

**WILDLIFE ECOLOGY TEAM
WILDLIFE HABITAT RELATIONSHIPS
IN WASHINGTON AND OREGON
FY2002**

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Title:

Demographic characteristics of spotted owls in the Oregon Coast Ranges, 1990-2002.

Principal Investigator(s) and Organization(s):

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Study Objective(s):

Describe the population ecology of the spotted owl in the Oregon Coast Ranges, to include age and sex specific birth and death rates, and population trend estimates.

Potential Benefit or Utility of the Study:

Information on the demography of spotted owl populations is needed to estimate population trends and assess the effects of different management strategies on spotted owls. This study provides data that can be used to assess survival, reproduction and population trends of spotted owls relative to landscape features in the Oregon Coast Ranges.

Research Accomplishments:

Study Area and Methods

The study area included a 575 km² Density Study Area (DSA) in which we tried to achieve a total population count in 8 of the 13 years of the study, and a 3,918 km² General Study Area (GSA) in

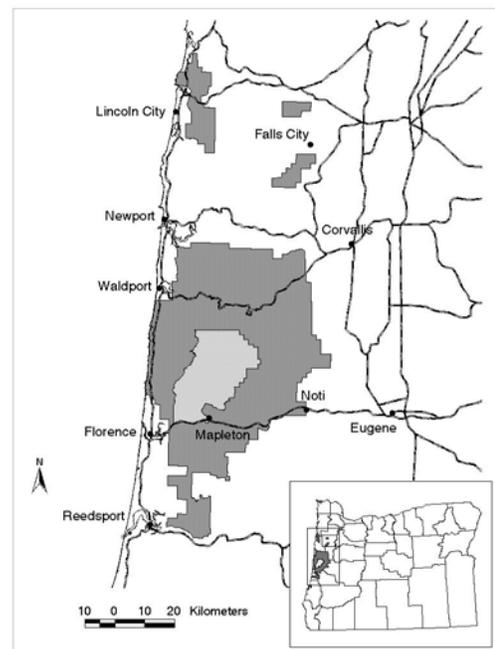


Figure 1. Oregon Coast Ranges Study Area. The dark shaded area represents the General Study Area (GSA) and the light shaded area represents the Density Study Area (DSA).

which we sampled many different owl territories, but did not try to achieve a total population estimate. The DSA included most of the north half of the Mapleton Ranger District and that portion of the Alsea Ranger District south of Township 14 South. The GSA encompassed the rest of the Siuslaw National Forest and adjacent Eugene and Salem BLM lands west of Interstate 5, south of State Highway 18, and north of, or proximal to, State Highway 126 (Fig 1). Interspersed areas of state, municipal, and private lands were also included in the GSA.

The entire DSA was surveyed each year with the exception of 1994, 1997, 1999, 2001, and 2002 when only known historic sites were monitored. Protocol on the DSA and GSA required a minimum of 3 complete visits before concluding that an area was not occupied. The effort to locate, band, and monitor owls in 1990-2002 consisted of a combination of our surveys and inventories conducted by personnel from the Siuslaw National Forest, Bureau of Land Management, and Oregon State University. Additional surveys were done on the DSA and GSA by private consulting firms and timber companies.

Results

In 2002 we conducted surveys at 204 historic owl territories. We detected 233 non-juvenile spotted owls at 132 sites, including 88 pairs, 41 single owls, and 8 sites where a male and female were detected but pair status was not determined (Fig 2, Appendix A). Four of the 41 single owls and one pair were extra birds located at sites that had pairs or other owls of the same sex. We confirmed the production of 31 young.

Number of Owls Marked

We banded 938 owls on the study area in 1990-2002, including 298 adults, 61, subadults, and 579 juveniles (Appendix B). We banded 38 spotted owls in 2002, including 3 adult males, 2 adult females, 2 subadult males, 3 subadult females, and 28 juveniles. We replaced color bands on 10 owls that were originally banded as juveniles and 3 adults that moved between sites on the study area.

