Joint Fire Science Program
Project 04-2-1-52
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Annual Progress Report
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1. Title:

Productivity and Habitat Use of Spotted owls in Relation to Fire Severity in southwestern Oregon: Can prescribed burns be used to reduce fire hazards in spotted owl habitat?

2. Principal Investigators and Organizations:

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3. Study Objectives:

- Compare occupancy and productivity of spotted owl territories before and after wildfire.
- Compare home range size and habitat use of spotted owls within burned areas to owls in unburned habitat.
- Determine the effects of fire severity on survival rates of adult spotted owls.
- Relate changes in occupancy, productivity, movements and habitat use to the severity and scale of wildfire.

4. Study Area Description:

Research is being conducted in the Biscuit, Timbered Rock and Quartz Fires and their surrounding areas. The fires occurred within three geographic areas of southwestern Oregon: the Siskiyou Mountains, the mid-coastal Siskiyou Mountains, and the Cascade Mountains. This area of Oregon is part of the Mixed-Conifer and Mixed-Evergreen vegetation zones. In this classification system a variety of tree species are found including: ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziessii*), incense cedar (*Clocedrus decurrens*), black oak (*Quercus kellogii*), Oregon white oak (*Quercus garryana*), Pacific madrone (*Arbutus menziessi*), and tanoak (*Lithocarpus densiflorus*).

The Quartz Fire ignited during a lighting storm in August, 2001. The boundaries of the fire were within the Glade Creek, Little Applegate, and Yale Creek watersheds within the Siskiyou Mountains. An estimated 2,484 ha of public (Rogue River and Siskiyou National Forest, Medford District – Bureau of Land Management, and Oregon Department of Forestry – Southwest Oregon District) and private land were burned within the Siskiyou Mountains.

The Biscuit Fire originated from several smaller fires initiated by lightning strikes in July, 2002, and eventually became a large complex fire, consuming 201,436 ha of public (Rogue River and Siskiyou National Forest, Medford District – Bureau of Land Management, Oregon Department of Forestry – Southwest Oregon District, and Josephine County, Oregon) and private land within the mid-Coastal Siskiyou Mountains.

The Timbered Rock fire started in July of 2002 during a lightning storm. The fire was confined within the boundaries of the Elk Creek watershed. Approximately 11,028 ha of public (Rogue River and Siskiyou National Forest, Medford District – Bureau of Land Management, and Oregon Department of Forestry – Southwest Oregon District) and private land were burned within the western edge of the southern Oregon Cascade Range.

5. Research Accomplishments:

Owl Capture and Radio-transmitter Attachment

Efforts to capture owls occurred from September, 2004 through June, 2006 within and around the boundaries of the Timbered Rock and Quartz Fires. To date, 26 individual owls have been captured and fitted with 7.5 gram backpack mounted radio-transmitters (Table 1). Twenty-three owls (11 pairs, 1 single) were captured from twelve historic owl cores, within and around the Timbered Rock fire. Three owls (1 pair, 1 single) were captured from two historic owl cores within and surrounding the Quartz Fire.

All radio-telemetry related research activities concluded at the end of the 2006 breeding season (August 2006). No additional owls will be captured or monitored past this point in time.

Table 1. Radio-tagged owls at the Timbered Rock and Quartz Fires

Site Name	Owls Captured	Date Captured	Inside/Outside Fire
Timbered Rock Fire			
Alco Rock	Pair	Male - 09/04 Female - 02/05	Inside
Flat Creek	Pair	Male - 03/05 Female - 09/04	Inside
Miller Mountain	Pair	Male - 09/04 Female - 09/04	Inside
Upper Timber Creek	Pair	Male - 09/04 Female - 09/04	Inside
Gobblers Knob	Pair	Male - 09/04 Female - 09/04	Inside
Hungry Elk	Pair	Male - 03/05 Female - 03/05	Outside
Lower Morine	Pair	Male - 02/05 Female - 02/05	Outside
South Boundary	Pair	Male - 03/05 Female - 03/05	Outside
Oliver Springs	Pair	Male - 03/05 Female - 03/05	Outside
Louis Creek	Pair	Male - 09/04 Female - 09/04	Outside
Hawk Creek	Male	Male - 09/05	Inside
Timbered Rock	Pair	Male - 05/06 Female - 05/06	Inside
Quartz Fire			
Yale Creek	Pair	Male - 04/05 Female - 06/05	Outside
Glade Creek	Male	Male - 04/05	Inside

