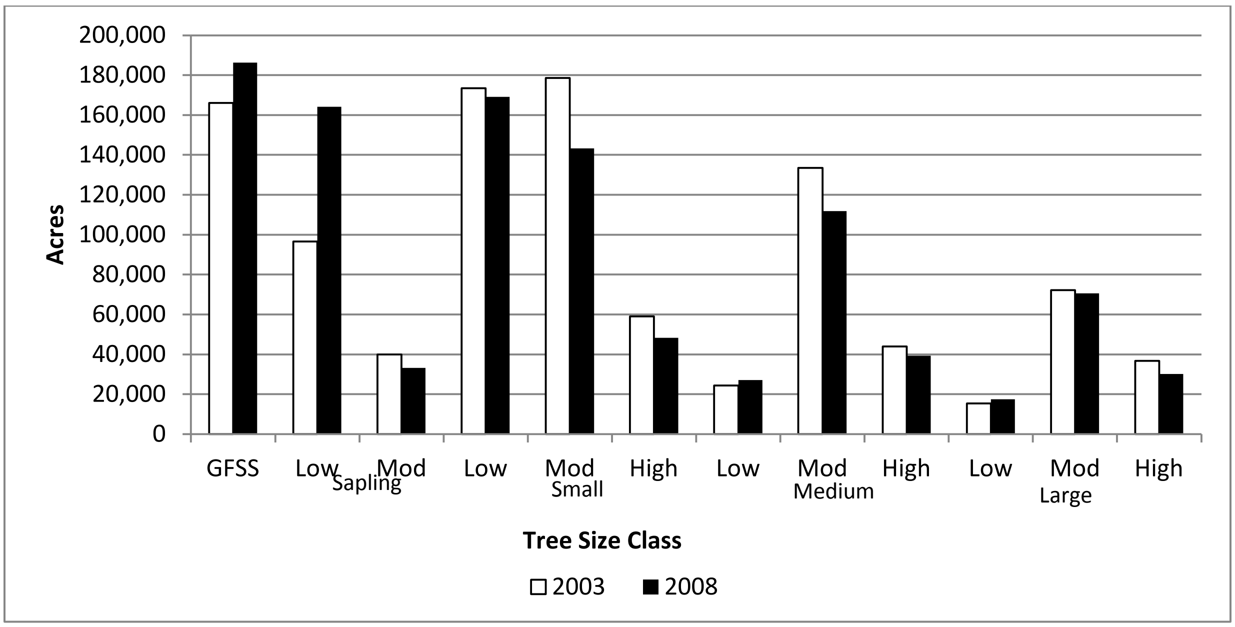

Figure 4. Macrovegetation Changes from the 2003 SPECTRUM Analysis to the 2008 Vegetation Dynamics Development Tool Analysis Forestwide