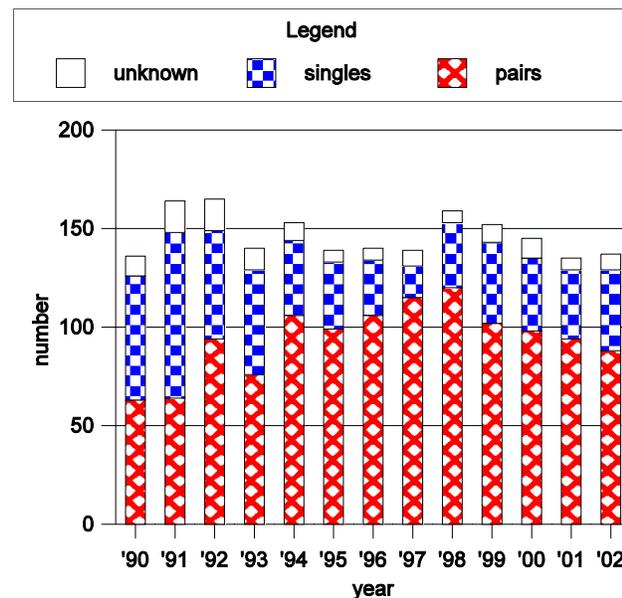


Figure 2. Number of sites occupied by pairs, single owls or males and females of unknown status on the DSA and GSA on the Oregon Coast Ranges Study Area, 1990-2002.

Movements, Emigration and Immigration

We confirmed movement between sites by 43 owls in 2002, including 31 owls that moved between sites in the Coast Ranges Study Area and 12 owls that moved between the Coast Ranges Study Area and adjacent areas. Movements within the study area included 10 owls banded as juveniles and not observed since they were first banded, 2 owls last observed as subadults, and 19 owls banded or last observed as adults.

In 2002 we confirmed 11 cases of emigration and 1 new immigrant into the study area. Emigrants included 10 owls originally banded as juveniles and 1 that was banded and last observed as an adult. Four of the emigrants were relocated on Roseburg BLM, two were relocated on Eugene BLM, one was relocated on Coos Bay BLM, one was relocated on Salem BLM, one was relocated on the Siuslaw National Forest, one was relocated on state land, and one was relocated on private land. The immigrant was last observed as a subadult at a location on private land.

Numbers of Owls Detected Within the Density Study Area

We detected 32 non-juvenile owls in the DSA in 2002. This was the second lowest count for all years of the study (Fig. 3, Appendix A). The count ranged from 31 in 1995 to 53 in 1991. In 1994, 1997, 1999, 2001, and 2002 the survey effort on the DSA was reduced to include only sites where occupancy had been established during previous years. Because of the reduced coverage we are only able to report a minimum count of adults and subadults on the DSA in those years. A large "floater" population and increased survey effort by Siuslaw National Forest personnel may have contributed to the relatively high owl counts during the first 3 years of the study. When the years of reduced survey coverage are excluded, counts of individuals on the DSA appear to indicate a decline between

1991 and 1995 and an increase between 1995 and 2000. In 2002 there were 11 pairs detected on the DSA. This was the lowest count of pairs in the DSA in all years of the study. We also counted 10 single owls on the DSA, including one case where a male and female were detected at the same site but pair status was undetermined. While the total number of adults and subadults on the DSA has fluctuated greatly with maximum and minimum estimates in 1991 and 1995, the number of pairs detected has remained

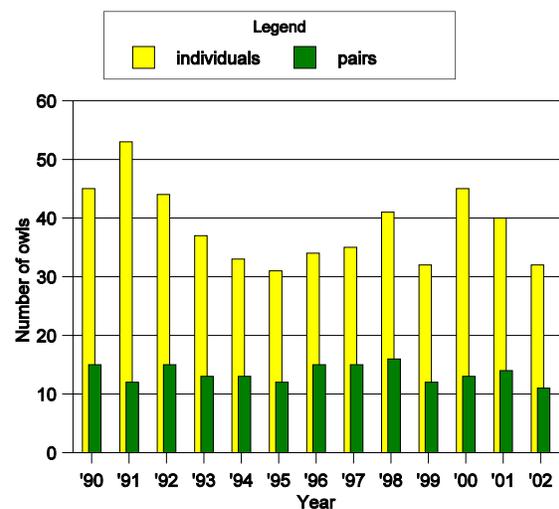


Figure 3. Number of individual and pairs of non-juvenile spotted owls on the DSA on the Oregon Coast Ranges Study Area, 1990-2002.

