EXPECTED VEGETATION RESPONSES ON THE TOOLBOX AND SILVER FIRES, SILVER LAKE DISTRICT, FREMONT NATIONAL FOREST

Frederick C. Hall

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Author

Frederick C. Hall, Ph.D., is a consultant for natural resource management. He retired from the USDA Forest Service in February, 2001, after 40 years of service. He may be reached at: PMB 454, 1521 Jantzen, Portland, OR 97217, phone 503-285-8729, e-mail <Fred_C_Hall@plantecolnw.com>, and information is available at: www.plantecolnw.com

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Abstract

Fires started by lightning on July 12, 2002, burned approximately 85,000 acres on the Silver Lake District, Fremont National Forest. This report summarizes expected vegetation responses in the next 30 years and for a period 50 to 75 years in the future. Four fire mortality classes were mapped: 0 to 25 percent tree kill, 26 to 50 percent, 51 to 85 percent, and 86 to 100 percent tree kill. The primary plant community affected was ponderosa pine/bitterbrush with some manzanita and Idaho fescue accounting for 45 percent of the Toolbox and 62 percent of the Silver fire acreage. Higher burn intensity seemed directly related to higher stand density resulting in very high dead wood volumes, 60 to 120 tons per acre. These are predicted to fall as ground fuel in 5 to 12 years creating a massive fire hazard and seriously limiting access by people, big game, and livestock. Site potential for stand density is low, only about 116 square feet basal area per acre for 1 inch diameter growth per decade (Growth Basal Area of 116). If diameter growth of 2 inches per decade is desired to attain Late and Old Structure (LOS), about 110 established trees per acre would require thinning at 10 inches dbh in about 40 years. Wildlife habitat in burn intensities under 50 percent tree kill will be reduced due to shrub death but moderately enhanced by herbaceous growth. Shrub recovery is expected in 10 to 20 years. Pre-burn wildlife habitat in fire intensities above 50 percent tree kill accommodated species which prefer dense stands. If fuel loading is reduced to provide access, habitat should change to provide for more species in the next 30 years. Grass for livestock forage should increase in all burn intensities. Riparian areas often had burn intensities above 50 percent tree kill. Shade will most likely decrease initially, however, most shrubs should sprout and down wood will tend to modify stream temperature. Down logs resulting from fire will probably enhance fish habitat and deter livestock grazing.

Acknowledgement: Susan Puddy, North End Silviculturist, provided very valuable information, images, maps and summaries of the Toolbox and Silver fires.

Introduction

Lightning caused fires burned 85,000 acres on the Silver Lake District, Fremont N.F. starting July 12, 2002. This report discusses expected vegetative responses on the Toolbox and the Silver fires for two periods: the next 30 years and 50 to 75 years in the future.

Background information includes maps of plant association distribution, burn mortality classes, slope steepness, and a soil resource inventory (SRI)(Wenzel 1979).

Land management scenarios

Two land management scenarios will be discussed: no action and generalized action to attain the Forest Service Proposed Action for Toolbox EIS. The latter encompasses the LRMP for Area 5 as modified by the Regional Forester's Eastside Forest Plan Amendment No. 2. The amendment calls for moving stands toward single story Late and Old Structural (LOS) condition within a historical range of variability.

The concept of historical range of variability has been discussed by Morgan, Aplet, and others (1994), and Parsons, Swetman and Christensen (1999). Historical condition may be described as 10 to 20 ponderosa pine trees per acre greater than 18 inches dbh with grass, some shrub understory, and very little woody fuel. Underburning, occurring at 15 to 25 year intervals (Hall 1976), effectively eliminated down wood, retarded shrub density, and thinned regeneration. Underburning apparently occurred when fuels accumulated 3 to 6 tons per acre, enough to carry fire, but not enough to ignite crown fires.

Plant association distribution

Plant associations represent potential natural communities established by field investigation and classification. Each is given an Ecoclass Code (Hall 1998) to facilitate mapping, inventory, and computer analysis. The plant associations used here are from Volland (1985), and Hopkins (1979). Successional and stand growth characteristics are used to predict response to fire.

Table 1 lists each plant association by the Ecoclass code used in mapping, its name, site index (SI) in feet for ponderosa pine, growth basal area (GBA)(Hall 1987) in square feet per acre for ponderosa pine and the percent occurrence on the Toolbox and Silver fires. Appendix A contains a map of Ecoclass distribution for each fire. Yellow high lighting identifies those associations making up 10 percent or more of the land area in each fire. Two plant associations, CP-S2-11 and 17, ponderosa pine/bitterbrush/Idaho fescue (17 has some manzanita) account for 44 percent of the Toolbox and 62 percent of the Silver fire land area.

Table 1. Ecoclass codes for silver and toolbox fire.

These are Ecoclass Codes listed on maps for the Silver and Toolbox Fires of July, 2002. Yellow highlight emphasizes Ecoclass Codes accounting for 10 percent or more of the land area.

Ecoclass	Description	SI	GBA	Percent Occurrence Toolbox	Percent Occurrence Silver
CJ-S1-12	WJ/ARAR/FEID	—	—	6	—
CJ-S3-11	WJ/PUTR/AGSP-FEID	—	—	—	10
CL-M3-11	LP/CANE-ELGL-WET	78	109		2
CL-G3-15	LP/FRVI-FEID	73	135	7	—
CL-G4-15	LP/SIHY-CAPA	66	79	—	
CL-S2-11	LP/PUTR/STOC-PUM	76	63		3
CL-S2-15	LP/RICE-PUTR/STOC-PUM	67	60		—
CP-CJ	SCATTERED PP AND WJ			1	
CP-C2-11	PP-WJ/CELE-PUTR-ARTR/FEID	76	108	5	2
CP-H3-11	PP-QA/POPR	78	124	1	
CP-S1-11	PP/PUTR-ARTR/FEID	65	59		—
CP-S1-21	PP/ARTR/POSE	76	99	4	
CP-S2-11	PP/PUTR/FEID-PUM	77	107	27	40
CP-S2-17	PP/PUTR-ARPA/FEID-PUM	77	126	17	22
CP-S2-12	PP/PUTR/STOC-PUM	80	70		3
CP-S3-11	PP/PUTR-CEVE/STOC-PUM	81	92		6
CW-C4-11	WF-PP-WP/RIVI	80	226	1	
CW-H2-11	WF-POTR/CAPE	78	136	7	—
CW-S1-14	WF/CEVE-PUM	85	77		4
GX	GRASSLAND	—	—	1	—
NR-CJ	ROCK, SCATTERED WJ	—	—	2	
NR-CP	ROCK, SCATTERED PP	—	—	1	—
NR-R	ROCK	—	—	1	
NR-SW	ROCK, SHRUBS	—	—	3	
MX	MEADOW	—	—	1	1
SD-19-12	ARAR/FEID	—	—	—	3
SD-29-13	ARTR/FEID-SIHY	—	—	10	—
SX-CP	SHRUBS WITH SCATTERED PP	—	—	1	—
SX-CJ	SHRUBS WITH SCATTERED WJ	—	—	4	—
TOTALS				100	97

Figure 1. View across sagebrush to fire mortality class 50 to 85 percent kill. Open areas represent Ecoclasses SD-29-11 and GX.

Burn mortality classes

Figure 1 illustrate sagebrush unburned with burned ponderosa pine in the background. Four classes of burn mortality have been mapped (app. B). They are: 0 to 25 percent of trees killed (fig. 2), 26 to 50 percent (fig. 3), 51 to 85 percent (fig. 4), and 86 to 100 percent of trees killed (fig. 5).

Table 2 lists those plant associations accounting for 10 percent or more of the land area by various burn mortality classes. The two most common ponderosa pine associations are CP-S2-11 and 17. Acreages burned by mortality class are listed. These associations are about 53 percent of the area so description of vegetative response will be based on their characteristics. Other descriptions will include riparian, mixed conifer, lodgepole, and juniper/shrub ecosystems.

Slope classes

Appendix C lists mapped slope classes in 5 percent increments. About 86 percent of the fire area has slopes under 15 percent. This gentle topography should preclude serious soil erosion and logging problems.

Figure 2. Fire mortality class **0 – 25 percent** tree kill. In this case, tree mortality is about 10 percent in diameters under 2 inches. Most of the shrubs have been burned. Ecoclass code CP-S2-11: pine/bitterbrush/fescue.

Figure 3. Fire mortality class **26 to 50 percent** tree kill. Here about 35 percent of the trees have been killed, mostly in the 4 to 6 inch class and below. Most of the shrubs have been burned. Ecoclass code CP-S2-17: pine/bitterbrush-manzanita/fescue.

Figure 4. Fire mortality class **51-85 percent** tree kill. In this case, tree mortality is about 70 percent in nearly all diameters. All of the shrubs have been burned. Fuel loading in the foreground is about 80 tons per acre.

Figure 5. Fire mortality class **86 to 100 percent** tree kill. The entire stand has been killed, apparently due to dense stocking. All the shrubs have been burned. Fuel loading in the background probably exceeds 120 tons per acre.

Table 2. Ecoclass codes associated with 10 percent or more of the land area by mortality class.

