

US Department of Agriculture Forest Service  
Pacific Northwest Research Station  
Olympic Peninsula Spotted Owl Demography Study  
2015 Annual Report  
January, 2016

**Title**

Demographic characteristics of northern spotted owls (*Strix occidentalis caurina*) in the Olympic National Forest, Washington, 1987–2015.

**Principal investigator**

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**Study objectives**

The primary study objectives are to estimate population trends, population age structure, reproductive rates, and survival rates of spotted owls in the Olympic Peninsula Demography Study Area. A secondary study objective is to estimate changes in occupancy of barred owls (*Strix varia*) within territories that were historically occupied by spotted owls.

**Potential benefits and utility of the study**

The Olympic Peninsula spotted owl demography study consists of studies conducted by the USDA Forest Service Pacific Northwest Research Station and the Olympic National Park. This document reports the results of surveys conducted by the Pacific Northwest Research Station. Gremel (2015) reported the results from the Olympic National Park surveys. The Olympic Peninsula demography study is 1 of 8 long-term demographic studies that constitute the federal monitoring program for the northern spotted owl under the Effectiveness Monitoring Program for the Northwest Forest Plan (Lint et al. 1999). These demographic studies are designed to monitor vital rates and populations trends of spotted owls on federal lands in the Pacific Northwest. During regional meta-analyses that occur every 5 years, data collected from these demographic studies are used to make inferences regarding the effects of biological covariates on vital rates and population trends of spotted owls (Forsman et al. 1996, Franklin et al. 1999, Anthony et al. 2006, Forsman et al. 2011, Dugger et al. 2016).

## **Study area**

The 94,800 ha Pacific Northwest Research Station study area is located on the northern Pacific and Hood Canal Districts of the Olympic National Forest and includes 40 sites that have been surveyed each year for spotted owls since 1991 (Fig. 1). The adjacent area surveyed by the National Park Service includes 128,000 ha within Olympic National Park (Gremel 2015; Fig. 2).

## **Methods**

Field and data collection methods used in this study have been described in a variety of sources and will be briefly recounted here (Franklin et al. 1996, Reid et al. 1999, Lint et al. 1999, Anthony et al. 2006). Each historical spotted owl territorial sites are completely surveyed  $\geq 3$  times each year using standardized protocols to estimate nesting status, and reproductive success of all territorial spotted owls detected within the area (Franklin et al. 1996, Lint et al. 1999). All owls detected are marked with color bands and US Fish and Wildlife Service numeric bands so that they can be identified visually, without trapping them every year. Capture histories of banded owls are used to estimate apparent annual survival, and apparent survival and recruitment are used to estimate the rate of population growth (Pradel 1996, Anthony et al. 2006, Forsman et al. 2011, Dugger et al. 2016).

All spotted owl surveys and captures are conducted under USDI Fish and Wildlife Service recovery permit TE-026280-11, Washington State Scientific collection permit 10-139, master banding permit 21249, and Oregon State University Animal Care and Use Permit 3628.

## **Results**

During the 2015 field season, we conducted 142 complete surveys to 40 historical survey areas (mean complete surveys per site =  $3.6 \pm 0.2$  SE). Of the 15 spotted owls we detected, 4 pairs and a single male were territorial at the sites where they were detected and 6 owls (1 pair, 3 males, 1 female) were detected at 5 sites as non-territorial according to the survey protocol (Table 1–2; Lint et al. 1999). In addition, a single adult female was confirmed as territorial and a first year subadult female was banded at the same non-demographic site.

The total number owls detected in 2015 increased from 2014 but was still far below 1987–1998 historical levels (Table 1). In contrast, the proportion of sites in which we detected barred owls remained high as 50% of the historical spotted owl sites had  $\geq 1$  barred owl detected (Fig. 3).

As expected, none of the 3 female spotted owls that were confirmed to protocol for nesting status in 2015 nested. On the PNW demography study there has not been a single successfully fledged spotted owl in odd years since 2005 (Tables 3–5).

### **Problems encountered**

One crew member broke a bone in the hand after slipping on a down tree and falling. Access to sites continued to be an issue because of road closures, and reduced road and trail maintenance.

### **Publications, presentations, and technology transfer completed in 2015**

Data collected in our study were used in a range-wide meta-analysis of spotted owl populations that was conducted in January 2014, in Corvallis, Oregon. The results of the meta-analysis will be published in 2016 (Dugger et al. 2016).

### **Duration of study**

Study was initiated in 1987 and will continue in 2016.

