92-0247

(180T)

DEPARTMENT OF
FOREST SCIENCE

OREGON
STATE
UNIVERSITY

Forestry Sciences Lab. 020
Corvallis, Oregon
97331-7501

September 30, 1993

MEMO TO: Ken Byford

FROM: Bill McComb Wm McComb

SUBJECT: Report on 1993 activities, Young Stand Management Study

Pretreatment data collection on habitat structure, bird communities, and small mammal and amphibian abundance has been completed. Preliminary analyses between bird abundance and habitat structure has begun and a manuscript describing those associations will be prepared this year. All data sets have been stored in the Forest Science databank.

Kelly Bettinger has sampled birds in 18 young stands ranging in age from 5-35 years and she will try to combine those data with the young stand data to develop chronosequence of bird and habitat patterns in Cascade young, managed stands. A copy of Kelly's proposal has been sent to Hal Legard and yourself.

Kevin McGarigal has begun to analyze data on snag patterns and abundance in managed sub-basins in the Coast Range. He is quantifying snag densities by patch type and snag distribution patterns at a range of spatial scales on the central Oregon Coast Range. He will be completing the analyses this fall and submitting the results to the Siuslaw National Forest by March.

/dks

Enclosures

Telephone
503-737-2244

Fax
503-737-1393

92-024

MONITORING CAVITY-NESTING BIRD USE IN CLEARCUTS AND WATERSHEDS ON WESTERN OREGON NATIONAL FORESTS

PROGRESS REPORT

Principal Investigators:

Bill McComb, Wildlife Biologist, Departments of Forest Science and Fisheries and Wildlife, Oregon State University, Corvallis, OR 97331

Kevin McGarigal, Wildlife Biologist, Department of Forest Science, Oregon State University, Corvallis, OR 97331

Sharon Hope, Forest Ecologist, Department of Forest Science, Oregon State University, Corvallis, OR 97331

Matt Hunter, Blue River District, Willamette National Forest, Blue River, OR

Forest Service Liaison:

Gene Silovsky, Regional Wildlife Ecologist, U.S. Forest Service, Portland, OR

TABLE OF CONTENTS

INTRODUCTION

In this report, we describe the progress that we have made to date on a pilot study that was conducted in FY90-91 that was designed to gain preliminary information on bird use of snags and responses to snag densities in recent harvest units; cavity-nesting bird relationships to watershed (~700-acre) scale habitat features, including snag densities; snag dynamics and snag-bird density through a retrospective examination of existing data sets; and sources of concern and problems faced by Forest Service biologists and logging contractors in implementing wildlife tree prescriptions in western Oregon and Washington.

Specifically, our objectives were to:

1. Accumulate as many data sets as possible that describe snag dynamics in managed forests of western Oregon and Washington, and summarize these. Revisit sites where snags have been marked in previous years to update existing data sets.

1. Accumulate as many data sets as possible that describe relationships between cavity-nesting bird abundance and snag abundance in managed forests of western Oregon and Washington, and summarize these data.

3. Assess the relationships between the cavity-nesting bird nest densities and residual snag densities (by size class, decay class etc.) in 18 3 to 5 year-old clearcuts in the Oregon Cascades.
4. Assess the relationship between snag densities (by stand condition) and cavity-nesting bird abundance over 10 watersheds (~700 acres each) in the Oregon Coast Range.
5. Develop and distribute a questionnaire to Forest Service Wildlife Biologists and logging contractors to identify areas of concern regarding implementation of wildlife tree prescriptions.

RETROSPECTIVE STUDIES

The retrospective studies were designed to assess data availability on each National Forest, within the U.S. Forest Service Pacific Northwest Research and U.S. Forest Service Forest Inventory and Analysis groups, and from other sources (Bureau of Land Management, Oregon State University, etc.). District and Supervisors Offices were contacted to determine what information on snag dynamics or snag-bird relationships may exist. Few data exist that have been collected in a consistent manner. We have gained permission form Barry Schrieber (Coast Range) and Bruce McCullough (Cascades) to use their data sets in combination with ours (see below) to assess relationships between cavity-nesting bird abundance and snag abundance at the stand scale.

Further, Abdel Azim Zumrawi, post-doctoral research assistant, has recently completed analyzing the Forest Service Inventory data from western Washington and eastern Oregon to assess snag fall rates for Douglas-fir, western hemlock, and ponderosa pine. The ponderosa pine fall rate data were supplemented with data from northern California provided by Martin G. Raphael and Michael L. Morrison. These data sets allowed construction of a computer model that will predicts 10-year fall rates of these species on non-federal lands in western Washington, eastern Oregon and northern California. The degree to which this model accurately predicts fall rates outside of that range is unknown. A final report is being completed for the Forest Service and will be available within the next month.

SNAG DENSITY - BIRD DENSITY RELATIONSHIPS

Methods

Because most cavity-nesting birds have territories that may not be wholly included within 1 stand, the basis for developing relationships between diurnal bird abundance and snag abundance was the number of cavity-nesting bird nests, by species, that occur within 18 3- to 5-year-old clearcuts. We selected a range of snag densities along a logarithmic scale within clearcuts in the Douglas-fir-western hemlock (Tsuga heterophylla) forest type in the Oregon Cascades. We defined forest type as the dominant members of a tree community that develops after harvest.

Relationships were tested with 2 types of dependent variables: nest densities (by species)/snag level and observations of individuals (by species)/snag level. Estimates of relative abundance will be used to determine if variable circular plot observations (VCP, Reynolds et al. 1980) provided an adequate index to the density of cavity-nesters actually nesting within these stands.

Strip transects were spaced 150 m apart and extended up to 50 m into the adjacent stand. Transects were marked with flagging prior to the field season. Each snag within the boundaries of the strip transects was examined carefully for signs of nesting use by cavity-nesting birds each month for 3 months (April, May and June 1991). Observation of each snag, listening for drumming, examination of the base of snags for chips, observing adults entering or exiting a cavity, and listening for young calling from the cavities were used to identify used cavities (similar to the methods described by Nelson 1988 and Schrieber 1987). Snags with an occupied cavity were marked with flagging. One observer conducted all of the formal nest searches. Additional nests were found during VCP counts.

Birds were counted in each stand 4 times during April, May, and June 1991. Variable circular plots were established at 150-m intervals along the transects. All birds seen or heard in the stand or along the stand edge were recorded by species and distance and their location mapped during an 8-minute observation period per VCP. Observations were made during the first 4 hours after official sunrise and not during rain or high wind.

All snags and green trees in each stand was counted and recorded by diameter class (beginning at 9 inches dbh) and decay class. All used and a stratified random sample of unused snags were characterized by measuring dbh, species, age (if known), decay class, height, top condition, presence of branches and twigs, bark cover, scorch percent (bark and sapwood), number of cavities, foraging sign (rating from none to high), distance to 2 nearest snags (for a dispersion index), number of snags surrounding the sample snag, distance to stand condition edge, distance to water, slope, aspect, topographic position, and lean. Additionally, the following variables were measured within 50 m of each VCP: percent cover of each tree and shrub species, vertical foliage profile description, and log lengths by decay and diameter classes. Snags used for nesting will be compared to unused random snags with discriminant function analysis to allow characterization of snags selected for nesting by each species.

Stand-level characteristics such as size, snag density by decay class and size class, green tree density, edge density, and percent mature forest within 0.5 mile of each stand center was determined for each stand. Habitat measured at the snag, microsite (<50 m from a snag), stand, and landscape levels will allow a multiscale analysis of habitat selection by cavity-nesters using these stands. We have just begun analysis at the stand level.

To date we have completed analysis of the relationship between snag densities and densities of cavity-nesting birds in these stands, and we have identified the relationship between nest densities and bird observations for cavity-nesting species. Because the study design was developed using a log-linear progression of snag densities, all analyses were conducted on log10 transformations of snag and bird variables. Following screening of all snag variables for high ($r > 0.7$) correlation, we used stepwise linear regression to identify the snag variables that best predicted the density of nests (by species and overall) and the density of bird observations (by species and overall). We also used simple linear regression to assess the relationship between the density of nests in a stand and the number of observations per ha per day of a species.

Results

The relationship between snags and bird abundance predicted by the Nietro et al. model for hairy woodpeckers and common flickers was not supported by our data (Figure 1.1). Our data seemed to be more curvilinear than linear, but there was no significant relationship between nest densities of these species and the abundance of snags of the size and decay class predicted by Nietro et al. (1985). It is likely that we did not detect strong relationships because the stands were too small relative to the size of the species' territories.

Nest density-snag density relationships. -- Of 88 nests found, only a few species had sample sizes large enough to permit analyses ($\underline{n} > 12$). The density of primary cavity-nester nests was only weakly associated ($R^2 = 18.0$, Table 1.1, Figure 1.2) with the density of hard snags > 9 inches dbh and > 60 feet tall. There were no significant relationships between hairy woodpecker nest density and the density of any type of snag. The density of common flicker nests was associated with the density of hard snags > 36 inches dbh and > 60 feet tall, but this relationship was also weak ($R^2 = 21$, Table 1.1, Figure 1.3). Furthermore, the y-intercept for flickers was significantly greater than 0, indicating that they can be present in stands that lack snags of this size.

On the other hand, the density of secondary cavity-nester nests was related to both the density of hard snags > 9 inches dbh > 60 feet tall and the density of soft snags 9-16 inches dbh and > 10 feet tall ($R^2 = 63$, Table 1.1, Figure 1.2). This relationship was relatively strong up to about 10 snags/ha (Figure 1.2). House wren and western bluebird nest densities were related to the abundance of hard snags > 9 inches dbh and > 60 feet tall, although this relationship was much stronger for house wrens than for western bluebirds (Table 1.1). The density of nests of all cavity-nesting birds combined was most highly associated with the density of hard snags > 9 inches dbh and > 60 feet tall. All y-intercepts for secondary cavity-nesters were not significantly different from 0.

<u>Bird density-snag density relationships.</u> -- Because we accumulated many more observations of birds during VCP's than during nest searches, we were able to assess relationships between snag densities and bird observations for more species than we could in the nest density analyses. Of the primary cavity nesters, only the abundance of northern flickers and red-breasted nuthatches showed any relationship with the density of snags in the stands (Table 1.2). The relationship between flicker observations and snag density (Table 1.2) was very similar to the relationship between flicker nest density and snag density (Table 1.1), including a y-intercept > 0. This is probably because flicker observations were a good predictor of the number of flicker nests (Table 1.3). Red-breasted nuthatch observations were associated with the density of soft snags > 9 inches dbh > 60 feet tall, but only 2 red-breasted nuthatch nests were found, and one of those was of questionable validity. Hence, observations of red-breasted nuthatches in these stands may have reflected foraging individuals rather than nesting birds.

Again, stronger relationships were detected between snag densities and bird observations for secondary cavity- nesters than for primary cavity nesters (Table 1.2, Fig. 1.4). The density of secondary cavity-nester observations was most highly related to the density of both hard and soft snags > 9 inches dbh > 60 feet tall. Relationships for individual species were relatively strong for house wrens, western bluebirds, and winter wrens (R^2 > 50, Fig. 1.5), although the y-intercept was > 0 for western bluebirds. The same types of snags were found to be associated with these species in both the nest density and bird observation analyses, probably because bird observations were relatively good indicators of nest density for most secondary cavity-nesters (Table 1.3). The strength of these relationships and the predictive power of the models are only relevant to clearcuts in these National Forests that are similar to those that we sampled. We provide ranges of snag densities sampled (Table 1.4) for your reference. We will test these relationships on Schrieber's and McCullough's data sets. We will also include other habitat variables into these models to see if we can improve the relationships.

The maximum density of primary cavity nesters that we would predict within the range of stands that we sampled was 1.8 per 10 ha (we actually detected about 3.3 nests per 10 ha [1.3 per 10 acres] on one stand) at 150 snags > 9 inches dbh, > 60 feet tall per 10 ha. To support 20% of this number of nests (0.4 per 10 ha) would mean that < 1 snag of this size per 10 ha (< 1 per 10 acres) would be required, but that to support the population at the 40% level (0.7 per 10 ha) would require about 10 of these snags per ha (4 per 10 acres). Remember that this relationship was weak and that there was a great deal of variability from the predicted values. Also, be aware that the number of secondary cavity nesters was also associated with the number of soft snags 9-16 inches dbh, and that the relationship between snag density and nest density was much stronger at the stand scale for secondary cavity nesters than for primary cavity nesters. Based on the relationship depicted in figure 1.2, we would predict that it would take 20 of these snags per 10 ha (8 per 10 acres) to support 20% of the maximum predicted nest density of secondary cavity nesters (25 nests/10 ha at 240 snags per 10 ha). Raising this goal to 40% of predicted maximum would mean that about 5 of these snags per ha (2 per acre) would be needed. Hence, at the stand level, the number of secondary cavity nesters nests seems to be more sensitive to snag density than the number of primary cavity nesters. Primary cavity-nesters may not be good indicators of habitat quality for secondary cavity nesters. Although more data are necessary, especially at larger spatial scales for primary cavity nesters, it seems that secondary cavity nesters may be better indicators of cavity- and snag-using fauna because they are the product of primary cavity-nester activity as well as of snag abundance.

Table 1.1. Predicting the number of nests/ha of cavity-nesting birds based on number of snags/ha on clearcuts, Willamette, Mt. Hood and Umpqua National Forests, 1991.

Species	y-intercept	predictor variable(s)[b] (snags/ha) Decay	dbh(in)	ht(ft)	predictor coefficient	Partial R^2	R^2	P
Hairy woodpecker (n=13)	--	--	--	--	--	--	--	--
Northern flicker (n=13)	0.011[c]	Hard	>36	>60	0.0300	20.8	20.8	0.057
Total primary cavity-nesters (n=30)	0.0219	Hard	>20	>60	0.0464	18.0	18.0	0.079
House wren (n=24)	-0.0123	Hard	> 9	>60	0.0821	58.0	58.0	0.000
Western bluebird (n=13)	0.006	Hard	> 9	>60	0.0223	28.7	28.7	0.021
Total secondary cavity nesters (n=57)	0.006	Hard	> 9	>60	0.0347	54.4	63.1	0.000
		Soft	9-16	>10	-0.5716	8.7		
Total cavity-nesters (n=88)	0.0180	Hard	> 9	>60	0.1608	63.1	63.1	0.000

[a] To calculate the number of nests/ha: Log_{10} (nests/ha) = y-intercept + (Log_{10} (predictor 1)*coefficie
+ (Log_{10} (predictor 2)* coefficient).

[b] Numbers of snags/ha were Log_{10} transformed for analysis.

[c] y-intercept differs from 0, P = 0.028.

Table 1.2. Predicting the number of observations/ha/day of cavity-nesting birds based on snags per on 18 clearcuts, Willamette, Mt. Hood, and Umpqua National Forests, 1991.

Species	y-intercept	predictor variable(s)[b] (snags/ha)			predictor coefficient	Partial R^2	Model R^2	P
		Decay	dbh(in)	ht(ft)				
Hairy woodpecker (n=114)	--	--	--	--	--	--	--	--
Northern flicker (n=62)	0.012[c]	Hard	>36"	>60	0.041	28.9	28.9	0.021-
Red-breasted nuthatch (n=31)	0.007[c]	Soft	> 9"	>60	0.683	39.9	39.9	0.005
Red-breasted sapsucker (n=22)	--	--	--	--	--	--	--	--
Total primary cavity-nesters	--	--	--	--	--	--	--	--
European starling (n=51)	0.000	Hard	9-16"	>10	0.069	31.6	46.3	0.0095
House wren (n=408)	0.022	Hard	> 9"	>60	0.248	47.5	57.1	0.0018
		Soft	> 9"	>60	2.954	9.6		
Violet-green swallow (n=30)	0.026[c]	Soft	16-36"	>10	-0.079	19.3	19.3	0.0685
Western bluebird (n=81)	0.023[c]	Hard	> 9"	>60	0.048	42.9	58.4	0.0014
		Grn trees	> 9"	>10	-0.034	15.5		
Winter wren (n=40)	0.008	Soft	16-36"	>10	0.150	48.2	75.1	0.0002
		Soft	> 9"	>60	-0.733	13.6		
		Soft	9-16"	>10	-0.169	13.2		
Total secondary cavity-nesters	0.018	Hard	> 9"	>60	0.055	49.2	58.3	0.0014
		Soft	> 9"	>60	2.772	9.1		
Total cavity-nesters	0.08[c]	Hard	> 9"	>60	0.058	44.8	52.4	0.0038
		Soft	> 9"	>60	2.501	7.6		

[a] To calculate the number of observations/ha/day: Log_{10} (observations/ha/day) = y-intercept (Log_{10} (predictor 1)*coefficient) + (Log (predictor 2)*coefficient) + (Log_{10} (predicto 3)*coefficient).