INTENSITY_	COUNT	ACRES	0-25	%	26-50	%	51-85	%	86+	%	Total
Toolbox Fire											
SD-19-13 0-25%	25	1032.6100	1046	4							
SD-19-13 26-50	46	396.1500			396	1					
SD-19-13 51-85	24	264.2500					264	1			
SD-19-13 86%+	46	1009.2100							1009	4	10
CP-S2-11 0-25%	48	378.1900	458	2							
CP-S2-11 26-50	66	2909.2500			2909	11					
CP-S2-11 51-85	54	1246.4900					1246	4			
CP-S2-11 86%+	72	2864.7000							2865	10	27
CP-S2-17 0-25%	30	1168.1100	1286	5							
CP-S2-17 26-50	25	1154.5600			1155	4					
CP-S2-17 51-85	33	878.7700					879	3			
CP-S2-17 86%+	41	1466.2500							1466	5	17
Silver Fire											
CP-S2-11-0-25%	69	2030.5000	2120	10							
CP-S2-11-26-49	83	2289.7100			2290	11					
CP-S2-11-50-85	61	1309.6900					1310	6			
CP-S2-11-86%+	67	2789.3600							2789	13	40
CP-S2-17-0-25%	45	592.7000	751	4							
CP-S2-17-26-49	43	1123.4900			1125	5					
CP-S2-17-50-85	29	660.6100					661	3			
CP-S2-17-86%+	45	2187.7900							2185	10	22
CJ-S3-11-0-25%	23	675.0400	675	3							
CJ-S3-11-26-49	26	712.6200			713	3					
CJ-S3-11-50-85	30	348.3300					348	2			
CJ-S3-11-86%+	30	405.8300							406	2	10

Summary

CP-S2-11: Toolbox 27%; Silver 40% -- average 33%

CP-S2-17: Toolbox 17%; Silver 22% -- average 20% Both about 53%

Photo monitoring

Few fires have been followed over time to determine vegetation and soil response to various degrees of burning. Such information could be of great value. Access and topography of these two fires provide opportunities to document change over time (Skovlin and Thomas 1995). Only a few critical procedures are required for photographic monitoring (Hall 2002). Once photo points have been established, repeat photos can be made during normal activities on the District.

Responses in the First 30 Years – Ponderosa Pine Types

Two scenarios are discussed: no action and attainment of Late Old Structure (LOS).

The ponderosa pine/bitterbrush/Idaho fescue associations (CP-S2-11 and 17) will be used to discuss vegetation responses during the next 30 years under the following topics: fuel loading, stand response, livestock grazing, wildlife habitat, and soils. Different responses in other vegetation types also will be presented.

Fuel loading

Standing fuel is expected to fall within the next 5 to 12 years. Figure 6 predicts snag life by diameter class ranging from only 4 to 5 years for trees 8-inches diameter to 12 years for 22-inch diameter snags (Dahms 1949, Keen 1955, Lyon 1977, Thomas and others 1979). Figures 4 and 5, fire mortality classes 51 to 85 and 86 to 100 percent tree kill, suggest a major proportion of fuel will fall within the next 6 years.

Down fuel loading in mortality classes 51 to 100 percent is estimated to range from 60 to 120 tons per acre (figures 4 and 5). Fuel loadings of only 30 to 40 tons are depicted in figures 7 and 8 (Maxwell and Ward 1976, 1980). Down fuel life for 18-inch material may be 45 to 50 years (figure 9). Maser and others (1979) suggest log residence times of 50 to 100 years. Smaller material should deteriorate fastest. Observations of pre-commercial thinning in 4- to 5-inch dbh ponderosa pine suggests most stems under 3 inches dbh (10- and 100-hour fuel) disintegrate by 20 years but 3- to 8-inch (1000 hour) fuels are still present.

No action: Fuel loading seems related to fire mortality class which is associated with stand density. In the next 30 years, down fuel should reach a maximum in about 10 years and then gradually decrease as 1- to 3-inch diameter materials (10- and 100-hour fuels) deteriorate. Maximum loadings will probably be 60 to 120 tons per acre creating a massive fire liability and greatly reducing accessibility. Should fire occur in this heavy fuel, all live trees would be killed and the soil surface sterilized to a degree inhibiting regeneration. Development of LOS condition might take more than 120 years.

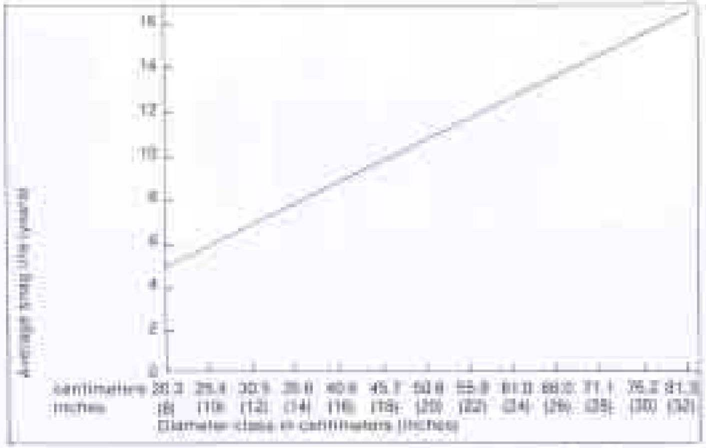


Figure 6. Average snag life for fire killed ponderosa pine by diameter class according to Dahms 1949 data (Dahms 1949, Thomas and others 1979, Fig. 86, p 151)

LOS attainment: will require fuel reduction to less than 6 tons per acre to simulate historic conditions. If woody fuel is retained, it would be best in larger diameter stems. Larger stems benefit wildlife (Maser and others 1979) and do not pose crown-fire liabilities that similar tons of 1 and 10 hour fuels have.

Stand response

No action: Mortality class 86 plus percent tree kill should have very sparse natural regeneration in the next 30 years because the fire burned in July prior to ponderosa pine seed maturity and because mortality class 86 plus percent probably burned hot enough to kill most seed on or in the ground. Surviving trees are too few to provide adequate regeneration to fully stock the site. Natural seedlings that become established should be growing at 3 to 4 inches in diameter per decade. Stand density after 30 years is expected to be less than desired for LOS condition.

Lower mortality classes have a proportionately greater number of surviving trees to provide seed for regeneration. However, in nearly all cases, advanced regeneration was killed by underburning. Mortality class 51 to 85 percent tree kill after 30 years might have sufficient trees per acre (110) for adequate LOS stocking but tree size would be less than that expected with prompt regeneration. Lower mortality classes would probably not only have sufficient stocking but also reasonably large trees which survived the fire.

LOS attainment: Creating stand conditions for LOS should consider site potential for stand growth. Table 1 lists the Site Index (SI) in feet at age 100 and Growth Basal Area (GBA)(Hall 1987) in square feet per acre for 1-inch diameter growth per decade for all forest plant associations in the burn area. The ponderosa pine/bitterbrush/Idaho fescue (CP-S2-11 and 17) associations average SI 77 and GBAs of 107 and 126 for a mean of 116.

DATA SHEET — Residue description type [illegible]

LOADING		
Size class (inches)	Weight (tons/acre)	Volume (ft^3/acre)
0.25-1.0	3.9	343
1.1-3.0	4.8	599
3.1-9.0	10.0	779
9.1-20.0	5.5	815
20.1+	6.8	410
Total	31.3	[illegible]

OTHER MEASUREMENTS

Average residue depth	(feet) 0.7
Ground area covered by residue 1/4-inch diameter and larger	(percent) 77
Average duff and litter depth	(inches) 1.7
Sound residue 3.1-inch diameter and larger — white fir	(percent) 43
Douglas-fir	(percent) 31
other	(percent) 22
Rotted residue 3.1-inch diameter and larger	(percent) 4

HARVEST INFORMATION

Gross volume cruised (M fbm/acre)	8.1
Net volume cruised (M fbm/acre)	8.2
Average stems/acre cut	41
Average d.b.h. of stems cut (inches)	19
Stand age (years)	170
Cutting prescription	Tree selection
Yarding method	Tractor
Slash treatment	None

PRECOMMERCIAL THINNING INFORMATION

Stems cut/acre	
Stems remaining/acre	
Basal area/acre before	
Basal area/acre after	
Average d.b.h. before (inches)	
Average d.b.h. after (inches)	
Thinning method	
Slash treatment	

FUEL RATING

U.S. Forest Service Region 6 Fuel type identification	[illegible]

REMARKS

Figure 7. Fuel loading in ponderosa – associated species, similar to Ecoclass CW-C4-11 showing 31 tons per acre following selection cutting. Fire mortality classes 50 to 85 and 86 to 100 would have far more down material (Maxwell and Ward 1976).

Figure 8. Fuel loading in ponderosa pine similar to CP-S2-17 showing 39 tons per acre. Fire mortality classes 50 to 85 and 86 to 100 would have far more down material (Maxwell and Ward 1980).

Figure 9. A 40-year-old stagnated stand of Douglas-fir photographed in 1966, left, and 1998, right, 32 years later. An 18-inch diameter ponderosa pine log at the foot of the meter board is still present. How long it had been down by 1966 is unknown but one might presume 10 to 20 years according to log surface condition. I would expect persistence of 18-inch fuel for at least 45 to 50 years. The stand, in 1998, was 72 years old demonstrating that stocking level control is essential for diameter growth. This figure illustrates the value of repeat photography.

Reforestation targets should reflect both GBA of the site and desired stand condition at first commercial entry. A desired stand, for example, might be trees 10-inchs dbh which have slowed to 2 inches per decade diameter growth. At 2 inches per decade, a GBA of 116 would be 60 square feet basal area or 110 trees per acre (SDI 110).

Adding 20 percent for mortality would suggest planting 130 trees per acre, an 18 foot spacing. At this spacing, trees growing for 30 to 40 years should be about 10-inchs dbh. However, if planting is delayed and minimal effort is expended for site preparation and animal damage control, planting mortality could reach 50 percent.

Planting should be based on tree mortality class to compensate for natural regeneration. Consider full planting (130 trees per acre) in mortality class 86 plus percent tree kill, 60 percent of full (i.e. 80 trees per acre) in mortality class 50 to 85 percent, and 30 percent (i.e. 40 trees per acre) in mortality class 25 to 50 percent tree kill. Trees surviving the fire would continue to grow and provide structure toward LOS attainment.

