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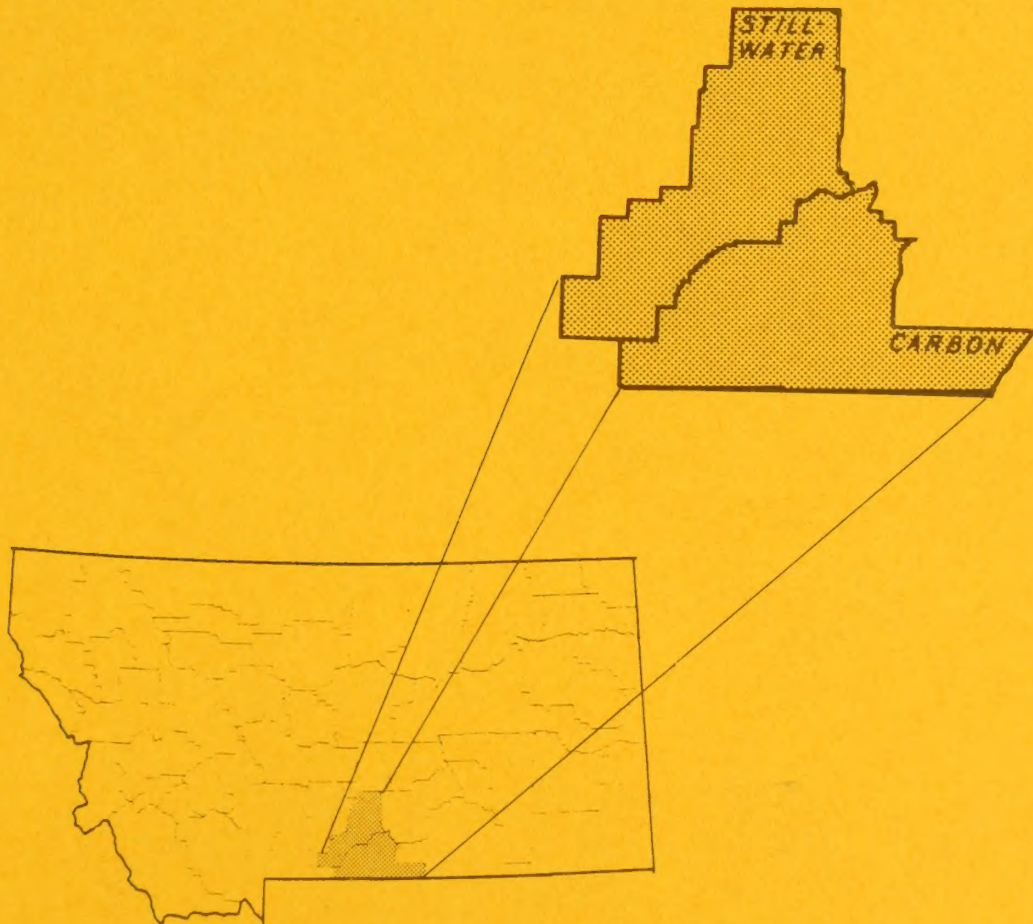
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# FOREST AREA AND TIMBER RESOURCE STATISTICS FOR THE BEARTOOTH WORKING CIRCLE, MONTANA, 1977

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Dorothy G. Felt



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FOR THE BEARTOOTH WORKING CIRCLE, MONTANA, 1977

Dorothy G. Felt

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## ACKNOWLEDGMENTS

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## RESEARCH SUMMARY

Presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

# CONTENTS

	Page
INTRODUCTION . . . . .	1
HIGHLIGHTS . . . . .	1
Area. . . . .	1
Inventory . . . . .	3
Growth and Mortality. . . . .	3
HOW THE INVENTORY WAS CONDUCTED. . . . .	3
DATA RELIABILITY . . . . .	4
TERMINOLOGY AND DATA TABLES. . . . .	4
TERMINOLOGY. . . . .	4
Land. . . . .	4
Water . . . . .	4
Land Use Classes. . . . .	5
Public Ownership Classes. . . . .	5
Private and Other . . . . .	5
Forest Type and Tree Species. . . . .	6
Area Condition Classes. . . . .	6
Class of Timber . . . . .	7
Tree Size Classes . . . . .	7
Volume. . . . .	7
Growth and Mortality. . . . .	8
Site. . . . .	8
Stand-Size Classes. . . . .	8

## TABLES

1 Area of forest land and percent standard error for the Beartooth Working Circle, 1977. . . . .	4
2 Net volume, net annual growth, and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for the Beartooth Working Circle, 1977. . . . .	4
3 Total land and water area in the Beartooth Working Circle by ownership class, 1977 . . . . .	9
4 Total land area in the Beartooth Working Circle by major land class and ownership class, 1977. . . . .	9
5 Area of commercial timberland in the Beartooth Working Circle by forest type, stand-size class, and site class, 1977 . . . . .	10
6 Area of State-owned commercial timberland in the Beartooth Working Circle by forest type, stand-size class, and site class, 1977. . . . .	11
7 Area of privately owned commercial timberland in the Beartooth Working Circle by forest type, stand-size class, and site class, 1977 . . . . .	12
8 Area of commercial timberland in the Beartooth Working Circle by stand volume and ownership class, 1977. . . . .	13
9 Area of commercial timberland in the Beartooth Working Circle by forest type and area condition class, 1977. . . . .	13

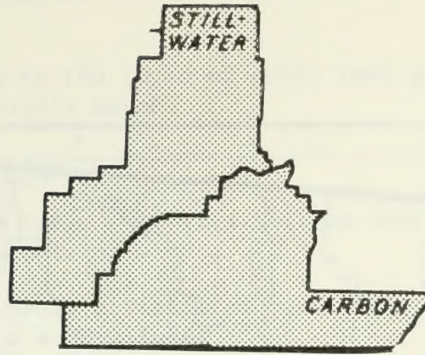
10	Area of productive reserved and other forest land in the Beartooth Working Circle by land class, ownership class, and forest type, 1977 . . . . .	14
11	Number of growing stock trees on commercial timberland in the Beartooth Working Circle by species and diameter class, 1977. . . . .	14
12	Number of cull and salvable dead trees on commercial timberland in the Beartooth Working Circle by ownership class, and softwoods and hardwoods, 1977 . . . . .	15
13	Net volume of growing stock on commercial timberland in the Beartooth Working Circle by ownership class, forest type, and stand-size class, 1977 . . . . .	16
14	Net volume of sawtimber on commercial timberland in the Beartooth Working Circle by ownership class, forest type, and stand-size class, 1977 . . . . .	17
15	Net volume of growing stock on commercial timberland in the Beartooth Working Circle by species and diameter class, 1977. . . . .	18
16	Net volume of sawtimber on commercial timberland in the Beartooth Working Circle by species and diameter class, 1977 . . . . .	18
17	Net volume of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by ownership class and species, 1977. . . . .	19
18	Net volume of timber on commercial timberland in the Beartooth Working Circle by class of timber, and softwoods and hardwoods, 1977. . . . .	19
19	Net volume of growing stock on commercial timberland in the Beartooth Working Circle by forest type and species, 1977 . . . . .	20
20	Net volume of sawtimber on commercial timberland in the Beartooth Working Circle by forest type and species, 1977 . . . . .	20
21	Net annual growth of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by ownership class and species, 1977 . . . . .	21
22	Annual mortality of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by ownership class, and softwoods and hardwoods, 1977 . . . . .	21
23	Annual mortality of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by cause of death and species, 1977 . . . . .	22

