Fire Risk and History of Spotted Owl Habitat in Oregon

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21ST OF NOVEMBER, 2014

Abstract

The threatened northern spotted owl (*Strix occidentalis caurina*) inhabit diverse areas with multiple layers of canopy, downed woody debris, and snags which can act as fuel ladders and has caused fire severity to increase. We performed spatial analysis to determine how much of the spotted owl critical habitat in western Oregon has been burned and the fire risk associated with the habitat. We quantified the area of spotted owl habitat burned in the last 10 years by fires 300 acres or larger using ArcMap tools including field calculator and buffer and found that 251 square miles of spotted owl habitat has been burned. We also used extract by mass and field calculator to determine how much of the spotted owl habitat is affected by each behavior fuel model. FBFM 5 results in 1,777 square miles at risk. FBFM 8 consists of 2,598 square miles at risk. And FBFM 10 consists of 1338 square miles at risk. We recommend extended protection of the critical northern spotted owl habitat in Oregon. We would also suggest that fire risk types FBFM 5, 8, 10 be carefully watched and display warnings to the public of fire risk during the dry season.

Introduction

The northern spotted owl (*Strix occidentalis caurina*) is a threatened subspecies inhabiting Washington, Oregon, and northern California (USFWS 2014). These owls nest in old growth forests (Ripple et al. 1997) that are structurally diverse with multiple layers of canopy, downed woody debris, and snags (Hershey et al. 1998, North et al. 1999). The multiple layers of canopy and fuel buildup can act as fuel ladders and has caused fire severity to increase (Wright and Agee 2004). Fire along with other factors are threatening spotted owl habitat, especially in drier areas (Davis and Lint 2005). Though fires do produce hollowed trees, a favored nest site of spotted owls (Forsman et al. 1984), occupancy of spotted owls declines after a fire (Clark et al. 2013). Since fire is such a threat to spotted owls, we performed spatial analysis to determine how much of the spotted owl critical habitat in western Oregon, shown below, has been burned and the fire risk associated with the habitat.

