ANNUAL RESEARCH REPORT
FY 2001
December 2001

1. Title:

Demographic Characteristics of Spotted Owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades.

2. Principal Investigators and Organizations:

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3. Study Objectives:

a. Estimate the population parameters of northern spotted owls on the Rogue River and Winema National Forests, specifically fecundity, survival rates, and annual rates of population change.

b. Elucidate the diet of spotted owls by collecting and analyzing regurgitated pellets.

c. Communicate results to other researchers examining spotted owl ecology across the Pacific Northwest.

4. Potential Benefit or Utility of the Study:

Studying the population biology, foraging ecology, and prey ecology of spotted owls will increase our understanding of factors affecting spotted owl populations. This study offers insights into how conservation can enhance or maintain spotted owl habitat. This study concurrently addresses validation and effectiveness monitoring requirements of the Northwest Forest Plan (1994) as they relate to the management of northern spotted owls.

5. Study Description and Survey Design:

This demographic study collects information on adult and juvenile owl survival rates, reproductive rates, annual rate of population change, and other population characteristics (Franklin et al. 1999). The study utilizes a sample of northern spotted owls within Northwest Forest Plan (1994) Land-use Allocations (LUA) of Late-Successional Reserve (LSR) and Matrix in the southern Oregon Cascades. Of particular interest are owl sites within the five large LSRs on our study area; the LSRs are intended to

provide the foundation for recovery of northern spotted owls.

6. Study Area

The Southern Cascades Study Area is approximately 2500 km^2 in size. The area is geographically situated on lands administered by the Rogue River National Forest (Ashland, Butte Falls, and the eastern portion of the Prospect Ranger Districts) and the Klamath Ranger District of the Winema National Forest.

The study area occupies the southern terminus of the Oregon Cascades including portions of both the western and eastern provinces. Landforms are primarily volcanic in origin and consist of plateaus and moderately dissected terrain (USDA and USDI 1994). The study area lies within the Mixed-Conifer, *Abies concolor*, *Abies magnifica shastensis*, and *Tsuga mertensiana* zones (Franklin and Dyrness 1973). Owl sites are located at elevations between 945 and 1825 meters (inclusive).

There are five LSRs associated with the study area; LSR 225, LSR 226, LSR 227, LSR 228, and LSR 229. Of these, LSR 225, 226 and 227 are large LSRs encompassing 16050, 20080, and 40970 hectares, respectively (USDA 1998). LSR 228 and LSR 229 are smaller, incorporating 1130 and 3710 hectares each (USDA 1997). The LSRs are situated entirely within the study area. LSR 227 spans the crest of the southern Oregon Cascades, and is jointly administered by the Rogue River and Winema National Forests.

7. Research Accomplishments (Demography) for FY 2001:

Site Occupancy

The number of sites surveyed to protocol was increased in 2001 to 153 locations, and spotted owls occupied 64% of the owl sites we visited. Among the sites that were surveyed, 77 were occupied by pairs and two by single males. At 19 sites, owls were detected but their social status was not determined (Figure 1, Table 1).

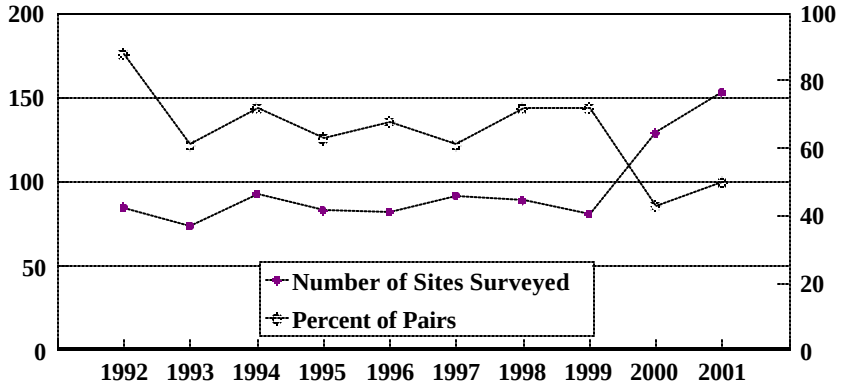


Figure 1. Annual percent of all sites occupied by owl pairs and total number of sites surveyed to protocol on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2001.

Table 1. Number of northern spotted owl sites (territories) surveyed and their respective occupancies on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2001[a].

Year	# Sites Surveyed[b]	# Sites w/ Pairs[a]	# Sites w/ Single Owls[a]	# Sites w/ Social Status Unknown[c]	Total Occupied Sites	# Sites Surveyed and Un-occupied[d]	# Sites Un-determined[e]	% Sites Occupied
1992	85	75	1	6	82	3	29	97
1993	74	45	4	8	57	17	36	77
1994	93	67	5	8	80	13	11	86
1995	83	52	9	11	72	11	22	87
1996	82	56	3	9	68	14	9	83
1997	92	56	4	8	68	24	27	74
1998	89	64	2	7	73	16	35	82
1999	81	58	6	5	69	12	44	85
2000	129	56	10	13	79	50	9	61
2001	153	77	2	19	98	55	0	64

[a]These figures may differ from previous reports; status as determined by protocol (Forsman 1995).
[b]All sites which were surveyed to protocol.
[c]Sites with a response by a male and/or female that did not meet pair or single status with $3 night visits.
[d]A minimum of 3 nighttime visits without a response was needed to infer unoccupied status.
[e]Sites with insufficient visits (#2 nighttime visits) including sites where owls were detected but social status was unknown.

The percentage of sites surveyed to protocol that were occupied by spotted owls (64%) increased slightly from 2000, but was less than average for all study years (0 = 79.6%, SE = 3.40, n = 10).

In 2001, spotted owls occupied 27 Matrix and 62 LSR sites (Table 2). In the Matrix allocation the percentage of occupied sites decreased in 2001 (57%) compared to 2000 (61%). The percentage of sites occupied by owl pairs in the Matrix (45%) was unchanged compared to 2000 (45%). In the LSRs the percentage of occupied sites (69%) improved relative to previous years and was 8% greater than in 2000. For the first time since we began to compare occupancy rates between the two Land-use Allocations in 1997, the percentage of occupied LSR sites with owl pairs (53%) was greater than for Matrix sites (Figure 2).