Owl Mortalities

Nine out of 26 radio-tagged owls have died during the course of research activities. Whenever possible the carcass was retrieved in a timely fashion and submitted for necropsy. All necropsies were performed by the Oregon State University, College of Veterinary Medicine, Veterinary Diagnostic Lab (VDL) in Corvallis, Oregon. The VDL was able to determine the cause of death for all carcasses that were submitted (Table 2). Six out of the nine owls were severely emaciated at the time of death and likely died of starvation. The Yale Creek Male was submitted for necropsy but the remains were in poor condition and limited results were obtained to help determine the cause of death, although it was confirmed the owl had a broken leg which likely led to its emaciated condition. The Miller Mountain and South Boundary males were not submitted for necropsy because both mortalities appeared to be predation events and few remains were found in the field. The transmitter from the South Boundary female switched to mortality mode but neither the carcass or transmitter were found after an extensive field search. We feel that this owl likely died of some unknown mortality source and that the transmitter did not come free from the owl. None of the owls submitted for necropsy have tested positive for West Nile Virus. Furthermore, the VDL found little evidence of adverse effects of the radio-transmitter harness package to the owls.

Table 2. Radio-tagged owl mortalities during research activities

Owl	Mortality Date	Cause of Death
Upper Timber Female	1/18/2005	Emaciation
Upper Timber Male	5/7/2005	Emaciation/Parasitism
Oliver Springs Female	5/16/2005	Emaciation/Parasitism
Miller Mountain Male	7/12/2005	Predation
Yale Creek Male	7/13/2005	Emaciation/Broken Leg
South Boundary Female	11/13/2005	Unknown Mortality
Hawk Creek Male	1/4/2006	Emaciation
South Boundary Male	2/13/2006	Predation
Glade Creek Male	4/8/2006	Emaciation

Radio-telemetry Effort

Owls were monitored on a consistent basis since the initial date of capture. Locations were obtained on alternate days of the week with up to five night time and two day time locations gathered every two weeks per owl. Roughly 3014 telemetry locations have been gathered on 26 different owls from September 2004 through August 2006 (Appendix A). Total numbers of locations on individual owls range from 26 to 188. Radio-telemetry efforts concluded in August, 2006.

Radio-transmitter Removal

Nine out of 26 owls died during the course of research activities, so 17 transmitters needed to be removed from owls. Ten of the 17 owls have had their radio-transmitter harness removed and seven owls have not. Demographic surveys were conducted during the 2006 breeding season in an attempt to find these owls but were unsuccessful. Attempts will be made again in the spring of 2007 to find the remaining radio-tagged owls and remove their transmitters.

Occupancy and Reproduction Surveys

Through cooperative efforts of the Bureau of Land Management (BLM), Boise Building Solutions, private contractors, and the Oregon Cooperative Fish and Wildlife Research Unit (OCFWRU), post-fire occupancy and productivity data have been gathered at 39 historic owl cores at three fires in southwestern Oregon. Four years of post-fire data has been collected at the Timbered Rock and Biscuit fires and five years of data has been collected at the Quartz Fire. 2006 marked the last year that post-fire demographic data will be collected as part of this research project.

Timbered Rock Fire

Post-wildfire surveys of historic owl territories located on BLM and privately administered lands were conducted by personnel from the BLM and Boise Building Solutions during the 2003 and 2004 breeding seasons. The OCFWRU assumed all survey responsibilities throughout the Timbered Rock Fire in 2005 and 2006, in addition to monitoring four sites on FS land from 2003 to 2006. To date, twenty-two historic owl sites have been monitored four years post-fire within the boundaries of the Timbered Rock Fire (Appendix B).

From 2003 to 2006 an average of 9.25 out of 22 sites have been occupied by at least one owl. The highest number of sites occupied was in 2003, with 12 sites occupied and a low of 7 sites occupied in 2006. Reproductive success has been relatively low inside of the fire boundaries with an average of 0.11 (range 0.00 – 0.25) young fledged per occupied site per year.

Biscuit Fire

Prior to the 2002 Biscuit Fire, there were roughly 50 known spotted owl territories within the fire perimeter. We have selected a sample of 9 historic owl cores on the eastern edge of the Biscuit Fire, which have been surveyed 4 years post-fire (Appendix C). The OCFWRU has conducted all surveys from 2003-2006.

During the four years post-fire the 9 sites that have been monitored at the Biscuit fire averaged 4.25 sites occupied per year. The 2003, 2004, and 2006 breeding seasons had at least 1 owl at 4 historic owl sites and in 2005 at least 1 owl was detected at 5 sites. The Biscuit Fire has enjoyed the highest reproductive success out of the three fires with an average of 0.59 young fledged per occupied site per year (range 0.00 – 1.75).

