BAGBY RESEARCH NATURAL AREA

Supplement No. 2[1]

William H. Moir, Chris Maser, and Jerry F. Franklin[2]

The Research Natural Area described in this supplement is administered by the Forest Service. Forest Service Research Natural Areas are located within Ranger Districts which are themselves administrative subdivisions of National Forests. Normal management and protective activities are the responsibility of District Rangers and Forest Supervisors. However, scientific and educational uses made of these tracts are a responsibility of the research branch of the Forest Service. Therefore, a scientist interested in using one of these tracts in Oregon or Washington should contact the Director of the Pacific Northwest Forest and Range Experiment Station (P.O. Box 3141, Portland, Oregon 97208) and outline the activity he plans. If extensive use of one or more Forest Service Research Natural Area is planned, a cooperative agreement between the scientist and the Forest Service may be necessary. The Forest Supervisor and District Ranger administering the affected Research Natural Area will be informed of mutually agreed upon activities by the Experiment Station Director. However, a scientist should still visit the administering ranger station when beginning his studies and explain the nature, purpose, and duration of his activities. Permission for brief visits to Research Natural Areas for observational purposes can be obtained from the District Ranger.

The Research Natural Area described within is a part of a Federal system of such tracts established for research and educational purposes. They are sites where natural features are preserved for scientific purposes and natural processes are allowed to dominate. Their main purposes are to provide:

1. Baseline areas against which effects of human activities can be measured;
2. Sites for study of natural processes in undisturbed ecosystems; and
3. Gene pool preserves for all types of organisms, especially rare and endangered types.

The total Federal system is outlined in "A Directory of the Research Natural Areas on Federal Lands of the United States of America. '" Of the 48 established Research Natural Areas in Oregon and Washington, 45 are described in "Federal Research Natural Areas in Oregon and Washington: A Guidebook for Scientists and Educators,'" vvith details on

[1] Supplement No.2 to "Federal Research Natural Areas in Oregon and Washington: A guidebook for scientists and educators," by Jerry F. Franklin, Frederick C. Hall, C. T. Dyrness, and Chris Maser (USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, 498 p., illus., 1972). The guide.book is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $3.50; stock number 0101.0225.

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[3] Federal Committee on Research Natural Areas. A directory of Research Natural Areas on Federal lands of the United States of America. Washington, D.C., Superintendent of Documents, 129 p., 1968.

" See footnote 1.

management and use of such tracts; this is the second supplement to that guidebook.

The guiding principle in management of Research Natural Areas is to prevent unnatural encroachments, activities which directly or indirectly modify ecological processes on the tracts. Logging and uncontrolled grazing are not allowed, for example, nor is public use which threatens significant impairment of scientific or educational values. Management practices necessary for maintenance of the ecosystem may be allowed.

Federal Research Natural Areas provide a uniquely valuable system of publicly owned and protected examples of undisturbed ecosystems which are available to the scientist. He can conduct his research with minimal interference and reasonable assurance that investments in long-term studies will not be lost to logging, land development, or similar activities. In return, the scientist wishing to use a Research Natural Area has the following obligations. He must:

1. Obtain permission from the appropriate administering agency before using the area;
2. Abide by the administering agency's regulations governing the use of the natural area including specific limitations on the type of research, sampling methods, etc., allowed; and
3. Inform the administering agency on the progress of the research, published results, and disposition of collected materials.

The purposes of these limitations are simpleto insure that the scientific and educational values on the tract are not impaired, to accumulate a documented body of knowledge about the tract, and to avoid conflict between new and old studies. Research on Research Natural Areas must be essentially nondestructive in character; destructive analysis of vegetation is generally not allowed nor are studies requiring extensive forest floor modification or extensive soil excavation. Collection of plant and animal specimens should be restricted to the minimum necessary for provision of voucher specimens and other research needs, but under no circumstances should collecting significantly reduce the population levels of a species. Collecting must also be carried out in accordance with State and Federal agency regulations. A scientist wishing to use a Research Natural Area within these broad guidelines must contact the administering agency' regarding the proposed use and obtain the necessary permission. Each agency differs slightly in its requirements.

[5] There are five agencies cooperating in this program in the Pacific Northwest: Forest Service in the U.S. Department of Agriculture; Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, and the National Park Service in the U.S. Department of Interior; and the Atomic Energy Commission.

BAGBY RESEARCH NATURAL AREA

Mature (250-year-old) Douglas-fir-western hemlock stands at middle elevations on eastand west-facing mountain slopes and benches in the northern Oregon Cascade Range.

