

Northern Spotted Owl and Barred Owl Population Dynamics



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Abstract

Populations of the *Strix occidentalis caurina* ('northern spotted owl' or 'owl') have been in precipitous decline over the past several decades (USFWS, 2011). Despite ongoing government intervention and attempt to arrest the decline, populations of the northern spotted owl have yet to stabilize, much less recover. In 2011, the United States Fish and Wildlife Service began implementation of a newly revised recovery plan which identifies ongoing threats to the owl's recovery, among them being the increasingly invasive presence of *Strix varia* ('barred owl'), a non-native and territorial bird (USFWS, 2011). This study spatially analyzes the current extent of the barred owl invasion in an effort to gain insight into the dynamic relationship that exists between it and the efforts to conserve northern spotted owl habitat within California.

Introduction

The habitat range of the northern spotted owl is comprised of structurally complex Pacific Northwestern forest and stretches from Northern California to British Columbia.¹ This study focuses on the Northern California area of the owl's range and identifies locations of critical barred owl invasion. Critical invasion is understood to mean those habitat areas in which the northern spotted owl concentrates nesting and roosting behavior and have been designated as 'activity centers.'² Population trends of northern spotted owl began to be observed closely beginning in 1973.³ Since that time many agencies and private entities have made it their business to keep track of the location and welfare of the owl in order to best ensure the survival of the species. The northern spotted owl is now perilously close to extinction due to ongoing habitat loss associated with timber harvest, fire and barred owl invasion,⁴ despite unprecedented efforts to protect the species.⁵ At present, the population status of the northern spotted owl is monitored and recorded in an online California Natural Diversity Database ('CNDDDB') geospatial database maintained by the California Department of Fish and Wildlife ('CDFW'). The database is specifically tailored to inform the policy decisions of both private and public entities as they relate to the welfare of the owl. Included in the northern spotted owl database are the current activity center locations as well as observed locations of the peripheral activity associated with those sites. Also included in the database at the locations of observed barred owl activity. Land managers of all types routinely report their field observations and survey findings in an ongoing effort to keep the database metadata current.⁶

The following study applies the data made available through the CNDDDB toward an analysis of the dynamic relationship between the barred owl's territorial expansion and the northern spotted owl's critical habitat range in California. The analysis consists of projecting the data into a chronological sequence of maps in order to represent the relational change in habitat between the two populations over time. Next, the analysis is used as a model to extrapolate future habitat relationship patterns between the two owl species.

¹ See USFWS, 2011

² *Ibid.*

³ *Ibid.*

⁴ *Ibid.*

⁵ See Zielinski, 2012

⁶ See USFWS, 2012



Figure 1. *North American habitat range of northern spotted and barred owls (Referenced from: Monahan & Hijmans, 2007, p. 57).*