## FIGURES

1	Beartooth Working Circle, Montana. . . . .	2
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BEARTOOTH



## INTRODUCTION

This resource bulletin presents the principal findings of the second forest inventory of State and private lands in the two county area making up the Beartooth Working Circle (fig. 1). Data collection began in January 1977 and was completed in October 1977. This bulletin does not note changes and trends since the inventory of eastern Montana in 1966, nor does it contain estimates of timber removals. These items will be included in the State Analytical Report to be published in the near future.

The primary objective of Resources Evaluation, a continuing nationwide undertaking conducted by the USDA Forest Service, is to provide an assessment of the renewable resource situation on the Nation's forest and rangelands. Fundamental to the accomplishment of this objective are the periodic State-by-State resource inventories. Originally, Resources Evaluation--formerly Forest Survey--was authorized by the McSweeney-McNary Act of 1928. The current authorization is through the Renewable Resources Research Act of 1978.

The resource inventories for the Rocky Mountain States of Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah, Wyoming, and western South Dakota are administered by the Intermountain Forest and Range Experiment Station, with headquarters in Ogden, Utah. These inventories provide information on the extent and condition of State and privately owned forest lands, volume of timber, and rates of timber growth and mortality. These data, when combined with similar information on Federal lands, provide a basis for the formulation of forest policies and programs and for the orderly development and use of the resources.

## HIGHLIGHTS

### Area

- State and private lands account for 1,724 thousand acres (698 thousand hectares), 70 percent of the total land area in the working circle.
- Forests occupy 112 thousand acres (45 thousand hectares), 7 percent of the total State and private land area in the working circle.
- Of the forest land, 68 thousand acres (27 thousand hectares), almost 54 percent, are classified as commercial timberland.
- Private ownership accounts for 61 thousand acres (25 thousand hectares), 90 percent of the commercial timberland.

MONTANA

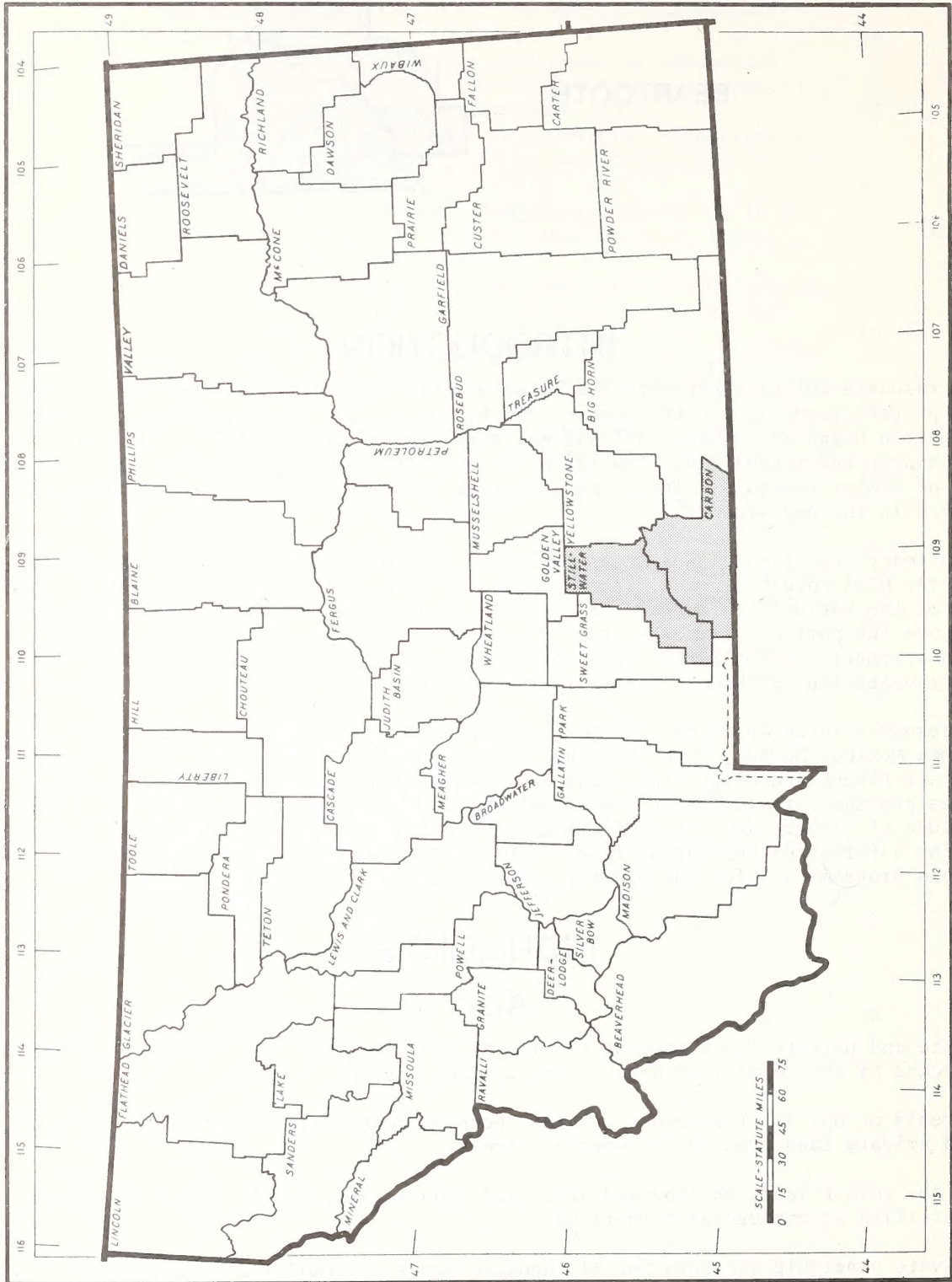


Figure 1.--Beartooth Working Circle, Montana.