Bagby Research Natural Area was established in January 1970 to provide examples of typical commercial forest types on lower slopes of the western Cascades. The stands are dominated by mixtures of 250-year-old Douglas-fir *(PseudotsugcL menz1:esii)* and western hemlock *(Tsuga heterophylla),* with lesser amounts of western redcedar *(Thuja pliwta).* The natural area is located in Clackamas County, Oregon, within the Estacada Ranger District (Estacada, Oregon) of the Mount Hood National Forest. It includes portions of both the east and west slopes of the Hot Springs Fork of the Collawash River and lies within sections 22, 23, 26, and 27, T. 7 S., R. 5 E., Willamette meridian. The boundaries generally follow physiographic features, i.e., main and secondary ridges (fig. BA-l) .

Access and Accommodations

Estacada, a small town 25 miles southeast of Portland, Oregon, provides the nearest public facilities. To reach the natural area, proceed up the Clackamas River for 49 km. (30.4 miles) along State Highway 224 and Forest Highway S-46. Turn right on S-63 and continue 6 km. (3.5 miles) to Forest Highway S-70. The trail head for Trail #544 is located 10 km. (6.3 miles) up the Hot Springs Fork of the Collawash River along Highway S-70 at N ohorn. This trail provides access to the streamside zone separating the two halves of the natural area. The U.S. Forest Service maintains several campgrounds along the Hot Springs Fork near the trail head. Bagby Hot Springs is located 2.5 km. (1.6 miles) south on the trail. Two abandoned trails climb from the Hot Springs into the southeastern and southwestern parts of the natural area. The Hot Springs area is for day use only with no overnight camping.

Environment

Bagby Research Natural Area is in a temperate, humid region with marked seasonal precipitation and temperature changes. There are no meteorological measurements within the natural area. The nearest weather station (Estacada 24 SE is about 20 km. (13 miles) to the northeast at 45° 05' N. latitude, 121 ° 59' W. longitude) probably does not reflect the climate at Bagby because of the highly variable effects of mountain topography upon local patterns of precipitation, temperature, and evaporation. Therefore, we must rely on regional data from averaged summaries for the Northern Cascades Meteorological Division of Oregon (U.S. Weather Bureau 1972).

The general precipitation pattern in the northern Oregon Cascade Range shows about 77 percent of the annual total occurring as both rain and snow from October through March (fig. BA-2). Recording stations in this region average a total of 1,740 mm. (69 inches) precipitation, with a very marked dry period in July and August when only 35 mm. (1.4 inches) of rainfall occurs (fig. BA-2).

January is the coldest month (0.8° C. *or* 33.5° F. average); both July and August are the warmest (respectively, 17.9° and 17.5° C. or 64° F. average). Under the Thornthwaite climatic classification system, Bagby Research Natural Area would probably fall within the B!B!'sa' type: a humid, cool mesothermal climate (Carter and Mather 1966). Although there is more than ample soil water recharge during cool months, it is likely that poor forest productivity on many sites (discussed below) can be partially attributed to water stresses on shallow soils during summer months.

The research area is located in the western Cascades, a subdivision of'the Cascade Range, consisting of deformed and partially altered flows and pyroclastic rocks of late Eocene to late Miocene age. According to Peck et al.