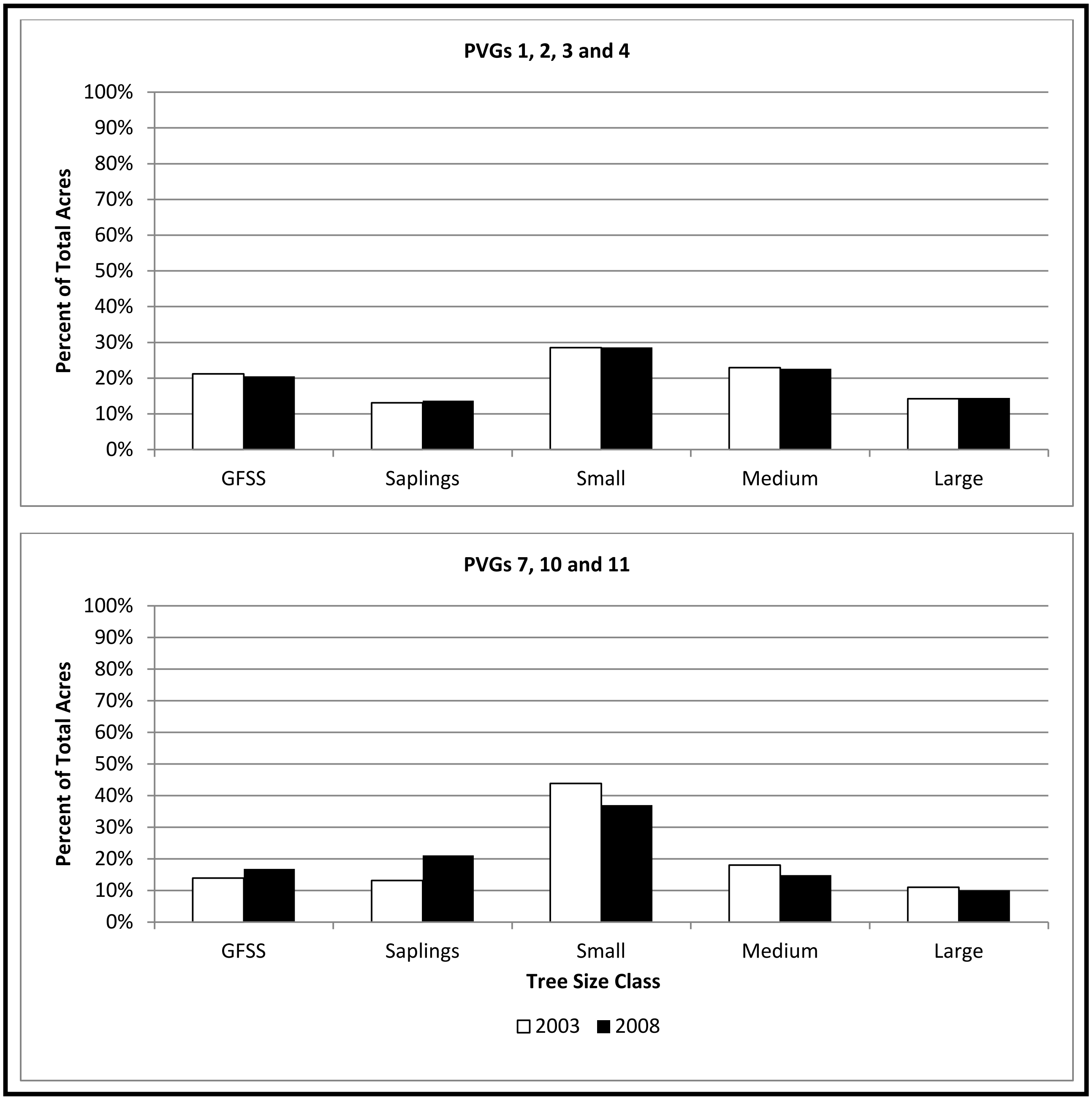

Figure 5. Macrovegetation Changes from the 2003 SPECTRUM Analysis to the 2008 Vegetation Dynamics Development Tool Analysis for PVGs 1, 2, 3 and 4 (Nonlethal-Mixed1 Fire Regimes) and PVGs 7, 10 and 11 (Mixed2-Lethal Fire Regimes)

8. Vegetation Dynamics Development Tool Model

The VDDT developed by ESSA Technologies, Ltd., of Vancouver, British Columbia, is a user-friendly computer tool that provides a modeling framework for examining the role of succession, various disturbance agents, and management actions for vegetation (Beukema and Kurz 2000). The VDDT model was designed to project changes in macrovegetation over time. It allows the projection of the combined effects of multiple factors—such as wildland fire, management treatments, pathogens, growth, and competition—over long time periods. The interaction of these factors can be quite complex and sometimes counterintuitive. The VDDT model provides a flexible framework for understanding this complexity by allowing users to define as many or as few interactions and connections as needed to tease out relationships. Figure 6 displays the relationships between the various analysis pieces and the VDDT model.

In the VDDT framework, landscapes are stratified into analysis units that share similar traits, usually definitions of macrovegetation and successional pathways. The tool allows users to create and display macrovegetation, pathways, disturbances, and treatments. Change along successional pathways is a function of time spent in a particular class. Once that time has passed, movement occurs to the next defined stage. Movement from disturbance or treatment is based on the probability of either and the defined effect (e.g., movement to another macrovegetative stage, resetting the original macrovegetative stage, timeframe).

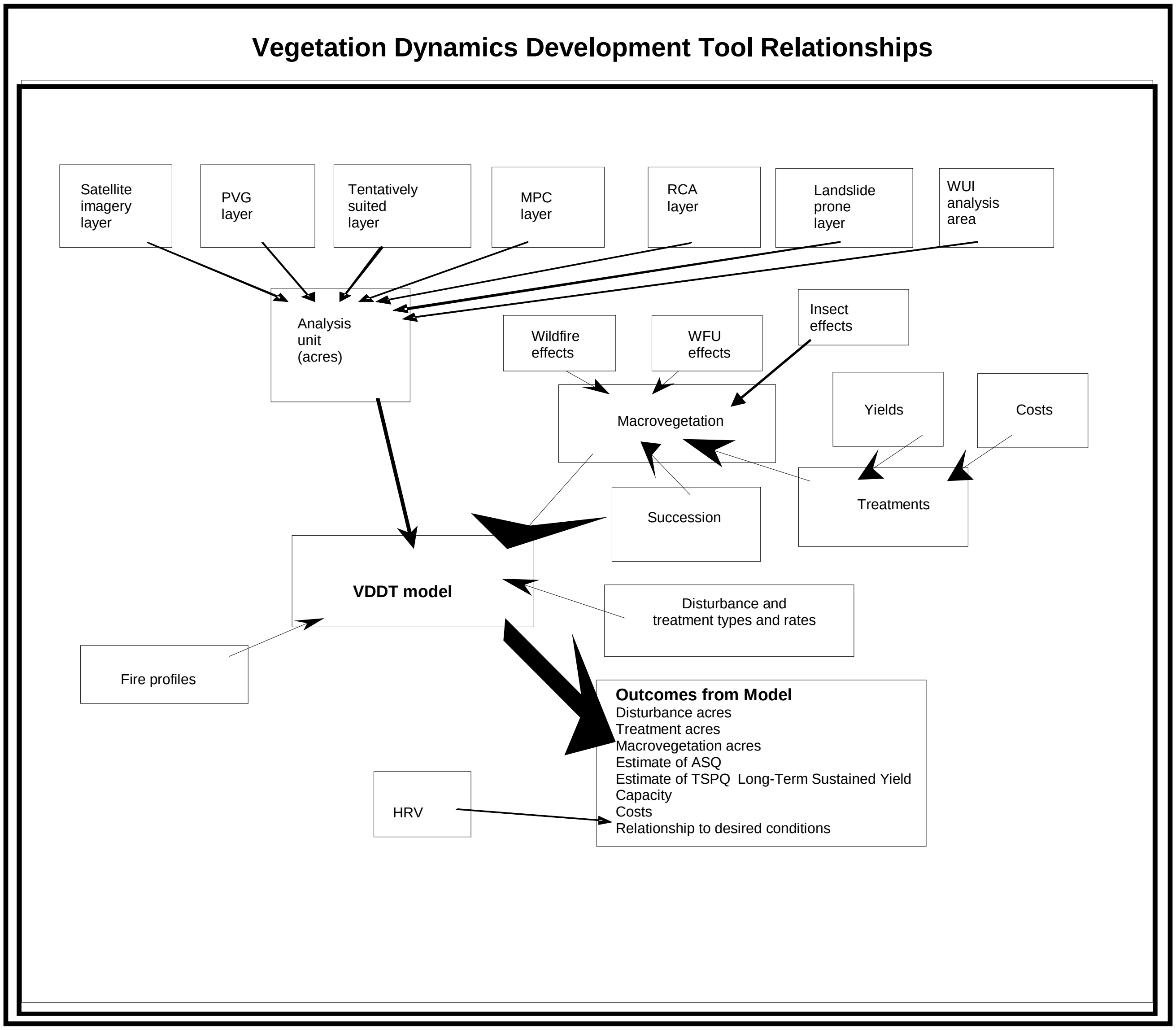

Figure 6. Schematic of the Interrelated Portions of the Vegetation Dynamics Development Tool (VDDT) Model

The model uses pixels as the unit of measure. The relationship of pixels to acres is defined by the user. The Forest Plan amendment analysis was based on one pixel to ten acres. Pixels are initially assigned to macrovegetation acres based on user-defined input files that usually represent the current condition. The model randomly assigns an age to each pixel based on the age parameters assigned to the macrovegetation. During model simulation, probabilities of disturbance and treatment are applied to pixels, which then move according to the defined effect. For each time period, disturbance probabilities are applied independent of what happened to a pixel in the past or the state of “adjacent” pixels. That is, the model does not account for the synergistic effects of disturbance like an insect epidemic followed by a wildfire, nor does it represent the risk to one pixel from a wildfire in a neighboring pixel.