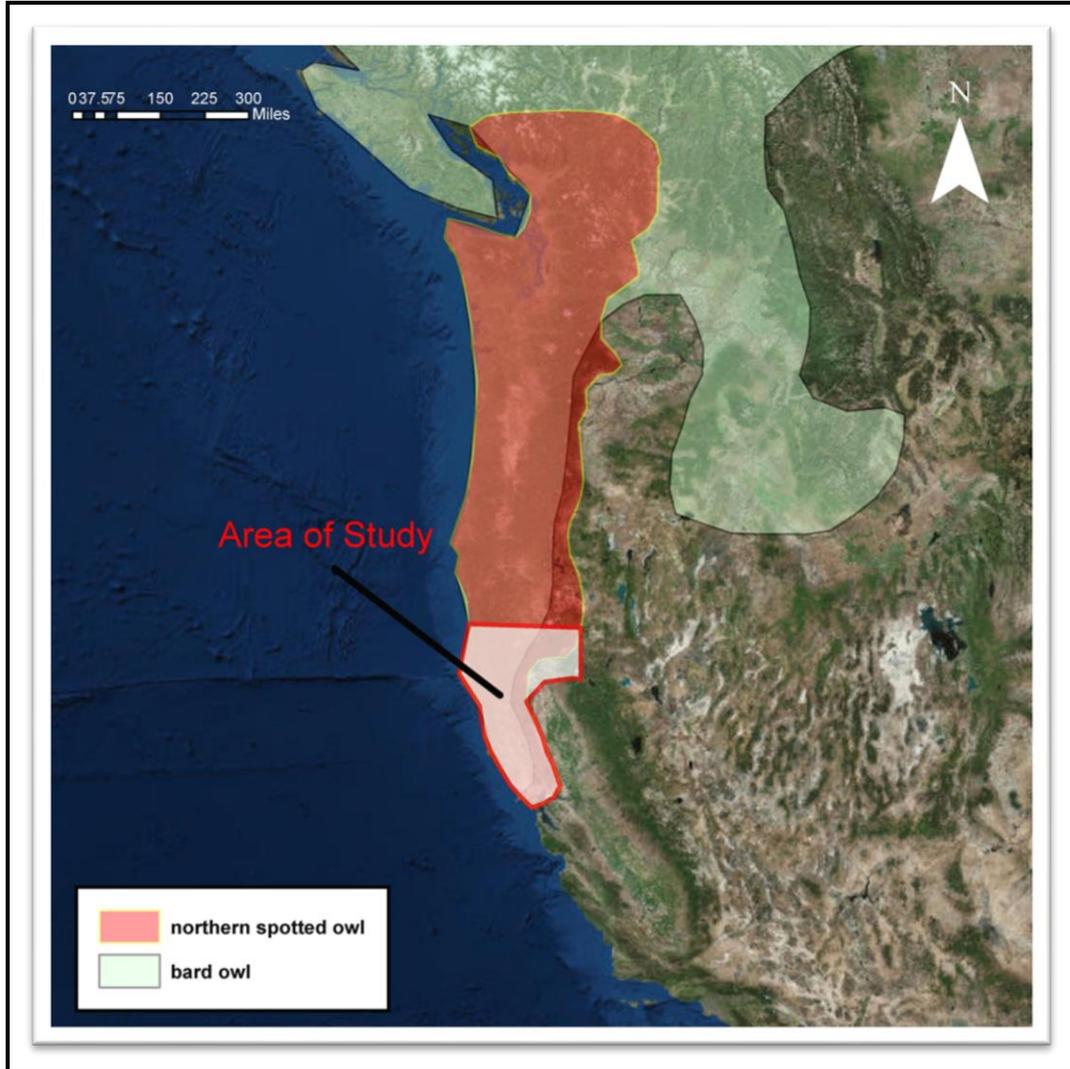


Figure 2. Area of study: California habitat range of northern spotted and barred owls.

Methods

Obtaining access to the database was at first a significant obstacle in pursuit of our project goals. Upon contacting the manager of the northern spotted owl database⁷ it became clear that access was a thing closely guarded out of concern for the owl's welfare.⁸ Both members of our group pledged that we would not disseminate the data to a third party nor harm the birds ourselves. Following receipt of the data we completed a QAQC assessment form,⁹ established an appropriate project file structure and then began our analysis.

At first, we projected the barred owl dataset from WGS 84 into the same coordinate system that the northern spotted owl dataset was defined: NAD 83. Next, we selected northern spotted owl activity centers and established a .7 mi¹⁰ radius buffer around each to indicate areas most sensitive to invasion by barred owl territorial expansion. Following this, we selected all observations of barred owl by location within the northern spotted owl buffered areas by time period, beginning with the year 1978 and ending in the present.¹¹ To do generate these time periods we used a Boolean operation to separate the data into desired year sets. Finally, we created layers of each time period to prepare for interpretation.

Results

Analysis of the data indicates that barred owl invasion of northern spotted owl critical habitat areas has substantially increased over the time period analyzed, culminating in a much more expansive population at present than had existed only a few decades ago. Specifically, while during the 1978-1990 period there were no observed invasions of critical northern spotted owl habitat,¹² invasions began during the 1990-1998 period in which there were 139 observations of barred owls invading northern spotted owl critical habitat areas (13% of northern spotted owl activity centers and 32% of total barred owl observations during that period). During the following period, 1998-2006,

⁷ At the California Department of Fish and Wildlife

⁸ Poaching is a real threat to the welfare and survival of the northern spotted owl survival (Whitney, 2014).

⁹ See Appendix, Item 1.

¹⁰ Dan Henson, a wildlife biologist who contributed to the USFWS the Recovery Plan published in 2011, provided our project with this recommendation.

¹¹ Dan Henson, the wildlife biologist, also provided our project with the recommended time periods of 1978-1990, 1990-1998, 1998-2006, and 2006-present.

¹² Although there did exist a barred owl presence in the northern spotted owl California range in the early years, none seem to have invaded any of the observed northern spotted owl activity centers.

284 barred owl invasions were observed within northern spotted owl critical habitat areas (40% of northern spotted owl activity centers and 36% of all barred owl invasions). A total of 395 barred owl observations out of the 1053 were subsequently observed invading northern spotted owl critical habitat areas in the final period, 2006-present (38% of northern spotted owl activity centers and 31% of all barred owl observations).

It is interesting to note that the analysis results vary from one time period to the next in terms of total northern spotted owl activity centers recorded. For instance, although the 1978-1990 period yielded only 293 critical habitat areas, the 1990-1998 period yielded 1,060 such habitat areas, the 98-06 period yielded 702 such habitat areas, and the final 2006-present period yielded 1,053 such habitat areas.