Denser stocking would retard height growth of ponderosa pine (Hall 1987, pp 37-39). Managing for diameter growth faster than 2 inches per decade should produce at least 20-inch dbh trees in 100 years.

Table 3. Example of cavity dweller preference for snag size. (Thomas and others 1979).

Letter code	Life form	Species	Minimum d.b.h. in centimeters (inches) suitable for nesting	1	2	3	4	5	6	7	8	9	10
PAAT	14	black-capped chickadee[1]	10.2 (4)		•	•	•			•	•	•	
GAGA	14	mountain chickadee[1]			•	•	•			•	•	•	
DEPU	13	downy woodpecker[2]	15.2 (6)	•	•				•+	•	•	•	
SPVA	13	yellow-bellied sapsucker[2]	25.4 (10)	•					•	•	•		
DEVI	13	hairy woodpecker[2]		•					•	•	•	•	
PADO	14	house sparrow				•	•			•	•		
EUAM	15	yellow pine chipmunk				•	•			•			
FASP	14	American kestrel	30.5 (12)			•	•			•			
OTAS	14	screech owl				•	•			•	•	•	
BUAL	14	bufflehead	38.1 (15)			•	•			•			
LOCU	14	hooded merganser				•	•			•			
AISP	14	wood duck	50.8 (20)			•	•			•			
BUCL	14	common goldeneye				•	•			•			

Types of cavities utilized: 1 Excavates cavity usually in sound wood; 2 Excavates cavity usually in soft or decayed wood; 3 Occupies cavity made by another species; 4 Occupies natural cavities created by decay, etc.; 5 Occupies spaces under loose bark.

Uses of cavities: 6 Construction part of supporting nest; 7 Nests and/or raises young; 8 Roosting; 9 Overwintering; 10 Hibernating.

[1]Primary excavators in soft wood.
[2]Primary excavators in sound wood.
• Symbol denotes occurrence only.

Livestock management

Livestock management has two considerations: (1) interspersion of riparian vegetation with dry land and (2) palatability of burned Idaho fescue compared with unburned.

Riparian areas tend to be more attractive to livestock due to highly palatable vegetation and water. Current management plans accommodate this. However, forested riparian areas often burned at 86 plus percent tree kill. Accessibility for livestock travel will decrease significantly as dead trees fall.

Idaho fescue palatability to cattle in the fire area is low if last year's growth is present. Observations following a prescribed fire workshop on the Fort Rock District in 1974 found cattle grazing in the spring clearly selected fescue with the leaves burned off in preference to unburned. Burned needlegrass and squirreltail showed the same preference. They grazed fescue down to a ¾ -inch stubble adjacent to plants with last season's dry leaves. After grazing to ¾ inch stubble, they shifted to the unburned plants. These preferences lasted through the grazing season.

Idaho fescue, at ¾ inch stubble, is utilized at about 60 percent if the leaves are 4 inches or less in length. If longer, utilization is higher. Utilization greater than 60 percent during the growing season detrimentally affects the plant's ability to compete (Conrad and Poulton 1966, Everett and Ward 1984).

Where fire has burned off last years leaves, fescue will not only be very palatable but may have suffered from heat damage (Everett and Ward 1984, Lent 1990). Therefore, late season grazing for the first two years would assure least damage to forage grasses.

No action: Livestock management is expected to follow recommended allotment plans. The major effect of fire will be restriction of livestock movement by down logs in areas with more than 51 percent tree kill. Most killed trees are expected to fall within 12 years and create access problems for another 20 years.

Livestock are expected to use aspen, willow, and alder sprouts. Degree of use depends upon adjacent vegetation palatability and access through down trees on riparian areas. If fall grazing is practiced the first two years, adjacent bunchgrasses should accumulate dry, year-old leaves rendering them less palatable.

LOS attainment: Fuel reduction consistent with LOS condition should eliminate any access problems for livestock. A significant reduction in tree cover as a result of the fire is expected to provide more forage than pre-burn for at least a 30-year period.

Wildlife habitat

No action: Burn mortality has had major impacts on wildlife habitat, both good and bad. The positive effect is to produce snags for woodpecker feeding and for cavity excavators and nesters (table 3). Feeding on freshly killed trees usually lasts only a few years (Thomas 1979). Cavity use is dependent upon length of time a tree is standing (figure 6). This enhancement will probably last up to 10 years. Trees surviving the fire would continue to provide cavity excavation sites.

Higher mortality class fuel loading would result in significant impediments to access and travel, partially reducing the advantage of increased shrub and herbaceous growth.

Habitat for some ground dwelling wildlife will be reduced with burn mortality classes 0 to 25 and 26 to 50 percent tree kill due to reduction of shrubs for approximately 10 years

(Everett and Ward 1966, Lent 1990). Bitterbrush, because its seeds had matured and had probably been cached by rodents, would tend to regenerate if animal utilization is limited. Bitterbrush in this area seldom sprouts after fire (Everett and Ward 1966, Lent 1990). Herbaceous vegetation should respond within 3 to 5 years.

Burn mortality classes 50-85 and 86 to 100 generally were habitat for a few species attracted to dense stand conditions. Wildlife habitat over the next 30 years should change to attract more species as herbaceous and shrub vegetation increases and trees grow in diameter.

LOS attainment: With management for LOS stand conditions, habitat for both cavity species and ground dwelling wildlife should improve. Maintenance of open tree cover should enhance herb and shrub production. If salvage is proposed, future snags may be provided by retaining some trees, 4 to 6 per acre, that have been fire damaged but might survive for more than 10 years (Petersen 1985). Snags need not be evenly distributed on every acre. Clumping can enhance cavity nester habitat (Thomas and others. 1997, p77). LOS attainment may not result in optimum wildlife habitat if prescribed fire and fuel reduction is planned.

Soil impacts

Burning affects soil microflora and nutrients (DeBano 1990; McNabb and Cormack 1990; Nissley, Zasoski and Martin 1980). Hot fires, consuming litter and duff, cause maximum change and may result in hydrophobic conditions. Cool fires may increase herbaceous production and palatability of some species (Hall 1976) while decreasing stand growth for a few years (Cochran and Hopkins 1991; Landsberg, Cochran and others 1984; Miller and Seidel 1990). Unfortunately, we can do little to influence effect of the current fires on soil under either a no action or LOS scenario.

No action: However, fuel loading in the next 30 years can provide very serious soil impacts if burned. The current fires tended to burn in tree canopies well above the ground (cover figure) consuming less fuel than the tons left standing. Fire in down fuel would burn hotter and longer close to or on the ground causing major soil damage. Consider how long soil remains bare under burned slash piles.

Erosion caused by burning is often associated with steep slopes (McNabb and Swanson 1990). Since 86 percent of the burned area is under 15 percent, erosion should not be a problem.

LOS attainment: The soil surface could be adversely impacted during fuel reduction treatment and reforestation. A major factor would be disruption of the soil surface by equipment and by competition reduction methods.

Responses in the First 30 Years – Other Kinds of Vegetation

Riparian vegetation (3% of area)

Riparian areas, commonly mixed conifer-quaking aspen (CW-H2-11), often had mortality classes above 51 percent tree kill which removed tree cover and reduced shrub height. However, herbaceous and shrub species usually had their growing points in moist environments limiting their kill.

No action: Shade will decrease initially, however, most shrubs should sprout producing more shade than under a tree canopy. Down wood from dead trees will increase stream shade, should enhance fish habitat, and hinder movement of ungulates. Quaking aspen, where present, probably will sprout providing palatable forage.

If burned, heavy fuel loading from 86 plus percent tree kill could have devastating effects on riparian vegetation and soils. Alder, aspen, and willow, in that order, have been observed to suffer from fire under 30 to 40 tons of fuel per acre. Presumably, heavier fuels would have more devastating effects. Cottonwood is susceptible to fire.

LOS attainment: A stocking potential of GBA 136 is about 1.2-times greater than ponderosa pine illustrated earlier. If 20 percent planting mortality is expected, about 160 trees per acre (16-foot spacing) might be appropriate which could include some white fir. A LOS scenario might suggest tree planting to include cottonwood. Cottonwood is one of the best riparian species because it grows large enough for most cavity nesters, produces leaves to enhance stream nutrients, grows very rapidly, and can recycle large wood effectively. Large wood on the stream should be retained while removing other fuel which would enhance fire prevention and improve access.

Shrub and juniper (15% of area)

Sagebrush and juniper plant communities, when burned, initially lose shrub and juniper (if present) cover but increase in herbaceous cover. After several years shrubs should increase enhancing wildlife habitat (Driver 1990; Everett and Ward 1984; Lent 1990). The **No action** and **LOS attainment** actions are similar because this vegetation is not forested.

Mixed conifer (Dryland) (3% of area)

No action: Many mixed conifer areas were overstocked resulting in 86 plus tree kill and massive standing fuel. This fuel should fall within 10 years creating a severe fire hazard. Regeneration is expected to be minimal except in tree kill areas less than 50 percent. But even in these areas, satisfactory stocking may not occur.

LOS attainment: Dryland mixed conifer sites are rather good with site indexes of about 80 feet and GBAs averaging 225 square feet per acre – almost twice the ponderosa pine plant associations. Fuels should be reduced to 3 to 6 tons per acre. Using the illustration earlier for LOS attainment of ponderosa pine, a first commercial entry stand would be 10-inchs dbh growing at 2 inches per decade. This is 210 trees per acre at 115 square feet basal area. Adding 20 percent for mortality, consider planting 250 trees per acre, a 13 foot spacing. Since greater total volume is often produced with mixed species, consider a 30 percent mixture of white fir with ponderosa pine. Ten-inch dbh trees should be available for thinning in 30 to 40 years.