relatively stable (Fig 3, Appendix A). Therefore, the large fluctuation in density area counts appears to be the result of fluctuations in the number of single owls rather than the number of resident pairs.

Sex Ratio of Adults and Subadults

The sex ratio of non-juvenile owls detected on the study area was weighted towards males in all years. The mean difference in the proportions of known sex owls detected was 0.10 with a maximum difference of 0.22 in 1991 and minimum of 0.02 in 1997. We suspect that the disproportionate number of males was due to sexual differences in detectability rather than real differences in numbers.

Reproduction

All estimates of reproductive parameters in 2002 were below average. Prior to 2001 and 2002, reproductive estimates were observed to follow a consistent “even-odd pattern” with higher reproduction in even numbered years and lower estimates in odd years (Fig 4, Appendix D-H). However, most of the 2001 reproductive estimates were the highest observed for all years and 2002 estimates, excluding mean brood size, were lower than all other even numbered years. In effect, the 2001 and 2002 reproductive estimates have reversed the observed pattern of “good”-“bad” reproduction from even-odd to odd-even.

The estimated proportion of females nesting in 2002 was 0.481, and varied among years, ranging from 0.154 in 1991 to 0.889 in 1990 ($\chi^2=237.719$, 12 df, $P<0.001$)(Appendix D). The proportion of females nesting in 2002 was lower than the mean of 0.500 for all years.

The proportion of females fledging young in 2002 was 0.247 and was lower than the mean of 0.343 for all years (Appendix E). The proportion of females fledging young varied among years ranging from 0.086 in 1999 to 0.653 in 2001 ($\chi^2=208.432$, 12 df, $P<0.001$).

The proportion of nesting females that successfully fledged young in 2002 was 0.541 (Appendix F), which was the third lowest estimate for all years of the study. The 2002 estimate of nest success reflects 17 failures out of 37 nesting attempts. Nest success ranged from 0.500 in 1999 to 0.821 in 2001 and varied among years

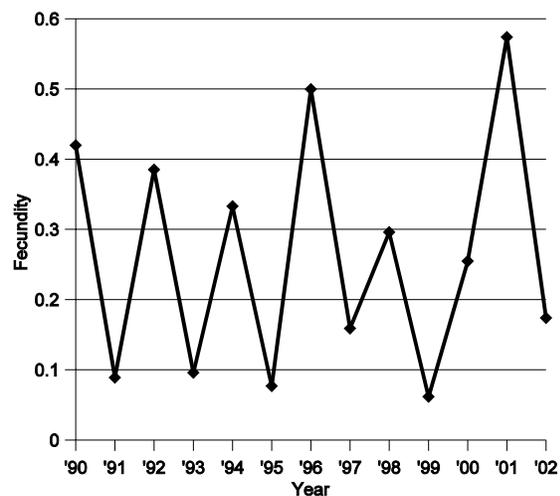


Figure 4. Estimated annual fecundity of female spotted owls on the Oregon Coast Ranges Study Area 1990-2002.

($\chi^2=20.508$, 12 df, $P=0.058$).

Estimated fecundity in 2002 was 0 for 1-2-yr-old females and 0.191 for >2-yr-old females. Estimated annual fecundity for all non-juvenile females was 0.174 and was low in comparison to the other even numbered years of the study (Fig 4, Appendix G). The 2002 fecundity estimate marks the second year in which reproductive estimates have departed from the pattern of high and low reproduction in even and odd years. Fecundity for non-juvenile females ranged from 0.062 in 1999 to 0.574 in 2001 and varied among years ($F=19.971$, 12 df, $P<0.001$).

