COMMENTS ON THE BITTERROOT FRONT RESTORATION PROJECT

My name is B. John (Jack) Losensky: Retired Forest Ecologist, living in Hamilton, Montana. I have a B.S. degree in Forest Management and a M.S. degree in Forest Ecology from Pennsylvania State University. I also have two years of post-graduate studies in Forest Ecology at the University of Montana. I was employed by the Forest Service for 35 years and after retiring I spent 20 years doing private consulting.

During much of my career I specialized in historical vegetation and fire studies. I have conducted numerous fire history studies and was responsible for developing a map of the historical vegetation in the Columbia River Basin. I also developed the successional pathways after disturbance for the LANDFIRE model developed by the Northern Forest Fire Laboratory in Missoula.

Based on my studies over 50 years I want to whole heartly support reintroduction of fire into the westside forests. It is apparent with only a limited study of the available information on historical fire that our forests are heavily overstocked on our drier sites and conversion to less fire tolerant trees is well under way. Fuel loadings vastly exceed natural conditions and fires have shifted from underburns to stand replacement events. In addition, more mesic sites have also shifted in a similar pattern with fire moving from a mixed burn also to stand replacement fires. Probably our most vulnerable sites might be in the lodgepole and high elevation sites. Where once dominated by young aged stands providing a patch like pattern on the landscape we now have extensive stands of old lodgepole with few breaks. Fuel loading can be as high as 200 tons per acre or more and control is impossible without the aid of rain at the end of the fire season. Following are a few points that I think the study should address.

POINTS OF CONCERN

1. Continued fire exclusion will result in the loss of major portions of the dry ponderosa type that was common on the lower forest slopes. These sites are being replaced by less stable communities of more disease and fire intolerant species. These changes will result in increased fire risk and more intensive fires.
2. The loss of age structure variability on mid to upper slope positions resulting in continuous uniform stand conditions leading to difficult control of wildfires.
3. The aging of the lodgepole type with a major loss in young, aged stands (less than 15 years) which are essential for good rabbit populations. Our lynx population is experiencing loss of numbers because of the lack of this food source.
4. The conversion of our lodgepole pine stands to subalpine fir stands resulting in a major increase in fire control issues.
5. Major losses in our whitebark pine forests because of competition with fire intolerant trees such as spruce and subalpine fir. This issue is exacerbated by blister rust which has impacted whitebark pine. This change has resulted in a major food source loss for grizzly bear.
6. Our forests have developed over eons of time with various environmental pressures such as fire and have developed characteristics that help to maintain them in this environment in a somewhat stable condition. Our various plants, birds and animals have also developed a niche in this environment that assures their continued presence. Changing of our forest characteristics will have significant impacts on these niches.

7. Continuing to ignore the impacts of fire exclusion and treatment of these lands will continue a threat to human life and property with a high expectation of future tragedies.

I have enclosed a copy of a report I prepared in 1988 for a portion of the area under consideration which might provide some historical perspective to your analysis. I have also included a table showing age structure for these sites at the time of settlement. This information was developed from the 1930's timber surveys and adjusted to 1900.

I look forward to continued involvement in the analysis of this project.

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AN ECOLOGICAL EVALUATION OF THE PLANT COMMUNITIES ON THE BITTERROOT FACE BETWEEN SAWTOOTH CREEK AND BLODGETT CREEK

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INTRODUCTION

The Bitterroot face provides the backdrop to the town of Hamilton and for this reason is of special interest to valley residents. To many it represents their window to the Bitterroot Forest and a visual expression of their perception of a quality environment. Visitors to the valley are also impressed by this visual backdrop and many have returned to live here as a result. Change in the appearance of this backdrop is considered by most people a negative impact that would degrade their home setting. For this reason there is a strong desire to maintain the view in its current condition. Unfortunately change does occur in nature and this site is no exception. Change can occur haphazardly as a result of a natural or man-caused event such as a wildfire or it can be managed over time by developing a long term strategy that recognizes the natural cycles within plant communities. Hopefully by developing an overall plan for the area the amount and impact of change can be minimized so that the natural backdrop to Hamilton can be maintained and at the same time reduce the risk of an unplanned event. The first step in this process is to determine the present condition and structure of the various plant communities. This knowledge can then be used to predict the normal cycle for each community and more importantly determine where they are in the cycle. By developing a vegetative management plan based on this information the impact of these natural events can be lessened and permitted to proceed in a more orderly manner.

The objectives of the study are:

1. Determine the present condition of the vegetative communities.
2. Determine where the stands are in the successional cycle.
3. Define the time frame before a significant change can be expected in the vegetative structure.
4. Define what changes can be expected over time with various management strategies.

STUDY AREA

The study area lies between Blodgett Creek on the north and Sawtooth Creek on the south. The west boundary is roughly delineated by the 7000 foot contour and the eastern boundary by the Forest boundary. Elevations range from 4600 to 7000 feet. Areas above 7000 feet were not sampled since they are normally impacted by fires burning into them from lower elevations rather than from starts in the type. Aspects vary from northwest through southerly with the majority of the area sloping in an easterly direction. There is a variety of vegetative communities found in the study area ranging from dry grass types represented by Douglas-fir/wheatgrass (Pfister 1977) through the moist grand fir/beadlily to the cooler subalpine fir/beargrass and menziesia types. Subalpine fir/woodrush occupies the higher elevations.