Lodgepole (6% of area)

Over half the lodgepole pine stands burned at greater than 51 percent tree kill. This resulted in high volumes of standing dead trees between 4 and 8 inches dbh (figure 5). This small size indicates stagnated stand conditions, a common problem with lodgepole pine (Lotan and others 1985, Gara and others 1985). Natural lodgepole regeneration is expected to be limited because this is *Pinus contorta spp. murrayana* which does not have serotinous cones (Wheeler and Critchfield 1985). The fire killed unripe seeds in the cones.

No action: Due to small tree diameter, 90 percent of the stems are expected to fall within 5 years. Deterioration of this fuel may take more than 30 years as suggested by Lotan and others (1985) in figure 2 (p 135), showing effects of beetle kill 30 years previously.

This down material will create a major fire hazard and would result in serious soil damage if burned.

LOS attainment: Reduction of fuel loading to 3 to 6 tons per acre would be required. Lodgepole does not lend itself well to descriptions of ponderosa pine LOS structure (Gara and others 1985) due to a short life span. Lodgepole associations most affected by the fire are fairly good sites with site index of 70 and growth basal area of 135. Others are quite poor at SI 65 and GBA of 65. Using GBA 135, one might consider a one-cut-clearcut system at age 40 or 50 of trees growing at 1.5 inches in diameter (70 percent of GBA) at 95 square feet basal area. This would be 175 trees per acre at 10 inches dbh.

But a serious problem would probably occur within 30 years. Lodgepole can produce viable cones and seeds by age 15. Thus one could expect periodic tree regeneration tending to cause stand stagnation. If attainment of 8 to 10 inches dbh is desired, at least one pre-commercial thinning should be expected. Consequently, planting more than 180 trees per acre may not be warranted.

Responses 50 to 75 Years Hence – Ponderosa Pine Types

Two scenarios are again used: no action and attainment of Late Old Structure (LOS). Comments are based on the same ponderosa/bitterbrush associations (CP-S2-11 and 17).

Fuel loading

No action: Fuel loading would have probably deteriorated from 60 to 120 tons down to 20 to 40 tons of larger diameter logs at 50 years and 10 to 20 tons at 75 years.

LOS attainment: Fuel should be less than 5 tons after 30 years. Commercial thinning slash, at 10 inches dbh, should have been treated and presumably the area underburned at about 20 year intervals to maintain less than 5 tons of fuel per acre.

Stand response

No action: Mortality class 86 percent kill would result in limited regeneration and low stocking due to lack of seed sources. Trees surviving the fire and natural regeneration would be growing rapidly in diameter, 2.5 to 3.5 inches per decade. Surviving trees would probably be 20 to 24 inches dbh but not in sufficient density for LOS condition.

Mortality classes less than 85 percent kill would have proportionally greater numbers of surviving trees and denser regeneration. All would have tree density adequate for LOS condition but tree size, except in the 0 to 25 percent kill class, might not be large single story structure. The stand would most likely be two-aged, surviving tree overstory and regeneration tree understory. In mortality classes under 50 percent kill, overly dense regeneration after 50 years is predicted to be a problem.

LOS attainment: Stands would have had a commercial thinning at about age 40. If half the basal area was removed, diameter growth of the remaining 55 to 60 trees per acre should have increased to about 4 inches per decade. Then it would gradually decrease to 2 inches as stand density increases to 60 square feet basal area per acre at about age 75 and 20 inches dbh. Control of excessive regeneration is presumed by use of underburning.

Livestock management

No action: Abundant grass for livestock should be available. Fuel loading would be limited to larger diameter logs as 1- to 3-inch (10- and 100-hour) fuels decompose improving access for animals.

LOS attainment: An open canopy of trees (50 to 60 square feet basal area per acre) should not significantly affect forage production. Livestock distribution would be unrestricted with fuel treatment and periodic underburning.

Wildlife habitat

No action: Abundant herbaceous forage would be produced and shrub cover would be near site potential. Little tree cover would be available in mortality classes 51 to 85 and 86 to 100 percent tree kill. Trees surviving fire would grow large enough in diameter to accommodate large cavity nesting species. Wildlife cover and habitat would be provided by larger diameter logs. Small animal habitat might be enhanced over pre-fire stand conditions. In mortality classes less than 50 percent, little change in habitat from year 30 to year 75 would be anticipated.

LOS attainment: Management for Late Old Structure would provide for cavity dependent species. However, underburning would periodically reduce shrub cover and maintain very open stand conditions which might be disadvantageous to some wildlife.

Soil impacts

Soils, already largely stable, would change little from age 30 to 75.

Responses 50 to 75 Years Hence - Other Kinds of Vegetation

Riparian vegetation

No action: Riparian areas should have become stable after 30 years due to rapid response of wetland vegetation to disturbance. Tree cover would be less than the LOS alternative. If ungulate use can be limited, aspen, willow, and alder cover should be near maximum for the sites and tree cover. Local floods are most likely more important than succession 50 years following fire.

LOS attainment: Planted trees should be growing well in diameter after commercial thinning at 10 inches dbh. By 75 years they should be about 20 inches dbh. If cottonwood was planted, it should have grown at 3 to 5 inches in diameter per decade and at 3 to 5 feet per year in height, overtopping coniferous neighbors. This stand structure could provide better wildlife habitat than existed prior to burning.

Shrub and juniper

No action and **LOS attainment**: Shrub plant communities should have stabilized by year 30. If juniper can grow on a site, it probably will continue a slow increase in cover.

Mixed conifer

No action: In mortality class 86 plus percent tree kill, stands would be dominated by ponderosa pine in open stand condition. Trees would still growing rapidly in diameter, probably better than 2 inches per decade. White fir would be increasing in density at a slow rate because the open stand condition should discourage its regeneration. At mortality classes below 86 percent, regeneration should be adequate to provide the number of trees per acre for LOS conditions. Mortality class 0 to 25 percent is expected by suffer from regeneration in excess of that suitable for desired diameter growth.

LOS attainment: With recommended stocking, stands should be approaching LOS condition, at least in dbh. Height growth should still be fairly rapid so attainment of desired flora and fauna in the crowns might be limited. Prescribed burning is presumed to control excessive regeneration.

Lodgepole

No action: A primary concern with no action is excessive regeneration resulting in stagnated stand conditions, a phenomenon common in the area.

LOS attainment: Attainment of LOS condition would require stocking level control. If a one-cut-clearcut system is employed, the stand should have been harvested by 75 years.

Appendix A

Ecoclass codes mapped on the Toolbox and Silver Fires, Silver Lake District, Fremont N.F. They are listed by the map "ECO" identification, count of map units, total acres by map unit, average size (acres/count=size), and percent occurrence. Yellow high lighting emphasizes those codes with 10 percent or more occurrence. The "total" column summarizes the yellow data.

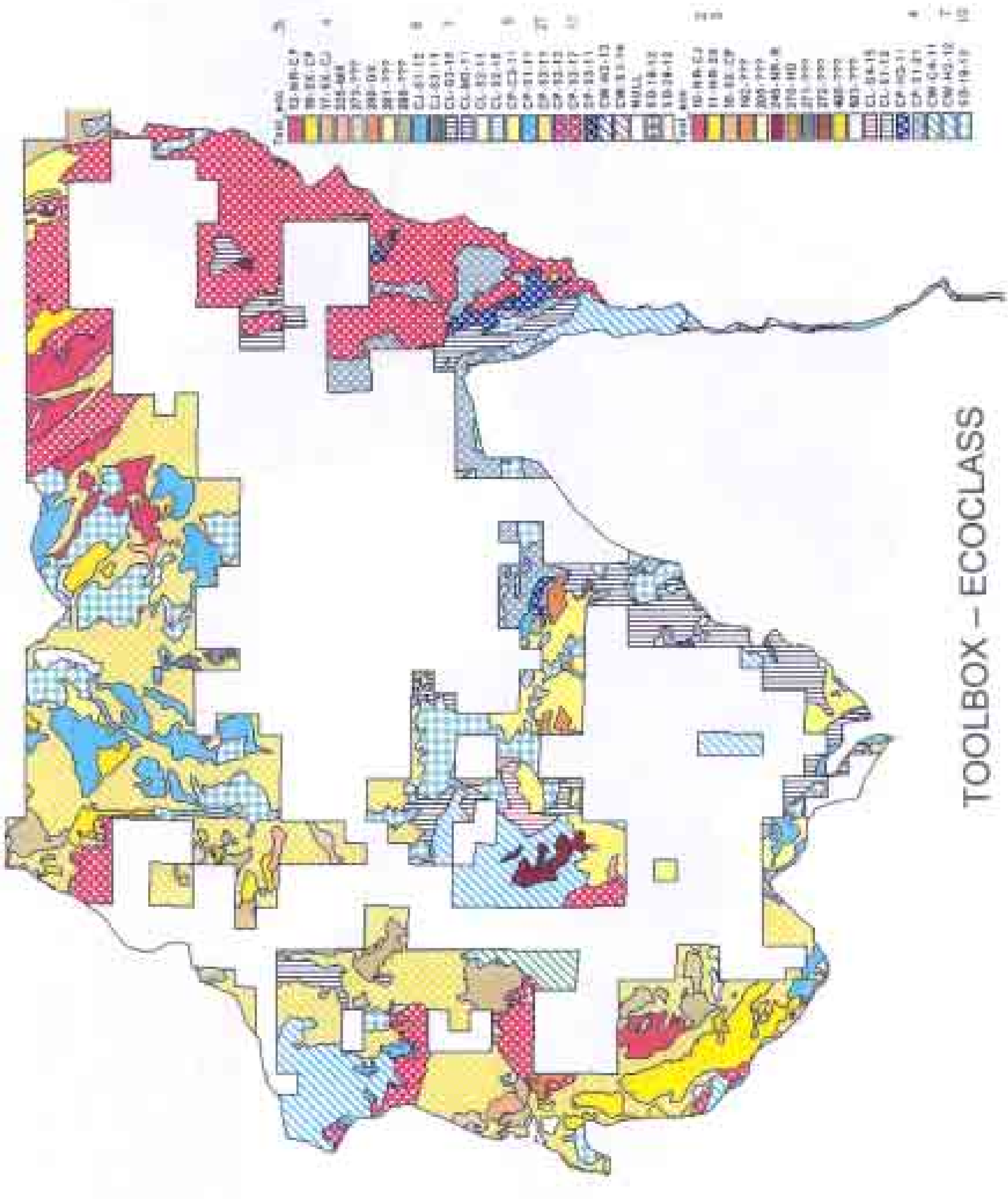
Maps following the summary identify the Ecoclass types. Percent occurrence of 2 percent and above is shown.