[b] Numbers of snags were Log_{10} transformed for analysis.

[c] y-intercept differs from 0, $P < 0.05$.

Table 1.3. Predicting the number of nests/ha based on the number of observations/ha/day, 18 clearcuts, Mt. Hood, Willamette, and Umpqua National Forests, 1991.

Species	y-intercept	Coefficient for observations	R^2	P
Hairy woodpecker	0.018	0.278	21.5	0.0524
Northern flicker	0.007	0.693	66.3	0.0001
Total primary cavity-nesters	0.052	0.247	14.0	0.1257
Western bluebird	0.006	0.491	51.7	0.0008
House wren	0.002	0.198	61.2	0.0001
Total secondary cavity-nesters	-0.018	0.374	61.7	0.0001

Table 1.4. Ranges for snag variables on 18 clearcuts, Willamette, Mt. Hood, and Umpqua National Forests, 1991.

Decay class	dbh (inches)	height (feet)	Minimum/ ha	Maximum/ ha
Soft	9-16	>10	0	0.4
Soft	>16-36	>10	0	1.8
Soft	>36	>10	0	1.9
Soft	> 9	>10	0.05	3.8
Hard	9-16	>10	0.12	31.8
Hard	>16-36	>10	0	15.9
Hard	>36	>10	0.17	6.3
Hard	> 9	>10	0.17	54.1
Both	> 9	>10	0.17	54.6
Soft	> 9	>60	0	0.12
Hard	> 9	>60	0	21.3

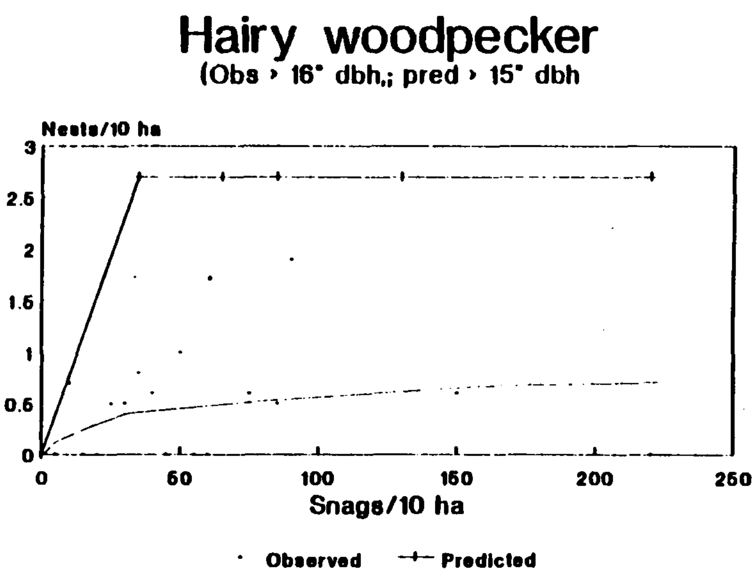
Figure 1.1. Relationships between the number of nests of hairy woodpeckers and common flickers found in clearcuts in the Cascades, 1991, and the predicted number of nests from Nietro et al. (1985).

Figure 1.2. Relationships between number of snags per ha and number of cavity-nesting bird nests per ha, Cascades clearcuts, 1991. Untransformed values are given parenthetically.

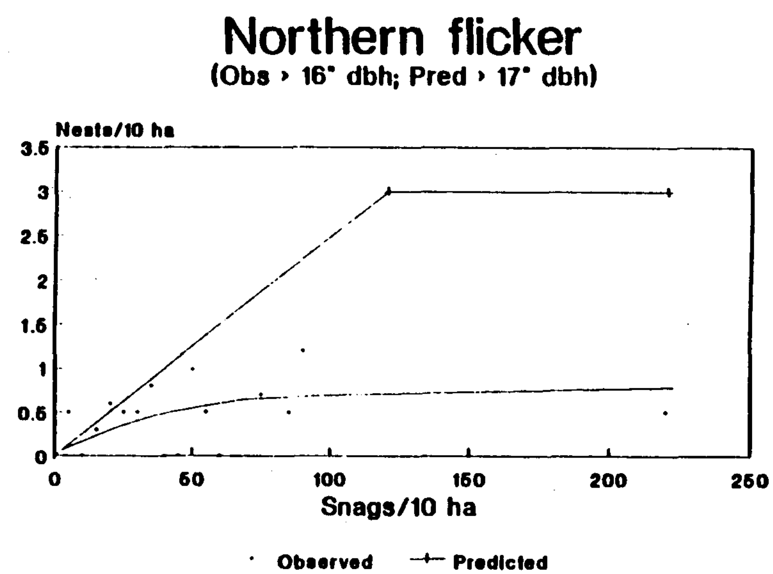
Figure 1.3. Relationships between number of snags per ha and number of cavity-nesting bird nests per ha, selected species, Cascades clearcuts, 1991. Untransformed values are given parenthetically.

Figure 1.4. Relationships between number of snags per ha and number of cavity-nesting bird observations per ha, Cascades clearcuts, 1991. Untransformed values are given parenthetically.

Figure 1.5. Relationships between number of snags per ha and number of cavity-nesting bird observations per ha, selected species, Cascades clearcuts, 1991. Untransformed values are given parenthetically.

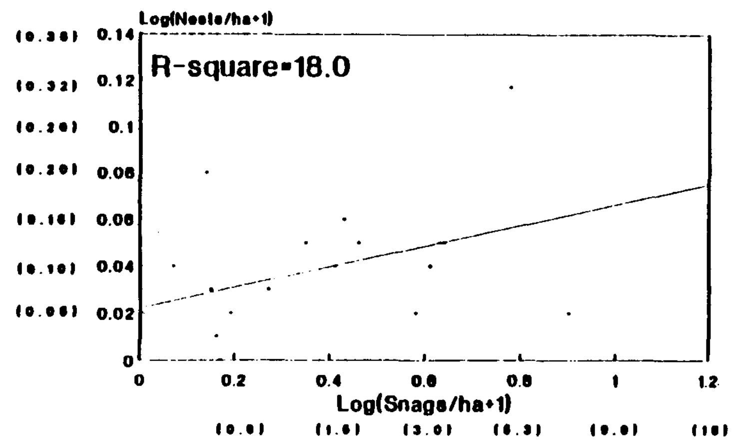


Hairy woodpecker
(Obs › 16" dbh,; pred › 15" dbh
Nests/10 ha
3
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250
Snags/10 ha
Observed
Predicted

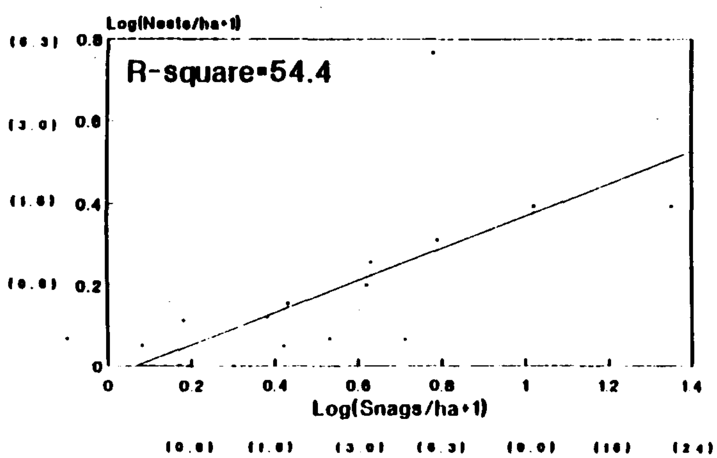


Northern flicker
(Obs › 16" dbh; Pred › 17" dbh)
Nests/10 ha
3.5
3
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250
Snags/10 ha
Observed
Predicted

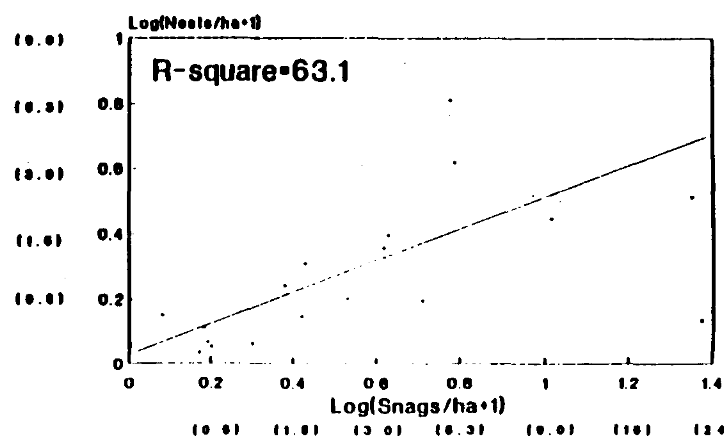
Primary cavity nester nests
(snags > 20" dbh, > 60' tall)



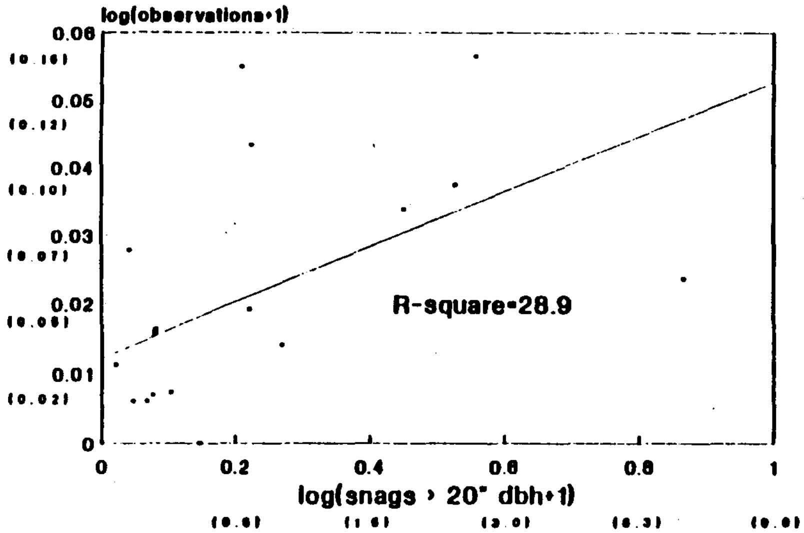
Total secondary cavity nesters
(snags > 9" dbh, > 60' tall)



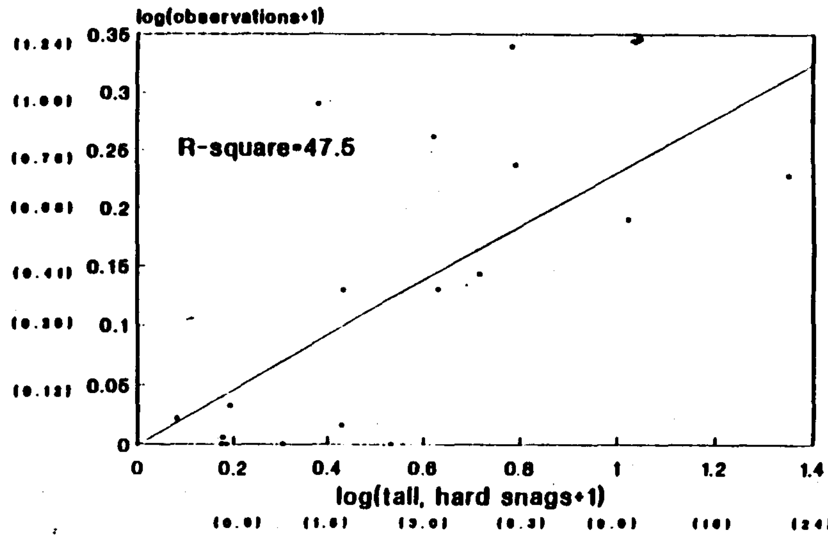
Total cavity nester nests
(snags > 9" dbh, > 60' tall)