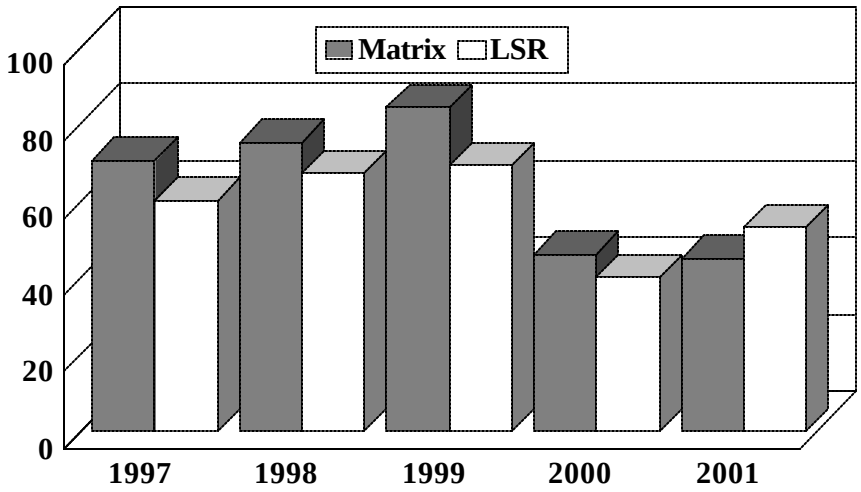
The consistency in the percentage of sites occupied by pairs in the Matrix LUA occurred despite an increased effort relative to the LSRs. Since 1997 there has been an 81% increase in the number of sites surveyed to protocol for the Matrix allocation, while the number of LSR sites has increased by approximately 58%. Additional years of data are needed before it can be determined whether changes in occupancy for the different Land-use Allocations represent a trend or is a consequence of sampling effort.

The number of spotted owl pairs located in 2001 at the five LSRs on the study area equaled or exceeded any previous year (see Appendices 1 and 2). In 2001, there were 12 owl pairs located in LSR 225, the largest number recorded to date. Since 1997 there has been an average of 9.4 (SE = 1.03; min. = 7, max. = 12) pairs in LSR 225. The number of owl pairs on LSR 226 has remained fairly stable since 1997. In 2001, there were 13 pairs located in LSR 226, slightly more than the average across years ($\bar{0}$ = 12.2, SE = 0.58, n = 5; min. = 10, max. = 13). Spotted owl pairs were detected at 18 sites in LSR 227 in 2001 ($\bar{0}$ = 13.4, SE = 1.54, n = 5), significantly more than in other years. Since 1997 this LSR has had the greatest fluctuation in the number of owl pairs (min. = 11, max. = 18). LSR 227 overlaps the Rogue River and Winema National Forests, therefore, part of the increase in the number owl pairs located in the LSR may be due to additional survey effort on the east side of the study area in 2001. One owl pair was located in LSR 228; this equaled the maximum number of pair sites detected on this small reserve in prior years. There were a total of 4 pairs in LSR 229 ($\bar{0}$ = 3.6, SE = 0.24) in 2001. The number of pairs located at LSR 229 has been very stable since 1997 (min. = 3, max. = 4).

Table 2. Number of spotted owl sites surveyed to protocol and their respective occupancies, stratified by Land-Use Allocation, on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2001[a].

LUA[bc]	Year	# Sites Surveyed	# Sites w/ Pairs	# Sites w/ Single Owls	# Sites w/ Social Status Unknown	Total Occupied Sites	# Sites Surveyed and Un-occupied	# Sites Un-determined	% Sites Occupied
Matrix	1997	27	19	1	2	22	5	10	82
	1998	24	18	0	1	19	5	13	79
	1999	19	16	0	2	18	1	18	95
	2000	38	17	1	5	23	14	7	61
	2001	49	22	2	4	28	21	0	57
LSR	1997	57	34	3	5	42	15	17	74
	1998	58	39	2	6	47	11	21	81

Matrix	1997	27	19	1	2	22	5	10	82
	1999	55	38	6	2	46	9	26	84
	2000							2	61
		84	34	9	8	51	33		
	2001	90	48	0	14	62	28	0	69



[a] Sites with Land-use Allocation designation “Other” not reported.

[b] See table 1 for column heading definitions.

[c] See the Northwest Forest Plan (1994) for a description of Land-use Allocation management strategies.

Figure 2. Percentage of sites surveyed to protocol that were occupied by northern spotted owl pairs, stratified by Land-use Allocation, on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2001.

Age and Sex Composition

In 2001, a minimum of 179 non-juvenile and 16 juvenile owls were detected. Of the non-juvenile owls located on the study area, 93.6% were adults ($3 years old) and 6.4% were subadults (Table 3). We could not ascertain the age of 12% of the study population, which was similar to most years of the study (0 = 13.4%, SE = 2.29, n = 10)(Table 3). The majority of unknown aged owls were auditory detections.

During the course of the study there have been fluctuations in the number of subadults in the study population (min.= 4; max. = 10)(Table 3). The average ratio of adults to subadult for all years combined was approximately 19:1. The 2001 ratio of adult to subadult owls of approximately 15:1 was slightly less than average, but was greater than in 2000 (11:1).

The male:female sex ratio for non-juveniles on the study area has favored males in every year of the study. The average sex ratio for all years of the study has favored males by approximately 1.21:1. In 2001 the sex ratio continued to favor males (1.24:1). Whether this difference is an artifact of survey methodology, detectability, territoriality, or some other factor(s) has not been determined.

Table 3. Age and sex composition of northern spotted owls detected on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2001.

Year	Adults (M,F)	Subadults (M,F)	Age Unknown (M,F)	Age Combined (M,F)	Juveniles[a]
1992	123 (70,53)	4 (2,2)	64 (30,34)	191 (102,89)	97
1993	113 (62,51)	9 (4,5)	17 (10,7)	139 (76,63)	13
1994	130 (66,64)	8 (4,4)	13 (9,4)	151 (79,72)	55
1995	111 (59,56)	8 (6,2)	13 (10,3)	136 (75,61)	20
1996	112 (56,56)	5 (4,1)	13 (7,6)	130 (67,63)	39

1997	111	7	14	132	16
	(63,48)	(2,5)	(7,7)	(72,60)	
1998	131	4	18	153	45
	(69,62)	(3,1)	(12,6)	(84,69)	
1999	119	5	16	140	12
	(69,50)	(1,4)	(10,6)	(80,60)	
2000	110	10	20	140	58
	(65,45)	(2,8)	(14,6)	(81,59)	
2001	147	10	22	179	16
	(78,69)	(4,6)	(17,5)	(99,80)	

[a]Juvenile owl numbers represent the yearly total number of young located from 1 April to 31 August.