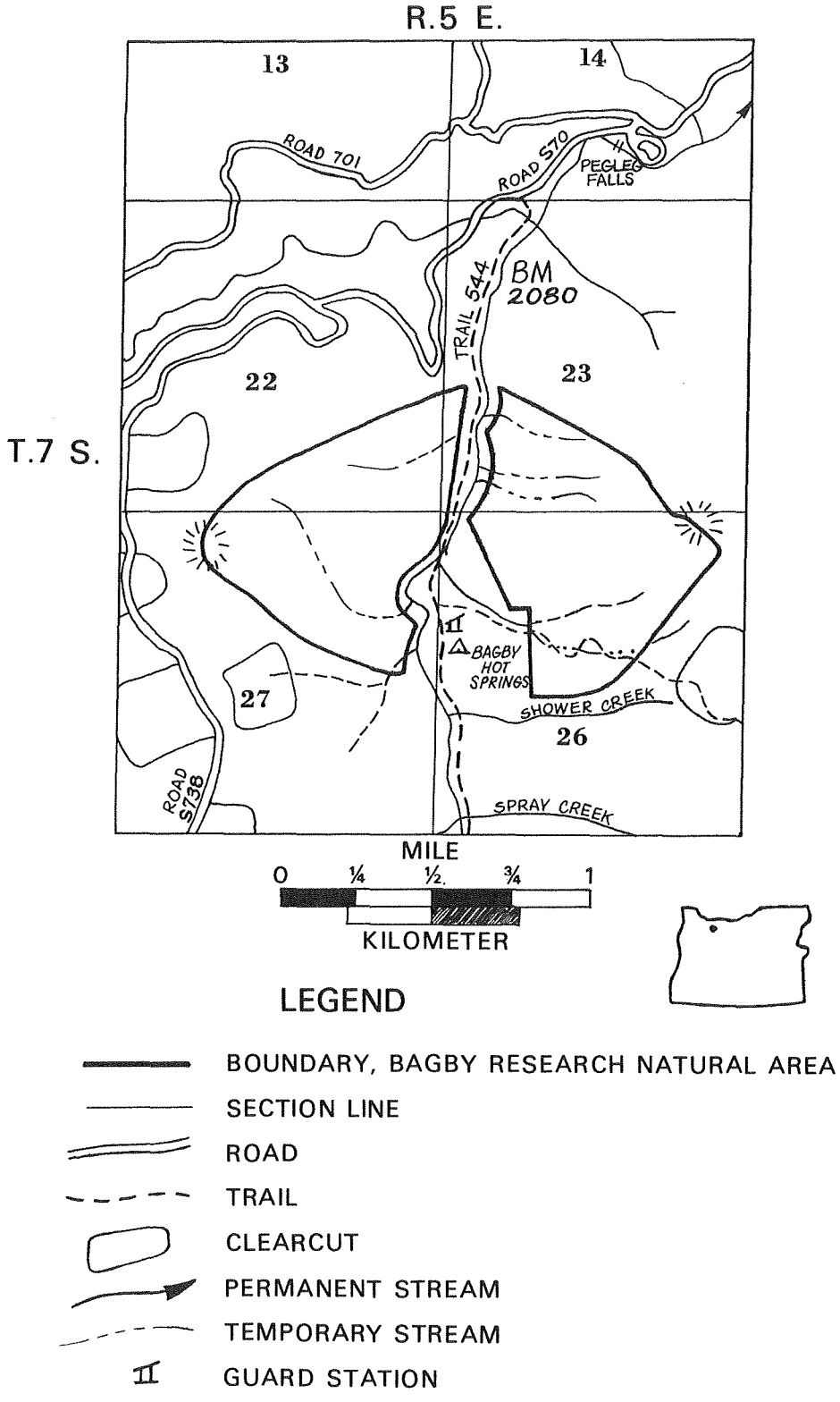

Figure BA-1.—Bagby Research Natural Area.