Mean brood size, defined as the number of young produced per female that nested and produced at least 1 young, was 1.409 (SE = 0.107) in 2002 and was the third lowest estimate for all years of the study (Appendix H). Among year variation in mean brood size ranged from 1.313 in 1990 to 1.758 in 2001 ($F=2.118$, $df=12$, $p=0.015$).

Problems Encountered:

Road closures and a reduction in forest road maintenance have gradually restricted access and resulted in a considerable increase in number of areas that need to be accessed on foot. This increase in walking surveys has led to increased survey times.

Research Plans for FY 03:

- a. Continue demographic study, begin field work in March 2003.
- b. Complete analysis of Oregon Coast Ranges Nest Tree data collected through 1997.
- c. Collect GPS locations for historic spotted owl nests on the study area.
- d. Forgo complete survey of Density Study Area due to poor access and lack of adequate resources to completely survey the entire area.
- e. Participate in a workshop to analyze study area and range wide population trends in northern spotted owls (scheduled for fall/winter 2003/2004).

Publications and Technology Transfer Activities:

- a. Selected demographic data were shared as needed with various federal, state, and private organizations for their management activities.
- b. Detailed summary information regarding survey results and site status determinations were provided to the biologists at the Siuslaw National Forest and the Eugene and Salem BLM Districts.
- c. Continued to collaborate with John Perkins and Gail Olson on a study to describe spotted owl nest trees and local characteristics around nests in the Oregon Coast

Range Mountains. Analysis is in progress.

- d. Escorted Angie DeSalvo and a group of international fellows (visiting scientists) from the World Forestry Center in Portland to view spotted owls in the field and discuss wildlife and forest management issues.
- e. Spent 2 days in the field with photojournalist Bert Gildart, providing background information for a story on spotted owls and tree voles that will be published in a children's magazine.
- f. Provided numerous updates regarding the current occupancy and reproductive status of selected owl site to Oregon Department of Forestry personnel.
- g. Compiled demographic and occupancy data as part of the ongoing effort to assess spotted owl performance through the use of habitat models.
- h. Compiled movement data collected through 2002 for a re-analysis of spotted owl dispersal that will focus on factors that may influence dispersal.
- i. Loschl gave a power point presentation of the 1990-2002 study results and presented a general overview of spotted owl research being done in the Oregon Coast Ranges for a Newport Oregon Audubon group.

Duration of Study:

- a. Initiated in FY 1990.
- b. Contingent upon future funding. Currently funded through FY 2003.

Appendix A. Number of pairs and single spotted owls located on the 575 km² Density Study Area (DSA) and the 3,918 km² General Study Oregon: 1990-2002.

Year	Pair		Single ¹		Adults/subadults		Total
	DSA ²	GSA	DSA ^b	GSA	DSA ^b	GSA	
1990	15	48	15	68	45	164	209
1991	12	52	29	87	53	191	244
1992	15	79	14	73	44	231	275
1993	13	63	11	64	37	190	227
1994	13	93	7	49	33	235	268
1995	12	87	7	39	31	213	244
1996	15	91	4	36	34	218	252
1997	15	100	5	27	35	227	262
1998	16	104	9	36	41	244	285
1999	12	90	8	51	32	231	263
2000	13	85	19	38	45	208	253
2001	14	80	12	35	40	195	235
2002	11	77	10	47	32	201	233

¹Defined as any owl that could not be confirmed as paired. This category included 3 spotted owls that were paired with barred or hybrid owls on the study area.

² Because of an incomplete survey effort on the DSA in 1994, 1997, 1999, 2001, and 2002 this is a minimum count.

Appendix B. Number of spotted owls banded on the Coast Ranges Study Area, Oregon: 1990-2002.

Year	Adults ¹		Subadults		Juveniles
	M	F	M	F	
1990	43	31	7	2	31
1991	28	24	2	4	7
1992	28	31	4	4	60
1993	6	8	2	0	13
1994	15	18	3	1	62
1995	5	8	1	2	13
1996	8	1	4	4	102
1997	4	8	4	0	36
1998	3	2	5	1	57
1999	2	5	1	1	10
2000	4	9	1	0	51
2001	1	1	0	3	99
2002	3	2	2	3	28
Total	150	148	36	25	579

¹ M = male, F = female.