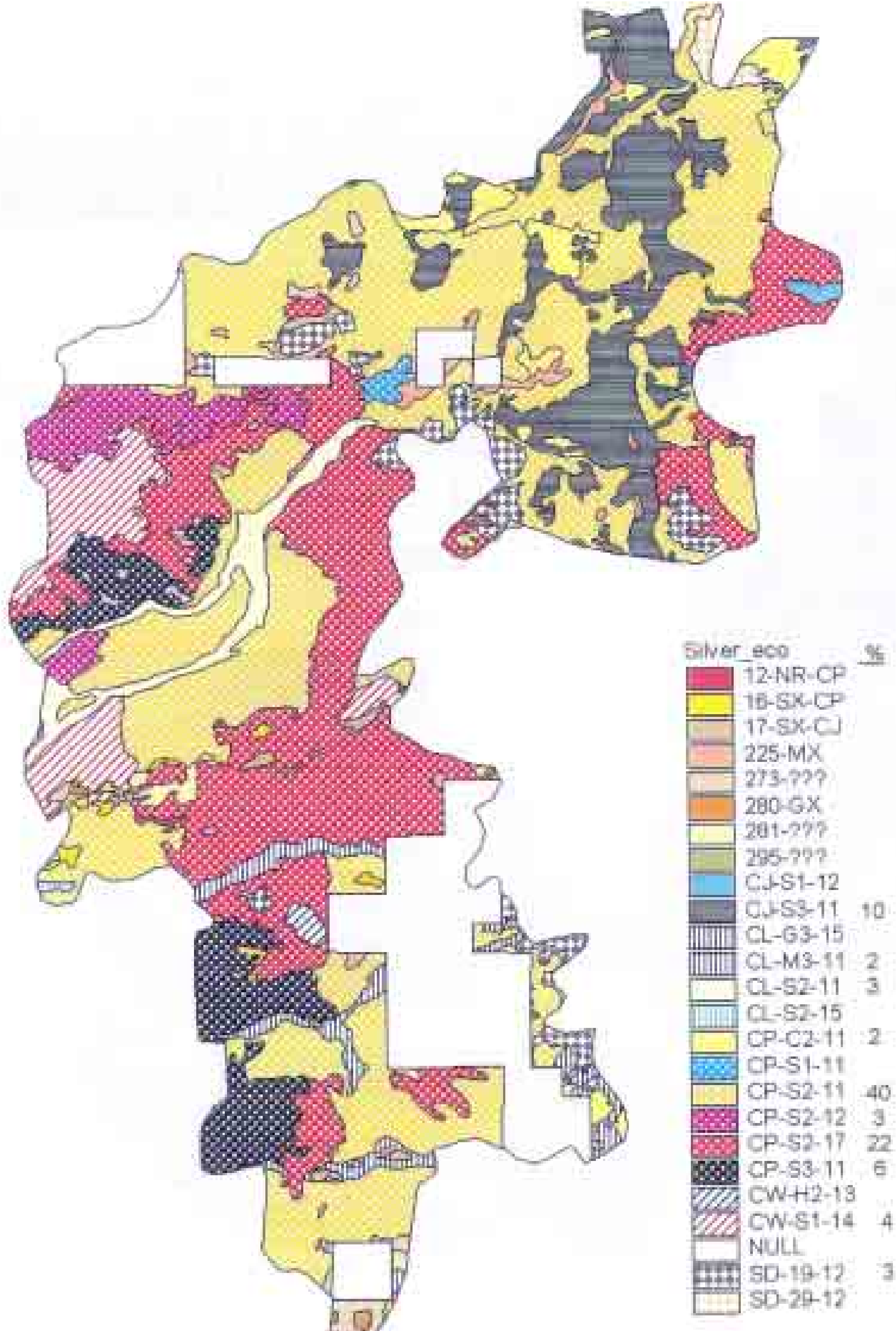
TOOLBOX ECOCLASS 17Jan03

ECO	COUNT	SUM_ACRES	Size	%	Total
10-NR-CJ	5	526.3900	113	2	
11-NR-SX	34	998.6100	29	3	
12-NR-CP	2	343.2000	165	1	
16-SX-CP	13	315.8900	24	1	
17-SX-CJ	18	999.9600	56	4	
192-???	1	1.7900			
205-???	1	0.2800			
22-CP-CJ	11	202.2200	18	1	
225-MX	7	176.4800	25	1	
245-NR-R	9	179.0500	20	1	
270-HQ	1	5.5800			
271-???	5	20.7900			
272-???	1	4.5900			
273-???	8	134.1400			
280-GX	11	191.2000	17	1	
281-???	5	27.1200			
400-???	1	7.0900			
503-???	1	2.2800			
CJ-S1-12	39	1550.7800	40	6	
CJ-S3-11	2	53.8000			
CL-G3-15	22	2024.2300	92	7	
CL-G4-15	1	137.1400			
CL-S1-12	1	0.0200			
CP-C2-11	20	1470.8600	73	5	
CP-H3-11	16	280.2500	17	1	
CP-S1-21	18	1228.0300	68	4	
CP-S2-11	38	7479.3500	197	27	
CP-S2-17	21	4785.6700	228	17	51
CW-C4-11	1	236.5200	236	1	
CW-H2-11	13	2097.5300	161	7	
NULL	6				
SD-29-13	50	2719.4600	54	10	
TOTALS		28203.5200		100	51

SILVER - ECOCLASS 17Jan03

ECO	COUNT	SUM_ACRES	Size	%	Total
12-NR-CP	1	12.2900			
16-SX-CP	14	96.8100			
17-SX-CJ	6	65.4300			
225-MX	18	213.9500	11	1	
273-???	21	244.8000	12	1	
280-GX	5	23.6100			
281-???	4	75.3100			
295-???	1	8.7100			
CJ-S1-12	1	44.6000			
CJ-S3-11	26	2191.8500	84	10	
CL-G3-15	5	124.1400			
CL-M3-11	7	395.2500	56	2	
CL-S2-11	1	531.7500	532	3	
CL-S2-15	1	14.5400			
CP-C2-11	14	460.1600	33	2	
CP-S1-11	1	69.6200			
CP-S2-11	32	8509.2300	266	40	72
CP-S2-12	3	645.9100	215	3	
CP-S2-17	19	4722.9100	249	22	
CP-S3-11	4	1241.6000	310	6	
CW-H2-11	1	53.7700			
CW-S1-14	4	928.1800	232	4	
NULL	6				
SD-19-12	18	622.6100	35	3	
SD-29-13	4	94.4100			
TOTALS		21393.7600		97	72


TOOLBOX – ECOCLASS



SILVER – ECOCLASS

Appendix B

Fire mortality classes mapped on the Toolbox and Silver fires, Silver Lake District, Fremont N.F. Four fire mortality classes were mapped by Ecoclass code: 0-25 percent tree mortality, 26-50 percent mortality, 51-85 percent, and 86-100 percent tree mortality. A summary table lists the map units by acres and percent of the acres. Yellow high lighting identifies those Ecoclass codes totaling 10 percent or more of the map acres.

Examples of fire mortality are shown in figures 2, 3, 4, and 5.

