United States
Department of
Agriculture

Forest Service

Timber Management

Washington, DC

March 1989

Proceedings of the National Silviculture Workshop

Silviculture for All Resources

Sacramento, California
May 11-14, 1987

SILVICULTURE IN GRIZZLY BEAR HABITAT

by

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Presented at the National Silviculture Workshop,
Sacramento, California, May 11 - 14, 1987

In recent years, grizzly bears have become a topic of considerable interest and controversy for public land managers, user groups, and environmentalists. For the silviculturist who is expected to provide healthy, productive forests as well as vegetative conditions favorable to the bear, grizzly bear habitat management can be challenging and complex, and at times, frustrating. My purpose in this paper is to discuss these challenges, and examine some of the ways that the silviculturist can respond to them.

I. Endangered Species Act

Since 1975, the grizzly bear (Ursus arctos l.) has been listed as a threatened species under the Endangered Species Act of 1973. The species now occupies portions of Montana, Wyoming, Idaho, and Washington on about 1% of its original range in the lower 48 states. The vast majority of the current range of the grizzly is on federal land, in National Parks and Forests. There are six identified grizzly bear ecosystems in the United States today, excluding Alaska. The Kootenai National Forest contains portions of the Northern Continental Divide ecosystem and the Cabinet/Yaak ecosystem. Most of my comments apply to the Kootenai National Forest and the Cabinet/Yaak ecosystem.

Under the Endangered Species Act, the Federal Agency with jurisdiction on the land, in this case the Kootenai National Forest, is responsible to ensure that all activities which it carries out, provides funding for, or authorizes on the National Forest are done in a manner that doesn't jeopardize grizzly bears or adversely affect their habitat. Planned activities in grizzly habitat are subjected to a biological evaluation in order to assess the potential effect on bears or their habitat. If the evaluation can't clearly determine that there will be no adverse effect, then a process of formal consultation with the U.S. Fish and Wildlife Service is begun. In most cases, mitigation measures are applied so that an adverse effect is avoided. In the case of timber sales, these mitigation measures may be timing of activities outside of periods when bears are known to take advantage of habitat components, road and area closures to vehicle travel, habitat

improvement projects, or use of displacement areas which provide secure alternative habitat for bears during the life of the planned project.

II. Cumulative Effects Analysis

Rather than considering the effect of one single timber sale or other government project on the bears, it has become desirable to study the cumulative effects of land management activities in time and space on bears and their habitat. Instead of analyzing the cumulative effects on the whole ecosystem, which in the case of the Cabinet/Yaak ecosystem would be 1300 square miles, these effects are studied on smaller bear management units within the ecosystem. Bear management units are geographically identifiable areas averaging about 100 square miles with known seasonal habitat values or components for grizzlies. The assumed average home range of an adult female grizzly is 100 square miles. The cumulative effects model considers habitat values along with the nature, intensity and duration of disturbances and computes a value for habitat effectiveness. If this value, upon analysis, drops below a threshold level, then habitat effectiveness would be considered to be lower than needed to allow recovery for grizzly bears. Using this analysis process then, activities such as timber sales may be prioritized within bear management units, and scheduled so that too many activities are not taking place concurrently in the same or adjacent areas, and the overall habitat effectiveness of the unit is not reduced below threshold level.

III. Recovery

In addition to this relatively negative, legalistic approach to grizzly bear habitat management, the Forest Service, along with other Federal and State agencies, is committed to recovering viable populations of grizzlies within identified ecosystems. Interagency guidelines for management of grizzly bears and their habitat have been prepared for the concerned National Forests and National Parks, and the States of Idaho, Montana, Washington and Wyoming. The plan for recovery of the grizzly bear includes the following:

1. Direct Habitat Improvement
2. Public Education
3. Law Enforcement
4. Augmentation of bear populations where suitable habitat exists

In the Cabinet/Yaak ecosystem, a viable recovered population is now considered to be 70 to 90 bears. The current population is estimated to be less than 20 bears.

IV. Forest Planning: What is the effect of grizzly bear management on allowable harvest?
In the analysis of timber outputs in the Forest Plan, harvest is limited to 8.3% of area in grizzly habitat per decade. This harvest

constraint is applied to about 70% of the regulated timber base on the Kootenai. On areas that are specifically allocated to grizzly bears and timber management in the Forest Plan, thinnings are allowed, but not entered into the FORPLAN runs, because of scheduling problems. Therefore, yields calculated for these areas are somewhat reduced from the maximum attainable under optimum timber management. This reduction applies to about 15% of the regulated timber base.

