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PERCEPTIONS OF IMPLEMENTING AND MONITORING WILDLIFE TREE PRESCRIPTIONS ON NATIONAL FORESTS IN WESTERN WASHINGTON AND OREGON

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Silvicultural prescriptions that benefit wildlife may be needed in managed Pacific Northwest forests if species associated with old forests are to recover (U.S. Fish and Wildlife Service 1992:481–526, McComb et al. 1993). Implementation of prescriptions will depend on coordination among a management triad: (1) agency personnel who provide the prescriptions for stands and landscapes, (2) forest industry contractors who implement the prescriptions, and (3) safety inspectors who enforce regulations designed to protect workers. The U.S. Department of Agriculture Forest Service (USFS) has been criticized for not succeeding in correct development, implementation, and monitoring of comparatively simple prescriptions that included provisions for trees and snags (Bull et al. 1986, Morrison et al. 1986).

Snags have been assumed essential for persistence of some cavity-using vertebrates (Thomas et al. 1979, Davis et al. 1983, Neitro et al. 1985). To maintain populations of cavity-dependent species, many U.S. National Forests have retained snags and trees (to replace snags that fall) in harvested units; these trees and snags are termed wildlife trees (USFS et al. 1992).

Number of wildlife trees retained have not always met USFS goals for cavity-nesting bird habitat (Bull et al. 1986, Morrison et al. 1986), suggesting that complex prescriptions for a federally threatened or endangered species might also be developed, but implemented insufficiently. Most wildlife tree management evaluations have addressed the number and condition of trees found on harvested units compared to prescribed numbers. Bull et al. (1986) reported that 31% of the 76 USFS Districts in their survey had snag levels below that necessary to sustain minimum populations of cavity-nesters (40% of potential populations, Thomas et al. 1979). Morrison et al. (1986) found that the number of snags in the eastern Sierra Nevada was only about 25% of that necessary to sustain minimum populations of cavity-nesting birds. Causes for inadequate retention of wildlife trees after harvesting were not thoroughly investigated. Styskel (1983) defined obstacles to reaching satisfactory snag levels in eastern Oregon as operational and technical as well as dependent on responsiveness of accountable personnel. Accountable personnel are represented among members of the management triad. Safety inspector duties are largely regulatory, so the greatest opportunity for change that might increase the likelihood of correct implementation of wildlife tree prescriptions seems to lie with biologists and contractors. Biologists assist with design of prescriptions (within the guidance provided by the forest plans) and contractors implement the prescriptions. We solicited opinions from USFS wildlife bologists and timber industry contractors on implementation and monitoring of wildlife tree prescriptions. We attempted to identify information needs and areas of communication that should be strengthened between these 2 groups if implementation and monitoring of future silvicultural prescriptions for wildlife is to succeed.

METHODS

We designed 2 surveys, each consisting of 30 statements chosen as important to wildlife tree program implementation and monitoring. Six statements were identical on both surveys; the remainder were specific to either wildlife biologists or logging contractors. Statements were based on preliminary discussions with wildlife biologists and harvesting specialists at Oregon State University, USFS, and the Oregon Department of Fisheries and Wildlife. Additional questions provided relevant background and personal information. Both surveys provided space for respondents to comment about the program.

Survey techniques followed Dillman (1978). Each 4-page survey consisted of an equal number of randomly ordered, negative and positive statements about the program. Negative statements were converted to positive statements for ease of presentation (Tables 1 and 2). Both groups were presented with statements in categories of policy, logistics, funding and personnel, and monitoring. In addition, biologists' surveys covered communication, contractors' role, biology, safety, funding sources, personnel turnover, measurement procedures, and management goals. The timber industry survey contained statements related to similar aspects of the program except statements dealing with logistics and safety replaced those on funding and measurement procedures. Respondents were asked to rate their opinion of the statements based on 5 agreement classes: "strongly agree," "moderately agree," "no opinion," "moderately disagree," and "strongly disagree." Surveys were numbered to assure respondent confidentiality.