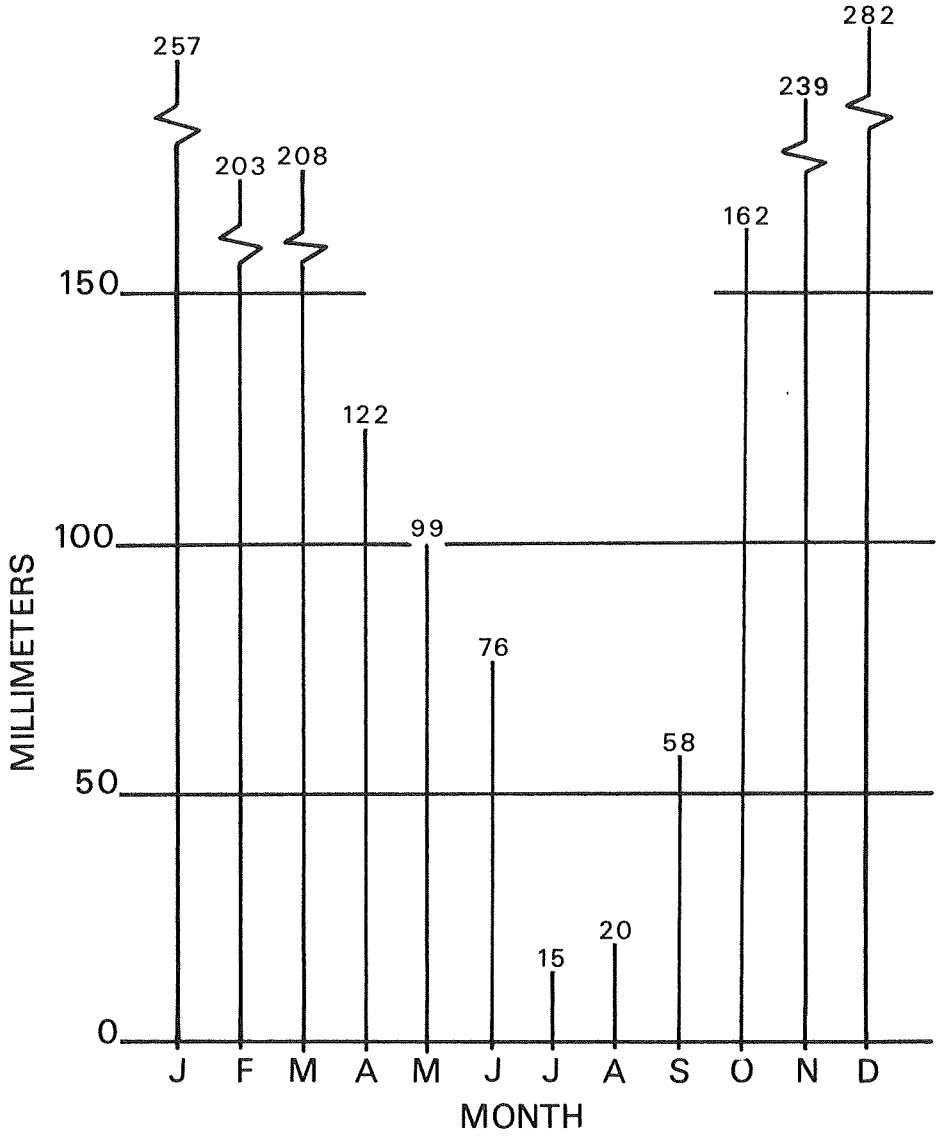

Figure BA-2.—Mean monthly precipitation averaged from various weather stations in the northern Cascades, Oregon (data from U.S. Weather Bureau 1972).

(1964), bedded rocks of the Sardine Formation (pyroxene andesite and less abundant basalt and dacite) occur in the natural area. These rocks are more silicic in composition than other western Cascade magmas and were probably erupted from a separate belt of vents during middle to late Miocene. The Clackamas drainage basin, in which Bagby is situated, exhibits abundant pyroclastic rocks, especially massive tuff-breccia, presumably deposited as mud- or ash-flows and landslide materials (Peck et al. 1964, p. 33).

The Bagby Research Natural Area is divided into eastern and western portions by the Hot Springs Fork of the Collawash River (fig. BA-l). Although structural features have been determined by the nature and depth of volcanic deposits, subsequent stream carving, flood deposits, and landslide events have shaped the present landscape. Elevation ranges from 670 to 1,180 m. (2,200 to 3,850 feet). Moderate to steep side slopes alternate with series of gentle benches throughout the natural area. High ridges are found along both the east and west boundaries. There is no evidence that glaciers occurred at these moderate elevations. However, floods from glacial outwash torrents originating in the Mount Hood area may have periodically caused massive damming of small tributaries by outwash sediments. Shallow lakes at margins of these flood terraces may have contributed to soil slumping and the creation of the series of benches found on the slopes. There is evidence that similar series of floods and landslides took place as recently as 1,000 years ago in the Bull Run-Sandy area.' The benches could also be purely local in origin. A small landslide occurred in the natural area during the very wet winter of 1964. Similar slumping of unstable, saturated soils may have caused at least some of the benchy topography in the natural area.

Soils of the area have not been studied, although some soil mapping has been carried out in the general region. A reconnaissance soil survey of nearby National Forest lands is referred to by Thomas et al. (1969) but is apparently unpublished. The general soil map of parts of Clackamas County, published by the USDA Soil Conservation Service (1970), does not encompass Bagby but includes mapping units within 6 km. (4 miles) west of the natural area. These mapping units feature soils derived from andesite bedrock and are described merely as well-drained soils of gentle to very steep slopes with a gravelly or cobbly loam surface layer, cobbly loam or loam subsoil, and a depth of 0.5 to 1.5 m. (20 to 60 inches) to hard rock. Stephens (see footnote 1) describes various soil series to the north of the Bagby Research Natural Area. He found no ash deposits; evidently, recent ash materials became incorporated with glacial and alluvial deposits, at least on lower elevation landforms. His Oneota, Dinger, or Enola Series, with a very thin, intermittent A2 horizon may occur in the natural area.

