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Northern Spotted Owl(Strix occidentalis caurina) Critical Habitat in California Burned from 2012-2016

Abstract

We visually represented the critical habitat of Northern Spotted Owls affected by fires in Northern California. The "Northern" Spotted Owl (*Strix occidentalis caurina*) (NSO) has critical habitat designated under the Endangered Species Act based on a strong association with forests that have structural complexity with a variety of canopy levels, and understory vegetation diversity. We acquired our data form the CA GIS data portal, the Cal-Fire Fire and Resource Assessment Program GIS portal, and the USFWS ECOS NSO data portal. Between 2012-2016 12% of NSO critical habitat in Northern CA was burned. Therefore, wildfire may have an impact on the quality and quantity of habitat available to the NSO. Many studies exist on how wildfires affect the California Spotted Owl (*Strix occidentalis occidentalis*) and have found that this subspecies can respond positively depending on the severity of the fire. More research is needed to see how the Northern Spotted Owl responds.

Introduction

The "Northern" Spotted Owl (*Strix occidentalis caurina*)(NSO) is currently listed as threatened under the Endangered Species Act (USFWS 1990). It inhabits old-growth conifer forest from Southern British Columbia to Northern California and has a strong association with forests that have structural complexity with a variety of canopy levels, and understory vegetation diversity (Spotted Owl Life History, 2017 and Franklin et al., 2000). The effect of wildfires on (NSO) site fidelity, breeding success, and survival is still under scrutiny. Some studies found that wildfires do not appear to significantly decrease the breeding success, survival and return rate if the fire is low severity and does not affect the entire spotted owl home range (Bond et al. 2002), while others have found high severity fires that affected a large portion of a NSO's home range decreased NSO occurrence and reproductive success (Gaines et al. 1995).

This analysis goal is to map all critical habitat in Northern California affected by fire from the year 2012 to 2016 in order to assess the potential effects on the NSO. We will visually represent all the areas under this critical habitat classification in Northern California that have been affected by wildfires using the USFWS GIS data files of the NSO critical habitat and historical GIS fire profile maps from the Cal-Fire Fire and Resource Assessment Program.

Methods

We acquired our data form the CA GIS data porta <https://data.ca.gov/dataset/ca-geographic-boundaries/resource/091ff50d-bb24-4537-a974-2ce89c6e8663>, the Cal-Fire Fire and Resource Assessment Program GIS portal <http://frap.fire.ca.gov/data/frapgisdata-sw-fireperimeters_download>, and the USFWS ECOS NSO data portal <https://ecos.fws.gov/ecp/report/table/critical-habitat.html>. First we connected our three files to ArcMap version 10.5.1 and projected them into NAD 1983 California Teale Albers. After this, we selected the counties in northern CA and exported the data to create a new layer. Next, we

clipped NSO critical habitat to the Northern California Counties layer. Then we searched by attribute to find all fires from 2012 to 2016, and exported data to create a new layer. Fires were then clipped from 2012-2016 to Northern California and intersected fire perimeters with critical habitat to create layer "burned critical habitat." Finally, we display all three layers (Layer 1 = the area in NSO critical habitat burned from 2012-2016. Layer 2 = Unburned NSO critical habitat. Layer 3 = areas burned outside NSO critical habitat from 2012-2016).

Results

Between 2012-2016 12% of NSO critical habitat in Northern CA was burned. Most of the critical habitat of the Northern Spotted Owl (*Strix occidentalis caurina*) in Northern California burned from 2012-2016 was in Trinity and Siskiyou counties. Both counties are inland and have a high percentage of critical habitat compared to coastal counties.

