# MIDDLE SANTIAM RESEARCH NATURAL AREA

*Supplement No. 24*[1]

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The Research Natural Area described in this supplement is administered by the Forest Service, an agency of the U.S. Department of Agriculture. Forest Service Research Natural Areas are located within Ranger Districts, which are administrative subdivisions of National Forests. Normal management and protective activities are the responsibility of District Rangers and Forest Supervisors. Scientific and educational uses of these areas, however, are the responsibility of the research branch of the Forest Service. Scientists interested in using areas in Oregon and Washington should contact the Director of the Pacific Northwest Research Station (319 S.W. Pine Street, Portland, OR 97204; mailing address, P.O. Box 3890, Portland, OR 97208) and outline activities planned. This Research Natural Area is within the Middle Santiam Wilderness and therefore falls under Wilderness jurisdiction. Restrictions on research are more stringent in Wilderness than in Research Natural Areas. Use of motorized equipment is restricted, and access can be more limited. In planning a study, the researcher should consult not only the District Ranger and the Director of the Pacific Northwest Research Station but also the Director of Wilderness and Special Areas section of the Recreation Division of the Pacific Northwest Region of the Forest Service, 319 S.W. Pine Street, Portland, OR 97204 (mailing address,P.O. Box 3623, Portland, OR 97208).

If extensive use of one or more Forest Service Research Natural Areas is planned, a cooperative agreement between the scientist and the Forest Service may be necessary. The Forest Supervisor and the District Ranger administering the affected Research Natural Area will be informed by the Research Station Director of mutually agreed on activities. When initiating work, a scientist should visit the administering Ranger Station to explain the nature, purpose, and duration of planned studies. Permission for brief visits to observe Research Natural Areas can be obtained from the District Ranger.

The Research Natural Area described in this supplement is part of a Federal system of such tracts established for research and educational purposes. Each Research Natural Area constitutes a site 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.

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[1]Supplement No. 24 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 (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1972. 498 p.).

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The Federal system is outlined in "A Directory of the Research Natural Areas on Federal Lands of the United States of America."[3]

Of the 96 Federal Research Natural Areas established in Oregon and Washington, 45 are described in "Federal Research Natural Areas in Oregon and Washington: A Guidebook for Scientists and Educators" (see footnote 1). Supplements to the guidebook describe additions to the system.

The guiding principle in management of Research Natural Areas is to prevent unnatural encroachments or activities that directly or indirectly modify ecological processes. Logging and uncontrolled grazing are not allowed, for example, nor is public use that might impair scientific or educational values. Management practices necessary for maintenance of ecosystems may be allowed.

Federal Research Natural Areas provide a unique system of publicly owned and protected examples of undisturbed ecosystems where scientists can conduct 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, a scientist wishing to use a Research Natural Area is obligated to:

1. Obtain permission from the appropriate administering agency before using the area;[4]
2. Abide by the administering agency's regulations governing use, including specific limitations on the type of research, sampling methods, and other procedures; and
3. Inform the administering agency on progress of the research, published results, and disposition of collected materials.

The purpose of these limitations is to:

1. Ensure that the scientific and educational values of the tract are not impaired;
2. Accumulate a documented body of knowledge about the tract; and
3. Avoid conflict between studies.

Research must be essentially nondestructive; destructive analysis of vegetation is generally not allowed, nor are studies requiring extensive modification of the forest floor or extensive excavation of soil. Collection of plant and animal specimens should be restricted to the minimum necessary to provide voucher specimens and other research needs. Under no circumstances may collecting significantly reduce populations of species. Collecting must also be carried out in accordance with applicable State and Federal agency regulations. Within these broad guidelines, appropriate uses of Research Natural Areas are determined by the administering agency.

[3]Federal Committee on Ecological Reserves. A directory of the Research Natural Areas on Federal lands of the United States of America. Washington, DC: U.S. Department of Agriculture, Forest Service; 1977.

[4]Six agencies cooperate in this program in the Pacific Northwest: U.S. Department of Agriculture—Forest Service; U.S. Department of the Interior—Bureau of Land Management, Fish and Wildlife Service, and National Park Service; U.S. Department of Energy; and U.S. Department of Defense.

# MIDDLE SANTIAM RESEARCH NATURAL AREA

**A 458-ha tract of old-growth *Pseudotsuga menziesii* forest on steep and frequently unstable topography along the Middle Santiam River in the Cascade Range in western Oregon.[5]**

Middle Santiam Research Natural Area (RNA) consists primarily of forests of old-growth *Pseudotsuga menziesii* and *Tsuga heterophylla* and spans the Middle Santiam River in a rugged portion of the Cascade Range in western Oregon. The forests are considered representative of the 400- to 500-year-old stands that are widely distributed in the western Cascade Range. Soils and topography are also typical of much of the commercial forest land in the western Cascades.

The 458-ha Middle Santiam RNA was established in December 1979 and is located on the Sweet Home Ranger District of the Willamette National Forest in Linn County, Oregon. It is located in portions of sections 7, 8, 17, 18, 19, 20, and 29, T. 19 S., R. 5 E., Willamette Meridian (lat. 44°30′ N., long. 122°20′ W.). The RNA is now located entirely within the Middle Santiam Wilderness, which was established by Congress in 1984.

## Access and Accommodations

Middle Santiam RNA is accessible by road systems that reach or approach the western, northern, southwestern, and southeastern boundaries (fig. 1). The western route is probably most useful because it provides access at river level to the center of the RNA and to a partially completed system of trails. The gate at the east end of the reservoir may be locked. Before proceeding, stop at the Sweet Home Ranger Station to get current road and traffic information and permission

[5]Scientific and common names of vascular plants are provided in appendix 1.

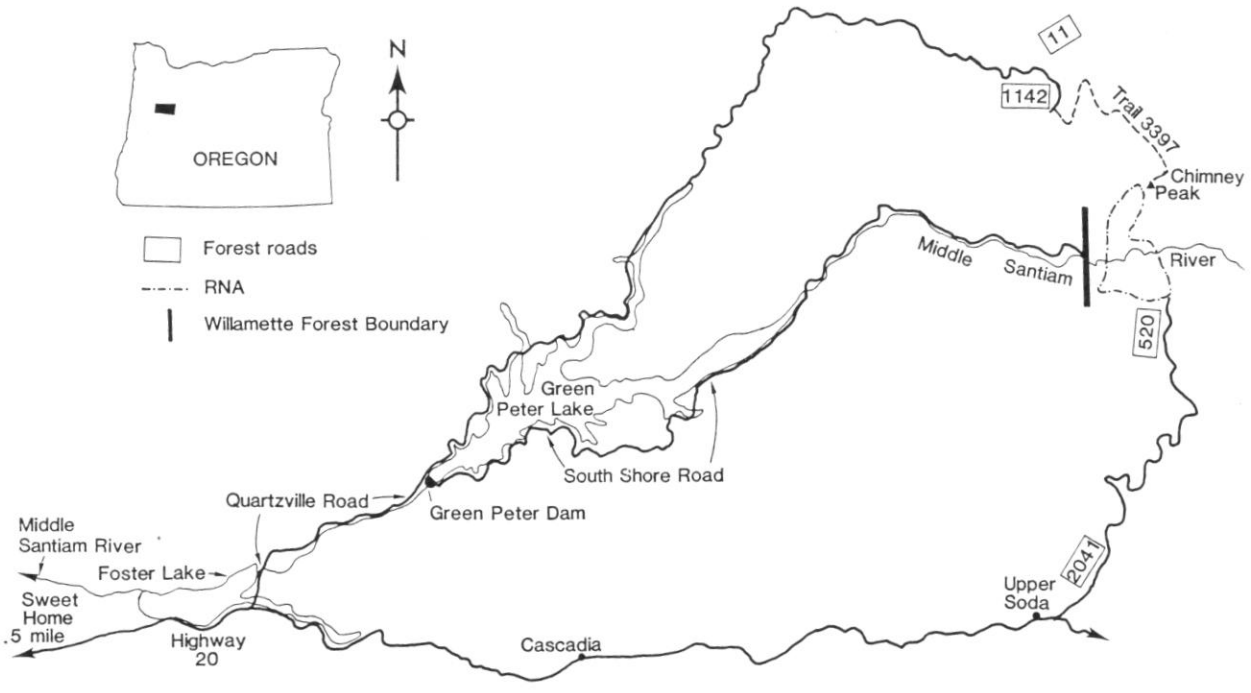


Figure 1—General location of the Middle Santiam Research Natural Area.