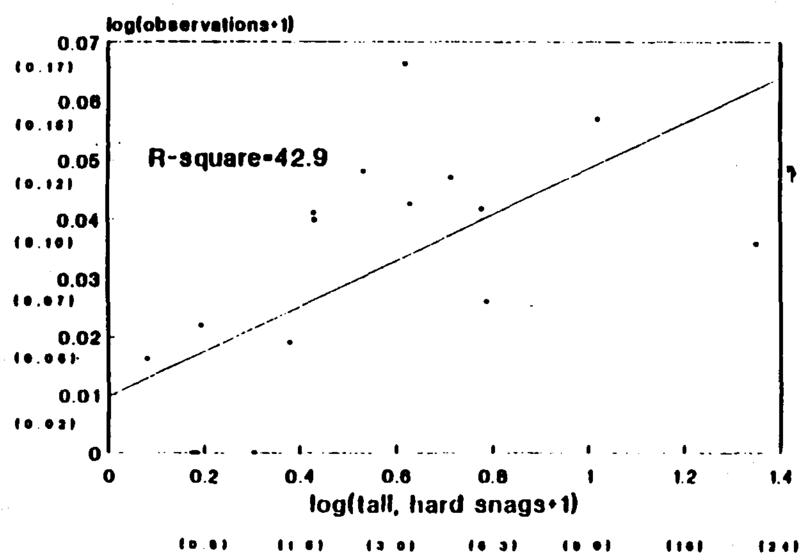
Northern flicker



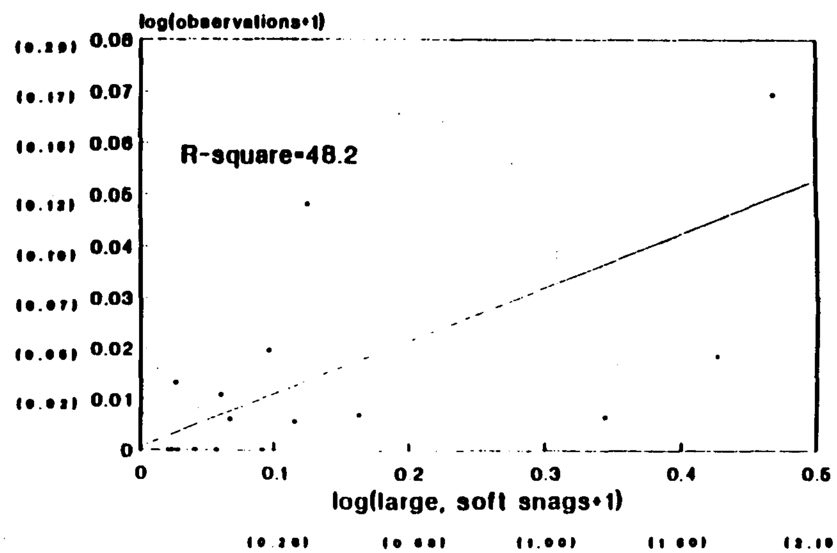
House wren



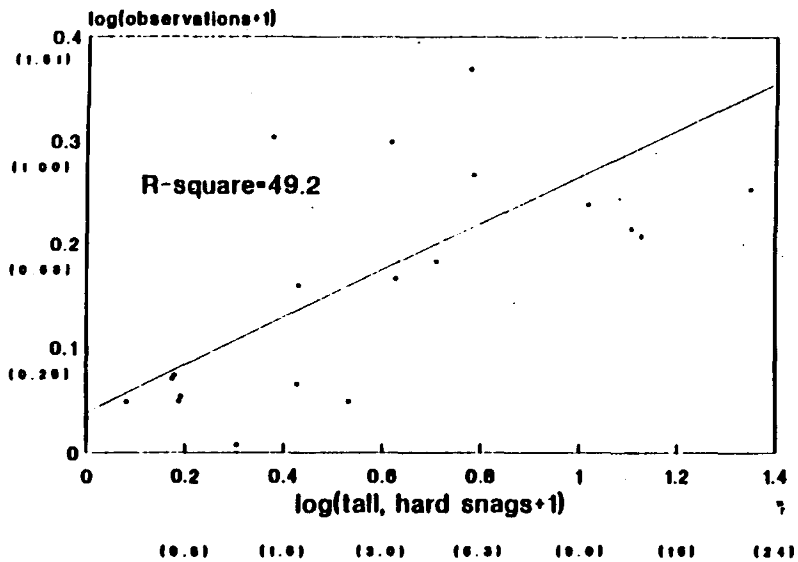
Western bluebird



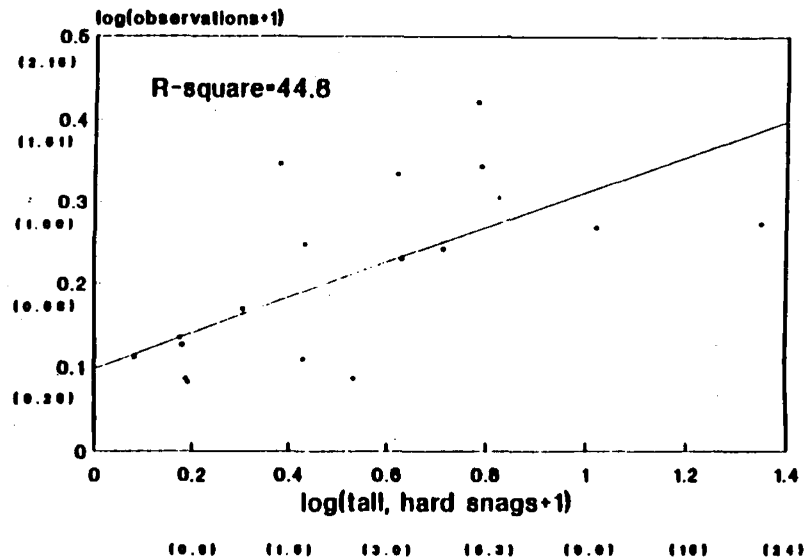
Winter wren



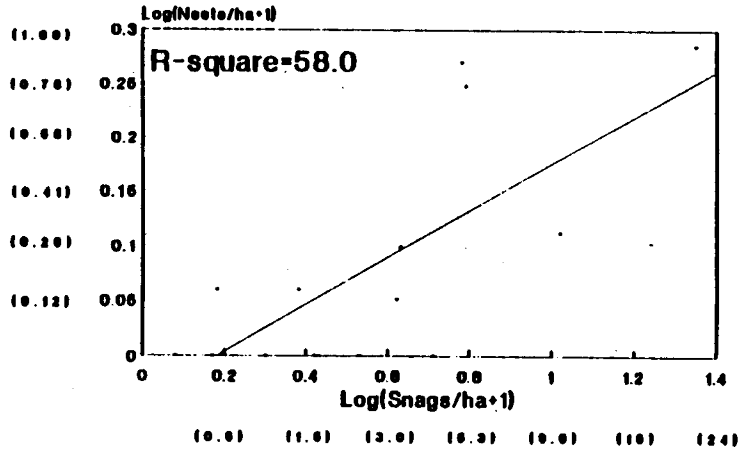
Secondary cavity nesters



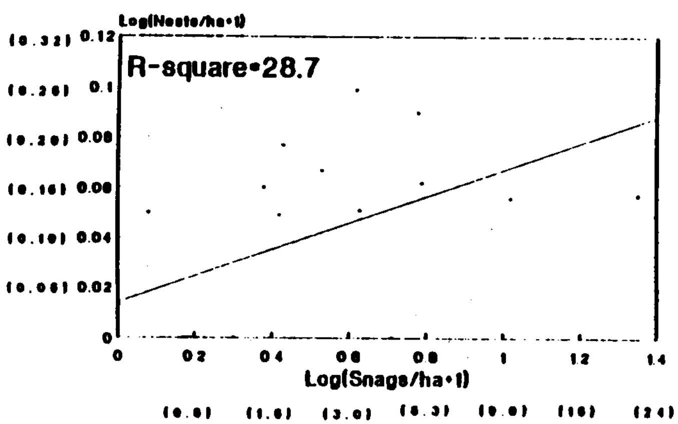
Total cavity nesters



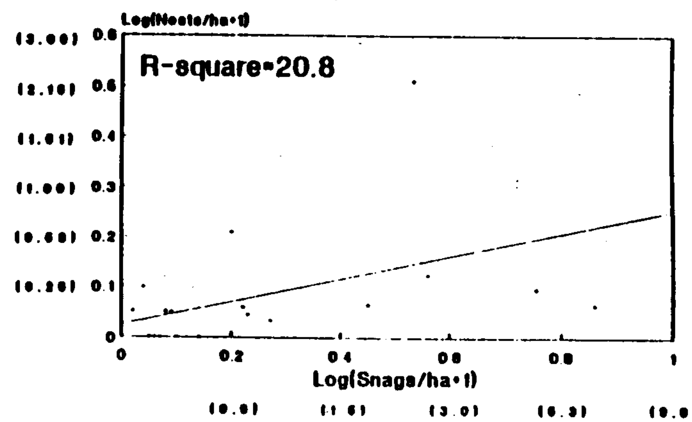
House wren nests
(snags > 9" dbh, > 60' tall)



Western bluebird nests
(snags > 9" dbh, > 60' tall)



Northern flicker nests
(snags > 36" dbh, > 10' tall)



SUB-BASIN SAMPLING OF SNAGS AND CAVITY-NESTERS

Methods

Birds were sampled using VCP's systematically arranged at 200-m intervals along transects spaced 400 m apart within each of 10 sub-basins. Transects were perpendicular to the contour. Belt transects were used to more accurately estimate snag availability. Transects will be 40 m wide and traverse the basin along the systematically arranged transects 200 m apart perpendicular to the contour. Characteristics of the sub-basin that describe the landscape pattern were collected for each watershed using GIS (ArcINFO). Regression was used to assess features influencing the abundance of cavity-nesters at the sub-basin scale.

Bird-Snag Relationships. -- We are aware of only one western Oregon study currently being conducted that assesses bird-habitat relationships over 3 scales of habitat: microsite, stand, and sub-basin. Preliminary data collected by McGarigal and McComb in the central Oregon Coast Range indicates that many of the reported population densities for cavity-nesting species used in Nietro et al. (1985) are not representative of actual densities in the central Oregon Coast Range (Table 2.1). This likely stems from the fact that most of the reported studies were from other geographic locations and were designed to sample cavity-nesting species at inappropriately small spatial scales.

Preliminary data also indicate that there are significant simple linear or curvilinear relationships between the availability of remaining mature forest in a sub-basin and the abundance of 14 of 15 species of cavity-nesting birds (e.g., Figs. 2.1 and 2.2). Similarly, significant simple correlations between snag density and the abundance of most cavity-nesting species exist as well at the subbasin scale (e.g., Figs. 2.1 and 2.2). However, because stand condition and snag density are highly confounded, we are unable to clearly distinguish between the effects of snag density and stand condition on bird abundance. Partial correlations between snag density and bird abundance reveal that snag density does not explain much variation in bird abundance at the sub-basin scale after accounting for stand condition (Figs. 2.1 and 2.2 and Table 2.5). Considering all possible combinations of snag type (full or partial), tree species, diameter class, height class, and decay class, only 84 of 2,268 partial correlations were significant ($\underline{P}<0.05$); this is less than would be expected by chance alone. However, there were many apparent trends that may become significant with larger sample sizes. Interestingly, the majority of the significant partial correlations involved hardwoods and partial snags.

We also examined a small set of correlations between each cavity-nesting bird species and selected snag types at the stand level (Tables 2.3 and 2.4), including a class (conifer, full, hard snags >20 ft and >20 in dbh; CFHHL) corresponding to the type of snag currently considered in the Siuslaw National Forest wildlife tree program. In general, the correlations were weak; several of the significant relationships were counter-intuitive (i.e., negative relationships), reflecting perhaps inadequate sample sizes more than anything else. There were no meaningful relationships between snag density and bird abundance in grass/forb, sapling, or pole stand conditions for any of the cavity-nesting species and snag classes examined. There were a few meaningful correlations in sawtimber stands (Tables 2.3 and 2.4); chestnut-backed chickadees and northern flickers were positively correlated with CFHHL snags in sawtimber stands, and red-breasted sapsuckers were positively correlated with total partial (mostly hardwood) snags. The latter result probably reflects the sapsuckers apparent close relationship with live bigleaf maple which often contains dead stems suitable for nest sites. Otherwise, the correlations were weak and/or counter-intuitive (e.g., Figs. 2.3 and 2.4). These findings may be caused by the relatively high snag densities in mature forest stands; perhaps snag densities in these stands are much higher than the threshold at which snag densities begin to limit bird abundance. Alternatively, the results may simply reflect small sample sizes.

These preliminary results highlight several important considerations. First, snags and stand condition are highly confounded at the sub-basin scale. This greatly constrains our ability to examine the exclusive effect of snag density on bird abundance. Without the ability to manipulate or control snag densities at the landscape-level, it may be more informative-- to examine the relationship between territory size and snag density for a large number of territories. Second, analyses based on correlational procedures (e.g., partial correlation analysis) have limited utility when sample sizes are small. Much of the preliminary analysis was severely constrained by small sample sizes. Third, the contribution of hardwoods and partially dead trees to the total dead wood resource should be given more emphasis in investigations of bird-snag relationships. Finally, although we have not analyzed the data yet, it is quite apparent that snags are heterogeneously distributed throughout the landscape at several spatial scales. We need to sample snags in a manner that will allow us to identify these spatial scales and not presume that we know what they are when we devise a sampling approach.

Snag Density and Distribution. -- Snag sampling was conducted in a manner that will allow us to quantify both snag density and snag distribution patterns across a range of scales.

Because the analysis of snag patterns is somewhat complex, we have not attempted any comprehensive analysis at this time in lieu of additional data currently be collected and in anticipation of collecting snag data on the remaining COPE study subbasins in the Coast Range. However, we have computed some preliminary snag density estimates by stand condition for a selected subset of snag classes (Table 2.2). However, based on a double-survey of a subset of transects we have verified that observers are not observing and recording all snags that occur within the 40-m belt transect. The detection distance varies among stand conditions and among observers. We now have a program (Cumulative Distribution Function Program) available that will allow us to adjust the snag density estimates to correct for the decreasing detectability of snags with increasing distance from the transect. The snag densities reported in Table 2 are unadjusted estimates and therefore represent a 30-100% underestimate of the true snag densities. The amount of underestimate will vary as a function of stand condition, snag size, and observer. We will make the appropriate adjustments after all snag data are collected.

In addition, several spatial pattern analysis techniques will be employed to quantify and graphically portray snag distribution patterns. Specifically, we will use one or more of the autocorrelation procedures (e.g., semivariance technique, wavelet analysis; Gay Bradshaw, pers. commun.), quadrat variance methods (e.g., contiguous quadrat procedure, Greig-Smith 1952; stepped blocking technique, Usher 1975; two-term local variance technique, Hill 1973; paired quadrat technique, Goodall 1974), and nearest-neighbor techniques (e.g., Holgate 1965a,b, Hopkins 1954, Johnson and Zimmer 1985, Besag and Gleaves 1973, Clark and Evans 1954) to assess snag distribution patterns. Each of these techniques will be used to detect the scale or scales at which the snag distribution patterns exhibit the greatest heterogeneity (e.g., to identify the scale or scales at which snags are clumped). We will consider snags both as a binomial variable (i.e., present or absent) and as a continuous variable (e.g., total wood volume based on dbh and height measurements) in these analyses. We have not initiated this analysis yet, in anticipation of additional data from the remaining COPE study subbasins.

Table 2.1. Cavity-nesting species sampled in the proposed westside Cascades study and maximum density estimates from the Coast Range pilot study.

Bird Species	Home range size[1] (ha)	Density[1] (pairs/40 ha)
Primary cavity-nesters:		
hairy woodpecker	18-23	1.7 - 2.2
red-breasted sapsucker[2]	42-63	0.6 - 1.0
common flicker	25-50	0.8 - 1.6
Secondary cavity-nesters:		
brown creeper	5-7	5.8 - 7.4
red-breasted nuthatch[2]	25-50	0.8 - 1.6
winter wren	2	18.2 - 20.2
house wren	2	18.2 - 20.2
chestnut-backed chickadee	4-5	7.7 - 10.0
western bluebird	?	?

[1] Estimates derived subjectively from number of detections and are likely to change somewhat when a more rigorous and objective density estimation technique is employed.
[2] These species are relatively uncommon in the Coast Range; it is likely that these species occur at much greater densities in the Cascades (Matt Hunter, pers. commun.).

Table 2.2. Snag densities (mean #/ha and range) by stand condition class and snag class in the Lobster Creek Basin, Oregon, 1991. Only a selected subset of snag categories are reported here, although densities have been calculated for all possible combinations of snag species (SP: C=conifer, H=hardwood, T=total), type (TY: F=full, P=partial, T=total), decay class (DC: H=hard, S=soft, T=total), height (HT: S= ≤6 m, H= ≥7 m, T=total), and diameter class (DI: M= >12 in, L= >20 in, T=total >4 in). Variances are not included with the means because they vary as a function of sample size and area sampled within each sampling unit; in the table below, samples represent independent stands of widely varying area. The number of stands and total area sampled within each stand condition is included in the footnote.

Snag Class					Stand Condition				
Sp	Ty	Dc	Ht	Di	Grass/Forb	Shrub	Sapling	Pole	Sawtimber
T	T	T	T	T	14.5 (5.2-27.0)	9.5 (3.9-15.2)	5.0 (1.0-13.1)	6.9 (1.2-25.4)	43.8 (19.2-66.4)
H	T	T	T	T	2.9 (0.0-14.0)	0.4 (0.0-0.7)	0.4 (0.0-1.9)	1.3 (0.0-6.6)	3.9 (0.0-18.7)
T	P	T	T	T	0.6 (0.0-2.1)	0.0 (0.0-0.0)	0.1 (0.0-0.9)	0.1 (0.0-0.5)	1.7 (0.0-3.5)
C	F	H	H	L	0.8 (0.0-2.7)	0.7 (0.0-1.5)	0.1 (0.0-0.8)	0.0 (0.0-0.2)	5.3 (0.7-12.2)

[1]Grass/Forb: 7 stands; 27.5 ha censused
Shrub: 2 stands; 5.3 ha censused
Sapling: 8 stands; 41.3 ha censused
Pole: 15 stands; 206.1 ha censused
Sawtimber: 12 stands; 295.6 ha censused

Table 2.3. Correlations (R^2, sign of the coefficient, P-value) between snag densities (#/ha) and relative abundance of each secondary cavity-nesting species by stand condition and snag class in the Lobster Creek Basin, Oregon, 1991. See table 2 for a description of stand conditions and snag classes and sample sizes. As in table 2, only a selected subset of snag categories are reported here and samples represent independent stands of widely varying area.

Stand Condition / Snag Class Sp Ty Dc Ht Di	BCCH	BRCR	CBCH	HOWR	RBNU	TRSW	VGSW	WEBL	WIWR
	Secondary Cavity-Nesting Species[1]								
Grass/Forb									
T T T T T	--	--	--	0 (0.986)	--	6 (0.595)	0 (0.919)	14 (0.405)	32 (0.186)
H T T T T	--	--	--	1 (0.820)	--	43 (0.109)	0 (0.960)	24 (0.265)	8 (0.552)
T P T T T	--	--	--	5 (0.645)	--	2 (0.787)	1 (0.836)	9 (0.505)	3 (0.710)
C F H H L	--	--	--	0 (0.921)	--	0 (0.993)	5 (0.634)	2 (0.794)	48(-) (0.085)
Sapling									
T T T T T	--	--	24 (0.215)	--	--	--	--	--	25 (0.207)
H T T T T	--	--	15 (0.342)	--	--	--	--	--	36 (0.117)
T P T T T	--	--	15 (0.338)	--	--	--	--	--	28 (0.177)
C F H H L	--	--	19 (0.283)	--	--	--	--	--	25 (0.204)

Table 2.3. Continued.

Stand Condition / Snag Class: Sp	Ty	Dc	Ht	Di	Secondary Cavity-Nesting Species[1]: BCCH	BRCR	CBCH	HOWR	RBNU	TRSW	VGSW	WEBL	WIWR
Pole													
T	T	T	T	T	0 (0.868)	--	37(-) (0.016)	--	--	--	--	--	0 (0.820)
H	T	T	T	T	0 (0.928)	--	8 (0.302)	--	--	--	--	--	8 (0.296)
T	P	T	T	T	0 (0.965)	--	7 (0.346)	--	--	--	--	--	0 (0.899)
C	F	H	H	L	0 (0.777)	--	9 (0.739)	--	--	--	--	--	6 (0.365)
Sawtimber													
T	T	T	T	T	--	1 (0.813)	5 (0.488)	--	0 (0.972)	--	--	--	17 (0.188)
H	T	T	T	T	--	3 (0.573)	20 (0.149)	--	8 (0.360)	--	--	--	17 (0.189)
T	P	T	T	T	--	4 (0.535)	0 (0.905)	--	0 (0.853)	--	--	--	39(-) (0.031)
C	F	H	H	L	--	10 (0.317)	45(+) (0.017)	--	36(-) (0.038)	--	--	--	13 (0.252)

[1](--) indicates insufficient bird detections in this stand condition to conduct statistical test.