Soils are derived from gneiss and granite parent material. Landforms are generally moderately dissected breaklands at the lower elevations with frost churned types on the upper slopes. Minor inclusions of glaciated types including glacial trough walls and valley trains are found associated with the major streams. Soils vary by aspect and elevation. Low elevation north slopes generally contain cool moderately deep soils of coarse loamy to loamy skeletal texture. These grade to cold soils of similar texture associated with frost

churned landtypes at the upper elevations. On south slopes soils are dry with loamy skeletal texture or skeletal soils associated with structurally controlled breaklands. Glacial till is found in a number of the drainages in the study area.

Total precipitation increases dramatically over an elevational gradient from a low of 40 inches on the east boundary to over 80 inches on the west boundary. The majority of this precipitation comes in the form of snow during the winter months.

HISTORY

One of the first sawmills in the Bitterroot Valley was established on the bank of Roaring Lion Creek in 1886. Logs came from the vicinity of the mill and it provided the lumber to build the town of Grantsdale. Marcus Daly erected his mill in Hamilton between 1889 and 1890 and logging was well underway by the late 1890's. Initially logs were hauled to the Bitterroot River by horses and floated to the mill. With the arrival of the railroad in 1899, river drives were no longer employed. Much of the volume removed by Daly was for use in his mining ventures in Butte and Anaconda. By the early 1900's most of the private land had been clearcut. Logging on the Forest began about this time and based on stump ages the study area was logged about 1924. Typically logging at this time employed the use of chutes to bring the logs down the mountain. They were generally constructed of Douglas-fir found on the site and were built down the ridges or in stream bottoms. Trees were cut and skidded to the chutes where they were chained together and brought to the landing in long trains. Here they were placed on railroad cars and taken to the mill in Hamilton. Other than return trails for the skidding teams, no roads were built into the sale area. After this initial logging there was little activity in the study area for almost 50 years. Fires were suppressed and some grazing may have occurred on the lower slopes. About 1968 a road was constructed to the Forest boundary in Canyon Creek. Since that time there have been a few salvage sales north of the road which have removed dead and high risk trees. These sales covered only that portion of the study area that could be skidded to the Canyon Creek road. Firewood cutting has also been conducted by individuals along the road. In the early 1980's a timber sale which included a majority of the study area was proposed. Limited roading was anticipated and log removal was to be by helicopter. The sale was offered but there were no bidders and plans were dropped. The area has since been allocated to roadless management under the Bitterroot Forest Plan with the exception of the area adjacent to the Canyon Creek road. This area will be managed to maintain scenic values and provide a low level of timber harvest.

VEGETATION

During the survey the area was mapped into six vegetative communities which are shown in Table 1.

Table 1. Vegetative Communities and Major Habitat Types in the Bitterroot Face Assessment Area

Community		Habitat Types	Acres
1	45%	Douglas-fir/pinegrass-wheatgrass phase	
	40%	Douglas-fir/snowberry-wheatgrass phase	
	10%	Douglas-fir/wheatgrass	198
	5%	Misc. types	
2	13%	Douglas-fir/pinegrass-kinnikinnick phase	
	42%	Douglas-fir/snowberry-pinegrass phase	
	18%	Douglas-fir/ninebark-pinegrass phase	
	18%	Douglas-fir/pinegrass-ponderosa pine phase	
	13%	Douglas-fir/huckleberry-kinnikinnick phase	535
	6%	Misc. types	
3	20%	grand fir/beargrass	
	75%	grand fir/twinflower-twinflower phase	325
	5%	Misc. types	
4	71%	subalpine fir/twinflower-twinflower phase	
	15%	subalpine fir/menziesia	950
	14%	Misc. types	
5	100%	subalpine fir/beargrass-huckleberry	363
6	100%	scree and rock	106
			2477

A field survey was made of each of the communities in the fall of 1986. Plots were taken to identify tree and shrub composition and age structure. The habitat type was identified for each plot. Basal area information was also collected at this time. Board foot volumes and fuel loadings were obtained from District files. The results of the survey follow.

COMMUNITY 1

The community is found principally north of the Canyon Creek road with only small acreages elsewhere. It is normally found on southeast to south aspects (75%). Minor areas occur on east aspects (20%) where soils are shallow. It ranges in elevation from 4600 to 5900 feet.

Natural Condition

This site is characterized by dry Douglas-fir habitat types occupied by stands of fire maintained ponderosa pine and some Douglas-fir. Stands are open and the understory is usually sparse. The sites are too droughty for other tree species. Fires normally were light underburns with an average occurrence of every 10 years. Fire favors both ponderosa pine and Douglas-fir establishment however repeated burning often eliminates reproduction of both species maintaining an open stand appearance. Occasionally the fire free interval was long enough to permit ponderosa pine to become fire resistant which gave it a

competitive edge over Douglas-fir. Fuels average about 11 tons per acre in old growth stands (Davis 1980).