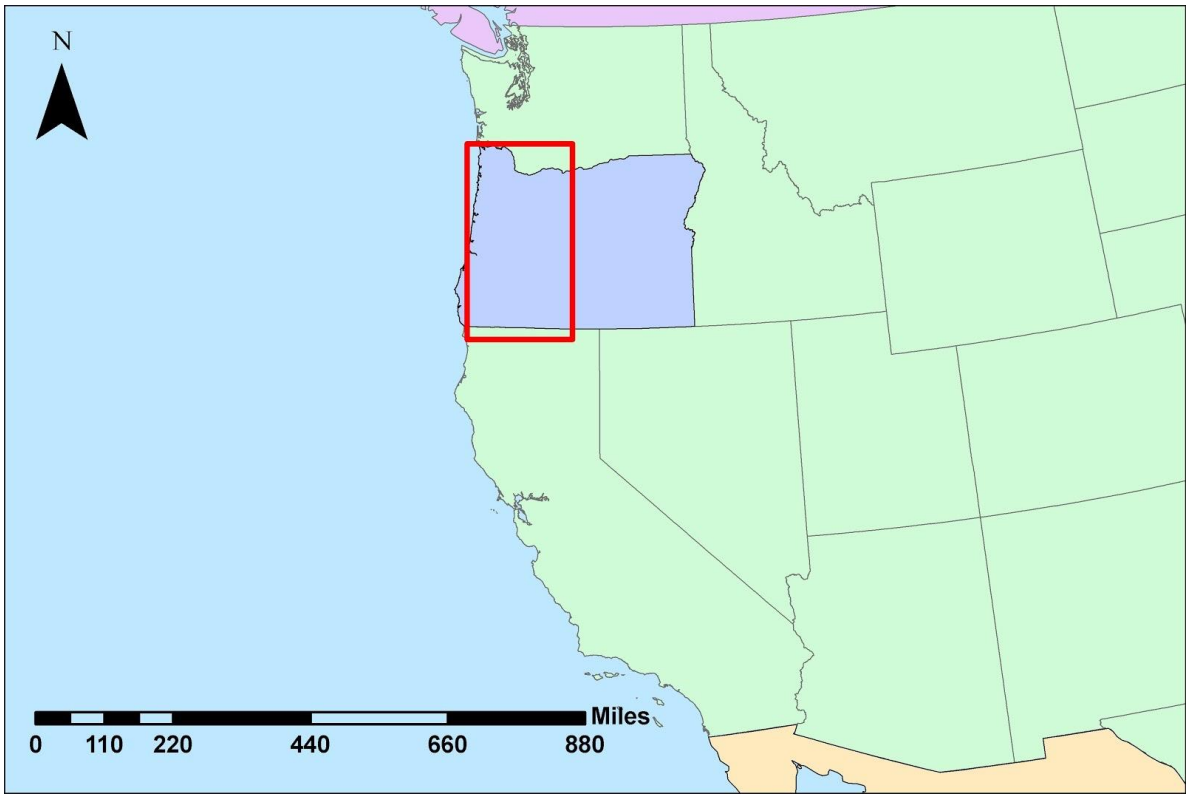

Figure 1. Map showing the location of critical spotted owl habitat in Oregon.

Methods

The data we acquired to complete this project were downloaded through various means. We acquired this data from the Fish and Wildlife Service website (http://www.fws.gov), the state of Oregon (http://www.oregon.gov), the GIS Data Depot (http://data.geocomm.com), Natural Earth (www.naturalearth.com) and through ArcGIS (http://www.arcgis.com). Once we downloaded the data we created a Quality Assurance/Quality Control form to ensure that it was viable data to use and then projected the data into ArcMap 10.1, Esri Inc., in North American Datum 1983 Oregon Statewide Lambert Feet Intl.

To analyze the data we had to go through many steps as it was necessary to prepare the different layers so that they were representative of the locations we wanted to focus on. We began by clipping our spotted owl habitat data to the state of Oregon so that we could calculate the total area of the habitat that lies solely within the state. To determine the area, we created a new attribute field and then calculated the area in square feet. Then, we tailored our layer for past fires by manipulating the attribute table. We elected to include fires that occurred from 2001-2011 that were greater than or equal to 300 acres (size classes E-G). After selecting these specific fires, we created two new attribute fields, area in square feet and radius, and used the field calculator to determine the values of each. This was necessary due to the fact that our past fires layer was point data and not polygons. Using our new attribute fields we were able to buffer each point, with the radius as our distance, to create a new layer that showed the actual area that was burned by past fire throughout Oregon. We clipped this layer to the spotted owl habitat, to see where the overlap was, then created a new attribute and calculated the area of the overlap.

Our last layer was created by clipping the fire risk data we had acquired to the spotted owl habitat. Because the fire risk layer was raster data and the spotted owl habitat was vector data, it was necessary to extract by mask to create a layer that showed us solely the fire risk of specific types of fires within the spotted owl habitat (see Table 1). Using this layer we were able to use the field calculator to covert the pixels within each fire risk to an area that we could utilize. This was done by first creating a new field and converting the pixels into square feet represented. Then, we converted the square feet into square miles to provide us with the area that was threatened by each type of fire.

Results

Oregon State accounts for approximately 98,379 square miles of land. Of those 98,379 square miles, 7,121 square miles are considered critical habitat for the endangered northern spotted owl. For this research, we looked at past fires in Oregon from the last 10 years. We also only selected fires that were 300 acres or larger. The total area of land that has been burned that meet these two criteria is 3,300 square miles. Of that area, about 251 square miles was critical habitat for the northern spotted owl.

In regards to fire risk, Table 1 below shows the fire behavior fuel model (FBFM) of the 13 different types of fire risk areas in Oregon and describes each type as well as lists the amount of land for each type at risk for fire in northern spotted owl habitat. The three largest models for fire behavior are FBFM 5 (low intensity fires of green shrubs), FBFM 8 (slow ground fires fueled by needles and leaves), and FBFM 10 (more intense surface and ground fires with frequent crowning and spotting). FBFM 5 results in 1,777 square miles at risk. FBFM 8 consists of 2,598 square miles at risk. And FBFM 10 consists of 1338 square miles at risk. For this report, it should be known that FBFM 0 is assumed to be a non-burnable fuel. Description data for this fuel model could not be found within the metadata provided with the data set. Because of this it was necessary for us to contact the originator of the data, Jim Wolf, who provided us with additional data that still did not answer our question. Although Jim was unsure he suspected that FBFM 0 represented non-burnable fuel.

