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1. Title:

Demographic Characteristics of Northern Spotted Owls (*Strix occidentalis caurina*) in the Klamath Mountain Province of Oregon.

2. Principal Investigators and Organizations:

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3. Study Objectives:

To estimate the population parameters of northern spotted owls on the Klamath Study Area (KSA) within the Klamath Mountain Province. These parameters include occupancy, survival and reproductive success. The lands are administered by the Glendale and South River Resource Areas of the Medford and Roseburg Districts of the USDI Bureau of Land Management (BLM).

4. Potential Benefit or Utility of the Study:

The KSA is one of 8 long term studies which assess trends in spotted owl populations and habitat as directed under the Northwest Forest Plan (1994). The survival and reproductive data will be used in population modeling to assess the long term stability of the population (Franklin et al. 1999). Data from some study areas will be used in the development of habitat predictive models for the spotted owl (Lint et al. 1999, Anthony et al. 2000).

5. Study Area Description and Survey Design:

The study area is located within the Klamath Mountains Province in SW Oregon and is approximately 1377 km^2 (340,224 ac)in size. This province is characterized by mixed conifer forests dominated by Douglas-fir (*Pseudotsuga menziesii*) and incense cedar (*Calocedrus decurrens*). Other species common include pine (*Pinus* spp.), grand fir (*Abies grandis*), pacific madrone (*Arbutus menziesii*), golden chinquapin (*Castanopsis chrysophylla*), and oak (*Quercus* spp.) (Franklin and Dyrness 1973). Sites within the current boundaries of the KSA were systematically surveyed from 1997-Present. A smaller study area (about 466 km^2) referred to as the Cow Creek Density Study is encompassed within the current boundaries and was intensively surveyed from 1990-1994.

The KSA includes portions of 2 BLM Districts (Medford and Roseburg), and much of the

intervening areas of private and state lands. The federal lands are in an alternating "checkerboard" pattern of ownership with private lands. This makes analysis by ownership or land allocation difficult since virtually all sites within a Late Successional Reserve (LSR) designation have a portion of their home range in a non-LSR designation. Of the 8 long term studies, 2 of them (Klamath and Tyee) are composed almost entirely of this checkerboard pattern of ownership.

The study monitors demographic parameters such as survival rates, reproductive rates, and annual rate of population change. The protocol currently used to determine site occupancy, nesting, and reproductive status for this project follows the guidelines specified by the Northern Spotted Owl Effectiveness Monitoring Plan for the Northwest Forest Plan (Lint et al. 1999). An attempt is made to color band or reobserve all previously banded individuals within the study. The reobservation of banded owls will be used for the calculation of survival rates (Franklin et al. 1999, Burnham et al. 1996).

6. Results for FY 2001:

Survey Effort

There are currently 144 sites within the study area. Two sites were not surveyed to protocol during 2001 due to their close proximity to an occupied site. Of the 142 sites surveyed, 87 were occupied by a pair, 13 were occupied by a single male, and 14 sites were occupied by one or 2 owls but social status was unknown (Appendix A). We detected at least one owl at 114 (80.3%) of the sites.

Owl Detections and Banding by Sex and Age

A total of 204 non-juvenile spotted owls were detected on the study area during 2001. We detected 113 males and 91 females resulting in a male:female sex ratio for non-juveniles of 1.23:1. Of the 189 non-juvenile owls identified on the study area, 153 (81.0%) were adults and 36 (19.0%) were subadults (Appendix B). The oldest known owl within the study area is a female that is at least 17 years old. A total of 101 owls were newly banded on the study area during 2001. Of these, 78 (77.2%) were fledglings, 14 (13.9%) were subadults, and 9 (8.9%) were adults. There were a total of 28 owls banded as juveniles in previous years and recaptured for the first time in 2001. Of the 51 non-juveniles encountered for the first time in 2001 (this includes banding and rebanding), the ages of 42 (82.4%) are known exactly or within 1 year.

