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# Treatment of an Old-Growth Stand and Its Effects on Birds, Ants, and Large Woody Debris: A Case Study

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## Abstract

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An old-structure stand with large amounts of tree mortality was treated to accelerate regeneration and reduce fuel loads but still maintain its function as old growth for selected bird species. The small-diameter (<15 inches in diameter at breast height [d.b.h.]), dead trees were removed as was some of the down wood <15 inches in diameter at the large end. All live trees of any size and all dead trees  $\geq 15$  inches d.b.h. were retained.

Vaux's swifts (*Chaetura vauxi*) and pileated woodpeckers (*Dryocopus pileatus*) continued to use the stand after harvest for nesting and roosting. Brown-headed cowbirds (*Molothrus ater*) were more than twice as common in the treated stand as in an adjacent unlogged, control stand.

In a comparison before and after harvest in the treated stand, the number of logs increased, the number of logs with ants increased, but the percentage of logs with ants decreased.

Keywords: Ants, down woody debris, old-structure stand, restoration, pileated woodpecker, Vaux's swift, Dryocopus, *Chaetura*, *Molothrus*, *Camponotus*, *Formica*.



## Introduction

Large amounts of tree mortality in many mixed-conifer stands in northeastern Oregon have resulted from the western spruce budworm (*Choristoneura occidentalis* Free.) outbreak of 1981-93. Stands with the most mortality are late-successional stands composed primarily of multiple layers of grand fir (*Abies grandis* (Dougl. ex D. Don) Lindl.). Treatment was desired in these stands to deal with the risk of fire and lack of early seral regeneration. Typically, a regeneration harvest would have been prescribed and the old structure converted to a very early structure. But these older stands are in short supply in most forests in northeastern Oregon and are important habitat for some wildlife species associated with older forests, so it is important that these stands be retained.

The goal of this study was to determine if an old-structure stand with large amounts of mortality could be altered to accelerate regeneration and reduce fuel loads but still maintain its function as old growth for selected bird species. To accomplish this goal, we harvested small-diameter dead trees to reduce fuels and reduce the risk of loss from catastrophic wildfire. In doing so, we maintained the large-diameter trees for old-growth characteristics and opened up the stand to encourage regeneration. A holistic approach to ecosystem management was taken in this limited microcosm (called Frog Heaven), and the effects on birds, ants, fire hazard, regeneration, soils, fisheries, and economics were considered.

To determine how this stand treatment affected wildlife, we monitored use of the stand by pileated woodpeckers (*Dryocopus pileatus*) and Vaux's swifts (*Chaetura vauxi*) before and after treatment. We selected these two species because they are associated primarily with older forests, and we knew they used this stand (Bull and Beckwith 1993). Other wildlife species primarily associated with older forests, such as the northern goshawk (*Accipiter gentilis*), white-headed woodpecker (*Picoides albolarvatus*), and American marten (*Martes americana*), were not found in the limited area represented at Frog Heaven and therefore could not be monitored. We conducted bird surveys in the treated stand and in an uncut old-structure stand (control) 0.1 mile away to ascertain differences in the relative abundance of bird species.

We also chose to monitor the occurrence of log-dwelling ants in the genera *Camponotus* (carpenter ants) and *Formica* (red wood ants) before and after treatment. These ants are primary prey of pileated woodpeckers (Bull and others 1992) and important predators of western spruce budworm (Torgersen and others 1990). Because ants nest in down wood, we inventoried down wood before and after logging. Our aim was to determine how down logs were affected, and how logging affected the occurrence of ants.

## Methods

In winter 1994, we treated a 38-acre stand at Frog Heaven (Sec. 18, T. 4 S., R. 34 E.), 26 miles southwest of La Grande, Oregon in the Wallowa-Whitman National Forest (fig. 1). This old-structure stand was in a grand fir/twinflower (*Linnaea borealis*) plant community (Johnson and Hall 1990). Species composition in the stand was 77 percent grand fir, 8 percent Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), 8 percent lodgepole pine (*Pines contorta* Dougl. ex Loud.), 5 percent western larch (*Larix occidentalis* Nutt.), and 2 percent ponderosa pine (*Pines ponderosa* Dougl. ex Laws). Basal area was 155 square feet per acre (of trees  $\geq 5$  inches in diameter at breast height [d.b.h.]), of which 107 square feet per acre was comprised of dead trees. Diameter-class distribution before harvest (stems per acre) was 84 percent in trees 6 to 14 inches d.b.h., 11 percent in trees 15 to 19 inches d.b.h., and 5 percent