Biota

The entire 227-ha. (560-acre) Research Natural Area can be assigned to SAF forest covel' type 230, Douglas-Fir-Western Hemlock (Society of American Foresters 1954). Th.e area is assignable to KUchler's (1964) Type 2, Cedar-Hemlock-Douglas Fir Forest. It is located in the upper part of western Oregon's *Tsuga heterophylla* Zone (Franklin and Dyrness 1969).

The most extensive community type, which is located in both the east and west parts of the natural area and comprises about 65 to 70 percent of the acreage, is composed of 250year-old stands of the *Tsuga heterolJhylln/ Rhododendron mac/'ophyllum-G(wltheria shallon* association (fig. BA-3).2 This vegetation is found on smooth or uneven side slopes and benches and on a variety of exposures and soils. Douglas-fir and western hemlock are codominant over most of the area, but western redcedar may contribute up to 10 to 15 percent of the overstory canopy coverage at some sites. Widely scattered western white pine *(Pinus l1wnticola)* and, rarely, large sugar pine *(P.*

, F. R. Stephens. Soil survey of the Bull RunSandy area, Mount Hood National Forest. Mimeogr. review draft on file at USDA Forest Service Forestry Sciences Laboratory, Corvallis, Oregon, 487 p. [n.d.]

2 C. T. Dyrness, Jerry F. Franklin, and W. H. Moil'. Forest communities of the central portion of the western Cascades in Oregon. 1972. Unpublished manuscript on file at USDA Forest Service Forestry Sciences Laboratory, Corvallis, Oregon.

Figure BA-3.—Typical mixed stand of 200- to 250-year-old Douglas-fir and western hemlock, with understory dominated by salal (*Gaultheria shallon*).

lamberticLna) are also found. Snags and broken-topped trees are common and contribute significantly to standing biomass in some locales. Tree reproduction is often limited to western hemlock; occasionally the hemlock is mixed with lesser amounts of western redcedar or, very rarely, grand fir *(Abies grandis). Rhododendron maerophyllum* is the most conspicuous understory dominant (fig. BA-4), forming as much as 75-percent cover on some sites (table BA-l). *Gaultheria shallon* ranges from 100-percent cover on drier sites to only a trace on wetter areas such as benches (plot W5 of table BA-l). Other common species include *Linnaea borecLlis, Vaeeinium pa1'vifolium, Chimaphila umbellata,* C. *menziesii, Berberis nervosa,* and *Listera eM'data.* The understory vegetation in the *Tsuga/Rhododendron-Gaultheria* association is not diverse, for only 11 to 21 vascular plant species are found in any particular plot, and fewer than five species have cover values exceeding about 3 percent (table BA-l). A moss layer is often welldeveloped, with total coverage of 80 percent or more. Abundant windthrow is also a characteristic of the forest floor in many areas. Unlike related vegetation in the central portion of the western Cascade Range, tree productivity here is quite low; the height of mature Douglas-fir in plot W3 (table BA-l) and elsewhere in this association scarcely exceeds about 30 m. (100 feet; see footnote 2).

