EVALUATION OF SNAGS ON THE UNIVERSITY OF IDAHO EXPERIMENTAL FOREST, NORTHERN IDAHO

A Thesis

Presented in Partial Fulfillment of the Requirement for the

DEGREE OF MASTER OF SCIENCE

Major in Wildlife Management

in the

UNIVERSITY OF IDAHO GRADUATE SCHOOL

by

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April 1982

AUTHORIZATION TO PROCEED WITH FINAL DRAFT:

This thesis of Gordon Donald Bunch for the Master of Sciences degree with major in Wildlife Management and titled "Evaluation of Snags on the University of Idaho Experimental Forest, Northern Idaho", was reviewed in rough draft form by each Committee member as indicated by the signatures and dates given below and permission was granted to prepare the final copy incorporating suggestions of the Committee; permission was also given to schedule the final examination upon submission of two final copies to the Graduate School Office:

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FINAL EXAMINATION: By majority vote of the candidate's Committee at the final examination held on date of 5 April 1982 Committee approval and acceptance was granted.

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ABSTRACT

The study evaluated some aspects of snag availability and use on the University of Idaho Experimental Forest in Northern Idaho during 1977 and 1978. Snags were sampled throughout the four major management compartments and stand types within those compartments. The volume and density (number of snags per unit area) were estimated. Physical characteristics of snags that relate to use by cavity-nesting birds were ascertained. Cavity-nesting bird densities were estimated. The amount of snag material cut by firewood cutters during one year was estimated.

In general, there was a greater volume of dead standing material and density of snags in the well-stocked stand types. Differences in volume and density also existed for snag tree species and management compartments. Volume of dead standing material ranged from 3.1 m^3 per ha (268 ft^3 per acre) in the Flat Creek compartment to .7 m^3 per ha (59 ft^3 per acre) in the Big Meadow Creek compartment ($P<0.05$). Density of snags ranged from 11 snags per acre to 3 snags per acre.

Cavity-nesting birds chose to nest or forage on snags that were characterized by diameters $\geq$ 14 inches at breast height, broken tops, rotten sapwood, few branches, and little bark remaining. Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) snags were preferred over other species.

Bird densities (number of birds per 40 ha) for 3 major feeding guilds were estimated on the two oldest, most well-stocked stand types on the Experimental Forest.

Firewood cutters prefer western larch (*Larix occidentalis*), if available, and they also prefer standing snags over downed material.

Snag availability may be expected to decline as the demand for firewood increases. Snag management guidelines are provided.

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Snags or dead standing trees are a natural component of forested lands and are created by fire, disease, insect infestation, wind damage, competition and other agents. There are many, sometimes conflicting uses of these snags. Intensive forest management reduces the availability of snags because of the lack of snag recruitment during shorter rotations and continual removal of potential snags during thinning operations (Thomas et al. 1975). The Occupational Safety and Health Act (OSHA) requires that: "all snags and trees dangerous to any operation such as railroad traffic, wood operations, landings, donkeys, rigging, and campsites, shall be felled" (OSHA 1980). The increasing trend to use snags containing sound wood for wood products was a major topic of discussion at a Dead Wood Symposium held in Spokane, Washington during 1978. Firewood cutters are removing a large amount of dead wood, both standing and downed material, to use in home heating. This trend is expected to increase with escalating costs of heating homes with oil, gas or electricity.

The complete removal of snags from forested lands is detrimental to those wildlife species that depend upon snags to meet their habitat requirements. Many studies demonstrate the importance of snags as cavity-nesting bird habitat (Balda 1975; Conner et al. 1975; McClelland et al. 1975; Bull 1975, 1977 and 1981; Hardin et al. 1977 and Scott 1978 among others).

This study on the University of Idaho Experimental Forest (hereafter referred to as the Experimental Forest) should provide forest and wildlife managers with information concerning the physical aspects of snags that make them valuable as cavity-nesting bird habitat in Northern Idaho as well as other forested areas with similar habitat types and climate. The study objectives were to: 1) estimate the volume and density of snags on the Experimental Forest; 2) evaluate cavity-nesting bird use of snags on that area; 3) estimate the amount of snag material cut for firewood during one year; 4) estimate the density of cavity-nesting birds on the Experimental Forest; and 5) prepare a management plan for the snags and associated cavity-nesting birds on the Experimental Forest.