A



B

Figure 1-Frog Heaven (A) before harvest and (B) after the small-diameter trees were removed (same photo point).

in  $\geq 20$  inches d.b.h. The Pacific Northwest Region stand exam program (USDA Forest Service 1985) and stand prognosis model (Johnson 1990) were used to determine species composition, basal area, and diameter-class distribution in the treated stand. Each of 20 sampling points consisted of a variable plot (BAF 40) and a 0.02-acre fixed plot (USDA Forest Service 1980).

An adjacent 55-acre stand 0.1 mile west of the treated stand was used as a control stand and was not logged. The control stand was in the same plant community and successional stage as the treated stand.

The history of Frog Heaven and surrounding stands includes both harvesting and insect outbreaks (Gast and others 1991). The stand was selectively fogged by railroad in the late 1940s, when the large-diameter ponderosa pine were removed. In the early 1960s, another selection harvest removed some of the large-diameter ponderosa pine, western larch, and Douglas-fir.

An outbreak of the mountain pine beetle (*Dendroctonus ponderosae*) in the 1970s caused mortality of lodgepole pine. Most of these dead trees fell over and formed the major component (60 percent) of the down wood in the stand before treatment. The western spruce budworm outbreak (1981-93) killed a large component of the understory fir and about 80-percent of the overstory fir in Frog Heaven. Douglas-fir bark beetles (*Dendroctonus pseudotsugae*) and fir engravers (*Scolytus ventralis*) also were very active in the stand.

### **Silvicultural Prescription**

The silvicultural prescription for the stand was a modified selection harvest with the intent to maintain large, old-structure components and regenerate the site with early seral species. The following standing trees were left: all western larch and ponderosa pine, all grand fir and Douglas-fir  $\geq 15$  inches d.b.h., and all live grand fir and Douglas-fir.

Harvesting of down logs was allowed with the following restrictions: retain logs  $\geq 15$  inches in large-end diameter, and retain at least 50 logs per acre. The large-diameter logs ( $\geq 15$  inches in diameter) were retained because pileated woodpeckers and black bears (*Ursus americanus*) forage extensively for ants in this material. The small-diameter logs were removed to reduce fuel loading and the risk of fire. Removing a portion of the logs provided a better chance of stopping a fire if one started and of reducing the intensity of a fire, but it was not our intent to "fireproof" the stand.

Several "no-cut" buffers and islands were left for structural diversity and habitat protection. A 100-foot uncut buffer was retained along a wet meadow, and another (30 to 100 feet wide) was retained along the edges of a dry grassland. Seven uncut islands, ranging from 0.1 to 1 acre, were retained around trees used by woodpeckers and swifts for nesting and roosting.

Winter logging was required to minimize soil disturbance and potential movement of sediment into the adjacent riparian area. Logging activity could occur on a minimum of 12 inches of snow or over frozen ground. No new roads were constructed. A standard of  $< 5$  percent soil disturbance was adopted because Frog Heaven is located in a spring Chinook salmon (*Oncorhynchus tshawytscha*) watershed.

Artificial regeneration was prescribed because the potential for natural regeneration was improbable owing to the lack of an early seral species seed source. Early seral species-ponderosa pine, western larch, and lodgepole pine-were planted to provide a diversity of tree species. Grand fir and Douglas-fir will seed naturally. Because Frog Heaven is within a sheep allotment, sheep will be excluded from the stand for 5 years to allow seedling establishment.

## **Bird Use**

We monitored use of the stand by Vaux's swifts, pileated woodpeckers, and other forest birds. Our objectives were to compare (1) the number of Vaux's swift nests and roosts before and after treatment, (2) roosting and foraging locations by pileated woodpeckers before and after treatment, and (3) avifauna between the treated and control stands after treatment.

