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SPRING-SEASON DEER BROWSING OF DOUGLAS-FIR ON THE CAPITOL FOREST IN WESTERN WASHINGTON

by

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ABSTRACT

Deer started browsing Douglas-fir shortly after bud burst began and continued browsing for about 1 month. Douglas-fir was eaten despite abundant new growth on many plant species that deer prefer in late spring and early summer. The beginning and ending of tree browsing did not seem to be related to any visual growth-stage characteristic except bud burst. Leaders were growing rapidly when browsing began and ended. Availability of other vegetation in similar stages of development also appeared unrelated to Douglas-fir browsing.

This paper reports results of a series of closely spaced observations of deer browsing obtained during exploratory work to develop methods for use in a more extensive, long-term study of deer/Douglas-fir relationships. The work was conducted from mid-April through July 1967 on two tracts of land about 15 miles southwest of Olympia, Washington. The areas are located in the 72,000-acre Capitol Forest which is managed by the Washington State Department of Natural Resources.

The logging history of the Capitol Forest is long and complex. Timber harvesting began under private ownership before 1900 and continued through the 1930's. Wildfires and reforestation failures have

resulted in stands of mixed ages composed mainly of second-growth Douglas-fir. Many acres are still understocked. Some are overgrown with undesirable hardwoods and are currently under intensive rehabilitation.

STUDY AREA

Each of two study sites consisted of about 1 acre. "Maple Flats" was on a site previously occupied by a closed stand of vine maple (*Acer circinatum*). The hardwoods had been hand-cleared and the area experimentally planted with Douglas-fir in February 1964 as part of a survival and growth study.[1/]

The second tract, known here as Porter Ridge, is about 7 miles west of Maple Flats and was planted most recently in the late 1950's.

From appearances of the trees, both areas had sustained intensive deer browsing during the past 2 or more years. The monthly browsing pattern on newly planted Douglas-fir at Maple Flats was investigated in 1964 and 1965.[2/]

During both years, deer browsed Douglas-fir in the late spring and early summer. A similar browsing sequence probably occurred on Porter Ridge.

METHODS

For this study, randomly selected Douglas-fir trees were repeatedly examined for signs of browsing at 7- to 10-day intervals starting in mid-April and ending on August 2, 1967. Fifty trees were inspected at Maple Flats and 25 on Porter Ridge. Incidences of browsing were recorded without regard to amounts of foliage removed.

In addition, shrubs were tagged and ground plots installed to determine which plants were available and eaten by deer at times when they browsed Douglas-fir. Browsing on tall shrubs was evaluated by tagging one branch available to deer on the two shrubs nearest each sample tree. Browsing on species of *Rubus* was determined by examining individual plants in circular mil-acre plots centered at each tree marker stake.

[1/] Unpublished data from Washington State Department of Natural Resources on file at the Forest Land Management Center, Olympia, Wash.

[2/] Unpublished data held by E. J. Dimock II at the Forestry Sciences Laboratory, Olympia, Wash.

Browsing of herbaceous species was determined by periodic examinations of all plants growing in circular 3.1-square-foot plots (fig. 1). Plots were established adjacent to 20 sample trees on Maple Flats and next to 10 trees at Porter Ridge.

A B

Figure 1.-- Herbage sampling plot at Maple Flats. (A) taken in April 1967 shows little deer forage; (B) taken in June 1967 shows abundance of forage.

In mid-June, percent cover of low-growing plants was estimated in each herbage utilization plot by use of cover classes adapted from Daubenmire.[3/] Cover of taller shrubs was estimated in circular milacre

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3/ Daubenmire, R. F. A canopy-coverage method of vegetational analysis. Northwest Sci. 33:43-49. 1959.

plots centered at the same 20 and 10 trees as above. Most plants are named according to Hitchcock[4] and Hitchcock et al.[5]

Pellet group counts were used to confirm the presence of deer during the study period.

RESULTS

Douglas-fir.--At study installation, the 50 trees at Maple Flats averaged 27.0 ± 2.1 inches (p = 0.05) in height. The 25 trees at Porter Ridge were taller, averaging 42.3 ± 4.9 inches. Measurements during the final examination showed that Maple Flats trees were then 34.1 ± 2.9 inches high, and those on Porter Ridge were 63.1 ± 7.1 inches. Trees on both areas were still growing when last measured so these values do not represent final heights for the year.

Bud burst was first noted on May 19 at Maple Flats when one tree met the arbitrarily set requirement that the terminal plus at least 10 percent of the lateral buds be opened. Seven days later, shoots on more than 20 percent of the trees at Maple Flats and almost 40 percent of those on Porter Ridge were growing (fig. 2).