to use the Middle Santiam road across Weyerhaeuser lands. To reach the western boundary of the RNA beginning at Sweet Home, drive east on U.S. Highway 20 for 3.5 mi and turn north on the Quartzville road at the east end of Foster Lake. Follow this road for 5 mi to Green Peter Dam. Cross Green Peter Dam, and travel 16 mi on South Shore Road, generally paralleling the south edge of Green Peter Lake. After crossing the east end of the lake, where the Middle Santiam River enters it, turn right. Continue on the main road along the north side of Middle Santiam River. At about 6.5 mi, pass a major fork of the road that crosses the Middle Santiam River on a concrete bridge. Do not turn, but continue along the north side of the river, crossing a tributary and climbing to the first major switchback about 7.5 mi from the gate. The boundary of the Willamette National Forest is about 300 ft east of the road at this point.

Two low-standard trails exist in the RNA. The longest of these begins at the Willamette Forest boundary (described above) and provides access to the lower slopes and benches of the RNA north of the river. It eventually reaches the river at a location that is fordable during low flows. This ford is located just upstream from a grove of very large Douglas-fir trees and downstream from an active mass soil movement (discussed later), both on the south side of the river. The trail swings downstream for a short distance along the toe of the slope, then climbs precipitously to a dead end about halfway up the north-facing slopes. A second trail begins on the ridge at the southwest corner of the RNA. To reach this trail from the Middle Santiam road, cross the concrete bridge at the 6.5-mi point and climb to the ridgetop on a series of logging-road spurs. The trail follows the ridge for about one-half mile, drops a short distance into the RNA, then ends. Midslope slump benches and the main surface of the large slump in the southeast portion of the RNA are most easily reached by one of these trails.

Access to the northern boundary of the RNA at Chimney Peak is by Forest Service Trail 3397 (figs. 1 and 2). To reach the trailhead, follow Forest Roads 11 and 1142 in the Quartz Creek drainage. The trailhead is located on Forest Road 1142. The distance from the trailhead to Chimney Peak is about 5 mi.

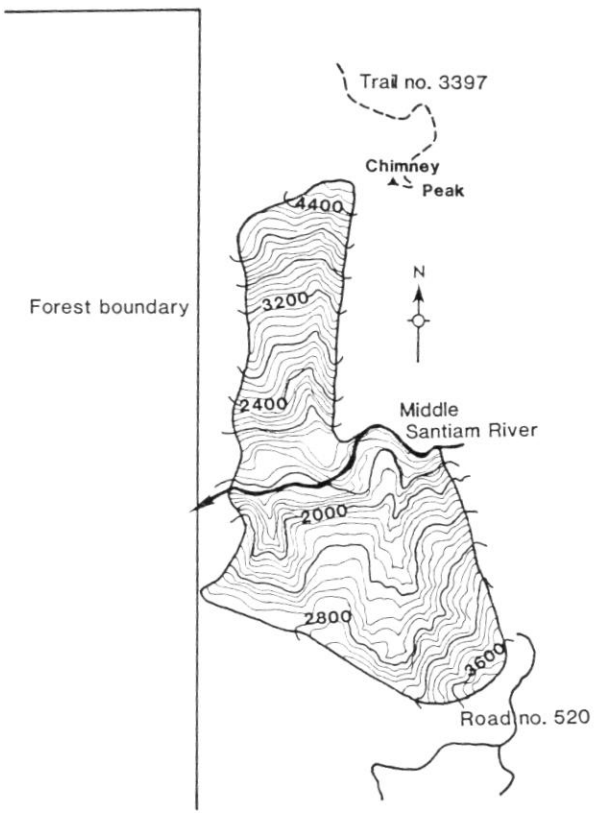


Figure 2—Middle Santiam Research Natural Area.

A system of Forest Service roads provides access to the southeastern corner of the RNA. From U.S. Highway 20 at Upper Soda, take Forest Road 2041 for 8.4 mi to its junction with Forest Road 520. Proceed along Forest Road 520 for 2.8 mi to a clearcut unit on the southeast boundary of the RNA.

Traveling cross-country is difficult in this area because of the steep, broken topography and heavy cover of brush, especially *Rhododendron macrophyllum*. Ridgetops along the southern boundary are especially brushy.

## Environment

The Middle Santiam RNA is a rugged, mountainous tract (figs. 2-5). It is divided into two segments by the Middle Santiam River.

Figure 3—Overview of the southeastern portion of the Middle Santiam Research Natural Area from Chimney Peak. Major stream drainage below scarp faces has been subject to extensive mass soil movements and has a poorly defined stream channel for much of its length.

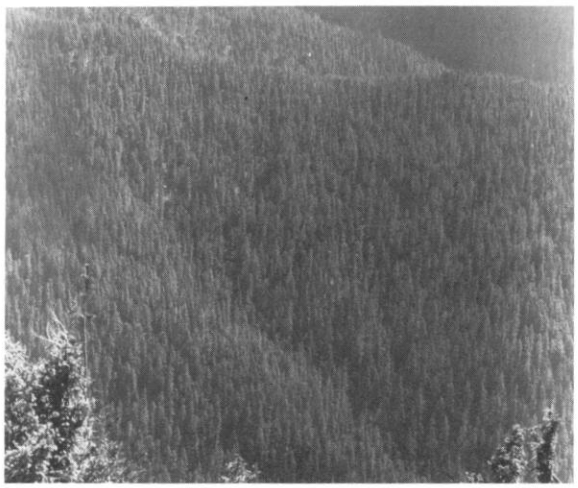

Figure 4—The second-order stream drainage in the southwestern corner of the Middle Santiam Research Natural Area has a well-defined stream course; this drainage is sometimes referred to as the Black Hole.

Figure 5—Mixed stand of Douglas-fir, western hemlock, and noble fir on the upper third of the south-facing slope in the Middle Santiam Research Natural Area as viewed (looking southwest) from Chimney Peak.

The northern segment has steep, essentially unbroken, south-facing slopes that average 70 percent. The southern segment, with slopes averaging 50 percent, includes several slump benches. Elevations range from 457 to 1433 m. Three complete second-order stream drainages tributary to the Middle Santiam River are in the RNA (fig. 2).

Bedrock in Middle Santiam RNA belongs to the Sardine formation, which is composed of lava flows, pyroclastic flows, and water-reworked volcanic rocks (Peck and others 1964). Andesite and basalt flows are found at midelevations to high elevations, whereas breccias and tuffs typify lower elevations.

The RNA occupies a geomorphologically active region (fig. 6). Instability is manifested in numerous shallow and deep-seated mass movements. Deep-seated mass movements are particularly conspicuous, forming scarps and slump benches, in the southern half of the RNA. The large, second-order watershed in the southeastern corner of the RNA consists almost entirely of an earthflow that currently appears to be inactive; a major scarp is located at the head of this flow (fig. 7).

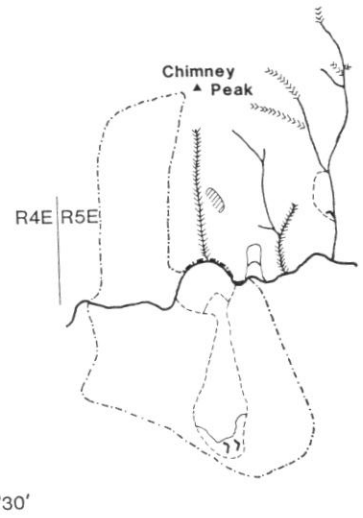


Figure 6—Mass soil movements in the Middle Santiam Research Natural Area and adjacent portions of the Middle Santiam drainage (adapted from Hicks 1982).