We monitored Vaux's swift nest and roost trees in the Frog Heaven area each summer since 1990. Active nests and roosts were located by watching trees used in previous years as well as additional potential trees (that is, hollow trees with a broken top or cavity) for 1 hour (total) during July or August for adult swifts entering or leaving. Such behavior would indicate that the tree was being used for nesting. Each summer since 1990, the area has been searched for about 40 staff-hours for nests and roosts.

To compare pileated woodpecker use of the treated and control stands before and after treatment, we captured the three resident adult pileated woodpeckers (two males and one female) in August 1993 and equipped them with radio transmitters (Bull and Holthausen 1993). We located each bird twice a week during the day and once every other week at a roost at night to determine the bird's location, home range size, and roost tree. Unfortunately, the two males died before the stand was treated; one was killed by a raptor in August, and the other was found dead with a large tumor on its back on 16 January 1994. We have data on the female from August 1993 until May 1994.

Avifauna were surveyed by using variable circular plots (Reynolds and others 1980) within the treated and control stands. Three plots, placed 500 feet apart, were located near the centers of the treated and control stands. Birds were surveyed at all plots four times between 15 May and 20 June 1994 at 1- to 2-week intervals. The surveys were conducted between sunrise and 1000 hours. Birds were surveyed for 10 minutes at each plot. The order of survey of the plots was reversed on each visit to the stand. Surveys were not done during inclement weather. The species detected, either heard or seen, and the estimated horizontal distance to each bird were recorded.

## **Down Wood and Ants**

Down wood was inventoried in 1/40th-acre plots along two transects in the treated stand and along one transect in the control stand. Each transect was 33 feet wide and was flagged at 33-foot intervals to delineate 33-foot-square plots. There were 75 plots in the treated stand and 40 in the control stand.

**Table 1-Number of nest and roost trees used by Vaux's swifts in Frog Heaven, 1990-94**

| Year                | Nests | Roosts |
|---------------------|-------|--------|
| Pretreatment:       |       |        |
| 1990                | 4     | 1      |
| 1991                | 3     | 0      |
| 1992                | 4     | 0      |
| 1993                | 2     | 1      |
| Posttreatment, 1994 | 5     | 2      |