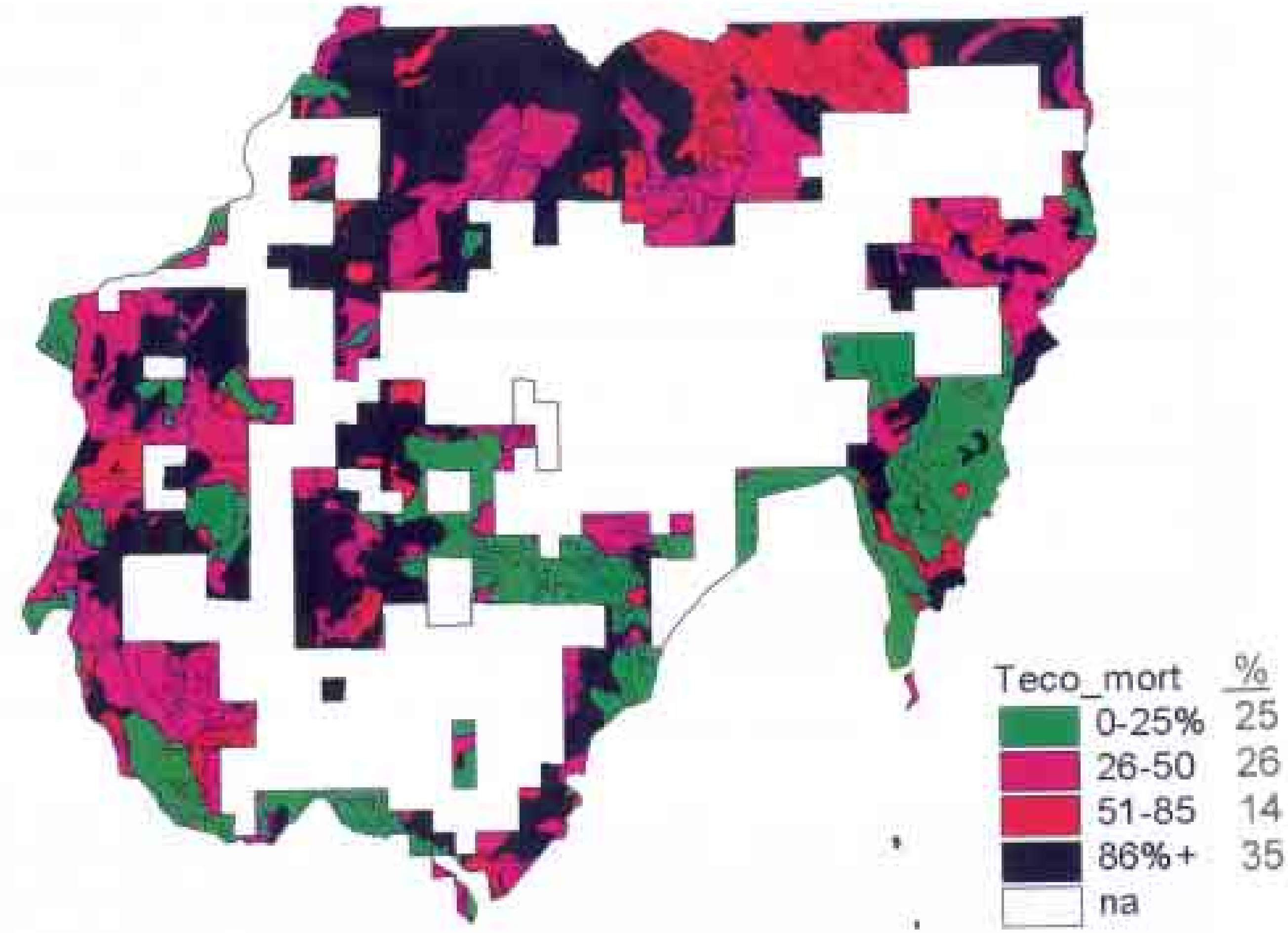
TOOLBOX - MORTALITY 17Janb03

INTENSITY	COUNT	ACRES	0-25	%	26-50	%	51-85	%	86+	%	Total
10-NR-CJ 26-50	1	34.5200			34						
10-NR-CJ 51-85	4	453.2500					453	2			2
10-NR-CJ 86%+	7	40.7200							41		
11-NR-SX	12	57.9200	58								
11-NR-SX 0-25%	12	351.4000	351	1							
11-NR-SX 26-50	15	288.9500			288	1					
11-NR-SX 51-85	11	40.7200					41				
11-NR-SX 86%+	17	259.6300							260	1	3
12-NR-CP 26-50	2	200.0800			200	1					
12-NR-CP 51-85	3	119.5900					120				
12-NR-CP 86%+	3	23.4500							23		1
16-SX-CP	1	3.2800									
16-SX-CP 0-25%	1	6.4400	9								
16-SX-CP 26-50	3	15.1600			15						
16-SX-CP 51-85	4	44.2800					44				
16-SX-CP 86%+	14	246.7300							247	1	1
17-SX-CJ	4	103.1100									
17-SX-CJ 0-25%	6	333.6700	427	2							
17-SX-CJ 26-50	21	265.0400			265	1					
17-SX-CJ 51-85	19	37.9300					38				
17-SX-CJ 86%+	19	260.1900							260	1	4
192-??? 86%+	1	1.7900							2		
205-???	1	0.2800									
22-CP-CJ	3	13.2400	13								
22-CP-CJ 26-50	10	32.2700			32						
22-CP-CJ 51-85	6	56.6500					57				
22-CP-CJ 86%+	4	99.7700							100		
225-MX 0-25%	4	87.8400	88								
225-MX 26-50	5	27.5400			27						
225-MX 51-85	5	6.1400					6				
225-MX 86%+	12	56.9900							57		
245-NR-R	4	4.0400									
245-NR-R 0-25%	1	2.5100	7								
245-NR-R 26-50	8	30.5800			31						
245-NR-R 51-85	1	12.4000					12				
245-NR-R 86%+	7	129.5000							130		1
270-HQ 0-25%	1	5.5800	6								
271-??? 0-25%	3	12.1600	12								
271-??? 26-50	1	0.0300									
271-??? 51-85	2	2.7900					3				
271-??? 86%+	1	5.8100							6		
272-??? 86%+	1	4.5000							5		
273-??? 0-25%	3	60.7000	61								
273-??? 26-50	6	31.0600			31						
273-??? 51-85	7	20.2200					20				
273-??? 86%+	11	22.1700							22		
280-GX 0-25%	9	142.5000	142								
280-GX 26-50	6	7.6800			8						
280-GX 86%+	4	41.0100							41		

280-GX na	1	0.0300									
281-???	2	3.5200									
281-??? 0-25%	1	4.5200	8								
281-??? 26-50	2	5.9300			8						
281-??? 51-85	5	13.1500					13				
400-??? 51-85	1	6.0300					6				
400-??? 86%+	1	1.0700							1		
503-??? 86%+	1	2.2600							2		
CJ-S1-12	16	88.0700									
CJ-S1-12 0-25%	23	240.4400	328	1							
CJ-S1-12 26-50	31	448.6400			449	2					
CJ-S1-12 51-85	21	207.7600					208	1			
CJ-S1-12 86%+	22	565.9100							566	3	6
CJ-S3-11 86%+	2	53.8600							54		
CL-G3-15	18	9.1900									
CL-G3-15 0-25%	33	259.1900	268	1							
CL-G3-15 26-50	25	301.1800			301	1					
CL-G3-15 51-85	16	220.2400					220	1			
CL-G3-15 86%+	23	1234.4100							1234	4	7
CL-G3-15 na	1	0.2100									
CL-G4-15 0-25%	3	0.6000	1								
CL-G4-15 26-50	1	10.0700			10						
CL-G4-15 86%+	1	126.4700							126		
CL-S1-12 0-25%	1	0.0200									
CP-C2-11	7	34.1700									
CP-C2-11 0-25%	15	568.9000	601	2							
CP-C2-11 26-50	16	288.8600			286	1					
CP-C2-11 51-85	8	135.8500					136				
CP-C2-11 86%+	24	444.8800							445	2	4
CP-C2-11 na	1	0.1700									
CP-H3-11	13	26.7300									
CP-H3-11 0-25%	4	188.2600	215	1							
CP-H3-11 26-50	3	23.0900			23						
CP-H3-11 51-85	5	29.0900					29				
CP-H3-11 86%+	9	13.1100							13		1
CP-S1-21	4	67.5600									
CP-S1-21 0-25%	18	826.1700	893	3							
CP-S1-21 26-50	9	202.8200			203	1					
CP-S1-21 51-85	7	56.7300					57				
CP-S1-21 86%+	12	74.9400							75		4
CP-S2-11	13	80.3500									
CP-S2-11 0-25%	48	378.1900	458	2							
CP-S2-11 26-50	66	2909.2500			2909	11					
CP-S2-11 51-85	54	1245.4900					1246	4			
CP-S2-11 86%+	72	2864.7000							2865	10	27
CP-S2-11 na	8	0.6300									
CP-S2-17	21	120.3200									
CP-S2-17 0-25%	20	1166.1100	1286	5							
CP-S2-17 26-50	25	1154.5600			1155	4					
CP-S2-17 51-85	33	878.7700					879	3			
CP-S2-17 86%+	41	1466.2500							1466	5	17

CW-C4-11 0-25%	2	73.2000	73								
CW-C4-11 26-50	2	44.8300			45						
CW-C4-11 51-85	1	8.9200					9				
CW-C4-11 86%+	2	109.5900							110		1
CW-H2-11	5	116.2100									
CW-H2-11 0-25%	8	451.8700	568	2							
CW-H2-11 26-50	19	687.6400			688	2					
CW-H2-11 51-85	13	96.0300					96				
CW-H2-11 86%+	21	745.8200							746	3	7
CW-H2-11 na	1										
NULL	2										
NULL 0-25%	4										
NULL 26-50	3										
NULL 86%+	4										
NULL na	7										
SD-19-13	9	14.1200									
SD-19-13 0-25%	25	1032.6100	1048	4							
SD-19-13 26-50	46	398.1500			398	1					
SD-19-13 51-85	24	264.2500					264	1			
SD-19-13 86%+	46	1009.2100							1009	4	10
TOTALS		28204.0300	6919	25	7407	26	3957	14	9606	35	96