Existing Condition

The stand is characterized by large open grown ponderosa pine with some Douglas-fir. There are scattered patches of younger aged trees that have regenerated since the turn of the century. Most of the area was partially cut about 1924 with harvest apparently concentrated on ponderosa pine. The volume removed does not appear to have exceeded 25% of the original stand. In the late 1960's a road was constructed into Canyon Creek and since then salvage operations have been conducted on the area north of this road. Firewood cutting has also been significant. As a result very few dead standing or down trees were noted and standing dead trees average only 1 sq.ft. of basal area per acre. Fuel loadings vary between 1.1 to 10.1 tons per acre and average about 4.3 tons per acre. Choke cherry is the most common shrub averaging 15 plants per acre and has been heavily utilized by wildlife. There are 15 ponderosa pine seedling and sapling sized trees per acre while Douglas-fir makes up better than a third of the pole component (See Table 2).

Table 2. Stand age and Structure Expressed in Trees Per Acre and Sq.Ft. of Basal Area Per Acre

SPECIES	NO. of TREES	BASAL AREA by AGE CLASS			
	SEED &SAPS	50	100-150	250+	Total
PP	15	12	6	26	44
	100%	63%	86%	87%	79%
DF	0	7	1	4	12
		37%	14%	13%	21%
Total	15	19	7	30	56
		34%	12%	54%	

Board foot volumes average about 6600 bdft. per acre with 5200 bdft. being ponderosa pine.

Fire History

Prior to 1900 this community averaged a fire every 10 years. Since 1900 the frequency has dropped to about one fire every 30 years. There is no indication that any of these burns were stand replacement events and the stand structure is characterized by a relatively young component and an old-growth component. The young age component has become established since 1900 and is probably the result of logging and fire suppression activity. Other than burning for slash reduction associated with salvage operations the last major fire on the site was about 1944. This site is a typical example of Davis's Fire Type 4 (Davis 1980).

Successional Status

Changes in this type have been somewhat limited in respect to species composition. There has been a marked increase in the amount of Douglas-fir in the younger aged portion of the stand; however the dryness of the type permits ponderosa pine to maintain a high representation. Species composition has also

been affected by past logging and the influence of periodic burning. The age structure has changed significantly as a result of timber harvest. Approximately 34 percent of the basal area in composed of trees around 50 years of age. While this represents a significant change from that expected under natural conditions, it does simplify management of this type as it provides more resiliency to change as the old growth component dies. Fuel loadings are less than normal for the type as a result of firewood cutting and salvage logging activity. This type is in good condition for a wide variety of management options. The stand is mid seral in successional development.

Future Trends

Because of past cutting the stand structure while old is in generally good condition and is not unduly threatened by stress related mortality. In addition approximately 46 percent of the basal area is under 150 years of age providing a buffer in the event of heavy mortality in the old growth. Near natural stand conditions can be maintained with underburning every 20 or 30 years. This treatment will prevent a buildup of reproduction and aid in nutrient cycling. Some shrub stimulation will also occur however this will be limited because of the dryness of the type. Timber salvage may also be used in most of the community to capture mortality. If fire is excluded an increase in the reproduction layer can be expected particularly Douglas-fir. As the understory component increases additional stress will be placed on the overwood as more of the available moisture and nutrients are utilized. Increased mortality may occur with the majority of the overwood expected to die in the next 50 years. There have been no fire starts in the community during the last 46 years, however, the proximity of the Canyon Creek Road does pose an additional threat.

COMMUNITY 2

This type is found throughout the study area on east and southeast aspects (76%) with a minor amount on northeast slopes (13%). Generally soils are deeper than in Community 1 and moisture stress is not as severe. Elevations range from about 4700 to 6300 feet.

Natural Condition

This community is made up of habitat types that are slightly more moist than Community 1 and will support a larger percentage of Douglas-fir under periodic natural burning. Fires normally burned on a 28 year average which maintained open seral stands. Tree species composition was dependent on seed source and intensity and frequency of past fires. Shrub and understory tree development could progress for a relatively long fire free period. As a result fuel loadings were heavier and burns could be more intense causing some mortality in the overwood. Stand structure therefore may typically be made up of even aged groups. Fuel loadings can be highly variable in the type but should average about 12 tons per acre.

Existing Condition

Stand conditions are highly variable because of past logging. Ponderosa pine is the major species along with Douglas-fir in the old growth component but are of equal importance over all age classes. Additionally there are minor volumes

of lodgepole pine and an occasional grand fir. Mistletoe is present on about a third of the plots with 43 percent of them characterized as containing a heavy infestation level. Spruce budworm damage is limited with only minor activity noted. Overstories vary from open stands of ponderosa pine and Douglas-fir to those with a dense understory of saplings and pole sized material. The portion of the type north of the Canyon Creek road has been partially salvaged in the recent past and woodcutting has occurred on the accessible areas. Fuel loading are estimated at 14 tons per acre. The amount of standing dead is significantly higher than found on Community 1 because of the lack of access on most of the type for woodcutters. An estimated 32.1 sqft. of basal area is composed of standing dead on the type or about 25 percent of the standing material. Shrubs are more common averaging about 32 plants per acre. The major species are maple, choke cherry and willow. Reproduction is much more common averaging 150 trees per acre of which 26 percent are ponderosa pine. In addition there are about 55 trees per acre that are dead of which ponderosa pine makes up 57 percent.