There were 11 non-juvenile barred owls (*Strix varia*) detected on the study area during 2001. At 5 sites we detected a pair, nesting was confirmed at 3 of these sites, and at least 7 young were produced (2 of these sites had triplets). A male spotted owl mated with a female barred owl at one site within the study area and 1 hybrid young was produced. There have been 5 hybrids produced at this site (1 in 2001, 2 in 2000, 2 in 1999). There was one hybrid non-juvenile located at a site within the study area during 2001. The hybrid was produced in 2000 at the previously mentioned mixed species site. A pair of spotted owls were also located at the site

where the non-juvenile hybrid was detected.

Reproduction

Yearly reproductive data (1983-2001) (Appendix C) includes nest success, fecundity rate, and mean brood size. The proportion of females nesting is the number of females that attempted to nest from the sample where nest status was determined. Nest success is the proportion of nesting females that fledged young. The fecundity rate is the number of female young produced per female. The mean brood size is the average number of young produced per successfully reproducing pair. Where appropriate, the data is split into 4 age classes; 1-year old, 2-year old, adult, and unknown age.

The proportion of females nesting was determined only for 2001. More analysis of previous years data is needed before data from 1983-2001 can be presented. During 2001, there were a total of 73 sites where nesting status was determined, 54 nesting (73.0%) and 20 not nesting (30.0%).

Of the sites where nesting occurred during 2001, 46 pairs successfully fledged young and 8 pairs nested and failed resulting in a nesting success rate of 85.2% (Appendix C).

The fecundity rate for 2001 was calculated at 0.500. This rate is higher than the average for the years 1983-2001 (0.379), and the highest since 1992 when it was 0.521 (Appendix C). The fecundity rate for the years 1983-2001 was split into 4 age classes. The rate for 1-year olds (0.058) was much lower than 2-year olds (0.306), adults (0.411), and unknown (0.305) (Table 1).

In 2001, the mean brood size (1.78) was higher than the average for the years 1983-2001 (1.59), and the highest since 1986 when it was 1.83 (Appendix C). The mean brood size for the years 1983-2001 was split into 4 age classes, all resulted in similar values (Table 1).

7. <u>Discussion for FY 2001</u>:

Survey Effort

The survey effort within the study area has varied over the years, however the general trend has been an increase in the number of sites surveyed (Figure 1). There has also been a concurrent increase in the number of sites occupied by at least one owl and occupied by a pair. Exceptions to the trend of increasing numbers of sites surveyed occurred during the years 1995 and 1996, when a change in priorities resulted in a reduction in survey effort. The KSA boundaries were established in 1997 and the survey effort increased significantly. Within the Klamath Study Area,

there were a fairly low number of sites sampled from 1983-1986, followed by a rapid increase in the number of sites surveyed (1987-1989). Beginning in 1990, the number of sites occupied by a pair or at least one owl leveled off which was consistent with survey effort over time (Figure 1).

Demographics

The age-specific fecundity estimates for the Klamath Study Area through 1998 (Franklin et al 1999) were higher than the 2001 estimate for 1-year-old owls and lower than the 2001 estimate for 2-year-old and adult owls (Table 1). The addition of 3 years of data may have refined the estimates. The general trend of low fecundity for 1-year-old owls followed by higher fecundity for 2-year-old owls and the highest for adult owls is exhibited by 11 of 14 study areas reported on in the 1998 meta-analysis (Franklin et al. 1999). There were low sample sizes (n = 5) and high standard errors at the 3 study areas where the 2-year old owls had higher fecundity rates than the 1-year old owls. Although fecundity varied by age class, the mean brood sizes did not appear to differ among age classes (Table 1). This indicates that 1-year olds are physically able to reproduce as well as older age classes, and some other factor is inhibiting their attempts at nesting.