Biologists' surveys were mailed in 1991 to western Oregon and western Washington U.S. Forest Service wildlife biologists listed in the 1990 Region 6 (Oregon and Washington) Biologist and Botanist Directory (Pacific Northwest Forest Service [PNWFS] biologists). The contractors' surveys were mailed simultaneously to western Washington contractors who were members of the Washington Contract Loggers Association in 1990 and to western Oregon forest industry contractors selected from the 1990 contract list for the Siuslaw National Forest (hereafter referred to as PNW [Pacific Northwest] contractors). The surveys sampled populations from the same geographic area. A follow-up letter was mailed to all individuals on each list 2 weeks after the surveys were distributed. Individuals who failed to respond by mail within 3 weeks (non-respondents) were telephoned to solicit responses. These data were used to assess non-response bias.

Data Analyses

"No opinion" responses were removed from tabulation and analyses because we wanted to identify items that elicited concern or agreement among the majority of biologists and contractors. Consequently, statements with ≥50% "no opinion" response were removed from analyses, resulting in the removal of 2 contractor statements ("safety guidelines conflict with correct implementation of >50% of prescriptions," ">50% of slash burns cause loss of wildlife trees") and 1 biologist statement ("escaped slash burns result in wildlife tree loss"). Analyses were conducted on the remaining 4 agreement classes, but classes were collapsed into "agree" and "disagree" for our results. We tested the null hypothesis that opinions from surveys returned by mail did not differ from opinions expressed by those individuals contacted by telephone (non-respondents) using chi-square goodness-of-fit tests (Steel and Torrie 1980: 482). A chi-square goodness-of-fit test also was used to assess departure from 50% "agree" versus "disagree" responses for each item. Within-group (Oregon and Washington contractors) and between-group (biologists and contractors) agreement of answers was tested with cross-tabulation chi-square (Steel and Torrie 1980:496).

RESULTS

All 56 PNWFS biologists returned questionnaires, but not all biologists responded to all questions (Table 1). Eight-five percent of 74 Oregon timber industry workers responded compared to 72% of 180 Washington contractors. We did not detect differences in opinion ($\chi^2 < 6.9$, 3 df, $P > 0.05$) between respondents and non-respondents in the Oregon contractor sample. Differences in opinion were detected for 2 statements between respondents and non-respondents for Washington contractors ("purchaser selection is a solution to conflict among triad members," $\chi^2 = 8.1$, 3 df, $P = 0.04$; "measurement inconsistencies are an impediment to program success," $\chi^2 = 9.8$, 3 df, $P = 0.02$). Responses to these 2 questions by Washington contractors may be biased, so we present results for Oregon contractors separate from Washington contractors. Responses of wildlife biologists did not differ between states ($\chi^2 < 7.0$, 3 df, $P > 0.05$) so results were pooled between states.

Respondent Characteristics

The PNWFS biologists were primarily men (69.6%) with <5 years service (48.2%) at the district level (82.1%) who were responsible for wildlife tree program monitoring. Seventy percent of the 193 PNW contractor respon-

Table 1. Responses of 56 U.S. Forest Service (USFS) wildlife biologists to statements concerning the Forest Service wildlife tree program, western Washington and Oregon, 1991–1992.

Statement synopsis	*n*	Percent		*P*[a]
		Agree	Disagree	
Policy				
USFS manuals adequately define criteria for program implementation	48	31	69	0.009
USFS forest plans adequately define tree selection criteria	54	41	59	0.174
The USFS is meeting management guidelines	56	45	55	0.423
A $500 fine/tree is sufficient deterrent to contract violation[b]	52	21	79	<0.001
Management should be dependent on bird territory sizes	52	92	8	<0.001
Logistics				
Contractors receive adequate technical information	44	73	27	0.003
Biologists should give direction to contractors	55	96	4	<0.001
Contractors are meeting contractual requirements[b]	47	55	45	0.466
Safety guidelines impede tree selection[b]	53	79	21	<0.001
Purchaser selection resolves selection-safety conflicts	44	64	36	0.070
Blowdown is considered in calculating wildlife tree prescriptions	49	41	59	0.199
Decay class is a primary factor in wildlife tree selection[b]	53	42	58	0.216
Information is needed on wildlife tree patterning[b]	55	98	2	<0.001
Information is needed on creating snags[b]	55	60	40	0.138
Funding and personnel				
Personnel is adequate to implement program	53	40	60	0.131
Personnel turnover affects program success	52	79	21	<0.001
Marking crews are adequately trained	49	29	71	0.003
National Forest funds limit program success	54	87	13	<0.001
K–V funds primarily support wildlife tree monitoring	53	75	25	<0.001
Monitoring				
We have a standard monitoring procedure	53	32	68	0.009
Data forms for monitoring should be regionally consistent	54	85	15	<0.001
District-level measurement inconsistencies impede program success	47	81	19	<0.001
National Forest measurement inconsistencies impede program success	47	72	28	0.002
Analyses of monitoring data at the forest level would be beneficial	42	71	29	0.005
Supervisors provide feedback on program problems	51	41	59	0.208
Cavity-nester needs are being met over stand rotations	52	12	88	<0.001
Contractors' evaluations are considered in program assessment	45	89	11	<0.001
We measure tree longevity	53	43	57	0.336