Table 3. Stand age and Structure Expressed in Trees Per Acre and Sq.Ft. of Basal Area Per Acre

SPECIES	NO. of TREES	BASAL AREA by AGE CLASS				STANDING
	SEED &SAPS	50	100-150	250+	TOTAL	DEAD
PP	40	7.9	4.7	37.4	50.0	23.2
	26%	27%	39%	73%	54%	72%
DF	110	21.1	5.8	13.7	40.5	8.4
	74%	73%	48%	27%	44%	28%
LP	0	0	1.6	0	1.6	0
			13%		2%	
GF	0	0	0	.5	.5	0
				T	T	
TOTAL	150	28.9	12.1	51.6	92.6	32.1
	31%	13%	56%			

Volumes average about 10,000 bdft. per acre with ponderosa pine composing about 5400 bdft.

Fire History

Prior to 1900 this area burned on average every 30 years which is slightly longer than the average reported by Arno. Since that time only one fire was recorded which was 77 years ago. There may also be a major gap in fire occurrence on this type between 1835 and 1910. Fire scars were limited on the type which could be the result of a lack of fire or low intensity fires which did not scar the trees. Whether this long fire free period did occur or is the result of sampling error is open to conjecture. Two starts have been recorded since 1940 one of which was greater than 10 acres.

Successional Status

Ponderosa pine is undergoing significant losses in its representation in this type. This is the result of past timber harvest and exclusion of fire. Ponderosa pine has lost about 46 percent of its coverage when the 50 year old age component is compared to the old-growth component. This trend is also occurring in the reproduction layer. The lodgepole component represents the affect of the last major burn in the type and its presence in the stand is waveform as a result of such events. The age structure of the community has also undergone significant changes with 31 percent in the age 50 class. This is similar to Community 1 and appears to be the result of past cutting in the type and fire exclusion. The community is mid seral in successional development.

Future Trends

While cutting has occurred on major portions of the type, the stand conditions are not as good as found in Community 1. Mistletoe and past spruce budworm damage have impacted major portions of the type and because of the mistletoe in the overwood, mortality is probably higher than in Community 1. Continued fire exclusion will permit Douglas-fir to increase its presence. Based on past mortality the old-growth timber will be dead in the next 100 years which will cause a significant loss of ponderosa pine in the stand. I would expect however that mortality will increase as stand stress increases through nutrient tie-up and water demands from understory reproduction. This in turn will accelerate mortality and significant losses could occur during the next 50 years. Whereas now ponderosa pine represents 66 percent of the mature stand, it will drop to about 31 percent during the time period.

COMMUNITY 3

The type is found on north and northeast slopes scattered over the study area or associated with riparian zones on all aspects. It ranges in elevation from 4600 to about 5900 feet on the slopes and below 5100 feet in the major drainages such as Canyon Creek.

Natural Condition

Fire frequency in this type is low and as a result dense stands of mixed species can develop. These stands have limited undergrowth because of the crown closure and the microenvironment is cool and moist which limit fire intensity and spread. Underburning is limited and usually results when a ground fire burns into the type and goes out. Fuel loading are variable and average about 25 tons per acre. When weather conditions permit a severe stand replacing fire can occur. Investigations indicate that this may have occurred every 150 to 500 years. Light to moderate ground fires occur on a 50 to 100 year cycle. Dense shrub communities often follow the fire which give way to various mixtures of tree species.

Existing Condition

Stands are composed of varying mixtures of Douglas-fir, grand fir, ponderosa pine and some lodgepole pine. Understories vary from relatively open to dense stands of sapling and pole sized material. Most of the area was logged during the 1924 period similar to the proceeding communities. There are about 20 tons per acre of down and woody fuels in this type. In addition there is about 14.0

sqft. basal area of standing dead material which represents about 12 percent of all the standing material. There are about 60 shrubs per acre composed of ninebark, alder and maple. The maple has generally grown out of reach of animal use. Reproduction averages about 315 trees per acre of which 76 percent is grand fir, 14 percent Douglas-fir and the remaining portion lodgepole pine and Engelmann spruce. In addition there are 315 trees per acre that are dead. Mistletoe was noted on 45 percent of the plots with 67 percent of them rated as heavy. Spruce budworm damage was noted on 30 percent of the plots. It was generally listed as light damage and there was little sign of recent activity.