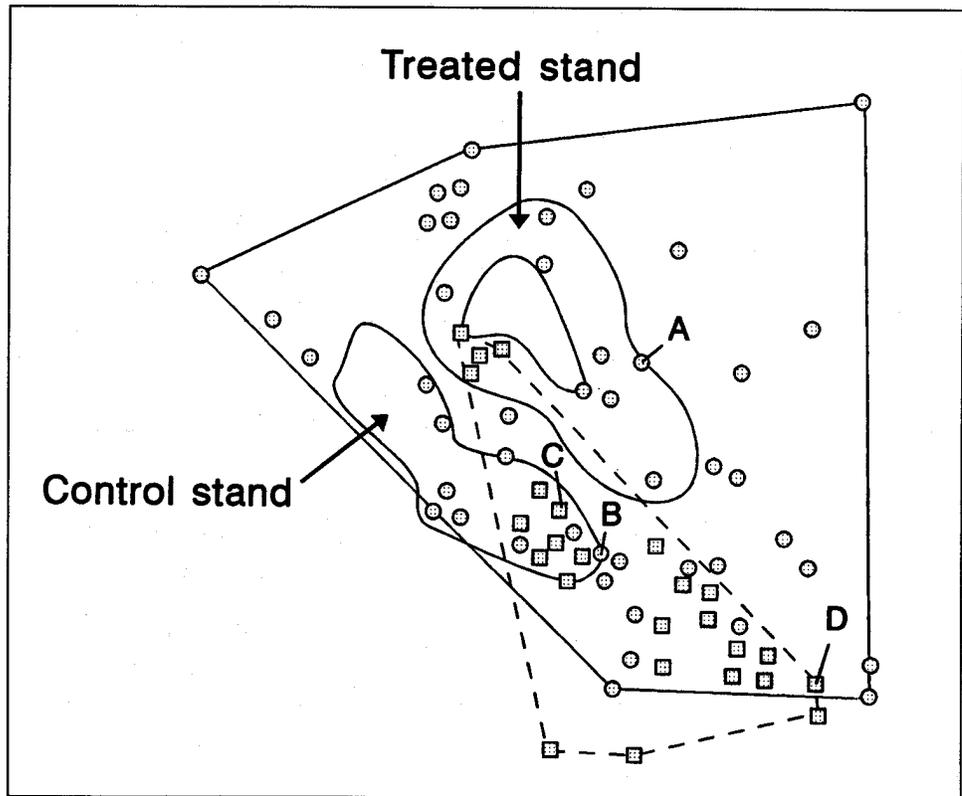


Figure 2-Locations and home range used by a female pileated woodpecker before (circles and solid line) and after treatment (squares and dashed line). The roost tree in the harvested area (A) was used from August until April; the second roost tree (B) was used in May. Two nest trees (C and D) with freshly excavated cavities were located in April and May.

All logs with a large-end diameter of  $\geq 6$  inches, and whose midlength fell within the plot, were tallied. Large-end and small-end diameters (including bark) were measured 2.5 inches from each end. When a log had any portion of the root-wad present, large-end diameter was taken just above the butt-swell. Diameter (including the bark) was estimated if the bark was partly or entirely absent. Total log length and species were recorded. Logs devoid of bark or that had decayed to the point where species could not be determined were recorded as "unknown." Douglas-fir and grand fir in advanced stages of decay were especially difficult to separate reliably so were combined as "firs."

Each log was examined along its entire length for signs of pileated woodpecker foraging and for ants. The presence of ants was determined by using a hatchet to remove pieces of bark or wood to expose ants. Smaller logs were rolled to expose ants that might be between the log and the forest floor. A sample of ants was collected for later identification in the laboratory. The presence of either *Camponotus* or *Formica* ants was recorded.

## Results

The Frog Heaven timber sale sold in December 1993 for \$1,315, or \$5.26 per ccf (1 ccf = 100 cubic feet), based on the 250 ccf that were removed. Logging started on 18 January 1994 and was completed in March. Although all the material was sold for fiber (chips), about 20 percent of the volume would have been merchantable as saw logs had the contractor chosen to sort the logs. Basal area of the stand after logging was about 110 square feet per acre, so 29 percent of the basal area was removed. There was very minor logging damage to the leave trees.

Winter 1994 was milder than normal, and the specification of logging over 12 inches of snow or frozen ground was difficult to meet. Logging operations were either stopped or limited to the morning hours during the mild weather. Soil disturbance was closely monitored by the timber sale administrator and fisheries biologist, and <5 percent soil disturbance was attained. Use of down wood was less than expected because the contractor had difficulty finding it under the snow.

The stand was planted with about 350 seedlings/acre in April 1994. Seedling composition was 60 percent western larch, 20 percent ponderosa pine, and 20 percent lodgepole pine. About 90-percent of the stand was stocked in October 1994.

## Bird Use

Vaux's swifts continued to use the two nest trees and one roost tree located within the sale boundaries after the harvest. The roost tree also contained an active swift nest. Two additional nests and one roost were located in the control stand in 1994. Table 1 shows the number of swift nests and roosts located in Frog Heaven between 1990 and 1994.

The female pileated woodpecker captured at a roost tree in Frog Heaven on 23 August 1993 was radio-located in the same roost tree on 30 nights between August and 9 April 1994 (fig. 2). She roosted in that tree during the logging operations in spite of a skid trail being within 75 feet of the tree.

Although her mate was found dead on 16 January, she was seen with another mate on 29 January. The male was seen and heard calling in Frog Heaven all spring. On one occasion, a third pileated was heard in Frog Heaven.

It appeared that the female and a new mate excavated two nest cavities. The first cavity was in a dead grand fir in the control stand, and the female roosted in that cavity at least one night in April. We suspect that the nesting attempt failed because incubation never commenced. The female was found dead of unknown causes in a second, recently excavated nest cavity on 24 May about 0.5 mile south of Frog Heaven.

This female had a home range size of 488 acres from August 1993 until May 1994. The area used during the 6 months before logging was larger (455 acres) than the area used for the 4 months after the onset of logging (114 acres) (fig. 2).

After the female's death, two pileateds were seen and heard in Frog Heaven and the adjacent stand throughout the summer. We do not know if these birds nested.