- Ponderosa pine, cottonwood, and Douglas-fir are the predominant forest types and occupy 88 percent of the commercial timberland. Aspen, lodgepole pine, and limber pine forest types cover the remaining area.
- Nearly all of the commercial timberland is in the 20 to 49 cubic foot productivity class, and nearly 90 percent of such land is privately owned.

## Inventory

- Growing stock volume amounts to 66 million cubic feet (1.9 million cubic meters) and sawtimber volume totals 218 million board feet.<sup>1</sup>
- Rough, rotten, and salvable dead trees comprise 2.9 million cubic feet (82 thousand cubic meters), 4 percent of the total sound wood volume.
- The largest share of the total growing stock volume is made up of ponderosa pine (43 percent), Douglas-fir (22 percent), and cottonwood (21 percent). Aspen, lodgepole pine, limber pine, Engelmann spruce, and juniper,<sup>2</sup> account for the remaining volume.
- Private owners control almost 90 percent of both the total growing stock and the sawtimber volume.

## Growth and Mortality

- Net annual growth totals 1,335 thousand cubic feet (38 thousand cubic meters). Growth and mortality are not measured for juniper trees.
- Eighty-nine percent of the total net growth is on private lands.
- The annual mortality of 334 thousand cubic feet (9.5 thousand cubic meters) offsets 20 percent of the gross annual growth.

## HOW THE INVENTORY WAS CONDUCTED

The inventory was designed to provide reliable statistics primarily at the State and working circle levels. Procedures were as follows:

1. Initial area estimates were based on the classification of 16,083 sample points systematically placed on the latest aerial photographs available. The sample points were summarized and grouped into strata for subsequent field sampling. The photo points, adjusted to meet known land areas, were used to compute area expansion factors for the field stratum means.

2. Land classification and estimates of timber characteristics and volume were based on observations and measurements recorded at 118 ground sample locations. Sample trees were selected using a 10-point cluster which includes fixed plots (1/300 acre) for trees less than 5.0 inches d.b.h. and variable plots (40 BAF) for trees 5.0 inches d.b.h. or larger.

3. For most species, volume and defect were computed using Kemp's equations. Juniper volumes were computed using Clendenen's pinyon/juniper equations and ponderosa pine was computed using equations developed for ponderosa pine in eastern Montana.

4. All photo and field data were sent to Ogden, Utah, for editing and were punched onto cards and stored for machine computing, sorting, and tabulation. Final estimates were based on statistical summaries of the data.

<sup>1</sup>International 1/4-inch rule.

<sup>2</sup>Although juniper usually occurs on unproductive forest land, when it occurs in mixtures with other species on productive sites, it is reported in the commercial timberland statistics.

## DATA RELIABILITY

Individual cells within tables should be used with caution. Some are based on very small sample sizes, and so result in high sampling errors. The standard error percents shown in tables 1 and 2 were calculated at the 67 percent confidence level.

Table 1.--Area of forest land and percent standard error for the Beartooth Working Circle, 1977

Item	Softwood types		Hardwood types		All types	
	Acres	Percent standard error	Acres	Percent standard error	Acres	Percent standard error
	Commercial timberland	51,297	11.0	16,341	20.8	67,638
Other forest land:						
Unproductive nonreserved	32,679	15.2	11,476	26.5	44,155	12.5

Table 2.--Net volume, net annual growth, and annual mortality of growing stock and sawtimber on commercial timberland, with percent standard error for the Beartooth Working Circle, 1977

Item	Softwoods		Hardwoods		All species	
	Volume	Percent standard error	Volume	Percent standard error	Volume	Percent standard error
	Net volume:					
Growing stock (M cubic feet)	46,961	16.8	19,453	24.3	66,414	12.6
Sawtimber (M board feet <sup>1</sup> )	155,309	16.4	62,490	29.4	217,799	13.6
Net annual growth:						
Growing stock (cubic feet)	737,068	20.8	597,556	34.1	1,334,624	18.0
Sawtimber (board feet <sup>1</sup> )	4,654,092	24.3	1,259,669	39.0	5,913,761	20.4
Annual mortality:						
Growing stock (cubic feet)	280,921	27.8	53,340	44.0	334,261	24.4
Sawtimber (board feet <sup>1</sup> )	813,444	36.7	151,155	51.8	964,599	32.0

<sup>1</sup>International 1/4-inch rule.

## TERMINOLOGY AND DATA TABLES

The following section contains definitions that are relevant to the timber resource data presented in this resource bulletin. Forest area and timber resource data for the Beartooth Working Circle, Montana, are displayed in tables 3 through 23.

### TERMINOLOGY

#### Land

Bureau of the Census.--Area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds less than 40 acres in area. Includes noncensus water. See definition below.

#### Water

Census water.--As defined by the Bureau of the Census, streams, sloughs, estuaries, and canals more than 1/8 of a statute mile in width; and lakes, reservoirs, and ponds more than 40 acres in area.

Noncensus water.--The same as defined by the Bureau of the Census, except minimum width of streams, sloughs, estuaries, and canals is 120 feet and minimum size of lakes, reservoirs, and ponds is 1 acre.

## Land Use Classes

Forest land.--Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Commercial timberland.--Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Areas qualifying have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future.)

Productive-reserved forest land.--Forest land sufficiently productive to qualify as commercial timberland, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

Other forest land.--Forest land incapable of producing 20 cubic feet per acre of industrial wood under management, because of adverse site conditions; includes both reserved and nonreserved forest land.

Nonforest land.--Land that has never supported forests and lands formerly forested where use for timber management is precluded by development for other uses.

## Public Ownership Classes

National Forest lands.--Federal lands legally designated as National Forest or purchase units and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Bureau of Land Management lands.--Federal lands administered by the Bureau of Land Management.

Indian lands.--Tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

State lands.--Lands owned by States, or lands leased to these governmental units for 50 years or more.

## Private and Other

County and municipal lands.--Lands owned by counties and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Forest industry lands.--Lands owned by companies or by individuals operating wood-processing plants.

Farmer-owned lands.--Lands owned by farm operators. (These exclude lands leased by farm operators from such nonfarm owners as railroad companies and States.)

Miscellaneous Federal lands.--Federal lands other than the following: (1) National Forest lands; (2) lands administered by the Bureau of Land Management; and (3) Indian lands.

Miscellaneous private lands.--Privately owned lands other than forest industry and farmer-owned lands.

# Forest Type and Tree Species

Forest types.--A classification of forest land based upon the species forming a plurality of live-tree stocking.

