AN ABSTRACT OF THE THESIS OF

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Title: TIMBER MANAGEMENT PLAN FOR THE UNIVERSITY FOREST

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The problem is to integrate three uses: Instruction, Research and Forest Operation on the same area of land with the least amount of conflict.

The objectives of this thesis are:

1. To compile the needed statistics for a plan from field data.
2. To combine the McDonald and Dunn blocks into one management plan.
3. To review and update 1953-54 plans for these blocks.
4. To develop a plan of intensive management.

Topics considered in the management plan are:

1. The effects of past management on existing growing stock.
2. The location and reservation of areas needed for research and instruction.
3. The determination of the growth rate and the allowable cut.
4. Prescribing methods of cutting on areas of different values.

The average annual cut allotted to both blocks is 2, 117 thousand board feet on Timber Key value areas and 502 thousand board feet on Landscape Management areas for a total of 2, 619 thousand board feet. These cuts were computed by the area-volume method used by the U.S. Forest Service and adapted to growing Douglas-fir in even-aged stands.

The highest priority of the various recommendations is given to regeneration of new stands. Since 10 percent of the total acreage is in stand age (0) class, it will take time and money to do this work.

The McDonald and Dunn blocks can be managed for instruction, research and forest operation.

Timber Management Plan for the University Forest

by

Gerald Alfred Meier

A THESIS

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TIMBER MANAGEMENT PLAN FOR THE UNIVERSITY FOREST

INTRODUCTION

The Oregon State University School of Forestry's forest consists of two blocks, McDonald and Dunn. The last management plan written for these blocks is 18 years old. Due to the current environmental interest in forested lands, it was decided to update these management plans using newer inventory and statistical approaches.

Scope

The problem is how to combine forest instruction, forest research and forest operation on the same land with the least possible conflict in order to provide an outdoor laboratory as well as benefit the forest itself. This school forest is used for instruction, research, public demonstration of forestry practices and forest operation.

Generally speaking, undergraduate instructional forestry programs require a wide variety of conditions such as old growth timber, recent logging areas, problem areas, young reproduction and stands for both precommercial and commercial thinning. However, research data, which is quite specific as to the requirements for the area selected, demands that the number of variables be reduced to a minimum so as not to mask the true results of the project. The

forest operation practices conducted on these lands may be dictated by budgetary limitations imposed upon the forest manager by the forestry school administration.

Objectives of the Thesis

The objectives of this thesis are:

1. To compile the inventory data needed for a timber management plan and present it in tabular form.
2. To combine the McDonald and Dunn blocks into one forest for management planning purposes.
3. To review and update 1953-54 plans for these blocks.
4. To develop a plan of intensive management utilizing the 1969-1970 timber type map.

STUDY AREA

Acquisition

Settlement began in this part of the Willamette Valley about 1840. Many large Douglas fir and oak trees were cut on this land at that time for fuel as well as building and fence construction. Some of the oak trees were also cut by stockmen for feed during a heavy snow in the spring of 1891 (1).

The entire area of the present day McDonald and Dunn forest had been heavily grazed by sheep and goats before the University acquired the land. The primary intent of the pioneers coming into this region was to use the land for agriculture. The first was Mr. George E. Cole who purchased an 80-acre tract from the Office of Commissioned Control of the Oregon Territory in 1855 (9). From 1864 to 1926, tracts of 80, 120 and 160 acres passed into private ownership. Several of these tracts have as many as 20 title transfers. Speculation constituted the chief interest in ownership as they passed from public to private control. However, the land was not productive because little material returns occurred in relation to the capital invested. Grazing was reduced as the new forest reproduced itself. Grazing and early cutting resulted in a patch-work pattern of alternate timbered and cutover areas as cover types. In 1926, the first property was acquired by Oregon State College's School of Forestry

for field instructions and research.

Between 1926 and 1940, 4,821 acres had been acquired principally as a result of a generous bequest by the late Mary J. L. McDonald. Additional acquisitions and purchases have increased the acreage of the McDonald block to the present 6,621 acres.

The entire Dunn Block, formerly the Adair Tract, was acquired in 1946 from the federal government when the Camp Adair Military Reservation was terminated. This block was to be used for field instruction and the income from the sale of timber utilized for forest research purpoases (13). The Adair Tract was renamed the Paul Dunn Forest in February, 1961, in honor of Paul Dunn, former Dean of the School of Forestry (13).

Management

McDonald Block

From 1916 to 1918, 200 acres of the forest were cut and milled in a small sawmill. This cut was made from marketable timber only, and the pole-timber and advanced reproduction were saved. After acquisition by the University in 1926, conditions on the land were materially altered.

The timbered areas were protected from fire, and the growing stock was increased by thinning and improvement cutting. The

unstocked areas were artificially restocked with pine or fir. Access roads and trails were built and the land was used for instruction and research.

An inventory of this block in 1940 by E. G. Mason (9) showed the following:

Area	Acres	%	Total Volume (M Bd. Ft.)	
Douglas fir old growth	135	2.8		
Douglas fir second growth	2,700	56.2	Douglas fir	43,685
White fir second growth	21	0.4	White fir	347
Hardwoods	206	4.3		44,032
Grass	690	14.4		
Cutover	1,021	21.3		
Ponderosa pine plantings	27	0.6		
	4,802	100.0		

Before 1948 management of the forest property was handled by the Dean of the School of Forestry with assistance from other forestry staff. In July, 1948, H. I. Nettleton, a full-time forestry faculty member, was placed in charge. He supervised protection, maintained the roads and advised the instructional and research staff relative to those uses of the areas (2). In 1959, William Davies was named manager of the forest property and salvage cutting was started. In July, 1973, Professor Davies retired and Mr. Marvin Rawley was appointed as forest manager.

Timber sales were contracted to local operators and supervised by the forest manager. Mature timber, blowdown and merchantable diseased or damaged trees received first priority in these sales. Roads were built or improved and timber stand improvements were made.

A thesis written in 1954 by Jack F. Gartz indicated an allowable cut of 1, 850 M board feet for a rotation of 100 years. This allowable cut was determined on a volume basis with an area check. It was estimated that there was 24, 160 M board feet of timber over 100 years of age and 149, 170 M board feet of timber will be produced by age 100. His cutting budget for the first decade was limited to an improvement cut of a forest-wide basis (6).

Dunn Block

In 1953, Edwin W. Pierson developed a preliminary management plan that recommended staggered clear-cut setting for harvesting as well as improvement cuts in intermediate stands. It indicated that there were 31, 092 M board feet on 3, 794 acres of timber land. He suggested an allowable cut of 995 M board feet on a rotation of 100 years (13).

Cutting History

An annual, cumulative cutting history of the volume harvested from each block was compiled from 1949 to date and is tabulated in

Table 1 in the Appendix.

Fire, Wind, Insects and Disease

Earlier, a general fire over the Willamette Valley foothills killed all but occasional trees (12). These trees acted as seed trees for the present stock. Since that time, only small fires have occurred due to better access by the 20-man fire crew that was formerly stationed at the Arboretum. Present fire protection is maintained by the Oregon State Forest Patrol located at Philomath, Oregon.

Normal winter storms including the October 12, 1962, windstorm, hit this forest, but the wind-thrown timber was promptly removed. Trees affected by insects or disease, except those stands reserved for study or research, were promptly removed by annual salvage sales.

CHARACTERISTICS OF THE FOREST

Location Boundaries and Ownership

McDonald Block

This block is located approximately five to ten miles northwest of Corvallis in Benton County, Oregon. The major portion of this block occupies a low ridge which lies in a northeast direction on the west edge of the Willamette Valley. The lower portion of the hills rise gently from the valley floor and increase in slope. The land ranges in elevation from 500 to 2,050 feet above sea level.