Figure 7—Erosional scarp in the southeast corner of the Middle Santiam Research Natural Area; deep-seated mass movements are common and active in this part of the Research Natural Area.

An active earthflow occupies the interfluve between the two main drainages in the south half of the RNA (figs. 2, 6); this earthflow is about 10 m thick and is estimated to be moving from 0.1 to 1.0 m/yr.[6] The northward movement is forcing the Middle Santiam River into Chimney Creek on the north bank of the river. Numerous springs and seeps and a large total volume of flow also indicate that the earthflow has captured much of the water from the large drainage to the east. Measurements of movement at two similar earthflows 2 and 4 mi to the east indicate that this earthflow may move throughout the year. The greatest movement is during the wet season. Slumping of the earth at the headwall of the earthflow recently led to two large debris avalanches. Movement is further indicated by numerous tension cracks, vegetation disruption, and leaning trees. The toe of the earthflow provides continuous inputs of rock, soil, and vegetation to the river.

[6]Personal communication, 1985, Fred Swanson, Forestry Sciences Laboratory, Corvallis, OR 97331.

The reach of the Middle Santiam River located within the RNA is in pristine condition. A variety of channel forms and aquatic habitats include bars and bedrock-controlled pools and riffles. The flood plain is not well developed because of the steep topography. The river, including most of its headwaters, is subject to human activities above the RNA and Wilderness boundaries.

Soils vary with elevation and landform but are generally immature. Colluvial and alluvial processes are important in mixing soil, and depositional parent materials dominate where soils are deep. Soils on the upper slopes and ridges in the northern segment of the RNA are shallow, very stony loams derived from andesite and basalt. On the gentle, more concave slopes, soils are moderately deep (50 to 100 cm), gravelly loams derived from igneous flow rocks. Some soils at lower elevations are developed from highly weathered tuffs and breccias and are locally very deep. These productive soils have friable silt loam surface horizons underlain by subsoils of silty clay loam to loam texture.

## Climate

The Middle Santiam RNA lies within the wet, mild climate typical of the *Tsuga heterophylla* Zone (Franklin and Dyrness 1973). The climate is strongly maritime, although the site is 80 mi from the Pacific Ocean. Summers are usually dry and warm, whereas winters are cool and wet. Meteorological data from the nearest climatic station at Cascadia (252 m in elevation and 10 air miles to the southwest of the RNA, fig. 1) are as follows (U.S. Weather Bureau 1960):

| | | |
|---|---|---|
| Mean annual temperature | 10.5 °C | (51.0 °F) |
| Mean January temperature | 2.8 °C | (37.0 °F) |
| Mean July temperature | 18.4 °C | (65.2 °F) |
| Mean January minimum temperature | -1.5 °C | (29.3 °F) |
| Mean July maximum temperature | 27.8 °C | (82.0 °F) |
| Mean annual precipitation | 150.9 cm | (61.26 in) |
| Mean June through August precipitation | 10.9 cm | (4.44 in) |

Microclimatic conditions vary significantly with slope, aspect, and elevation. Precipitation probably increases substantially from the lowest to the highest elevations in the RNA. Snow accumulation varies from transient snow cover at lower elevations to deposits of 1 m or more at higher elevations that may persist until June.

## Vegetation

The majority of the Middle Santiam RNA is covered by old-growth coniferous forest stands. Categories and percent cover, according to the Society of American Forester's cover types (Eyre 1980), are No. 229, Pacific Douglas-Fir (30 percent); No. 230, Douglas-fir—Western Hemlock (65 percent); and No. 226, Coastal True Fir—Hemlock (5 percent). The latter cover type is found at elevations above 1000 m. The primary Küchler (1964) type represented is Cedar-Hemlock-Douglas fir forest. The RNA falls within the temperate *Tsuga heterophylla* Zone of Franklin and Dyrness (1973), except for the highest elevations, which are ecotonal to the subalpine *Abies amabilis* Zone.

The general composition of the forest is illustrated by the vegetative data (tables 1 and 2). *Pseudotsuga menziesii* is the dominant tree species throughout most of the northern half of the RNA, but it shares dominance with *Tsuga heterophylla* in most stands throughout the southern half. *Tsuga heterophylla* is the major tree species in the reproduction size classes throughout the RNA and would presumably be the major climax species. *Thuja plicata* is common on cool, moist slopes and benches; *Abies amabilis* is common at higher elevations. Minor tree species include *Pinus lambertiana, A. procera, P. monticola, Acer macrophyllum, Alnus rubra,* and *Arbutus menziesii.*

**Table 1—Physical features, plant association type, and coverage of major plants on 8 reconnaissance plots north of the river in the Middle Santiam Research Natural Area; all except plot 4 are old-growth stands**

| Item | Plot number | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Physical features: | | | | | | | | |
| Elevation (feet) | 2,300 | 2,600 | 2,700 | 3,100 | 2,600 | 2,700 | 2,950 | 2,150 |
| Slope percent/aspect | 80/S | 80/S | 80/S | 70/WNW | 60/S | 100/E | 15/S | 80/SE |
| Landform | Ridgetop | Ridge | Ridge | Upper 1/3 slope | Mid-1/3 slope (convex) | Mid-1/3 slope | Mid-1/3 slope | Lower 1/3 slope |
| Plant association[1] | TSHE/ GASH | TSHE/ BENE-GASH | PSME/ GASH | TSHE/ RHMA-GASH | TSHE/ GASH | TSHE/ BENE | TSHE/ RHMA-BENE | TSHE/ BENE |
| Percent tree cover (mature/reproduction):[2] | | | | | | | | |
| Douglas-fir | 50/Tr | 60/Tr | 10/40 | 70/A | 40/A | 35/A | 10/A | 60/A |
| Western hemlock | A/20 | A/30 | 10/5 | 30/5 | 15/60 | 10/20 | 75/15 | 10/30 |
| Sugar pine | 2/2 | A/Tr | A/1 | 8/A | | | | |
| Pacific madrone | | Tr/A | 2/A | | | | | |
| Percent shrub cover:[2] | | | | | | | | |
| Salal | 40 | 35 | 30 | 35 | 75 | Tr | 4 | |
| Vine maple | 10 | 10 | 1 | | 60 | 45 | 3 | 20 |
| Oregon grape | 15 | 30 | 5 | 2 | Tr | 1 | 7 | 85 |
| Golden chinkapin | 10 | | 5 | | | | | |
| Pacific poison oak | Tr | Tr | 1 | | | | | |
| Creambush rockspirea | Tr | | 1 | | | | | |
| Baldhip rose | Tr | 1 | 1 | | | | | Tr |
| Pacific rhododendron | | | Tr | 20 | | 4 | 30 | |
| Red whortleberry | 2 | | | Tr | | 1 | 1 | Tr |
| Hairy manzanita | | | 15 | | | | | |
| Common beargrass | 5 | 10 | 9 | 1 | | Tr | Tr | |
| Modest whipplea | 6 | 4 | 1 | | | Tr | | |
| Percent herb cover:[2] | | | | | | | | |
| Common princes-pine | 3 | 2 | 5 | Tr | Tr | Tr | | |
| Oregon iris | | Tr | Tr | | | | | |
| Western fescue | Tr | Tr | Tr | | | | | |
| California dewberry | Tr | Tr | Tr | | | | | |
| White hawkweed | Tr | 1 | Tr | | | | | |
| Whitevein pyrola | Tr | Tr | | Tr | Tr | | | Tr |
| Deerfoot vanillaleaf | Tr | 2 | | | | Tr | | Tr |
| Starflower | | Tr | Tr | | | | | |
| Twinflower | 8 | | | | | 1 | 2 | Tr |
| Redwoods violet | 2 | | | | | Tr | | Tr |
| Western swordfern | | | Tr | | Tr | 5 | Tr | 15 |
| Pacific coralroot | Tr | | | | Tr | Tr | | |
| Threeleaf anemone | Tr | | | | | | Tr | |

[1]BENE = *Berberis nervosa*, GASH = *Gaultheria shallon*, PSME = *Pseudotsuga menziesii*, RHMA = *Rhododendron macrophyllum*, TSHE = *Tsuga heterophylla*.
[2]Tr = trace, A = absent.