Nest Success

We checked 59 owl pairs for nesting success in 2001. Of these, 12 pairs (20%) attempted to nest, the lowest rate of nesting recorded during the study. On average, 57% (SE = 8.62%) of pairs have attempted to nest in each of the last ten years. Annually, the rate of nest failure has been approximately 15% (SE = 3.83%). Three sites (25%) where nesting was attempted failed to fledge young in 2001, significantly more than in most years (95% CI = 6.98, 22.02). The proportion of nesting failures, however, appears to be unrelated to the proportion of pairs attempting to nest ($F = 0.009$, $p = 0.9261$, $df = 8$).

Over the course of the study there have been wide annual fluctuations in both the percentage of pairs nesting (min. = 20%; max = 92%) and the percentage of pairs fledging young (min. = 14%; max. = 90%). The tendency is for high and low reproductive years to alternate with even and odd years, respectively (Figure 3). This trend continued for the Southern Cascades Study Area, however, several other spotted owl populations in Oregon exhibited significant departures from this cycle in 2001 (E. Forsman pers. comm.).

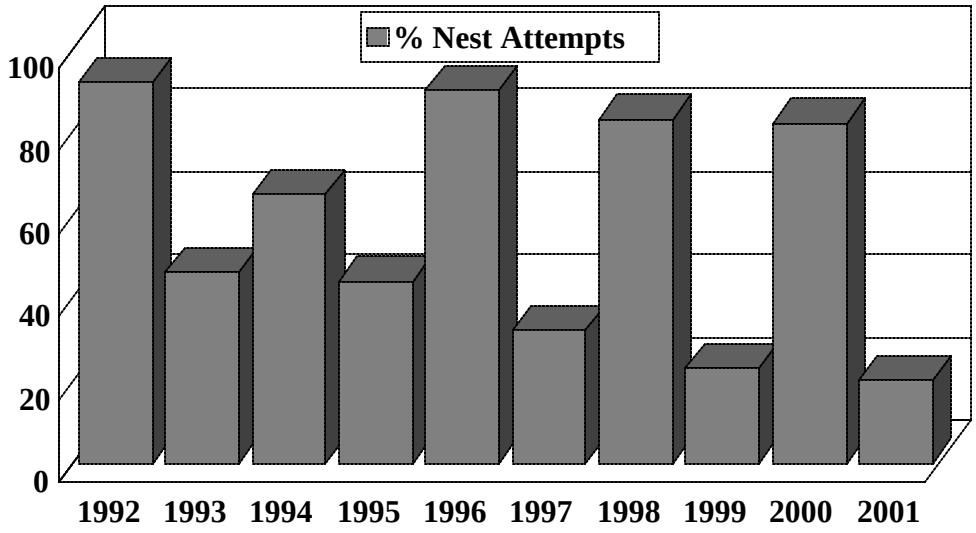


Figure 3. Percentage of northern spotted owl pairs attempting to nest on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2001.

Reproductive Success

The average number of young produced per total number of pairs surveyed to protocol in 2001 was 0.22, which was lower than the mean for all years of the study ($\bar{0}$ = 0.69, SE = 0.154, n = 10) (Figure 4). The average number of young produced per successfully reproducing pair in 2001 (1.60) was similar to most other years ($\bar{0}$ = 1.64, SE = 0.056, n = 10)(Table 4).

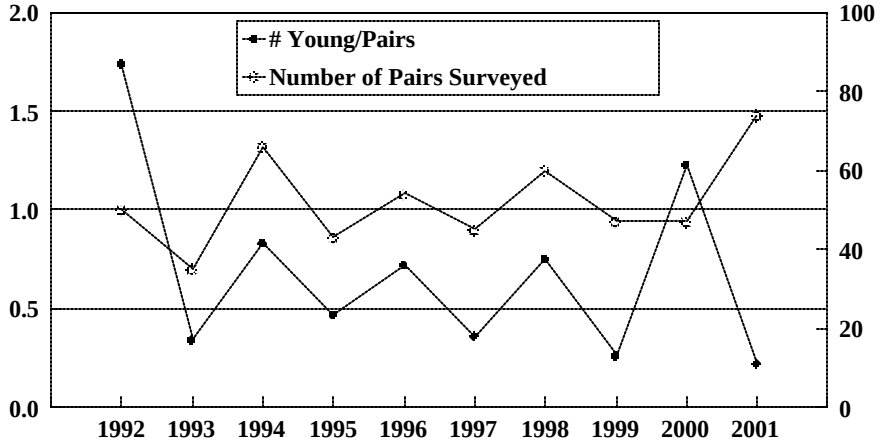


Figure 4. The number of young produced per total number of owl pairs surveyed to protocol on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2001.

Table 4. Summary of reproductive success surveys for northern spotted owls on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1992-2001.

Year	# Pairs Checked	# Pairs Fledging Young	# Young Fledged	% Pairs Producing Young	Average # of Young/ Successful Pair	Average # of Young/Pair
1992	50	45	87	90	1.93	1.74
1993	35	8	12	23	1.50	0.34
1994	66	30	55	46	1.83	0.83
1995	43	12	20	28	1.67	0.47
1996	54	25	39	46	1.56	0.72
1997	45	11	16	24	1.46	0.36
1998	60	33	45	55	1.36	0.75
1999	47	7	12	15	1.71	0.26
2000	47	33	58	70	1.76	1.23
2001	74	10	16	14	1.60	0.22

The average number of young produced per pair in LSRs ($\bar{0}$ = 0.580, SE = 0.239, n = 5; min. = 0.07, max. = 1.38), while similar to Matrix areas ($\bar{0}$ = 0.586, SE = 0.118, n = 5; min. = 0.20, max. = 0.86), has fluctuated more widely (Appendix 3, Table 5). We are investigating the association between the availability of suitable habitat, owl productivity, and LUA.

Table 5. Summary of reproductive success surveys for northern spotted owls, stratified by Land-use Allocation, on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1997-2001.