Oak and Soap creeks are the major drainage systems in the forest while Jackson, Calloway and Baker creeks are small streams of minor importance. All streams originate within the forest boundary, join other streams in the valley and drain into the Willamette River. Topographic features associated with the Soap Creek drainage are the roughest in the forest. Its valley has steep sides, high surrounding ridges, and numerous, narrow tributary drainages joining the main drainage.

Dunn Block

This block is located ten miles north of the city of Corvallis in Benton and Polk Counties, Oregon, and is just north of McDonald block.

The topography of this area ranges from gentle slopes suitable for tractor logging to steep slopes adaptable to cable logging methods. Exposures are generally northeast and southeast. There are only a few sharp, bare ridgetops or rock outcrops. Elevations vary from 500 to 1, 900 feet above sea level. The two important stream drainages are Soap Creek flowing northeast and North Fork of Berry Creek flowing northeast. Berry Creek has its origin in this block (13).

Weather

The climate is mild with open winters, droughy periods during the summer and comparative freedom from wind and electrical storms. Normal annual precipitation is approximately 40 to 50 inches with January being the wettest month. The average number of days without measurable rain is 119. The average annual temperature is 52.4°F. with an average low in January of 32.9°F. and an average maximum high in August of 82.3°F. Snowfall for a period of 60 years has averaged 5.99 inches a year.

A periodic phenomenon occurring in the forest known as a "silver thaw" is produced by the accumulation of frozen atmospheric moisture upon the branches and trunks of standing trees. The weight of this ice breaks the tree tops and therefore causes wounds which permit the infection of many trees with a top rot fungus (Fomes cajenden).

Soils

The main soil types are Olympic clay and silty-clay in the higher elevation, Aiken silty-clay loam on the middle elevations and Wapato clay near the stream bottoms. These soils are known locally as "red hill" soils. They occur under humid to sub-humid conditions with long periods of drought during the summer months. Chemically, these "red hill" soils are characterized by a distinct acid reaction and a low content of available potassium and calcium which is attributable to the heavy precipitation occurring in western Oregon during the winter.

Timber

McDonald Block

This block is composed, primarily, of even-aged stands of Douglas fir (Pseudotsuga menziesii Mirb Franco), with grand fir (Abies grandis) and big leaf maple (Acer macrophyllum), occurring in a mixture to a limited extent. There are smaller amounts of hard-wood stands composed of Oregon white oak (Quercus garryana), red alder (Alnus ruba), and big leaf maple (Acer macrophyllum).

These stands occur on sites that may be unfavorable to Douglas-fir.

Due to interruptions such as fires, the Douglas-fir growing stock has a patchwise structure of relatively even-aged stands. In regard to productivity, approximately 25 percent of these lands have been classed as low Site Class II, 50 percent as Site Class III and 25 percent as Site Class IV quality.

The average stocking for this block, based on volume per acre, is between 50-75 percent of the normal as described by McArdle's Douglas-fir yield tables (10). The stocking of the individual stands, based on crown closure, is shown on the type map in the Appendix.

Tables 2 and 3 are summaries of the Douglas-fir types by age classes, net volumes and area. These net volumes were determined by a 1968 field inventory by Charles Lewis and the area were determined by a dot count of the forest type map by John Meyer (7).

Dunn Block

With the exception of minor amounts of Oregon ash (Fraxinus

latifolia), the timber types are essentially the same as those in the McDonald block.

THE MANAGEMENT PLAN

Management Objectives

For ease of management, the forest land was divided into two blocks and five compartments. The McDonald block has four compartments -- McDonald 1, 2, 3, and 4. The Dunn block has one compartment. Compartment boundaries are indicated on a map in the Appendix.

Present Area and Volume

Block	Compartment	Area (Acres)	% of Total	Total Net Volume (MBF)	Average Volume/ Acre
McDonald	M-1	1,415	14	20,289	14.34
	M-2	2,771	28	39,388	14.21
	M-3	1,320	13	0	0
	M-4 (L. Mgt.)	1,115	11	30,373	25.55
Dunn	D-1	3,539	34	41,466	11.71
	Total	10,160	100	131,516	12.94

Inventory

As mentioned previously, Mr. Charles Lewis conducted a field inventory of these two blocks in 1968 and 1969 for the purpose of estimating a total volume by sampling the type islands rather than the land

subdivisions. Aerial photos were taken in 1967 and used by H. Chickering, Jr. to make a topographic map with forested and non-forested areas delineated. The aerial photos were timber typed and a type map was compiled from them.

The cruise lines were plotted on the aerial photos with starting points located along the roads. Variable radius, half circle, temporary plots with 16 foot sighting points were located along these cruise lines. The timber types along these cruise lines were also field checked.

The total number of cruise plots was not pre-determined. The points were spread over the forest so that an average volume could be determined for each timber type.

A Volume Basal Area Ratio table with a 16' sighting point taken from Log Scaling and Timber Cruising by J. R. Dilworth, 1970, was programmed for the OSU computer and used to compute the volumes.

Site index was determined for some of these temporary plots by determining the age and total height of the sample trees.

The area in acres of each timber type was compiled from a dot grid from the timber type map and was recorded by township, range and section (7).

Road System

At the present time, there are approximately 46 miles of primary, rocked roads and 20 miles of secondary, non-rocked roads, usable only in dry weather.

The McDonald block has most of its primary road system completed, and more secondary roads will be constructed as access is needed to manage the area. Some of the roads need to be rocked if placed under intensive logging use. At the present time, there are 30 miles of rock-surface roads and 10 miles of dirt-surface roads.

In the Dunn block, the roads need grading, ditching and rock surfacing because most of the roads do not have any rock. Management, logging, and access by vehicles are limited to the drier periods of the year.

Regeneration

McDonald and Dunn Blocks

There are many existing regeneration problems in these blocks due to difficult site conditions, various exposures and large amounts of existing species.

If funds are available, the following recommendations are proposed.

A. Using the present type map and the new aerial photos of 1972,

each compartment should have an extensive survey to locate the following:

1. All grass types.
2. Cutover or XO types.
3. Areas of little or no reproduction - with or without brush.
4. Brushy areas.

B. All the above types and areas should be visited on the ground and a reproduction survey made to locate existing reproduction and brush. The needed prescriptions should then be written to properly manage the areas.

C. These prescriptions should include planting or replanting with 2-0 or larger stock, brush control using herbicides or mechanical site preparation, adequate protection from rodent and deer damage, etc. Frequent on-the-ground examinations would be needed to determine the results, progress and possible changes needed for the future. The research section of the forestry school staff should be consulted to help write the above prescriptions.

D. When current timber sales are planned and laid out, regeneration problems should be carefully considered and intensive efforts made to carry out the restocking of the area.

E. All non-commercial hardwoods should be killed by using existing silvicides on the timber sale areas.

Commercial Thinning

McDonald Block

Commercial thinning can be done in fully-stocked stands between 35 and 120 years of age (17, 20). According to the recent timber type map and field inventory, there are between 300 and 350 acres of fully-stocked stands in this block which could be thinned in order to reduce mortality and redistribute growth. Intensive field examinations are needed to determine how much should be cut (Table 4).

Dunn Block

Commercial thinning in this area should be expanded into the fully-stocked stands. However, according to the timber type map, there are only 150 acres in this category. If these stands are near a road, they could be thinned, but the volume harvested would not be sufficient to allow for road development (Table 4).

Multiple Use

Forest Landscape Management

There are two main travel zones that border the forest from which areas of timber can be seen. These zones are Highway 99 North, located east of both the McDonald and Dunn blocks, and Highway

34, from which parts of the McDonald block can be seen.

Highway 99 North Travel Influence Zone. There are two view categories, as far as the observer is concerned, in this travel influence zone. They are broken into foreground and foreground-middleground categories (8).