[a] Chi-square 2-class goodness-of-fit test, 1 df, regarding equality of agreement.
[b] Statements offered to biologists and contractors.

Table 2. Responses of 130 western Washington and 63 Oregon forest industry workers to questions regarding wildlife tree implementation on U.S. Forest Service lands, 1991–1992.

Statement synopsis	Washington				Oregon			
	n	Agree (%)	Disagree (%)	*P*[a]	*n*	Agree (%)	Disagree (%)	*P*[a]
Policy								
An open forum among triad members would be useful	120	72	28	<0.001	54	72	28	<0.001
Educational workshops would be beneficial	120	70	30	<0.001	53	53	47	0.680
A $500 fine/tree is sufficient deterrent to contract violation[b]	106	75	25	<0.001	53	83	17	<0.001
Purchaser selection of trees is a solution to conflict among triad members	114	62	38	0.009	57	67	33	0.012
Contractors are reluctant to bid on units with wildlife trees	109	84	16	<0.001	47	66	34	0.029
Agency or industry has a standard procedure for selecting trees	94	34	66	<0.001	56	30	70	0.003
Logistics								
Contractors choose wildlife trees on >50% units	90	78	22	<0.001	40	75	25	0.002
Timber sale administrators define selection criteria for contractors	107	64	36	0.003	50	70	30	0.005
Agency biologists understand constraints faced by operators	124	7	93	<0.001	59	10	90	<0.001
Contractors should receive information from biologists	117	68	32	<0.001	55	71	29	0.001
Contractors are meeting contractual agreements[b]	102	89	11	<0.001	49	94	6	<0.001
Safety guidelines impede selection of wildlife trees[b]	102	66	34	0.002	53	68	32	0.009
Clumps are operationally more efficient than scattered trees	116	61	39	0.016	59	95	5	<0.001
Uniformly distributed trees slow harvesting operations	129	92	8	<0.001	63	88	12	<0.001
Timber sales have wildlife trees on the unit periphery	88	36	64	0.011	40	80	20	0.019
Conflicts only occur when trees are retained near roads	97	39	61	0.033	53	26	74	0.001
Information is needed on tree patterning[b]	113	84	16	<0.001	60	75	25	<0.001
Information is needed on creating snags[b]	111	28	72	<0.001	53	32	68	0.009
Blowdown contributes to tree loss	129	74	26	<0.001	59	86	14	<0.001
Decay class is a prime selection factor[b]	82	26	74	<0.001	44	36	64	0.070
Safety								
OR-OSHA and WISHA guidelines adequately cover safety issues[c]	101	31	69	<0.001	48	42	58	0.248
Blowdown is a safety hazard	126	88	12	<0.001	57	81	19	<0.001
Uniformly distributed trees are a safety hazard	128	87	13	<0.001	63	90	10	<0.001
Funding and personnel								
Cost allowances should be made to contractors for wildlife tree implementation	110	10	90	<0.001	51	25	75	<0.001
Agency staff turnover is affecting implementation	87	43	57	0.163	37	57	43	0.411
Monitoring								
Measurement inconsistencies are an impediment to program success	71	59	41	0.123	29	55	45	0.577

Table 2. Continued.

Statement synopsis	Washington				Oregon			
	n	Agree (%)	Disagree (%)	*P*[a]	*n*	Agree (%)	Disagree (%)	*P*[a]
Contractor comments should be included in program evaluations	129	94	6	<0.001	61	95	5	<0.001
Program should be evaluated at regional level	98	85	15	<0.001	50	76	24	<0.001

[a] Chi-square 2-class goodness-of-fit test, 1 df, regarding equality of agreement.
[b] Statements offered to biologists and contractors.
[c] Oregon Occupational Safety and Health Act (OR-OSHA) and Washington Industrial Safety and Health Act (WISHA).

dents were men; 27% had <5 years experience working with wildlife trees but 28% percent had >10 years of experience. Most Washington contract logger respondents operated their own companies (61%), whereas only 31% of Oregon respondents owned contracting companies, providing further rationale for separating results between Oregon and Washington contractors.