### **Acknowledgements**

This study was funded by the USDI Bureau of Land Management, USDA Forest Service Region 6, and the USDA Forest Service Pacific Northwest Research Station.

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Table 1. Number of spotted owls detected per year on the USDA Forest Service Pacific Northwest Research Station Olympic Peninsula Demography Study, 1987–2015. Data subdivided by spotted owl sex and age.

Year	Sites	Males			Females			Total
		Adults	Subadults	Age unknown	Adults	Subadults	Age unknown	
1987	14	10	0	1	9	0	2	22
1988	20	11	2	2	12	0	1	28
1989	28	22	0	1	16	0	3	42
1990	36	20	2	2	26	0	2	52
1991	40	27	1	2	25	1	3	59
1992	40	29	3	2	30	2	1	67
1993	40	27	3	2	27	0	5	64
1994	40	27	0	6	30	1	1	65
1995	40	28	0	3	24	0	1	56
1996	40	26	1	2	26	0	0	55
1997	40	25	0	1	20	1	4	51
1998	40	26	1	3	22	1	4	57
1999	40	10	0	2	10	0	1	23
2000	40	21	1	0	13	0	3	38
2001	40	13	0	5	17	0	1	36
2002	40	14	0	5	11	0	2	32
2003	40	13	0	3	8	0	3	27
2004	40	13	0	1	12	1	2	29
2005	40	12	0	0	11	2	0	25
2006	40	8	0	1	6	0	1	16
2007	40	9	0	2	4	0	4	19
2008	40	11	0	0	10	0	3	24
2009	40	6	0	0	3	1	1	11
2010	40	5	1	2	6	0	2	16
2011	40	3	0	3	4	0	2	12
2012	40	3	0	3	4	0	3	13
2013	40	4	1	0	5	0	2	12
2014	40	5	0	0	5	0	0	10
2015	40	4	0	5	2	0	4	15

Table 2. Number of spotted owl territories on the USDA Forest Service Pacific Northwest Research Station Olympic Peninsula Demography Study in which we located territorial pairs and singles, floaters, status uncertain, or no spotted owls, 1987–2015.

Year	Sites	Pairs	Singles	Floaters	Status uncertain	No owls
1987	14	9	3	0	0	2
1988	20	12	3	0	0	5
1989	29	19	4	0	0	6
1990	36	23	5	0	0	8
1991	40	24	5	2	2	7
1992	40	32	2	0	0	6
1993	40	28	6	0	0	6
1994	40	30	2	1	1	6
1995	40	22	9	0	1	8
1996	40	26	3	0	0	11
1997	40	20	6	1	1	12
1998	40	23	6	1	0	10
1999	40	6	9	0	1	24
2000	40	14	8	0	0	18
2001	40	15	4	1	2	18
2002	40	13	3	0	3	21
2003	40	8	6	0	4	22
2004	40	13	0	0	1	26
2005	40	11	2	0	1	26
2006	40	7	2	0	0	31
2007	40	4	7	0	3	26
2008	40	9	3	0	2	26
2009	40	3	2	0	3	32
2010	40	6	3	0	1	30
2011	40	2	4	0	3	31
2012	40	5	2	2	0	31
2013	40	4	3	0	0	33
2014	40	5	0	0	0	35
2015	40	4	1	0	6	15

Table 3. Number of spotted owls banded on the USDA Forest Service Pacific Northwest Research Station Olympic Peninsula Spotted Owl Demography Study, 1987–2015. Non-fledglings are classified as adults ( $\geq 3$  years) and subadults (S1 = 1 year and S2 = 2 years).

Year	Fledglings	Males			Females			Total
		Adults	S1	S2	Adults	S1	S2	
1987	0	15	2	1	15	0	0	33
1988	13	11	1	3	13	0	0	41
1989	46	22	1	0	25	0	1	95
1990	62	19	6	3	22	1	7	120
1991	31	17	5	3	15	2	2	75
1992	78	23	1	2	21	0	1	126
1993	0	15	1	1	12	1	1	31
1994	32	8	1	1	11	1	1	55
1995	0	13	3	1	2	0	0	19
1996	58	5	0	2	9	0	3	77
1997	25	2	0	1	6	1	0	35
1998	26	2	1	1	4	2	0	36
1999	0	0	0	0	1	0	0	1
2000	1	6	0	0	5	0	0	12
2001	26	2	1	0	7	1	0	37
2002	28	1	1	0	4	0	0	34
2003	0	5	1	0	1	1	0	8
2004	36	6	0	0	5	1	0	48
2005	1	1	2	0	3	3	3	13
2006	6	0	0	0	0	0	0	6
2007	0	1	0	0	1	0	0	2
2008	11	2	0	0	3	0	0	16
2009	0	0	0	0	0	0	1	1
2010	0	0	0	1	0	0	0	1
2011	1	0	0	0	1	0	0	2
2012	1	0	0	0	1	0	0	2
2013	0	0	0	0	0	0	0	0
2014	5	2	0	0	2	0	0	9
2015	0	0	0	0	0	1	0	1