The foreground distance is limited from 0 to 1/2 mile, and the observer himself is either in the view or is below the landscape. The land is moderate to steep, forested and undisturbed. The management prescription for the timber is light selection, maintenance of the hardwood component for contrast, stabilization of the soil on microsites, and avoidance of vertical skidways. Roads should be of low standard with a screen on the lower side. Any other uses should be screened from the observer.

In the foreground-middleground category, where the level of the landscape is moderate to steep, the forest can be disturbed without impairing the observer's view because they are from 1/2 to 5 miles from the forest landscape. The management direction for the timber is for light selection or shelterwood. Revegetation and healing of scars caused by roads should be as rapid as possible and no new roads across open areas built until screening can be established. Other uses in the area should be screened.

Highway 34 Travel Influence Zone. Part of the McDonald block would be in the background (five miles or more) from this influence

zone. The observer can look both above and below his line of sight and see the forested land which is moderate to steep and undisturbed. The management prescription for the timber should be single selection, shelterwood, small strip or staggered clearcut that would blend in with the topography. The roads should be placed where they can be concealed from the observer. Other uses of the land should also be hidden.

Using timber type maps in the Appendix, the boundary of this landscape management area was determined, and the acres by timber types were compiled. These areas were multiplied by volumes per acre to obtain a total volume of 30,373 M board feet of standing timber included in the landscape management plan. There were 1,115 acres with an average volume of 25.55 M board feet per acre (Table 5).

One entire compartment, M-4, of the McDonald block was placed into Landscape Management Key Value as it is both the foreground and foreground-middleground view categories.

The forest manager may add more Landscape Management area and reduce the Timber Key Value acreage of the McDonald block by subdividing Compartment M-2 into M-2A and M-2B with M-2B to be included in Landscape Management (Tables 8 and 9).

The main reason for this subdivision is that the private property adjacent to the forest boundary may be developed into homesites which places some of the land into a foreground management category which is different than management of timber key value areas.

Controlled Hunting of Big Game

Since 1954, a controlled deer hunt to harvest surplus animals has been conducted on these two blocks. An average of 3,000 hunter-days and 335 deer per year have provided sportsmen with excellent outdoor recreation. This hunt is a joint effort of the Fisheries and Wildlife Department of Oregon State University and the Oregon Game Commission. It has helped reduce animal damage to both planted and natural forest trees (Table 6) (16).

REGULATION

Pure Conifers[1]

An 80-year rotation is recommended for Pure Conifers. The average site quality of the area is middle Site III, and according to McArdle (10, p. 41), culmination of the mean annual increment for cubic feet is 70 years of age. Cubic feet was used instead of board feet due to the trend to 100 percent yarding and the errors in the Scribner log rule between cruising and scaling. If ten years is added for regeneration purposes, the rotation will be 80 years.

Yield Curve

Ninety-one prism points were selected out of the cruised prism points on both the McDonald and Dunn blocks. Representatives of all the principal timber types were classified as to age and site index on these points (Figure 3).

A stepwise regression analysis was made to determine the relationship of volume per acre to the age of the stands (14, p. 171-172). From this analysis, the equation for the yield curve was computed. This equation is shown in Table 7.

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[1] Pure Conifers: Timber stands that do not contain a hardwood component.

Est. Volume/acre = 82.07 + 59.23 $(Age)^2$ + 1.66 (Basal area) (Age).

Growth

The growth per acre was computed for all the different age groups, and the periodic annual increment (PAI) was 12,697.2M/10 years or a total mean annual increment (MAI) of 1,269.7 M/year. Growth per acre on 4,332 acres is 293 board feet per acre per year (Table 9).

Allowable Cut Calculation (11, p. 169-175)

Timber Key Value. The 0-10 age group of 987 acres was omitted because it was not known whether they were pure or mixed conifer and they were not included in the field inventory. A total of 4,332 acres remains as forest land. An estimate of the area to cut each year is made by dividing this acreage by the rotation period of 80 years. This results in 54 acres/year. An area-volume check is made to compute the allowable cut per year (Table 10).

All the forest types will be under even-aged management with clearcut harvesting employed for the final harvest cut. The size and shape of these clearcuts could be in the form of strips or groups up to 40 acres in size. Intermediate cuts will be considered as part of

the allowable cut only after intensive field examinations are made.

Due to the lack of adequate field data, a stand and stocking table cannot be determined for this forest; consequently, the percentage of volume harvested from thinning that applies toward the allowable cut will initially be an estimate. As data are collected from thinning sales and stand examinations, the actual figure will be adjusted to achieve a more realistic value.

The sustained-yield allowable cut is computed by the area-volume regulation method used by the U.S. Forest Service and adopted to growing Douglas-fir as even-aged stands. The information needed for computing the allowable cut by this method includes the following:

1. Unit land ownership status and official plot acreage data.
2. Acreages by age-classes.
3. Stocking percent.
4. Forest producing capacity.
5. Potential producing capacity.
6. Forest stand volume per acre of mature and immature timber.

Landscape Management Key Value (Compartment M-4, McDonald Block) (Tables 9 and 10).

Timber Type	Acres	Volume/ Acre (Bt. Ft.)	Total Growth (M/year)	(Bd. ft. /A/Yr.)
Pure Conifer	728.7	32,469	392	538
Mixed Conifer	386.5	17,000	108	280
	1,115.2		500	

If the total area of Compartment M-4 is entered once every ten years with a selection or shelterwood cut as prescribed, the following harvest could be made:

Timber Type	10 Year Growth (BF/Acre)	Yearly Rotation (Acres)	Total Cut (M)
Pure Conifers	5,380	73	392.7
Mixed Conifers	2,800	39	109.2
		112	501.9

Compartment M-2B, McDonald Block.

Timber Type	Acres	Volume/ Acre (Bd Ft.)	Total Growth M/Yr.	Net Growth (Bd. Ft. / Acre/Yr.)
Pure Conifers	351	13,065	221	633
Mixed Conifers	225	19,626	213	947

If the total area of Compartment M-2B is entered once every ten years with a selection or shelterwood cut as prescribed, the following harvest could be made:

Timber Type	10 Year Growth (Bd. Ft. /Acre)	Yearly Rotation (Acres)	Total Cut (M)
Pure Conifer	6,330	35	221.6
Mixed Conifer	9,470	22	208.3
TOTAL		57	429.9

This allowable cut was calculated on the net growth of the area to be entered.

Area-Volume Check

The area-volume check is shown in Table 10. The various steps in the series of computations included using the empirical yield Table 7, for the final harvest volume per acre at the age when the various age groups are to be cut (15).

An example of the various steps of computations is as follows:

1. Present age group = 120+ years.
2. Area - 283 acres.
3. Periodic years to cut - $\frac{283 \text{ acres}}{54 \text{ A/year}}$ = 5.2 years.
4. Cumulative years to cut - 5.2 years.
5. Present volume per acre - 30,500 bd. ft.
6. Total volume per age group - 8,631 M bd. ft.
7. Age when cut - 120 years+.
8. From empirical yield table:

   Final harvest volume per acre - 41,900 bd. ft.
9. Total final harvest volume - 11,883 M bd. ft.

This final harvest volume for all age groups is summed and divided by the total acres of 4,332 to compute the average volume per acre when cut which is 32.6 M. This final harvest volume is also divided by the rotation age of 80 years to compute the average annual allowable volume of 1,767.3 M bd.ft. per year.