**Table 2—Physical features, plant association type, and coverage of major plants on 9 reconnaissance plots south of the river in the Middle Santiam Research Natural Area; all plots are old-growth stands**

| | Plot number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Item | 9 | 16 | 17 | 10 | 11 | 15 | 14 | 13 | **12** |
| Physical features: | | | | | | | | | |
| Elevation (feet) | 2,100 | 2,400 | 1,600 | 1,950 | 1,850 | 2,550 | 2,800 | 3,300 | 3,450 |
| Slope percent/aspect | 80/N | 20/NW | 0/A | 85/W | 5/N | 40/N | 10/N | 60/NW | 50/N |
| Landform | Upper 1/3 slope | Bench | River terrace | Mid-1/3 slope | Bench | Mid-1/3 slope | Ridge-top | Upper 1/3 slope | Upper 1/3 slope |
| Plant association[1] | TSHE/ OXOR | TSHE/ OXOR | TSHE/ OXOR | TSHE/ RHMA-BENE | TSHE/ VAAL-RHMA/ COCA | TSHE/ RHMA-XETE | TSHE/ RHMA-BENE | TSHE/ RHMA-XETE | ABAM/ RHMA-XETE |
| Percent tree cover (mature/reproduction)[2] | | | | | | | | | |
| Douglas-fir | 25/A | 70/A | 40/A | 15/A | 65/A | 5/A | 65/A | 30/A | 15/A |
| Western hemlock | 25/7 | 35/40 | 65/35 | 65/25 | 35/25 | 75/20 | 40/35 | 20/1 | 70/2 |
| Western redcedar | 25/1 | | 15/A | 25/5 | 5/A | 35/1 | 25/15 | | 30/1 |
| Bigleaf maple | Tr/A | | | | | | | | |
| Pacific silver fir | | | | | | | 15/1 | A/1 | A/2 |
| Noble fir | | | | | | | | | 2/A |
| Western white pine | | | | | | | Tr/A | 15/5 | Tr/1 |
| Percent shrub cover: | | | | | | | | | |
| Vine maple | 1 | | 35 | 5 | 5 | 2 | 2 | | |
| Pacific rhododendron | | | 2 | 20 | 70 | 65 | 80 | 85 | 75 |
| Oregon grape | 1 | 4 | 5 | 20 | 3 | 10 | 1 | | 2 |
| Golden chinkapin | | | | 1 | 1 | 3 | 10 | 7 | |
| Red whortleberry | 1 | 2 | 5 | 4 | 25 | 20 | | | 5 |
| Western yew | | | | 5 | | 2 | | | |
| Pacific dogwood | | | 3 | 2 | | | | | |
| Salal | | 1 | 4 | | 15 | 15 | 30 | 20 | 3 |
| Alaska huckleberry | | | | | 10 | 2 | 20 | 25 | 25 |
| Big whortleberry | | 1 | 10 | | 1 | 1 | | | 2 |
| Percent herb cover: | | | | | | | | | |
| Western swordfern | 60 | 7 | 45 | 3 | | 2 | | | |
| Oregon oxalis | 40 | 85 | 40 | | | 1 | | | |
| White vancouveria | 3 | 4 | 6 | 1 | | | | | |
| Deerfern | 45 | 5 | 2 | | | | | | |
| Deerfoot vanillaleaf | 2 | 10 | 1 | 1 | | | | | |
| Coolwart foamflower | 2 | 2 | 2 | 1 | | | | | |
| Cutleaf goldthread | 1 | 1 | 3 | 10 | | 3 | | | 1 |
| Hooker's fairybells | 1 | | 4 | | | | | | |
| Pacific trillium | 1 | 1 | 1 | | | 1 | | | |
| Redwoods violet | | 1 | | 2 | | | | | |
| Coolwart | | | 5 | 20 | 20 | 5 | 10 | | 2 |
| Common princes-pine | | | | 3 | 3 | 2 | | | 3 |
| Common beargrass | | | | 2 | 1 | 7 | 15 | 40 | 20 |
| Rattlesnake plantain | | | 1 | 1 | | 1 | 1 | | 1 |
| Alpine pyrola | | | | 1 | | | | | |
| California dewberry | | 2 | 2 | 1 | 1 | | | | |
| Threeleaf anemone | | | | 1 | | | | | |
| Bunchberry dogwood | | 1 | | | 25 | 1 | | 1 | |
| Oregon wintergreen | | | | | | | 1 | 3 | 3 |

[1]ABAM = *Abies amabilis*, BENE = *Berberis nervosa*, COCA = *Cornus canadensis*, OXOR = *Oxalis oregana*, RHMA = *Rhododendron macrophyllum*, TSHE = *Tsuga heterophylla*, VAAL = *Vaccinium alaskaense*, XETE = *Xerophyllum tenax*.
[2]A = absent, Tr = trace.

Forest communities in the RNA provide a good cross-section of communities in the *Tsuga heterophylla* Zone of Oregon's western Cascades. Plant associations in the Middle Santiam RNA include (following the classification of Hemstrom and others 1985):

Douglas-fir/salal
Western hemlock/salal
Western hemlock/dwarf Oregon grape-salal
Western hemlock/rhododendron-salal
Western hemlock/dwarf Oregon grape
Western hemlock/rhododendron-Oregon grape
Western hemlock/rhododendron-Alaska huckleberry/bunchberry dogwood
Western hemlock/rhododendron/beargrass
Pacific silver fir/rhododendron/beargrass
Western hemlock/oxalis

The forests on the steep, south-facing slopes north of the Middle Santiam River belong primarily to the western hemlock/salal, dwarf Oregon grape-salal, and rhododendron-salal community types (table 1). A few sites are sufficiently dry that they approach climax *Pseudotsuga menziesii* sites (for example, plot 3), whereas more mesic environments are typified by western hemlock/Oregon grape and rhododendron-Oregon grape associations (fig.8).

Figure 8—Typical old-growth forest stand on modal site (western hemlock/rhododendron/Oregon grape association), Middle Santiam Research Natural Area.

The most common understory species are *Gaultheria shallon, Rhododendron macrophyllum, Acer circinatum, Berberis nervosa, Whipplea modesta, Tiarella* spp., *Chimaphila umbellata,* and *Xerophyllum tenax.* Dry-site indicator species include *Arbutus menziesii, Holodiscus discolor, Rhus diversiloba, Festuca occidentalis,* and *Iris tenax.* Forests on the slopes and ridgetop near Chimney Peak have not been sampled. The shift from temperate to subalpine tree species appears to be abrupt, however, in contrast to the gradual increase in importance of *Abies amabilis* characteristic of the RNA south of the river.

Mesic and moist forest conditions predominate on the north-facing slopes south of the Middle Santiam River and on benches and terraces near the river (table 2). Characteristic communities on well-watered benches with deep soils and some river terraces belong to the western hemlock/oxalis association (fig. 9).

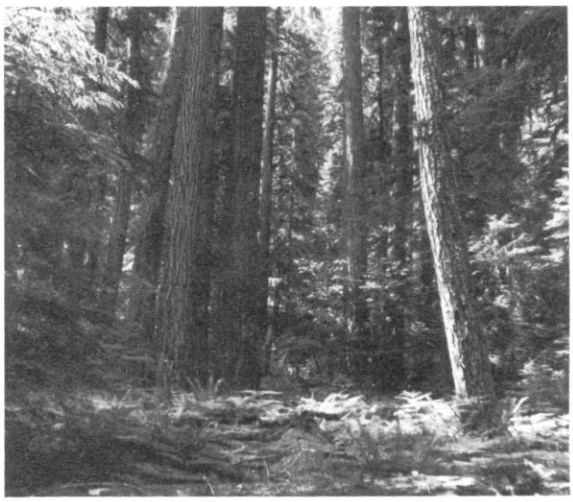

Figure 9—Massive, parklike old-growth groves (western hemlock/oxalis association) characterize moist slump benches and river terraces in the Middle Santiam Research Natural Area.