Quartz Fire

Post-fire surveys in the Quartz Fire and the surrounding area began in 2002. Efforts have been made by employees of Boise Building Solutions, private contractors and the OCFWRU to conduct surveys at 9 historic owl cores within and around the Quartz Fire (Appendix D).

Nine sites within the boundaries of the Quartz fire have been consistently monitored since the 2002 breeding season. Of these 9 sites there has been an average of 4.4 sites occupied per year. At least 1 owl was detected at 6 sites in 2002, 5 sites in 2003 and 2004, and 3 sites in 2005 and 2006. Reproductive success at these 9 sites has averaged 0.33 young per occupied site per year (range 0.00 – 0.60). Additional sites were monitored some years but a consistent effort was not made every year and these sites are not included in this discussion.

Vegetation Sampling for Habitat Mapping

During the summer of 2006, vegetation plots were sampled to help create fire severity and habitat maps at all three fires. Plots with a 15m radius were used to assess fire severity and stand level habitat features. Non-random plots will be used to develop training sites for satellite image classification of fire severity and post-fire spotted owl habitat. Validation sites were placed randomly in the field and will be used to determine the overall accuracy of satellite derived habitat and fire severity maps.

Habitat and fire severity maps have not been created at this time. Analysis of vegetation plot data and construction of maps will begin in the fall of 2006. All maps will be created using Landsat 7+ETM images and will have a resolution of 30 meters. Fire severity will be grouped into the following; unburned, low, moderate, and high, based on the amount of overstory vegetation altered by the fire. Spotted owl habitat will be grouped based on the dominant overstory tree sizes with the following classification; early seral, pole, young, mature, old, and hardwoods.

6. Data Analysis:

Owl survey statistics have been summarized for the three fires (Appendix E). A rigorous assessment of demographic trends will not be conducted until all data collection is complete after the 2006 breeding season. Analysis of the effects of wildfire on spotted owl occupancy and productivity will begin in the fall of 2006.

Minimum convex polygon and 95% fixed and adaptive kernel home ranges of owls monitored during this research project have been calculated (Appendix F). The mean 95 % fixed kernel home range size for owls within the fire (n=10) with a suitable sample size was 623 HA (range 256 – 950 HA). While owls outside the fire (n=10) with a suitable sample size had a mean 95% fixed kernel home range size of 573.5 HA (range 126 - 1015 HA). Pairs of owls where each individual was monitored for at least six months, had locations pooled and a pair home range was calculated (Appendix G). Owl pairs inside the fire (n=4) had a mean combined 95% fixed kernel home range of 811 HA (range 453 – 1155), compared to owl pairs outside the fire (n=4) with a mean of 621 HA (range 208 – 845).

At this time there has been no analysis to help explain differences in individual or pair home range sizes. Once fire severity and habitat maps have been created, covariates will be generated to help explain differences in home range size among individual owls. Habitat use analysis will also be conducted to investigate post-fire habitat use.

7. Future Research Plans:

During the fall of 2006 we plan to conduct detailed, site level fire severity and habitat measurements within areas of high and low use for each individual owl. These measurements will then be used to compare high and low use owl habitat within a

burned landscape. These measurements will likely provide insight into features that are important to spotted owls following wildfire.

Analysis of all data collected to this point in time will begin in earnest starting in October 2006. All of the telemetry, survival and demography data will be analyzed to determine the effects of the severity and scale of wildfire on spotted owls. We hope to provide initial results of our data at workshops and conferences beginning in the spring of 2007, with the completion of a thesis in the summer/fall of 2007. Manuscripts will be submitted for publication shortly after the completion of the Masters thesis.

8. Acknowledgements:

Many agencies and personnel have helped contribute to data collection, including: Doug Barret (Wildlife Biologist, Westside Ecological), Tim Burnett (Wildlife Biologist, Private Contractor, Boise Building Solutions/Forest Capitol Resources), Jim Harper (Wildlife Biologist, Butte Falls Resource Area, Medford District BLM), Dave Clayton (Forest Wildlife Biologist, Rogue River and Siskiyou National Forest, USFS), Steve Adams, Laura Friar, Tom Phillips, Denise Strejc (Faculty Research Assistants, Oregon State University, Department of Fisheries and Wildlife) and Amy Price (Volunteer). We would like to thank Frank Wagner (Faculty Research Assistant, Oregon State University, Department of Fisheries and Wildlife) for assistance with field logistics and data collection. Dwayne Price (Oregon State Police) provided air flights for aerial searches of spotted owls. We would also like to thank the Klamath Falls Office of the United States Fish and Wildlife Service for additional support through the purchase of additional radio-transmitters, donation of computers for field work, and loaning additional radio receivers.