V. Discussion of Specific Habitat Needs of Grizzly Bears

A. Feeding

Grizzlies are omnivorous animals, but the greatest part of their diet is plant foods. They range widely to areas where food can be found in abundance. Most of their foods are found in areas that are at least seasonally wet or moist. Typically, grizzlies are at low elevations in the spring, where they feed on grasses, sedges, and forbs in floodplains, riparian areas, snowchutes, and revegetated roadsides. In the spring, only a small portion of their total habitat is available to them. With summer season, grizzlies shift to feeding on succulent

SCIENTIFIC AND COMMON NAMES FOR KEY BEAR FOODS
in the CABINET/YAAK ECOSYSTEM

SCIENTIFIC NAME	COMMON NAME
Trees	
Pinus albicaulis	Whitebark pine
Shrubs	
Amelanchier alnifolia	Serviceberry
Cornus stolonifera	Red-osier dogwood
Rosa spp.	Wild rose
Shepherdia canadensis	Buffalo-berry
Sorbus scopulina	Mountain ash
Vaccinium globulare	Blue huckleberry
Vaccinium scoparium	Whortleberry
Forbs	
Angelica spp.	Angelica
Athyrium filix-femina	Lady fern
Equisetum spp.	Horsetail
Erythronium grandiflorum	Glacier lilly
Hedysarum spp.	Hedysarum
Ligusticum spp.	Licorice root
Lomatium spp.	Biscuit root
Osmorhiza spp.	Sweet-cicely
Taraxicum spp.	Dandelion
Trifolium spp.	Clover
Veratrum viride	False hellebore
Graminoids	
Carex spp.	Sedges
Graminae spp.	Grasses

forbs in riparian areas, and on berries as they become available. They also seek out high elevation meadows and open, grassy timber stands for grasses and sedges during the summer. Grizzlies tend to move back to lower elevations in the fall, where they feed on remaining berries, roots, forbs, and grasses and sedges in flood plains. There is considerable indication in some areas, including the Kootenai National Forest, that the availability of berries (i.e., vaccinium, shepherdia canadensis, sorbus spp.) is important to winter survival and reproductive success in bears.

Seral plant communities which originate from wildfires provide many of the key grizzly bear foods in northwestern Montana. It is hoped that, in the absence of the large wildfire burns that were present until the last 50 to 60 years, silvicultural methods will provide similar plant communities. On many logged sites, the same bear foods are found in abundance. Habitat improvement projects include prescribed burns in areas not allocated to regulated timber harvest.

B. Security

Grizzly bears, having no natural enemies other than humans, have adapted poorly to human presence in their habitat. Some of the things which have reduced effective grizzly habitat in the recent past are: gas, oil, and mineral exploration, rural subdivisions, summer home development, and timber harvest activities. Timber sales have had a negative impact on grizzlies because of extensive road systems which remain open to the public long after the sales are closed, frequently repeated entries, and in some cases, damage to habitat components.

Important areas to retain security or hiding cover are adjacent to key feeding areas, such as wet meadows, riparian areas, alpine meadows, avalanche chutes, and berry fields, and along travel corridors, such as ridge tops and stream bottoms. Security is also provided by limiting the frequency and duration of human presence near key habitat. In the Kootenai Forest Plan, a goal is to achieve an average of 3/4 of a mile of road that is open to the public for each section of land within grizzly bear management units. In many cases, road closures that are enforced for the public also must be applied to Forest Service activities, such as stand exams or reconnaissance surveys.

VI. Specific Silvicultural Considerations under Grizzly Bear Habitat Management

A. Silvicultural System

In general, silvicultural systems which require less stand tending throughout the rotation are favorable in that there are fewer disturbance creating entries, and roads can stay closed for longer periods of time. Also, systems are preferred in which seral plant communities are developed or maintained, and mosaic patterned forests of interspersed forage and cover are developed. For these reasons, even-aged management systems are preferred over selection systems for uneven-aged management. An exception to this might be in the management of riparian areas, where it may be desired to retain cover over long periods of time. Another exception could be on wet sites, where a change in the water table resulting from complete canopy removal could adversely affect desirable forage plants.