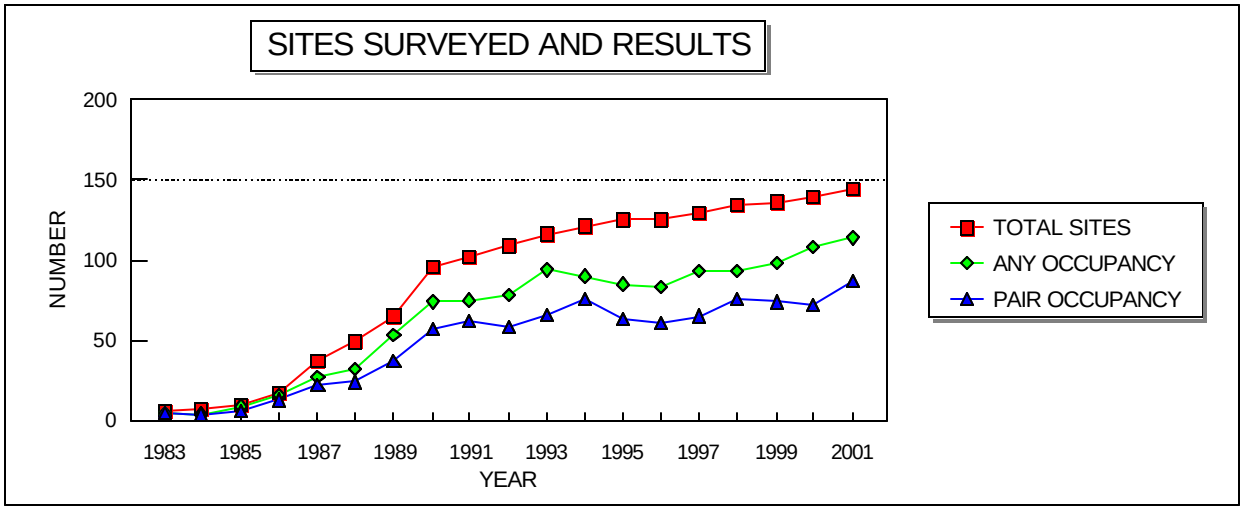

Figure 1. Occupancy status of sites in the KSA (1983-2001). Included are the number of sites in the study area, the number with at least 1 owl detection, and the number with a pair as defined by protocol.

The largest number of juveniles detected within the study area occurred during 2001, however the fecundity rate was equal or higher than 2001 during 1983-1986, 1990, and 1992. This may be partially explained by the increase in survey effort and the number of sites surveyed, resulting in fewer juveniles produced that were not detected. In addition, the fecundity rate for the early years (1983-1986) was calculated from a small sample size and at a time when a well documented protocol did not exist.

The age composition of the population during 1995 and 1996 appears to be skewed much higher towards owls >2 years old (Table 1). The number of subadult owls present during those years is less than half of 1994 or 1997. This may be partially explained by the preceding low reproductive years on the study area (1993 and 1995).

Table 1. Fecundity rate and mean brood size by age class within the KSA. Also included is the average fecundity rate for 15 studies across the range of the owl. Sites where backpack transmitters were attached to females during the nesting season were excluded from the calculation during the years of attachment. (a)

Age class	Mean fecundity, 15 studies 1985-1998	Mean fecundity (N), 1985-1998	Mean fecundity (N), 1983-2001	95% CI for fecundity	Mean brood size (N), 1983-2001	95% CI for brood size
1-yr	0.078	0.130 (30)	0.058 (43)	0.000-0.127	1.67 (3)	0.23-3.10
2-yr	0.161	0.273 (59)	0.306 (80)	0.217-0.396	1.48 (33)	1.30-1.66
Adult	0.321	0.394 (507)	0.411 (689)	0.378-0.445	1.61 (352)	1.56-1.66
Unk	NA	NA	0.305 (41)	0.188-0.421	1.32 (19)	1.09-1.55
Total			0.379 (853)	0.015-0.434	1.59 (407)	1.54-1.64

(a) Preliminary data, values may change.

8. Acknowledgments:

Many people and organizations contributed to the success of this project. Without the dozens of dedicated people collecting the field data, none of this could have happened. In addition, biologists from surrounding areas have contributed information regarding owl movements. Several private timber companies have been gracious enough to allow access to sites on their property. The primary government agencies involved in the Klamath Study Area are the BLM and the State of Oregon. Funding for rangewide demographic studies comes from BLM, USDA Forest Service, and the National Park Service.