Appendix A: Total number of telemetry locations for each owl from September, 2003 - August, 2006

Owl	Breeding	Non-Breeding	Total Locations	Owl Status
Timbered Rock Fire				
Alco Rock Male	80	69	149	Transmitter Failure
Alco Rock Female	82	76	158	Transmitter Failure
Flat Creek Male	74	75	149	Transmitter Failure
Flat Creek Female	85	103	188	Transmitter Removed
Gobblers Knob Male	83	90	173	Transmitter Failure
Gobblers Knob Female	88	84	172	Transmitter Removed
Hawk Creek Male	0	44	44	Emaciation
Hungry Elk Male	74	33	107	Transmitter Removed
Hungry Elk Female	81	59	140	Transmitter Failure
Louis Creek Male	72	92	164	Transmitter Removed
Louis Creek Female	56	91	147	Transmitter Removed
Lower Morine Male	81	38	119	Transmitter Failure
Lower Morine Female	84	43	127	Transmitter Removed
Miller Mountain Male	71	87	158	Predation
Miller Mountain Female	82	92	174	Transmitter Removed
Oliver Springs Male	89	62	151	Transmitter Removed
Oliver Springs Female	34	0	34	Emaciation
South Boundary Male	80	54	134	Predation
South Boundary Female	77	25	102	Unknown Mortality
Timbered Rock Male	30	0	30	Transmitter Functioning
Timbered Rock Female	40	0	40	Transmitter Removed
Upper Timber Male	25	52	77	Emaciation
Upper Timber Female	0	39	39	Emaciation
Quartz Fire				
Glade Creek Male	59	54	113	Emaciation
Yale Creek Male	0	27	27	Emaciation
Yale Creek Female	32	66	98	Transmitter Failure
All Locations	1559	1455	3014	

Appendix B: Timbered Rock Fire spotted owl survey effort post fire

Site Name	Site Number	Landowner	Years Surveyed
Alco Creek	2001	BLM/Private Timber	2003 - 2006
Alco Ridge	4029	BLM/Private Timber	2003 - 2006
Alco Rock	2012	BLM	2003 - 2006
Alco Rock West	2275	BLM	2003 - 2006
Elkhorn Creek	1833	BLM	2003 - 2006
Flat Creek	2011	BLM	2003 - 2006
Flat Creek Divide	2252	BLM	2003 - 2006
Gobblers East	1829	BLM	2003 - 2006
Gobblers Knob	0885	BLM	2003 - 2006
Hawk Creek	1828	USFS/BLM	2003 - 2006
Lower Pelt Creek	3606	USFS	2003 - 2006
Lower Timber Creek	1950	BLM	2003 - 2006
Middle Creek	0056	BLM	2003 - 2006
Miller Mountain	0898	BLM	2003 - 2006
Pelt Creek	1056	USFS	2003 - 2006
Ragsdale	1825	BLM	2003 - 2006
Shell Rock	0884	BLM	2003 - 2006
Timbered Rock	0954	BLM	2003 - 2006
Upper Elkhorn Creek	3113	USFS	2003 - 2006
Upper Pelt Creek	2677	USFS	2003 - 2006
Upper Timber Creek	2057	BLM	2003 - 2006
West Branch Elk Creek	2002	BLM	2003 - 2006

Appendix C: Biscuit Fire spotted owl survey effort post fire

Site Name	Site Number	Landowner	Years Surveyed
East Chief Creek	4318	USFS	2003 - 2006
Days Gulch	F411	USFS	2003 - 2006
Mikes Gulch	F411	USFS	2003 - 2006
North Sixmile Creek	F248	USFS	2003 - 2006
Pine Creek Camp	F315	USFS	2003 - 2006
Red Dog Creek	F066	USFS	2003 - 2006
Silver Falls	F117	USFS	2003 - 2006
Squaw Creek	F152	USFS	2003 - 2006
Sourgrass	3390	BLM	2003 - 2006