Forest trees.--Woody plants having a well-developed stem and usually more than 12 feet in height at maturity.

Commercial species.--Tree species presently or prospectively suitable for industrial wood products.

Softwoods.--Coniferous trees, usually evergreen, having needles or scalelike leaves.

Hardwoods.--Dicotyledonous trees, usually broad-leaved and deciduous.

## Area Condition Classes

Stocking.--Stocking is an effort to express the extent to which growing space is effectively utilized by present or potential growing stock trees of commercial species. "Percent of stocking" is synonymous with "percentage of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Basal area is used as a basis for measuring stocking.

"Stocking percentages" express current area occupancy in relation to specified standards for full stocking based on number, size, and spacing of trees considered necessary to fully utilize the forest land.

Full utilization of the site is assumed to occur over a range of basal area. As an interim guide, 60 percent of the normal yield table values has been used to establish the lower limit of this range, which represents full-site occupancy. This is called 100-percent stocking. The upper limit of full stocking has been set at 132 percent. Sites with less than 100-percent stocking represent understocking with less than full-site occupancy. Overstocking is characterized by sites with over 133-percent stocking.

Class 10.--Areas fully stocked (100 to 132 percent) with desirable trees and not overstocked (133 percent or more).

Class 20.--Areas fully stocked with desirable trees, but overstocked with all live trees.

Class 30.--Areas medium to fully stocked (60 to 99 percent) with desirable trees and with less than 30 percent of the area controlled by other trees and/or inhibiting vegetation or surface conditions that will prevent occupancy by desirable trees.

Class 40.--Areas medium to fully stocked with desirable trees and with 30 percent or more of the area controlled by other trees and/or conditions that ordinarily prevent occupancy by desirable trees.

Class 50.--Areas poorly stocked (16.7 to 59 percent) with desirable trees, but fully stocked with growing stock trees.

Class 60.--Areas poorly stocked with desirable trees, but with medium to full stocking of growing stock trees.

Class 70.--Areas nonstocked (less than 16.7 percent) or poorly stocked with desirable trees, and poorly stocked with growing stock trees.

Class 80.--Low-risk old-growth stands.

Class 90.--High-risk old-growth stands.

Nonstocked.--Areas less than 16.7 percent stocked with growing stock trees.

## Class of Timber

Growing stock trees.--Live trees of commercial species qualifying as desirable or acceptable trees. (Excludes rough, rotten, and dead trees.)

Desirable trees.--Growing stock trees (1) having no serious defect in quality limiting present or prospective use for timber products; (2) of relatively high vigor; and (3) containing no pathogens that may result in death or serious deterioration before rotation age.

Acceptable trees.--Growing stock trees meeting specified standards of size and quality, but not qualifying as desirable trees.

Rough trees.--(1) Live trees that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and/or do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of roughness or poor form; and (2) all live trees of noncommercial species.

Rotten trees.--Live trees that do not contain at least one 12-foot saw log or two noncontiguous saw logs, each 8 feet long or longer, now or prospectively, and/or do not meet Rocky Mountain Regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume (cubic-foot basis) in a tree is rotten.

Salvable dead trees.--Standing or down dead trees that are considered merchantable by Rocky Mountain Regional standards.

Saw-log portion.--That part of the bole of sawtimber trees between the stump and the saw-log top. A 1-foot stump is used.

Upper-stem portion.--That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs, whichever occurs first.

## Tree Size Classes

Seedlings.--Live trees less than 1.0 inch in diameter at breast height.

Saplings.--Trees 1.0 to 4.9 inches in diameter at breast height.

Poletimber trees.--Trees at least 5.0 inches in d.b.h., but smaller than sawtimber size.

Sawtimber trees.--Trees exceeding poletimber size. In the Intermountain States, the minimum d.b.h. for softwood sawtimber is 9.0 inches and for hardwoods, 11.0 inches.

## Volume

Cull volume.--Portions of a tree's volume that are not usable for industrial wood products because of rot, form, or other defect.

Net volume.--Gross volume less deductions for cull.

Growing stock volume.--Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) outside bark. Net volume equals gross volume less deduction for rot and missing bole sections.

Sawtimber volume.--Net volume in board feet of sawtimber trees of commercial species. Net volume equals gross volume less deduction for rot, sweep, crook, and other defects that affect use for lumber.

## Growth and Mortality

Net annual growth.--The increase in net growing stock volume of a specified size class for a specific year. (Components of net annual growth include the increment in net volume of trees at the beginning of the specific year and surviving to its end, plus the net volume of trees reaching the size class during the year, minus the net volume of trees that died during the year, minus the net volume of trees that became rough or rotten trees during the year.)

Mortality.--Number or sound-wood volume of growing stock trees dying from natural causes during a specified period, usually annually.

## Site

Site class.--A classification of forest land in terms of inherent capacity to grow crops of industrial wood.

Site classifications are based upon the mean net annual growth of growing stock (not including thinnings or mortality loss) attainable at culmination of mean net annual growth over age. Height-age relationships are usually used as indicators of the specified volume-site class.

## Stand-Size Classes

Sawtimber stands.--Stands at least 16.7 percent stocked with growing stock trees, with half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.--Stands at least 16.7 percent stocked with growing stock trees in which half or more of this stocking is in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.--Stands at least 16.7 percent stocked with growing stock trees in which more than half of the stocking is saplings and/or seedlings.

Nonstocked land.--Commercial timberland less than 16.7 percent stocked with growing stock trees.



## FOREST SURVEY TABLES

Table 3.--Total land and water area in the Beartooth Working Circle  
by ownership class, 1977

Ownership class	Acres	Hectares
National Forest	510,195	206 470
Bureau of Land Management	208,456	84 359
National Park Service <sup>1</sup>	28,035	11 345
State	96,395	39 010
Private and other	1,627,511	658 633
<b>Total land area</b>	<b>2,470,592</b>	<b>999 817</b>
Census water	9,408	3 807
<b>Gross area<sup>2</sup></b>	<b>2,480,000</b>	<b>1 003 624</b>

<sup>1</sup>Not included with miscellaneous Federal ownership (a category of private and other) for purposes of clarity.

<sup>2</sup>U.S. Bureau of the Census, land and water area of the United States, 1970.