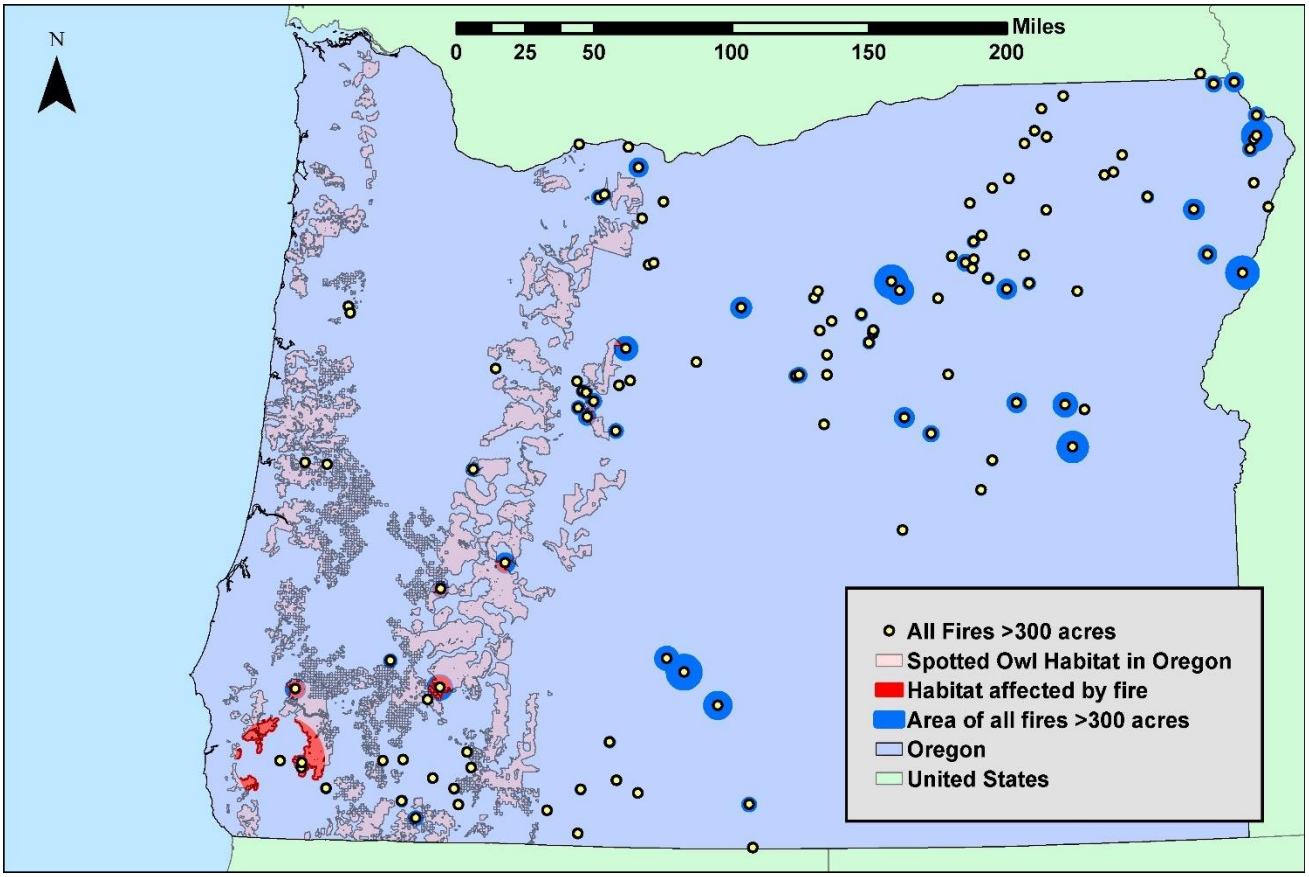

Figure 2. Critical spotted owl habitat and its associated fire history compared to all past fires in Oregon (>300 acres).