Table 2.4. Correlations (R^2, sign of the coefficient, P-value) between snag densities (#/ha) and relative abundance of each primary cavity-nesting species by stand condition and snag class in the Lobster Creek Basin, Oregon, 1991. See table 2 for a description of stand conditions and snag classes and sample sizes. As in table 2, only a selected subset of snag categories are reported here and samples represent independent stands of widely varying area.

Stand Condition	Snag Class					Primary Cavity-Nesting Species[1]			
	Sp	Ty	Dc	Ht	Di	HAWO	NOFL	PIWO	RBSA
Grass/Forb									
	T	T	T	T	T	22	0	9	--
						(0.287)	(0.955)	(0.509)	
	H	T	T	T	T	31	34	21	--
						(0.197)	(0.166)	(0.307)	
	T	P	T	T	T	0	14	0	--
						(0.980)	(0.405)	(0.953)	
	C	F	H	H	L	3	3	20	--
						(0.731)	(0.714)	(0.313)	
Sapling									
	T	T	T	T	T	3	1	17	--
						(0.696)	(0.843)	(0.307)	
	H	T	T	T	T	0	6	21	--
						(0.996)	(0.547)	(0.249)	
	T	P	T	T	T	3	15	26	--
						(0.708)	(0.339)	(0.194)	
	C	F	H	H	L	1	13	25	--
						(0.874)	(0.386)	(0.204)	

Table 2.4. Continued.

Stand Condition Snag Class					Primary Cavity-Nesting Species[1]			
Sp	Ty	Dc	Ht	Di	HAWO	NOFL	PIWO	RBSA
Pole								
T	T	T	T	T	5	3	31(-)	9
					(0.410)	(0.517)	(0.032)	(0.276)
H	T	T	T	T	14	2	15	2
					(0.170)	(0.609)	(0.159)	(0.656)
T	P	T	T	T	11	2	14	9
					(0.224)	(0.580)	(0.172)	(0.268)
C	F	H	H	L	3	5	4	16
					(0.560)	(0.444)	(0.459)	(0.136)
Sawtimber								
T	T	T	T	T	6	7	0	6
					(0.460)	(0.409)	(0.974)	(0.434)
H	T	T	T	T	3	25(-)	4	0
					(0.572)	(0.096)	(0.514)	(0.852)
T	P	T	T	T	4	11	8	42(+)
					(0.550)	(0.284)	(0.369)	(0.024)
C	F	H	H	L	12	40(+)	65(-)	11
					(0.270)	(0.027)	(0.002)	(0.281)

[1](--) indicates insufficient bird detections in this stand condition to conduct statistical test.

Table 2.5. Partial correlations (partial R^2, sign of the coefficient, P-value) between snag densities (#/ha) and relative abundance of each secondary cavity-nesting species by snag class, accounting for the percent of subbasin in large sawtimber condition, in the Lobster Creek Basin, Oregon, 1991. As in table 2, only a selected subset of snag categories are reported here. Samples represent 10 250-300 ha subbasins distributed throughout the Lobster basin and surrounding area.

Snag Class					Secondary Cavity-Nesting Species[1]								
Sp	Ty	Dc	Ht	Di	BCCH	BRCR	CBCH	HOWR	RBNU	TRSW	VGSW	WEBL	WIWR
T	T	T	T	T	1 (0.847)	5 (0.572)	53(-) (0.027)	38(-) (0.077)	2 (0.744)	1 (0.819)	14 (0.318)	18 (0.262)	0 (0.950)
H	T	T	T	T	1 (0.789)	10 (0.406)	10 (0.419)	25 (0.170)	2 (0.843)	0 (0.881)	17 (0.264)	3 (0.649)	3 (0.682)
T	P	T	T	T	2 (0.688)	2 (0.724)	0 (0.881)	3 (0.683)	9 (0.440)	12 (0.370)	0 (0.974)	4 (0.596)	9 (0.424)
C	F	H	H	L	1 (0.776)	3 (0.678)	3 (0.683)	27 (0.152)	9 (0.422)	3 (0.677)	12 (0.356)	3 (0.634)	10 (0.417)

Snag Class					Primary Cavity-Nesting Species			
Sp	Ty	Dc	Ht	Di	HAWO	NOFL	PIWO	RBSA
T	T	T	T	T	33 (0.107)	3 (0.674)	11 (0.376)	42(-) (0.059)
H	T	T	T	T	32 (0.116)	24 (0.185)	28 (0.144)	14 (0.320)
T	P	T	T	T	11 (0.373)	14 (0.325)	33 (0.107)	0 (0.873)
C	F	H	H	L	33 (0.103)	31 (0.116)	1 (0.769)	17 (0.272)

[1](--) indicates insufficient bird detections in this stand condition to conduct statistical test.

10. LIST OF FIGURES

Brown Creeper-Snag Relationship

Subbasin-Level/Total Soft Snags

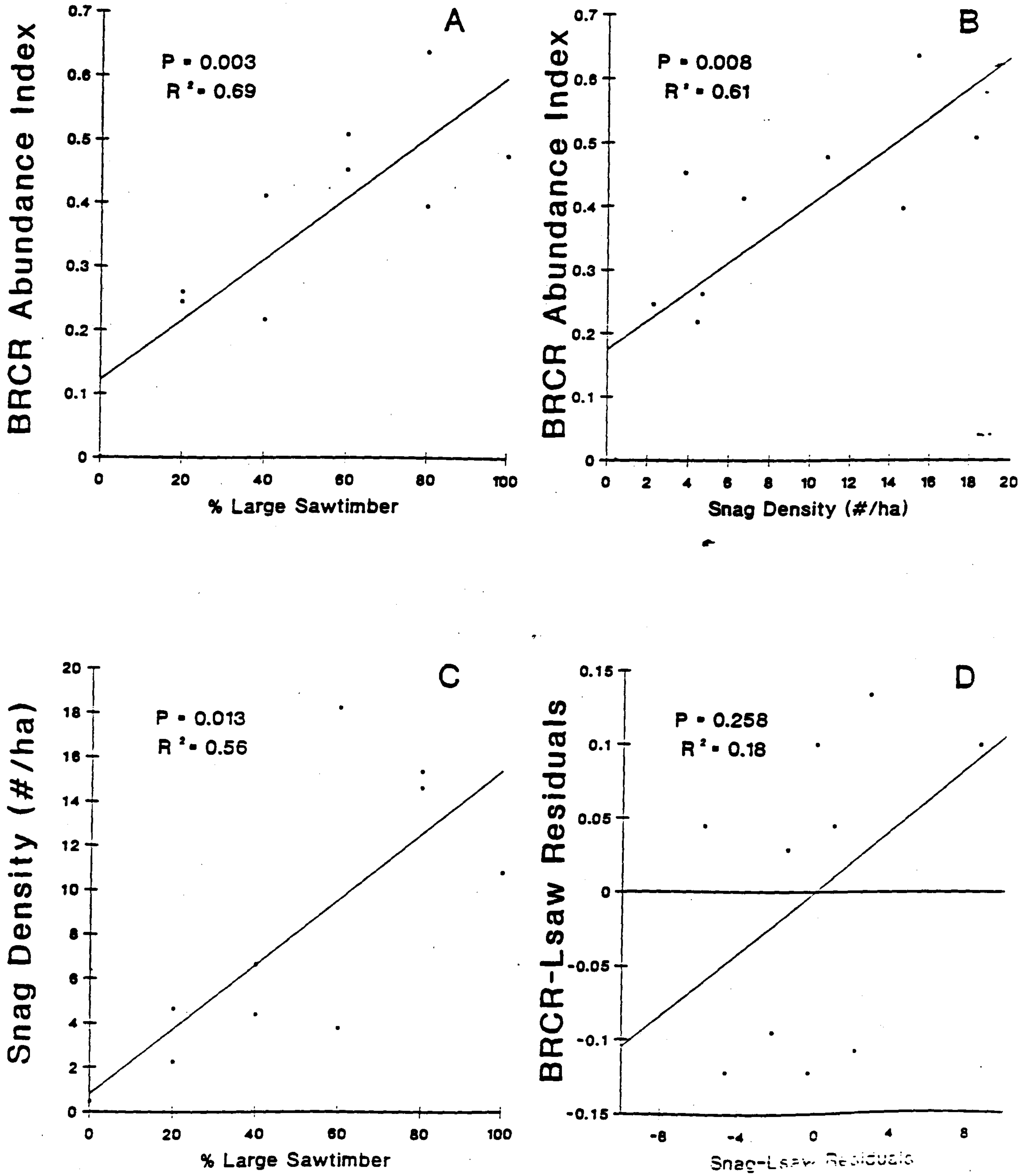


Figure 1

Hairy Woodpecker-Snag Relationship
Subbasin-Level/Total Snags

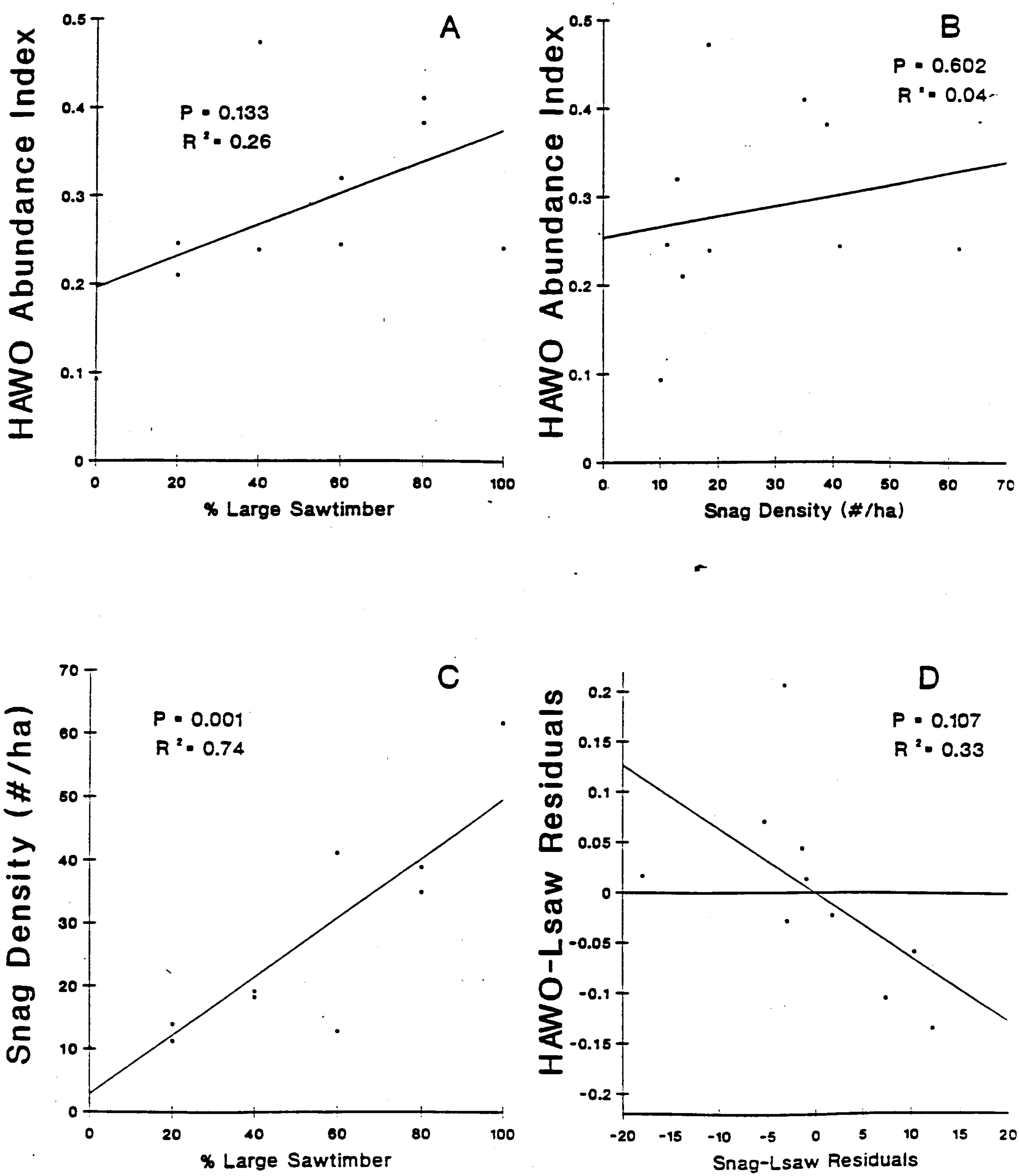
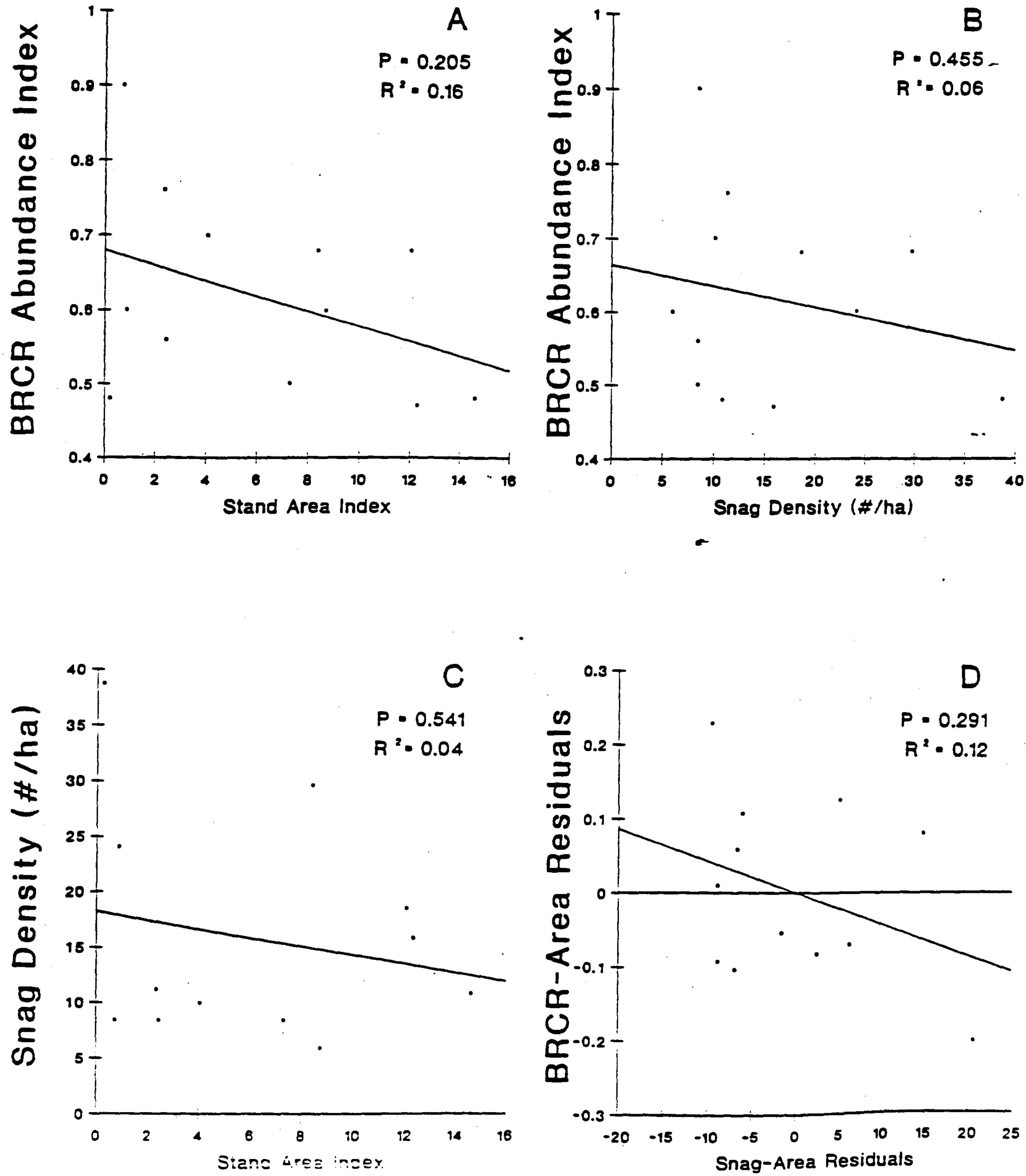