After reaching an equal age class distribution, the total production for the rotation period will be the yield per acre times the number of regulated commercial acres. The sustained yield capacity is reached by dividing the number of years cutting will progress. This calculation is as follows:

Sustained Yield Capacity (Timber Key Value).

$$\text{Pure Conifers} -- \frac{29,705 \text{ M/acre} \times 4,964 \text{ acres}}{80 \text{ years}} = 1,842 \text{ M bd. ft. /year}$$

$$\text{Mixed Conifers} -- \frac{17,823 \text{ M/acre} \times 3,520 \text{ acres}}{80 \text{ years}} = \frac{784 \text{ M bd. ft. /year}}{2,626 \text{ M bd. ft. /year}}$$

If the mixed conifer types are converted to pure conifer, their sustained yield capacity would increase from 784 M bd. ft. to 1,307 M bd. ft. This calculation is carried out as follows:

$$\frac{29,705 \text{ M/acre} \times 3,520 \text{ acres}}{80 \text{ years}} = 1,307 \text{ M bd. ft.}$$

1,307 M - 784 M = 523 M bd. ft. increase.

Present Timber Sale Policy

Because the forest is used for instruction, research, and operation at the same time and on the same ground, the present policy is that the forest manager has a two-year negotiated contract with a qualified contractor to do the necessary field work. These qualifications include those necessary for forest planning and engineering as

well as logging.

A ten-year plan of removing all blowdown, salvage and general cleanup has just been concluded, and all dead and dying timber is salvaged every year.

A shelterwood type of cutting is practiced where the overstory is removed if there is adequate reproduction already established. The timber fellers have been trained to do their marking with the chainsaw and can readily select additional trees if needed to improve the stand. Close coordination and understanding is needed between the contractor and the forest manager to do the necessary work. A predetermined hourly rate has been compiled for each part of the operation. Thus, the forest is maintained in a healthy, growing condition (2).

Mixed Conifers[1]

The culmination of cubic feet mean annual increment for the conifer component in these stands is 70 years. The regeneration period will be increased to 20 years due to difficulty in regenerating hardwood and brushy types. This rotation will then be 90 years for the first rotation.

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[1]Mixed Conifers - Timber stands that contain a hardwood component.

Allowable Cut Computations

If the total acreage of 3,100 acres in this type is divided by 90 years, the result would be an average of 34 acres per year. The present volume per acre in the mixed types is 10.3 M bd. ft. per acre. Using this average volume on 34 acres produces a total volume to cut of 350 M bd. ft.

Total Annual Allowable Cut

Timber Key Value Area

Timber Type	Volume (M)	Clear Cut (Acres)	Partial Cut (Acres)
Pure Conifers	1,767	54	--
Mixed Conifers	350	34	--
Landscape Mgt. Areas			
Pure Conifers	393	--	73
Mixed Conifers	109	--	39
	2,619	88	112

Summary

The above summary would change slightly if the forest manager elects to add Compartment M-2B of the McDonald block to the Landscape Management category. The effects of this option are as follows:

A. Timber Key Value Areas

1. Reduce the clear-cut acres from 88 to 81 acres per year.
2. Reduce the volume to be cut from 2,117 M to 1,948 M board feet per year.

B. Landscape Management Areas

1. Increase partial-cut acres from 112 to 169 acres.
2. Increase the volume to be cut from 502 M to 932 M board feet.

It should be remembered that the allowable cut is not fixed but is subject to change as new and more precise estimates are made from subsequent inventories. The present period for recomputation is ten years; therefore, adjustments can be made by the forest manager to increase the allowable cut by including thinnings of commercial size stands or by increasing the conversion of the mixed conifer types to pure conifer types if he so desires.

It is hoped that many refinements for managing second-growth stands will be made in the next two to three decades.

Sustained Yield Capacity

The productive capacity, or sustained yield, for the tract will be based on a 80-year rotation for both pure conifer and mixed conifer types. From the present stocking percentages by timber types, it is determined that the average weighed stocking for the average ages of

the two broad conifer types is as follows:

	Average Weighed Stocking[1]	Average Age (Years)
Pure Conifers	65	62.94
Mixed Conifers	39	56.54

The average site index for the pure conifers is 140 or middle site class III.

By referring to McArdle's yield tables (10, p. 27) for Douglas-fir, projecting growth from the present age to the rotation age and interpolating for the average weighed stocking, the gross yield for an average acre is obtained.

The computed yields are as follows:

Timber Type	Years	Volume Scrib. BF	%	Volume Scrib. BF
Pure Conifers	80	45,700	65[2]	29,705
Mixed Conifers	80	45,700	39[3]	17,823

Due to the yearly salvage on these areas, the computed yields are the same for both gross and net.

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[1] The computations of these values may be found in Tables 15 and 16 in the Appendix.

[2] Table 15.

[3] Table 16.

PRIORITIES OF THIS PLAN

I. Harvest of Timber Key Value Areas

A. Convert Mixed Conifer Types to Pure Conifer Types.

If converted to Pure Conifer, the Annual Allowable Cut can be increased to 523 M board feet. At $100.00/M stumpage, this would amount to $52,300 yearly.

B. Pure and Mixed Conifer categories.

After they reach an equal age class distribution, the Annual Allowable Cut can be increased from 2,116 M board feet to 2,626 M board feet or 510 M board feet more. At $100/M stumpage, this increase would amount to $51,000 yearly.

C. Commercial Thinning.

After intensive stand examinations of the fully-stocked stands, commercial thinning could be increased. No estimate can be made at this time as to the increase in cut.

II. Regeneration

A. An intensive ground survey of the cutover, brush and grass types in each compartment especially McDonald-3 is needed.

B. Prescriptions should be written for planting or replanting, brush control and control of animal damage.

C. On the ground examinations are needed to determine the results of these prescriptions.

D. Reforestation plans should be made and executed for current timber sales.

III. Acquisition

A. Discussions should be started to purchase the N1/2 of Section 8 of T 11S, R 5W, W. M. to block up land ownership.

IV. Personnel

A. Additional, full -time, forestry-oriented personnel are needed for intensive management.

One area not covered in this timber management plan is forest recreation. The school forest is receiving intense pressure from all sides by the public for recreation use. One suggestion is that a complete recreation plan be made as soon as possible. It could point out if planned timber harvest is compatible or conflicting with recreation.

REVISION OF PLAN

Management plans should be revised at least at ten-year intervals to adjust to current inventories and utilization practices. It is hoped that another field inventory and management plan be made before 1981-82 so that a 17-19 year lapse between plans does not occur as previously.

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APPENDIX

Table 1. Cutting history of McDonald and Dunn blocks (thousands of bd. ft.)

Year	McDonald		Dunn		Both Forests	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
49-50	31.97	31.97	--	--	31.97	31.97
50-51	--	31.97	--	--	--	31.97
51-52	766.40	798.37			766.40	798.37
52-53	18.25	816.62	6,105.00	6,105.00	6,123.25	6,921.62
53-54	100.00	916.62			100.00	7,021.62
54-55	--	916.62	156.02	6,261.02	156.02	7,177.64
55-56	238.65	1,155.27	3,504.29	9,765.31	3,742.94	10,920.58
56-57	271.25	1,426.52	575.99	10,341.30	847.24	11,767.82
57-58	373.90	1,800.42	70.97	10,412.27	444.87	12,212.69
58-59	492.09	2,292.51	56.12	10,468.39	548.21	12,760.90
59-60	1,013.06	3,305.57	750.15	11,218.54	1,763.21	14,524.11
60-61	1,474.29	4,779.86	1,418.66	12,637.20	2,892.95	17,417.06
61-62	2,537.65	7,317.51	2,505.05	15,142.25	5,042.70	22,459.76
62-63	5,125.88	12,443.39	1,180.45	16,322.70	6,306.33	28,766.09
63-64	2,790.94	15,234.33	2,827.73	19,150.43	5,618.67	34,384.76
64-65	1,623.95	16,858.28	4,760.57	23,911.00	6,384.52	40,769.28
65-66	4,876.93	21,735.21	813.80	24,724.80	5,690.73	46,460.01
66-67	3,887.01	25,622.22	61.61	24,786.41	3,948.62	50,408.63
67-68	988.16	26,610.38	1,803.31	26,589.72	2,791.47	53,200.10
68-69	544.61	27,154.99	2,132.62	28,722.34	2,677.23	55,877.33
69-70	1,572.00	28,726.99	2,602.90	31,325.24	4,174.90	60,052.23
70-71	2,593.00	31,319.99	768.37	32,093.61	3,361.37	63,413.60
71-72	3,624.00	34,943.99	47.00	32,140.61	3,671.00	67,084.60
72-73	2,816.33	37,760.32	20.00	32,160.61	2,836.33	69,920.93

Table 2. Net volumes and areas of timber types on McDonald block by types and age classes.