Species richness (mean number of bird species per survey point) averaged 10.0 in the treated stand and 10.2 in the control stand. Species abundance (mean number of birds per survey point) averaged 13.2 in the treated stand and 12.8 in the control stand. We detected too few individuals of most species to calculate detectability distances and relative abundances with just 1 year of sampling, so we present the average number of individuals of each species heard or seen per survey (table 2).

## Down Wood and Ants

The species composition of logs present before harvest was 60 percent lodgepole pine, 20 percent grand fir, 6 percent Douglas-fir, 4 percent western larch, 1 percent ponderosa pine, and 9 percent unknown. The species composition was not statistically different after harvest, although there was a slight shift to proportionately more Douglas-fir and western larch.

After harvest there was a substantial increase in the number of logs per acre in both the treated and control stands (table 3). The contractor removed fewer logs than expected because of the difficulty finding the logs under the snow. Before harvest there were 129 logs per acre, and after harvest this increased to 237 logs per acre, an increase of 84 percent between 1993 and 1994. Unexpectedly, the number of logs in the control also increased from 87 to 135 logs per acre, an increase of 56 percent between 1993 and 1994. Overall, the majority of the increases in the control occurred in the small-diameter classes (fig. 3). The number of large-diameter logs (=15 inches) increased in both the treated and control stands but at a lesser percentage than the small-diameter logs.

The tonnage of logs was similar in both stands before treatment and was greater in 1994 (table 3). There was a 40-percent increase in tonnage in the treated stand and a 30-percent increase in the control stand.

Although the number of logs with *Camponotus* and *Formica* ants increased between 1993 and 1994 in the treated stand (table 3), the percentage of logs with ants decreased from 29 to 22 percent. In the control stand, the percentage of logs with ants decreased precipitously from 35 to 19 percent (table 3).

Both the number and percentage of logs with recent pileated foraging signs increased in the control stand but decreased in the treated stand (table 3).

**Table 2-Average number of birds heard or seen during 4 surveys in the treated and control stands at Frog Heaven, 1994**

| Species   | Treated stand | Control stand |
|---|---------------|---------------|
| Red-tailed hawk<br>( <i>Buteo jamaicensis</i> )             | 0.25          | 0             |
| American kestrel<br>( <i>Falco sparverius</i> )             | .5            | 0             |
| Pileated woodpecker<br>( <i>Dryocopus pileatus</i> )        | .5            | 1.25          |
| Hairy woodpecker<br>( <i>Picoides villosus</i> )            | .25           | .75           |
| Black-backed woodpecker<br>( <i>Picoides arcticus</i> )     | .75           | .25           |
| Northern flicker<br>( <i>Colaptes auratus</i> )             | .75           | 2.0           |
| Williamson's sapsucker<br>( <i>Sphyrapicus thyroideus</i> ) | .5            | 0             |
| Unknown woodpecker  | .25           | 1.0           |
| Unknown sapsucker   | .5            | 1.0           |
| Western flycatcher<br>( <i>Empidonax</i> sp.)               | 0             | .25           |
| Unknown flycatcher  | .25           | .5            |
| Vaux's swift<br>( <i>Chaetura vauxi</i> )                   | 3.0           | 1.75          |
| Common raven<br>( <i>Corvus corax</i> )                     | 1.0           | .5            |
| Steller's jay<br>( <i>Cyanocitta stelleri</i> )             | 1.25          | .75           |
| Gray jay<br>( <i>Perisoreus canadensis</i> )                | .25           | .75           |
| Mountain chickadee<br>( <i>Parus gambeli</i> )              | 1.5           | 2.5           |
| Red-breasted nuthatch<br>( <i>Sitta canadensis</i> )        | 3.25          | 3.75          |
| Brown creeper<br>( <i>Certhia americana</i> )               | .25           | .5            |
| Ruby-crowned kinglet<br>( <i>Regulus calendula</i> )        | 1.0           | 0             |
| Golden-crowned kinglet<br>( <i>R. satrapa</i> )             | 0             | .25           |
| American robin<br>( <i>Turdus migratorius</i> )             | 3.5           | 2.25          |