9. Literature Cited:

Anthony, R., G. Olson, E. Forsman, J. Reid, P. Loschl, W. Ripple, E. Glenn, and K. Harkins. 2000. Predicting Abundance and Demographic Performance of Northern Spotted Owls from Vegetative Characteristics. Report on Phase I: Evaluation of Different Methods for Habitat Mapping. 100pp.

Burnham, K.P., D.R. Anderson, and G.C. White. 1996. Meta-Analysis of vital rates of the northern spotted owl. Studies in Avian Biology 17:92-101.

Franklin, A.B., K.P. Burnham, G.C. White, R.G. Anthony, E.D. Forsman, C. Schwarz, J.D. Nichols, and J. Hines. 1999. Range-wide status and trends in northern spotted owl populations. Colorado Cooperative Wildlife Research Unit, Colorado State University, Fort Collins, Colorado, USA and Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Corvallis, Oregon, USA. 71pp.

Franklin, J.F., and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. U.S. Department of Agriculture - Forest Service. Gen. Tech. Rpt. PNW-GTR-8.

Lint, J.B., B.R. Noon, R.G. Anthony, E.D. Forsman, M.G. Raphael, M. I. Collopy and E.E. Starkey. 1999. Northern spotted owl effectiveness monitoring plan for the Northwest Forest Plan. U.S. Department of Agriculture - Forest Service. Gen. Tech. Rpt. PNW-GTR-444. 43pp.

USDA and USDI. 1994. Final supplemental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. 2 volumes. U. S. Department of Agriculture - Forest Service and U.S. Department of Interior - Bureau of Land Management, Portland, Oregon, USA.

Appendix A. Territories surveyed and occupancy results by year within the KSA. (a)

Year	Total sites	Sites w/ pair	Sites w/ single	Sites w/ undetermined status (b)	Total occupied sites	Sites w/ no occupation (c)	Sites w/ incomplete survey (d)
1983	6	5	0	0	5	1	0
1984	7	4	0	0	4	3	0
1985	10	6	1	2	9	1	0
1986	17	13	2	1	16	1	0
1987	37	22	4	1	27	3	3
1988	49	24	4	4	32	5	6
1989	65	37	7	9	53	4	3
1990	96	57	9	8	74	14	7
1991	102	62	11	2	75	18	7
1992	109	58	14	6	78	20	10
1993	116	66	17	11	94	12	10
1994	121	76	5	9	90	20	11
1995	125	63	13	9	85	17	22
1996	125	61	11	11	83	20	22
1997	129	65	16	12	93	23	13
1998	134	76	11	6	93	25	13
1999	136	74	9	15	98	30	6
2000	139	72	16	20	108	18	10
2001	144	87	13	14	114	24	2

(a) Preliminary data, values may change.
(b) Undetermined status may include one or 2 owls, does not qualify as a pair or a resident single.
(c) No occupancy determined with at least 3 survey visits.
(d) Incomplete survey is 2 visits or less (usually no visits).

Appendix B. Sex and age composition of spotted owls located within the KSA (1983-2001). Non-juvenile owls where the sex could not be determined are not included. (a)