STUDY AREA

The 2897 ha (7158 acre) University of Idaho Experimental Forest consists of seven units (compartments) located 18 to 56 km (11 to 35 miles) northeast of Moscow, Idaho (Fig. 1). Data were collected on four units: Flat Creek (Unit 3), East Hatter Creek (Unit 2), West Hatter Creek (Unit 1) and Big Meadow Creek (Unit 4). These compartments included 98 percent of the total study area. The Flanagan Creek compartment (Unit 5) was not sampled because of inadequate access, and two other compartments were too small to sample.

The Experimental Forest lies within the Cedar (Thuja), Hemlock (Tsuga), Pine (Pinus sp.) western forest types (Kuchler 1964). Precipitation ranges from 63 to 89 cm (25 to 35 inches) per year and occurs mostly in the winter (Pitkin 1977). Habitat types present on the Experimental Forest are: Grand fir/pachistima (Abies grandis/Pachistima myrsinites), western redcedar/pachistima (Thuja plicata/Pachistima myrsinites), Douglas-fir/ninebark (Pseudotsuga menziesii/Physocarpus malvaceus) and subalpine fir/pachistima (Abies lasiocarpa/Pachistima myrsinites) (Daubenmire 1968). Major tree species found on the Experimental Forest are grand fir, Douglas-fir, western redcedar, ponderosa pine (Pinus ponderosa), western larch (Larix occidentalis), lodgepole pine (Pinus contorta) and western white pine (Pinus monticola). These species comprise 38, 22, 13, 10, 7, 6 and 2 percent of the total gross volume respectively. Fifty-four percent of the forest volume consists of sawtimber larger than 41 cm (16 inches) diameter at breast height (dbh) (Pitkin 1977). The forest is mostly well-stocked and contains patches of old growth timber although such disturbances as fire, insect damage, disease, and logging are evident.