Figure 2

Brown Creeper-Snag Relationship

Stand-Level/Total Soft Snags



Hairy Woodpecker-Snag Relationship

Stand-Level/Total Snags

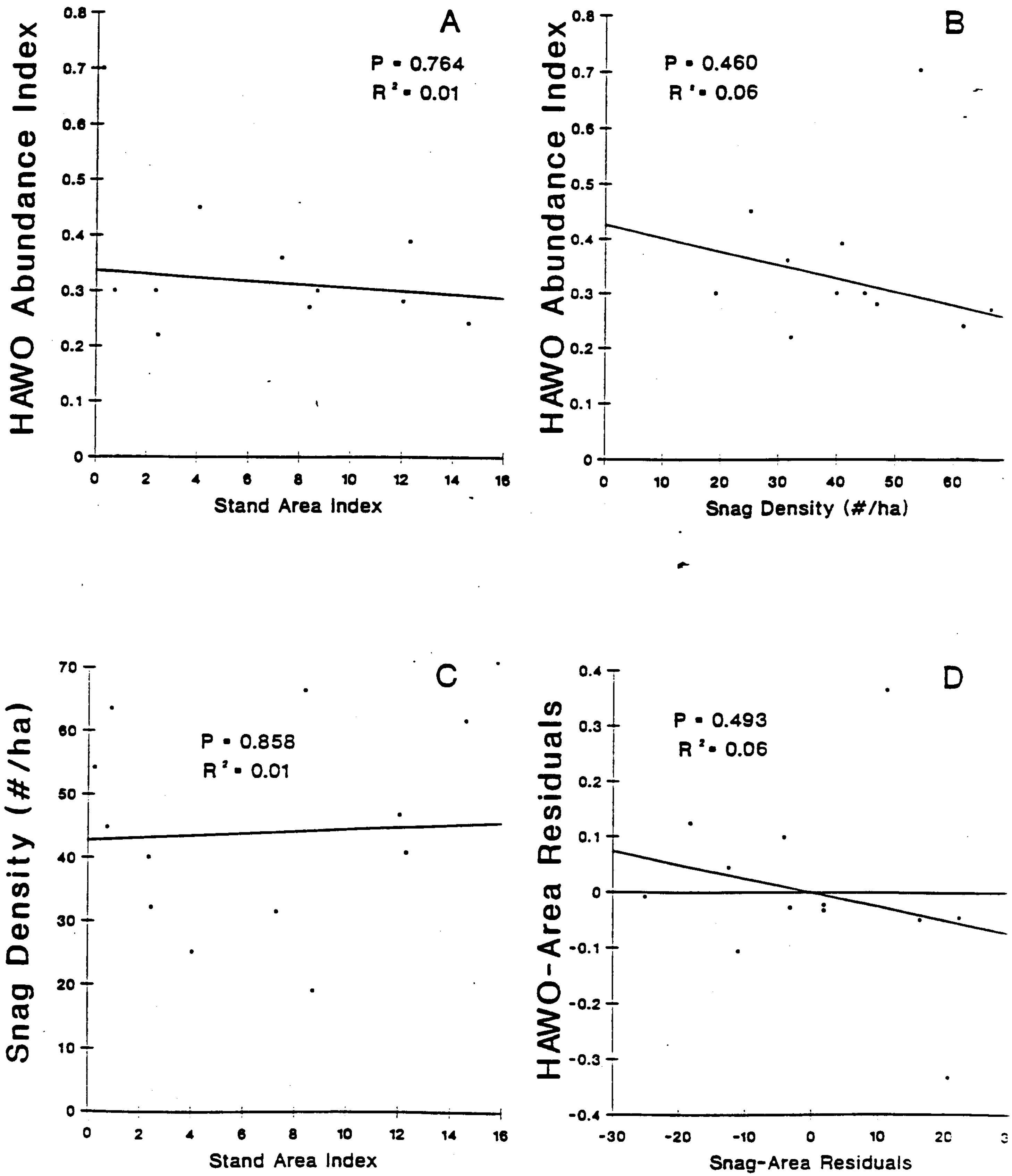


Figure 4

WILDLIFE TREE PROGRAM QUESTIONNAIRE

Introduction

For a number of years, wildlife biologists and logging contractors have expressed reservations about the wildlife tree program. From a series of telephone conversations in late 1991, it appeared that the goals of logging operators, wildlife biologists and WISHA or OR-OSHA were not always reached during program implementation. As a result, 2 questionnaires were developed to evaluate the wildlife tree program. The purpose of the questionnaires was to determine perceived limitations to the program and to provide a means to improve program implementation and effectiveness. We designed the survey to define problematic aspects of the program and to establish where resolution of these aspects should be attempted between Forest Service personnel and contractors in conjunction with OR-OSHA or WISHA personnel.

The first survey targeted 61 Forest Service wildlife biologists in the Pacific Northwest who were responsible for program monitoring. The second survey polled opinions of Washington and Oregon logging contractors familiar with the wildlife tree program. Wildlife biologists and harvesting experts reviewed the surveys. The wildlife biologist survey focussed on issues related to communication, logging contractor roles, biology, funding, measurement, safety, personnel and management goals. The logging contractor survey also involved these issues but the questions reflected the contractors' concerns. One objective of the logging operator survey for example, was to solicit opinions from contractors about possible safety hazards and wildlife tree designation. The surveys included a smaller subset of identical questions so that direct comparisons could be made between groups on certain issues.

The wildlife biologist survey was distributed in late March 1992 and the logging contractor survey in early April. When possible, all non respondents were contacted by telephone. As a result, percent response could be calculated excluding Forest Service employees or contractors no longer working with the program, and non qualified individuals. At this time, no active contact has been initiated with OR-OSHA or WISHA individuals.

Status

All wildlife biologist surveys have been returned, tabulated and analyzed. The 5 non respondents have been classified. The majority of logging contractor surveys have been returned but response has been slower than with wildlife biologists. Although data from most Washington logger contractor surveys have been entered only preliminary analyses have been performed and no data from Oregon contractor surveys have been analyzed. Response rates of Washington contractors are estimated at 60 percent with daily returns that will increase this figure. Oregon contractor response is 70 percent and may increase. Results of the wildlife biologist survey are given below.

The 56 respondents were primarily men with <5 years service at the District level who were responsible for wildlife tree program monitoring. The survey consisted of 38 questions grouped into 8 categories chosen as important to evaluate the effectiveness of the wildlife tree program. In addition to the categories outlined previously, personal profiles of individual respondents and some general information was included in the questionnaire.

Data Analyses

Responses to the questions were tabulated using a SAS frequency distribution program. We used Chi-Square Goodness-of-Fit and Pearson Product-Moment correlations conducted in SPSS to examine the data. "No opinion" responses were removed from tabulation and analyses. All statements were made positive (see questionnaire) to tabulate data. One question which dealt with loss of wildlife trees due to escaped slash burns was removed from analysis because of numerous "no opinion" responses.

Results

Chi-Square Goodness-of-Fit tests for four opinion classes (strongly agree, moderately agree, moderately disagree and strongly disagree) showed that all questions except 2 were significantly different from expected distribution at $\underline{P}$=0.05. When the 4 classes were collapsed into two groups (Agree and Disagree) 10 questions had no significant difference from expected response distribution (Table 1). The majority of these questions were from the Biology and Management Goal categories. Detailed results are given under the category headings and category frequency distributions are provided in Appendix 1. Two-class Chi-Square tests appear in Table 3.1 and Pearson Product Moment correlations in Table 3.2. correlations ($\underline{r}$) among questions within categories are generally below 0.400.

Communication and Information Exchange

Opinions often depended upon individual Districts and National Forests. According to survey results, wildlife biologists felt that National Forest manuals do not define the criteria necessary to conduct the wildlife tree program (Table 3.1) but respondents did not have statistically differing opinions as to whether or not National Forest management plans define the characteristics necessary for wildlife tree selection (two-class Chi-Square $\underline{P}=0.208$). It should be noted, however, that more respondents felt that management plans do not adequately define the criteria. Respondents also were divided in their opinion concerning feedback from National Forest Supervisors about problems concerning the wildlife tree program. Again, more respondents felt that supervisors are not giving sufficient feedback to District personnel (Appendix 1, Table 3.1). Biologists agreed that they should provide direction to Timber Sales Administrators concerning wildlife tree selection (two-class Chi-Square $\underline{P}=0.000$). Questions about manual definition and feedback were positively correlated (Table 3.2) but the question concerning direction given by wildlife biologists to timber sale administrators was negatively related to the former question group (Table 3.2).

Logging Contractor Role

Wildlife biologists believed that timber sale contractors receive technical information before selecting wildlife trees but they differed in opinion as to whether or not contractors meet contract requirements (Table 3.1). Although biologists agreed that logging contractor opinions should be included in wildlife tree program effectiveness evaluations (two-class Chi-Square $\underline{P}=0.003$), they strongly believed that a $500 fine is not a sufficient deterrent for contractual violations (two-class Chi-Square $\underline{P}=0.000$).

Biology

Wildlife biologists agreed that more information is needed concerning patterns of wildlife trees on units but differed in opinion as to whether or not more information is needed on methods to create wildlife trees (Appendix 1 and Table 3.1). Responses also were mixed concerning whether or not blowdown is accounted for in calculations of wildlife tree numbers. This finding no doubt depends on the practices of individual Districts. Wildlife biologists agreed, however, that habitat needs of cavity nesters are not being met because green or newly killed trees dominate the leave tree population (two-class Chi-Square $\underline{P}=0.000$). In terms of tree selection, biologists had differing opinions on the question of whether or not decay class is being used as a primary selection factor for wildlife trees (two-class Chi-Square $\underline{P}=0.216$) although more respondents felt that decay class is not being used. More respondents also believed that tree longevity is not being measured, but again, significant differences between the two groups could not be detected (Appendix 1 Table 3.1).

Measurement

There was agreement that data collection forms should be consistent within a Region and that a standard procedure does not presently exist. The two questions were positively correlated (Table 3.2).

Funding

According to respondents, both District and National Forest funds limit the wildlife tree program. These questions were also positively correlated (Table 3.2). KV funds were felt to be the prime source of funds used to conduct wildlife tree monitoring ($\underline{P}=0.000$).

Personnel

Although more respondents felt that there were insufficient personnel to cope with the wildlife tree program there were no statistically significant differences between respondents that felt there were sufficient persons and those that felt there were not. However, respondents agreed that marking crews do not receive sufficient training (two-class Chi-square $\underline{P}=0.003$). Moreover, staff turnover was considered to significantly affect implementation of the program.

Safety

According to wildlife biologists, OR-OSHA and WISHA guidelines do constitute a significant impediment to the selection of wildlife trees. Purchaser selection was seen as a possible although not complete solution to safety conflicts (two-class Chi-Square $\underline{P}=0.070$).

Management Goals

Respondents could not agree whether or not program management goals are being met. Moreover, they differed in opinion concerning whether adequate numbers of trees are being left. Respondents agreed that lack of consistency in selecting and measuring wildlife trees at both the District and Regional level was an impediment to the program and analysis at the Supervisor Office level was seen as helpful to the wildlife tree program (two-class Chi-Square $\underline{P}=0.005$). Wildlife biologists did agree that wildlife tree abundance should be managed over areas comparable in size to the territories of each species of cavity nesting bird (two-class Chi-Square $\underline{P}=0.000$).

General Information

Respondents felt that monitoring should take place every 3-5 years and wildlife biologists should conduct monitoring. In terms of wildlife tree selection, wildlife biologists believed that they are selecting <20 percent of the trees. In their opinion, more trees are being selected by purchasers or others (Appendix 1).

Discussion

Wildlife biologist opinions followed many of the same trends that were evidenced during telephone conversations 6 months earlier. Questions that were perceived as factual or high order needs reflected distinct agree-disagree patterns but approach oriented questions often did not elicit a strong single opinion. Biologists' comments (Appendix 1) were concerned with tree selection responsibility -contractor or biologist, landscape level management, funding, and inadequate personnel to implement the program successfully. These priority questions had significantly different agree and disagree classes.

Of importance in this survey, is the fact that biologists will welcome the comments of logging contractors in conjunction with the wildlife tree program. This suggests that a forum or conference on issues about the program might be positively received. Those present should include representatives from the logging industry, WISHA (Labor and Industry) OR-OSHA and Forest Service wildlife biologists. Preliminary data also shows that logging contractors believe that a forum would be of benefit to resolving conflicts related to safety guidelines and hazard tree definition.

Measurement inconsistencies and variation in program procedures might be overcome by meetings conducted at the National Forest level. Certain core data could be collected in a standardized fashion and other data at the discretion of the District. Most wildlife biologists believed that analysis at the S.O. level would be of benefit to the program. This position might provide not only greater continuity to the program but assist landscape level management. Adequate marking crew training and the training of others participating in the program could be provided through short courses if this is not already being undertaken.

It seems that training of all personnel actively involved in the wildlife tree program could be of great benefit in improving implementation of the program. Cursory examination of the logging contractor data suggests that logging operators feel knowledge about the biology of wildlife tree selection would assist them. Training in harvesting systems might be helpful to wildlife biologists. A short course in basic silviculture, harvesting, and wildlife biology could be organized for OR-OSHA and WISHA personnel.

Questions concerning patterns of wildlife trees, and landscape management, are not easily answered (see Biologists' comments in Appendix 1). Perhaps a forum would assist in bringing on going research to those who normally would not hear of it.

Summary

Respondent opinions were divided as to whether or not the management goals of this program are being met. Furthermore, some wildlife biologists appear concerned about future funding and staffing of the wildlife tree program. Respondents were open to incorporating contractor opinions into program evaluation, but felt that $500 fines for contract violations were not sufficient. According to survey results, contractors are receiving technical information before selecting trees. There was agreement that measurement and procedures should be consistent within a Region and that an S.O. position to analyze data for the program would be beneficial. WISHA and OR-OSHA guidelines do impact wildlife tree selection and purchaser selection was seen as one possible avenue to reduce safety conflicts. Respondents recognized that habitat needs of cavity nesters are not being met because of the dominance of green wildlife trees on sites and felt that information concerning patterning of tree on units would be useful.

Table 3.1. Chi-square 2-class tests for questions from the wildlife biologist questionnaire.

No	Question	Agree	Disagree	P value
1	Nat. F. manuals define criteria for program	15	33	.009
2	Supervisors provide feedback on program problems	21	30	.208
3	Contractors receive technical information	32	12	.003
4	Data forms Regionally consistent	46	8	.000
5	Contractors meeting contractual requirements	26	21	.466
6	$500 fine is sufficient deterrent	11	41	.000
7	District funds limit program	48	6	.000
8	Safety guidelines impede tree selection	42	11	.000
9	Escaped slash burns result in tree loss	18	13	.369
10	Information needed on tree patterning	54	1	.000
11	Information needed on creating trees	33	22	.138
12	Biologists should give direction to contractors	53	2	.000
13	Blowndown included in tree number calculations	20	29	.199
14	Purchaser selection resolves selection-safety conflicts	28	16	.070
15	Cavity nester needs are being met over stand rotation	6	46	.000
16	Nat. F. Mgmt. plans define tree selection criteria	22	32	.174
17	Decay class is a primary selection factor	22	31	.216
18	Personnel is adequate to implement program	21	32	.131
19	KV funds prime source for tree monitoring	40	13	.000
20	Tree measurement inconsistencies at District level is a program impediment	38	9	.000
21	Contractor opinions incorporated into program evaluation	40	5	.000
22	Marking crews adequately trained	14	35	.003
23	Nat. F. funds limit program	47	7	.000
24	Tree measurement inconsistencies at Nat. F. level is a program impediment	34	13	.002
25	We are meeting management guidelines	25	31	.423
26	Analysis at Supervisor's level beneficial	30	12	.005
27	Personnel turnover affects program	41	11	.000
28	We have a standard monitoring procedure	17	36	.009
29	We measure tree longevity	23	30	.336
30	Management should be bird-territory size dependent	48	4	.000

Table 3.2. Pearson product moment correlations among questions with categories form the wildlife biologists questionnaire.