Individual disturbances or treatments can be turned off or turned up quickly and any number of simulation years can be modeled. This flexibility is the primary power of the model as it allows users to quickly run and test a variety of scenarios and time frames. Another important aspect of the model is that it provides a common platform for resource specialists and managers to collectively define, test, and communicate complex systems and interactions.

8.1 Model Type

VDDT is a probability-based model within a platform of states and transitions. Once the current conditions have been defined, changes in acres (pixels) of macrovegetation (states) are a function of succession, disturbance, and treatment (transitions). The one downside of the model is that it does not represent contagion (the connectivity of treatments or disturbance over a landscape) or spatial patterning of change.

8.2 Outcomes from the Modeling Process

NFMA regulations (36 CFR 219.12(f) (9)) require that each alternative indicate the following:

- The conditions and uses that would result from long-term application of the alternative
- The goods and services to be produced, and the timing and flow of these resource outputs together with associated costs and benefits
- Standards and guidelines for resource management
- The purpose of the proposed management direction

The analysis for the Forest Plan amendment along with the current Forest Plan and proposed management direction (USDA Forest Service 2003a), meets the requirements listed above for the NFMA.

8.3 Acres of Forested Vegetation Macrovegetation

The VDDT model was run for 300 years. Acres of macrovegetation were summarized in output spreadsheets for decades 1 through 5, 10, 15, and 30. Basic result outputs were generated for the two alternatives in and out of the WUI Analysis Area and for the Sawtooth Wilderness (see example in Figure 7). Outputs were combined in a separate process as necessary to facilitate the various analyses presented in the EA.

8.4 Estimation of Allowable Sale Quantity, Total Sale Program Quantity, and Long-Term Sustained Yield Capacity

The sustainable level of timber harvest volume from suited acres is referred to as ASQ, and the total volume of timber harvested from suited and nonsuited timberlands is referred to as TSPQ. Long-term Sustained Yield Capacity (LTSYC) is an estimation of the timber harvest volume that can be sustained over time and provides a cap to the amount of ASQ that can be removed. Suited and nonsuited timberland acres are defined by MPC and other attributes and are discussed in greater detail in Timberland Resources. Estimates of the timber volume generated from mechanical treatments were included in the VDDT model to estimate ASQ, TSPQ, and LTSYC. ASQ, TSPQ, and LTSYC were modeled by analysis area, and alternative scenarios were adjusted as necessary to meet the nondeclining flow requirement in the Forest Service Handbook for ASQ tested using a trend-line (Figure 8). Scenarios that did not produce a positive trend-line were considered not viable and discarded. The areas in and out of the WUI Analysis Areas were later combined to develop the totals and trend-lines for the alternative as a whole.

Area-Wide Summary Report - All MPC Groups Combined

Area:	Sawtooth CPZ	Alternative:	NA
Acres:	146,917	Run Date:	28-Apr-10

Notes:
First try after fixing ages, IRSW pathways, and yields, etc.

28-Apr-10, 1200

Inputs

Natural Disturbances - Average Annual Acres

Decade	Wildfire	I & D	Both
1	7	601	608
2	691	688	1,379
3	327	767	1,094
4	363	740	1,103
5	7	898	905

Fire Summary

Long Term Average Return Intervals

Wildfire	WFU	MIF	All Fire
540	973	263	138

Management Disturbances - Average Annual Acres

Decade	PCT	CT	CTFB	IRSW	SWOR	SEL	RTCC	PLT	WFU	MIF	All
1	3	108	374	30	4	57	4	26	158	238	1,002
2	5	134	404	36	1	68	9	24	145	291	1,117
3	1	143	458	28	1	73	7	35	130	322	1,198
4	4	147	488	42	3	66	7	30	151	369	1,307
5	1	150	547	41	2	89	4	40	144	454	1,472

Costs and Outputs

Average Annual Amounts

Decade	Cost MM$	Timber ASQ MMBF	Timber non-ASQ MMBF	Timber Total MMBF	Timber Total CCF
1	0.6	1.079	1.755	2.8	4,972
2	0.6	1.230	1.978	3.2	5,628
3	0.7	1.152	2.248	3.4	5,965
4	0.7	1.297	2.412	3.7	6,507
5	0.8	1.462	2.606	4.1	7,137

Figure 7. Example of Vegetation Dynamics Development Tool Outcomes Up through Decade 5