Table 4. Stand age and Structure Expressed in Trees Per Acre and Sq.Ft. of Basal Area Per Acre

SPECIES	NO. of TREES SEED &SAPS	BASAL AREA by AGE CLASS 50	100-150	250+	TOTAL	STANDING DEAD
PP	0	2.0	1.0	26.0	29	9.0
		5%	20%	43%	27%	64%
DF	45	13.0	0	30.0	43	4.0
	14%	32%		49%	41%	29%
GF	240	22.0	2.0	5.0	29	0
	76%	55%	40%	8%	27%	
LP	15	3.0	2.0	0	5	1.0
	5%	8%	40%		5%	7%
S	15	0	0	0	0	0
	5%					
TOTAL	315	40	5	61	106	14
		38%	5%	58%		

Volumes average about 13,300 bdft. per acre with Douglas-fir representing about 41 percent of the volume, grand fir and ponderosa pine each contain 27 percent and lodgepole pine the remaining volume.

Fire History

Limited information is available on past fire occurrence as there are few fire scared trees. Based on the age structure of the seedling to pole sized trees the last major fire occurred in 1910. This apparently was a spotty burn resulting in a mix of stand conditions. Portions show signs of underburning with most of the overwood in tact. These stands are generally mixtures of Douglas-fir and ponderosa pine which could survive the fire. On other portions generally above the limits of ponderosa pine only islands of Douglas-fir and grand fir are left. The remaining stand is composed of dense lodgepole pine with some Douglas-fir. There have been three fire starts in the type since 1940 one of which burned more than 10 acres.

Successional Status

Stand condition is variable but generally show more impacts from past fire exclusion and harvesting than Community 2. Successional change is progressing much more rapidly. The stands are generally late seral in structure. The 50 year age category represents a much higher proportion of the basal area than found under normal stand conditions because of past logging and fire exclusion. But contrary to the first two communities the component is occupied by grand fir which is not conducive to stand stability.

Future Trends

It would appear that major losses will occur in the next 50 years. As this loss occurs ponderosa pine will drop from 43 percent of the stand to about 7 percent resulting in only scattered ponderosa pine trees remaining. Significant losses can be expected in Douglas-fir with its share dropping from 49 percent to 29 percent. Major increases can be expected in grand fir and is expected to represent 53 percent of the stand during the same period. Stand structure will continue to move to a multi-layered condition of climax species which are highly susceptible to spruce budworm damage and fire mortality.

COMMUNITY 4

This type is commonly found on northeast aspects (62 percent) with minor amounts on east (22 percent) and north (12 percent) slopes. Elevations range from 4900 to 7000+ feet.

Natural Conditions

Fire occurrence is generally low in this type but when they do burn the fires are often severe. The average fuel loadings is about 30 tons/acre but are highly variable and may reach 80 tons/acre. Stand composition is also highly variable as a result of past fire frequency and intensity. Repeated burns will often favor lodgepole pine but light underburns can result in a mixed stand of seral and climax species. The average fire interval is 24 years for underburns. Stands can remain unburned for extended periods which result in stand replacement type fires about every 75 years. Protection of these sites has led to abnormal fuel loadings and many of them pose a high fire hazard.

Existing Conditions

Stands are composed of mixtures of Douglas-fir, lodgepole pine and subalpine fir with scattered ponderosa pine and an occasional grand fir. Stands are composed of individual or small groups of old growth Douglas-fir in a sea of 6 to 10" lodgepole pine. Generally this area has limited logging history probably because of the small amount of ponderosa pine in the original stand. No logging has occurred in the type since the 1924 activity. Fuel loadings average 16 tons per acre with an additional 19.4 sq.ft of basal area of standing dead material. Shrubs are very limited in the type and none occurred on any study plots. Reproduction averages 750 trees per acre plus an additional 150 dead stems per acre. Subalpine fir is the principal species along with minor amounts of Douglas-fir, grand fir, lodgepole pine and scattered Engelmann spruce. Mistletoe is less of a problem on this site and is confined to Douglas-fir. Where it does occur however it can have a significant impact. Spruce budworm has been a problem in these stands in the past but no recent damage was noted.

Table 5. Stand age and Structure Expressed in Trees Per Acre and Sq.Ft. of Basal Area Per Acre

SPECIES	NO. of TREES SEED &SAPS	BASAL AREA by AGE CLASS 50	100-150	250+	TOTAL	STANDING DEAD
PP	0	0	0 0 5%	2.9 2% 5	2.9	0
DF	124 17%	0	21.2 41%	35.9 59% 60	57.1 50%	10.0 50%
GF	79 11%	0	0	0.4 1%	0.4 T	0
LP	44 6%	2.4 100%	18.2 35%	11.2 18% 19	31.8 28%	4.7 25%
AF	494 66%	0	12.4 24%	8.8 14% 15	21.2 18%	4.7 25%
S	9 1%	0	0	0 50.2	0	0
TOTAL	750	2.4 2%	51.8 45%	~~61.2~~ 53%	115.3	19.4

The stand contains about 10,100 bdft. per acre of which 5100 is Douglas-fir, 2800 is lodgepole pine and 1900 feet of subalpine fir. Lessor amounts of ponderosa pine and grand fir are also present.