	Factor 1. Communication and Information Exchange		Q2	Q12	Q16*	
Q1	Nat. F. manuals define criteria for program		.4201 (44) p=.002	-.3691 (47) p=.005	.2678 (48) p=.033	
Q2	Supervisors provide feedback on program problems			-.2208 (50) p=.062	.2190 (50) p=.063	
Q12	Biologists should give direction to contractors				-.0968 (53) p=.245	
Q16*	Nat. F. Mgmt. plans define tree selection criteria					

	Factor 2. Contractor Role		Q5	Q6	Q21*	
Q3	Contractors receive technical information		.1898 (40) p=.120	.1311 (.42) p=.204	.3231 (35) p=.029	
Q5	Contractors meeting contractual requirements			.0624 (45) p=.342	.2249 (39) p=.084	
Q6	$500 fine is sufficient deterrent				.0203 (42) p=.449	
Q21*	Contractor opinions incorporated into program evaluation					

	Factor 3. Biology		Q11	Q13	Q15	Q17	Q29*
Q10	Information needed on tree patterning		.2331 (54) p=.045	-.1209 (48) p=207	-.1818 (52) p=.099	-.0758 (52) p=.297	-.2160 (52) p=.062
Q11	Information needed on creating trees			.0212 (48) p=.443	-.2556 (51) p=.035	-.3491 (52) p=.006	.0257 (53) p=.427
Q13	Blowndown included in tree number calculations				.0337 (45) p=.413	.1405 (48) p=.170	.2082 (46) p=.082
Q15	Cavity nester needs are being met over stand rotation					.4198 (49) p=.001	-.2090 (49) [=.422
Q17	Decay class is a primary selection factor						.0801 (50) p=.290
Q29*	We measure tree longevity						

	Factor 4. Measurement		Q4	28*			
Q4	Data forms Regionally consistent		--	-.2233 (51) p=.058			
Q28*	We have a standard monitoring procedure						
	Factor 5. Funding		Q19*	Q23			
Q7	District funds limit program		-.1722 (52) p=.111	-.3451 (53) p=.006			
Q23	Nat. F. funds limit program			-.1422 (51) p=.160			
Q19*	KV funds prime source for tree monitoring						
	Factor 6. Personnel		Q22	Q27*			
Q18	Personnel is adequate to implement program		.1195 (46) p=.214	-.1742 (49) p=.116			
Q22	Marking crews adequately trained			-.2910 (46) p=.025			
Q27*	Personnel turnover affects program						
	Factor 7. Safety		Q8*				
Q14	Purchaser selection resolves selection-safety conflicts		-.1381 (42) p=.191				
Q8*	Safety guidelines impede tree selection						
	Factor 8. Management Goals		Q24	Q25	Q26	Q30*	
Q20	Tree measurement inconsistencies at District level is a program impediment		.2084 (42) p=.093	-.2968 (47) p=.021	-.2055 (37) p=.111	.1211 (44) p=.217	
Q24	Tree measurement inconsistencies at Nat. F. level is a program impediment			.0163 (47) p=.457	.1094 (37) p=.260	.2358 (43) p=.064	
Q25	We are meeting management guidelines				-.0768 (42) p=.314	-.1221 (53) p=.194	
Q26	Analysis at Supervisor's level beneficial					-.0374 (39) p=.411	
Q30*	Management should be bird-territory size dependent						

List of Figures.

Figure 3.5. Frequency distribution of responses dealing with monitoring and funding. frm consis=data forms should be consistent across the region; stand proc.=we have a standard monitoring procedure; Dfundlim=district funding is limiting success; Fundsrce=National forest funding is limiting success; Nfundlim=KV funds are limiting success.

Figure 3.6. Frequency distribution of responses that dealt with personnel limitations and safety. Adeqat per=Adequate personnel are available to implement the program; crew train=marking crews are adequately trained; turnover=Personnel turnover affects the program; safety-sel=safety guidelines impede tree selection; purch-sol=purchaser selection of trees resolves selection-safety conflicts.

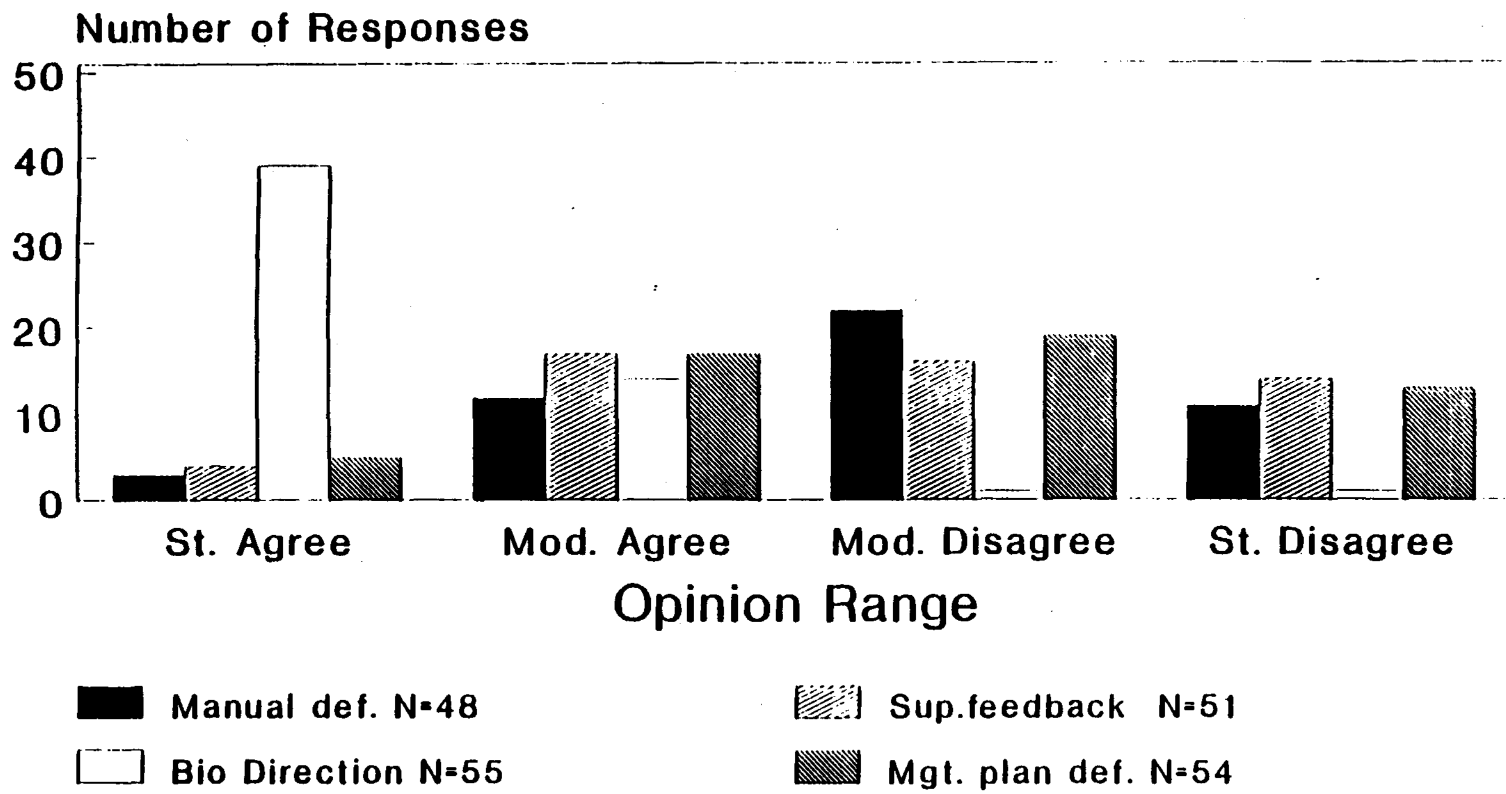
Figure 3.7. Frequency distribution of responses that dealt with achieving management goals. D. inconsist=district level inconsistencies in measurements are an impediment to achieving goals; NF inconsist=National Forest inconsistencies in measurement are an impediment to achieving success; Adeqate trees=We are meeting guidelines by leaving adequate trees; Supanal=analysis of the program at the SO level would be beneficial; Tersizbrd=Management should be conducted at a scale consistent with the territory size of the bird species.

Figure 3.8. Personal information regarding the respondents.

Figure 3.9. Percent of wildlife trees that are purchaser select,selected by biologists or other.

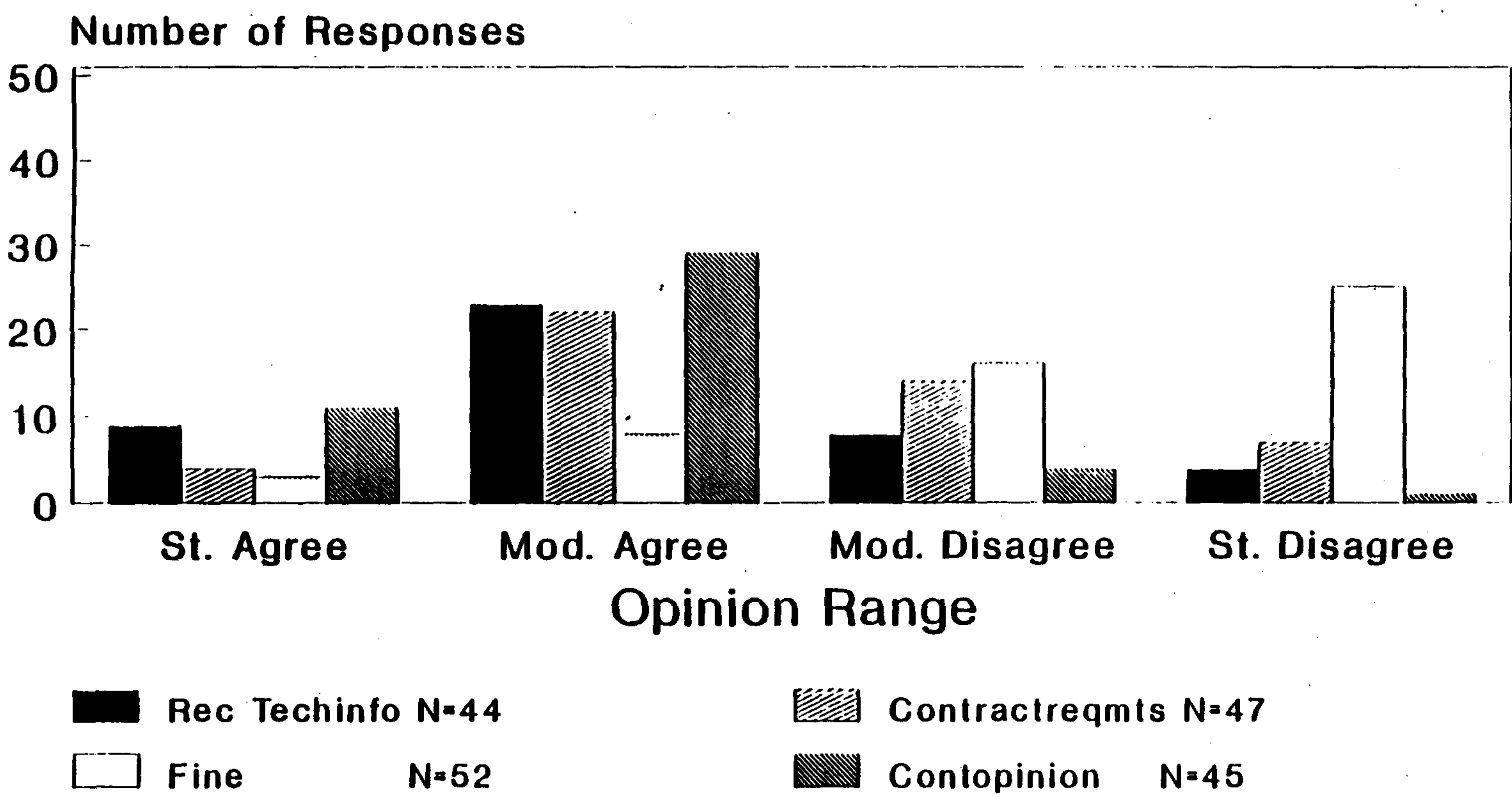
Figure 3.10. Percent of respondents indicating that monitoring of trees should be conducted every 1, 3, or 5 years; b) surveys should be conducted by silviculturists, wildlife biologists, timber sale planners or others; c) should the person that responded to the survey be responsible for this monitoring.

Frequency Distribution
Communication and Information
Regional and District Biologists