B. Site Preparation Method

The method used to prepare the site for regeneration is usually important in determining how the seral community develops, and what plant species are favored. On moist or wet sites, desirable grizzly bear forage species such as cow-parsnip (Heracleum lanatum), angelica, and wet site grasses and sedges are very sensitive to soil compaction or severe soil disturbance which may be caused by mechanical scarification. On upland sites, many of the berry producing shrubs reproduce well vegetatively and poorly by seed. This is true of blue huckleberry and mountain ash, two important grizzly food producers. These plants are often among the first to resprout after a wildfire. As long as the duff is not so dry that it is consumed to a great extent, the rhizomes of blue huckleberry will resprout quickly after fire. Although the berry producing shrubs are often favored by fire, mechanical scarification, especially if applied uniformly, can be very damaging to these plants. If dozer piling is done, the result often has been that berry producing shrubs are uprooted, and their importance on the site is greatly reduced. Clearcutting or heavy partial cutting without any site preparation, in situations where vaccinium is already established, may actually result in the best shrubfield development.

When choosing site preparation method, there is often a conflict between grizzly bear forage needs and reforestation requirements. If would be easy to say that broadcast burning is always the method of choice, but there are several factors which limit the use of broadcast burning. Some of these are:

Lack of post logging fuels to carry a successful burn
Limited number of days when burning can meet the prescribed results
Lack of personnel to do all the burning when the conditions are right
Economics - Mechanical scarification is often less expensive, especially if it is a requirement of the timber purchaser.
Smoke Management - Usually further reduces the number of days when burning can be done.

If tradeoffs are made, usually the sites with the most potential for berry production are scheduled for broadcast burning. Other areas may be planned for mechanical scarification, if soils are not susceptible to compaction, and slopes are not generally over 35 per cent. Dozer scarification can be modified by using a brush blade, and by attempting to reduce the amount of scarification to the minimum necessary to achieve the prescribed stocking level. There are other site preparation tools that may be helpful in reducing the total amount of disturbance in gentle to moderately steep slopes, if there aren't large amounts of logging slash. These include patch scarifiers, such as the Leno scarifier, or other scarifiers mounted to the blade or drawbar of the prime mover. Another tool to be considered is the drag chain scarifier, although its effectiveness in brushfields has not yet been proven.

C. Regeneration Method

In many cases where development of grizzly foods is being encouraged by a light application of site preparation, the choice of natural regeneration is limited. In stands where there is already a developed shrub canopy, attempts to burn to prepare the site for natural seeding are often unsatisfactory. The choice of planting may be necessary in order to meet the stocking objectives for timber management, and to get seedlings established in the developing shrubfield.

D. Harvest Unit Size, Shape, and Placement.
The general objective for timber management in grizzly bear habitat is to have interspersed forage and cover, with at least 30% of the area in hiding and thermal cover. Cover is generally not a problem on the Kootenai, because of the heavily forested nature of the area. Key grizzly use areas, such as avalanche chutes, meadows, and riparian areas need to be avoided, and should have areas of security cover adjacent to them. Shaping of units is used wherever possible to increase the amount of "edge" or boundary, and make forage areas more effective. In order to allow for effective cover, a minimum of 600 feet in uncut corridors between harvest units is the standard on the Kootenai National Forest in grizzly bear habitat. In planning unit placement, travel corridors need to be considered, so that cover may be maintained along them. Cutting along both sides of a main ridge, for example, would be avoided.

VII. Summary

The grizzly bear, under the protection of the Endangered Species Act, offers some unique challenges to the silviculturist. Special requirements for grizzly bear habitat such as feeding and security must be considered when preparing silvicultural prescriptions. Silvicultural activities must be scheduled so as to minimize disturbance to the bears, and access to areas in grizzly bear habitat may be difficult because of road closures. Grizzly bear habitat requirements need to be considered in selection of silvicultural systems, site preparation for reforestation, reforestation method, and harvest unit size, shape, and location. After the loss of effective habitat that the grizzly has endured in the last century, our efforts to retain a viable population in the few remaining grizzly bear ecosystems appear to be worthwhile.