**Table 2-Average number of birds heard or seen during 4 surveys in the treated and control stands at Frog Heaven, 1994 (continued)**

| Species  | Treated stand | Control stand |
|--|---------------|---------------|
| Swainson's thrush<br>( <i>Catharus ustulatus</i> )       | .75           | .25           |
| Hermit thrush<br>( <i>C. guttatus</i> )                  | 1.0           | 1.5           |
| Mountain bluebird<br>( <i>Sialia currucoides</i> )       | .25           | 0             |
| Solitary vireo<br>( <i>Vireo solitarius</i> )            | .75           | 0             |
| Warbling vireo<br>( <i>V. gilvus</i> )                   | .25           | 0             |
| Yellow-rumped warbler<br>( <i>Dendroica coronata</i> )   | 2.5           | 1.75          |
| Townsend's warbler<br>( <i>D. townsendi</i> )            | 0             | .25           |
| Orange-crowned warbler<br>( <i>Vermivora celata</i> )    | .5            | .75           |
| Unknown warbler  | .25           | 1             |
| Western meadowlark<br>( <i>Sturnella neglecta</i> )      | 0             | .25           |
| Brown-headed cowbird<br>( <i>Molothrus ater</i> )        | 2.25          | 1             |
| Western tanager<br>( <i>Piranga ludoviciana</i> )        | 2.75          | 2             |
| Chipping sparrow<br>( <i>Spizella passerina</i> )        | 3.5           | 3.75          |
| Lincoln's sparrow<br>( <i>Melospiza lincolni</i> )       | .25           | 0             |
| Unknown sparrow  | .25           | .25           |
| Dark-eyed junco<br>( <i>Junco hyemalis</i> )             | 3.75          | 4.25          |
| Cassin's finch<br>( <i>Carpodacus cassinii</i> )         | .25           | .5            |
| Unknown finch  | 0             | 1.25          |
| Evening grosbeak<br>( <i>Coccothraustes vespertina</i> ) | 1             | 0             |
| Pine siskin<br>( <i>Carduelis pinus</i> )                | 0             | .5            |

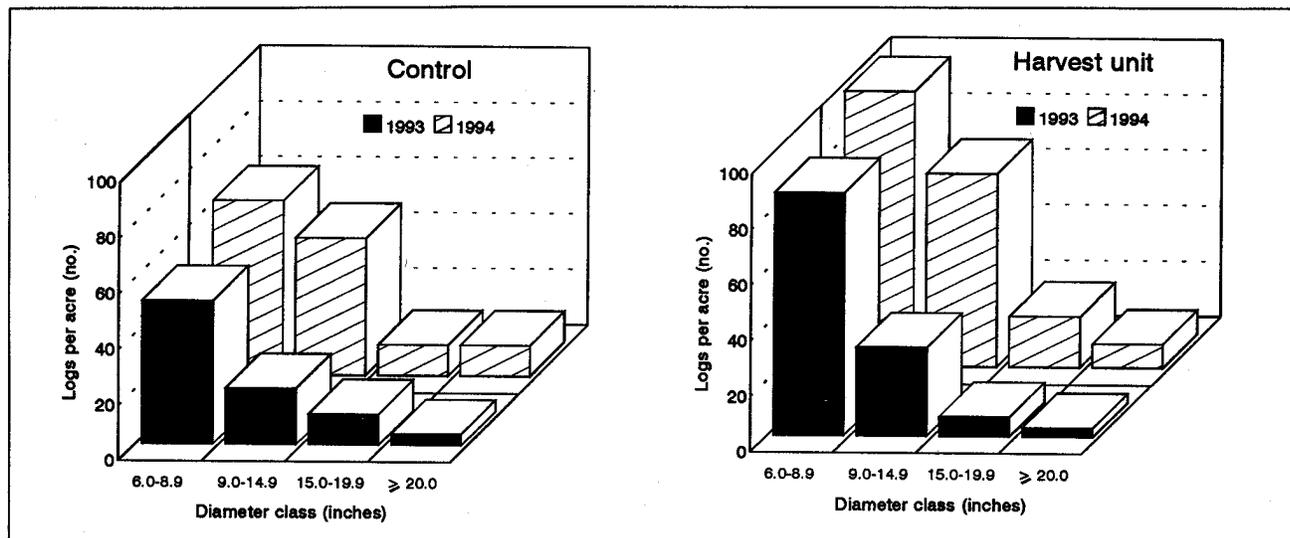


Figure 3-Number of logs per acre by diameter class in treated and control stands at Frog Heaven in 1993 and 1994. The treated stand was logged between sampling periods