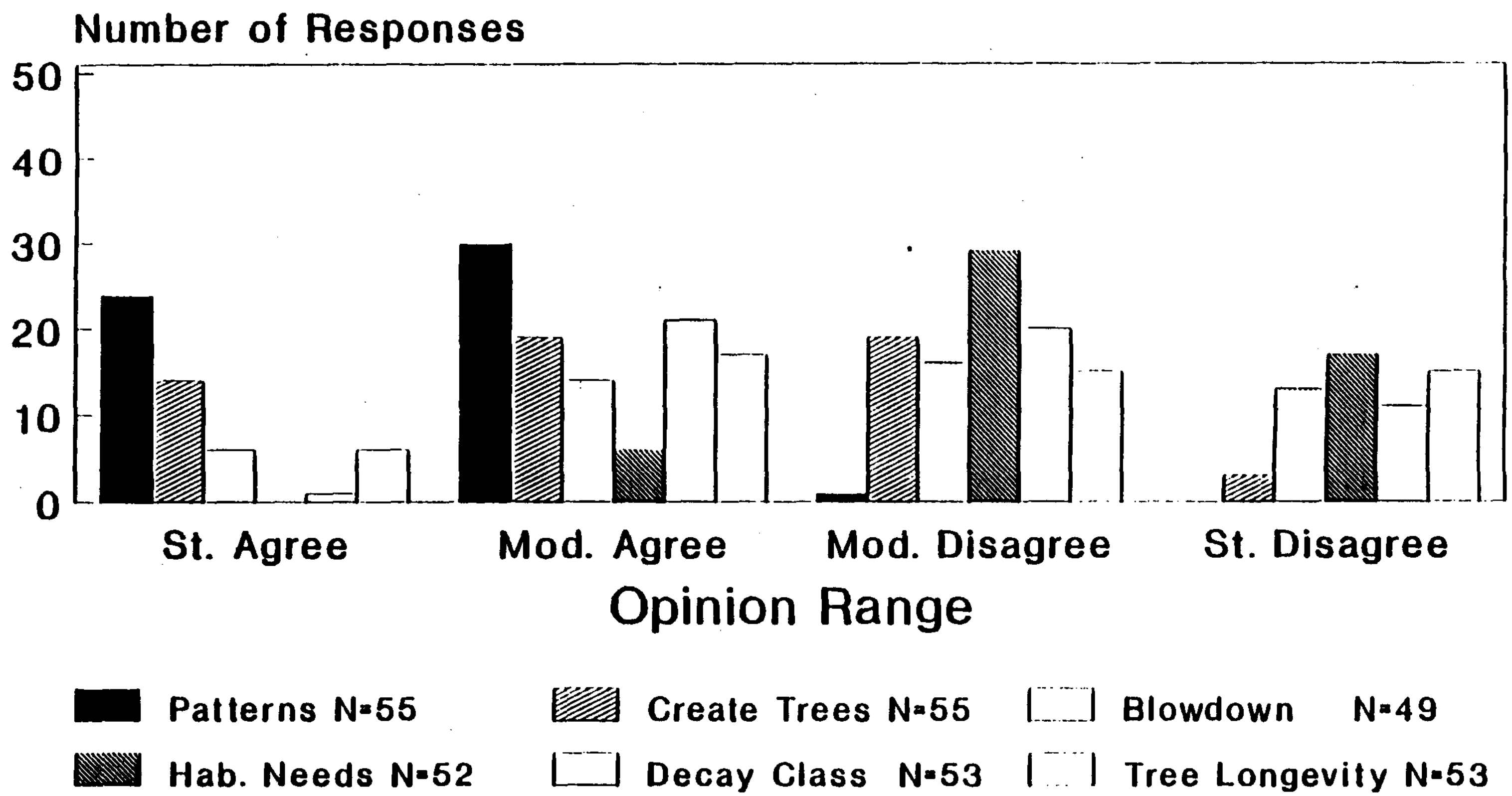
N=56 No opinion removed

Frequency Distribution
Contractor Role
Regional and District Biologists



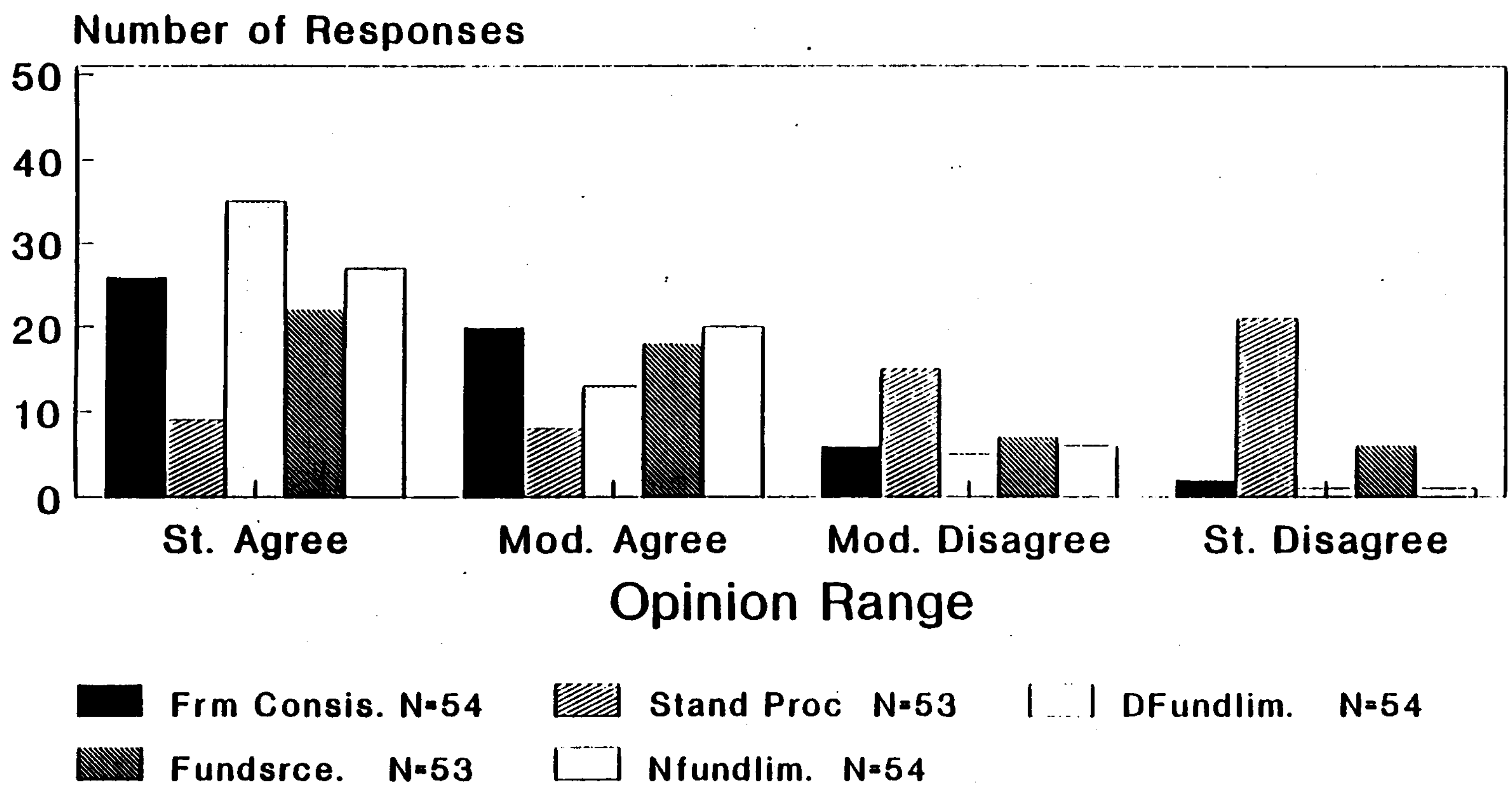
N=56 No opinion removed

Frequency Distribution
Biology
Regional and District Biologists



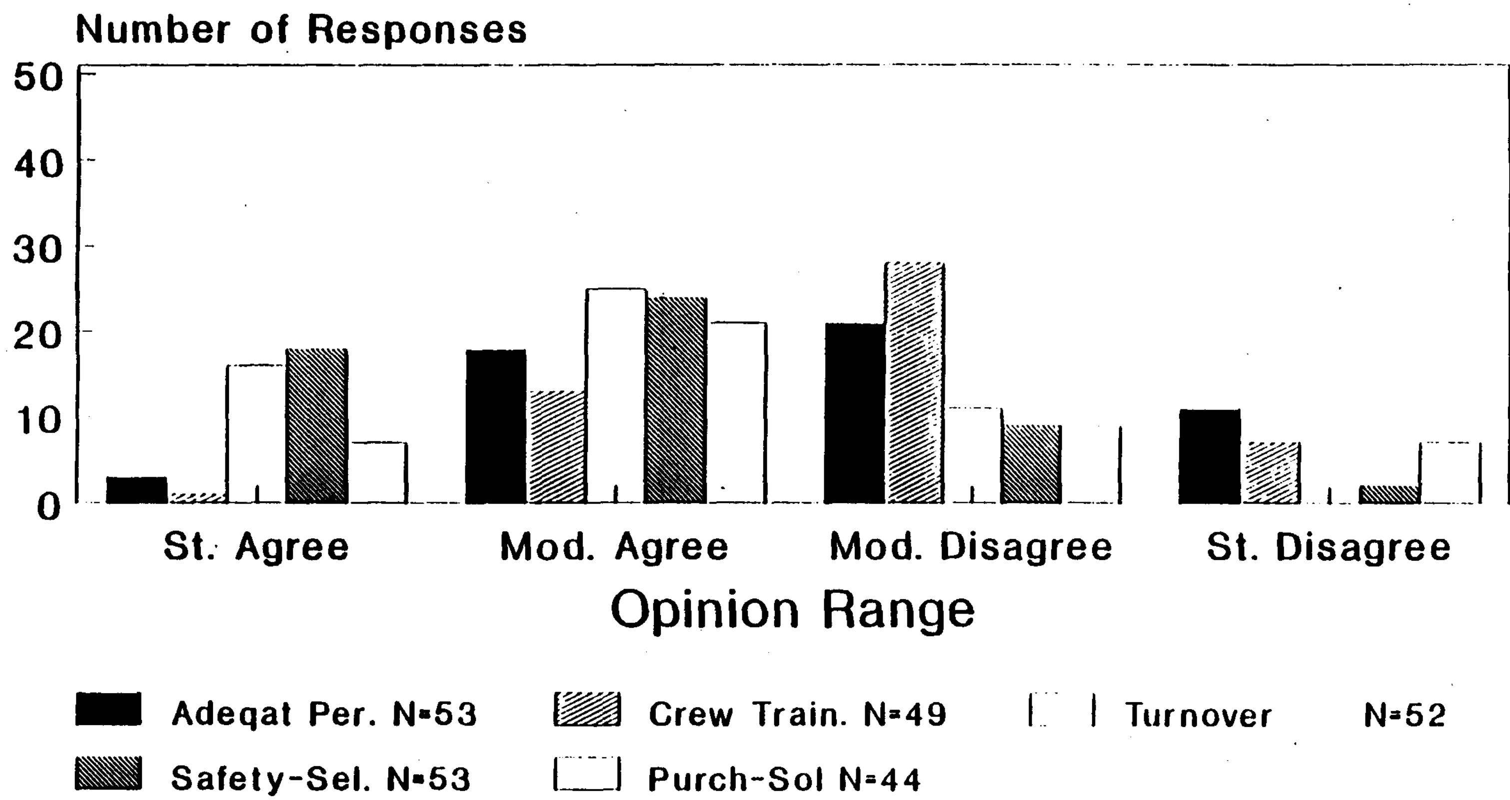
N=56 No opinion removed

Frequency Distribution
Measurement and Funding
Regional and District Biologists



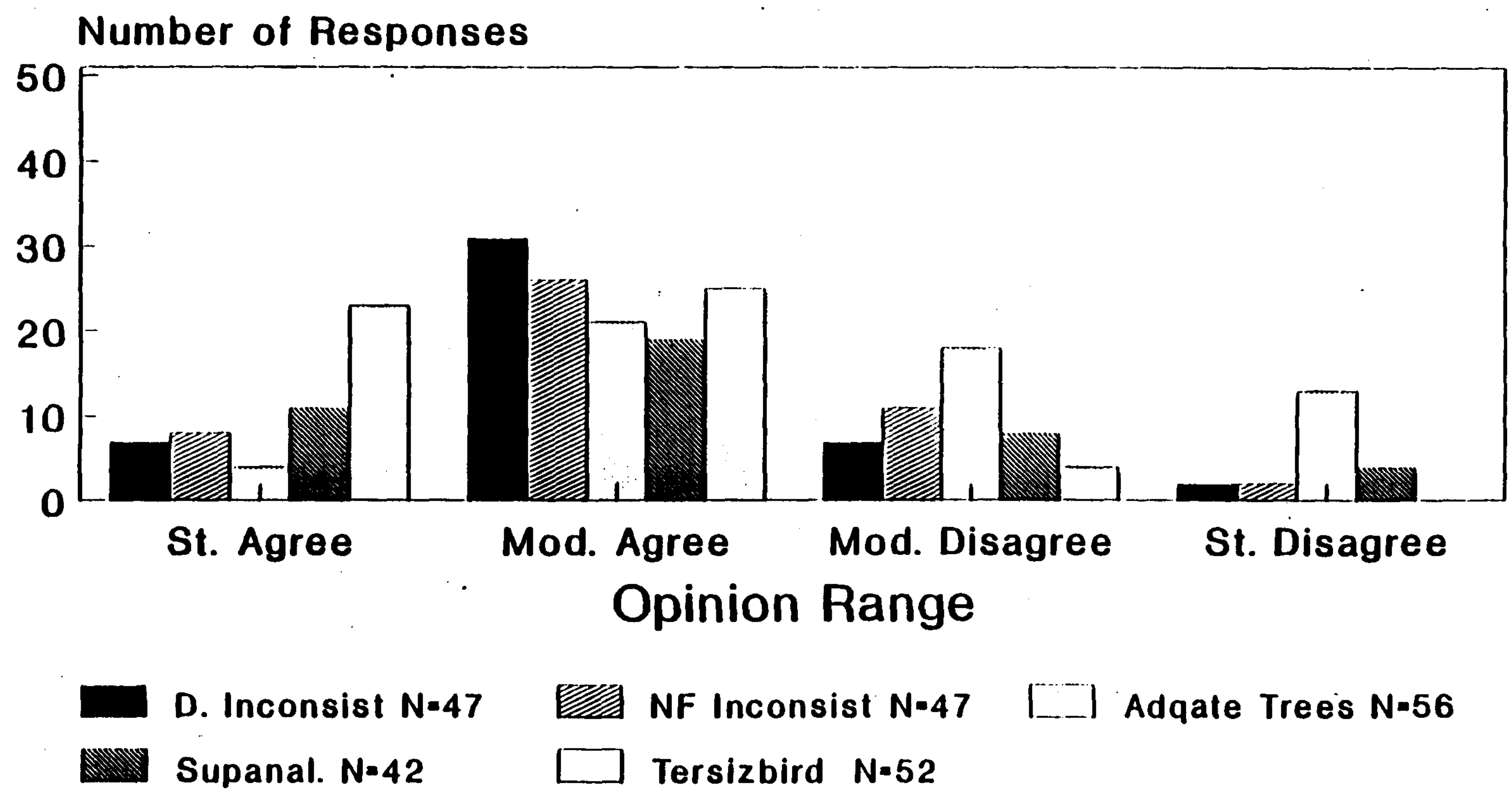
N=56 No opinion removed

Frequency Distribution
Personnel and Safety
Regional and District Biologists



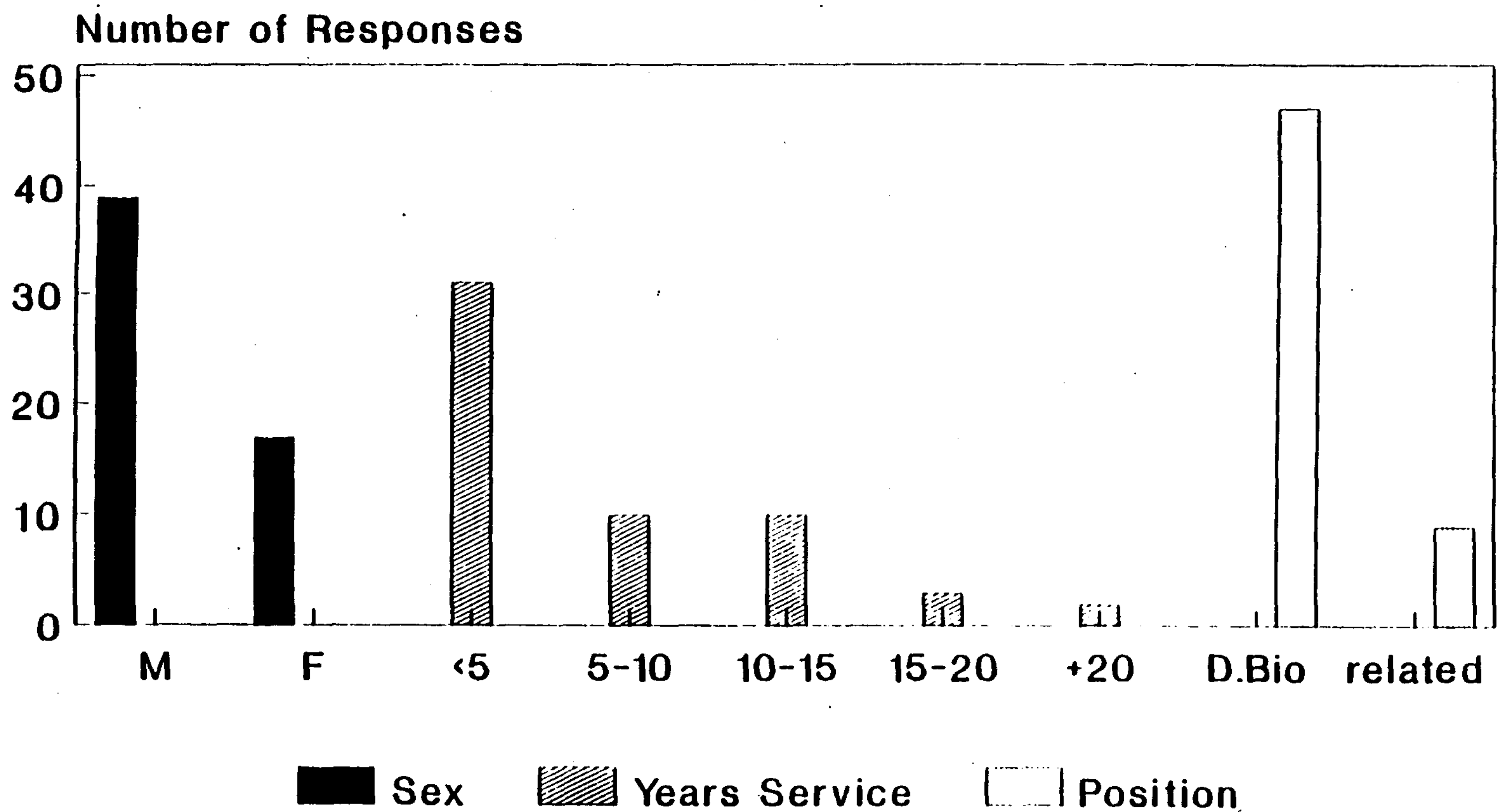
N=56 No opinion removed

Frequency Distribution
Management Goals
Regional and District Biologists



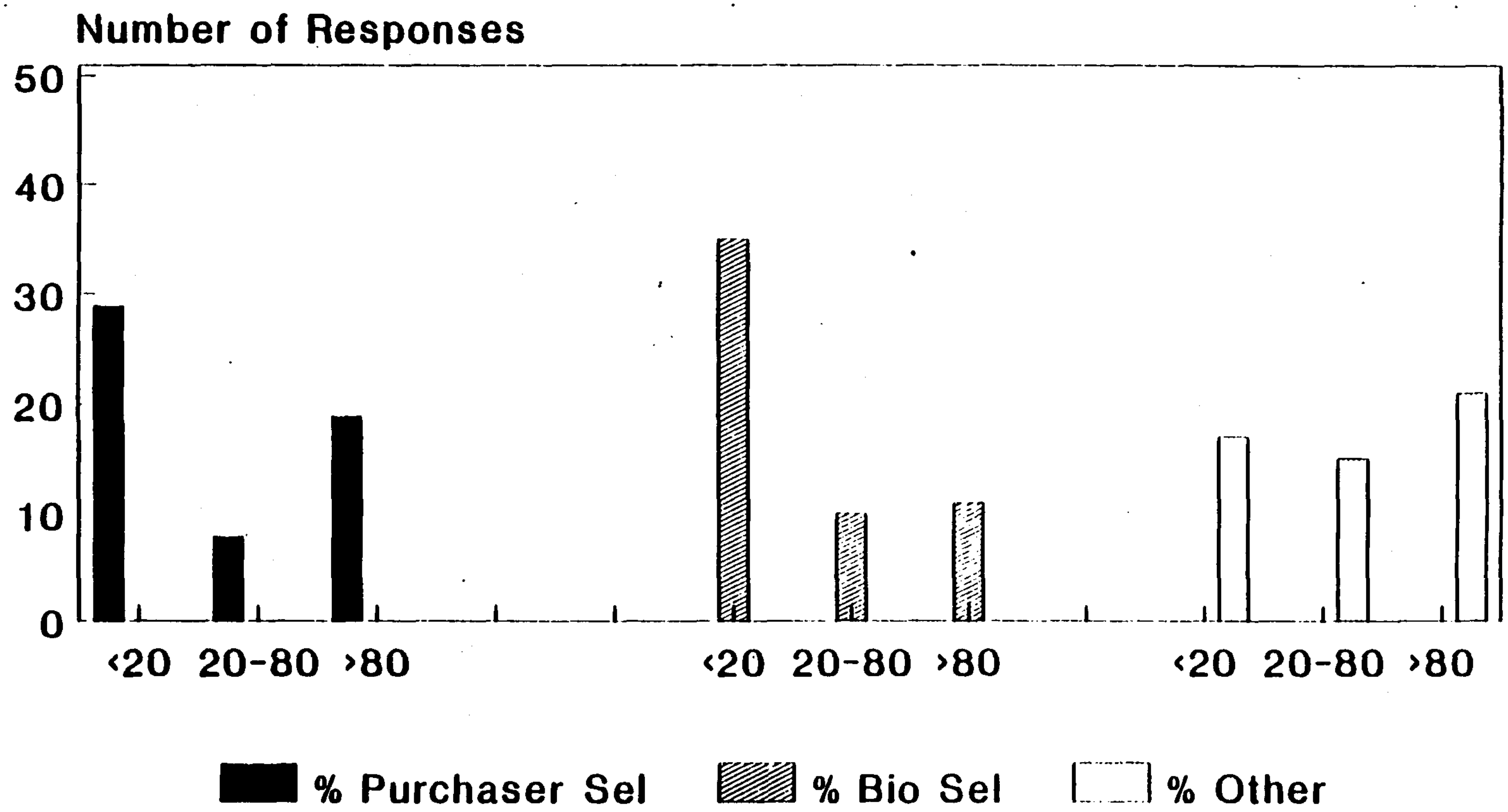
N=56 No opinion removed

Frequency Distribution
Personal Information
Regional and District Biologists



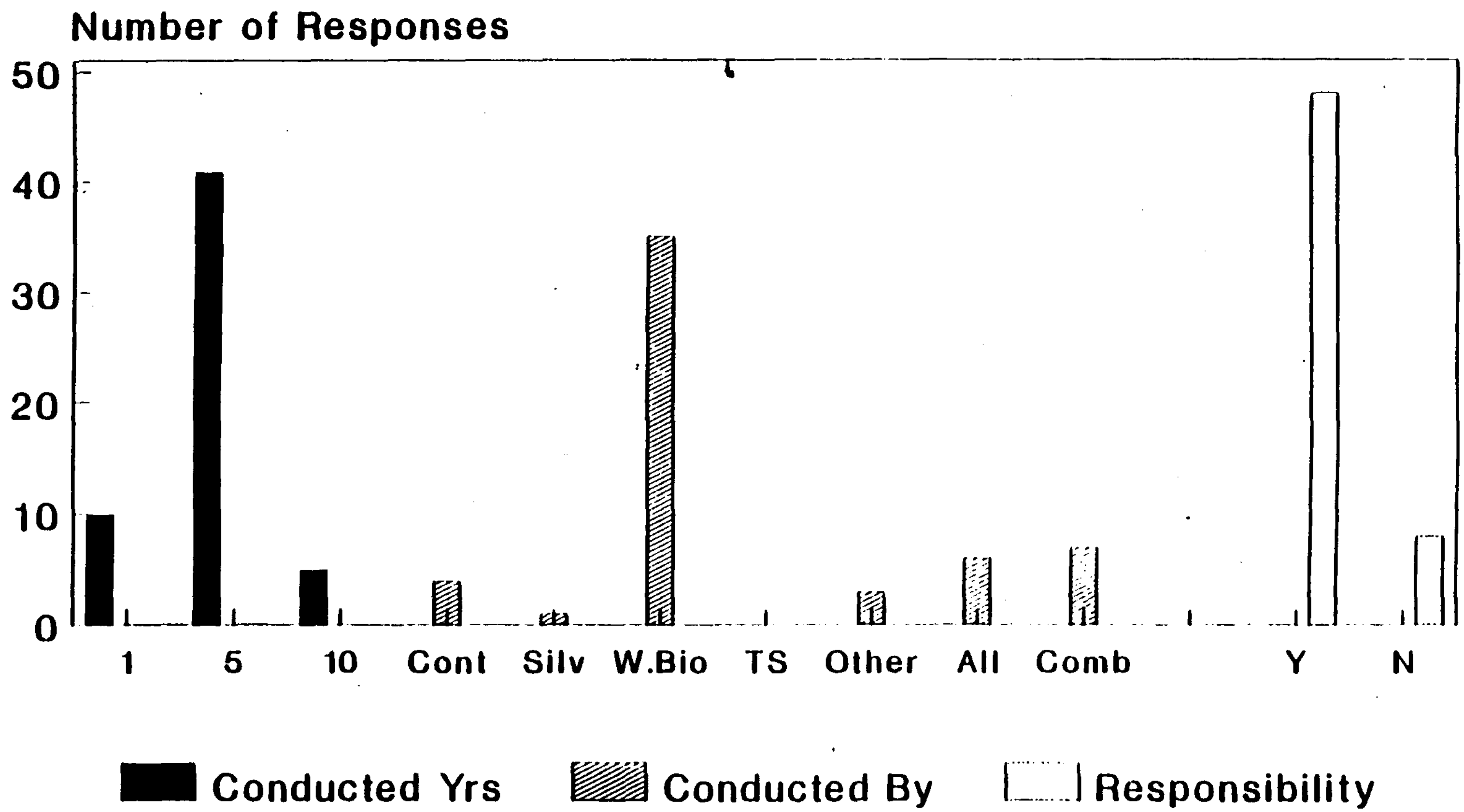
N=56

Frequency Distribution
General Information A
Regional and District Biologists



N=56

Frequency Distribution
General Information B



N=56
Some chose survey in yr 3
Combination respondent selected

APPENDIX 1.1

Wildlife Biologists' Comments

Slightly over 50 percent of the respondents commented on the program. Many respondents commented next to the questions that were of interest. However, final comments are presented here under several categories.

General Comments

There is no "Program" per se... it is an "activity" which tracks the Forest Plan and project-level standards and guidelines, and requirements (sale provisions, etc). Instilled in the planning, design, layout, implementation and followup.

Forest standard and guideline minimums need to be raised substantially for program to work.

I want to know the results of this survey, your interpretation and strategy for action. Furthermore I want to be involved with the systematic, development, application and sharing of a Regional W. Tree M. Program. I invite your calling on me for involvement.

Until line officers are held directly accountable for the wildlife tree program it is unlikely that it will improve.

The monitoring program should be developed and managed by a biologist.

The responsibility for the wildlife tree monitoring program should be shared amongst wildlife biologists silviculturists and foresters. Each of these resource areas has something to contribute and make an effective program. When short of personnel contractors would also be effective, although I feel strongly that FS employees need to get out in the field and see what is happening.

Some of these questions are harder to answer because the Forest is moving to lump sum payment-i.e. our District is selecting wildlife clumps and part of the time, letting the purchaser select scattered trees. Also we just added in a factor to compensate for Wildlife tree blowdown.

We have not done as much systematic monitoring as we should be. We are beginning a concerted effort to do so. I was skeptical about purchaser select when the choice first became available; but after seeing the results, I am "converted". Purchasers have been doing a very good job-we are getting all we ask for. In many instances, purchasers are leaving more trees than we (FS) did. (we could miss our goal [60 %] but purchaser would be on target. Another advantage of purchaser select is that the purchaser becomes "part of the process", helps us do our jobs (part of the "team" if you will). A fly in the ointment is the FS movement to "lump sum" sales, rather than " scaled" sales. It will be very difficult to use purchaser select in lump sum because there is much more uncertainty for the purchaser-more need to get as much volume out as possible, because all is paid for up front-not after scaling.

I feel good about the District WL tree monitoring program that we have, although there is a limited amount of time that we can spend on it. The current Forest-level "monitoring plan used for Forest Plan monitoring is a joke in its current form. I still consider the process of spending thousands of dollars to create snags, after you cut down perfectly good ones already present,to be the ultimate irony.

Is currently a joke, no time for implementation, monitoring or protection from site preparation burns.

More standardization for characteristics, monitoring and retention is needed. Loss due to blowdown is significant.

Comprehensive Comments

1. Our future plan needs to reflect what we do on the ground with wildlife trees.

2. There needs to be better coordination between the Timber Shop and Wildlife Shop at the Supervisors level.

3. Better direction passed down to District Timber Shops from S.O.'s Timber Shop.

4. Wildlife personnel are continually pointing out the obvious regulation to District Timber personnel. Once the Timber Shop knows the proper regulation they implement with no problem.

5. Need better data tracking between SO/District Timber Shop/Wildlife Shops.

6. We are leaving proper tree amounts/types on our district.

7. I feel we need better distribution of trees throughout the logging unit. Sale. Adm. still put too many trees in the bottom of the unit.

8. I would like to see 50 % scattered 50 % clumped [on] 50 % lower half and 50 % upper half of unit.

Large concerns of many FS bios:

1. Does leaving 40 percent habitat structure equate to 40 percent population?

2. Does leaving WLTs in open clearcut serve all indigenous cavity users for geographic province? Eg. Doug.-fir forest cavity users?

3. No T.S. KV funds in future for admin. program.

4. Need for alt. scheme to 40 percent harvest-acre subdrainage. Will HCA's and other non harvest areas meet viable populations?

   Wildlife tree monitoring could be contracted WL bios; with future budget individual Dist. Bios won"t have $ or time (no time now for adequacy). Regional $ for large area or geographic survey monitoring would be cost efficient and have consistency.

Funding, Personnel and Management Goal Comments

Funding is very much a limiting factor although it would be ideal to survey every year.

No funding source has allowed the sampling of stands to collect snag data for us to effectively model what will happen to snag numbers through time. $ and personnel limitations due to large work loads usually necessitates skipping this important phase. Monitoring doesn't have the target type of stipulation that some other projects do thus it is often easier to overlook.

The main problem I see the WLT program faced with is limitation of KV funds for snag creation 5 yrs post harvest, if more appropriated funds aren't made available specifically for this purpose. We've only monitored areas to review immediate post-harvest topping needs, and I see a definite need to put more focus to the entire program. Funding and personnel is a definite problem. We're now considering topping trees in currently managed stands (2nd growth fire history) to achieve higher snag levels. More info is needed specifically relating to snag life of various species in the western Cascades. Also its been noted that survival of green trees especially on dry south aspects can be low in some instances (hemlocks) which is a real concern if we're counting on these for future snags.