LUA[a]	Year	Number of Pairs Checked	Number of Pairs Fledging Young	Number of Young Fledged	Percentage of Pairs Producing Young	Average Number of Young/ Successful Pair	Average Number of Young/Pair	Mean Fecundity[b], # Females
Matrix	1997	16	5	7	31	1.40	0.44	0.219 (16)
	1998	18	10	13	56	1.30	0.72	0.361 (18)
	1999	14	6	10	43	1.67	0.71	0.357 (14)
	2000	14	7	12	50	1.71	0.86	0.429 (14)
	2001	20	3	4	15	1.33	0.20	0.100 (20)
LSR	1997	27	6	9	22	1.50	0.33	0.167 (27)
	1998	35	21	30	60	1.43	0.86	0.429 (35)
	1999	30	1	2	3	2.00	0.07	0.032 (31)

Matrix	1997	16	5	7	31	1.40	0.44	0.219 (16)
	2000	29	23	40	79	1.74	1.38	0.690 (29)
	2001	47	7	12	15	1.71	0.26	0.128 (47)

[a]Sites with Land-use Allocation designation "Other" not reported.

[b]Average fecundity estimate = number of female young produced per female owl (assume a 1:1 sex ratio of young at birth).

In 2001, the number of young produced per pair across all the LSRs (0.36) was similar to the mean of the averages for all years ($\bar{0}$ = 0.59, SE = 0.194, n = 5; min.= 0.067, max. = 1.17) (Appendix 3). Reproductive success for LSR 225 in 2001 was 0.18 young per pair. Over the last five years an average of 0.62 young were fledged per pair in LSR 225 (SE = 0.311; min. = 0.18, max. = 1.83). The average number of young fledged per pair in LSR 226 since 1997 ($\bar{0}$ = 0.60, SE = 0.272; min. = 0.0, max. = 1.55) was similar to 2001 (0.39). The average reproductive success of owl pairs in LSR 227 (0.22) was similar to previous years ($\bar{0}$ = 0.51, SE = 0.181, n = 5; min. = 0.0, max. = 1.00). The smaller LSRs have experienced relatively greater fluctuations in the number of young fledged per pair, reflecting small sample sizes. The only pair located in 2001 at LSR 228 fledged a single juvenile, as in 1998. In 1999 and 2000, no young were located at LSR 228. There were no breeding pairs located in LSR 229 in 2001, lowering the average reproductive success across years ($\bar{0}$ = 0.73, SE = 0.323, n = 5; min. = 0.0, max. = 1.67).

In 2001, average fecundity was 0.108 (SE=0.0337, n = 74) for all females, and 0.114 (SE = 0.0350, n = 70) for adult females (Figure 5). No subadult females nested or were observed with young.

Fecundity rates for all females (adult and subadults) in the Matrix and LSRs has followed a pattern similar to reproductive success for pairs. Since 1997, the average fecundity in LSRs (θ = 0.28, SE = 0.113, n = 5; min. = 0.03, max. = 0.69) has been more variable than in the Matrix allocation (θ = 0.29, SE = 0.059, n = 5; min. = 0.1, max. = 0.43).

Bandings/Re-observation

We banded 60 owls (16 fledglings, 6 subadults and 38 adults) on the study area in 2001. There were a total of 148 banded owls of known identity that we observed in the study population. Based on re-observations of banded owls (excluding juveniles), the minimum average age for males was 6.2 years (SE = 0.438, n = 74) and 5.7 years (SE = 0.390, n = 74) for females. The oldest owl observed was at least 17 years old.

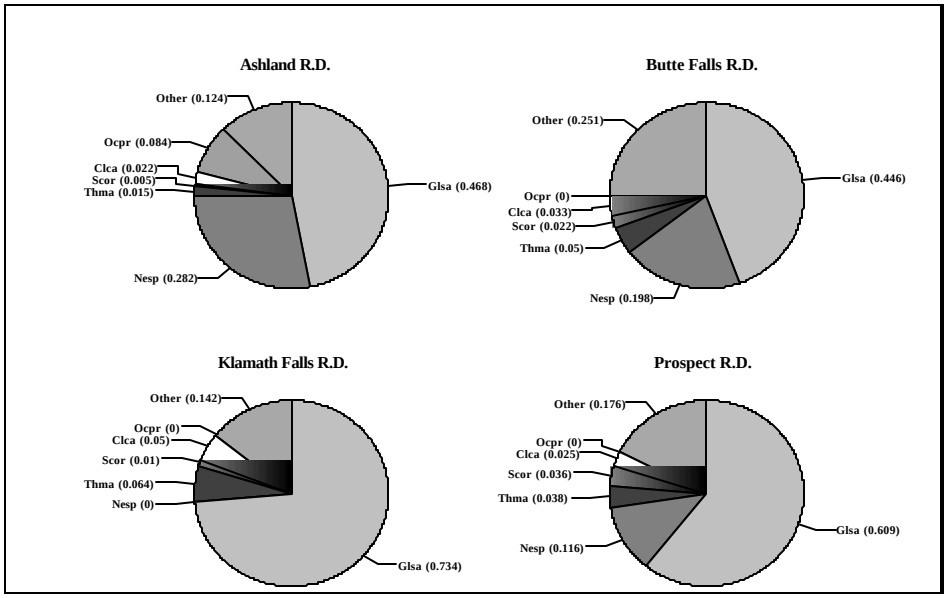
There were 15 major inter-territory movements of owls in 2001. Twelve owls originally banded as fledglings (1992 [2], 1994, 1996 [2], 1997, 1998 [3], 2000 [3]) were recaptured as territorial adults/subadults. Three adult owls were recaptured or resighted at new locations.

Spotted Owl Diets

We initiated an analysis of northern spotted owl diets in 2000, and opportunistically collected pellets from 44 owl sites. A total of 176 pellets representing 580 identified prey specimens were gathered. The majority of the biomass in the sample consisted of northern flying squirrels (*Glaucomys sabrinus*) and woodrat species (*Neotoma cinerea* and *Neotoma fuscipes*), with smaller quantities of pika (*Ochotona princeps*), California red-backed voles (*Clethrionomys californicus*), coast moles (*Scapanus orarius*), and Mazama pocket gophers (*Thomomys mazama*)(Figure 5). The proportion of flying squirrels and woodrats in the diets of owls varied among the different U.S.F.S. Ranger Districts in the study area. We will be completing our analysis of the samples collected in 2001 by spring of 2002.