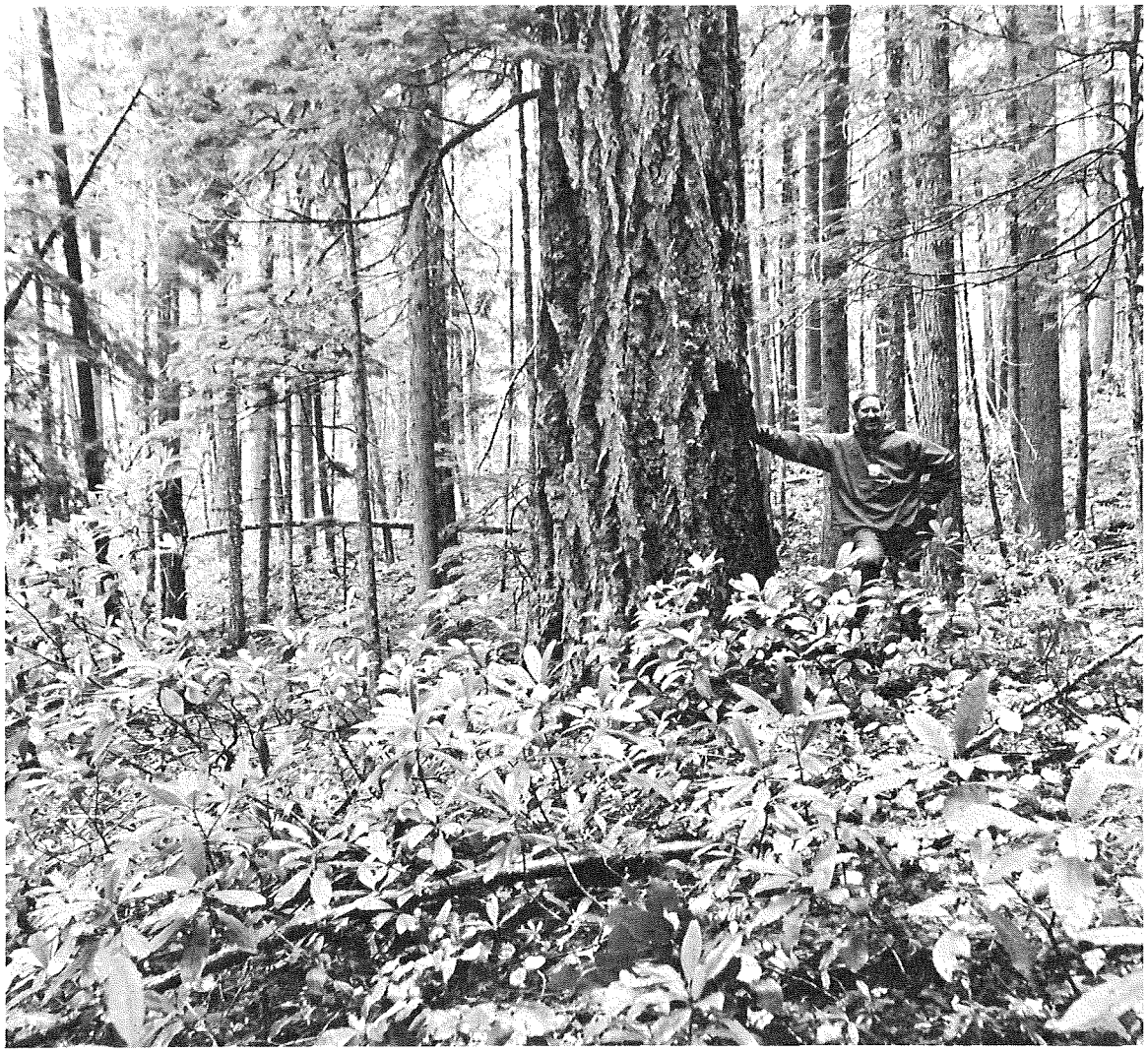

Figure BA-4.—*Rhododendron macrophyllum* and *Gaultheria shallon* are major plants of the understory at lower elevations. Although scattered, old trees, such as the Douglas-fir here, are found in the Bagby Research Natural Area, most of the overstory trees are about 200 to 250 years old.

Gentle to very steep, west-facing slopes along the high ridge of the eastern boundary of the area have vegetation similar to the *Tsuga heterophylla-Abies amabilis/Linnaea borealis* association (see footnote 2). Stands of 200- to 250-year-old trees are mostly Douglas-fir; but western hemlock, noble fir *(Abies procera)*, and western white pine also are found. Tree reproduction (seedlings and saplings) are mainly western hemlock, but limited numbers of Pacific silver fir *(Abies (~mabilis)* are found along the main ridge itself. The understory vegetation is well developed and diverse-over 30 species were found in each of plots E2 and E3 of table BA-1, and about 10 or 11 of these exceeded 3-percent cover. Only occasional patches of *Rhododendron* are found, and the tall shrub stratum is sparse. Herbs and low shrubs contribute over 50-percent cover. Dominant species are *Linnaea borealis, Achlys triphylla, Berberis nervasa,* and *Viola sempervirens.* Other common

Table BA-1.—Understory vegetation of Bagby Research Natural Area recorded in reconnaissance plots[1]