I feel strongly that Regional standard form should be developed for wildlife tree monitoring. The form should consist of a high-priority "short list" of information w/ additional "long list" fields for additional data collected on only a sub-sample of units or all as the budget allows. My major concerns include the lack of funding source for long term monitoring beyond the 5-year KV limitation; and the loss of soft snag habitat across the landscape. Those snags are either incinerated, or not even left in units.

We have KV money and KV plans for monitoring wildlife trees but due to lack of personnel we have been doing the minimum or less.

Current manpower and perm. work force is not conducive to development of adequate tree selection and monitoring program on this District.

I don't believe that a tree monitoring program exists beyond lip service. We all intend to do this but drop it as workloads increase. KV funds the initial monitoring and so short term monitoring isn't a problem - having the people or time to contract the work is the problem.

Monitoring is definitely falling short, primarily due to lack of funds, time and personnel. Research is also insufficient which affects non-Bio acceptance of current WL tree Mgt. procedures. I believe both of these have improved in the last couple of years. But the need is still great and current hiring ceilings and reduced funding will likely have an impact.

Our database is in place--questionable that we will ever have the personnel or $ to monitor trees.

Minimum viable population needs of 20 %, 40 % and 60 % are not adequate to meet cavity-nester needs. Even these minimum standards are rarely met.

Current wildlife tree diameters are too small. Need larger clumps of trees.

Monitoring should be done at landscape levels (5000-10,000 acres) with purpose and need clearly defined. We need to monitor w/clear objectives. Monitoring should be done to meet LMP needs.

Current Mgnt. of wildlife tree policy in {deleted} does not do an adequate job of describing standing dead and down components-rotation of the stand is addressed based on decay periods. Affect of site preparation activities is not addressed properly. Example is small diameter not fire resistant species in units proposed for site Prep Broadcast Burning. Evelyn Bull's work is starting to show that 40 % biological potential may only get 20 % population viability. Stand monitoring can be done but need better methods for evaluating wild/dead-down components at various spatial scales.

Appendix 1.2. Survey booklet.

Wildlife Tree Monitoring Program
Questionnaire

ID No.

[illegible] the response most similar to your own opinion concerning the Forest Service [illegible] Tree Program. Circle the appropriate level for questions 25 and 29

	Strongly Agree	Moderately Agree	No Opinion	Moderately Disagree	Strongly Disagree
[illegible] National Forest manuals do not define the [illegible] necessary to conduct the Wildlife Tree Program	1	2	3	4	5
[illegible] National Forest Supervisors give feedback to District staff concerning any problems with the Wildlife Tree Program.	1	2	3	4	5
[illegible]) Timber Sale contractors do not receive technical information from Forest Service personnel before selecting wildlife trees	1	2	3	4	5
4) Data collection forms should be consistent within a Region.	1	2	3	4	5
5) Timber Sale contractors are meeting contractual requirements for wildlife tree selection	1	2	3	4	5
6) A $500 fine per tree is not sufficient deterrent to prevent violation of contractual requirements.	1	2	3	4	5
7) District funds limit the Wildlife Tree Monitoring Program.	1	2	3	4	5
8) OR-OSHA and WISHA guidelines do not impede successful selection of snags andgreen wildlife trees	1	2	3	4	5
9) Over 50% of escaped slash burns contribute to loss of wildlife trees.	1	2	3	4	5

	Strongly Agree	Moderately Agree	No Opinion	Moderately Disagree	Strongly Disagree
10) More information is needed concerning patterning (CLUMPED VS SCATTERED) of wildlife trees on units.	1	2	3	4	5
11) We do not need more information concerning methods to create wildlife trees.	1	2	3	4	5
12) Biologists should provide direction to Timber Sale administrators on wildlife tree selection.	1	2	3	4	5
13) Blowdown is not accounted for in calculations of wildlife tree numbers in prescriptions.	1	2	3	4	5
14) Purchaser-selection of wildlife trees is a not solution to tree selection-OR-OSHA or WISHA conflicts.	1	2	3	4	5
15) Habitat needs of cavity nesters are not being met over the stand rotation because green or newly killed trees dominate the leave tree population	1	2	3	4	5
16) National Forest Mgmt. plans clearly define the characteristics necessary for wildlife tree selection	1	2	3	4	5
17) Decay class is not being used as a primary selection factor for wildlife trees.	1	2	3	4	5
18) There is an adequate number of District personnel to implement wildlife tree prescriptions.	1	2	3	4	5
19) K. V. funds are not the prime source of funds to conduct wildlife tree monitoring.	1	2	3	4	5
20) Lack of consistency in selecting and measuring wildlife trees among Districts within each National Forest is an impediment to the wildlife tree program.	1	2	3	4	5

	Strongly Agree	Moderately Agree	No Opinion	Moderately Disagree	Strongly Disagree
21) Wildlife Tree Program effectiveness evaluations should include contractor opinions	1	2	3	4	5
22) Marking crews do <u>not</u> receive adequate training in wildlife tree selection.	1	2	3	4	5
23) National Forest funds are limiting the Wildlife Tree Monitoring Program	1	2	3	4	5
24) Lack of consistency in selecting and measuring wildlife trees among National Forests within the Region does <u>not</u> impede the success of the Program	1	2	3	4	5
25) Our (Ranger District/National Forest/Region) is meeting management guidelines by leaving an adequate number of wildlife trees	1	2	3	4	5
26) Additional analysis of wildlife tree data at the Supervisor's office level would <u>not</u> help the Wildlife Tree Monitoring Program.	1	2	3	4	5
27) Forest Service personnel turnover does <u>not</u> affect implementation of the Wildlife Tree Program	1	2	3	4	5
28) Our (Ranger District/National Forest/Region) has a standard procedure for monitoring wildlife trees	1	2	3	4	5
29) Our Ranger District/National Forest/Region) does <u>not</u> monitor wildlife trees for tree longevity	1	2	3	4	5
30) Wildlife tree abundance and distribution should be managed over areas comparable in size to the territories of each species of cavity nesting bird	1	2	3	4	5

31) You are: M F

32) The number of years you have worked in your current position with the Forest Service is (circle one):

0 - 5 5 - 10 10 - 15 15 - 20 20 +

33) Your position title is:

34) What percent of your timber harvest units with wildlife trees are purchaser-selected?

35) What percentage are selected by: Biologists Others

36) Survey of wildlife trees should be done every (circle one) years: 1 5 10

37) Wildlife tree monitoring should be conducted by (circle one): Contractors

Silviculturalists Wildlife Biologists Timber Sales Personnel Others

38) Are you responsible for wildlife tree monitoring? Y N

39) Please feel free to comment upon any specific aspects of the Wildlife Tree Monitoring Program that you wish.