Timber Type	Age Class (yrs.)	Net Volume (M bd. ft.)	Total	Area (Acres) Productive	Non-Productive	Total
XO	0	--	--	1059.88		1059.88
	10	--	--	--		--
D1	20	173.5	173.5	761.45		761.45
D2	30	2999.5	2999.5	635.10		635.10
D3	40	4633.3		733.83		
	50	2785.1		197.95		
	60	--	7418.4	--		931.78
D4	70	9595.5		537.90		
	80	14716.2		549.78		
	90	2165.3		101.87		
	100	4635.2		309.51		
	110	34002.0		775.52		
	120	14074.4	79188.6	400.14		2674.72
D5	270	269.4	269.4	27.00		27.00
Hdwds					84.55	84.55
Grass					420.56	420.56
Total			90,049.8	6,089.93	505.11	6,621.42

Table 3. Net volumes and areas of timber types on the Dunn block by types and age classes.

Timber Type	Age Class (years)	Net Volume (M bd. ft.)	Total	Area (acres) Productive	Non-Productive	Total
XO	0			19.06		19.06
	10					
D1	20	2,588	2,588	692.19		692.19
D2	30	5,647	5,647	892.30		892.30
D3	40	4,383		491.46		
	50	3,397		295.16		
	60	226	8,006	16.05		802.67
D4	70	4,806		287.96		
	80	4,072		211.21		
	90	1,455		66.55		
	100	6,787		277.48		
	110	5,057		186.95		
	120	3,048	25,225	10283		1,132.98
Total		41,466	41,466			3,539.20
Grass/ Hdwds					2,558.39	
Section 9						
D3	40	283.4				
D4	70	1,200.7	1,484.1	69.82		124.89
Total					2,558.39	3,664.09

Table 4. Fully-stocked (=), pure conifer stands 35 years and older from the timber type map.

Age	Type	Acres	Net Vol. / Acre (BF)
	McDonald Block		
50	D3	36	41,400
70	D4-/D3=	53	32,101
70	D4=/D3-	13	58,376
80	D4=	9	38,850
80	D4-/D3=	36	49,715
80	D5-/D4=	2	49,735
110	D4=	53	77,051
110	D4=/D3-	78	42,538
120	D4=	11	35,925
120/100	D5-/D4=	45	32,301
Total		336	
	Dunn Block		
70	D4=/D3-	15	39,900
90	D4=	13	73,600
90	D4=/D3-	28	35,700
110	D4=	18	68,000
110	D4-/D3=	63	32,200
Total		137	

Table 5. Landscape management (McDonald block). Summary by section.

Section	Acres	Net Volume MBF	
	Compartment M-4		
30	96.99	693.3	
25	305.05	5,317.7	
35	78.80	3,215.0	
36	490.71	14,745.9	
2	77.57	3,651.3	
3	40.02	621.6	
9	22.00	278.1	
10	77.67	1,851.0	
Total	1,188.82	30,373.9	
	Compartment M-2B		
9	218	5,014	
15	56	286	
16	421	3,137	
17	23	464	
Total	718	8,901	12,397 Bd. ft. / acre avg.

$\frac{30,373.9 \text{ MBF}}{1,188.82}$ = 25.55 M/Acre average

$\frac{8,901 \text{ MBF}}{718 \text{ A}}$ = 12.40 M/Acre average

Table 6. Controlled hunting of big game. History of hunter success and harvest in McDonald Forest.

Year	Hunter Days	Deer Killed	Percent Successful per Hunter Day
1954*	909	212	23
1955	1,465	251	17
1956	1,454	223	15
1957	1,438	315	22
1958	1,349	277	21
1959	1,845	243	13
1960	3,496	504	14
1961	3,220	424	13
1962**	3,212	290	9
1963	4,749	498	10
1964	4,124	418	10
1965	2,997	256	9
1966	2,507	244	10
1967	3,168	338	11
1968	2,968	284	9
1969	2,615	221	8
1970	7,477	608	8
1971	5,189	425	8
1972	1,702	100	6
Totals:	35,884	6,131	11

* Adair tract only
** Cyclone Frieda

Table 7. Stepwise regression analysis.

I. Variables

X_1 -- Age
X_2 -- $(Age)^2$
X_3 -- $(Age)^3$
X_4 -- Basal area
X_5 -- $(Basal\ area)^2$
X_6 -- (Basal area)Age
X_7 -- (Basal area)x $(Age)^2$
X_8 -- (Basal area)x Age.

Step No.	Variable Entering	R-Square	Standard Error (%)	Constant
1	6	0.773	81.5	2533.16
2	2	0.779	81.0	82.07
3	4	0.790	79.3	-5541.43
4	1	0.793	79.3	-3288.40
5	3	0.794	79.5	3883.53
6	7	0.795	79.8	6803.89
7	8	0.795	80.3	6917.51
8	5	0.799	80.0	-645.55

The equation at the end of step 2 was used due to the large negative constant at the end of step 3 which would have resulted in a negative value for age groups 10, 20 and 30 years.

This equation is:

$$\hat{Y} = 82.07 + 59.23\ X_2 + 1.66\ X_6$$

Age	Est. Net Vol/Acre (Bd. ft.)
20	2,927
30	5,099
40	7,448
50	10,094
60	13,086
70	15,506
80	21,420
90	25,513
100	30,005
110	35,797
120	41,990

Table 8. Mean annual increment (timber key value). McDonald and Dunn blocks -- pure conifers.

1968-69 Stand Age	Total Acres	Yield Table Vot/Acre Net BF	Net Total Yield (M)	1978-79 Stand Age	Acres	Yield Table Vot/acre Net BF	Total Yield Net (M)
20	601	2,927	1759.1				
				30	601	5,099	3064.5
30	1177	5,099	6001.5				
				40	1177	7,448	8758.8
40	457	7,448	3403.7				
				50	457	10,094	4613.0
50	232	10,094	2341.8				
				60	232	13,086	3036.0
60	16	13,086	209.4				
				70	16	15,506	248.1
70	345	15,506	5349.6				
				80	345	21,420	7389.9
80	585	21,420	12425.4				
				90	585	25,513	14925.1
90	67	25,513	1709.4				
				100	67	30,005	2010.3
100	225	30,005	6751.1				
				110	225	35,797	8054.3
110	344	35,797	12314.2				
				120	344	41,990	14444.6
120+	283	41,990	11883.2				
				130	283	47,000	13301.0
Total	4332		64148.4				76845.6

76,845.6 - 64,148.4 = 12,697.2 M.

$$\frac{12,697.2\ M}{10\ year} = 1,269.7\ M \qquad \text{Growth} = \frac{1,269.7\ M}{4,332\ A} = 293\ B.F./A/yr$$

Table 9. Area-volume check (Timber key value). Pure conifers, 54 acres/year.