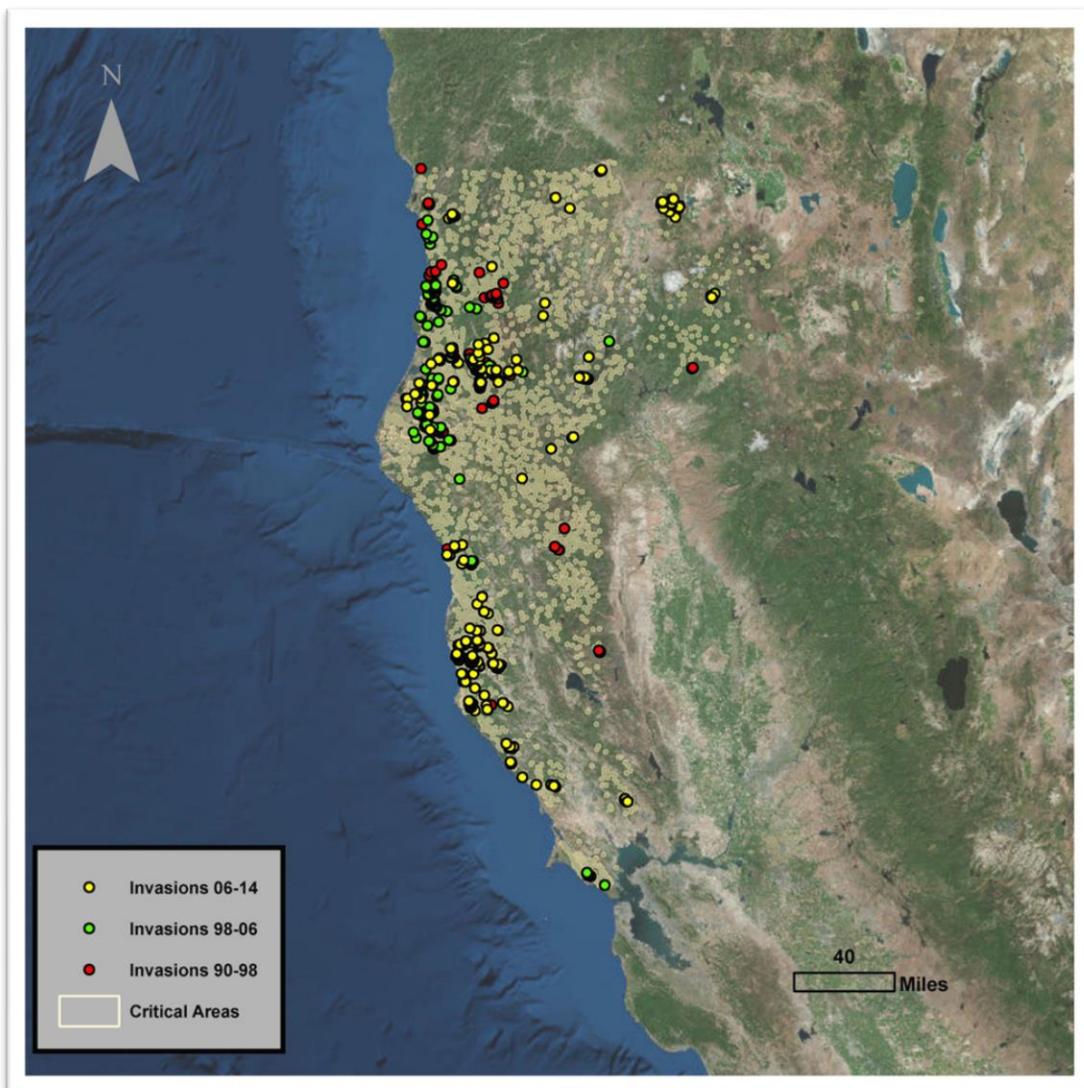


Figure 3. *Critical northern spotted owl habitat areas as encroached upon by barred owl throughout the California range over the past several decades.*

Discussion

Data analysis shows that barred owl invasion into northern spotted owl critical habitat areas has been increasing over time. Consideration of this trend provides insight into current and future management of the northern spotted owl. As the Revised Recovery Plan is implemented it will behoove land managers to consider the stress placed upon the northern spotted owl by barred owl encroachment.