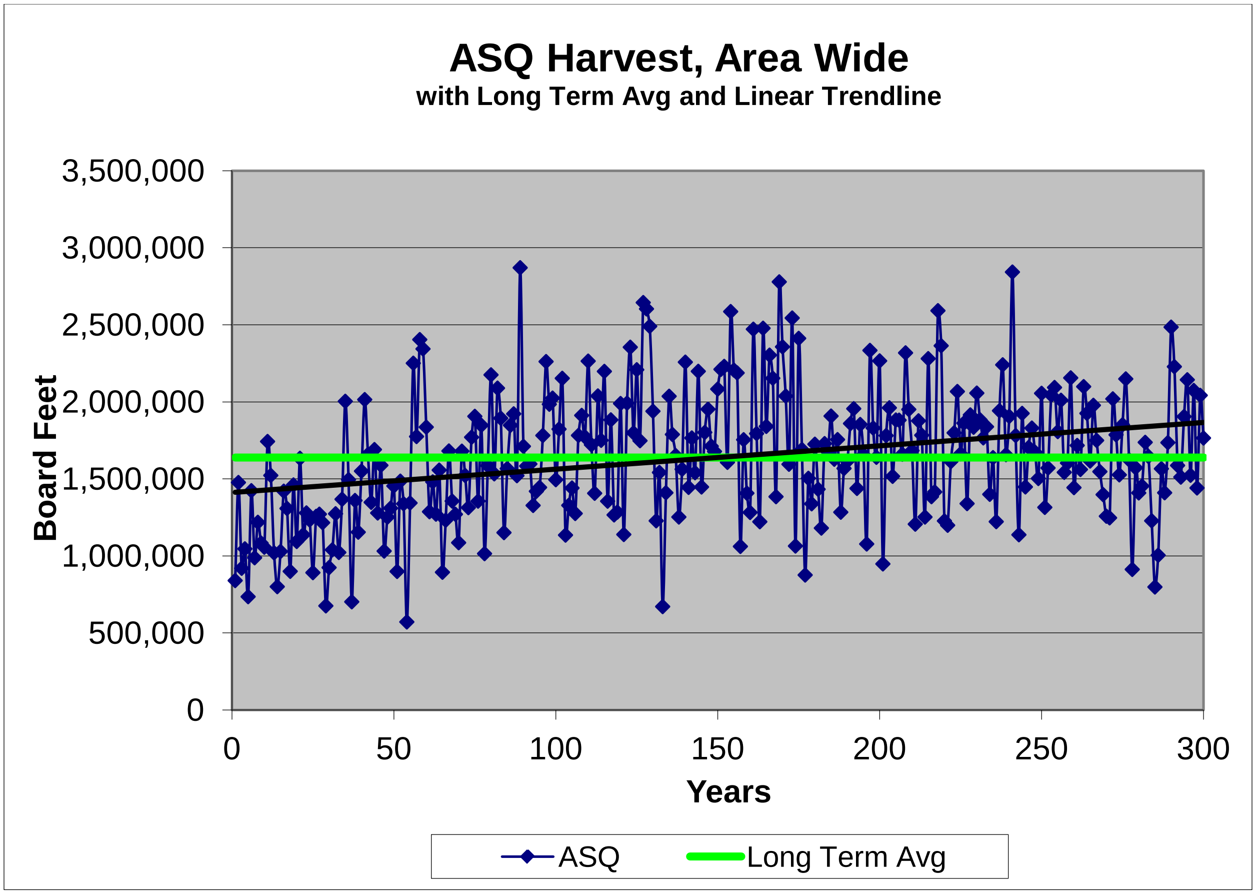

Figure 8. Example of Allowable Sale Quantity Vegetation Dynamics Development Tool Outputs with Linear Trend-line and Long-Term Average

LTSYC was developed based on assumptions about growth rates established for PVG 7. Of all the PVGs, growth rates in PVG 7 are the slowest and take the longest to get into the macrovegetation considered the endpoint of succession (large tree size class, high canopy cover class). From the GFSS stage, it takes 210 years to reach large tree size class, high canopy cover class. Therefore, it is assumed that the maximum possible long-term sustained yield would not be achieved until year 211 or later. It was also assumed that the timber yield per acre within all classes is equal across the span of years that define the class, and therefore the long-term sustained yield for large tree size class, high canopy cover class would not increase after year 211. That is, once acres move into the large tree size class, high canopy cover class, the yield assigned to this class does not change over time, which means that the maximum possible LTSYC for any given scenario would be reached no later than year 211. Expressed in terms of rotation lengths, rotations as long as 210 years for PVG 7—in combination with other, shorter rotations for other PVGs—could produce the greatest possible sustained yield over the long term. However, any rotations longer than 210 years would not generate any larger yield volumes, so the LTSYC could not increase past that point. LTSYC was therefore determined by taking the average of the annual ASQ volumes for years 211 through the end of the model simulation (i.e., year 300) for all PVGs. This approach assumes that every scenario simulated would have provided a chance to put every acre of suited timberland through at least one full rotation so that yields beyond that point would be the maximum possible for that scenario.

Terrestrial Wildlife

9. Introduction

The strategy for conserving wildlife species and their habitats is based on a fine-filter and coarse-filter approach. The fine-filter units are individual species defined as focal species. Focal species help link together landscape attributes and functions. The coarse-filter units are habitat families, which are groupings of focal species and their relationships with source habitats forest-wide (mid-scale). Species within habitat families occupy similar major vegetative "themes". In the Forested Biological Communities four habitat families were identified that represent different vegetative themes and different types of source habitat across the extent of forestlands. Measures for assessing focal species and habitat families were developed from many of the same data sources used to conduct the vegetation analysis described above, or were developed using outputs from the vegetation analysis. The primary analysis questions for terrestrial wildlife in the forested communities were:

1. How much source habitat existed historically?
2. How much source habitat exists currently?
3. What is the change between historical and current source habitat and arrangement across the Forest?
4. How do risks to source habitat vary across the forest?
5. What is the current sustainability outcome for focal species and habitat families?
6. How do the alternatives affect source habitat trends for focal species and habitat families?
7. How do the alternatives affect source environments for habitat family 3?
8. How do the alternatives affect sustainability outcomes for focal species and habitat families?

Additional details regarding the Terrestrial Wildlife Analysis Process are contained in the *Wildlife Technical Report for the 2011 Sawtooth National Forest Plan Amendment to Implement a Forest Wildlife Conservation Strategy*. The technical report also contains discussions regarding the limitations of the use of some data and methodologies (e.g. focal species).