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APPENDIX:

AN EXAMPLE OF A SILVICULTURAL PRESCRIPTION FOR TIMBER HARVEST IN KEY GRIZZLY BEAR HABITAT

SILVICULTURAL PRESCRIPTION
UNIT 2, HI HARE SALE
PARENT STAND NO. 410-4-10

PREPARED BY: J.C.REICHERT
DATE: 1/14/87

I. EXISTING CONDITIONS
A. SITE DESCRIPTION
MANAGEMENT DIRECTION MA 14 TGRIZ - MAINTAIN OR ENHANCE HABITAT FOR GRIZZLY BEAR, REDUCE HUMAN/BEAR CONFLICT, AND ASSIST IN BEAR RECOVERY, WHILE PROVIDING FOR A PROGRAMMED LEVEL OF TIMBER PRODUCTION.

STAND ACRES 104 TREATED ACRES 12
SLOPE 20-40% HABITAT TYPE WH/CLUN ELEVATION 4800-5000' ASPECT NW
SOILS AND LANDTYPE DEEP GLACIAL TILL, WITH ABOUT 12" LOESS CAP. LANDTYPE GROUP IS 352, GLACIALLY ROUNDED VALLEY SIDESLOPES, ON NORTH ASPECT.

B. PRESENT STAND
DENSITY(BA/A) 220 (TREES/ACRE<7") 346 (TREES/ACRE>7") 89
VOLUME(MBF/ACRE) 40 PAI(CUBIC FT/ACRE/YR) 120

SPECIES COMPOSITION MIXED SPECIES STAND OF 30% WESTERN LARCH, 20% RED CEDAR, 10% WESTERN HEMLOCK, 15% DOUGLAS-FIR, AND REPRESENTATION OF WHITE PINE, SUBALPINE FIR, ENGELMANN SPRUCE, AND GRAND FIR. UNDERSTORY IS PRIMARILY RED CEDAR, WESTERN HEMLOCK, SUBALPINE FIR, AND GRAND FIR.

STRUCTURE SAWLOG SIZE STAND WITH A FAIRLY DENSE OVERSTORY CANOPY.

AGE CLASSES OVERSTORY IN THIS UNEVEN-AGED STAND RANGES IN AGE FROM 100 TO 200+ YEARS.

STAND HISTORY THERE HAVE BEEN NO PREVIOUS HARVEST ENTRIES IN THIS STAND.

CONDITION MATURE STAND, WHICH IS BEGINNING TO BE AFFECTED BY LARCH DWARFMISTLETOE AND INDIAN PAINT FUNGUS IN HEMLOCK AND GRAND FIR. A LIGHT INFECTION LEVELS OF WHITE PINE BLISTERRUST IS ALSO PRESENT.

UNDERSTORY VEGETATION IS PATCHY, DUE TO OVERSTORY CANOPY. PATCHES OF DEVELOPED SHRUB LAYER CONSIST OF BLUE HUCKLEBERRY, MENZIESIA, RIBES, AND MOUNTAIN MAPLE. OVERALL SHRUB COVER IN THE STAND IS ABOUT 20%. HUCKLEBERRY PLANTS ARE GENERALLY SMALL AND UNPRODUCTIVE DUE TO SHADE.

EXISTING FUEL LOADING 16 TONS PER ACRE, WITH DUFF DEPTH OF 2 TO 3 INCHES.

ADJACENT STAND 15 ACRE STAND 410-4-04, TO THE NW, WAS CLEARCUT IN 1962, HAD NO FUEL TREATMENT. STAND IS WELL STOCKED, IS IN HIDING COVER, AND HAS ABOUT 30% COVER IN VACCINIUM, WITH GOOD BERRY PRODUCTION IN MOST YEARS.

II. DIAGNOSIS OF TREATMENT NEED

A. TREATMENT GOAL: AN EVEN-AGED STAND WHICH AT 130 YEARS OF AGE HAS 250 SQUARE FEET OF BASAL AREA AND PROVIDES A MEAN ANNUAL INCREMENT OF 90 TO 100 CUBIC FEET PER ACRE PER YEAR. SPECIES COMPOSITION SHOULD BE APPROXIMATELY 25% WHITE PINE, 25% WESTERN LARCH, AND 25% DOUGLAS FIR, WITH THE REMAINDER IN SHADE TOLERANT SPECIES. STAND SHOULD PROVIDE FORAGE (HUCKLEBERRIES) FOR GRIZZLY BEARS IN EARLY DEVELOPMENTAL STAGES, WITH ABOUT 30% SHRUB COVER IN HUCKLEBERRY. STAND SHOULD BE IN HIDING COVER BY AGE 20