Pres. Age Group	Area Acres	Years to Cut Per.	Years to Cut Cum.	Virgin BF/ Acre	Virgin Total MBF	Age When Cut	Final Harvest Vol. BF/Acre	Final Harvest Vol. Total M BF
120+	283	5.2	5.2	30,500	8,631	120+	41,990	11,883
110	344	6.4	11.6	47,690	16,405	125	46,000	15,824
100	225	4.2	15.8	27,125	6,103	115	38,894	8,751
90	67	1.2	17.0	24,063	1,612	105	32,901	2,204
80	585	10.8	27.8	26,225	15,342	110	35,797	20,941
70	345	6.4	34.2	28,921	9,978	105	32,901	11,351
60	16	0.3	34.5	22,881	366	95	27,759	444
50	232	4.3	38.8	13,429	3,116	90	25,513	5,919
40	457	8.5	47.3	4,728	2,161	85	23,466	10,724
30	1,177	21.7	69.0	5,181	6,098	100	30,005	35,310
20	601	11.0	80.0	210	126	100	30,005	18,030
Total	4,332				80,282			141,381

$\frac{141,381\ M}{4,332\ Acres}$ = 32.636 M/acre - average

$\frac{141,381\ M}{80\ years}$ = 1,767.3 M/year average - AAC

$\frac{4,332\ Acres}{80\ years}$ = 54.2 acres/year - average.

Table 10. Landscape management summary (McDonald block, Compartment M-4).

Stand Age	Pure Conifers Volume			Mixed Conifers Volume			Total Volume		
	Acres	Net MBF	Avg./Acre (Bd. Ft.)	Acres	Net MBF	Avg./Acre (Bd. Ft.)	Acres	Net MBF	Avg./Acre (Bd. Ft.)
20	6.39	4.5	704	10.00	6.9	690	16.39	11.4	695
30	45.04	217.4	4,826	--	--	--	45.04	217.4	4,826
40	34.06	188.4	5,531	51.93	488.4	9,404	85.99	676.8	7,870
50	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--
70	15.49	306.1	19,761	34.50	487.9	14,142	49.99	794.0	15,883
80	130.69	2,787.5	21,329	--	--	--	130.69	2,787.5	21,329
90	101.87	2,165.3	21,255	--	--	--	101.87	2,165.3	21,255
100	--	--	--	228.81	2,835.7	12,393	228.81	2,835.7	
110	390.04	17,890.0	45,867	20.83	977.5	46,927	410.87	18,867.5	45,920
120	5.12	91.6	17,890	40.46	1,777.8	43,939	45.58	1,869.4	41,013
Total	728.70	23,650.8		386.53	6,574.2	17,008	1115.2	30,225	27,100

Table 11. Landscape management summary (McDonald block, Compartment M-2B).

Stand Age	Pure Conifers Volume			Mixed Conifers Volume			Total Volume		
	Acres	Net MBF	Avg. BF/ Acre	Acres	Net MBF	Avg. BF/ Acre	Acres	Net MBF	Avg. BF/ Acre
20	14	19	1,357	6	6	1,000	20	25	1,250
30	43	272	6,325	--	--	--	43	272	6,325
40	--	--	--	11	60	5,454	11	60	5,454
50	173	888	5,133	48	673	14,020	221	1,561	7,063
60	--	--	--	--	--	--	--	--	--
70	62	1,816	29,290	--	--	--	62	1,816	29,290
80	50	1,385	27,700	--	--	--	50	1,385	27,700
90	9	206	22,777	--	--	--	9	206	22,777
100	--	--	--	87	1,164	13,379	87	1,164	13,379
110	--	--	--	73	2,513	34,424	73	2,513	34,424
Total	351	4,586	13,065	225	4,416	19,626	576	9,002	15,677

Table 12. Mean annual increment landscape management (McDonald block, Compartment M-4).

Pure Conifers: 1968-69 Stand Age	Total Acres	Net Yield Table Vol/A	Net Total Yield (M)	1978-79 Stand Age	Acres	Yield Table Vol/A	Net Total Yield (M)
20	6.39	2,927	18.7	30	6.39	5,099	32.6
30	45.04	5,099	23.1	40	45.04	7,448	335.2
40	34.06	7,448	253.7	50	34.06	10,094	343.2
50	--	10,094	--	60	--	13,086	--
60				70	--	15,506	--
70	15.49	15,506	240.3	80	15.49	21,420	332.0
80	130.69	21,420	2,760.8	90	130.69	25,515	3,267.5
90	101.87	25,513	2,597.7	100	101.87	30,005	3,056.1
100	--	30,005	--	110	--	35,797	--
110	390.04	35,797	13,963.4	120	390.04	41,990	16,376.1
120	5.12	41,990	214.1	130	5.12	47,000	240.6
Total	728.70		20,061.8				23,983.3

$23,983.3 - 20,061.8 = 3,921.5$ M

$\frac{3,921.5 \text{ M}}{10 \text{ years}} = 392.15$ M/Yr.

Growth: $\frac{392.15 \text{ M}}{728.7 \text{ A}} = 538$ BF/A/Yr.

Table 13. Mean annual increment landscape management - McDonald block, Compartment M-2B.

1968-69 Stand Age	Acres	Net Yield Table Vol/A.	Net Total Yield (M)	1978-79 Stand Age	Acres	Net Yield Table Vol/A.	Net Total Yield (M)
20	14	2,927	41.0	30	14	5,099	71.4
30	43	5,099	219.3	40	43	7,448	320.3
40	--	--	--	50	--	--	--
50	173	10,094	1,746.3	60	173	13,086	2,263.9
60	--	--	--	70	--	--	--
70	62	15,506	961.4	80	62	21,420	1,328.0
80	50	21,420	214.2	90	50	25,515	1,275.0
90	9	25,513	336.7	100	9	30,005	270.0
Total	351	--	3,318.9		351	--	5,528.6

5,528.6 M - 3,318.9 M = 2,209.7 M Growth

$\frac{2,209.7 \text{ M}}{10 \text{ years}} = 220.97 \text{ M/year}$

$\frac{220.97 \text{ M/yr}}{351 \text{ acres}} = 633 \text{ BF/A/yr.}$

Table 14. Age classes and percent stocking - pure conifers - entire forest.

Age Class	Total Acres	Average Stocking Percent	Area X Age Class	Area X Stocking
270	14	77	3,780	1,078
120	273	85	32,760	23,205
110	734	67	80,740	49,178
100	224	60	22,400	13,440
90	168	70	15,120	11,760
80	715	55	57,200	39,325
70	359	70	25,230	25,130
60	16	62	960	992
50	232	55	11,600	12,760
40	497	72	19,880	35,784
30	1221	67	36,630	81,807
20	606	66	12,120	39,996
10	--	--	--	--
0	1060	--	--	--
Total	6119		318,420	334,455

Average age class - $\frac{318,420}{5,059 \text{ acres}} = 62.94$ years

Average percent stocking - $\frac{334,455}{5,059 \text{ acres}} = 65.12$ percent

Table 15. Age classes and percent stocking - mixed conifers - entire forest.

Age Class	Total Acres	Average Stocking Percent	Area X Age Class	Area X Stocking
270	13	--	3,510	--
120	230	55	27,600	12,650
110	229	--	25,190	--
100	363	--	36,300	--
90	--	--	--	--
80	46	70	3,680	3,220
70	467	25	32,690	11,675
60	--	--	--	--
50	261	25	13,050	6,525
40	723	--	28,920	--
30	306	55	9,180	16,830
20	847	--	16,940	--
10	--	--	--	--
0	--	--	--	--
Total	3,485		197,060	50,900

Average age class - $\frac{197,060}{3,485 \text{ acres}} = 56.54$ years

Average percent stocking - $\frac{50,900}{1,310 \text{ acres}} = 38.8$ percent

Table 16. Summary of timber key value - entire forest.