Figure 5. Biomass proportion of prey items (by Ranger District) collected from spotted owl locations on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 2000. Clca = California red-backed vole, Glsa = northern flying squirrel, Nesp = woodrat sp., Ocpr = pika, Scor = coast mole, Thma = Mazama pocket gopher.

Apparent Survival, Fecundity, and Population Trend



A workshop was conducted to analyze range-wide demographic data of northern spotted owls in December 1998 (Franklin et al. 1999). The workshop was held as a requirement of the *Northern Spotted Owl Effectiveness Monitoring Plan for the Northwest Forest Plan* (Lint et al. 1999). Fecundity, apparent survival, and population trend [8]) were estimated for the Southern Cascades Study Area during the workshop.

A suite of 20 models incorporating Cormack-Jolly-Seber estimators in Program MARK was used to estimate age-specific apparent survival for 446 color-marked owls in the analysis (Table 6). Seven of the eight most parsimonious models (those with the lowest AIC values [Akaike's Information Criteria])(Akaike 1973), had some form of time (t) variation associated with survival (f) and/or recapture probabilities (p)(Table 7). Apparent survival from the model that "best fit" the data varied by age-class and time, averaging 0.284 (SE = 0.198) for juveniles, 0.382 (SE = 0.257) for first-year subadults, 0.576 (SE = 0.113) for second-year subadults, and 0.816 (SE = 0.017) for adults. Apparent survival and recapture probabilities did not differ between males and females. The estimate of annual fecundity was 0.321 (SE = 0.03) for adult females, 0.170 (SE = 0.060) for 2-year-old subadult females, and 0.159 (SE = 0.090) for 1-year-old subadult females. Using the estimates of survival based on the four age class model and the empirical estimates of age-specific fecundity, 8 = 0.846 (SE = 0.021), which is significantly different from 1.0 {95% CI (0.806, 0.887)}. These results suggest that the population is decreasing, however, this result must be qualified in that we did not adjust our estimate of juvenile survival and lambda for emigration. For a summary and context of the population trend estimate see Anthony et al., *Demographic Characteristics of Spotted Owls (Strix occidentalis caurina) in the Southern Oregon Cascades* (2000).

Table 6. Banded northern spotted owls used in capture-recapture analysis on the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1991-1998.

Year	Adult Females	Adult Males	Two Year Old Subadult Females	Two Year Old Subadult Males	One Year Old Subadult Females	One Year Old Subadult Males	Juveniles
1991[a]	34	45	2	1	0	0	6
1992	28	29	1	0	0	1	53
1993	16	19	6	4	1	1	10
1994	15	14	2	2	0	0	40
1995	5	4	0	3	0	1	8
1996	2	6	0	3	0	0	18
1997	3	2	0	0	0	0	5
1998	7	16	0	0	0	0	31
Totals	110	135	13	13	1	3	171

[a]Includes adult owls banded prior to 1991.

Table 7. Models for apparent survival (f) and recapture probability (p) representing the 8 most parsimonious *a priori* models for the Southern Cascades Study Area, Rogue River and Winema National Forests, Oregon, 1991-1998. Age-classes denoted as J for juvenile, S1 for 1-year old, S2 for 2-year old, and A for adult ($3-years old). NJ indicates non-juveniles where S1, S2, and A classes were combined. Models are ranked by Akaike's Information Criterion (Akaike 1973) as adjusted (‡ = 1.3853) for over-dispersion of the data (QAICc)(Burnham and Anderson 1998).

Model[a]	Delta QAICc	QAICc	Number of Parameters	Deviance
{f (J, [[S1,S2,A]+t]), p(*a4'*,NJ)}	901.108	0.00	14	417.179
{f ([J,S1,S2,A]+t), p(*a4'*,NJ)}	903.098	1.99	14	419.935
{f (J,S1,S2,A), p(*a4'*,NJ)}	904.800	3.69	8	439.348
{f (J,[[S1,S2,A]+s]+t), p(*a4'*,NJ)}	905.164	4.06	15	419.932
{f (J,[[S1,S2,A]+s]+t), p([*a4'*][NJ+T'*R*])}	906.853	5.74	16	419.401
{f (J,[[S1,S2,A]+s]+t), p([*a4'*],[NJ+ln[T])	906.912	5.80	16	419.482
{f (J,[NJ+t]), p(*a4'*,NJ)}	907.201	6.09	12	431.329
{f (J,[[S1,S2,A]+s]+t), p[*a4'*],[NJ+s]}	908.064	6.96	17	418.201

[a] Model subscripts indicate age (a), sex (s), or time (t, T) effects. An *a4'* indicates that owls banded as juveniles have different recapture rates over 3 years following first capture than owls banded initially as non-juveniles. Time effects varied by year (t), or were linear (T) or logarithmic (lnT); *'R* indicates a special year effect corresponding to a reduction in recapture effort.

8. Discussion for FY 2001:

In 2001 we attempted to reduce the potential for undetected internal emigration by banded owls within and adjacent to the study area by:

a. coordinating our effort with personnel from Crater Lake National Park, including them on our banding permit and assisting them as they reinstituted a banding program. Six adult owls were banded on the park in 2001. We hope that this sample of owls might be included with the sample of owls on the Rogue River and Winema National Forests in the next Effectiveness Monitoring Workshop for Northern Spotted Owls scheduled for 2003.
b. increasing our efforts in Matrix and Wilderness LUAs, particularly in the Klamath Ranger District of the Winema National Forest. The spotted owl population on the Klamath Ranger District is the only group of owls located on the eastern slope of the Oregon Cascades to be included in long-term monitoring under the Northwest Forest Plan (1994).
c. increasing the size of the field crew (5) compared to previous years (4). We were consequently able to complete surveys to additional locations within the study area and improve the quality of our efforts at the sample of sites surveyed in 2000.

The snow pack in 2001 was considerably lower than in most years, reflecting the most severe drought in the area since 1976. The lack of snow allowed us to access some sites as much as three weeks earlier than in most years. We were able to survey to protocol more sites than in previous field seasons and had no sites where an "undetermined" status was assigned (Table1). The increased access coupled with a larger crew of experienced field biologists improved our ability to determine nesting and reproductive status for owls over much of the study area relative to previous years (Figure 3, Table 5) .