Year	Adult (M,F)	Subadult (M,F)	Age unk (M,F)	Total non-juvenile (M,F)	Juvenile
1983	0 (0,0)	0 (0,0)	10 (5,5)	10 (5,5)	5
1984	4 (2,2)	0 (0,0)	4 (2,2)	8 (4,4)	3
1985	12 (7,5)	0 (0,0)	3 (1,2)	15 (8,7)	6
1986	17 (10,7)	1 (1,0)	10 (4,6)	28 (15,13)	18
1987	32 (19,13)	9 (5,4)	16 (6,10)	57 (30,27)	8
1988	44 (26,18)	13 (4,9)	11 (7,4)	68 (37,31)	17
1989	77 (43,34)	5 (2,3)	17 (9,8)	97 (54,43)	18
1990	101 (57,44)	12 (6,6)	19 (10,9)	132 (73,59)	52
1991	113 (61,52)	16 (7,9)	12 (7,5)	141 (75,66)	40
1992	107 (61,46)	16 (6,10)	16 (10,6)	139 (77,62)	59
1993	117 (63,54)	24 (13,11)	19 (12,7)	160 (88,72)	22
1994	125 (67,58)	28 (13,15)	16 (9,7)	169 (89,80)	55
1995	121 (67,54)	9 (1,8)	19 (14,5)	149 (82,67)	18
1996	117 (63,54)	8 (3,5)	21 (13,8)	146 (79,67)	56
1997	117 (59,58)	23 (16,7)	23 (12,11)	162 (87,75)	52
1998	127 (69,58)	26 (13,13)	19 (9,10)	172 (91,81)	41
1999	130 (72,58)	17 (6,11)	33 (17,16)	180 (95,85)	44
2000	134 (75,59)	19 (8,11)	33 (20,13)	186 (103,83)	65
2001	151 (80,71)	36 (20,16)	17 (13,4)	204 (113,91)	82

(a) Preliminary data, values may change.

Appendix C. Fecundity rate and mean brood size by year within the KSA. Years with an * represent years when backpack transmitters were attached to females during the nesting season, these sites are excluded from the calculation. (a)

Year	Nest success (N)	95% CI for Nest Success	Mean fecundity (N)	95% CI for fecundity	Mean brood size (N)	95% CI for brood size
1983	1.00 (4)	NA**	0.625 (4)	0.227-1.023	1.25 (4)	0.45-2.05
1984	1.00 (2)	NA**	0.500 (3)	0.000-1.742	1.50 (2)	0.00-7.85
1985	1.00 (4)	NA**	0.600 (5)	0.081-1.119	1.50 (4)	0.58-2.42
1986	1.00 (6)	NA**	0.786 (7)	0.422-1.150	1.83 (6)	1.40-2.26
1987*	1.00 (4)	NA**	0.250 (14)	0.003-0.497	1.75 (4)	0.95-2.55
1988*	1.00 (12)	NA**	0.425 (20)	0.235-0.615	1.42 (12)	1.09-1.74
1989*	0.92 (12)	0.73-1.00	0.250 (32)	0.113-0.387	1.45 (11)	1.10-1.81
1990*	0.82 (38)	0.69-0.94	0.521 (48)	0.394-0.648	1.61 (31)	1.43-1.79
1991*	0.75 (32)	0.59-0.91	0.345 (58)	0.226-0.463	1.67 (24)	1.43-1.91
1992*	0.90 (41)	0.81-1.00	0.528 (53)	0.409-0.647	1.51 (37)	1.31-1.72
1993	0.83 (18)	0.64-1.00	0.175 (63)	0.090-0.260	1.47 (15)	1.18-1.75
1994	0.84 (37)	0.71-0.96	0.387 (71)	0.276-0.499	1.77 (31)	1.59-1.96
1995	0.72 (18)	0.49-0.95	0.145 (62)	0.068-0.223	1.38 (13)	1.08-1.69
1996	0.95 (40)	0.88-1.00	0.475 (59)	0.368-0.581	1.47 (38)	1.31-1.64
1997	0.97 (31)	0.90-1.00	0.406 (64)	0.291-0.522	1.73 (30)	1.57-1.90
1998	0.79 (38)	0.65-0.93	0.281 (73)	0.194-0.368	1.37 (30)	1.18-1.55
1999	0.90 (29)	0.78-1.00	0.338 (65)	0.229-0.448	1.69 (26)	1.50-1.88
2000	0.88 (49)	0.78-0.97	0.464 (70)	0.364-0.564	1.51 (43)	1.36-1.67
2001	0.85 (54)	0.75-0.95	0.500 (82)	0.396-0.604	1.78 (46)	1.66-1.91
1983-2001	0.87 (469)	0.84-0.90	0.379	0.015-0.434	1.59 (407)	1.54-1.64

(a) Preliminary data, values may change.