Major taxa	Plot:	E1	W3	W4	W2	W5	W1	E2	E3	E4
	Elev. (meters):	730	980	850	880	730	790	1,070	1,000	820
	Exposure:	S	ENE	E	E	ENE	E	SW	W	W
	Slope (percent):	20	65	60	25	20	60	40	100	110
	Type:[2]	A	A	A	A	—	B	C	C	—
		Percent cover								
Trees:[3]										
Tsuga heterophylla		40	8	15	4	20	20	20	25	5
Thuja plicata		35	--	--	4	+	--	--	--	--
Abies procera		--	--	--	--	--	--	--	--	--
Abies grandis		--	--	+	--	--	--	--	--	--
Tall shrubs:										
Acer circinatum		--	6	15	2	35	15	tr[4]	20	60
Rhododendron macrophyllum		75	65	55	35	50	1	tr	--	--
Taxus brevifolia		--	--	--	--	--	15	--	--	--
Holodiscus discolor		--	--	--	--	--	--	--	tr	--
Low shrubs:										
Gaultheria shallon		65	60	20	2	0	3	--	--	--
Berberis nervosa		6	1	10	2	7	35	5	50	25
Rosa gymnocarpa		--	--	--	--	--	--	4	1	1
Vaccinium sp.		--	--	--	--	20	--	--	--	--
Vaccinium parvifolium		5	--	4	1	--	1	1	--	--
Symphoricarpos mollis		--	--	--	--	--	--	--	5	--
Herbs or very low evergreen shrubs:										
Chimaphila umbellata		1	1	0	0	0	0	5	2	0
Chimaphila menziesii		--	--	--	--	--	--	--	--	--
Linnaea borealis		7	1	2	--	40	10	30	70	7
Polystichum munitum		--	--	--	--	--	--	--	1	20
Achlys triphylla		--	--	--	--	--	--	12	60	70
Adenocaulon bicolor		--	--	--	--	--	--	10	7	--
Tiarella unifoliata		--	--	--	--	--	--	6	--	--
Coptis laciniata		--	--	1	--	1	--	2	7	2
Viola sempervirens		1	--	--	--	--	2	10	15	4
Goodyera oblongifolia		--	--	--	--	--	--	--	--	--
Cornus canadensis		--	--	--	--	2	--	--	--	--
Rubus ursinus		--	--	--	--	--	--	--	--	--
Galium oreganum		--	--	--	--	--	--	--	3	2

[1] Reconnaissance methods used are described in Franklin, Dyrness, and Moir (1970).
[2] After C. T. Dyrness, Jerry F. Franklin, and W. H. Moir. Forest communities of the central portion of the western Cascades in Oregon. 1972. Unpublished manuscript. A = *Tsuga heterophylla/Rhododendron macrophyllum-Gaultheria shallon* association; B = *Tsuga heterophylla/Rhododendron-Berberis nervosa* association; C = *Tsuga heterophylla-Abies amabilis/Linnaea borealis.*
[3] Reproduction only. Cover rounded to the nearest percent; the + indicates presence in the approximately 0.5-ha. plot.
[4] tr = trace.

species include *Coptis lacim:ata, Listera caurina, Adenocaulon bicolor,* and *Chimaphila umbellata.*

High and intermediate elevations have communities transitional to the two vegetation types just described; such sites may support moderately dense 200- to 250-year-old stands of Douglas-fir and western hemlock with virtually no understory vegetation (total cover less than 0.5-percent) (fig. BA-5). Tree reproduction is also very sparse. The outstanding feature of such habitats is the heavy

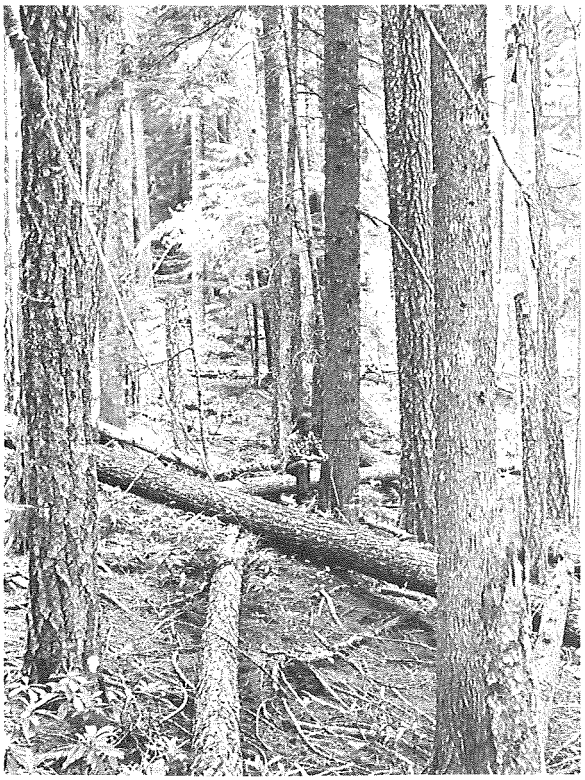

Figure BA-5.—Dense Douglas-fir-western hemlock stand with heavy forest floor accumulation and sparse shrub cover and tree reproduction.