B. ALTERNATIVES CONSIDERED: 1. REGENERATE BY CLEARCUTTING, 2. REGENERATE BY SEED TREE CUTTING.

C. LOGICAL TREATMENT SEQUENCE:

	REGENERATE BY CLEARCUTTING		REGENERATE W/ SEED TREES
YR 0	CLEARCUT, 40MBF/A $60/M	YR 0	SEED CUT, 37MBF/A $60/M
YR 1	BROADCAST BURN, SITE PREP $200/AC	YR 1	UNDERBURN, SITE PREP $200/AC
YR 2	HANDPLANT, 538 TREES/A $240/AC	YR 4	FILL PLANT, 250 TREES/A $200/AC
YR 15	PRECOMMERCIAL THIN TO 400/A $160/AC	YR 15	PRECOMMERCIAL THIN TO 400/A $160/AC
YR 130	CLEARCUT, 40 MBF/A, B/BURN, HANDPLANT	YR 130	SEED CUT, 37 MBF/A, U/BURN, FILL PLANT

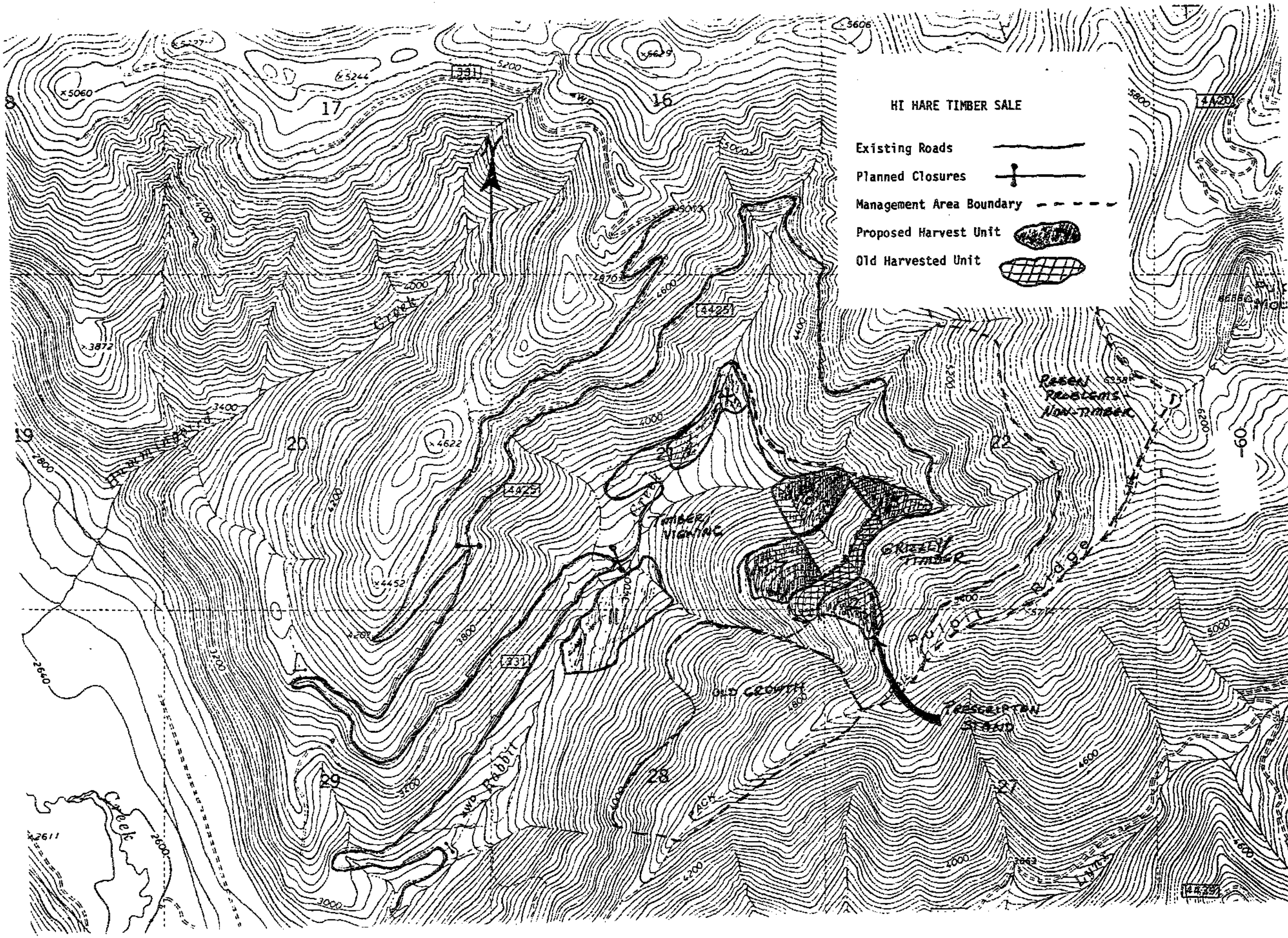
ECONOMIC COMPARISON @ 4% DISCOUNT RATE (ASSUMPTIONS: NO REAL UNIT COST OR VALUE INCREASE OVER TIME)