Understories have a rich ground layer dominated by *Polystichum munitum, Oxalis oregana, Blechnum spicant,* and other herbs and ferns. Similar western hemlock/swordfern communities occur on moist, moderate to very steep, middle to lower slopes. Modal sites are characterized by western hemlock/rhododendron and rhododendron-Oregon grape associations (table 2). One area on a bench near the Middle Santiam River had a distinctive community belonging to the western hemlock/rhododendron-Alaska huckleberry/bunchberry dogwood association (plot 11 in table 2). Forests high on the slopes and on ridgetops typically grade from western hemlock/rhododendron-salal to western hemlock/rhododendron-beargrass. Overstories in many of these stands are in poor condition, with extensive infections of dwarf mistletoe in the *Tsuga heterophylla.* The dense, tangled, shrubby understories are dominated by *Rhododendron macrophyllum* (fig. 10). The least productive forest is the Pacific silver fir/rhododendron-beargrass type near the southeast corner of the RNA (plot 12 in table 2); stunted trees are scattered through a nearly continuous cover of *Rhododendron macrophyllum.*

Figure 10—Junglelike understories of Pacific rhododendron, salal, and beargrass characterize some of the upper-slope and ridgetop sites near the southern boundaries of the Middle Santiam Research Natural Area.

Riparian plant communities are well developed along at least one of the second-order streams (Campbell and Franklin 1979). They are dominated by mixtures of shrubs, such as *Acer circinatum, Rubus spectabilis, Ribes bracteosum,* and *Oplopanax horridum,* and a rich array of ferns and dicotyledonous herbs (fig. 11).

Figure 11—Riparian vegetation is well developed along the second-order stream in the southwestern corner of the Middle Santiam Research Natural Area.

Forest productivity (as measured by site index) varies widely over the Middle Santiam RNA. It is at a minimum in the dry western hemlock/salal, rhododendron-salal, and rhododendron-beargrass and in the Pacific silver fir /rhododendron-beargrass types. Maximum diameters of 50 to 100 cm and heights of 30 to 50 m are typical of such sites. On well-watered slopes, benches, and river terraces, the forests have moderate to high productivity. Maximum heights range from 69 to 84 m and maximum diameters from 140 to 203 cm.

An exceptional 2.5-ha stand of old-growth *Pseudotsuga menziesii-Tsuga heterophylla* is on a river terrace near the center of the RNA. A 1-ha portion of this stand was first examined by a U.S.-Japanese research team as part of the International Biological Program (IBP) (Fujimori and others 1976). An irregularly shaped, permanent sample plot was subsequently established on 2 ha of the stand in 1977 (fig. 12).

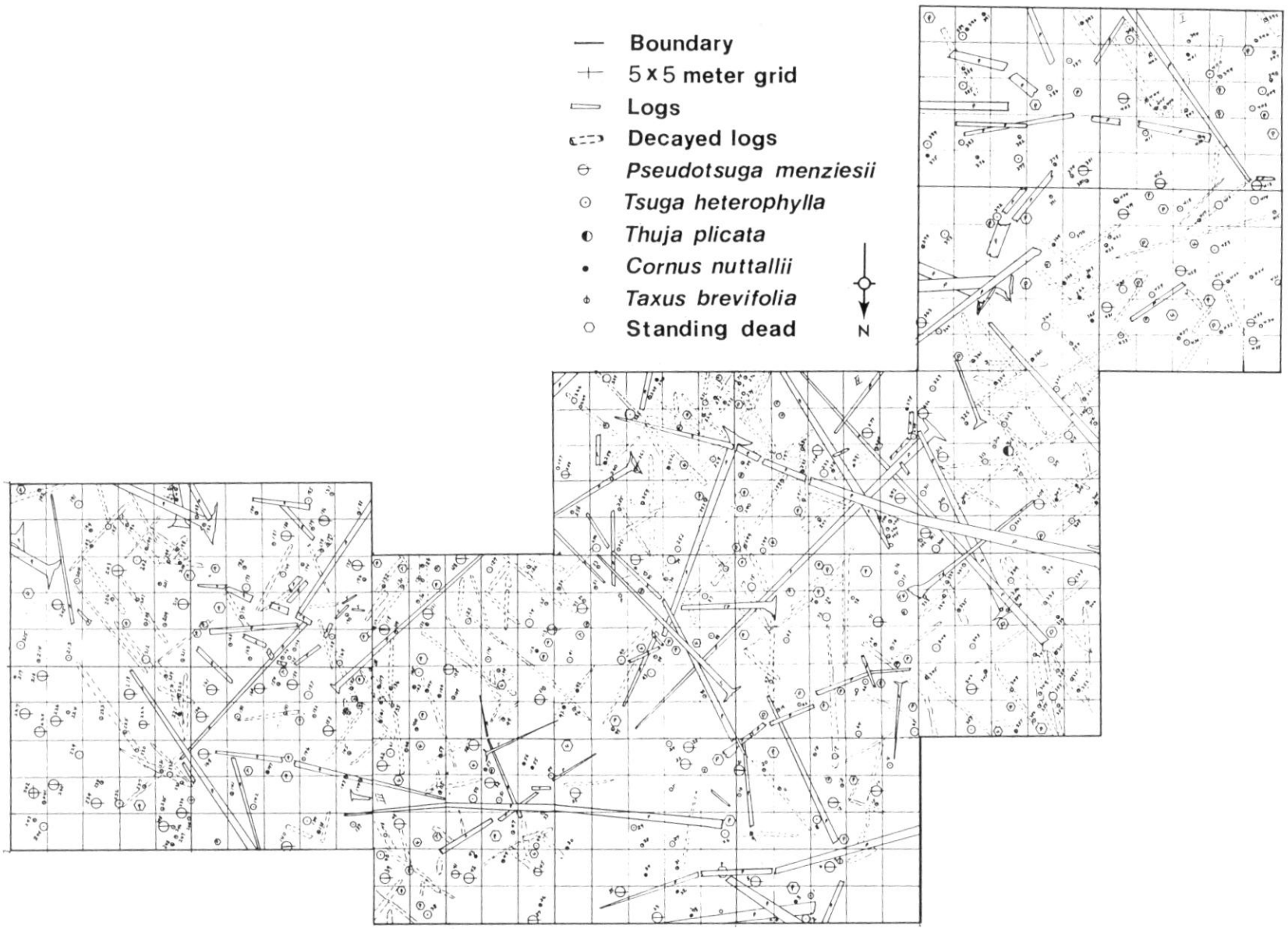


Figure 12—Map of permanent sample plot on alluvial terrace adjacent to the Middle Santiam River.

In the IBP sample plots, the diameters of most of the *Pseudotsuga menziesii* exceed 115 cm (table 3). Heights of the dominants are 70 to 80 m. Total stem volume, including bark, was calculated as 3600 $m^3$/ha (Fujimori and others 1976). Remeasurement of the permanent sample plot in 1984 revealed that 25 trees of the original sample of 437 had died in the 7 years for a mortality rate per annum of 0.81 percent; the 25 included only one large (169.2 cm) *Pseudotsuga menziesii,* however.

**Table 3—Stand table for a 1-ha plot in a superlative old-growth Douglas-fir—western hemlock stand[1]**

| | Mean diameter class (centimeters) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 15 | 25 | 35 | 45 | 55 | 65 | 75 | 85 | 95 | 105 | 115 | 125 | 135 | 145 | 155 | 165 | 175 | 185 | 195 | 205 | Total |
| *Pseudotsuga menziesii* | | 1 | | 1 | | | 2 | 1 | 2 | 4 | 4 | 10 | 11 | 11 | 13 | | 3 | 4 | | 1 | 68 |
| *Tsuga heterophylla* | 61 | 37 | 15 | 12 | 14 | 7 | 9 | 4 | 1 | | | | | | | | | | | | 160 |
| *Thuja plicata* | | | | | | | | | | | | | | | 1 | | | | | | 1 |
| *Acer macrophyllum* | 1 | | | | | | | | | | | | | | | | | | | | 1 |
| *Acer circinatum* | 32 | | | | | | | | | | | | | | | | | | | | 32 |
| *Cornus nuttallii* | | 1 | | | | | | | | | | | | | | | | | | | 1 |

[1]Sampled by the International Biological Program (Fujimori and others 1976). Diameter classes include ± 5 cm of the mean.