10. Selection of Focal Species

A total of 345 terrestrial vertebrate species known or expected to occur on the Forest were compiled from a variety of data sources. This list was cross-referenced against species identified by the State of Idaho, other Federal agencies, and conservation organizations. Of the 345 species, 207 were identified as species of conservation concern or interest. The identified species included those on the U.S. Fish and Wildlife Service list of threatened, endangered, proposed or candidate species and the Region 4 Regional Forester sensitive species list as well as species selected through other criteria. Species dropped from the list met the following criteria:

1. The species was not identified by the U.S. Fish and Wildlife Service as threatened, endangered, proposed or candidate
2. The BLM or Forest Service (Region 4) did not designate the species as sensitive
3. The species was not identified as rare at the global (G1-G3) or state (S1-S3) level

4. The species was not identified as a species of potential concern in the Interior Columbia Basin (ICB) assessment or by the state of Idaho

Each of the 207 species was assigned to a habitat family using the process documented by Wisdom et al. (2000). Any species assigned to a habitat family by Wisdom et al. were maintained in that same family. Species not identified by Wisdom et al. were assigned by Forest personnel based on habitat information from the NatureServe (2009) species accounts. Two additional families not identified by Wisdom et al. were developed for a total of 14 families for the Forest. Of these 14 families, 4 are tied to upland forestlands. These 4 families (Family 1, 2, 3 and 4) were those evaluated through this assessment of the Forested Biological Communities.

Focal species represent a subset of the species assigned to a family. They serve as an "umbrella" under which numerous species, ecological functions, effects, and outcomes can be evaluated. Surrogate species are often selected for analysis when it is not feasible to address the life requisites of all species that could potentially occur on a landscape the size of a national forest. Focal species were used in this assessment to address key ecosystem attributes important to a number of species; they were not intended to act as direct surrogates for other species. Surrogate species approaches work best at broad management scales where management objectives are designed to conserve a large number of species or represent broad biodiversity issues.

Focal species were selected to represent the full array of responses to the kinds of conditions that may result from management activities. Focal species were selected using Key Ecological Functions (KEFs) and Key Environmental Correlates (KECs). KEFs are the set of ecological roles performed by a species in its ecosystem and KECs are how a species responds to biotic and abiotic habitat features within their environment. Of the two factors, KECs are most often the factor affected by land management activities.

The ICB project developed a Species Environmental Relations (SER) database that identified KEFs and KECs for species in the ICB area. This database provided a mechanism for selecting focal species for the forest. The selection was a systematic process that assessed the full set of KEFs and KECs embodied by an individual species, from which the set of species that best represented as many as possible KEFs and KECs in a family were selected. The intent was to select the fewest species that represented the greatest number of KEFs and KECs with the caveat that all threatened, endangered, proposed, candidate and sensitive species, and Management Indicator Species be included in the subset. Additional considerations included selection of species with more demanding habitat requirements or narrower habitat associations, as well as species that represented KEFs or KECs which could be affected by management actions. Table 25 displays the number of KEFs and KECs covered by the selected focal species. Differences between the total number of KEFs and KECs versus the numbers covered by the focal species are due to one or more of the following:

1. The SER database is hierarchical; some KEFs or KECs are subsets of others and only the broadest category was attributed to the species;
2. Some KEFs or KECs are not affected by management actions;
3. Some KEFs or KECs are covered by selection of focal species in one or more or the other families within the Forested Biological Community

Table 25. Total Number of Species Assigned, Number of Focal Species, Total Number of KEFs, Number of KEFs Covered by the Focal Species, Total Number of KECs, Number of KECs Covered by the Focal Species for Four Habitat Families on the Sawtooth National Forest

Family	Total Number of Species Asigned	Number of Focal Species	Total Number of KEFs	Number of KEFs Covered by Focal Species	Total Number of KECs	Number of KECs Covered by Focal Species
1	4	2	9	8	55	24
2	36	11	38	27	106	80
3	6	3	20	9	55	34
4	1	1	5	5	9	9

11. Describing Historical and Current Source Habitat

11.1 Source Habitat

Based on the best available science, species relationships with source habitats were determined for the 17 focal species used in the analysis; family source habitat relationships were aggregated from the information developed for the focal species included in a family. Detailed summaries intended for use at the mid- and fine-scale were developed for each focal species. Vegetative elements described in the literature were cross-walked to PVG-macrovegetation (tree size class and canopy cover class) combinations in order to link to the alternative comparison outcomes generated through the forested vegetation analysis (see Forested Vegetation sections 2.4, 2.5 and 2.6 in this Appendix). Habitat components important for each species were condensed to provide a “best fit” to the elements used to describe vegetation. To assess the change in source habitat distribution, the spatial layers used to generate the VDDT simulation units (see Analysis Process for Forested Vegetation section 2.7 in this Appendix) in addition to the 5th HUC watersheds were analyzed spatially using GIS. The same forested vegetation source habitat definitions of PVG-macrovegetation combinations were assessed in both the VDDT and GIS analyses. However, for the spatial analysis source habitat provided by vegetation other than forestlands (e.g. shrublands, woodlands) was also included based on the LANDFIRE covertypes. This information was not used in the VDDT modeling for this assessment since the focus was the Forested Biological Communities.

Source habitat definitions were developed for the 17 focal species and the 4 habitat families. Two types of habitat were identified: 1) historical source habitat and 2) departed habitat. Historical source habitats were the PVG-macrovegetation combinations that species would have used pre-European settlement. Departed habitats are PVG-macrovegetation combinations that can develop source habitat characteristics for species in addition to what has been defined as historical source habitat. These are conditions that likely occurred in small amounts in the historical landscape, but are much more extensive currently and therefore represent a greater opportunity to some species. For the analysis, departed habitats are those conditions that were not identified as part of the HRV (see Chapter 3, Forested Vegetation Diversity and Fire Regime Condition Class section 3.2.1.3). An example is the large tree size class, high canopy cover class in PVG 2. Historically this macrovegetative condition was considered to be rare on the landscape because of frequent disturbance. However, due to changes in disturbance regimes, this combination occurs currently (see Chapter 3, Forested Vegetative Diversity and Fire Regime Condition Class section 3.2.4.1 Table 3-14) and some focal species, particularly those in Family 2, can use these vegetative conditions similar to source habitat. Departed habitat definitions were developed for some but not all species.