Biologist Responses

Eighty-eight percent of PNWFS biologists disagreed that "cavity-nester needs are being met over stand rotations" (Table 1). Moreover, these biologists believed that the current criteria for the wildlife tree program were not adequately described in USFS manuals. Current wildlife tree prescriptions suggest snag densities that should be provided within harvest units to meet the needs of primary cavity nesters over larger areas (e.g., Neitro et al. 1985). Rather, PNWFS biologists agreed that management should be based on biologically meaningful scales, such as bird territory size. These changes may necessitate alteration of Forest Plans and coordination among land managers within a planning area.

PNWFS biologists also agreed that forest industry contractors received adequate technical information to select trees or to harvest around trees selected by the agency (Table 1). However, biologists indicated that agency crews that marked wildlife trees were not adequately trained and that personnel turnover affected success of implementation. PNWFS biologists felt that they should provide direction to contractors to achieve implementation success. Although Knudsen–Vandenburg (K–V) funds, administered by the USFS for post-harvest management, are the primary source of funds for wildlife tree monitoring, biologists thought that National Forest and District funds were limiting success of the wildlife tree program.

Most PNWFS biologists agreed that there were no standard procedures for monitoring wildlife tree implementaton, and data forms for monitoring should be consistent throughout the region (Table 1). PNWFS biologists believed that monitoring of program implementation was impeded by district- and forest-level inconsistencies in monitoring approaches. These biologists also responded that a forest-level analysis of monitoring data would benefit them.

Contractor Responses

Washington contractors had opinions that differed from expected (50%) on 26 of 28 statements and Oregon timber industry workers expressed opinions that differed from expected on 24 of 28 statements (Table 2). PNW contractors responded that purchaser selection of wildlife trees could help resolve conflicts among the members of the management triad. PNW contractors selected wildlife trees on >50% of those units that they purchased. USFS timber sale administrators defined the criteria for wildlife tree selection, and although contractors agreed that PNWFS biologists should pro-

vide information to contractors on tree selection, they also responded that biologists did not understand the constraints faced by the operators. PNW contractors responded that personnel turnover among PNWFS biologists affected the success of the wildlife tree program. PNW contractors supported open forums and educational workshops to increase communication among PNWFS biologists, safety officers, and contractors.

PNW contractors responded that tree distribution problems were not limited to the periphery of the unit nor to areas near roads. They indicated that uniform wildlife tree distribution over harvest units decreased harvesting efficiency and increased industry concerns regarding safety, especially when blowdown was possible (Table 2). Washington contractors responded that the Washington Industrial Safety and Health Act (WISHA) guidelines did not adequately cover safety issues. PNW contractors responded that cost allowances for dealing with wildlife tree provisions were not considered in sales from Forest Service lands, and they were reluctant to bid on timber sale units that included wildlife trees. PNW contractors overwhelmingly agreed that they should be asked to comment during evaluation of the wildlife tree program.

Biologist–Contractor Comparisons

PNWFS biologists and PNW contractors agreed that safety concerns impeded selection of wildlife trees and that more information was needed on wildlife tree patterning in managed stands (Tables 1 and 2). They disagreed on the level of fines sufficient to deter contract violation ($\chi^2 = 62.3$, 3 df, $P < 0.01$). Contractors indicated that they were meeting requirements within units, a view not shared by 45% of biologists ($\chi^2 = 38.2$, 3 df, $P < 0.01$). Contractors were less interested than biologists in obtaining information on creating snags ($\chi^2 = 29.0$, 3 df, $P < 0.01$). We could not detect differences of opinion in the role that decay class should have in wildlife tree selection ($\chi^2 = 7.0$, 3 df, $P = 0.07$).