Fire History

No clear evidence could be found on past fires in this type. Fire scars are limited on the existing stand and the amount of subalpine fir and Engelmann spruce in the stand suggest a relatively low level of fire in the past 100 years. Lodgepole pine which appears to have been established at the last disturbance is about 110 years of age. Islands composed of Douglas-fir and grand fir are found scattered over the area which are in excess of 200 years of age. This burn was fairly severe based on the density of lodgepole pine reproduction. A portion of the area did have some fire scars on the lodgepole pine which were about 75 years old. This burn apparently was a light underburn as there is no significant age group associated with it. There have been four starts since 1940 all of which were contained at less than 1/4 acre.

Successional Status

While logging and recent fire have not influenced this type a stand replacement type of fire has dictated the present stand structure. Ponderosa pine has played a minor role in this type and will drop out of the type in the next 50 years if fire exclusion is continued. Major portions of the type contain

almost pure stands of lodgepole pine on them as a result of a replacement type fire about 100 years ago. Natural thinning has progressed in the lodgepole with light to moderate amounts of down material now on the site. The age of subalpine fir in this type is questionable and there may be some in the 50 year age category. Douglas-fir is a major component of the older age material. Much of this material is in a high risk condition and significant loss in representation of the species will occur in the next 50 years. About 14 percent of the standing material is dead and mortality is progressing more noticeably through this stand. The stand is late seral in successional development.

Future Trends

The age structure is more typical of an old growth stand as it has limited representation in the 50 year age category. This makes the stand susceptible to insect and disease outbreaks and a major mountain pine beetle epidemic will most likely occur during the next 20 to 40 years which will characteristically kill 75 to 85 percent of the lodgepole component. As a result the lodgepole component is expected to drop from 28 percent of the stand to 4 percent with a corresponding increase in subalpine fir. This event along with the continued deterioration of the Douglas-fir component suggests a significant increase in the fuel loading and potential for a stand replacing fire during this time period. The stand is generally mid seral but may not advance further because of the high likelihood of a stand replacing burn.

COMMUNITY 5

This type is found on the upper slopes of the study area on east and northeast aspects. Elevations range from 5700 to 7000+ feet. This type was not sampled at the higher elevations therefore the information presented may be biased toward the lower elevation of the type.

Natural Condition

Conditions found here are very similar to Community 4 but these sites tend to be drier or at least have a dry summer period when compared to Community 4. Lodgepole pine may often cover extensive areas although other species are common. Fire may have been more common than found in Community 4 particularly underburns. Stand replacement fires have an average occurrence of about every 100 years.

Existing Condition

Stands are variable in structure ranging from almost pure lodgepole pine to mixed stands of ponderosa pine, Douglas-fir and subalpine fir. Sites tend to be rocky. No evidence of logging was found in this type. Fuels average about 21 tons per acre with an additional 20 sqft of basal feet of standing dead material. Maple is common scattered over the site (60 shrubs per acre) but because of growth form they are not of value to animal use. Reproduction is heavy in the type averaging about 1320 trees per acre of which 73 percent are subalpine fir with the remainder Douglas-fir, lodgepole pine and Engelmann spruce.

Table 5. Stand age and Structure Expressed in Trees Per Acre and Sq.Ft. of Basal Area Per Acre

SPECIES	NO. of TREES SEED &SAPS	BASAL AREA by AGE CLASS 50	100-150	250+	TOTAL	STANDING DEAD
PP	0	0	0	28.0	28.0	4.0
				100%	32%	20%
DF	180	4	24.0	0	20.0	4.0
	14%	100%	24%		20%	20%
LP	120	0	20.0	0	20.0	4.0
	9%		29%		20%	20%
AF	960	0	32.0	0	32.0	8.0
	73%		47%		32%	40%
S	60	0	0	0	0	0
	5%					
TOTAL	1320	4.0	68.0	28.0	100.0	20.0
		4%	68%	28%		

There is about 7300 bdft per acre on the site which is composed of 2300 feet of subalpine fir 2100 feet of ponderosa pine and the remainder a mixture of Douglas-fir and lodgepole pine. These values are based on a limited sample and the amount of ponderosa pine is significantly less over the type.

Fire History

Information is again limited as there are only scattered large old growth trees and fire scars are limited. The lodgepole stands are generally older originating about 1850. A major portion of this stand died about 50 years ago and many of these are now on the ground. The scattered old Douglas-fir are in the 150 to 200 year category. There is no indication of fire occurring in these stands in over 130 years. There have been two fire starts in the area since 1940 both of which were limited to spot fires.

Successional Status

It is obvious however that there has been a significant change in this type over the last 150 years. Very little of the type falls in an old growth age category. Whether stands at this elevation commonly reach old age is open to conjecture. My premise is that a 200 year-old stand in this type is probably somewhat unusual and where they did occur they were made up of small islands missed by the last burn. Fires in the type are normally less frequent than on the drier types and are commonly stand replacement type of events. The area burned about 130 years ago at which time a major portion of the stand was replaced by lodgepole pine. About 50 years ago a major portion of this stand died. The majority of these are now on the ground. Normally fire would have followed the mortality of 50 years ago but effective fire control prevented

this event. As a result the amount of subalpine fir appears to be increasing. The stands are mid seral in successional development.