Tree browsing was first observed June 12 on both areas (fig. 3). By that time, shoot growth had begun on more than 80 percent of the sample trees. Between June 12 and the preceding inspection 10 days earlier, more trees were browsed than during any succeeding interval. Actually, nearly half of all the browsing recorded during the study took place during that period. On Porter Ridge, browsing continued at a relatively high rate for 2 more weeks, until June 30, and then stopped abruptly. The higher rate continued 1 week longer at Maple Flats and then declined there also. No browsing was detected at either location after July 17, and only one tree was browsed after July 7. Unbrowsed leaders were measured at Porter Ridge on July 7, 17, and August 2 to determine if the reduction in browsing observed on July 7 might be associated with a declining growth rate of shoots. Mean leader lengths of 13.6, 18.0, and 23.0 inches on respective dates indicated that shoots were still growing rapidly almost 3 weeks after the latest instance of browsing.

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[4] Hitchcock, A. S. Manual of the grasses of the United States. Ed. 2, rev. by Agnes Chase. U.S. Dep. Agr. Misc. Pub. 200, 1051 pp.

[5] Hitchcock, C. L., Cronquist, A., Owenby, M., and Thompson, J. W. Vascular plants of the Pacific Northwest. Univ. Wash. Pub. Biol. Vol. 17, parts 2, 3, 4, and 5. Seattle: Univ. Wash Press. 1955-64.

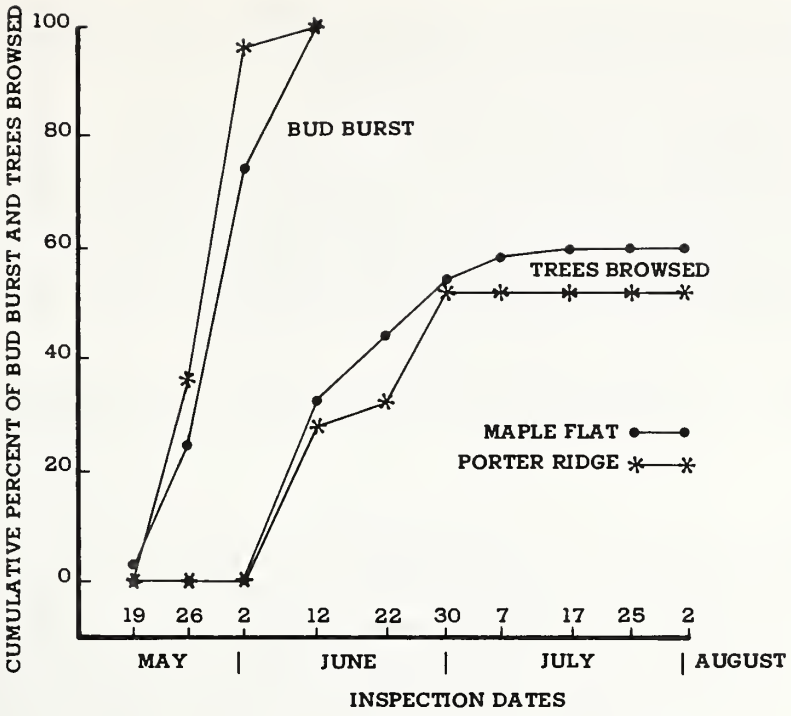

Figure 2.--Cumulative patterns of bud burst and browsing of Douglas-fir

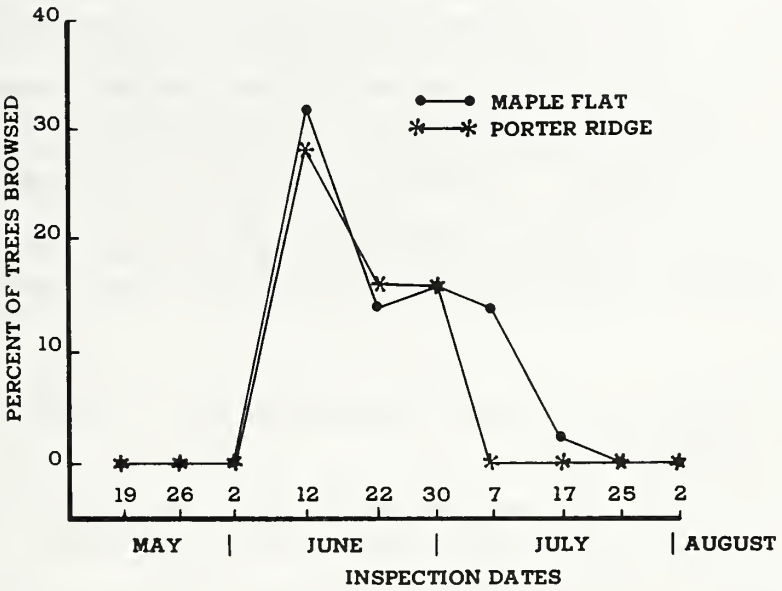

Figure 3.--Chronological patterns of browsing of Douglas-fir.