Appendix C. Number of spotted owls detected on the 575 km² Density Study Area (DSA) and the 3,918 km² General Study Area (GSA) on the Coast Ranges Study Area, Oregon: 1990-2002. M = male, F = female, U = unknown sex.

Year	Adult		Subad.		Unknown age			Juv	Non-juv Count
	M	F	M	F	adult/subad.				
	M	F	M	F	M	F	U		
DSA ¹									
1990	16	10	5	2	5	4	3	9	45
1991	21	13	3	0	10	3	3	2	53
1992	15	17	1	0	6	2	3	12	44
1993	15	15	0	0	3	1	3	2	37
1994	14	14	2	0	1	1	1	12	33
1995	14	13	0	0	3	1	0	3	31
1996	12	15	4	1	2	0	0	14	34
1997	15	15	2	0	1	2	0	5	35
1998	16	15	3	1	5	1	0	8	41
1999	15	13	1	1	1	0	1	1	32
2000	20	11	2	3	5	3	1	3	45
2001	17	14	1	1	3	2	2	13	40
2002	13	7	1	2	4	4	1	2	32
GSA									
1990	39	30	4	2	39	33	17	33	164
1991	62	49	5	4	41	21	9	8	191
1992	79	74	7	7	36	22	6	58	231
1993	70	64	5	0	32	17	2	12	190
1994	87	87	13	8	27	13	0	58	235
1995	98	85	3	4	15	6	2	12	213
1996	100	81	5	10	12	10	0	94	218
1997	101	97	8	6	7	7	1	32	227
1998	104	95	14	8	11	12	0	59	244
1999	105	93	2	3	14	9	5	12	231

Appendix C (continued). Number of spotted owls detected on the 575 km² Density Study Area (DSA) and the 3,918 km² General Study Area (GSA) on the Coast Ranges Study Area, Oregon: 1990-2002. M = male, F = female, U = unknown sex.

Year	Adult		Subad.		Unknown age			Juv	Non-juv Count
	M	F	M	F	adult/subad.				
					M	F	U		
GSA (continued)									
2000	98	89	3	1	10	5	2	48	208
2001	90	73	2	3	14	12	1	96	195
2002	81	73	6	7	23	9	2	29	201
COMBINED									
1990	55	40	9	4	44	37	20	42	209
1991	83	62	8	4	51	24	12	10	244
1992	94	91	8	7	42	24	9	70	275
1993	85	79	5	0	35	18	5	14	227
1994	101	101	15	8	28	14	1	70	268
1995	112	98	3	4	18	7	2	15	244
1996	112	96	9	11	14	10	0	108	252
1997	116	112	10	6	8	9	1	37	262
1998	120	110	17	9	16	13	0	67	285
1999	120	106	3	4	15	9	6	13	263
2000	118	100	5	4	15	8	3	51	253
2001	107	87	3	4	17	14	3	109	235
2002	94	80	7	9	27	13	3	31	233

¹ Because of an incomplete survey effort on the DSA in 1994, 1997, 1999, 2001, and 2002 this is a minimum count.

Appendix D. Proportion of female spotted owls that nested on the Coast Ranges Study Area, Oregon: 1990-2002. Estimates were calculated for both paired and single females whose nesting status was determined by 1 June.