St. Avg.	Pure Conifers Volume			Mixed Conifers Volume			Total All Types Volume			Acres % of Total
	Total Acres	Net MBF	Avg/A BF	Total Acres	Net MBF	Avg/A BF	Total Acres	Net MBF	Avg/A BF	
0	--	--		--	--		987	--	--	12
10	--	--		--	--		--	--	--	
20	601	137.8	229	837	367.7	439	1,438	505.5	352	16
30	1,177	6,108.8	5,190	306	447.7	1,463	1,483	6,556.5	4,421	17
40	457	2,161.8	4,730	672	3,717.0	5,531	1,129	5,878.8	5,207	14
50	232	3,115.7	13,429	261	1,850.5	7,090	493	11,966.2	22,508	6
60	16	366.1	22,881	--	--	--	16	366.1	22,881	--
70	345	9,976.8	28,918	433	5,516.7	12,740	778	15,493.5	19,914	9
80	585	15,964.0	27,289	46	452.9	9,846	631	16,416.9	26,017	8
90	67	1,877.3	28,019	--	--	--	67	1,877.3	28,019	1
100	225	6,076.1	27,004	134	3,426.4	25,567	359	9,502.5	26,469	4
110	344	17,114.9	49,753	208	8,875.2	42,669	552	25,990.1	47,084	7
120	269	8,574.1	31,874	190	7,104.0	37,389	459	15,678.1	34,141	6
270	14	189.8	13,557	13	79.6	6,123	27	269.4	9,978	--
Total	4,332	71,670.2	16,544	3,100	31,937.8	10,302	8,419	103,608.0		100

Table 17. Acres and volumes by stand age - entire forest.

Stand Age	Pure Conifer Type[1] Total Acres	Pure Conifer Type[1] Net MBF	Pure Conifer Type[1] Avg/A BF	Mixed Conifer Type[2] Total Acres	Mixed Conifer Type[2] Net MBF	Mixed Conifer Type[2] Avg/A BF	All Types Acres	All Types Net MBF	All Types Avg/A BF	Acres % of Total
0	1,060	--	--	--	--	--	1,060	--	--	11.0
10	--	--	--	--	--	--	--	--	--	--
20	606	142.3	210	847	374.7	442	1,453	517.0	356	15.1
30	1,221	6,326.2	5,181	306	447.0	1,460	1,527	6,773.2	4,434	15.9
40	497	2,350.2	4,728	723	4,205.4	5,816	1,220	6,555.6	5,372	12.7
50	232	3,115.7	13,429	261	1,950.5	7,473	493	5,066.2	10,274	5.1
60	16	366.1	22,881	--	--	--	16	366.1	22,881	0.2
70	359	10,382.9	28,921	467	6,004.6	12,857	826	16,387.5	19,840	8.6
80	715	18,751.5	26,225	46	452.9	9,843	761	19,204.4	25,236	7.9
90	168	4,042.6	24,063	--	--	--	168	4,042.6	24,063	1.7
100	224	6,076.1	27,125	363	6,262.1	17,250	587	12,338.2	21,019	6.1
110	734	35,004.9	47,690	229	9,852.7	43,024	962	44,857.6	46,605	10.0
120	273	8,575.7	31,412	230	8,881.8	38,616	503	17,457.5	34,707	5.2
270	14	189.8	13,557	13	79.6	6,123	27	269.4	998	0.3
Total	6,119	95,324.0		3,485	38,511.3		9,604	133,835.3		

[1]Pure conifer type - a stand without a hardwood component, based on the Timber Type map.

[2]Mixed conifer type - a stand with a hardwood component, based on the Timber Type map.

Table 18. Summary - timber key value and landscape management key value - McDonald Forest.

Stand Age	Pure Conifers Type (1)[1] Volume Acres	Net MBF	Avg/A BF	Mixed Conifers Type (2)[2] Volume Acres	Net MBF	Avg/A BF	Total All Types Volume Acres	Net MBF	Avg/A BF
0	1,060	--	--	--	--	--	1,060	--	--
10	--	--	--	--	--	--	--	--	--
20	548	67.5	123	213	106.0	498	761	173.5	228
30	571	2,922.8	5,119	64	76.7	1,198	635	2,999.5	4,724
40	327	1,669.6	5,106	407	2,963.7	7,282	734	4,633.3	6,312
50	116	2,073.5	17,875	82	711.6	8,678	198	2,785.1	14,066
60	--	--	--	--	--	--	--	--	--
70	171	5,474.2	32,013	367	4,121.3	11,230	538	9,595.5	17,836
80	550	14,716.2	26,757	--	--	--	550	14,716.2	26,757
90	102	2,165.3	21,228	--	--	--	102	2,165.3	21,228
100	67	1,595.1	23,807	243	3,040.1	12,511	310	4,635.2	14,952
110	645	29,385.5	45,559	130	4,616.5	35,512	775	34,002.0	43,874
120	171	5,192.6	30,366	230	8,881.8	38,617	401	14,074.4	35,098
270	14	189.8	13,557	13	79.6	6,123	27	269.4	9,978
Total	4,341	65,452.1		1,749	24,597.3		6,090	90,049.4	
Avg. Volume/Acre	--	15,033 BF				14,067			14,756

[1]Pure conifers - a stand without hardwoods, based on Type Map.

[2]Mixed conifers - a stand with hardwoods, based on Type Map.

Table 19. Timber key value - Dunn block.

Stand Age	Pure Conifers Type (1)[1] Volume			Mixed Conifers Type (2)[2] Volume			Total All Types Volume		
	Acres	Net MBF	Avg/A BF	Acres	Net MBF	Avg/A BF	Acres	Net MBF	Avg/A BF
0	--	--	--	--			--		
10	--	--	--	--			--		
20	58	74.8	1,290	634	268.7	424	692	343.5	496
30	650	3,403.4	5,236	242	371.0	1,533	892	3,774.4	4,231
40	170	680.6	4,004	317	1,241.7	3,917	487	1,922.3	3,947
50	116	1,042.2	8,985	179	1,238.9	6,921	295	2,281.1	7,733
60	16	366.1	22,881	--	--	--	16	366.1	22,881
70	189	4,908.7	25,972	100	1,883.3	18,833	289	6,792.0	23,502
80	165	4,035.3	24,456	46	452.9	9,846	211	4,488.2	21,271
90	67	1,877.3	28,019	--	--	--	67	1,877.3	28,019
100	158	4,481.0	28,361	120	3,222.0	26,850	278	7,703.0	27,709
110	88	5,619.4	63,857	99	5,236.2	52,891	187	10,855.6	58,051
120	103	3,383.1	32,846	--	--	--	103	3,383.1	32,846
Total	1,780	29,868.9		1,737	13,914.7		3,517	43,786.6	

[1]Pure conifers - a stand without hardwoods, based on Type Map.

[2]Mixed conifers - a stand with hardwoods, based on Type Map.

Table 20. Present age class distribution of growing stock of pure conifer types - entire forest.

Age Class Years	Acres per Age Class	Percent of Area by Age Class	Acres in Sequence of Age
0	1,060	19.0	19.0
10	--	--	19.0
20	606	10.0	27.0
30	1,221	21.0	46.0
40	497	8.0	55.0
50	232	2.3	59.0
60	16	0.1	59.1
70	359	5.9	65.0
80	715	11.7	77.0
90	168	2.7	80.0
100	224	3.7	83.4
110	734	12.0	95.0
120	273	4.5	99.9
270	14	0.1	100.0
Total	6,119	100.0	

Table 21. Present age class distribution of growing stock of mixed conifer types - entire forest.