buildup of forest floor litter including generous quantities of recently windthrown trees (fig. BA-6). Mycotrophic, achlorophyllous plants (Furman and Trappe 1971) are conspicuous on the shaded forest floor, including *CorctllorhizCL striata,* C. *maculCLtCL,* C. *mertens£anCL, Allotr01)CL virgcLtcL, HY1)OP£tys monotropCL,* and *PyrolcL picta* f. *aphylla.*

Special vegetation types include dense *Rhododend1'on* and vine maple *(Ace1' circ£natwn)* thickets on the high east ridge, and vine maple and *Berberis nel'VOSCL* on extremely steep west-facing slopes with very stony soils (plot E4 in table BA-1). The absence of permanent streams or springs within the natural area precludes special streamside or aquatic vegetation.

A tentative list of mammals believed to utilize the Bagby Research Natural Area as residents or transients is provided in table BA-2.

Figure BA-6.—Windthrow is a common feature of the forest floor at the Bagby Research Natural Area. Note also the sparse understory flora. This photo was taken on the high ridge along the western boundary.

Table BA-2.—Tentative list of mammals which utilize the Bagby Research Natural Area as residents or transients

Order	Scientific name	Common name
Insectivora	*Neürotrichus gibbsi*	shrew mole
	Scapanus orarius	coast mole
	Sorex trowbridgii	Trowbridge shrew
Chiroptera	*Eptesicus fuscus*	big brown bat
	Lasionycteris noctivagans	silver-haired bat
	Lasiurus cinereus	hoary bat
	Myotis californicus	California myotis
	Myotis evotis	long-eared myotis
	Myotis lucifugus	little brown myotis
	Myotis thysanodes	fringed myotis
	Myotis volans	long-legged myotis
	Myotis yumanensis	Yuma myotis
	Plecotus townsendi	Townsend big-eared bat
Lagomorpha	*Lepus americanus*	snowshoe hare
Rodentia	*Arborimus longicaudus*	red tree vole
	Clethrionomys californicus	California red-backed vole
	Erethizon dorsatum	porcupine
	Eutamias townsendi	Townsend chipmunk
	Glaucomys sabrinus	northern flying squirrel
	Microtus oregoni	Oregon or creeping vole
	Neotoma cinerea	bushy-tailed wood rat
	Peromyscus maniculatus	deer mouse
	Tamiasciurus douglasi	chickaree
Carnivora	*Felis concolor*	mountain lion or cougar
	Lynx rufus	bobcat
	Martes americana	marten
	Mustela erminea	short-tailed weasel or ermine
	Mustela frenata	long-tailed weasel
	Spilogale putorius	spotted skunk or civet cat
	Ursus americanus	black bear
Artiodactyla	*Odocoileus h. columbianus*	black-tailed deer

History of Disturbance

There are no major disturbances by man within the natural area. Several abandoned hiking trails once penetrated the area, but they are difficult to find.

Natural disturbances include a landslide in 1964 and abundant windthrow and mechanical tree damage within the last decade. The age structure of forest trees (figs. BA-3 and BA-4) suggests that an intense fire swept the area 200 to 250 years ago.

Research

There is no ongoing research within this area. The area can contribute, however, to regional studies of forest and soil classification. A variety of forest ecological processes can also be studied here, including rates of forest floor litter and log breakdown, the study of mechanical forces, succession upon small landslides on forest slopes, and insectplant relations for mycotrophic herbs. The productivity of forest trees is poor here, yet

the stands are examples of typical commercial types; and studies of factors limiting growth, including soil fertility and biogeochemical cycling of critical nutrients, present good research opportunities.

Maps and Aerial Photographs

Special maps applicable to the natural area are: *Topography-15'* Battle Ax, Oregon quadrangle, scale 1: 62,500 issued by the U.S. Geolog'ical Survey in 1956; and *geologyGeologic Map of Oregon West of the 121st Meridian,* scale 1: 500,000 (Peck 1961), and *Reconnaissance Geologic Map and Sections of the Western Cascade Range, Oregon, North of Latitude* 43° *N.,* scale 1: 250,000 (Peck et al. 1964). Either the District Ranger or Forest Supervisor (Mount IIood National Forest, Portland, Oregon) can provide information regarding the most recent aerial photos and forest type maps for the area.

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