Future Trends

About 17 percent of the standing material is dead and mortality is expected to continue in species other than lodgepole pine at about the present rate. There should be a marked increase in mortality in the lodgepole pine component in the next 20 years as a result of mountain pine beetle activity. In time the stand will become dominated by subalpine fir with lessor amounts of Douglas-fir. A minor amount of lodgepole pine will also be found on the site. The amount of Douglas-fir is expected to increase but this will be short lived and with time subalpine fir will form almost pure stands. There is, however, a high likelihood of a stand replacement fire before this would occur.

COMMUNITY 6

The south facing slopes into Canyon and Sawtooth Creeks are occupied by this community. Rock cliffs and talus slopes cover a major portion of the area with islands of vegetation present. Sampling was not conducted on the type because of the difficulty in implementing any treatment and the limited vegetation.

DISCUSSION AND CONCLUSIONS

With the exception of Community 1, significant changes to stand structure are underway in the study area. These changes are expected to accelerate during the next decade. The presence of ponderosa pine will decrease significantly on all sites with Douglas-fir increasing in the drier community types and decreasing in the moister environments. Grand fir and subalpine fir will increase in stands where present. Lodgepole pine may decrease dramatically in the next twenty years as a result of mountain pine beetle activity. With the exception of Community 1, there has been a marked increase in the seedling and sapling component providing a fuel ladder into the overwood. Insect and disease infestations are common in all communities with severity increasing on the moister sites. Dwarf mistletoe is common in all but the driest stands principally in the Douglas-fir component. Fire has apparently not been effective in restricting this pathogen on the dry sites as it is common in old growth trees. This may be the result of more underburning rather than stand replacement fires. Even on areas that burned hot, islands were left which permitted the continuation of the pathogen. Much of the mortality of the Douglas-fir and grand fir in the old growth component seems to be associated with mistletoe. As the amount of Douglas-fir and grand fir increases in these stands, mistletoe will become more of an impact on stand health. Spruce budworm has been a problem in the stands in the recent past particularly in the grand fir component. Present infestation levels are currently low, however, continued cyclic damage will occur. As a result much of the grand fir, subalpine fir and Douglas-fir reproduction has been damaged and will not survive to reach the overwood layer. The shrub community has been particularly affected by fire exclusion and the closure of crown canopies. Most shrubs are decadent and have grown out of reach for big game.

The most significant finding of the study was that stand conditions are not as deteriorated as might have been expected. The impact of fire exclusion may have been softened by logging activity at the turn of the century and salvage

logging since then on the drier sites. Fuel accumulations are near average or slightly above when compared to conditions found by Davis (Davis 1980). Fuel loading are heavy enough, however, to permit a stand replacing type of fire during a high fire risk period.

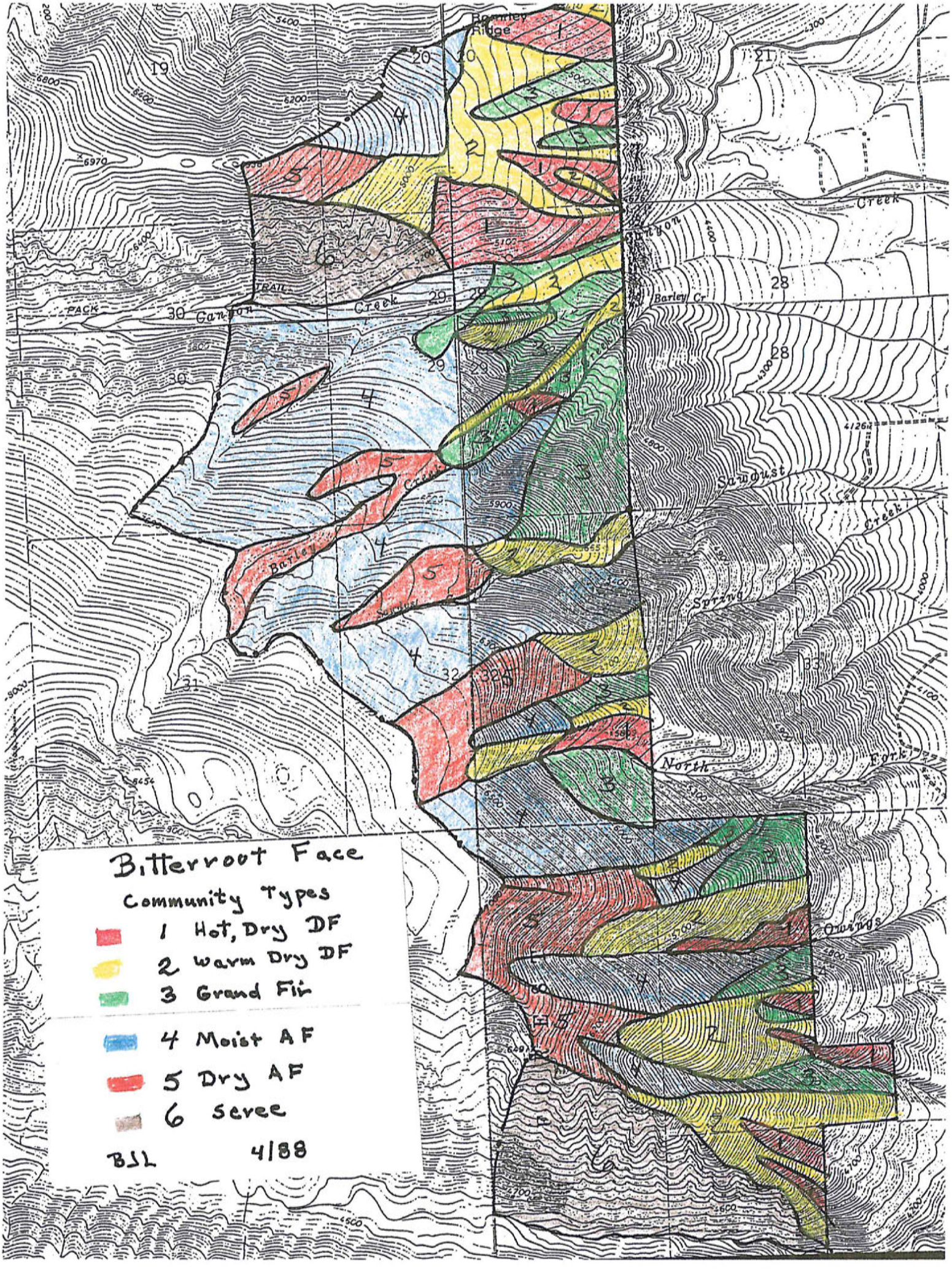
Stands in the study area are moving toward climax resulting in less stable conditions. This change will accelerate over the next 20 years. Based on the historic fire occurrence on the study area for the past 46 years and the frequency of severe fire years on the Bitterroot Forest, there is a one in 20 chance that a major fire will burn in the study area in any given year. While continued fire protection may not affect this probability it can result in an increased fire severity when a fire does occur. Increased fuel loadings will also make it increasingly more difficult to control fire starts. If a fire start occurs during a high fire danger period as it did in Blodgett Creek in 1985 a major stand replacement fire could occur. There is a high probability that this could occur in the next 30 years. This type of fire could have a significant impact on the visual resource of Hamilton.