Age Class Years	Acres per Age Class	Percent of Area by Age Class	Acres in Sequence of Age
0	--	--	--
10	--	--	--
20	847	24	24.0
30	306	9	33.0
40	723	21	54.0
50	261	8	61.0
60	--	--	61.0
70	467	13	74.0
80	46	1	75.0
90	--	--	75.0
100	363	10	86.0
110	229	7	93.0
120	230	7	100.0
270	13	--	
Total	3,485	100	

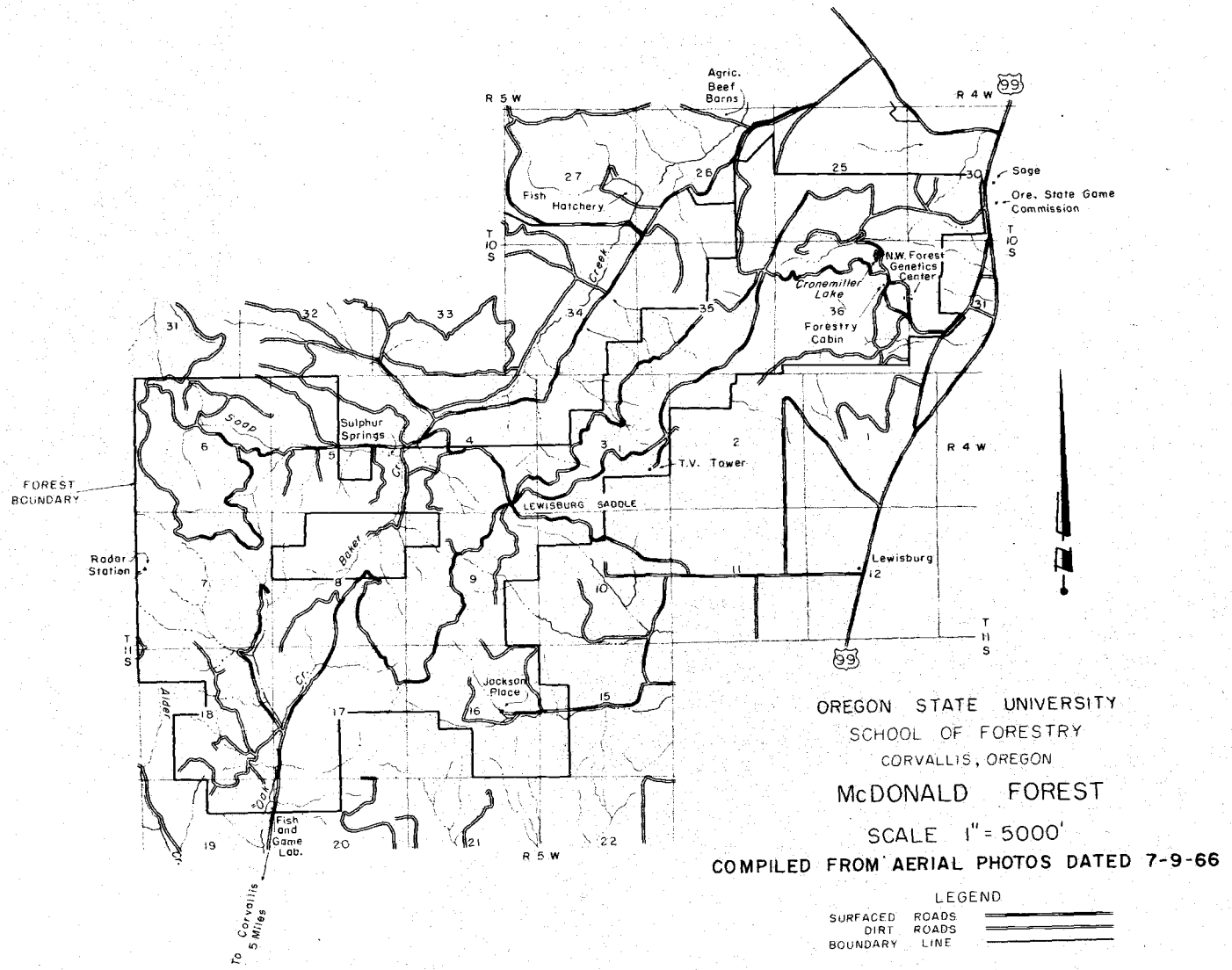

Figure 1. Vicinity map of McDonald Block.

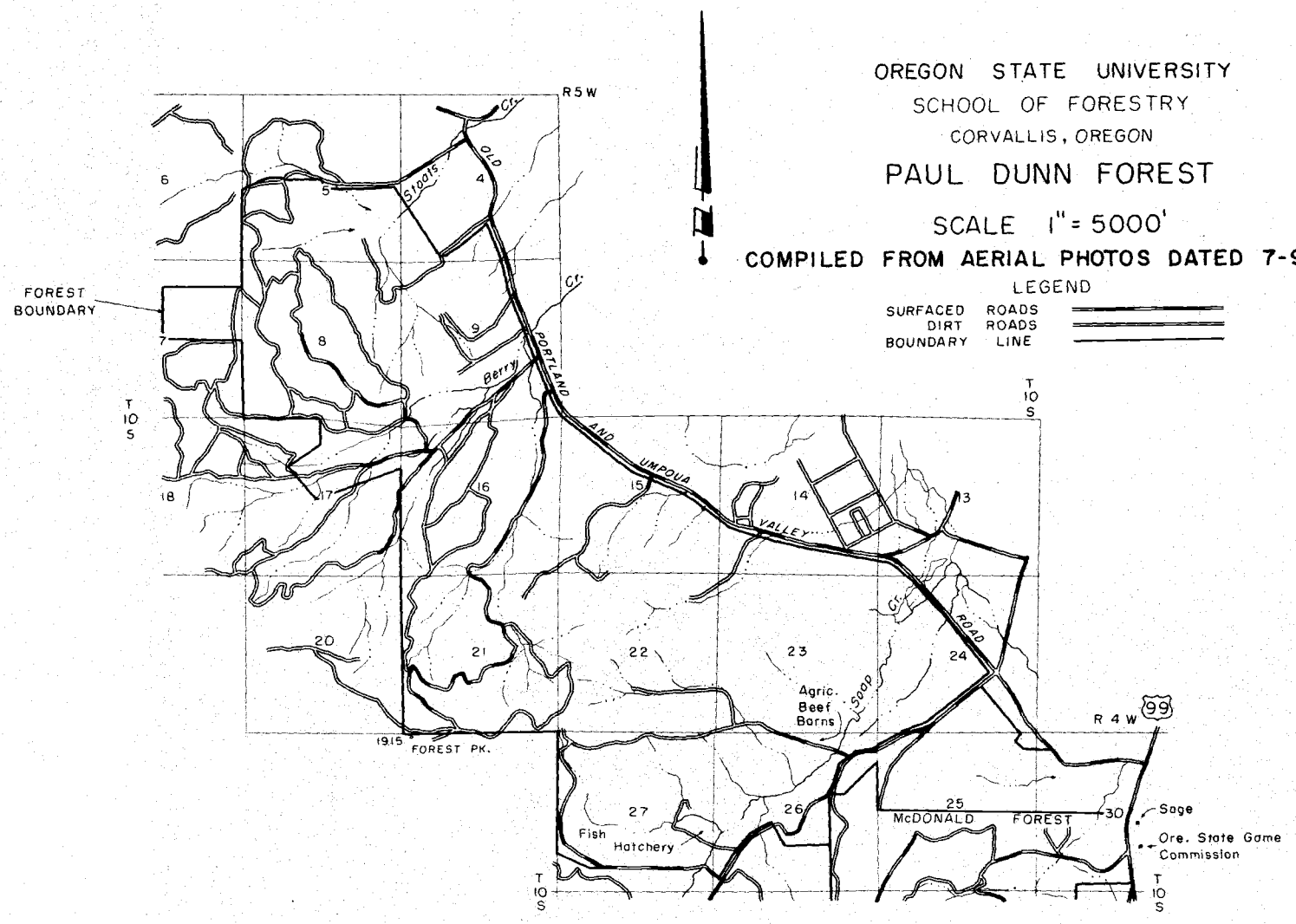

Figure 2. Vicinity map of Dunn Block.