Table 4.--Total land area in the Beartooth Working Circle  
by major land class and ownership class, 1977

Land class	Ownership class					
	State		Private <sup>1</sup>		Total	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
Commercial timberland	6,812	2 757	60,826	24 615	67,638	27 372
Productive reserved	72	29	329	133	401	162
Other forest land:						
Unproductive reserved	--	--	--	--	--	--
Unproductive nonreserved	3,428	1 387	40,727	16 482	44,155	17 869
<b>Total forest land</b>	<b>10,312</b>	<b>4 173</b>	<b>101,882</b>	<b>41 230</b>	<b>112,194</b>	<b>45 403</b>
Nonforest land	86,083	34 837	1,525,629	617 403	1,611,712	652 240
<b>Total land area</b>	<b>96,395</b>	<b>39 010</b>	<b>1,627,511</b>	<b>658 633</b>	<b>1,723,906</b>	<b>697 643</b>

<sup>1</sup>On this and all following tables, the private ownership category includes a small portion of miscellaneous Federal, and county and municipal ownership.

Table 5.--Area of commercial timberland in the Beartooth Working Circle  
by forest type, stand-size class, and site class, 1977

Forest type and stand-size class	Site class				All classes
	120+	85-119	50-84	20-49	
----- Acres -----					
Douglas-fir:					
Sawtimber	--	--	--	7,386	7,386
Poletimber	--	--	--	2,569	2,569
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	--	--
Total	--	--	--	9,955	9,955
Ponderosa pine:					
Sawtimber	--	--	1,285	25,316	26,601
Poletimber	--	--	--	3,761	3,761
Sapling and seedling	--	--	--	6,772	6,772
Nonstocked	--	--	--	1,326	1,326
Total	--	--	1,285	37,175	38,460
Lodgepole pine:					
Sawtimber	--	--	--	1,732	1,732
Poletimber	--	--	--	--	--
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	--	--
Total	--	--	--	1,732	1,732
Limber pine:					
Sawtimber	--	--	--	--	--
Poletimber	--	--	--	--	--
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	1,150	1,150
Total	--	--	--	1,150	1,150
Aspen:					
Sawtimber	--	--	--	447	447
Poletimber	--	--	--	2,625	2,625
Sapling and seedling	--	--	--	2,125	2,125
Nonstocked	--	--	--	--	--
Total	--	--	--	5,197	5,197
Cottonwood:					
Sawtimber	--	--	--	6,812	6,812
Poletimber	--	--	--	1,680	1,680
Sapling and seedling	--	--	1,326	1,326	2,652
Nonstocked	--	--	--	--	--
Total	--	--	1,326	9,818	11,144
All types:					
Sawtimber	--	--	1,285	41,693	42,978
Poletimber	--	--	--	10,635	10,635
Sapling and seedling	--	--	1,326	10,223	11,549
Nonstocked	--	--	--	2,476	2,476
Total	--	--	2,611	65,027	67,638

Table 6.--Area of State-owned commercial timberland in the Beartooth Working Circle by forest type, stand-size class, and site class, 1977

Forest type and stand-size class	Site class				All classes
	120+	85-119	50-84	20-49	
----- Acres -----					
Douglas-fir:					
Sawtimber	--	--	--	652	652
Poletimber	--	--	--	326	326
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	--	--
Total	--	--	--	978	978
Ponderosa pine:					
Sawtimber	--	--	163	2,294	2,457
Poletimber	--	--	--	373	373
Sapling and seedling	--	--	--	456	456
Nonstocked	--	--	--	141	141
Total	--	--	163	3,264	3,427
Lodgepole pine:					
Sawtimber	--	--	--	282	282
Poletimber	--	--	--	--	--
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	--	--
Total	--	--	--	282	282
Limber pine:					
Sawtimber	--	--	--	--	--
Poletimber	--	--	--	--	--
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	69	69
Total	--	--	--	69	69
Aspen:					
Sawtimber	--	--	--	118	118
Poletimber	--	--	--	518	518
Sapling and seedling	--	--	--	247	247
Nonstocked	--	--	--	--	--
Total	--	--	--	883	883
Cottonwood:					
Sawtimber	--	--	--	724	724
Poletimber	--	--	--	168	168
Sapling and seedling	--	--	141	140	281
Nonstocked	--	--	--	--	--
Total	--	--	141	1,032	1,173
All types:					
Sawtimber	--	--	163	4,070	4,233
Poletimber	--	--	--	1,385	1,385
Sapling and seedling	--	--	141	843	984
Nonstocked	--	--	--	210	210
Total	--	--	304	6,508	6,812

Table 7.--Area of privately owned commercial timberland in the Beartooth Working Circle by forest type, stand-size class, and site class, 1977

Forest type and stand-size class	Site class				All classes
	120+	85-119	50-84	20-49	
----- Acres -----					
Douglas-fir:					
Sawtimber	--	--	--	6,734	6,734
Poletimber	--	--	--	2,243	2,243
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	--	--
Total	--	--	--	8,977	8,977
Ponderosa pine:					
Sawtimber	--	--	1,122	23,022	24,144
Poletimber	--	--	--	3,388	3,388
Sapling and seedling	--	--	--	6,316	6,316
Nonstocked	--	--	--	1,185	1,185
Total	--	--	1,122	33,911	35,033
Lodgepole pine:					
Sawtimber	--	--	--	1,450	1,450
Poletimber	--	--	--	--	--
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	--	--
Total	--	--	--	1,450	1,450
Limber pine:					
Sawtimber	--	--	--	--	--
Poletimber	--	--	--	--	--
Sapling and seedling	--	--	--	--	--
Nonstocked	--	--	--	1,081	1,081
Total	--	--	--	1,081	1,081
Aspen:					
Sawtimber	--	--	--	329	329
Poletimber	--	--	--	2,107	2,107
Sapling and seedling	--	--	--	1,878	1,878
Nonstocked	--	--	--	--	--
Total	--	--	--	4,314	4,314
Cottonwood:					
Sawtimber	--	--	--	6,088	6,088
Poletimber	--	--	--	1,512	1,512
Sapling and seedling	--	--	1,185	1,186	2,371
Nonstocked	--	--	--	--	--
Total	--	--	1,185	8,786	9,971
All types:					
Sawtimber	--	--	1,122	37,623	38,745
Poletimber	--	--	--	9,250	9,250
Sapling and seedling	--	--	1,185	9,380	10,565
Nonstocked	--	--	--	2,266	2,266
Total	--	--	2,307	58,519	60,826

Table 8.--Area of commercial timberland in the Beartooth Working Circle  
by stand volume and ownership class, 1977

Stand volume per acre <sup>1</sup>	Ownership class		
	State	Private	State and private
	Acres		
Less than 1,500 board feet	2,135	18,589	20,724
1,500 to 4,999 board feet	3,339	29,026	32,365
5,000 to 9,999 board feet	1,091	11,333	12,424
10,000 board feet or more	247	1,878	2,125
All classes	6,812	60,826	67,638

<sup>1</sup>International 1/4-inch rule.