Table 4. Annual reproductive statistics for female spotted owls from the USDA Forest Service Pacific Northwest Research Station Olympic Peninsula Demography Study, 1987–2015. Sample size only includes females where protocols for nesting status or the number of young produced where met.

Year	Proportion of females that nested			Proportion of females that produced young			Proportion of nesting females that produced young		
	n	$\pi$	95% C.I.	n	$\pi$	95% C.I.	n	$\pi$	95% C.I.
1987	16	0.19	0.00–0.38	19	0.11	-0.03–0.24	3	0.67	0.13–1.20
1988	19	0.26	0.07–0.46	27	0.33	0.16–0.51	5	1.00	—
1989	20	0.40	0.19–0.61	39	0.67	0.52–0.81	8	1.00	—
1990	35	0.71	0.56–0.86	52	0.56	0.42–0.69	24	0.63	0.43–0.81
1991	46	0.41	0.27–0.56	53	0.34	0.21–0.47	19	0.79	0.61–0.97
1992	48	0.90	0.81–0.98	63	0.78	0.68–0.88	43	0.86	0.76–0.96
1993	51	—	—	54	—	—	0	—	—
1994	49	0.84	0.73–0.94	56	0.54	0.41–0.67	41	0.66	0.51–0.80
1995	35	—	—	36	—	—	0	—	—
1996	37	0.89	0.79–0.99	50	0.68	0.55–0.81	33	0.67	0.51–0.83
1997	34	0.50	0.33–0.67	45	0.36	0.22–0.50	17	0.76	0.56–0.97
1998	43	0.56	0.41–0.71	45	0.42	0.28–0.57	24	0.71	0.53–0.89
1999	10	—	—	12	—	—	0	—	—
2000	25	0.12	-0.01–0.25	30	0.03	-0.03–0.10	3	0.33	-0.20–0.87
2001	31	0.55	0.37–0.72	34	0.44	0.27–0.61	17	0.88	0.73–1.04
2002	29	0.76	0.60–0.91	30	0.50	0.23–0.54	22	0.68	0.49–0.88
2003	26	—	—	26	—	—	18	—	—
2004	32	0.78	0.64–0.93	32	0.75	0.60–0.90	25	0.84	0.70–0.98
2005	29	0.03	-0.03–0.10	29	0.03	-0.03–0.10	29	0.03	-0.03–0.10
2006	8	0.88	0.65–1.10	9	0.67	0.36–0.98	8	0.75	0.45–1.05
2007	7	—	—	0	—	—	0	—	—
2008	4	0.50	0.01–0.99	9	0.78	0.51–1.05	4	0.50	0.01–0.94
2009	6	—	—	6	—	—	0	—	—
2010	5	0.80	0.45–1.15	5	—	—	5	—	—
2011	4	—	—	4	—	—	0	—	—
2012	6	—	—	6	0.33	-0.04–0.71	5	0.2	-0.15–0.55
2013	2	—	—	0	—	—	0	—	—
2014	5	1.00	—	5	0.80	0.45–1.15	5	0.80	0.45–1.15
2015	2	—	—	0	—	—	0	—	—

Table 5. Estimated fecundity ( $\beta \pm SE$ ) of female spotted owls on the USDA Forest Service Pacific Northwest Research Station Olympic Peninsula Demography Study, 1987–2015. Fecundity is defined as the number of female young produced per female, assuming a 50:50 sex ratio of offspring.