## Fauna

Tentative lists of terrestrial vertebrates—reptiles, amphibians, birds, and mammals—are given in appendix 2. These lists are compiled from species lists for similar sites in the western Cascades and not from a sampling of the RNA.

Many vertebrate and invertebrate species characteristic of old-growth forests doubtless occur within the Middle Santiam RNA; for example, the northern spotted owl. The area north of the river is a Spotted Owl Management Area. A pair of adult owls as well as fledglings have been seen in the area.

The RNA is also considered to be important elk wintering range.

## Disturbance History

Wildfire, mass soil movements, and floods are the most important natural catastrophic disturbances that have affected the RNA. Charcoal is abundant in the soils, and fire scars are occasionally found on trees, particularly on the dry, south-facing slopes. The old-growth *Pseudotsuga menziesii* trees are generally 400 to 500 years old, indicating that the entire area was probably subjected to catastrophic wildfire about 500 years before the present. This is comparable to the major forest age class of the H.J. Andrews Experimental Forest (Franklin and Waring 1979). There have almost certainly been more recent wildfires on the steep, south slopes north of the river.

Major geomorphological disturbances have already been discussed. The mass soil movements are the most prominent.

Wind causes mortality of individual trees or small patches of trees within the RNA, but no large areas of blowdown have been seen. Significant windthrow may occur within the RNA in the future as a consequence of the clearcutting of all forests outside the National Forest boundary, to the immediate west of the RNA. Many trees have already blown down just inside the forest boundary, including the extreme southwestern corner of the RNA. A small concentration of blowdown outside the RNA was salvaged by the Forest Service in the mid-1970's, before establishment of the Wilderness.

## Research

The Middle Santiam RNA provides a large array of research opportunities because of the variety of old-growth *Pseudotsuga menziesii* community types; complete, small watersheds; reach of river; and extensive active and dormant mass movements. In a series of RNA's in the western Cascades the Middle Santiam represents old forests; Bagby RNA (Mount Hood National Forest), middle-aged forests; and Hagan Block proposed RNA (Willamette National Forest), young forests. These RNA's provide an opportunity to study the structure and function of different stages in forest development. Middle Santiam RNA has also one of the few protected, low-elevation, old-growth *Pseudotsuga menziesii* forests, and it includes a river terrace western hemlock/oxalis community that is rare in the Oregon Cascades. A richness of animal species is frequently found in low-elevation old growth, which makes Middle Santiam RNA an important area for wildlife studies.

The RNA provides a benchmark site to study natural ecological processes, and it can be profitably used for comparison with areas subject to human activities or experimental treatment. For example, the RNA is a useful control for the H.J. Andrews Experimental Forest about 25 air miles to the south; vegetation and environment are very similar at the two sites. It is also useful as a natural control for studies of factors affecting the behavior of earthflows on sites that have been subject to forest harvesting or roadbuilding.

Several research projects are underway or have been completed at Middle Santiam RNA. The 2-ha permanent sample plot mentioned earlier is part of a system of plots being established on RNA's and Experimental Forests throughout Oregon and Washington. These reference plots provide sample areas for studying a variety of forest processes, including growth and mortality of trees, small-mammal populations, dynamics of understory vegetation, and litter fall and decomposition. The 2-ha plot overlaps the stand measured by the IBP research team. Composition and biomass of the riparian zone in the small southwestern watershed (known as the Black Hole) have been described (Campbell and Franklin 1979). The RNA has been used extensively (12 study sites) by research teams studying the composition and structure of old-growth forests as a part of a regional old-growth wildlife habitat study. The old-growth data set includes estimates of biomass, coarse woody debris (snags and logs), densities of snags and logs, and estimates of canopy cover from fisheye photography. These data and data for the 2-ha sample plot are on file at Forestry Sciences Laboratory, Project 4151, 3200 Jefferson Way, Corvallis, OR 97331.

The active soil mass movement on the south side of the river has been mapped as a part of a master's thesis project on mass movements in the Middle Santiam River drainage (fig. 6) (Hicks 1982). Water-quality samples are being collected from the river by Weyerhaeuser Company at the National Forest boundary. Finally, fungal mycorrhizae have been collected from rotten logs in the RNA and have been identified and archived at the herbarium at Oregon State University in Corvallis, Oregon.

## Maps and Aerial Photography

Special maps applicable to Middle Santiam RNA are: **Topographic**—Detroit (1956), Quartzville (1956), Cascadia (1955), and Echo Mountain (1955), Oregon quadrangles, scale 1:62,500, issued by the U.S. Geological Survey; and **Geologic**—Oregon west of the 121st Meridian, scale 1:500,000 (Peck 1961). Either the District Ranger or the Forest Supervisor (Willamette National Forest, Eugene, Oregon) can provide information about the most recent aerial photographs and forest-type maps for the area. The map library, Department of Geography, University of Oregon, Eugene, has older photo sets and other maps that may not be available at the Forest Service.

## Metric and English Equivalents

1 centimeter (cm) = 0.4 inch (in)
1 meter (m) = 3.3 feet (ft)
1 hectare (ha) = 2.5 acres
1 kilometer (km) = 0.6 mile (mi)

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## Appendix 1

A list of vascular plants in the Middle Santiam Research Natural Area follows:[1] [2]

| Scientific name | Common name |
|---|---|
| *Abies amabilis* (Dougl.) Forbes | Pacific silver fir |
| *Abies procera* Rehder | Noble fir |
| *Acer circinatum* Pursh | Vine maple |
| *Acer macrophyllum* Pursh | Bigleaf maple |
| *Achlys triphylla* (Smith) DC. | Deerfoot vanillaleaf |
| *Adenocaulon bicolor* Hook. | American adenocaulon |
| *Alnus rubra* Bong. | Red alder |
| *Amelanchier alnifolia* Nutt. | Saskatoon serviceberry |
| *Anemone deltoidea* Hook. | Threeleaf anemone |
| *Apocynum androsaemifolium* L. | Spreading dogbane |
| *Arbutus menziesii* Pursh | Pacific madrone |
| *Arceuthobium campylopodum* Engelm. | Yellow leafless mistletoe |
| *Arctostaphylos columbiana* Piper | Hairy manzanita |
| *Arenaria macrophylla* Hook. | Sandwort |
| *Athyrium filix-femina* (L.) Roth. | Ladyfern |
| *Berberis nervosa* Pursh | Cascade hollygrape; dwarf Oregon grape (Hemstrom and others 1985) |
| *Blechnum spicant* (L.) With. | Deerfern |
| *Calypso bulbosa* (L.) Oakes | Calypso |
| *Castanopsis chrysophylla* (Dougl.) A. DC. | Golden chinkapin |
| *Ceanothus velutinus* Dougl. ex Hook. | Snowbrush ceanothus |
| *Chimaphila menziesii* (R. Br.) Spreng. | Menzies princes-pine |
| *Chimaphila umbellata* (L.) Bart. | Common princes-pine |
| *Circaea alpina* L. | Alpine circaea |
| *Clintonia uniflora* (Schult.) Kunth | Queencup beadlily |
| *Coptis laciniata* Gray | Cutleaf goldthread |
| *Corallorhiza mertensiana* Bong. | Pacific coralroot |
| *Cornus canadensis* L. | Bunchberry dogwood |
| *Cornus nuttallii* Aud. ex T. & G. | Pacific dogwood |
| *Corylus cornuta* var. *californica* (DC.) Sharp | California hazel |
| *Disporum hookeri* (Torr.) Nicholson | Fairybells |
| *Dryopteris dilatata* Gray | Mountain woodfern |
| *Festuca occidentalis* Walt. | Western fescue |
| *Galium triflorum* Michx. | Sweetscented bedstraw |
| *Gaultheria ovatifolia* Gray | Oregon wintergreen |
| *Gaultheria shallon* Pursh | Salal |
| *Goodyera oblongifolia* Raf. | Rattlesnake plantain |
| *Gymnocarpium dryopteris* (L.) Newm. | Oak-fern |
| *Hieracium albiflorum* Hook. | White hawkweed |
| *Holodiscus discolor* (Pursh) Maxim. | Creambush rockspirea |