9. Acknowledgments:

Many people have contributed to the success of this project, including: Jim Boultier (Winema National Forest Telecommunications Shop), Tim Burnett (Wildlife Biologist, Boise Cascade Co., Inc.), Jim Goode (Zone Wildlife Biologist, Butte Falls and Prospect Ranger Districts, Rogue River National Forest), Jim Harper (Wildlife Biologist, Butte Falls Resource Area, Medford District BLM), Jim Rees (South Zone Wildlife Biologist, Klamath and Chiloquin Ranger Districts, Winema National Forest), Don Longan (Siskyou and Rogue River National Forests Telecommunications Shop) and Fred Way (Zone Wildlife Biologist, Ashland and Applegate Ranger Districts, Rogue River National Forest). We also thank the Rogue River and Winema National Forest Supervisors offices', the Regional Office of the U.S. Forest Service, the Portland Field Office of the U.S. Fish and Wildlife Service, and Wildlife Images-Animal Rehabilitation Center for their support.

10. Research Plans for FY 2002:

a. Continue the demographic study, including stratification of owl sites by Land-use Allocation.

b. Continue the collection and analysis of spotted owl pellets.

c. Continue the collection of data on northern spotted owl nest trees and nest sites.

d. Continue to assist personnel from Crater Lake National Park with the implementation of their banding program.

11. Presentations and Technology Transfer Completed in FY 2001:

Posters.

a. Anthony, R., F. Wagner, S. Andrews, M. Dragoo, W. King, T. O'Brien, and T. Phillips. 2001. Demographic characteristics of northern spotted owls (*Strix occidentalis caurina*) in the Southern Oregon Cascades; Effectiveness Monitoring for the Northwest Forest Plan. Presented at Celebrate the Harvest. September 15, 2001, Southern Oregon Research and Extension Center, Central Point, Oregon, USA.

b. Poage, N.J., J.C. Tappeiner, and S. Andrews. 2001. Long-term tree ring growth patterns of individual old Douglas-fir trees (*Pseudotsuga menziesii*) in western Oregon, USA: Silvicultural implications for developing old-growth characteristics in young managed forests. Presented at Tree Rings and People: International Conference on the Future of Dendrochronology. September 22-26, 2001, Davos, Switzerland.

c. Andrews, S., J.Perkins, J.A. Thrailkill, N.J. Poage, and J.C. Tappeiner. 2001. Silvicultural Approached to Develop Northern Spotted Owl Nesting Habitat, East-Central Coast Ranges,

Oregon. Presented at the Old-growth Development Workshop. November 7-9, 2001, H.J. Andrews Experimental Forest, Blue River, Oregon, USA.

Presentations.

a. S. Andrews conducted a field trip to active owl sites for personnel affiliated with Wildlife Images, a wildlife rehabilitation center.

Technology Transfers.

a. R.G. Anthony, F. Wagner and S. Andrews participated in data coordination efforts with personnel from other demographic studies.

b. Project personnel provided the USDA-USFS Ranger Districts, USDI-BLM Resource Areas, and USDI-Crater Lake National Park with owl location information and have coordinated surveys.

12. Duration of the Study:

a. Initiated in FY 1992.

b. This project is part of the long-term *Northern Spotted Owl Effectiveness Monitoring Plan for the Northwest Forest Plan* (Lint et al. 1999).

13. Literature Cited:

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Appendix 1. Occupancy status of surveyed sites within the five Late-Successional Reserves (LSRs) in the Southern Cascades Study Area, Rogue River and Winema National Forest, Oregon, 1997-2001.

LSR-225		1997			1998			1999			2000	
Site Name	**MSNO[a]**	**OS[b]**	**RS[c]**	**YP[d]**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**
Abbott Creek RNA	2675	P	N	0	UN	N	U	P	N	0	UN	N
Abbott Creek RNA West	3599	P	N	0	P	Y	1	P	N	0	P	Y
Bert Creek	0579	P	N	0	P	Y	1	P	Y	2	P	Y
Betsy	4284	NR	N	0	NR	N	0	SD	N	0	UN	N
Buck Canyon	1058	P	N	0	P	Y	1	P	N	0	P	Y
Coco	0616	P	N	0	P	Y	0	NR	N	U	P	Y
Foster Creek	3594	P	N	0	P	Y	0	P	N	U	P	Y
Foster Glades	3592	P	Y	2	NR	N	0	P	N	0	P	Y
Foster-Styx	4285	P	N	0	NR	N	U	NR	N	U	SU	N
Hamaker	3597	UN	N	0	NR	N	U	NR	N	U	SU	N
Ice Creek	4287	UN	N	0	SD	N	U	A	N	0	PU	N
Log Pile	2702	P	N	0	NR	N	U	PU	N	0	RM	N
Minnehaha Creek	3596	UN	N	0	SU	N	U	UN	N	0	UN	N

Rabbit Ears Creek	3595	NR	N	U	SD	N	U	NR	N	U	SU	N	U	P	N	0
Rogue-Umpqua	3593	-	-	-	-	-	-	-	-	-	RM	N	U	UN	N	0
Soda Springs	4286	SU	N	U	SU	N	U	P	P	U	SU	N	U	SU	N	U
Travail Creek	2693	P	N	0	P	Y	1	P	P	0	UN	N	0	UN	N	0
Wolf Peak	0577	P	Y	0	P	N	0	SU	SU	U	RM	N	U	P	Y	2

(Cont.)

LSR-226		**1997**			**1998**			**1999**			**2000**			**2001**		
Site Name	**MSNO**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**
29 Creek	0614	UN	N	0	NR	N	U	NR	N	U	P	N	0	UN	N	0
Bessie Creek	2703	-	-	-	-	-	-	-	-	-	UN	N	0	UN	N	0
Bessie Rock	0585	RM	N	U	RM	N	0	RM	N	0	P	Y	2	UN	N	0
Big Ben	3653	UN	N	0	NR	N	U	UN	N	U	UN	N	0	P	N	0
Black Bear Swamp	3652	UN	N	0	NR	N	U	UN	N	0	UN	N	0	I	N	0
Cold Springs	4282	UN	N	0	SU	N	U	UN	N	0	UN	N	0	UN	N	0
Elkhorn Creek	2689	NR	N	U	NR	N	U	SD	N	U	UN	N	0	P	N	0
Fantail	2697	UN	N	0	UN	N	0	UN	N	0	UN	N	0	UN	N	0
Fool Creek	1876	NR	N	U	NR	N	U	NR	N	U	SU	N	U	UN	N	0
Geyser Springs	4291	UN	N	0	UN	N	0	P	N	0	P	Y	2	P	Y	2
Ginkgo Creek North	2682	P	N	0	P	N	0	NR	N	U	I	N	0	I	N	0
Ginkgo Creek South	2695	P	N	0	P	N	0	P	N	0	P	Y	2	P	N	0
Imnaha	1005	P	Y	1	P	Y	2	P	N	0	P	Y	1	P	Y	1