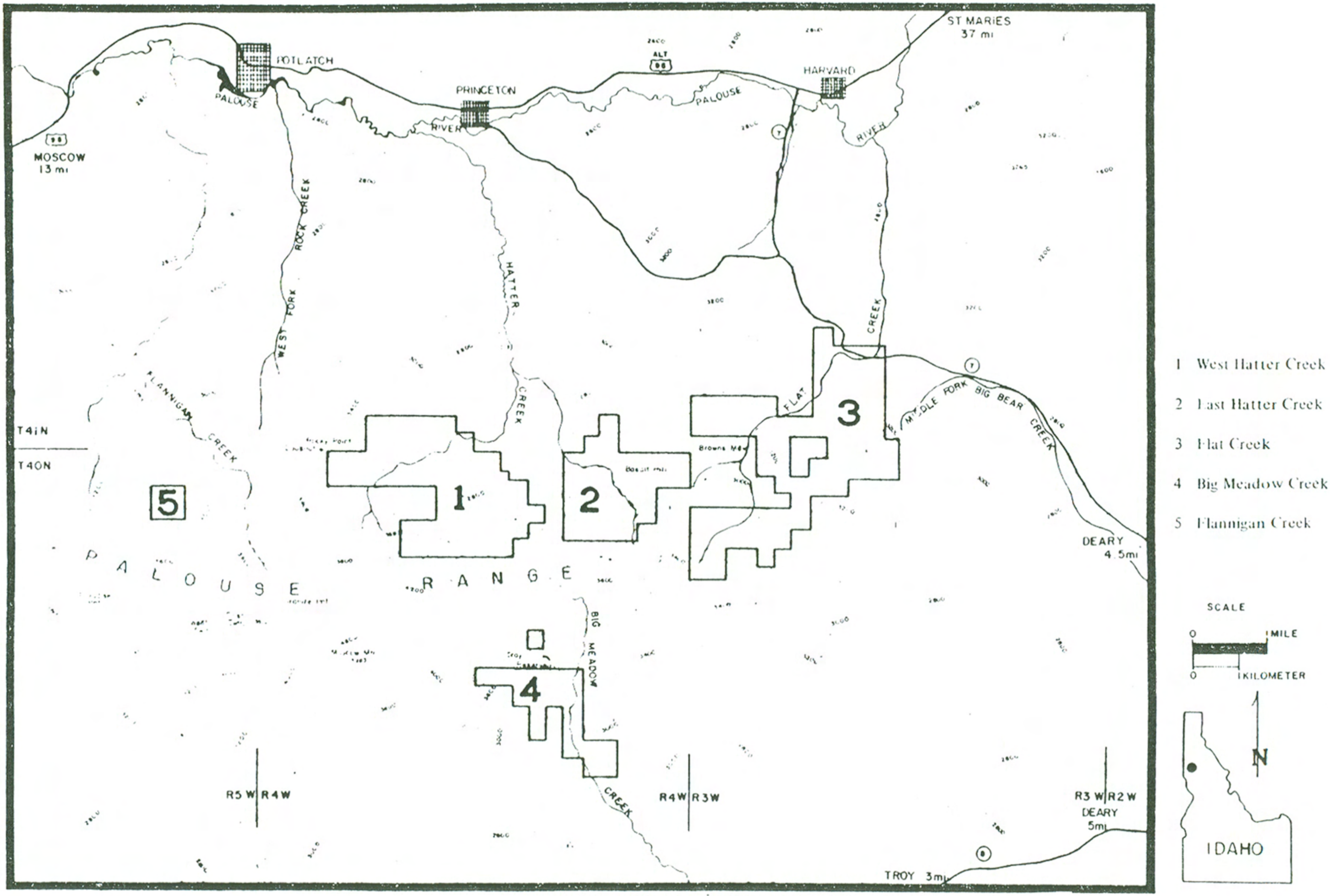

Fig. 1. Location of compartments comprising the University of Idaho Experimental Forest.

METHODS

Descriptive features, such as stand locations and habitat types, were obtained from a report on the Experimental Forest by G. Allen (1975). The report partitions the major forest compartments (Flat Creek, East Hatter Creek, etc.) into manageable subcompartments of 121 to 162 ha (300 to 400 acres). A number of stand types occur within each compartment. These stand types and compartments will be referred to throughout this report (Table 1) and are described in detail in Appendix B. Data analysis was conducted by compartment and stand type to facilitate integration of results into future forest management policy for the Experimental Forest.

Snag Volume and Density

Aerial photographs and topographic maps were used to delineate 16 ha (40 acre) blocks on the forest prior to initiation of field work. Each block constituted a sampling unit. A 20 x 305 m (66 x 1000 ft) strip transect was established within each of the 178 units (Fig. 2). Transects started 31 m (100 feet) from a randomly selected corner of each unit and were contained within the bounds of the sampling unit. Data were collected from 51 transects selected at random.

Field work was conducted from June to September 1977 and from July to mid-August 1978. The starting point of each transect was permanently marked with a numbered plastic tag attached to the base of the nearest large tree. A compass bearing was followed for transect placement. Snags occurring within the 10 m (33 feet) bounds on either side of the transect were counted. A 31 m (100 feet) fiberglass tape was used to measure distance.

Table 1. Basic stand descriptions ascertained from aerial photography interpretation (Allen 1975), University of Idaho Experimental Forest, 1975.

Stand Height Greater Than 40 Feet

Code	Crown Cover Description	Crown Cover Texture
21	Medium and well stocked	Coarse 1/
22	Medium and well stocked	Fine
23	Poorly stocked	Coarse
24	Poorly stocked	Fine
25	Two storied--overstory with manageable understory. Overstory generally poor but not more than medium stocked. Understory poorly (or more) stocked: at least 100 trees per acre would be left after removing overstory.	

Stand Height Less Than 40 Feet

Code	Crown Cover Description	Crown Cover Texture
26	Medium and well stocked	Fine
27	Poorly stocked	Fine
28	Apparently nonstocked	

Other

Code	Crown Cover Description
40	Noncommercial forest
60	Nonforest
92	Water (noncensus)

1/ Texture is a visual interpretation of the impression given by variability of crown size.