DISCUSSION

Neither PNWFS biologists nor PNW contractors responded that the goals of providing cavity-nester habitat and safe extraction of timber, respectively, were being met. USFS management goals are in transition in the Pacific Northwest and they focus on both stand and landscape management, with less emphasis on clearcutting than in the past (e.g., U.S. Fish and Wildl. Serv. 1992:481–526). The Oregon Forest Practices Act requires tree or snag retention within harvest units on state and private lands within Oregon. As a result, the problems we identified may not only continue on USFS lands within units managed with a variety of regeneration systems, but similar or additional problems may be encountered on state and private lands in the near future.

We expect that transitions in management strategies will affect the successful implementation of wildlife tree prescriptions and possibly more complex prescriptions for northern spotted owls (*Strix occidentalis caurina,* U.S. Fish and Wildl. Serv. 1992:481–526). PNWFS biologists believed that wildlife tree abundance should be managed over biologically meaningful areas, such as bird territories (Bull and Holthausen 1993). Habitat management for cavity-nesting birds will probably have to occur over a range of spatial scales to be effective (Gutzwiller and Anderson 1987), but such a change may entail revisions to forest plans. Establishing a National Forest program coordinator could be helpful to insure program continuity and assist in landscape level management. As management goals evolve toward landscape scales over multiple ownerships with stands as building blocks for managed landscapes, greater communication and cooperation among members of the management triad will be necessary.

Styskel (1983) outlined 5 barriers to meeting

management goals for adequate wildlife tree or snag retention: (1) unresponsive personnel, (2) insufficient data on the characteristics of existing snags, (3) pressure to maximize timber harvest yields, (4) inadequate snag longevity data, and (5) snag loss through human causes. Based on our results, we suggest that some of these difficulties occur in western Washington and Oregon. Most PNWFS biologists did not believe written guidelines were sufficiently clear to achieve management goals and PNWFS biologists and PNW contractors were uncertain if there was sufficient knowledge to determine wildlife tree distribution patterns to retain on units. Moreover, less than half of USFS biologists monitored wildlife tree longevity (Table 1), and we have observed that monitoring methods were not consistent among districts within the USFS nor among land management agencies. Blowdown, a recognized source of wildlife tree loss, was taken into account by only 40% of PNWFS biologists when calculating required wildlife trees during forest planning and development of stand prescriptions (Table 1).

There are other limits to implementation of the wildlife tree program. PNWFS biologists indicated that inadequate time and funds curtailed program implementation. Furthermore, PNW contractors were concerned about safety guideline conflicts when leaving snags on units and believed that profits were reduced by leaving live trees for wildlife.

New management strategies for wildlife and timber (e.g., U.S. Fish and Wildlife Service 1992:481–526) will generate future operational and technical difficulties (McComb et al. 1993). Management recommendations concerning tree patterning and tree selection depend on the wildlife and tree species to be managed, the effective area that best accommodates each wildlife species, harvest system, regeneration system, and tree size. Neitro et al. (1985) compiled a comprehensive guide on snags that included harvesting strategies for wildlife trees, wildlife tree definitions, and cavity-nesting species requirements. It provided a basis for management and generated hypotheses for research (e.g., Bull and Holthausen 1993). Bull et al. (E. L. Bull, B. Carter, M. Henjum, R. Holthausen, J. Johnson, K. Mellen, and M. Raphael, USFS, Portland, Oreg., unpubl. rep., 1991) advocated monitoring to determine relationships between species population levels and snag densities. To date, districts have not consistently monitored program implementation, effectiveness, or model validation (Table 1), but Bull et al. (USFS, Portland, Oreg., unpubl. rep., 1991) described protocols to enhance coordination among districts and forests. At present, there is insufficient information to determine if prescribed snag levels are adequate to maintain cavity-nesting birds in western Washington and Oregon. However, based on wildlife biologists' opinions and recent research results (Bull and Holthausen 1993), prescribed snag levels may be insufficient to maintain populations.

SCOPE AND LIMITATIONS

Our scope of inference and the following recommendations pertain only to USFS lands in western Oregon and Washington and only to implementation and monitoring of wildlife tree prescriptions in that region. The third group in the management triad was not surveyed because it is largely regulatory and because an Oregon Occupational Safety Act administrator was unwilling to participate in the survey. Consequently, the opportunities for coordination of management activities with safety inspectors is unknown. The degree to which implementation is affected by harvest system (e.g., cable, helicopter, ground skid), regeneration system (e.g., clearcut, shelterwood, selection), or timber size (second or old growth) was not investigated, though each of these factors undoubtedly influences implementation success. Despite these limitations, our results suggest that increased communication among members of the management triad will benefit

implementation of prescriptions. Further, some of the following management recommendations may apply to other private, state, and federal land managers required to provide wildlife trees following harvest.