Table 1. This table shows the different Fire Behavior Fuel Models for fire risk, what each one represents and the associated amount of northern spotted owl critical habitat at risk

Fire Behavior Fuel Model (FBFM)	Definition	Total area of land (in square miles)
0	Assumed to be “non-burnable” fuel	n/a
1	Surface fires that burn fine herbaceous fuels, cured and curing fuels, little shrub or timber present, primarily grasslands and savanna	108
2	Burns fine, herbaceous fuels, stand is curing or dead, may produce fire brands on oak or pine stands	7
4	Fast spreading fire, continuous overstory, flammable foliage and dead woody material, deep litter layer can inhibit suppression	50
5	Low intensity fires, young, green shrubs with little dead material, fuels consist of litter from understory	1777
6	Broad range of shrubs, fire requires moderate winds to maintain flame at shrub height, or will drop to the ground with low winds	605
8	Slow, ground burning fires, closed canopy stands with short needle conifers or hardwoods, litter consist mainly of needles and leaves, with little undergrowth, occasional flares with concentrated fuels	2598
9	Longer flames, quicker surface fires, closed canopy stands of long-needles or hardwoods, rolling leaves in fall can cause spotting, dead-down material can cause occasional crowning	607
10	Surface and ground fire more intense, dead-down fuels more abundant, frequent crowning and spotting causing fire control to be more difficult	1338
11	Fairly active fire, fuels consist of slash and herbaceous materials, slash originates from light partial cuts or thinning projects, fire is limited by spacing of fuel load and shade from overstory	15
50	Residential	1
97	Ice or snow	<1
98	Open water	8
99	Bare rock	6

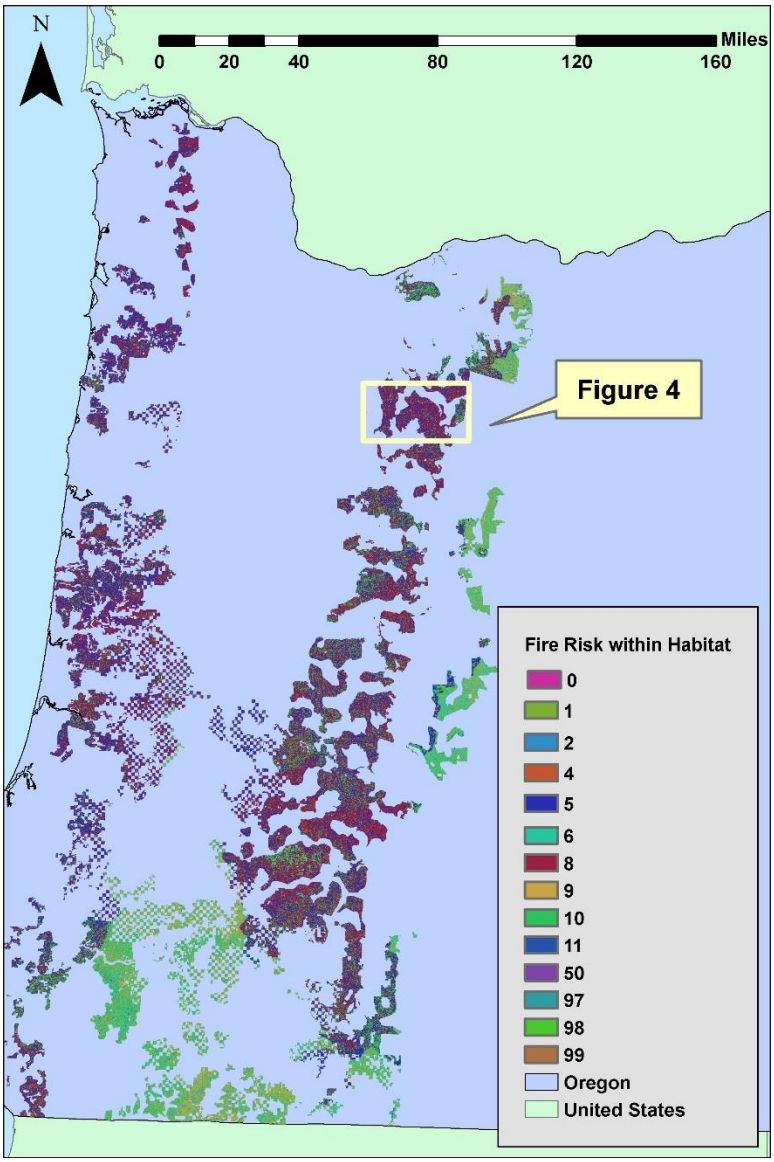

Figure 3. Critical spotted owl habitat and its associated fire risk.