Yellow highlight 53%



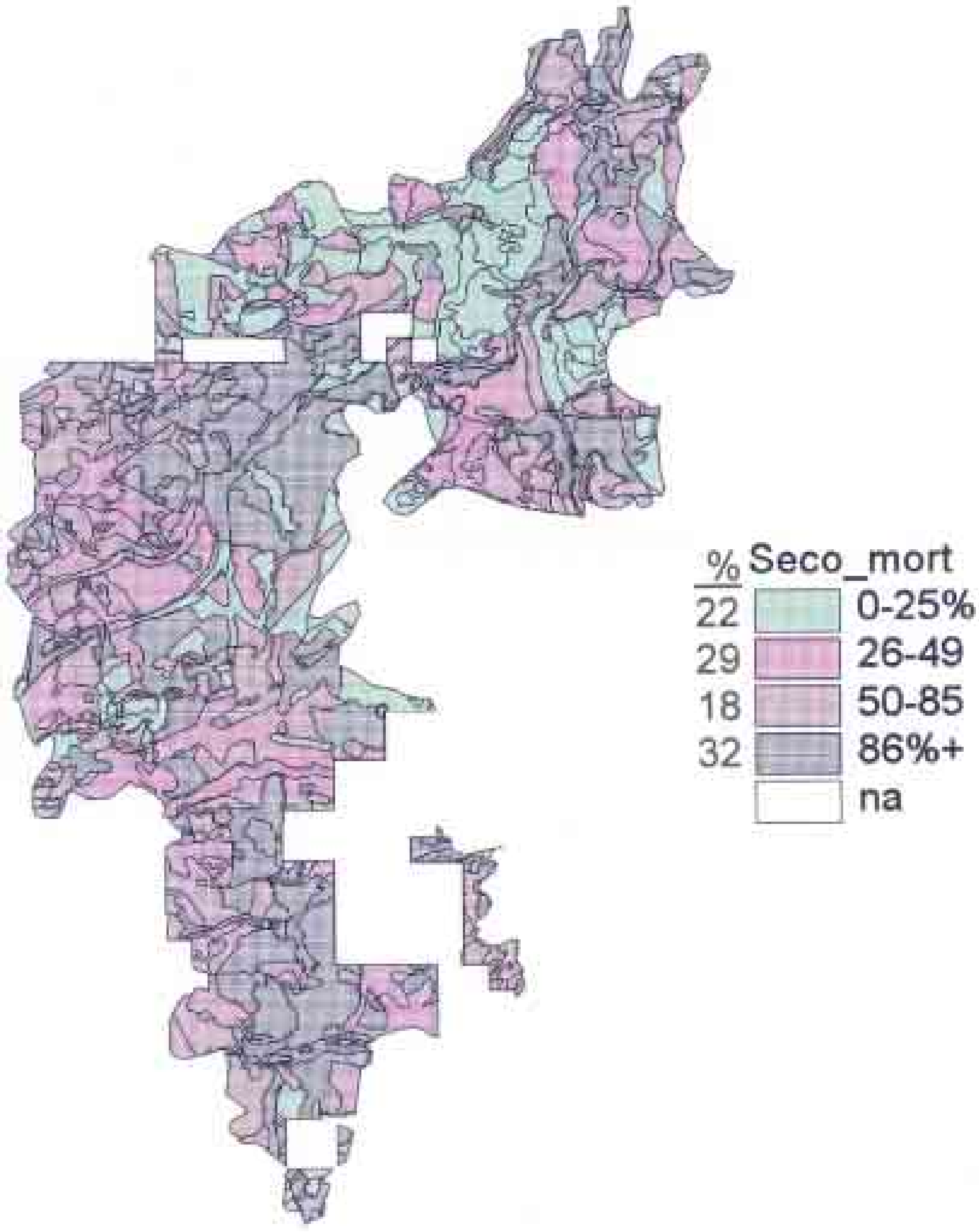
TOOLBOX – FIRE MORTALITY

SILVER - MORTALITY 17Jan03

INTENSITY	COUNT	ACRES	0-25	%	26-50	%	51-85	%	86+	%	Total
12-NR-CP-0-25%	1	2.0000	2								
12-NR-CP-26-49	2	1.2900			1						
12-NR-CP-50-85	1	8.2900					8				
12-NR-CP-86%+	1	0.7100							1		
16-SX-CP-	2	1.3500									
16-SX-CP-0-25%	10	18.1800	19								
16-SX-CP-26-49	10	42.8800			42						
16-SX-CP-50-85	6	29.5400					29				
16-SX-CP-86%+	7	6.8300							7		
17-SX-CJ-0-25%	4	10.4800	10								
17-SX-CJ-26-49	3	29.5600			30						
17-SX-CJ-50-85	3	7.6200					8				
17-SX-CJ-86%+	4	17.7900							18		
225-MX-	2	1.2600									
225-MX-0-25%	13	62.7200	64								
225-MX-26-49	10	19.6000			20						
225-MX-50-85	10	33.1500					33				
225-MX-86%+	14	77.1900							77		1
273-???-	3	22.7100									
273-???-0-25%	13	70.3700	92								
273-???-26-49	16	32.0900			32						
273-???-50-85	16	83.8600					84				
273-???-86%+	12	35.9700							36		1
280-GX-0-25%	2	14.8400	15								
280-GX-26-49	1	7.3000			7						
280-GX-50-85	5	1.3100					1				
280-GX-86%+	2	0.1500									
281-???-	1	0.7200									
281-???-0-25%	4	60.5800	61								
281-???-26-49	1	3.4700			3						
281-???-50-85	9	7.5200					8				
281-???-86%+	3	3.0000							3		
295-???-0-25%	1	1.8400	2								
295-???-26-49	1	6.7900			7						
295-???-50-85	2	0.1000									
CJ-S1-12-	1	5.2000									
CJ-S1-12-0-25%	1	10.0500	5								
CJ-S1-12-86%+	1	29.3400			29						
CJ-S3-11-	8	50.1500	50								
CJ-S3-11-0-25%	23	675.0400	675	3							
CJ-S3-11-26-49	26	712.6200			713	3					
CJ-S3-11-50-85	30	348.3300					348	2			
CJ-S3-11-86%+	30	405.8300							406	2	10
CL-G3-15-	5	53.7400									
CL-G3-15-50-85	4	38.3600			92						
CL-G3-15-86%+	3	32.0400					32				
CL-M3-11-	4	6.7700									
CL-M3-11-0-25%	5	14.4100	21								
CL-M3-11-26-49	8	189.1100			189	1					

CL-M3-11-50-85	10	31.0800					31				
CL-M3-11-86%+	10	153.8800							154	1	2
CL-S2-11-	1	0.0300									
CL-S2-11-0-25%	6	81.6100	82								
CL-S2-11-26-49	10	164.0200			164	1					
CL-S2-11-50-85	9	17.5500					18				
CL-S2-11-86%+	8	268.5500							269	1	2
CL-S2-15-	1	3.9500									
CL-S2-15-0-25%	1	10.3000	14								
CL-S2-15-26-49	1	0.0300									
CL-S2-15-50-85	1	0.2600									
CP-C2-11-	7	50.0400									
CP-C2-11-0-25%	8	192.4700	142								
CP-C2-11-26-49	9	121.2900			122						
CP-C2-11-50-85	6	55.5000					56				
CP-C2-11-86%+	4	40.8800							41		2
CP-S1-11-0-25%	2	19.3700	19								
CP-S1-11-86%+	1	50.4600							50		
CP-S2-11-	21	90.0300									
CP-S2-11-0-25%	69	2030.5000	2120	10							
CP-S2-11-26-49	83	2289.7100			2290	11					
CP-S2-11-50-85	51	1309.6900					1310	6			
CP-S2-11-86%+	67	2789.3600							2789	13	40
CP-S2-11-na	1	0.0400									
CP-S2-12-	3	9.3200									
CP-S2-12-0-25%	6	34.7800	44								
CP-S2-12-26-49	10	133.6600			134						
CP-S2-12-50-85	10	283.6100					284	1			
CP-S2-12-86%+	12	184.5500							185	1	2
CP-S2-17-	10	158.3900									
CP-S2-17-0-25%	48	592.7000	751	4							
CP-S2-17-26-49	43	1123.4900			1123	5					
CP-S2-17-50-85	29	660.6100					661	3			
CP-S2-17-86%+	45	2187.7900							2188	10	22
CP-S3-11-	6	23.2600									
CP-S3-11-0-25%	1	0.3200	24								
CP-S3-11-26-49	18	524.3000			524	2					
CP-S3-11-50-85	8	426.9200					427	2			
CP-S3-11-86%+	22	266.7800							267	1	5
CW-H2-11-0-25%	1	5.0900	5								
CW-H2-11-86%+	1	48.6800							49		
CW-S1-14-	5	21.8800									
CW-S1-14-0-25%	10	70.6900	94								
CW-S1-14-26-49	6	434.8000			435	2					
CW-S1-14-50-85	8	242.0400					242	1			
CW-S1-14-86%+	15	158.7400							159	1	4
NULL-	3										
NULL-50-85	7										
NULL-na	3										
SD-19-12-	10	70.3000									
SD-19-12-0-25%	9	192.2800	263	1							

SD-19-12-26-49	6	96.3200		1	96						
SD-19-12-50-85	16	182.1800					182	1			
SD-19-12-86%+	24	81.5200							82		3
SD-29-12-	2	3.0900									
SD-29-12-0-25%	2	5.1400	8								
SD-29-12-50-85	2	49.5900			50						
SD-29-12-86%+	4	36.5800							57		
TOTALS		21593.8600	4602	22	8103	29	3782	18	6819	32	100
							Total last column				94
							Yellow highlight				72%



SILVER - -FIRE MORTALITY

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Appendix C

Percent slope map units on the Toolbox and Silver Fires, Silver Lake District, Fremont N.F. Slope map units are listed by 5 percent classes, count of map units, total acres in the map unit, average size of the map unit (acres/count=size), and percent of the map with the map unit. Yellow high lighting emphasizes those map units with 9 percent or more "Total" is the percent of acres less than 16 percent slope. Acres are summarized separately by USFS and private land.