Table 9.--Area of commercial timberland in the Beartooth Working Circle  
by forest type and area condition class, 1977

Forest type	Area condition class										Nonstocked	All classes	Hectares
	10	20	30	40	50	60	70	80	90				
	Acres												
Douglas-fir	--	--	--	--	1,284	3,937	1,285	--	--	3,449	--	9,955	4 029
Ponderosa pine	--	--	--	2,434	6,060	5,624	16,645	--	--	6,371	1,326	38,460	15 564
Lodgepole pine	--	--	--	--	1,732	--	--	--	--	--	--	1,732	701
Limber pine	--	--	--	--	--	--	--	--	--	--	1,150	1,150	465
Aspen	--	--	--	--	4,303	894	--	--	--	--	--	5,197	2 103
Cottonwood	--	--	--	--	3,493	5,971	1,680	--	--	--	--	11,144	4 510
All types	--	--	2,434	16,872	16,426	19,610	--	--	9,820	2,476	--	67,638	27 372

Table 10.--Area of productive reserved and other forest land in the Beartooth Working Circle by land class, ownership class, and forest type, 1977

Land class	Forest type										All types
	Ponderosa: pine	Lodgepole: pine	Limber: pine	Juniper	Other: softwoods	Total: softwoods	Aspen	Cottonwood: hardwoods	Other: hardwoods	Total: hardwoods	
Productive reserved area:											
State	--	--	--	72	--	72	--	--	--	--	72
Private	--	--	--	329	--	329	--	--	--	--	329
Other forest land area:											
Unproductive nonreserved:											
State	768	326	138	414	676	2,322	751	163	192	1,106	3,428
Private	8,960	2,243	2,161	7,822	9,171	30,757	4,309	1,122	4,939	10,370	40,727
Unproductive reserved:											
State	--	--	--	--	--	--	--	--	--	--	--
Private	--	--	--	--	--	--	--	--	--	--	--
All areas:											
State	768	326	138	486	676	2,394	751	163	192	1,106	3,500
Private	8,960	2,243	2,161	8,151	9,171	30,686	4,309	1,122	4,939	10,370	41,056
Total acres	9,728	2,569	2,299	8,637	9,847	33,080	5,060	1,285	5,131	11,476	44,556
Total hectares	3 937	1 040	930	3 495	3 985	13 387	2 048	520	2 076	4 644	18 031

Table 11.--Number of growing stock trees on commercial timberland in the Beartooth Working Circle by species and diameter class, 1977

Species	Diameter class (inches at breast height)																All classes
	1.0- 2.9	3.0- 4.9	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+ :		
Douglas-fir	425	884	851	795	279	199	51	46	14	7	8	5	4	1	1	3,570	
Ponderosa pine	2,169	1,262	1,024	774	734	364	270	122	50	35	29	6	7	2	3	6,851	
Lodgepole pine	27	67	49	41	66	39	25	8	--	--	--	--	--	--	--	322	
Limber pine	87	69	59	25	34	22	12	3	3	--	--	--	--	--	--	314	
Subalpine fir	92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	92	
Engelmann spruce	40	--	--	14	--	8	--	--	--	--	--	--	--	1	--	63	
Juniper	2,956	583	231	46	21	6	--	--	--	--	--	--	--	--	--	3,847	
Total softwoods	5,796	2,865	2,214	1,695	1,134	638	358	183	67	42	37	11	11	4	4	15,059	
Aspen	1,925	703	471	348	185	40	12	--	--	--	--	--	--	--	--	3,684	
Cottonwood	395	381	146	91	71	85	68	106	82	35	24	9	7	3	4	1,507	
Total hardwoods	2,320	1,084	617	439	256	125	80	106	82	35	24	9	7	3	4	5,191	
All species	8,116	3,949	2,831	2,134	1,390	763	438	289	149	77	61	20	18	7	8	20,250	

Table 12.--Number of cull and salvable dead trees on commercial timberland in the Beartooth Working Circle by ownership class, and softwoods and hardwoods, 1977

Ownership class and species group	Cull trees		Salvable dead trees
	Sound	Rotten	
----- Thousand trees -----			
State:			
Softwoods	151	( <sup>1</sup> )	151
Hardwoods	23	( <sup>1</sup> )	23
Total	174	( <sup>1</sup> )	174
Private:			
Softwoods	1,384	1	1,385
Hardwoods	137	1	138
Total	1,521	2	1,523
State and private:			
Softwoods	1,535	1	1,536
Hardwoods	160	1	161
Total	1,695	2	1,697

<sup>1</sup>Less than 0.5 thousand trees.

Table 13.--Net volume of growing stock on commercial timberland in the Beartooth Working Circle by ownership class, forest type, and stand-size class, 1977

Ownership class:	Forest type	Stand-size class				All classes	Thousand cubic meters
		Sawtimber	Poletimber	Sapling/seedling	Nonstocked		
State:							
	Douglas-fir	875	645	--	--	1,520	43
	Ponderosa pine	2,298	245	143	25	2,711	77
	Lodgepole pine	279	--	--	--	279	8
	Limber pine	--	--	--	9	9	( <sup>1</sup> )
	Aspen	120	561	224	--	905	26
	Cottonwood	1,112	122	321	--	1,555	44
	All types	4,684	1,573	688	34	6,979	198
Private:							
	Douglas-fir	9,406	4,434	--	--	13,840	392
	Ponderosa pine	22,260	1,762	1,935	214	26,171	741
	Lodgepole pine	1,449	--	--	--	1,449	41
	Limber pine	--	--	--	139	139	4
	Aspen	334	2,546	1,654	--	4,534	128
	Cottonwood	9,496	1,102	2,704	--	13,302	377
	All types	42,945	9,844	6,293	353	59,435	1 683
State and private:							
	Douglas-fir	10,281	5,079	--	--	15,360	435
	Ponderosa pine	24,558	2,007	2,078	239	28,882	818
	Lodgepole pine	1,728	--	--	--	1,728	49
	Limber pine	--	--	--	148	148	4
	Aspen	454	3,107	1,878	--	5,439	154
	Cottonwood	10,608	1,224	3,025	--	14,857	421
	All types	47,629	11,417	6,981	387	66,414	1 881

<sup>1</sup>Less than 0.5 thousand cubic meters.