[1]Nomenclature follows Garrison and others (1976).
[2]Plants listed have been verified; a complete survey has not been made.

| Scientific name | Common name |
|---|---|
| *Iris tenax* Dougl. ex Lindl. | Oregon iris |
| *Linnaea borealis* L. | Twinflower |
| *Listera* sp. R. Br. | Listera |
| *Lonicera ciliosa* (Pursh) DC. | Western trumpet honeysuckle |
| *Menziesia ferruginea* Smith | Rusty menziesia |
| *Oplopanax horridum* (J. E. SM.) Miq. | American devilsclub |
| *Oxalis oregana* Nutt. Ex T. & G. | Oregon oxalis; oxalis (Hemstrom and others 1985) |
| *Pedicularis racemosa* Dougl. ex Hook. | Sickletop pedicularis |
| *Pinus lambertiana* Dougl. | Sugar pine |
| *Pinus monticola* Dougl. ex D. Don | Western white pine |
| *Polystichum munitum* (Kaulf.) Presl. | Western swordfern; swordfern (Hemstrom and others 1985) |
| *Pseudotsuga menziesii* (Mirbel) Franco | Douglas-fir |
| *Pteridium aquilinum* (L.) Kuhn in Von Cer Cecken | Bracken |
| *Pterospora andromedea* Nutt. | Woodland pinedrops |
| *Pyrola asarifolia* Michx. | Alpine pyrola |
| *Pyrola picta* Smith | Whitevein pyrola |
| *Rhododendron macrophyllum* G. Don | Pacific rhododendron; rhododendron (Hemstrom and others 1985) |
| *Rhus diversiloba* T. & G. | Sumac |
| *Ribes bracteosum* Dougl. ex Hook. | Stink currant |
| *Rosa gymnocarpa* Nutt. | Baldhip rose |
| *Rubus nivalis* Dougl. ex Hook. | Snow dewberry |
| *Rubus parviflorus* Nutt. | Western thimbleberry |
| *Rubus spectabilis* Pursh | Salmonberry |
| *Rubus ursinus* Cham. & Schlecht. | California dewberry |
| *Smilacina stellata* (L.) Desf. | Starry solomonplume |
| *Streptopus amplexifolius* (L.) DC. | Claspleaf twistedstalk |
| *Symphoricarpos mollis* Nutt. | Snowberry |
| *Taxus brevifolia* Nutt. | Pacific yew |
| *Thuja plicata* Donn | Western redcedar |
| *Tiarella trifoliata* L. | Foamflower |
| *Tiarella unifoliata* Hook. | Coolwart foamflower |
| *Trientalis latifolia* Hook. | Western starflower |
| *Trillium ovatum* Pursh | Pacific trillium |
| *Tsuga heterophylla* (Raf.) Sarg. | Western hemlock |
| *Vaccinium alaskaense* Howell | Alaska huckleberry (Hemstrom and others 1985) |
| *Vaccinium membranaceum* Dougl. ex Hook. | Big whortleberry |
| *Vaccinium parvifolium* Smith | Red whortleberry |
| *Vancouveria hexandra* (Hook.) Morr. & Dec. | White vancouveria |
| *Viola sempervirens* Greene | Redwoods violet |
| *Whipplea modesta* Torr. | Modest whipplea |
| *Xerophyllum tenax* (Pursh) Nutt. | Common beargrass; beargrass (Hemstrom and others 1985) |

## Appendix 2

Reptiles, amphibians, birds, and mammals believed to be in the Middle Santiam Research Natura Area are listed below:[1]

| Order | Scientific name | Common name | Elevation and habitat[2] |
|---|---|---|---|
| | | REPTILES AND AMPHIBIANS[3] | |
| Candata | *Ambystoma gracila* | Northwestern salamander | Low-mid; riparian, upland (during rains) |
| | *Aneides ferreus* | Clouded salamander | Low; upland |
| | *Batrachoseps wrighti* | Oregon slender salamander | Low-mid |
| | *Dicamptodon ensatus* | Pacific giant salamander | Low-high; riparian, upland |
| | *Ensatina eschscholtzi* subspecies *oregonensis* | Ensatina | Low; riparian-upland |
| | *Plethodon dunni* | Dunn's salamander | Low; riparian-upland |
| | *Rhyacotriton olympicus* | Olympic salamander | Low; riparian |
| | *Taricha granulosa* | Rough-skinned newt | Low-high; riparian, upland |
| Anura | *Ascaphus truei* | Tailed frog | Low-mid; riparian |
| | *Bufo boreas* | Western toad | Low-high; riparian, upland |
| | *Hyla regilla* | Pacific tree frog | Low-mid; riparian, upland |
| | *Rana aurora* | Red-legged frog | Low; riparian, upland (only during heavy rains) |
| | *Rana cascadae* | Cascade frog | High; riparian, upland |
| Serpentes | *Charina bottae* | Rubber boa | Low-mid; upland |
| | *Diadophis punctatus* | Ringneck snake | Low; upland |
| | *Thamnophis ordinoides* | Northwestern garter snake | Low-high; upland |
| | *Thamnophis sirtalis* | Common garter snake | Low-high; upland, riparian |
| Squamata | *Sceloporus occidentalis* | Western fence lizard | Low; upland |
| | | BIRDS[4] | |
| Anseriformes | *Aix sponsa* | Wood duck | Low; riparian |
| | *Ardea herodias* | Great blue heron | Low; riparian |
| | *Histrionicus histrionicus* | Harlequin duck | Low; riparian |
| | *Mergus merganser* | Common merganser | Low; riparian |

[1]Vertebrates listed are believed to use the area during some part of the year; information supplied by Chris Maser, wildlife biologist, U.S. Department of the Interior, Bureau of Land Management, Forestry Sciences Laboratory, Corvallis, Oregon.

[2]Elevation: low=300 to 800 m, mid=800 to 1200 m, high=1200+ m.

[3]Nomenclature follows Stebbins (1966).

[4]Nomenclature follows Peterson (1961).