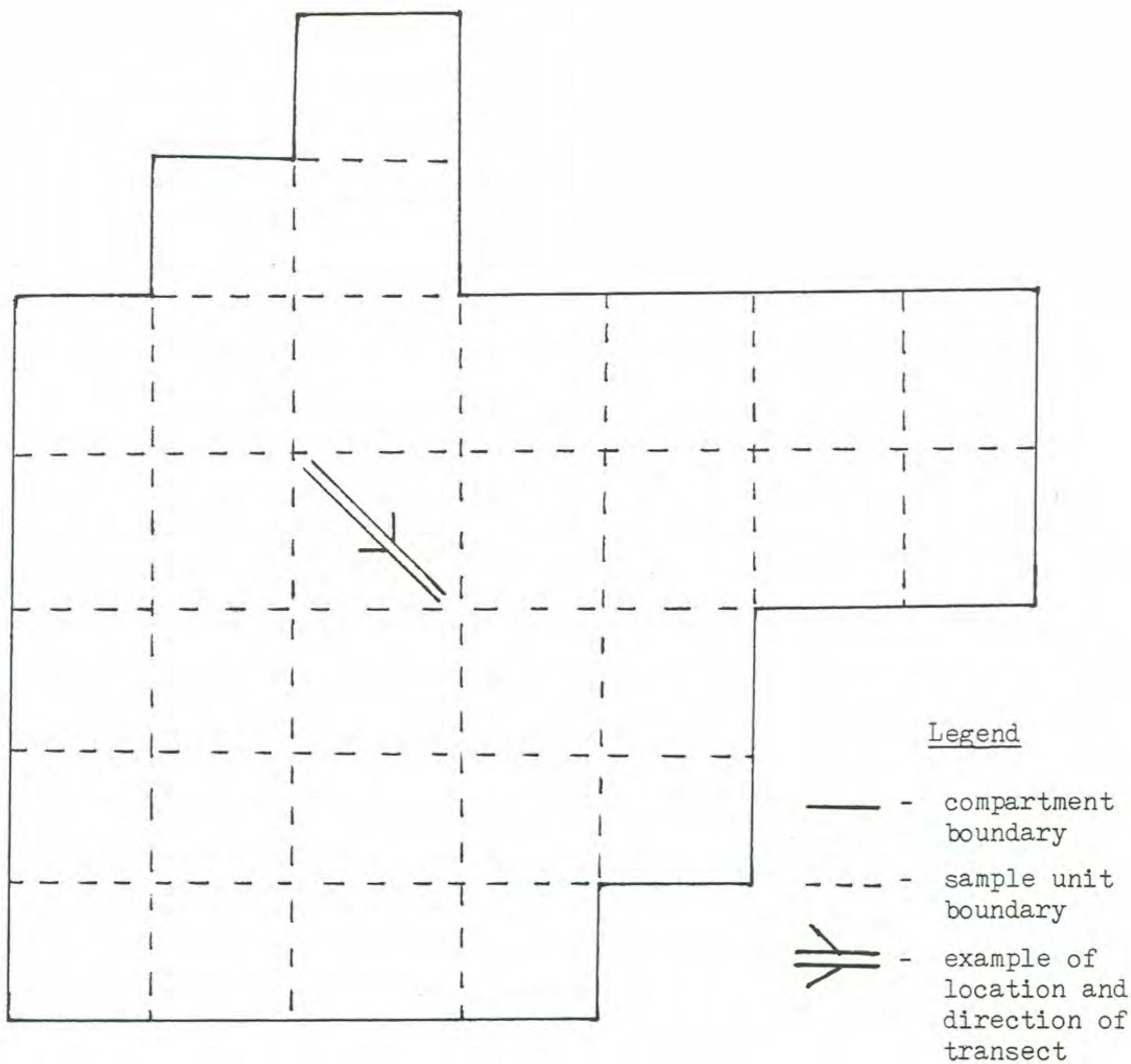

Fig. 2. Orientation and location of snag transect, East Hatter Creek compartment, University of Idaho Experimental Forest.

Snag locations along transects were plotted on aerial photographs. A map delineating locations of stand types was superimposed on these aerial photographs to determine stand types in which snags occurred. Volume of dead standing material was determined with a standard regional volume table for intact snags greater than 33 cm (13 inches) dbh. Volume of snags less than 33 cm dbh was ascertained from a table of volume for small trees (Allen et al. 1976). Snags with broken tops were treated as cull trees and form class tables gave the percent of the remaining bole below the break (Dilworth 1976:184). Volume for broken snags was then gained from volume tables.