King Spruce Trail	2698	P	N	0	P	N	0	RM	N	U	P	Y	2	P	N	0
Lava Ridge	3633	UN	N	U	SU	N	U	P	N	0	P	Y	2	P	N	0
Lick Creek	1048	-	-	-	UN	N	0	NR	N	U	P	N	0	UN	N	0
Lodgepole	0350	NR	N	U	SD	N	U	NR	N	U	UN	N	0	SU	N	U
Lower Red Blanket	2696	NR	N	U	P	Y	1	P	N	0	A	Y	2	P	N	0
Nichols Creek	0602	NR	N	U	NR	N	U	UN	N	0	UN	N	0	UN	N	0
Onion Springs	2690	UN	N	0	NR	N	U	NR	N	U	UN	N	0	UN	N	0
Otter Spring	0587	P	N	0	P	Y	2	P	N	0	P	Y	0	SU	N	U

(Cont.)

LSR-226		**1997**			**1998**			**1999**			**2000**			**2001**		
Site Name	**MSNO**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**
Rustler Peak	3651	P	N	0	P	Y	1	P	N	0	P	Y	2	P	N	0
South Fork	1006	SU	N	U	P	N	U	P	N	0	P	Y	2	P	N	0
South Red Blanket	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	2
Upper Elkhorn Creek[E]	-	-	-	-	P	N	0	UN	N	U	SU	N	U	-	-	-
Upper Lick Creek	3620	NR	N	U	NR	N	U	NR	N	U	UN	N	0	UN	N	0
Upper Red Blanket	1053	P	N	0	P	Y	2	P	N	0	UN	N	0	P	Y	0
Varmint Creek	1872	P	N	U	P	N	0	P	N	0	SD	N	U	P	N	0
Wickiup Creek	0611	P	N	0	P	N	0	P	N	U	UN	N	U	UN	N	0
Zimmerman Butte	0617	P	Y	1	P	Y	2	P	N	0	P	N	0	UN	N	0

(Cont.)

LSR-227		1997			1998			1999			2000			2000		
Site Name	**MSNO**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**
Beaver Dam	3644	SU	N	U	P	Y	2	PU	N	0	SU	N	0	P	N	0
Big Draw Creek	4274	P	N	U	P	N	U	P	N	0	P	N	0	P	Y	2
Bigfoot	0626	SU	N	U	RM	N	U	P	N	0	RM	N	U	UN	N	0
Billie Creek	2749	-	-	-	-	-	-	-	-	-	-	-	-	P	N	0
Brown Mountain	1782	SD	N	U	P	N	U	NR	N	U	UN	N	0	UN	N	0
Cloud Lakes East	2387	-	-	-	-	-	-	UN	N	0	P	N	U	UN	N	0
Cox Butte	0944	P	N	U	PU	N	U	RM	N	U	RM	N	U	A	N	0
Crystalline Springs	2263	NR	N	U	SU	N	0	NR	N	U	UN	N	0	UN	N	0
Custer	3647	-	-	-	-	-	-	-	-	-	UN	N	U	SU	N	U

Eagles Roost	2754	UN	N	0	UN	N	0	UN	N	0	UN	N
Ellick Creek	0622	-	-	-	-	-	-	-	-	-	-	-
Fish Lake	3641	SU	N	U	P	Y	2	RF[n]	N	U	P	Y
Fourmile Creek	1786	P	N	0	P	Y	1	P	N	0	P	Y
Grizzly Creek IA	-	-	-	-	-	-	-	-	-	-	-	-
Heppsie	0990	RM	N	0	P	Y	0	P	N	0	P	N
High Knob	0039	-	-	-	UN	N	0	SD	N	U	P	Y
Iron Spring	4279	P	Y	2	P	Y	1	P	N	0	P	Y
Lake of the Woods	2240	UN	N	0	UN	N	0	NR	N	U	UN	N
Lava Lakes	3643	P	N	0	P	Y	1	P	N	0	P	Y
Little Elk Prairie	0995	NR	N	U	UN	N	U	NR	N	U	P	N
Low Echo North	2241	NR	N	U	SD	N	0	SU	N	U	UN	N
Low Echo South	2585	-	-	-	-	-	-	-	-	-	NR	N

(Cont.)

LSR-227		**1997**			**1998**			**1999**			**2000**	
Site Name	**MSNO**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**
Lower Rock Creek	2237	P	N	0	P	N	0	P	N	0	P	N
Lower Rock Creek II	-	P	N	0	NR	N	U	NR	N	U	UN	N
Nannie Creek	2540	UN	N	U	P	N	0	P	N	U	RM	N
PCT	3646	P	Y	2	P	Y	2	P	N	0	P	Y
Robinson Butte	0624	SD	N	U	SD	N	U	SD	N	U	UN	N
Robinson Prairie	-	NR	N	U	NR	N	U	SD	N	U	UN	N
Rocky Point	2239	SD	N	U	UN	N	0	SD	N	U	UN	N
Rye Spur	1783	A	N	U	P	N	U	RM	N	U	UN	N
Short Creek Prairie	3645	P	N	0	P	N	0	SD	N	0	RM	N
South Mountain	2243	UN	N	0	P	Y	2	P	N	0	UN	N
Switchbacks	3642	NR	N	U	UN	N	0	NR	N	U	SU	N
West Rock Creek II	2581	-	-	-	-	-	-	-	-	-	-	-
Upper/West Rock Creek	1773	-	-	-	-	-	-	-	-	-	UN	N
Upper Cox Creek	-	NR	N	U	NR	N	U	NR	N	U	UN	N

(Cont.)