Year	No. of females			Proportion nesting					
	by age class ¹			Adult		Subadult		Combined	
	A	S	U	Prop.	95% C.I.	Prop.	95% C.I.	Prop.	95% C.I.
1990	19	2	6	0.895	0.60-0.99	1.000	0.07-1.00	0.889	0.66-0.98
1991	38	1	0	0.158	0.05-0.33	0.000		0.154	0.05-0.32
1992	66	6	4	0.712	0.56-0.83	0.500	0.06-0.89	0.684	0.55-0.80
1993	69	0	1	0.232	0.12-0.36			0.229	0.12-0.36
1994	86	5	2	0.663	0.53-0.77	0.400	0.01-0.87	0.634	0.51-0.74
1995	86	3	0	0.163	0.08-0.27	0.000		0.157	0.08-0.26
1996	84	8	3	0.821	0.70-0.90	0.625	0.17-0.92	0.800	0.69-0.88
1997	100	6	0	0.420	0.31-0.53	0.000		0.396	0.29-0.51
1998	98	7	3	0.602	0.48-0.71	0.286	0.01-0.73	0.593	0.48-0.70
1999	92	2	1	0.174	0.09-0.28	0.000		0.168	0.09-0.27
2000	85	2	0	0.541	0.41-0.66	0.500	0.00-0.99	0.540	0.41-0.66
2001	75	2	2	0.867	0.75-0.94	0.000		0.848	0.73-0.92
2002	66	7	4	0.530	0.38-0.67	0.000		0.481	0.35-0.61
Average				0.507	0.47-0.54	0.294	0.16-0.45	0.500	0.46-0.53

¹ A = adult, S = 1-2-year-old subadult, U = unknown age adult/subadult.

Appendix E. Proportion of female spotted owls that fledged young on the Coast Ranges Study Area, Oregon: 1990-2002. Estimates were calculated for all paired and single females for which the number of young fledged was determined before 31 August.

Year	No. of females			Proportion of females fledging young					
	by age class ¹			Adults		Subadults		Combined	
	A	S	U	Prop.	95% C.I.	Prop.	95% C.I.	Prop.	95% C.I.
1990	33	4	13	0.697	0.48-0.85	0.750	0.09-1.00	0.640	0.46-0.78
1991	53	2	1	0.132	0.04-0.27	0.000		0.125	0.04-0.25
1992	80	7	4	0.538	0.40-0.66	0.143	0.00-0.61	0.495	0.37-0.61
1993	71	0	2	0.113	0.04-0.22			0.123	0.05-0.23
1994	96	6	3	0.469	0.35-0.58	0.000		0.438	0.33-0.55
1995	93	3	1	0.097	0.04-0.19	0.000		0.093	0.04-0.18
1996	93	10	5	0.667	0.54-0.77	0.400	0.08-0.76	0.630	0.51-0.73
1997	110	6	0	0.246	0.16-0.35	0.000		0.233	0.15-0.33
1998	101	8	4	0.396	0.28-0.51	0.125	0.00-0.55	0.372	0.27-0.48
1999	101	2	2	0.079	0.03-0.16	0.000		0.086	0.03-0.17
2000	96	4	0	0.333	0.23-0.45	0.250	0.00-0.83	0.330	0.23-0.44
2001	86	4	5	0.674	0.55-0.78	0.000		0.653	0.53-0.76
2002	76	8	5	0.263	0.15-0.39	0.000		0.247	0.15-0.36
Average				0.351	0.32-0.38	0.156	0.07-0.28	0.343	0.31-0.37

¹ A = adult, S = 1-2-year-old subadult, U = age unknown adult/subadult.

Appendix F. Proportion of nesting female spotted owls that produced young on the Coast Ranges Study Area, Oregon: 1990-2002. Estimates were calculated for females whose nesting status was determined by 1 June.