TOOLBOX SLOPE 17Jan03

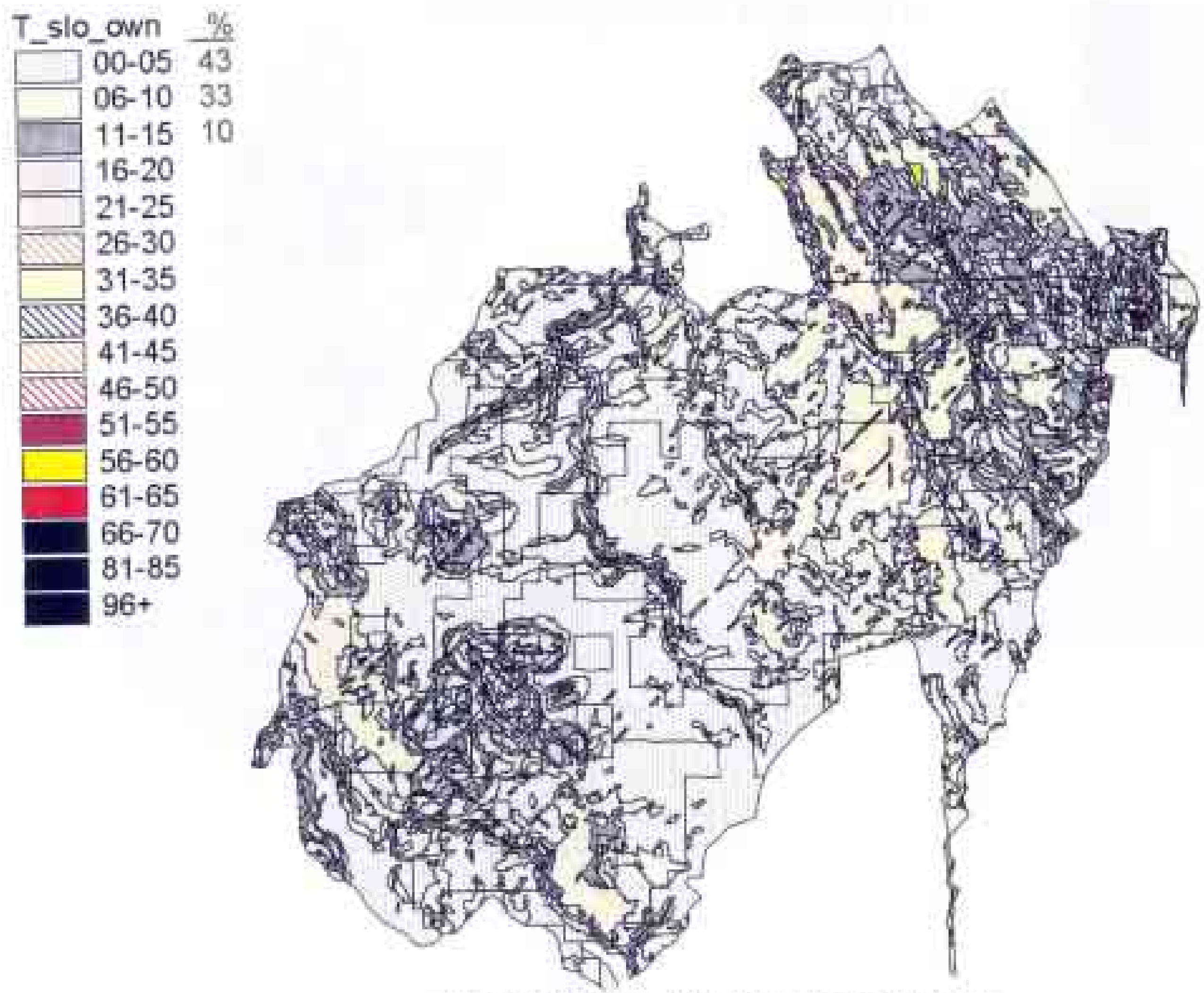
SLOPE_BY	COUNT	SUM_ACRES	Size	%	Total
FRF 00-05	188	13145.0501	70	47	
FRF 06-10	248	8858.0600	36	31	87
FRF 11-15	218	2620.8400	28	9	
FRF 16-20	137	1645.6000	12	6	
FRF 21-25	94	961.4400	10	3	
FRF 26-30	54	517.8100	10	2	
FRF 31-35	25	188.1200	7	1	
FRF 36-40	17	127.3200	7	1	
FRF 41-45	7	28.7800			
FRF 46-50	15	61.7100			
FRF 51-55	11	20.1900			
FRF 56-60	9	13.0400			
FRF 61-65	11	5.6400			
FRF 66-70	6	5.0400			
FRF 81-85	5	0.3100			
FRF 96+	11	4.5600			
TOTALS		28203.5101		100	87

PVT 00-05	206	12721.5701		39	
PVT 06-10	298	11478.3701		36	87
PVT 11-15	288	3821.0400		12	
PVT 16-20	166	1936.6200		6	
PVT 21-25	103	1103.2500		3	
PVT 26-30	49	344.9300			
PVT 31-35	28	221.8000			
PVT 36-40	21	226.4100			
PVT 41-45	14	100.2700			
PVT 46-50	17	153.2200			
PVT 51-55	7	71.5800			
PVT 56-60	5	61.4200			
PVT 61-65	2	16.1500			
PVT 66-70	1	9.1100			
		32265.7402		96	87

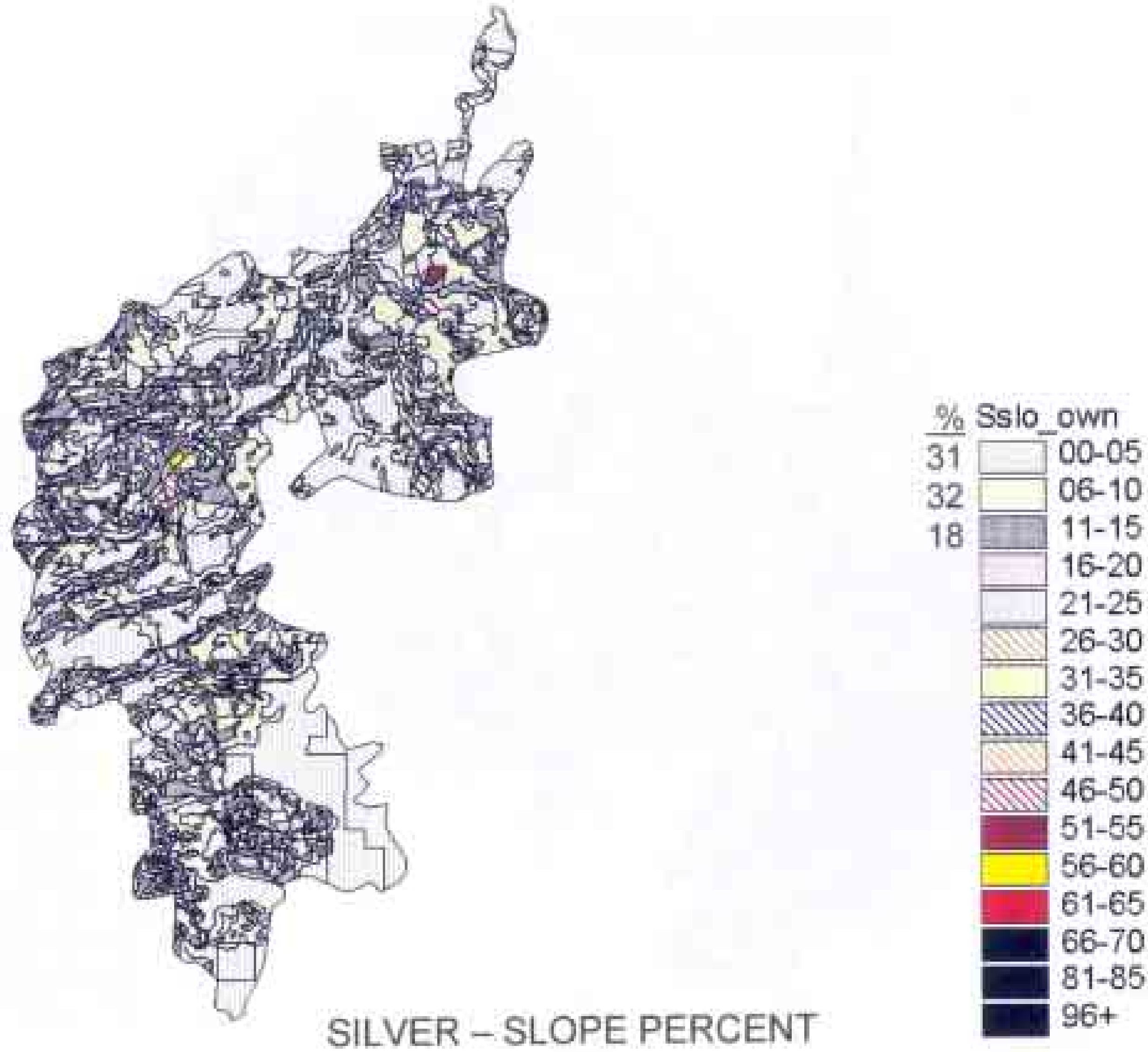
SILVER - SLOPE 17Jan03

OWN_SLOPE	COUNT	SUM_ACRES	Size	%	Total
FR-NF00-05	160	6717.7600	42	31	
FR-NF06-10	197	6897.6800	34	32	81
FR-NF11-15	249	3771.4200	15	18	
FR-NF16-20	192	1987.8200	10	9	
FR-NF21-25	95	1118.3800	12	5	
FR-NF26-30	45	390.5400	9	2	
FR-NF31-35	28	238.2000	8	1	
FR-NF36-40	17	239.8000	14	1	
FR-NF41-45	6	108.6600	18	1	
FR-NF46-50	6	78.8300			
FR-NF51-55	1	28.3500			
FR-NF56-60	1	14.9900			
TOTALS		21393.4300		100	81

PRIVT00-05	32	1830.8101		58	
PRIVT06-10	50	737.7000		23	91
PRIVT11-15	39	315.3600		10	
PRIVT16-20	20	160.4200		5	
PRIVT21-25	8	75.2700			
PRIVT26-30	2	26.2500			
PRIVT31-35	1	5.4500			
PRIVT36-40	1	0.6400			
PRIVT41-45	4	19.3700			
TOTALS		3171.2801		96	91



TOOLBOX – SLOPE PERCENT


% Sslo_own
31 00-05
32 06-10
18 11-15
16-20
21-25
26-30
31-35
36-40
41-45
46-50
51-55
56-60
61-65
66-70
81-85
96+
SILVER – SLOPE PERCENT

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