| Order | Scientific name | Common name | Elevation and habitat[2] |
|---|---|---|---|
| Falconiformes | *Accipiter gentilis* | Goshawk | Low-mid; old growth |
| | *Buteo jamaicensis* | Red-tailed hawk | Low-high |
| | *Cathartes aura* | Turkey vulture | Low-high |
| Galliformes | *Bonasa umbellus* | Ruffed grouse | Low-mid |
| | *Dendragapus obscurus* | Blue grouse | Low-high |
| Columbiformes | *Columba fasciata* | Band-tailed pigeon | Low-high |
| | *Zenaidura macroura* | Mourning dove | Low-mid |
| Strigiformes | *Aegolius acadius* | Saw-whet owl | Low-mid; old growth |
| | *Bubo virginianus* | Great-horned owl | Low-mid |
| | *Glaucidium gnoma* | Pygmy owl | Low-mid; old growth, riparian |
| | *Strix occidentalis* | Spotted owl | Low-high; old growth |
| Caprimulgiformes | *Chordeiles minor* | Common nighthawk | Low-high; openings |
| Apodiformes | *Chaetura vauxi* | Vaux's swift | Low-high; old growth |
| | *Megaceryle alcyon* | Belted kingfisher | Low; riparian |
| | *Selasphorus rufus* | Rufous hummingbird | Low-high; openings, forest margins |
| Piciformes | *Colaptes cafer* | Red-shafted flicker | Low-high |
| | *Dendrocopos pubescens* | Downy woodpecker | Low-high; second growth, old growth |
| | *Dendrocopos villosus* | Hairy woodpecker | Low-high; old growth |
| | *Dryocopus pileatus* | Pileated woodpecker | Low-high; old growth |
| | *Sphyrapicus varius* | Red-breasted sapsucker | Low-high; old growth |
| Passeriformes | *Bombycilla cedrorum* | Cedar waxwing | Low-high |
| | *Certhia familiaris* | Brown creeper | Low-high; old growth |
| | *Cinclus mexicanus* | Dipper (water ouzel) | Low-high; riparian |
| | *Contopus sordidulus* | Western wood pewee | Low-high; forest margins |
| | *Corvus corax* | Common raven | Low-high; cliff |
| | *Cyanocitta stelleri* | Steller's jay | Low-high; old growth |
| | *Dendroica auduboni* | Audubon's warbler | Low-mid; forest margins |
| | *Dendroica occidentalis* | Hermit warbler | Low-high; old growth |
| | *Dendroica townsendii* | Townsend's warbler | Low-high; old growth |
| | *Empidonax difficilis* | Western flycatcher | Low-high; old growth |
| | *Empidonax hammondii* | Hammond's flycatcher | Low-mid; old growth |
| | *Empidonax oberholseri* | Dusky flycatcher | Low-high; forest margin |
| | *Hesperiphona vespertina* | Evening grosbeak | High; openings, old growth |

| Order | Scientific name | Common name | Elevation and habitat[2] |
|---|---|---|---|
| | *Hylocichla guttata* | Hermit thrush | Low-high; old growth |
| | *Hylocichla ustulata* | Swainson's thrush | Low-high; old growth |
| | *Ixoreus naevius* | Varied thrush | Mid-high; old growth |
| | *Junco hyemalis* | Slate-colored junco | Low-high; openings |
| | *Leucosticte tephrocotis* | Gray-crowned rosy finch | Mid-high; old growth |
| | *Loxia curvirostra* | Red crossbill | High; old growth |
| | *Melospiza melodia* | Song sparrow | Low-high; openings |
| | *Myadestes townsendi* | Townsend's solitaire | Low-high; old growth, riparian |
| | *Nucifraga columbiana* | Clark's nutcracker | High; old growth, forest margins |
| | *Oporornis tolmiei* | MacGillivray's warbler | Low; forest margins |
| | *Parus articapillus* | Black-capped chickadee | Low-high; second growth, old growth |
| | *Parus rufescens* | Chestnut-backed chickadee | Low-high; second growth, old growth |
| | *Passerella iliaca* | Fox sparrow | Low-high; openings |
| | *Perisoreus canadensis* | Gray jay | Mid-high; old growth |
| | *Petrochelidon pyrrhonota* | Cliff swallow | Cliff; low; riparian |
| | *Pinicola enucleator* | Pine grosbeak | Low-high; old growth |
| | *Pipilo erythrophthalmus* | Rufous-sided towhee | Low-high; openings |
| | *Piranga ludoviciana* | Western tanager | Low-high; old growth |
| | *Regulus calendula* | Ruby-crowned kinglet | Low-high; old growth |
| | *Regulus satrapa* | Golden-crowned kinglet | Mid-high; old growth |
| | *Sialia mexicana* | Western bluebird | High; openings, forest margins |
| | *Sitta canadensis* | Red-breasted nuthatch | Low-high; old growth |
| | *Spinus pinus* | Pine siskin | Low-high |
| | *Stelgidopteryx ruficollis* | Rough-winged swallow | Low; riparian |
| | *Sturnus vulgaris* | Starling | — |
| | *Tachycineta thalassina* | Violet-green swallow | Low-high; openings, riparian |
| | *Troglodytes troglodytes* | Winter wren | Low-high; old growth, second growth |
| | *Turdus migratorius* | Robin | Low-high |
| | *Vireo solitarius* | Solitary vireo | Low-mid |
| | *Zonotrichia leucophrys* | White-crowned sparrow | Low-high; openings |

| Order | Scientific name | Common name | Elevation and habitat[2] |
|---|---|---|---|
| | | MAMMALS[5] | |
| Insectivora | *Neurotrichus gibbsi* | Shrew-mole | Low-high; riparian-upland |
| | *Scapanus orarius* | Pacific mole | Low-high; riparian-upland |
| | *Sorex bendirei* | Pacific water shrew | Low-high; riparian |
| | *Sorex obscurus* | Dusky shrew | Low-high; riparian-upland |
| | *Sorex trowbridgei* | Trowbridge shrew | Low-high; second growth, old growth |
| | *Sorex vagrans* | Vagrant shrew | Low-high; upland |
| | *Sorex obscurus* | Dusky shrew | Low-high; riparian-upland |
| Chiroptera | *Eptesicus fuscus* | Big brown bat | Low-high; old growth, second growth |
| | *Lasionycteris noctivagans* | Silver-haired bat | Low-high; old growth, second growth |
| | *Lasiurus cinereus* | Hoary bat | Low-high |
| | *Myotis californicus* | California myotis | Low-high; riparian |
| | *Myotis evotis* | Long-eared myotis | Low-high; riparian |
| | *Myotis lucifugus* | Little brown myotis | Low-high |
| | *Myotis volans* | Long-legged myotis | Low-high |
| | *Myotis yumanensis* | Yuma myotis | Low; riparian |
| | *Plecotus townsendi* | Western big-eared bat | Low-high; cliff, old growth, second growth |
| Lagomorpha | *Lepus americanus* | Snowshoe hare | Low-high |
| | *Ochotona princeps* | Pika | Mid-high; talus slopes |
| Rodentia | *Aplodontia rufa* | Mountain beaver | Low-mid |
| | *Castor canadensis* | Beaver | Low; riparian |
| | *Clethrionomys occidentalis* | California red-backed vole | Low-high; second growth, old growth |
| | *Erethizon dorsatum* | Porcupine | Low-high |
| | *Eutamias townsendi* | Townsend chipmunk | Low-high |
| | *Glaucomys sabrinus* | Northern flying squirrel | Low-high; second growth, old growth |
| | *Microtus longicaudus* | Longtail vole | Low; riparian |
| | *Microtus richardsoni* | Richardson vole | Low-high; riparian |
| | *Neotoma cinerea* | Bushytail woodrat | Low-high; talus slopes, old growth |
| | *Peromyscus maniculatus* | Deer mouse | Low-high |
| | *Phenacomys albipes* | Pacific phenacomys | Low; riparian |
| | *Phenacomys longicaudus* | Tree phenacomys | Low-mid; second growth, old growth |
| | *Tamiasciurus douglasi* | Chickaree | Low-high; second growth, old growth |
| | *Zapus trinotatus* | Pacific jumping mouse | Low; riparian |

[5]Nomenclature follows Burt and Grossenheider (1976).

| Order | Scientific name | Common name | Elevation and habitat[2] |
|---|---|---|---|
| Carnivora | *Canis latrans* | Coyote | Low-high; openings |
| | *Felis concolor* | Mountain lion | Low-high |
| | *Lutra canadensis* | River otter | Low-mid; riparian |
| | *Lynx rufus* | Bobcat | Low-high |
| | *Martes americana* | Marten | Low-high; talus slopes, old growth |
| | *Mustela erminea* | Shorttail weasel | Low-high |
| | *Mustela frenata* | Longtail weasel | Low-high |
| | *Mustela vison* | Mink | Low-mid; riparian |
| | *Procyon lotor* | Raccoon | Low-mid; riparian |
| | *Spilogale putorius* | Spotted skunk | Low-mid |
| | *Ursus americanus* | Black bear | Low-high |
| | *Vulpes fulva* | Red fox | Mid-high; openings |
| Artiodactyla | *Cervus elaphus* subspecies *roosevelti* | Roosevelt elk | Low-high |
| | *Odocoileus hemionus* subspecies *columbianus* | Blacktail deer | Low-high |



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The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.



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