Year	Adults	Subadults	Adults	Subadults	Combined <sup>1</sup>
			$\beta \pm SE$	$\beta \pm SE$	$\beta \pm SE$
1987	18	1	0.08 ± 0.06	—	0.08 ± 0.06
1988	25	2	0.24 ± 0.08	—	0.24 ± 0.07
1989	39	0	0.54 ± 0.07	—	0.54 ± 0.07
1990	46	5	0.47 ± 0.07	0.10 ± 0.10	0.42 ± 0.06
1991	50	3	0.31 ± 0.06	0.17 ± 0.17	0.30 ± 0.06
1992	57	6	0.66 ± 0.05	0.50 ± 0.18	0.64 ± 0.05
1993	49	0	—	—	—
1994	53	1	0.42 ± 0.06	—	0.39 ± 0.06
1995	36	0	—	—	—
1996	43	3	0.56 ± 0.07	0.33 ± 0.17	0.54 ± 0.06
1997	43	0	0.31 ± 0.07	—	0.30 ± 0.06
1998	39	3	0.31 ± 0.07	0.50 ± 0.29	0.31 ± 0.06
1999	11	0	—	—	—
2000	29	0	0.02 ± 0.02	—	0.02 ± 0.02
2001	33	0	0.36 ± 0.08	—	0.38 ± 0.08
2002	28	0	0.45 ± 0.09	—	0.45 ± 0.08
2003	22	1	—	—	—
2004	23	4	0.74 ± 0.08	0.38 ± 0.24	0.60 ± 0.08
2005	22	5	0.02 ± 0.02	—	0.02 ± 0.02
2006	8	0	0.50 ± 0.16	—	0.50 ± 0.14
2007	7	0	—	—	—
2008	9	0	0.63 ± 0.16	—	0.61 ± 0.14
2009	5	1	—	—	—
2010	5	0	—	—	—
2011	3	0	—	—	—
2012	6	0	0.17 ± 0.11	—	—
2013	6	0	—	—	—
2014	5	0	0.70 ± 0.20	—	0.70 ± 0.20
2015	6	1	—	—	—

<sup>1</sup>Includes 18 females of unknown age that were not reported in this table.