11.2 Historical Source Habitat

Historical source habitats were determined forest-wide using the low and high end of the HRV for the PVG-macrovegetation combination, and for each 5th HUC watershed based on the mean of the low and high end of the HRV range (see Forested Vegetation Diversity and Fire Regime Condition Class section 3.2.1.3). For the watershed, the amount of historical source habitat was estimated based on a weighted average of the HRV mean using acres of PVG. Though the results could not be displayed spatially, the historical source habitat acre estimates for each species and family were assigned to each watershed within the GIS attribute table. The estimate for each species and family was cross-walked to a “Historical Source Habitat” class that was displayed for each watershed to compare watersheds forest-wide. These classes were:

0. None [no source habitat]
1. >0% but < 25% [of the watershed] area [contained source habitat]
2. >= 25% but < 50% [of the watershed] area [contained source habitat]
3. >=50% but <75% [of the watershed] area [contained source habitat]
4. >=75% [of the watershed] area [contained source habitat]

11.3 Current Source Habitat

Current source habitat acres were determined forest-wide, and for each 5th HUC watershed based on the acres of historical and departed PVG-macrovegetation combinations. Though results from this assessment could be displayed spatially, the current source habitat estimates for each species and family were assigned to each watershed within the GIS attribute table. Using the same classes described in section 2.2, a “Current Source Habitat” class was generated from the results in order to compare watersheds forest-wide.

11.4 Change in Source Habitat from Historical to Current

Historical estimates of source habitat were compared to current for each watershed to generate a change class. Acres of historical or current source habitat were converted to a percentage of the watershed and a “Change in Source Habitat” class was generated from the difference between these two values. The classes were:

0. No Source Habitat
1. Decrease in Habitat >= 60% [from historical to current]
2. Decrease in Habitat >= 20% and < 60% [from historical to current]
3. Decrease or Increase in Habitat <20% [from historical to current]
4. Increase in Habitat >=20% and <60% [from historical to current]
5. Increase in Habitat >= 60% [from historical to current]

The display of these classes for each species and family was used to assess changes in the quantity and distribution of source habitats across the forest.

Source habitat models for wolverine and Canada lynx were different than as described above. Because of the way source habitat was defined for these two species, historical source habitat estimates could not be developed. The same was true for the forest-wide current source habitat estimates that linked to the VDDT modeling. Therefore, for these two species only the current source habitat developed through spatial analysis was used in the assessment.

12. Characterizing Risk Factors

Through the summary of the analysis related to species and their habitats, several types of risk were identified. Based on a synthesis of the information, the risk factors chosen for the analysis were road density, noxious weeds, livestock grazing, and winter recreation. Spatial datasets for all four risk factors had been developed for the 2003 Forest Plan (USDA Forest Service 2003b). Only risk factors that were relevant to a focal species or family were assessed.

Each risk factor spatial dataset was intersected with a layer that displayed "Source Habitat Capacity" which was an attribute distinct from historical and current source habitat. Source habitat capacity was based on the PVGs that defined the PVG-macrovegetation source habitat combinations and represented the spatial extent of area (see Forested Vegetation section 2.4) where source habitat macrovegetation could be present at some point in time. For this analysis it was the mapped extent of the PVG based on the assumption that the entire PVG area has the capability to produce source habitat. Though the mapped extent of the PVGs contains some area that at the site-scale has low potential to produce vegetation (e.g. rock outcrops) the amount of area in this condition is very small. Analyses of the risk factors were conducted for watersheds based on the intersection of the risk factor with source habitat capacity, not the watershed as a whole.

The road density dataset contained all mapped roads regardless of status. Because of this, some areas may have over-estimated densities because roads have been closed. Conversely, unmapped open roads, or user-created roads are unaccounted. This dataset was used because it was the most comprehensive information available forest-wide. Each watershed was assigned to a road density category of <0.7 miles per square mile; 0.7 to 1.7 miles per square mile; >1.7 miles per square mile based on the intersection of the risk factors with source habitat capacity.

The dataset for noxious weeds was based on "weed susceptibility" which was defined as areas that have the potential to establish populations of leafy spurge, rush skeleton weed, diffuse knapweed, spotted knapweed, and yellow star thistle under the right conditions. Noxious weeds may or may not be present currently. The livestock grazing risk factor was assessed using the range suitability layer which displays areas suitable for livestock grazing. Similar to the weed susceptibility layer, livestock grazing can occur in these areas but may or may not be ongoing currently. Weed susceptibility and livestock grazing risks were assigned to one of five categories based on the overlap of the risk factor with source habitat capacity area:

0. None [no overlap of risk factor with the source habitat capacity area]
1. >0 but <25% [of the source habitat capacity] area [overlaps with a risk factor]
2. >=25% but <50% [of the source habitat capacity] area [overlaps with a risk factor]
3. >=50% but <75% [of the source habitat capacity] area [overlaps with a risk factor]
4. >=75 % [of the source habitat area capacity] area [overlaps with a risk factor]

Winter recreation risk was analyzed using the winter Recreation Opportunity Spectrum (ROS). Like described for livestock grazing the ROS identifies the potential for winter recreation, not actual use. Of all the winter recreation activities that can occur across the forest, motorized winter recreation was the factor of greatest interest. This risk factor was evaluated using the same classes described for weed susceptibility and range suitability.

13. Determining Sustainability Outcomes

Changes in habitat, risk factors and species occurrence data were used to develop sustainability outcomes for each focal species for alternative comparison. Sustainability outcomes were determined through use of a “matrix” that provided a means to combine current baselines, habitat connectivity on the landscape, and risks to focal species in a consistent manner. Six conservation principles structure the matrix:

1. Species well distributed across their range are less susceptible to extinction than species confined to small portions of their range.
2. Habitat in contiguous blocks is better than fragmented habitat.
3. Large blocks of habitat containing large populations of species are superior to small blocks of habitat containing few individuals.
4. Blocks of habitat close together are better than blocks far apart.
5. Interconnected blocks of fragmented habitat are better than isolated blocks, and dispersing individuals travel more readily through habitat resembling that preferred by the species in question.
6. Blocks of habitat that are in areas where the direct and indirect effects of human disturbance are low are more likely to provide all elements of species’ source environment than areas where it is not.