Table 14.--Net volume of sawtimber on commercial timberland in the Beartooth Working Circle by ownership class, forest type, and stand-size class, 1977

Ownership class:	Forest type	Stand-size class			All classes
		Sawtimber	Poletimber	Sapling/seedling: Nonstocked	
State:					
				Thousand board feet <sup>1</sup>	
	Douglas-fir	2,953	790	--	3,743
	Ponderosa pine	8,428	576	109	9,510
	Lodgepole pine	1,155	--	--	1,155
	Limber pine	--	--	26	26
	Aspen	530	178	--	882
	Cottonwood	4,989	229	--	6,481
	All types	18,055	1,773	135	21,797
Private:					
	Douglas-fir	32,616	5,437	--	38,053
	Ponderosa pine	81,872	4,226	924	92,856
	Lodgepole pine	6,145	--	--	6,145
	Limber pine	--	--	403	403
	Aspen	1,472	493	--	3,337
	Cottonwood	42,507	2,062	--	55,208
	All types	164,612	12,218	1,327	196,002
State and private:					
	Douglas-fir	35,569	6,227	--	41,796
	Ponderosa pine	90,300	4,802	1,053	102,366
	Lodgepole pine	7,300	--	--	7,300
	Limber pine	--	--	429	429
	Aspen	2,002	671	--	4,219
	Cottonwood	47,496	2,291	--	61,689
	All types	182,667	13,991	1,462	217,799

<sup>1</sup>International 1/4-inch rule.

Table 15.--Net volume of growing stock on commercial timberland in the Beartooth Working Circle by species and diameter class, 1977

Species	Diameter class (inches at breast height)												
	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+ All classes
	----- Thousand cubic feet -----												
Douglas-fir	2,530	3,817	2,244	2,401	892	1,098	416	215	304	226	258	78	107
Ponderosa pine	1,818	3,201	5,275	4,477	4,496	2,953	1,704	1,440	1,577	381	529	202	405
Lodgepole pine	201	274	682	609	476	207	--	--	--	--	--	--	--
Limber pine	182	121	266	267	217	64	77	--	--	--	--	--	--
Engelmann spruce	--	54	--	107	--	--	--	--	--	--	114	--	275
Juniper	73	83	21	16	--	26	--	--	--	--	--	--	219
Total softwoods	4,604	7,550	8,488	7,877	6,081	4,328	2,197	1,655	1,881	607	787	394	512
Aspen	1,520	2,024	1,611	529	206	--	--	--	--	--	--	--	--
Cottonwood	357	491	735	1,301	1,459	2,640	2,636	1,333	1,181	557	459	221	393
Total hardwoods	1,677	2,515	2,346	1,830	1,665	2,640	2,636	1,333	1,181	557	459	221	393
All species	6,281	10,065	10,834	9,707	7,746	6,968	4,833	2,988	3,062	1,164	1,246	615	905

Table 16.--Net volume of sawtimber on commercial timberland in the Beartooth Working Circle by species and diameter class, 1977

Species	Diameter class (inches at breast height)											
	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 22.9	23.0- 24.9	25.0- 26.9	27.0- 28.9	29.0+ All classes	
	----- Thousand board feet, International 1/4-inch rule -----											
Douglas-fir	7,519	10,721	4,417	5,744	2,234	1,161	1,678	1,251	1,449	440	629	37,243
Ponderosa pine	13,434	17,800	21,499	15,297	9,195	7,899	8,523	2,092	2,840	1,069	2,025	101,673
Lodgepole pine	3,172	3,500	2,700	1,145	--	--	--	--	--	--	--	10,517
Limber pine	974	1,519	1,226	349	419	--	--	--	--	--	--	4,487
Engelmann spruce	--	579	--	--	--	--	--	--	--	624	--	1,203
Juniper	63	49	--	74	--	--	--	--	--	--	--	186
Total softwoods	25,162	34,168	29,842	22,609	11,848	9,060	10,201	3,343	4,289	2,133	2,654	155,309
Aspen	XXXXX	2,689	1,054	--	--	--	--	--	--	--	--	3,743
Cottonwood	XXXXX	6,670	7,384	13,070	12,677	6,217	5,365	2,502	2,067	997	1,798	58,747
Total hardwoods	XXXXX	9,359	8,438	13,070	12,677	6,217	5,365	2,502	2,067	997	1,798	62,490
All species	25,162	43,527	38,280	35,679	24,525	15,277	15,566	5,845	6,356	3,130	4,452	217,799

Table 17.--Net volume of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by ownership class and species, 1977

Ownership class	Species										
	Douglas-fir : pine	Ponderosa : pine	Lodgepole : pine	Lamber pine	Engelmann : spruce	Juniper	Total : softwoods	Aspen	Cottonwood	Total : hardwoods	All species
GROWING STOCK											
Thousand cubic feet											
State	1,461	2,682	434	71	29	22	4,699	837	1,443	2,280	6,979
Private	12,925	25,756	2,015	1,123	246	197	42,262	4,853	12,320	17,173	59,435
Total	14,386	28,438	2,449	1,194	275	219	46,961	5,690	13,763	19,453	66,414
GROWING STOCK											
Thousand cubic meters											
State	42	76	12	2	1	1	134	23	41	64	198
Private	366	729	57	32	7	5	1,196	138	349	487	1,683
Total	408	805	69	34	8	6	1,330	161	390	551	1,881
SAWTIMBER											
Thousand board feet, International 1/4-inch rule											
State	3,445	9,484	1,802	270	127	20	15,148	469	6,180	6,649	21,797
Private	33,798	92,189	8,715	4,217	1,076	166	140,161	3,274	52,567	55,841	196,002
Total	37,243	101,673	10,517	4,487	1,203	186	155,309	3,743	58,747	62,490	217,799

Table 18.--Net volume of timber on commercial timberland in the Beartooth Working Circle by class of timber, and softwoods and hardwoods, 1977

Class of timber	Softwoods		Hardwoods		All classes	
	Thousand cubic feet					
Sawtimber trees:						
Saw log portion	29,834	10,023	39,857			
Upper-stem portion	4,973	2,892	7,865			
Total	34,807	12,915	47,722			
Poletimber trees	12,154	6,538	18,692			
All growing stock trees	46,961	19,453	66,414			
Sound cull trees	386	246	632			
Rotten cull trees	30	30	60			
Salvable dead trees	1,614	596	2,210			
All timber	48,991	20,325	69,316			

Table 19.--Net volume of growing stock on commercial timberland in the Beartooth Working Circle by forest type and species, 1977