While there are serious problems in the study area related to present stand structure there are also some viable options still available for treatment of most of them. Treatments permitted in most of Community 1 under the Forest Plan can be used to maintain large old growth ponderosa pine with limited impact on the recreational enjoyment of the area or impair the visual resource to Hamilton. Using all aged management with periodic underburning will accomplish this goal. Based on the present land allocation in the Forest Plan for the remainder of the area opportunities are more limited. A program of underburning can be initiated in Community 2 and 3 which in time can stabilize these types. There is a greater risk in these types that small groups of overwood may be killed and these may be visible from Hamilton. This impact should be of short duration however. A 30-year average burning frequency should replicate natural conditions. There are fewer opportunities to treat Communities 4 and 5. They are generally not suitable for spring burning because of fuel types and because of the fuel buildups and topographical position will be difficult to burn in the fall. Species composition is also a deterrent because of the preponderance of fire susceptible species present. Unless an innovative solution can be developed there is a strong probability that this visual resource may be lost during the next 30 years either to a mountain pine beetle outbreak or a stand replacement burn.

REFERENCES

Pfister, R.D.; Kovalchik, B.L.; Arno, S.F.; Presby, R.C. 1977. Forest habitat types of Montana. USDA Forest Service, Gen Tech. Rep. INT-34, 174p. Int. For. & Range Expt. Sta., Ogden, Utah.

Davis, Clayton & Fisher 1980. Fire ecology of Lolo National Forest Habitat Types. USDA Forest Service, Gen Tech. Rep. INT-79, Int. For. & Range Expt. Sta., Ogde, Utah.


Bitterroot Face
Community Types
1 Hot, Dry DF
2 Warm Dry DF
3 Grand Fir
4 Moist AF
5 Dry AF
6 Scree
BJL 4/88
Barley Ridge
Barley Cr
Sawdust Creek
Spring
North Fork
Owings
Barley Canyon
Creek
TRAIL
PACK
Canyon

AGE STRUCTURE IN 1900 FOR MAJOR COVER TYPES IN RAVALLI COUNTY

PERCENT BY AGE CLASS*

COVER TYPE	NON-STKED	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-200	200+
PP	7	5	1	<1	0	1	2	6	6	34	38
L-DF	10	<1	6	8	0	21	13	20	20	1	1
DF	3	5	8	16	18	18	16	11	11	1	3
S-F**	0	0	0	0	0	4	21	36	36	2	1
LP	14	13	9	12	13	29	2	0	0	1	7
AVG	7	6	4	5	7	11	6	7	7	18	22

*Developed from data from the 1930's timber inventory.
**A minor amount of western red cedar and grand fir are found in this type.

Of significance is the very limited amount of old growth with the exception of ponderosa pine and the high percent of lodgepole pine less than 40 years of age.