Quantitative and qualitative indicators, called conservation principle indicators (CPIs) were the mechanism for assessing sustainability. Each CPI was assessed using a low, moderate or high relative risk category. The number of CPIs for each conservation principle ranged from one to three. The change in source habitat from historical to current, the risk factors described above, and information such as species occurrence and distribution were used to assess CPIs. In many cases the CPIs and their measures are a surrogate for representing risk as direct measures of risk are often not available. For example, the road density risk factor is a surrogate measure for CPIs used to assess conservation principles related to fragmentation and human disturbance since direct measures of these risks are not available.

Each CPI was characterized individually. Multiple CPIs occurring within one conservation principle were considered together. A detailed discussion of the synthesis of the matrix was used to determine and document the current sustainability outcome for each focal species. Sustainability outcomes were defined as Outcome A, B, C, D or E:

- **Outcome A—**Suitable environments are either broadly distributed or of high abundance compared to their historical distribution. The combination of distribution and abundance of environmental conditions provides opportunity for continuous or nearly continuous intraspecific interactions for the focal species. Species with this outcome are likely well distributed throughout the planning area.

- **Outcome B—**Suitable environments are either broadly distributed or of high abundance compared to their historical distribution, but gaps exist where suitable environments are absent or only present in low abundance. However, the disjunct areas of suitable environments are typically large enough and close enough to permit dispersal among subpopulations and to allow the species to potentially interact as a metapopulation. Species with this outcome are likely well distributed throughout most of the planning area.
- **Outcome C—**Suitable environments are distributed frequently as patches and/or exist at low abundance. Gaps where suitable environments are either absent or present in low abundance are large enough such that some subpopulations are isolated, limiting opportunity for intraspecific interactions. Opportunity exists for subpopulations in most of the planning area to interact, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in species' range in the planning area may have resulted. Species with this outcome are likely well distributed on only a portion of the planning area.
- **Outcome D—**Suitable environments are frequently isolated and/or exist at very low abundance. While some of the subpopulations associated with these environments may be self-sustaining, limited opportunity exists for population interactions among many of the suitable environmental patches. For species for which this is not the historical condition, reduction in the species' range in the planning area may have resulted. These species are likely not well distributed in the planning area.
- **Outcome E—**Suitable environments are highly isolated and exist at very low abundance, with little or no possibility of population interactions among suitable environmental patches, resulting in strong potential for extirpations within many of the patches and little likelihood of recolonization of such patches. There has likely been a reduction in the species' historical range, except for some rare, local endemics that may have persisted in this condition since the historical time period. Species with this outcome are not well distributed throughout much of the planning area.

The information used to develop the sustainability outcomes for the current condition provided indicators for assessing effects of the alternatives. Sustainability outcomes were developed for each alternative as described in Chapter 3.

14. Defining Source Habitat For VDDT And Modeling Trends

Source habitat trends were generated for 15 of the 17 focal species for each of the three alternatives using the VDDT outcomes. Trends were based on the historical and departed source habitat definitions and displayed relative to the high and/or low end of the HRV range for each alternative. Outcomes were generated for old forest and large tree habitat.

14.1 Old Forest Habitat

In the growth matrix developed for VDDT an "old forest habitat" was defined for all PVGs except PVG 10 (Table 26). This growth matrix was used in discussions of the successional pathways, and wildland fire, insect and treatment to maintain the visibility of this stage during development of modeling effects. Conceptually the "old forest" macrovegetation was the stage modeled in VDDT. Initial conditions were established based on the assumption that currently acres in the large tree size class, low canopy cover class were predominately lower than the canopy cover that would have defined old forest habitat (>30 percent). Therefore, these acres were assigned to the large tree size class, 10 to 29 percent and acres in the large tree size class, moderate canopy cover class were assigned to the large tree size class, 30 to 69 percent. Old forest habitat trends were developed directly from the VDDT outputs using the old forest macrovegetation class.

Table 26. Growth Matrix for the Vegetation Dynamics Development Tool Modeling With the Old Forest Macrovegetation Stage For PVGs 1, 2, 3, 4, 7 and 11

Tree Size Class	Canopy Cover Class			
	None	Low (LO) Canopy Cover 10 to 39 percent	Moderate (MO) Canopy Cover 40 to 69 percent	High (H) Canopy Cover 70 to 100 percent
Grass/Forb/ Shrub/Seedling				
Sapling (SP)				
Small (SM)				
Medium (M)				
Large (L)		**Canopy Cover 10 to 29 percent**	**Canopy Cover 30 to 69 percent (Old Forest Macrovegetation)**	

To determine the acres of large tree size class, low and moderate canopy cover class presented in the Forested Vegetation Diversity and Fire Regime Condition Class, the VDDT outcomes were mathematically adjusted post-modeling to account for the assumption that some portion of the "old forest" macrovegetation would fall into low canopy cover class and some portion would be within the moderate canopy cover class. This adjustment varied by PVG and MPC Group (see Forested Vegetation section 2.3). For all PVGs and MPC Groups, 25 percent of the "old forest macrovegetation" was assigned to the large tree size class, low canopy cover class with the remainder in the large tree size class, moderate canopy cover class. This adjustment was based on an assumption that treatments or disturbances that move acres into the "old forest macrovegetation" class are likely to produce conditions that fall into the low canopy cover class. This adjustment also assumes that acres that move into the "old forest macrovegetation" through succession are more likely to fall into the moderate canopy cover class. Since treated or disturbed acres are not identified separately from acres that move into the class through succession, the adjustment was an attempt to account for both situations.

14.2 Large Tree Habitat

Trends for the large tree habitat were developed by summing acres in the canopy cover 10 to 29 percent, canopy cover 30 to 69 percent and canopy cover 70 to 100 percent classes.