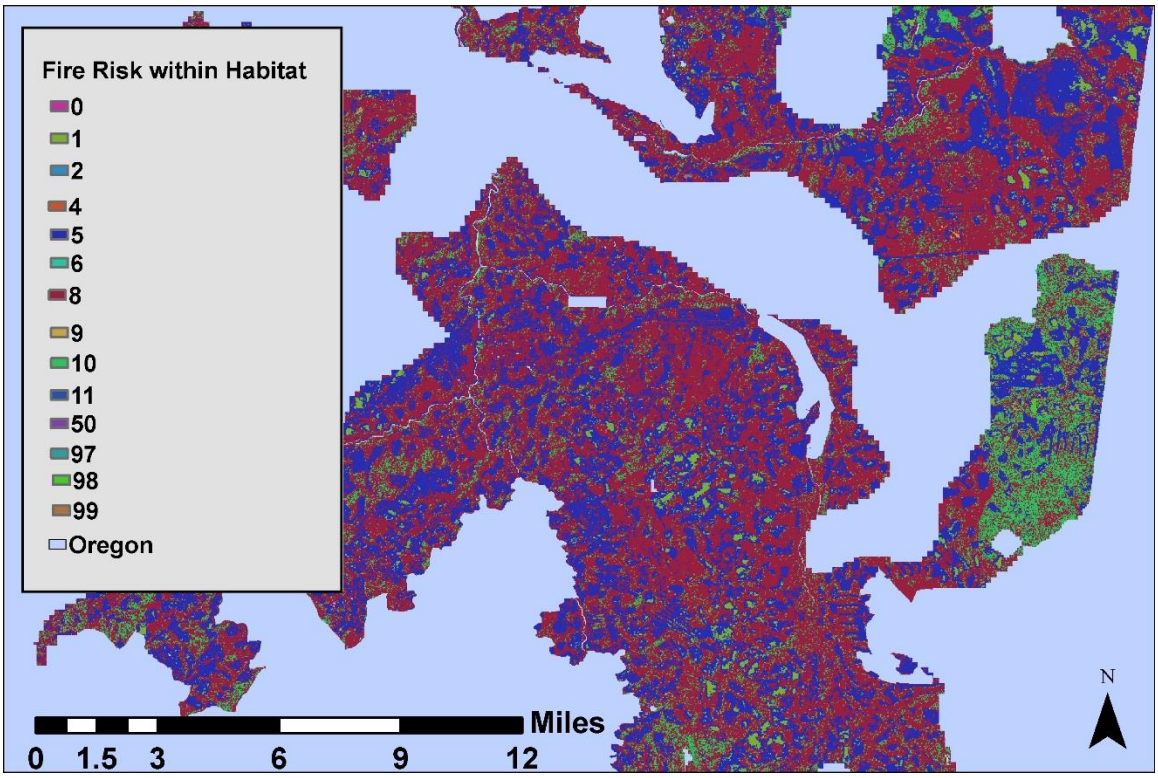

Figure 4. Close up view of critical spotted owl habitat and its associated fire risk.

Conclusion

This report assesses the amount of northern spotted owl habitat that has been burned by fires larger than 300 acres in the past 10 years. It also shows the future potential fire risk areas in northern spotted owl habitat. In the last 10 years, about 251 square miles of the 7,121 square miles of critical owl habitat has been burned. This means 28% of northern spotted owl habitat in Oregon has been burned in 10 years. FBFM 5, 8, and 10 are the largest areas at risk, which equals 5,713 or about 80% of all critical habitat.

After analyzing this data, we recommend extended protection of the critical northern spotted owl habitat in Oregon. The US Forest Service as well as local agencies may want to consider building fire lines or fire buffers around all critical habitat. We would also suggest that fire risk types FBFM 5, 8, 10 be carefully watched and display warnings to the public of fire risk during the dry season. We would also recommend that forest agencies consult ecologists, fire experts, and zoologists in order to study the effects of fire suppression in this area.

Acknowledgements

Data for this study was provided by the Fish and Wildlife Service, Oregon's Department of Forestry, GIS Data Depot, Natural Earth and through ArcGIS. The computers and labs provided to acquire and analyze the data was provided through Humboldt State University.

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