Appendix D: Quartz Fire spotted owl survey effort post fire

Site Name	Site Number	Landowner	Years Surveyed
Dutchman South	7005	USFS	2002 - 2006
Garvin Gulch	1877	USFS	2002 - 2006
Glade Creek	3845	USFS	2002 - 2006
Happy Dutch	-----	USFS	2002 - 2006
Hendricks Creek	7000	Private Timber	2002 - 2006
Lick Gulch	1876	BLM	2002 - 2006
New Site	-----	USFS	2002 - 2006
Quartz Gulch	0957	BLM	2002 - 2006
Woodpecker Springs	0627	USFS	2002 - 2006
Yale Creek	2713	USFS	2002 - 2003, 2005 - 2006

Appendix E: Summary of post-fire demographic surveys for 2002-2006 breeding seasons in the Quartz, Timbered Rock and Biscuit Fires

Quartz Fire

Year	Number of Sites Surveyed	Number of Sites Occupied	Number of Breeding Pairs	Number of Successful Pairs	Number of Young Per Occupied Site
2002	9	6	0	0	0.00
2003	9	5	2	2	0.40
2004	9	5	4	3	0.60
2005	9	3	2	1	0.33
2006	9	3	1	1	0.33

Biscuit Fire

Year	Number of Sites Surveyed	Number of Sites Occupied	Number of Breeding Pairs	Number of Successful Pairs	Number of Young Per Occupied Site
2003	8	4	0	0	0.00
2004	9	4	4	4	1.75
2005	9	5	2	2	0.60
2006	9	4	0	0	0.00

Timbered Rock Fire

Year	Number of Sites Surveyed	Number of Sites Occupied	Number of Breeding Pairs	Number of Successful Pairs	Number of Young Per Occupied Site
2003	22	12	2	1	0.08
2004	22	10	2	1	0.10
2005	22	8	1	1	0.25
2006	22	7	0	0	0.00

Appendix F: Cummulative Home Range Sizes For Individual Radio-tagged Owls

Owl	Inside Fire	No. of Locations	Home Range Calculation Method: 95% Fixed Kernel (HA)	95% Adaptive Kernel (HA)	100% Minimum Convex Polygon
Timbered Rock Fire					
Alco Rock Female	Yes	158	355	NA[D]	5546
Alco Rock Male	Yes	149	354	642	1202
Flat Creek Female	Yes	188	256	478	842
Flat Creek Male	Yes	149	597	1009	1447
Gobblers Knob Female	Yes	172	883	1091	1316
Gobblers Knob Male	Yes	173	950	1265	1487
Hawk Creek Male[A]	Yes	44	1692	2481	6666
Hungry Elk Female	No	140	584	828	1642
Hungry Elk Male	No	107	781	1042	970
Louis Creek Female	No	147	126	228	732
Louis Creek Male	No	164	142	282	1309
Lower Morine Female	No	127	792	1076	1137
Lower Morine Male	No	119	1015	1433	2211
Miller Mountain Female	Yes	174	835	1094	1910
Miller Mountain Male	Yes	158	820	1290	1784
Oliver Springs Female[B]	No	34	44	70	33
Oliver Springs Male	No	151	580	771	856
South Boundary Female	No	102	497	650	1597
South Boundary Male	No	134	914	1486	2510
Timbered Rock Male[C]	Yes	30	755	908	493
Timbered Rock Female[C]	Yes	40	362	465	588
Upper Timber Male	Yes	77	682	793	627
Upper Timber Female[A]	Yes	39	520	618	401
Quartz Fire					
Glade Creek Male	Yes	113	498	637	941
Yale Creek Female	No	98	304	432	778
Yale Creek Male[B]	No	27	358	530	341

A - Only a limited number of non-breeding locations obtained before owl died (Hawk Creek Male was likely dispersing)

B - Only a limited number of breeding locations obtained before owl died (Oliver Springs Female was nesting)

C - Only monitored during the 2006 breeding season

D - Program KernelHR would not calculate an adaptive kernel home range estimate for this owl

Appendix G: Combined Home Range Size For Pairs of Owls

			Home Range Calculation Method		
Owl Pair	**Inside Fire**	**No. of Locations**	**95% Fixed Kernel (HA)**	**95% Adaptive Kernel (HA)**	**100% Minimum Convex Polygon (HA)**
Alco Rock	Yes	307	651	1970	5775
Flat Creek	Yes	337	453	639	1504
Gobblers Knob	Yes	345	1155	1437	2210
Hungy Elk	No	247	640	929	2064
Louis Creek	No	311	208	415	1309
Lower Morine	No	246	845	1203	2567
Miller Mountain	Yes	332	986	1312	2640
South Boundary	No	236	790	1104	2695