15. Estimates of the HRV of Old Forest Habitat

The ICB landscape assessment provides an estimate of the historical ranges of old forest structural stages (Hann et al. 1997) using a process similar to that which generated the HRV for Appendix A of the Forest Plan. Estimates were developed for each Ecological Reporting Unit (ERU) within the ICB including the Central Idaho ERU which covers most of the Sawtooth National Forest. The process for estimating the old forest habitat ranges (included in Appendix E of the Forest Plan) is described below.

The extent of historical structural stages was summarized for cover types and counties within the ICB from historical data. Proportions for each cover type and structural stage were developed and then extrapolated to ecological sections. Pixels within the sections were randomly assigned a historical cover type and structural stage based on the proportioning developed from the historical information. These cover type-structural stage combinations were assigned to terrestrial community types which were mapped at 1-km2 resolution. These units provided the "states" in the state and transition modeling for the landscape dynamics assessment. Like described for the VDDT modeling above, a "state" was a unit of macrovegetation. Estimates were developed for three types of forests: Dry Forest, Moist Forest and Cold Forest. Based on information contained in the ICB assessment, PVGs were assigned to forest categories (Table 27).

Table 27. PVG and Fire Regime Assignments to ICB Terrestrial Community and Forest Categories

Forest Category	Terrestrial Community Type	PVGs Assigned	Fire Regime
Dry Forest	Dry Douglas-fir with Ponderosa Pine Dry Douglas-fir without Ponderosa Pine Interior Ponderosa Pine	PVG1, PVG2	Nonlethal
Moist Forest	Moist Douglas-fir	PVG3	Mixed1
Cold Forest	Spruce-Fir Dry with Aspen Spruce-Fir Dry without Aspen Spruce-Fir (LPP>WBP) Spruce-Fir (WBP>LPP)	PVG4, PVG7, PVG11	Mixed1-Mixed2

The HRV was based on the extent of the historical structural stage which defined Year 0 and a simulation out to 100 years. Year 0 defined the HRV minimum and Year 100 defined the HRV maximum. Estimates from the BLM/FS Land Ownership Group were used to derive the old forest ranges. The states were also assigned to old forest habitat or old growth based on the closest fit to the definitions. Tables 28 - 30 display by percentage of the state, the ranges of old forest.

Table 28. Old Forest Habitat HRV Estimates for Dry Forests (PVGs 1 and 2)

State	Year 0	Year 100	Best Fits Old Forest Habitat or Old Growth Definitions
Late-seral Shade Intolerant Multi-layer Forest	7	9	Old Forest Habitat
Late-seral Shade Intolerant Single-layer Forest	10	40	Old Forest Habitat
Total	17	49	
Late-seral Shade Tolerant Multi-layer Forest	5	8	Old Growth
Late-seral Shade Tolerant Single-layer Forest	4	4	Old Growth
Total	9	12	

In PVGs 1 and 2, the source habitat of concern is old forest habitat (dominated by ponderosa pine) rather than old growth (where Douglas-fir would be a dominant or co-dominant). The attributes developed for PVGs 1 and 2 in Appendix E of the Forest Plan represent old forest habitat. Morgan and Parsons (2001) estimated that historically very little old growth occurred in PVGs 1 and 2 in the Southern Idaho Batholith. Though Hann et al. (1997) estimated old growth for Dry Forest in the Central Idaho ERU, which includes vegetative communities that most closely represent PVGs 1 and 2, their Dry Forest also includes vegetative communities like PVG 4, and communities in northern Idaho that have longer fire return intervals. Therefore the vegetative communities described by Hann et al. (1997) have greater potential to produce old growth. For these reasons, the range for Appendix E was based only on the states that crosswalked to Old Forest Habitat. Therefore the range of Old Forest Habitat in Appendix E was defined as 17 to 49 percent.

Table 29. Old Forest Habitat HRV Estimates for Moist Forests (PVG 3)

State	Year 0	Year 100	Best Fits Old Forest Habitat or Old Growth Definitions
Late-seral Shade Intolerant Multi-layer Forest	5	13	Old Forest Habitat
Late-seral Shade Intolerant Single-layer Forest	5	4	Old Forest Habitat
Total	10	17	
Late-seral Shade Tolerant Multi-layer Forest	9	16	Old Growth
Late-seral Shade Tolerant Single-layer Forest	1	2	Old Growth
Total	10	18	
Total for Both Physiognomic Types	20	35	

In PVG 3, the states that fit Old Growth as well as Old Forest Habitat both provide habitat for species in our area. The historical fire regime for this PVG is primarily mixed1 on the Forest, depending on habitat types. Old Forest Habitat would develop in areas with higher rates of disturbance and Old Growth conditions would develop in areas with lower rates of disturbance. The definitions in Appendix E accommodate both kinds of conditions. Therefore the range for Old Forest Habitat in Appendix E was defined as 20 to 35 percent.

Table 30. Old Forest Habitat HRV Estimates for Cold Forests (PVGs 4, 7 and 11)

State	Year 0	Year 100	Best Fits Old Forest Habitat or Old Growth Definitions
Late-seral Shade Intolerant Multi-layer Forest	5	10	Old Forest Habitat
Late-seral Shade Intolerant Single-layer Forest	11	8	Old Forest Habitat
Total	16	18	
Late-seral Shade Tolerant Multi-layer Forest	6	15	Old Growth
Late-seral Shade Tolerant Single-layer Forest	1	1	Old Growth
Total	7	16	
Total for Both Physiognomic Types	23	34	

In PVGs 4, 7, and 11, the states that fit Old Growth as well as Old Forest Habitat both provide habitat for species in our area because the historical fire regimes for these PVGs range from mixed1 to mixed2 depending on the PVGs and habitat types within the PVGs. Therefore, Old Forest Habitat would develop in areas with more variable or mixed fire regimes and Old Growth conditions would develop in areas with longer fire return intervals. Across the landscape, these two conditions would transition into each other or would occur in patches interspersed with other tree size classes. Therefore the range for Old Forest Habitat in Appendix E was defined as 23 to 34 percent.

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