**Table 3-Amounts of down logs in the treated and control stands in Frog Heaven in 1993 and 1994**

| Log characteristic  | Treated stand <sup>a</sup> |               | Control stand |               |
|---|----------------------------|---------------|---------------|---------------|
|   | 1993                       | 1994          | 1993          | 1994          |
| Logs per acre (no.) <sup>b</sup>  | 129.4                      | 237.3         | 86.9          | 135.4         |
| Logs per acre (tons)  | 17.4                       | 24.3          | 16.2          | 21.1          |
| Logs per acre with ants<br>(no.; percentage<br>in parentheses)  | 37.2<br>(29%)              | 52.9<br>(22%) | 30.3<br>(35%) | 26.3<br>(19%) |
| Logs per acre with recent<br>pileated woodpecker foraging<br>sign (no.; percentage<br>in parentheses) | 4.3<br>(3%)                | 3.2<br>(1%)   | 6.1<br>(7%)   | 13.4<br>(10%) |

<sup>a</sup> The treated stand was harvested between sampling periods.

<sup>b</sup> Logs = 6 inches large-end diameter.

## **Discussion Silvicultural Prescription**

The harvest prescription in Frog Heaven achieved some of the desired results: (1) the stand continued to look like and to function as old growth for swifts and pileated woodpeckers; (2) the fuel loading contributed by standing small-diameter trees was reduced by the removal of 250 ccf of fiber; (3) the stand was opened sufficiently to permit successful planting of western larch, ponderosa pine, and lodgepole pine; and (4) the number of logs containing ants was not reduced.

We recognize that stand conditions after this harvest treatment are short term, because within 5 to 20 years the residual dead overstory likely will fall over. At that time, the regeneration is expected to be 5 to 15 feet tall and should provide some cover for pileated woodpeckers and black bears that forage on the large-diameter down wood. Fuel loading will increase but primarily in the large 10-hour fuels and not in the 1- to 10-hour flashy fuels.

The removal of the small-diameter trees reduced the fire hazard by reducing the amount of fuels <3 inches in diameter. These fine fuels affect the rate of fire spread. The addition of larger down logs resulting from harvest will not affect the rate of spread of a fire but may contribute to an increase in fire intensity. Fire intensity will be moderated, however, because many of the fuels were broken and in close contact with the ground from the activity of the skidder. This condition should lead to fuels that remain moist and decay rapidly.

## **Bird Use**

We believe that the treated stand continued to function as old growth for Vaux's swifts and pileated woodpeckers because those birds continued to use the stand for nesting and roosting after it was harvested. However, more logs in the control stand had pileated woodpecker foraging after logging than before, and the treated stand had less foraging after logging. This change in foraging may indicate an avoidance of the treated stand and relocation of foraging effort in the nearby control stand. The sample size was too small to yield definitive results. In addition, we did not attribute the death of the female pileated woodpecker to the logging activity because she died some distance from the treated stand, and the treated stand comprised <7 percent of her home range.

Species richness and abundance detected during bird surveys were similar in the harvested and control stands. With only a few months lapsing after harvest, it was really too early to detect differences. Surveys should continue for 3 to 5 years to detect potential changes.

One notable difference in avifauna was more than double the number of brown-headed cowbirds (*Molothrus ater*) in the treated stand as compared with the control stand. The brown-headed cowbird is an obligate brood parasite that lays its eggs in nests of other bird species. The host then incubates eggs of the cowbird and raises their young (Ortega and others 1994). The brown-headed cowbird prefers forest edge habitats and may be the cause of declines in other species that it parasitizes.

## **Down Wood and Ants**

Changes in the species composition, number, and tonnage of logs tallied in 1994 were a result of the contribution of new logs not removed during harvest. In the control stand, there was also an increase in logs and tonnage, but this was a result of natural events such as wind-throw and breakage. Harvesting thus tended in this case to mimic the natural log recruitment that occurred in the control.