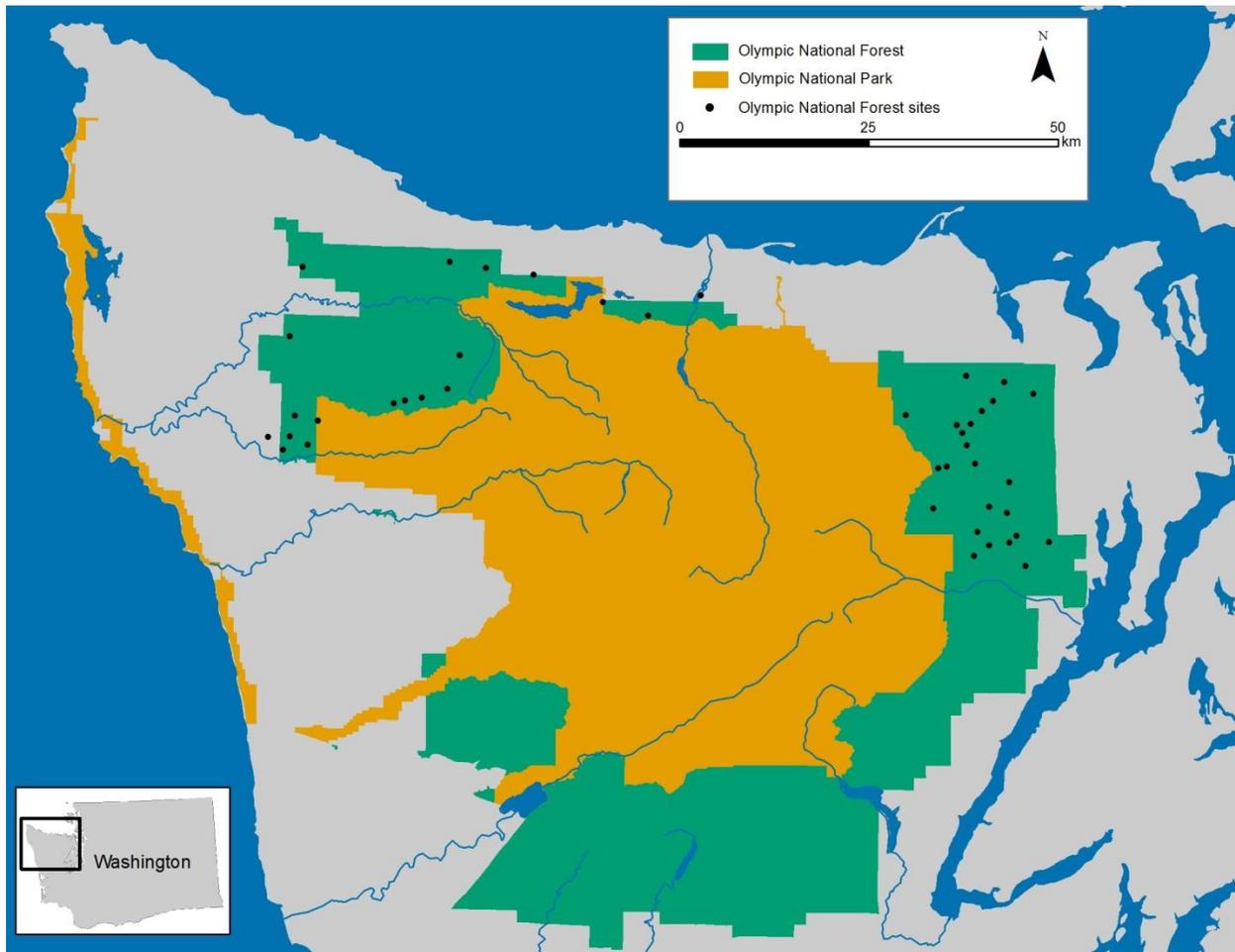


Figure 1. USDA Forest Service Pacific Northwest Research Station spotted owl demography study area, Washington. The dark box in the lower left insert indicates the study area. Black dots indicate spotted owl sites that were surveyed from 1987–2015.