LSR-228		1997			1998			1999			2000			2001		
Site Name	**MSNO**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**
Buck Peak	0024	-	-	-	UN	N	U	NR	N	U	UN	N	0	P	Y	1
High Knob II	1785	-	-	-	SU	N	0	RM	N	U	UN	N	0	UN	N	0
Upper Clover Creek	2758	-	-	-	P	Y	1	P	N	0	RM	N	U	UN	N	0

LSR-229		1997			1998			1999			2000			2001		
Site Name	**MSNO**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**	**OS**	**RS**	**YP**
Cedar Springs	2244	P	N	U	P	Y	1	P	N	0	P	Y	2	P	N	0
Dry Creek	0007	P	N	U	P	Y	1	P	N	0	P	Y	2	P	N	0
Sevenmile Creek	2762	RM	N	U	P	Y	2	P	N	0	P	Y	1	P	N	0
Wildcat Creek	2266	P	Y	1	P	N	0	P	N	0	RM	N	U	P	N	0

[a]MSNO = Master Site Number.

[b]OS = occupancy status; P = pair, UN = unoccupied, NR = no response after ─3 night visits, SD = response with ─3 night visits but social status unknown, SU = response with Š3 night visits but social status unknown, A = owls in addition to pair, PU = one owl meets residency status while a second owl of the opposite sex was detected but did not meet pair or resident status, RM = resident male, I = response at site attributed to owls overlapping from an adjacent site, RF = resident female.

[c]RS = reproductive status; N = Non-reproductive, Y= Reproductive.

[d]YP = young produced.

[E]Elkhorn Creek and Upper Elkhorn Creek combined in 2001.

Appendix 2. Summary statistics of site occupancy for the Late-Successional Reserves (LSRs) of the Southern Cascades Study Area, Rogue River and Winema National Forest, Oregon, 1997-2001.

LSR[a]	Year	Total Number of Sites Surveyed to Protocol	Total Number of Occupied Sites	Percent of Occupied Sites	Percent of All Sites with Pairs	Percent of Occupied Sites with Pairs
225	1997	15	12	80.0	73.3	91.7
	1998	10	9	90.0	70.0	77.8
	1999	12	11	91.7	83.3	90.9
	2000	18	14	77.8	38.9	50.0
	2001	18	14	77.8	66.7	85.7
226	1997	20	12	60.0	50.0	83.3
	1998	19	16	84.2	68.4	81.3
	1999	20	14	70.0	60.0	85.7
	2000	28	15	53.6	46.4	86.7
	2001	29	16	55.2	44.8	81.3
227	1997	18	14	77.8	55.6	71.4
	1998	26	19	73.1	61.5	84.2
	1999	19	17	89.5	63.2	70.6

	2000	34	18	52.9	32.4	61.1
	2001	36	28	77.8	50.0	64.3
228	1997	-	-	-	-	-
	1998	3	2	66.6	33.3	50.0
	1999	2	2	100	50.0	50.0
	2000	3	1	33.3	0.00	0.00
	2001	3	1	33.3	100	100
229	1997	4	4	100	75.0	75.0
	1998	4	4	100	100	100
	1999	4	4	100	100	100
	2000	4	4	100	75.0	75.0
	2001	4	4	100	100	100

[a]See Northwest Forest Plan (1994) for LSR descriptions and forest management strategies.

Appendix 3. Summary statistics of reproductive parameters for the Late-Successional Reserves (LSRs) of the Southern Cascades Study Area, Rogue River and Winema National Forest, Oregon, 1997-2001.

LSR[a]	Year	Number Pairs Checked for Nesting[b,c]	Number Pairs Attempting to Nest	Number Pairs Checked for Reprod[d]	Number of Pairs with Fledged Young	Number of Young Fledged	Percent of Pairs Producing Young	Number Young per Successful Pair	Number of Young per Total Number of Pairs	Mean Fecundity[b], # Females
225	1997	7	1	11	1	2	9.09	2.00	0.18	0.091 (11)
	1998	3	3	7	4	4	57.1	1.00	0.57	0.286 (7)

	1999	3	2	6	1	2	16.7	2.00	0.33	0.143 (7)
	2000	6	6	6	6	11	100	1.83	1.83	0.917 (6)
	2001	8	1	11	1	2	9.09	2.00	0.18	0.091 (11)
226	1997	5	2	8	2	2	25.0	1.00	0.25	0.125 (8)
	1998	7	6	12	6	10	100	1.67	0.83	0.417 (12)
	1999	7	0	11	0	0	0	0.00	0.00	0.000 (11)
	2000	11	10	11	9	17	81.8	1.89	1.55	0.773 (11)
	2001	12	4	13	3	5	23.1	1.67	0.39	0.192 (13)
227	1997	3	1	7	2	4	28.6	2.00	0.57	0.286 (7)
	1998	8	7	11	7	11	63.6	1.57	1.00	0.500 (11)
	1999	6	0	9	0	0	0	0.00	0.00	0.000 (11)
	2000	8	5	9	5	7	55.6	1.40	0.78	0.389 (9)
	2001	13	3	18	2	4	11.1	2.00	0.22	0.111 (18)
228	1997	-	-	-	-	-	-	-	-	-
	1998	0	0	1	1	1	100	1.00	1.00	0.500 (1)
	1999	0	0	1	0	0	0	0.00	0.00	0.000 (0)
	2000	0	0	0	0	0	0	0.00	0.00	-
	2001	0	0	1	1	1	100	1.00	1.00	0.500 (1)

(Cont.)

LSR[a]	Year	Number Pairs Checked for Nesting[b,c]	Number Pairs Attempting to Nest	Number Pairs Checked for Reprod[d]	Number of Pairs with Fledged Young	Number of Young Fledged	Percent of Pairs Producing Young	Number Young per Successful Pair	Number of Young per Total Number of Pairs	Mean Fecundity[b], # Females
229	1997	1	1	1	1	1	100	1.00	1.00	0.500 (1)

1998	0	0	4	3	4	75.0	1.33	1.00	0.500 (4)
1999	1	0	3	0	0	0	0.00	0.00	0.000 (3)
2000	3	3	3	3	5	100	1.67	1.67	0.833 (3)
2001	4	0	4	0	0	0	0.00	0.00	0.000 (4)

[a]See Northwest Forest Plan (1994) for LSR descriptions and forest management strategies.

[b]Includes only those pairs with nesting/non-nesting status determined by June 1 or June 15 (elevations $ 1375 meters), plus females examined for the presence of a brood patch by June 21.

[c]Numbers refer only to managed points within the LSR.

[d]Reproductive success estimates were calculated using August 31 as the cutoff date.

[e]Fecundity is calculated as the total number of female young fledged per female checked for reproductive success by August 31 (1:1 sex ratio of fledged young at birth is assumed).