Harvest contributed slightly more large-diameter logs than did natural recruitment in the control. Large logs contribute less to fire hazard, represent better ant-colonizing substrate, and provide better foraging habitat for woodpeckers than down logs <15

inches in diameter. We attributed the general decrease in proportional use of logs by ants to the addition of newly fallen trees for which insufficient time had passed to allow colonization by ants. These new, noncolonized logs added to the total number of logs and thus decreased the proportional representation of ant colonization. We therefore do not conclude that the harvest had a detrimental effect on representation of ant colonies. We suggest that for future studies of harvest effects on ants, individual logs be tagged and monitored for at least three to five seasons.

This project was a case study with only 1 year of data, and additional research is needed before definitive recommendations can be made. This harvest treatment reduced fuels and fire risk and encouraged regeneration in an old successional-stage stand with heavy mortality. More years of surveys are needed to determine if populations of brown-headed cowbirds continue to increase and if foraging by pileated woodpeckers resumes in the harvested stand. Green, healthy, older forests do not require management to improve habitat for the bird species considered here.

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## Literature Cited

- Bull, E.L.; Beckwith, R.C. 1993.** Diet and foraging behavior of Vaux's swifts in northeastern Oregon. *Condor*. 95: 1016-1023.
- Bull, E.L.; Beckwith, R.C.; Holthausen, R.S. 1992.** Arthropod diet of pileated woodpeckers in northeastern Oregon. *Northwestern Naturalist*. 73: 42-45.
- Bull, E.L.; Holthausen, R.S. 1993.** Habitat use and management of pileated woodpeckers in northeastern Oregon. *Journal of Wildlife Management*. 57: 335-345.
- Grit, W.R., Jr.; Scott, D.W.; Schmitt, C. [and others]. 1991.** Blue Mountains forest health report: new perspectives in forest health. [Location of publisher unknown]: U.S. Department of Agriculture, Forest Service, Malheur, Umatilla, and Wallows-Whitman National Forests. [Unconventional pagination].
- Johnson, C.G., Jr.; Hall, F.C. 1990.** Plant associations of the Blue Mountains. R6-ECOL Area 3. [Portland, OR]: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region.
- Johnson, R.R. 1990.** The Blue Mountains geographic variant of the stand prognosis model. [Washington, DC]: U.S. Department of Agriculture, Forest Service, Timber Management.
- Ortega, C.P.; Ortega, J.C.; Cruz, A. 1994.** Use of artificial brown-headed cowbird eggs as a potential management tool in deterring parasitism. *Journal of Wildlife Management*. 58: 488-492.
- Reynolds, R.T.; Scott, J.M.; Nussbaum, R.A. 1980.** A variable circular-plot method for estimating bird numbers. *Condor*. 82: 309-313.
- Torgersen, T.R.; Mason, R.R.; Campbell, R.W. 1990.** Predation by birds and ants on two forest insect pests in the Pacific Northwest. In: Morrison, M.L.; Ralph, C.J.; Verner, J.; Jehl, J.R., Jr., eds. *Avian foraging: theory, methodology, and applications*. Studies in Avian Biology No. 13. Lawrence, KS: Allen Press: 14-19.
- U.S. Department of Agriculture, Forest Service. 1980.** Field instructions for timber resource inventories. Portland, OR: Division of Timber Management, Pacific Northwest Region. 111 p.
- U.S. Department of Agriculture, Forest Service. 1985.** Stand exam program. [Portland, OR]: Pacific Northwest Region.





**Bull, Evelyn L.; Torgersen, Torolf R.; Blumton, Arlene K.; McKenzie, Carol M.; Wyland, Dave S. 1995.** Treatment of an old-structure stand and the effect on birds, ants, and large woody debris: a case study. Gen. Tech. Rep. PNW-GTR-353. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

An old-structure stand with large amounts of mortality was treated to accelerate regeneration and reduce fuel loads but still maintain its function as old-growth for selected bird species and ants. Vaux's swifts and pileated woodpeckers continued to use the stand after harvest for nesting and roosting. Brown-headed cowbird populations, more than doubled after harvest. After harvest, amount of downed wood increased as did the number of logs with ants.

Keywords: Ants, down woody debris, old-structure stand, restoration, pileated woodpecker, Vaux's swift, *Dryocopus*, *Chaetura*, *Molothrus*, *Camponotus*, *Formica*.

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