MANAGEMENT RECOMMENDATIONS

The USFS et al. (1992) developed a practical guide to harvesting operations for Washington forest workers that considers wildlife tree retention. The guide, a cooperative effort by forest industry, state, and federal agencies, provides examples of operational strategies for leaving wildlife trees (primarily clumps) and defines hazard tree areas. These guidelines are a step toward resolving some problems inherent to the wildlife tree program in the Pacific Northwest. These guidelines could be improved to address concerns raised by PNWFS biologists and PNW contractors. A similar guide for Oregon would be helpful if it received support from the timber industry and was introduced in conjunction with evolving Forest Service management goals. Similar guidelines will probably be needed for more complex prescriptions for northern spotted owls. Vast areas of forest land in Oregon and Washington are managed by federal agencies, so achieving habitat goals on these areas is imperative if populations of forest wildlife are to persist. Management may be most effective where strategies are coordinated among landowners within a management area. State and private land managers may soon be faced with similar difficulties (amendments to both the Oregon and Washington Forest Practices Acts), so we believe that land management agencies should consider a continuing education program for biologists, Forest Practices Act foresters, agency marking crews, and forest industry contractors. The program would provide necessary information to implement prescriptions in a safe and efficient manner that best meets the needs of selected wildlife species. Wildlife biologists, harvesting specialists, and safety inspectors should be involved, both as instructors and participants, in such a program to facilitate equitable involvement by all members of the management triad.

Backhouse (1990) expressed concern about wildlife tree retention and conflicts with safety regulations, harvesting, and silvicultural practices in British Columbia. Recommendations to ensure adequate wildlife trees included establishing policy and guidelines, providing extension programs, and conducting further research into wildlife requirements. Our survey dealt with the technical and managerial problems perceived by PNWFS biologists and PNW contractors in western Washington and Oregon. We make the following recommendations based on our results:

1. Reevaluate the current approach toward management of cavity-nesting and snag-using wildlife in western Washington and Oregon.

2. Modify written guidelines concerning the wildlife tree program to reflect current criticism and changing program objectives. We believe that management and monitoring should be conducted over a range of spatial scales, including those equal to or larger than the territory sizes of the species being managed. In our opinion, management and monitoring should be coordinated among managers within ecoregions.

3. Implement a Pacific Northwest forum on wildlife tree issues that concern biologists and contractors. Those present should include representatives from PNW contractors, Safety Divisions, and PNWFS biologists. It would be appropriate to invite participants from other regions, Canadian provinces, and state forestry offices, as well as interest groups involved in forest plan reviews.

4. Increase timber industry participation in decision-making when developing prescriptions for wildlife and timber and revising forest plans.

5. Implement continuing education sessions for all personnel actively involved in the wildlife tree program. The program could be ad-

ministered by universities and supported jointly by The Wildlife Society and the Society of American Foresters. Short courses in basic wildlife biology and forestry could be organized for Safety Division personnel. Short courses in wildlife biology and harvesting could be arranged for contractors and wildlife biologists, respectively. Safety instruction probably would benefit both biologists and contractors.

6. Intensify research related to wildlife tree patterns and management of wildlife trees at biologically meaningful scales.

7. Establish National Forest wildlife tree program coordinators to provide not only greater continuity to the program but to assist with regional assessment of implementation and landscape-level management.

8. Incorporate a tree loss factor in calculations of requisite wildlife trees (Snag Recruitment Simulator Software, B. G. Marcot, USFS, Portland, Oreg.; Snag Dynamics Projection Model software, A. Zumwari, W. C. McComb, and J. Ohmann, Oregon State Univ., Corvallis; Morrison and Raphael 1993). Monitoring of tree and snag longevity could provide local estimates of snag dynamics.

9. Clarify Forest Service personnel and funding requirements for the program to meet requirements described by the National Forest Management Act. Congressional appropriations should be sought to meet these requirements.