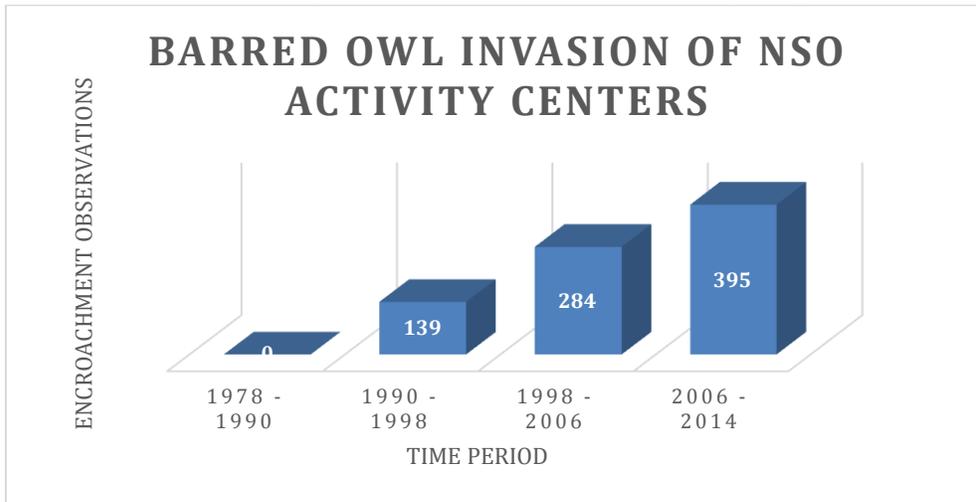
Error may have occurred as a consequence of sampling bias resulting in an incomplete record of northern spotted owl critical habitat areas in relation to barred owl encroachment throughout the California range. Surveying and observations are more likely to have occurred in relation both to locations that were easier to access via roads as well as the increased attention given to a certain area due to research being conducted there. Clearly the northern spotted owl population is not fluctuating so dramatically as to gain and lose hundreds of nesting areas between time periods. Therefore, sampling bias may have led to inaccurate population density records; skewing the apparent impacts of barred owl invasion generally.

Conclusion

The recovery plan as it is currently being implemented by USFWS will need to account for an increasingly profound impact of barred owl upon critical territory of the northern spotted owl in the present and near future. In light of this analysis we recommend the USFWS and CDFW will have to amend their long-term recovery plan for the northern spotted owl or at least take further consideration the relationship of the two species. This means that these agencies will have to take precautionary approaches to leasing out state and federal land for logging and recreational purposes that might encroach on the northern spotted owls' native habitat.

Our analysis confirms that USFWS literature of northern spotted owl populations are declining while barred owl populations are increasing. Based on the science in the literature and our analysis, there is an increase of barred owl encroachment on northern spotted owl activity centers which poses a challenge to the USFWS plan. Our science shows that northern spotted owl and barred owl conflicts are increasing and cannot be good for the prospect of the northern spotted owl. This information is shown on Table 1.

Table 1 Shows the rise of barred owl invasions chronologically.



Acknowledgements

We would like to thank CDFW and Kate Whitney for entrusting us with the data required for endeavoring on this project, Dan Henson for his expertise, Dr. Jeff Dunk for his helpful advice during the research phase of the project, as well as Dr. James Graham for helping us get through the tough patches.

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Appendix

Item 1.

Quality Assurance / Quality Control
Dataset Assessment Form

General Dataset Information

Dataset/File Name: Spotted_Owl_Observations.shp
Source/Author: California Department of Fish and Wildlife

Relative Geographic Extent: Northern California Date of Creation: 2014
Collection/Creation Method: Observations, Surveying, GPS Date of Download: 2014
Contact Information: Kate Whitney (CDFW)

Review Information

Spatial Data Type: Point File Format: Shapefile
Current Spatial Reference: NAD_1983_California_Teale_Albers
If *incorrect* or *missing*, what should the Spatial Reference be?: NAD_1983_California_Teale_Albers
Visual inspection results/ major problems/ red flags: No issues. Data is good.

Raster-Specific

Resolution of the dataset (cell size and linear unit): N/A

Notes/Comments

Project is in NAD_1983. Good.

Reviewer Information

Name: Evan Johnson and Adam Bucher Date reviewed: 12/7/2014
Email: akb424@gmail.com, ejohnson@humboldt.edu

Quality Assurance / Quality Control
Dataset Assessment Form

General Dataset Information

Dataset/File Name: ds8_wm
Source/Author: California Department of Fish and Wildlife

Relative Geographic Extent: Northern California Date of Creation: 2014
Collection/Creation Method: Observations, Surveying, GPS Date of Download: 10/2014
Contact Information: Kate Whitney (CDFW)

Review Information

Spatial Data Type: Point File Format: .gdb
Current Spatial Reference: WGS_1984_Web_Mercator_Auxiliary_Sphere
If *incorrect* or *missing*, what should the Spatial Reference be?: NAD_1983_California_Teale_Albers
Visual inspection results/ major problems/ red flags: The data needs to be referenced in NAD_1983_California_Teale_Albers

Raster-Specific

Resolution of the dataset (cell size and linear unit): N/A

Notes/Comments

Data needs to be projected into NAD_1983_California_Teale_Albers.

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