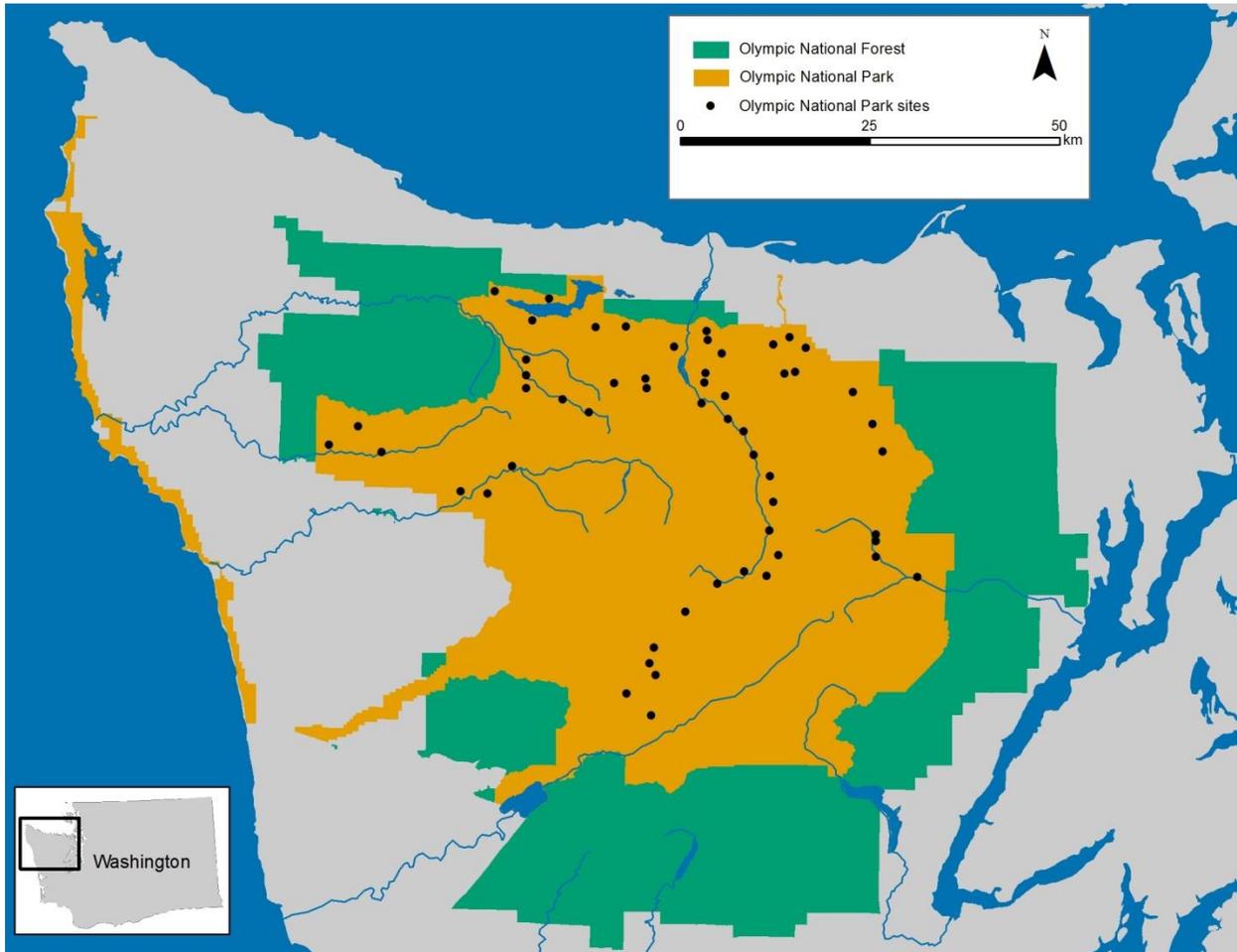


Figure 2. Olympic National Park spotted owl demography study area, Washington. The dark box in the lower left insert indicates the study area. Black dots indicate spotted owl sites that were surveyed from 1992–2015.

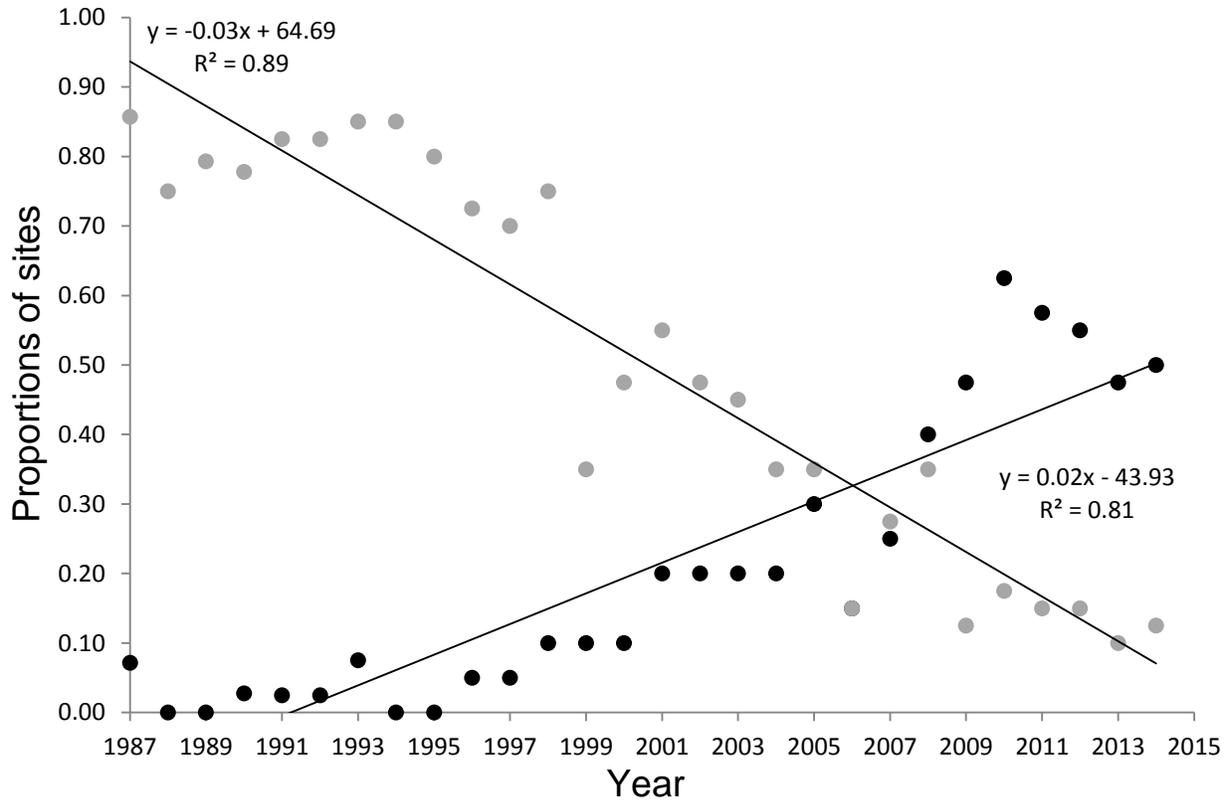


Figure 3. Proportion of monitored owl territories ( $n = 40$ ) with detection of  $\geq 1$  spotted owls (gray dots) and  $\geq 1$  barred owl (black dots) on the USDA Forest Service Pacific Northwest Research Station Olympic Peninsula spotted owl demography study, 1987–2015.