SUMMARY

We surveyed 56 USFS wildlife biologists and 193 timber contractors to identify factors influencing implementation of the USFS's wildlife tree program in western Oregon and Washington. Contractors and wildlife biologists agreed that safety guidelines impeded selection of wildlife trees and that research was needed to define optimum wildlife tree patterns within harvest units. The 2 groups disagreed on fines sufficient to deter contract violation and on information needs to create wildlife trees. PNWFS biologists believed that biologically meaningful scales such as bird territory sizes should form the basis for wildlife tree prescriptions, that funds limit wildlife tree program implementation, and that inconsistencies in monitoring procedures reduced program effectiveness. Contractors advocated use of tree clumps on harvested sites because clump location increased harvesting efficiency and because clumps are considered safer. Contractors responded that purchaser selection of trees would help alleviate conflicts with agencies and safety inspectors and that they were willing to accept information from biologists. Contractors and biologists responded that there should be standard criteria for wildlife tree selection and measurement. We recommend clarification of management goals, increased research, development and distribution of written guidelines and policies, and development of a forum to facilitate problem resolution among biologists, logging contractors, and safety inspectors.

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LITERATURE CITED

BACKHOUSE, F. 1990. Wildlife trees. Their role in British Columbia's forests. B.C. For. Resour. Comm., Vancouver. 6pp.

BULL, E. L., AND R. S. HOLTHAUSEN. 1993. Habitat

use and management of pileated woodpeckers in northeastern Oregon. J. Wildl. Manage. 57:335–345.

———, J. W. THOMAS, AND K. HORN. 1986. Snag management on National Forest in the Pacific Northwest—1984. West. J. Appl. For. 1:41–43.

DAVIS, J. W., G. A. GOODWIN, AND R. A. OCKENFELS, EDITORS. 1983. Snag habitat management: proceedings of the symposium, U.S. For. Serv. Gen. Tech. Rep. RM-99. 226pp.

DILLMAN, D. A. 1978. Mail and telephone surveys–the total design method. John Wiley and Sons, Inc., New York, N.Y. 325pp.

GUTZWILLER, K. A., AND S. H. ANDERSON. 1987. Short-term dynamics of cavity-nesting bird communities in disjunct floodplain habitats. Condor 89:710–720.

MCCOMB, W. C., T. A. SPIES, AND W. H. EMMINGHAM. 1993. Stand management for wildlife and timber in Douglas-fir forests. J. For. 91(12):31–42.

MORRISON, M. L., AND M. G. RAPHAEL. 1993. Modeling the dynamics of snags. Ecol. Appl. 3:322–330.

———, M. F. DEDON, M. G. RAPHAEL, AND M. P. YODER-WILLIAMS. 1986. Snag requirements of cavity-nesting birds: are USDA Forest Service guidelines being met? West. J. Appl. For. 1:38–40.

NEITRO, W. A., V. W. BINKLEY, S. P. CLINE, R. W. MANNAN, B. G. MARCOT, D. TAYLOR, AND F. WAGNER. 1985. Snags (wildlife trees). Pages 129–169 *in* E. R. Brown, ed. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 1. U.S. For. Serv. Publ. No. R6-F&WL-192-1985.

STEEL, R. G. D., AND J. H. TORRIE. 1980. Principles and procedures of statistics—a biometrical approach. McGraw-Hill Book Co., New York, N.Y. 633pp.

STYSKEL, E. W. 1983. Problems in snag management implementation—a case study. Pages 24–27 *in* J. W. Davis, G. A. Goodwin, and R. A. Ockenfels, eds. Snag habitat management: proceedings of the symposium. U.S. For. Serv. Gen. Tech. Rep. RM-99.

THOMAS, J. W., R. G. ANDERSON, C. MASER, AND E. BULL. 1979. Snags. Pages 60–77 *in* J. W. Thomas, ed. Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington. U.S. For. Serv. Agric. Handb. 553.

U.S. FISH AND WILDLIFE SERVICE. 1992. Recovery plan for the northern spotted owl—draft. U.S. Fish and Wildl Serv., Washington, D.C. 662pp.

U.S. FOREST SERVICE, WASHINGTON DEPARTMENT OF NATURAL RESOURCES, WASHINGTON DEPARTMENT OF LABOR AND INDUSTRIES, WASHINGTON FOREST PROTECTION ASSOCIATION, AND WASHINGTON CONTRACT LOGGERS ASSOCIATION. 1992. Reserve tree selection guidelines. 24pp.

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