DISCOUNTED BENEFITS:	$2322	$2148
DISCOUNTED COSTS:	$ 486	$ 436
PNV:	$1836	$1712

D. PREFERRED ALTERNATIVE: ALTERNATIVE 1 IS PREFERRED. FILL PLANTING IS EXPECTED UNDER SEED TREE ALTERNATIVE, BECAUSE OF LIGHT SITE PREP NEEDED TO FAVOR HUCKLEBERRIES. NO SEED TREE REMOVAL PLANNED UNDER MANAGEMENT GUIDANCE (1 COMMERCIAL ENTRY PER ROTATION).

F. DETAILED PRESCRIPTION SUMMARY:

ACTION	TIME	SPECIFICATIONS
HARVEST	YR 0	CLEARCUT, TRACTOR LOG WITH DESIGNATED TRAILS. LEAVE SNAGS AND SNAG CANDIDATES, PER KOOTENAI SNAG GUIDELINES, PREFERABLY NOT HEAVILY MISTLETOED LARCH.
SITE PREP AND FUEL TREATMENT	YR 1	BROADCAST BURN. SITE PREP OBJECTIVES ARE AN AVERAGE DEPTH OF DUFF OF 1" TO 2", UP TO 10% EXPOSED MINERAL SOIL, AND 10 TO 15 TONS PER ACRE OF LARGE RESIDUAL FUELS AFTER BURNING. (LOWER DUFF SHOULD GENERALLY REMAIN INTACT SO THAT HUCKLEBERRY RHIZOMES ARE NOT KILLED BACK)
REFORESTATION	YR 2	PLANT 538 TREES PER ACRE OF WL, DF, AND WP (F2 RUST RESISTANT STOCK) IN EQUAL PROPORTIONS. USE 2-0 BAREROOT STOCK. PLANT WITHIN 1 SEASON OF BURNING SO TREES CAN GET ESTABLISHED ABOVE THE SHRUB LAYER.
EXAMS	YRS 3, 5, 7	DESIRED STOCKING LEVEL IS 400-600 CROP TREES PER ACRE, WITH THE MINIMUM ACCEPTABLE BEING 350, AND WITH 80% OF 100TH ACRE PLOTS BEING STOCKED. ROAD #4425 WILL BE CLOSED TO VEHICULAR TRAFFIC, SO NEED TO PLAN ON COST OF 3 MILE WALK IN.
PRECOMMERCIAL THINNING	YR15-20	MAY BE SCHEDULED DEPENDING ON OTHER SALE ACTIVITY IN THE AREA. THIS MAY NOT BE NECESSARY DUE TO LIMITED NATURAL SEEDING.


HI HARE TIMBER SALE
Existing Roads
Planned Closures
Management Area Boundary
Proposed Harvest Unit
Old Harvested Unit
Creek
Rabbit
Ridge
OLD GROWTH
TIMBER/VIEWING
GRIZZLY TIMBER
PRESCRIPTION STAND
RESEN PROBLEMS NON-TIMBER
331
4425
4420
8
17
16
19
20
22
28
29
27
60
5200
5000
4600
4000
3800
3400
2800
2600
3000
4200
4400