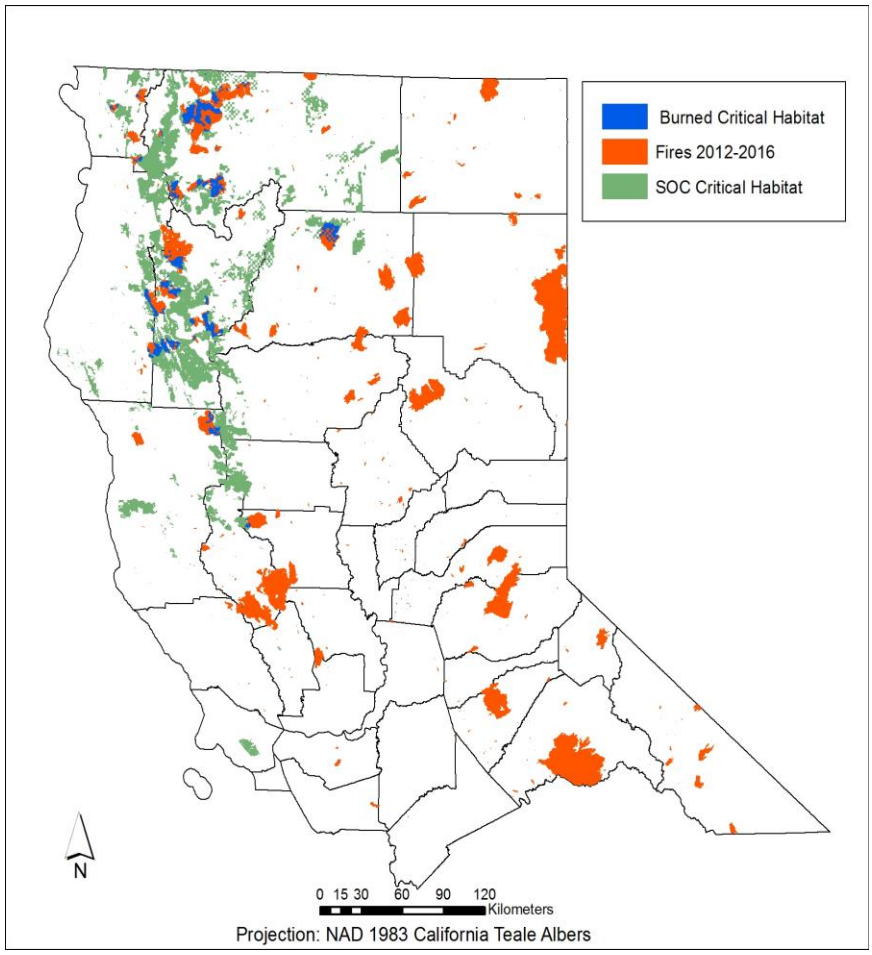

Figure 1. Map representing the critical habitat of Northern Spotted Owl (*Strix occidentalis caurina*) burned in Northern California between 2012-2016, the unburned critical habitat, and fires outside critical habitat from 2012-2016.

Discussion

Approximately 12% of critical habitat burned down in 5 years. With projected increase in frequency and severity of wildfires resulting from global warming, the rate at which NSO critical habitat burns is likely to accelerate.This level of prevalence warrants further study on the effects of fire on the quality of habitat for northern spotted owls. Future analysis should also consider the severity of the fires in areas designated NSO critical habitat. One study in the Sierra Nevada mountain range found that California Spotted Owl's (*Strix occidentalis occidentalis*) site occupancy did not significantly change after a low to moderate fire, and suggests that low to moderate severity fires help increase habitat characteristics crucial for California Spotted Owl site occupancy (Roberts et al. 2011). Another study found that most owls foraged in high-severity burned forest more than in all other burn categories, while they seemed to select low to moderate severity burned areas for roosting and nesting (Bond et al. 2009). Fire with varied severity can be beneficial for California Spotted Owls, but more research is still needed for Northern Spotted Owls.

Conclusion

It is well known knowledge that the endangered Northern Spotted Owl (NSO) inhabits structurally complex old growth forest in Northern california. The effects of how much fire effects NSO site fidelity, breeding success, and foraging success still needs to be studied, but we do know that designated critical habitat of NSO is being burned by wildfires. During this project we visually represented forests that burned, critical habitat of NSO that burned, and critical habitat of NSO that did not burn in Northern California from 2012-2016. We found that around 12 percent of NSO habitat burned from 2012-2016 in Northern California (see fig. 1). To perform this analysis we used ArcMap version 10.5.1 and used three data lays including U.S Fish and Wildlife critical habitats, fire parameters from CAL FIRE, and California County Boundaries.

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References

Bond, M. L., R. J. Gutiérrez, A. B. Franklin, W. S. LaHaye, C. A. May and M. E. Seamans. 2002. Short-term effects of wildfires on spotted owl survival, site fidelity, mate fidelity, and reproductive success. Wildlife Society Bulletin 30:1022-1028.

Bond, M. L., D. E. Lee, R. B. Siegel, and J.P. Ward. 2009. Habitat use and selection by california spotted owls in a postfire landscape. Journal of Wildlife Management 73:1116-1124.

Franklin, A. B., D. R. Anderson, R. J. Gutierrez, and K. P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern california. Ecological Society of America 70:539-590.

Gaines, W. L., R. A. Strand, and S. D. Piper. 1995. Effects of the hatchery complex fires on northern spotted owls in eastern washington cascades, Fire effects on rare and endangered species habitats conference Coeur d'Alene, Idaho, USA.

Roberts, S. L., J. W. Van Wagtendonk, K. A. Miles, and D. A. Kelt. 2011. Effects of fire on spotted owl site occupancy in a late-successional forest. Biological Conservation 144:610-619.

The Cornell Lab of Ornithology [Cornell University]. 2017. Spotted Owl Life History. <https://www.allaboutbirds.org/guide/Spotted_Owl/lifehistory>. Accessed 23 March 2018.

U.S. Fish and Wildlife Service [USFWS]. 1990. Environmental Conservation ONline System. Species Profile for Northern Spotted Owl. <https://ecos.fws.gov/ecp0/profile/speciesProfile? spcode=B08B>. Accessed 23 March 2018.