In all, 60 percent of the trees at Maple Flats and 52 percent at Porter Ridge were browsed to some degree (fig. 2). Thirteen percent of all trees were browsed more than once.

Other plants.--Although many of the same plant species were present on both areas, the dominants and the average cover of most species were strikingly different (table 1). The dominant hardwood at Maple Flats was cascara (*Rhamnus purshiana*). Individual cascara plants were well distributed over the area and reached heights of 8 feet or more. Repeated clipping by mountain beaver (*Aplodontia rufa*) kept crown cover relatively low despite large numbers of plants.

Plants of *Vaccinium* were the more abundant taller shrubs at Porter Ridge. Most were *V. parvifolium*, but many *V. ovalifolium* were also present.

Periodic observations of seasonal plant development indicated that leaf growth on woody plants began about 2 weeks before Douglas-fir bud burst. Most herbaceous species were also partially leafed out by that time. When Douglas-fir browsing began, those plant species favored by deer were estimated to be at or beyond the half-leafed stage. During the period when conifers were browsed, deer fed mainly on leaves and new twigs of woody plants and Douglas-fir (table 1 and fig. 2). Except for the browsing of flower buds and heads of *Hypochaeris radicata*, use of herbaceous plants was almost nonexistent.

CONCLUSIONS

Although the findings presented here resulted from a single, 1-year small-scale study, we believe they indicate a browsing pattern that may occur on many areas in the Douglas-fir region. Preliminary results of studies in the Coast Ranges of west-central Oregon suggest that intensive browsing of Douglas-fir in many clearcut units may also be limited to a short period following bud burst.[6/] Browning and Lauppe[7/] report a similar pattern in northwestern California.

Deer browsed Douglas-fir despite abundant new growth on many species of plants that deer prefer in the late spring and early summer.[8/]

6/ Unpublished data held by the writer at the Forestry Sciences Laboratory, Olympia, Wash.

7/ Browning, B. M., and Lauppe, E. M. A deer study in a redwood-Douglas-fir forest type. Calif. Fish and Game 50:132-147. 1964.

8/ Brown, E. R. The black-tailed deer of western Washington. Wash. State Game Dep. Biol. Bull. 13, 124 pp. 1961.

Table 1.--Ground cover composition and forage utilization on two study areas; Capitol Forest, Washington, 1967

Species	Percent cover		Maple Flats		Porter Ridge	
	Maple Flats	Porter Ridge	Apr. 17 to Aug. 2	June 2 to July 7	Apr. 17 to Aug. 2	June 2 to July 7
			---- Percent of shrubs with browsing -----			
Trees and taller shrubs:						
Pseudotsuga menziesii	(1/)	(1/)	60	58	52	52
Rhamnus purshiana	8	0	1	0	0	0
Acer circinatum	2	0	33	29	0	0
Vaccinium parvifolium	<1	2	100	0	60	55
Corylus cornuta	<1	0	0	0	0	0
Salix scouleriana	0	2	0	0	85	77
Vaccinium ovalifolium	0	<1	0	0	100	33
			---- Percent of plots with browsing -----			
Low shrubs and herbs:						
Pteridium aquilinum	20	2	0	0	0	0
Rubus ursinus	17	9	0	0	37	26
Rubus spectabilis	17	1	19	19	50	40
Vancouveria hexandra	17	0	0	0	0	0
Chrysanthemum leucanthemum	10	0	0	0	0	0
Holcus lanatus	6	16	0	0	0	0
Hypochaeris radicata	6	40	33	33	80	80
Lotus crassifolius	5	0	0	0	0	0
Elymus glaucus	3	<1	8	0	50	0
Crepis capillaris	2	<1	0	0	0	0
Senecio jacobaea	2	<1	0	0	0	0
Anaphalis margaritacea	1	1	0	0	0	0
Solidago canadensis	1	0	0	0	0	0
Galium triflorum	1	0	0	0	0	0
Luzula spp.	<1	1	0	0	0	0
Asarum caudatum	<1	6	0	0	0	0
Cirsium sp.	<1	1	0	0	0	0
Rumex acetosella	<1	1	0	0	0	0
Total plant cover 2/	89	60				
Bare ground	1	0				
Litter	96	69				

1/ Not estimated.

2/ 21 additional plant species were recorded but only those averaging at least 1 percent of cover on either area are shown.

Deer did not browse all or even moderate amounts of any reportedly preferred species. In fact, browsing was so inconspicuous on most species, except Douglas-fir, that relatively minute examinations were required to detect use.

The initiation and cessation of tree browsing did not appear to be related to any visible growth-stage characteristics except bud burst. Leaders were growing rapidly when browsing began and ended. Availability of other vegetation in similar stages of development appeared to have no effect on Douglas-fir browsing.

If the short-term pattern of spring-season browsing described here proves to be widespread, then reappraisal of current deer damage control practices might be appropriate since growing-season protection may only be needed for a few weeks following bud burst.