Year	No. of females			Proportion of nesting females fledging young					
	by age class ¹			Adult		Subadult		Combined	
	A	S	U	Prop.	95% C.I.	Prop.	95% C.I.	Prop.	95% C.I.
1990	16	2	5	0.813	0.48-0.96	1.00	0.07-1.00	0.739	0.47-0.90
1991	6	0	0	0.667	0.14-0.96			0.667	0.14-0.96
1992	47	3	2	0.830	0.66-0.93	0.333	0.00-0.92	0.789	0.62-0.90
1993	15	0	0	0.533	0.22-0.80			0.533	0.22-0.80
1994	57	2	0	0.737	0.58-0.85	0.000		0.712	0.55-0.83
1995	14	0	0	0.643	0.29-0.88			0.643	0.29-0.88
1996	69	5	2	0.783	0.64-0.88	0.600	0.07-0.95	0.763	0.63-0.86
1997	42	0	0	0.619	0.43-0.78			0.619	0.43-0.78
1998	59	2	3	0.678	0.52-0.80	0.500	0.00-0.99	0.641	0.49-0.77
1999	16	0	0	0.500	0.20-0.77			0.500	0.20-0.77
2000	46	1	0	0.652	0.47-0.80	1.00	0.00-1.00	0.660	0.48-0.80
2001	65	0	2	0.831	0.69-0.92			0.821	0.68-0.91
2002	35	0	2	0.543	0.33-0.73			0.541	0.34-0.72
Average				0.711	0.66-0.76	0.533	0.22-0.80	0.695	0.65-0.74

¹ A = adult, S = 1-2-year-old subadult, U = unknown age adult/subadult

Appendix G. Estimated fecundity (\hat{b}) of female spotted owls on the Coast Ranges Study Area, Oregon: 1990-2002. Fecundity was defined as the number of female young produced per female, assuming a 1:1 sex ratio of offspring. Estimates were calculated for individual females for which the number of young fledged was determined before 31 August.

Year	No. of females			Fecundity					
	by age class ¹			Adults		Subadults		Combined	
	A	S	U	\hat{b}_A	SE	\hat{b}_S	SE	\hat{b}	SE
1990	33	4	13	0.470	0.065	0.375	0.125	0.420	0.052
1991	53	2	1	0.094	0.036	0.000	0.000	0.089	0.034
1992	80	7	4	0.419	0.048	0.143	0.143	0.385	0.045
1993	71	0	2	0.085	0.030			0.096	0.032
1994	96	6	3	0.359	0.043	0.000	0.000	0.333	0.040
1995	93	3	1	0.081	0.027	0.000	0.000	0.077	0.026
1996	93	10	5	0.522	0.044	0.350	0.150	0.500	0.042
1997	110	6	0	0.168	0.030	0.000	0.000	0.159	0.029
1998	101	8	4	0.312	0.042	0.125	0.125	0.296	0.040
1999	101	2	2	0.059	0.021	0.000	0.000	0.062	0.021
2000	96	4	0	0.260	0.041	0.125	0.125	0.255	0.039
2001	86	4	5	0.593	0.049	0.000	0.000	0.574	0.047
2002	76	8	5	0.191	0.040	0.000	0.000	0.174	0.035
Average				0.273	0.012	0.117	0.036	0.266	0.011

¹ A = adult, S = 1-2-year-old subadult, U = age unknown adult/subadult.

Appendix H. Mean brood size of female spotted owls on the Coast Ranges Study Area, Oregon: 1990-2002. Estimates were calculated for all females for which the number of young fledged was determined before 31 August.

Year	No. of females			Mean brood size ²					
	by age class ¹			Adults		Subadults		Combined	
	A	S	U	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE
1990	23	3	6	1.348	0.102	1.000	0.000	1.313	0.083
1991	7	0	0	1.429	0.202			1.429	0.202
1992	43	1	1	1.558	0.077	2.00		1.556	0.075
1993	8	0	1	1.500	0.189			1.556	0.176
1994	45	0	1	1.533	0.075			1.522	0.074
1995	9	0	0	1.667	0.167			1.667	0.167
1996	62	4	2	1.565	0.063	1.750	0.250	1.588	0.060
1997	27	0	0	1.370	0.095			1.370	0.095
1998	40	1	1	1.575	0.087	2.000		1.595	0.084
1999	8	0	1	1.500	0.189			1.444	0.176
2000	32	1	0	1.563	0.089	1.000		1.545	0.088
2001	58	0	4	1.759	0.062			1.758	0.059
2002	20	0	2	1.450	0.114			1.409	0.107
Average				1.555	0.026	1.500	0.167	1.550	0.025

¹A = adult, S = 1-2-year-old subadult, U = age unknown adult/subadult.

²Mean brood size was defined as the number of young produced per female that nested and produced at least one young.