Forest type	Species										All species
	Douglas-fir : pine	Ponderosa : pine	Lodgepole : pine	Limber pine	Engelmann : spruce	Juniper	Total : softwoods	Aspen	Cottonwood	Total : hardwoods	
	----- Thousand cubic feet -----										
Douglas-fir	14,269	63	83	945	--	--	15,360	--	--	--	15,360
Ponderosa pine	94	28,375	93	101	--	219	28,882	--	--	--	28,882
Lodgepole pine	23	--	1,705	--	--	--	1,728	--	--	--	1,728
Limber pine	--	--	--	148	--	--	148	--	--	--	148
Aspen	--	--	568	--	--	--	568	4,815	56	4,871	5,439
Cottonwood	--	--	--	--	275	--	275	875	13,707	14,582	14,857
All types	14,386	28,438	2,449	1,194	275	219	46,961	5,690	13,763	19,453	66,414

Table 20.--Net volume of sawtimber on commercial timberland in the Beartooth Working Circle by forest type and species, 1977

Forest type	Species										All species
	Douglas-fir : pine	Ponderosa : pine	Lodgepole : pine	Limber pine	Engelmann : spruce	Juniper	Total : softwoods	Aspen	Cottonwood	Total : hardwoods	
	----- Thousand cubic meters -----										
All types	408	805	69	34	8	6	1,330	161	390	551	1,881

Forest type	Species										All species
	Douglas-fir : pine	Ponderosa : pine	Lodgepole : pine	Limber pine	Engelmann : spruce	Juniper	Total : softwoods	Aspen	Cottonwood	Total : hardwoods	
	----- Thousand board feet, International 1/4-inch rule -----										
Douglas-fir	36,952	313	473	4,058	--	--	41,796	--	--	--	41,796
Ponderosa pine	291	101,360	529	--	--	186	102,366	--	--	--	102,366
Lodgepole pine	--	--	7,300	--	--	--	7,300	--	--	--	7,300
Limber pine	--	--	--	429	--	--	429	--	--	--	429
Aspen	--	--	2,215	--	--	--	2,215	1,721	283	2,004	4,219
Cottonwood	--	--	--	--	1,203	--	1,203	2,022	58,464	60,486	61,689
All types	37,243	101,673	10,517	4,487	1,203	186	155,309	3,743	58,747	62,490	217,799

Table 21.--Net annual growth of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by ownership class and species, 1977

Ownership class	Species										All species
	Douglas-fir : pine	Ponderosa : pine	Lodgepole : pine	Limber pine	Engelmann : spruce	Total : softwoods	Aspen	Cottonwood	Total : hardwoods	Total	
	GROWING STOCK										
	Cubic feet										
State	22,960	44,062	1,073	-721	661	68,035	44,144	28,966	73,110	141,145	
Private	208,825	458,988	6,508	-10,857	5,569	669,033	275,254	249,192	524,446	1,193,479	
Total	231,785	503,050	7,581	-11,578	6,230	737,068	319,398	278,158	597,556	1,334,624	
	GROWING STOCK										
	Cubic meters										
State	650	1 248	30	-21	19	1 926	1 250	820	2 070	3 996	
Private	5 913	12 997	185	-307	157	18 945	7 794	7 057	14 851	33 796	
Total	6 563	14 245	215	-328	176	20 871	9 044	7 877	16 921	37 792	
	SAWTIMBER										
	Board feet, International 1/4-inch rule										
State	91,686	329,118	31,650	-6,782	3,396	449,068	17,337	116,013	133,350	582,418	
Private	816,037	3,220,673	245,799	-106,094	28,609	4,205,024	126,970	999,349	1,126,319	5,331,343	
Total	907,723	3,549,791	277,449	-112,876	32,005	4,654,092	144,307	1,115,362	1,259,669	5,913,761	

Table 22.--Annual mortality of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by ownership class, and softwoods and hardwoods, 1977

Species group and ownership class	Growing stock		Sawtimber	
	Cubic feet	Cubic meters	Board feet <sup>1</sup>	Board feet <sup>1</sup>
Softwoods:				
State	30,557	865	88,425	
Private	250,364	7 090	725,019	
Total	280,921	7 955	813,444	
Hardwoods:				
State	5,804	164	15,106	
Private	47,536	1 346	136,049	
Total	53,340	1 510	151,155	

<sup>1</sup>International 1/4-inch rule.

Table 23.---Annual mortality of growing stock and sawtimber on commercial timberland in the Beartooth Working Circle by cause of death and species, 1977

Cause of Death	Species									
	Douglas-fir	Ponderosa pine	Lodgepole pine	Limber pine	Total softwoods	Aspen	Cottonwood	Total hardwoods	All species	
Fire	--	27,228	--	--	27,228	--	--	--	--	27,228
Animal	--	27,267	--	--	27,267	8,639	--	8,639	--	35,906
Weather	51,905	110,062	31,276	25,791	219,034	--	19,487	19,487	--	238,521
Unknown	--	--	7,392	--	7,392	2,871	22,343	25,214	--	32,606
Total	51,905	164,557	38,668	25,791	280,921	11,510	41,830	53,340	--	334,261
GROWING STOCK										
Cubic feet										
GROWING STOCK										
Cubic meters										
Fire	--	771	--	--	771	--	--	--	--	771
Animal	--	772	--	--	772	245	--	245	--	1 017
Weather	1 470	3 117	886	730	6 203	--	551	551	--	6 754
Unknown	--	--	209	--	209	81	633	714	--	923
Total	1 470	4 660	1 095	730	7 955	326	1 184	1 510	--	9 465
SAWTIMBER										
Board feet, International 1/4-inch rule										
Fire	--	152,040	--	--	152,040	--	--	--	--	152,040
Animal	--	40,645	--	--	40,645	--	--	--	--	40,645
Weather	143,949	110,459	177,882	146,054	578,344	--	97,766	97,766	--	676,110
Unknown	--	--	42,415	--	42,415	--	53,389	53,389	--	95,804
Total	143,949	303,144	220,297	146,054	813,444	--	151,155	151,155	--	964,599

Felt, Dorothy G.

1980. Forest area and timber resource statistics for the Beartooth Working Circle, Montana, 1977. USDA For. Serv. Resour. Bull. INT-24, 22 p. Intermt. For. and Range Exp. Stn., Ogden, Utah 84401.

This bulletin presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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KEYWORDS: Forest surveys (regional), forest area classification, stand volume.

Felt, Dorothy G.

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This bulletin presents land area, commercial timberland area, timber inventory, and growth and mortality data based on Resources Evaluation standards.

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The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

The Intermountain Station includes the States of Montana, Idaho, Utah, Nevada, and western Wyoming. About 231 million acres, or 85 percent, of the land area in the Station territory are classified as forest and rangeland. These lands include grasslands, deserts, shrublands, alpine areas, and well-stocked forests. They supply fiber for forest industries; minerals for energy and industrial development; and water for domestic and industrial consumption. They also provide recreation opportunities for millions of visitors each year.

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