Snag densities were calculated for the 0.6 ha (1.5 acre) transects and were extrapolated to stand type and management compartment. Analysis of Variance (ANOVA) was used to test differences in volume and density of snags by compartment and stand type. Results of ANOVA were treated with a Duncan's Multiple Range Test to ascertain differences between management compartments and stand types.

Individual Snag Data

Forty-three measurements were taken for snags $\geq$ 1.8 m (6 feet) tall and $\geq$ 15 cm (6 inches) dbh (Appendix C). Each snag base was permanently marked with a numbered aluminum tag. Each snag was numbered consecutively and could be additionally labelled as "T" (within the transect and used by wildlife) or "W" (used by wildlife but occurred off the transect). Placement of the tags insured that windthrow would leave them attached. Permanent marking of the snags will facilitate future studies on snag attrition and snag use by cavity-nesting birds.

Feeding use by birds was assumed if there were excavations on the lower 1.2 m (4 feet) of the snag. Bull (1975) determined that most foraging was done at or below this height. These excavations were considered the result of feeding activity if they were < 5 cm (2.5 inches) in depth and of an irregular shape with rough edges. Excavations were assumed nesting-roosting cavities when they occurred above 1.2 m (4 feet) and they were rounded or elliptical. These cavities were examined to determine if they were blind holes of only a few inches in depth or were of sufficient depth to be considered nest cavities. Nest holes were considered current if fresh wood chips occurred near the base of the snag, a bird was observed using the cavity, or the edges of the hole appeared freshly excavated. Snags having evidence of use by cavity-nesters were examined both on and off transects.

Snag height was measured to the nearest foot with a clinometer. The clinometer was also used to measure percent slope. Diameter at breast height was measured to the nearest inch with a standard metal diameter tape. Diameter measurements were grouped into four categories: 15.2 to 33 cm (6 to 13 inches), 35.6 to 53.3 cm (14 to 21 inches), 55.9 to 73.7 cm (22 to 29 inches) and 78.7 to 93.9 cm (31 to 37 inches). Relative soundness of the snag was rated according to the force required to turn a small torque wrench attached to the end of an increment borer in accordance with a technique developed by Bull (1975). A snag was considered to be rotten to soft if the relative soundness rating was 0 to .4 m-kg (0 to 3 ft-lbs) at a 2 inch depth, soft to sound if .6 to 1.1 m-kg (4 to 7 ft-lbs), sound if 1.2 to 1.5 m-kg (8 to 11 ft-lbs), and case-hardened if > 1.7 m-kg (12 ft-lbs) of force was necessary to turn the increment borer. The age of a snag was ascertained by counting the growth rings of a core sample taken from the tree with an increment borer. Age at death could not be determined when the snag was in a deteriorated condition. Percent canopy coverage was measured with a spherical densiometer. The observer counted the total number of points of the canopy reflected on 17 intersects of the spherical densiometer while facing in four cardinal directions. This total was multiplied by a constant of 1.5 (Strickler 1959).

Analysis of Snag Characteristics

The relationship between snag characteristics and uses by birds was analyzed differently depending on whether the variables were continuous or coded by class. Discriminant analysis was used to analyze continuous snag variables (Biomedical Programming 1975). This approach has worked well in other related studies (James 1971 and Conner et al. 1976). Class variables were analyzed using chi-square tests of association. Significant characteristics from all analyses were further analyzed with preference ratios and Bonferoni Z statistics (Neu et al. 1974). These analyses were conducted for each snag use (nesting-roosting, feeding, and combined use).

Firewood Cutting

Permits are required to cut firewood on the Experimental Forest. Illegal firewood cutting (individuals without permits) probably took place but could not be assessed. The Experimental Forest was visited on five weekends during the fall of 1977 and all firewood cutters encountered were checked for permits, species of tree cut, and the amount of snag material removed. A number of permittees was contacted by telephone at the end of the firewood cutting season and the total volume of snag material removed and snag tree species cut was estimated. The "in field" checks were used to assess the accuracy of the telephone survey.

Location of Complete Research:

Author & Title: Gordon Donald Bunch:
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University of Idaho Library:

Call Number- SD359.I3B8

College of Natural Resources:

Department- Wildlife

Other Sources: