Marbled Murrelet Habitat Analysis on the Oregon Coast

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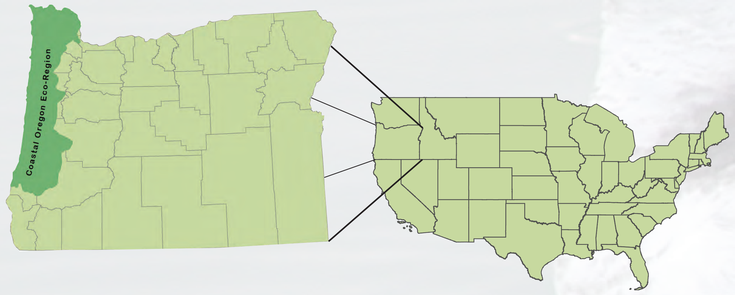
Introduction

The Marbled murrelet is a seabird/shorebird species whose geographic range spans the entirety of the Pacific Rim. It is listed as an endangered species by the International Union for Conservation and has been recognized as an endangered species by the United States and Canada since the early 1990's. What makes this specific species of interest from an ecology or conservation lens is its close relationship to old growth forests. It wasnt until 1974 that scientists actually determined that the marbled murrelet nest up in the canopy of large conifer forests. Further research then showed that they only are able to nest about 30 to 50 km inland, and rarely 900m above sea level (Mather et al.) The Pacific Northwest offers some of the few remaining patches of old growth coniferous forest and due to past and present anthropogenic effects is almost entirely eliminated. When nesting the Marbled murrelet prefers large patches of moss in the canopy of the forest. The Douglas fir (Pseudotsuga menziesii) and other fir, hemlock, and cedar species are some of the only trees capable of supporting large moss pads on their branches for the murrelet to nest in. With a constant loss of these large multi-story old growth forests it is possible that the Marbled murrelet will soon be unable to continue to nest and reproduce here in the Pacific northwest. The goal of this research is to identify critical habitat areas along the Oregon coast and identify areas that have a relationship with old growth forests. We gathered habitat data from the fish and wildlife service, forest cover data from the Regional Ecosystem Office, and the watershed data from the USGS. With this date we hypothesize that there will be a larger percentage of old growth forest than any other class type of forest in the areas of habitat. We will also looking at some of the compounding effects on habitat like distance from urbanized areas.

Study Area



We chose to analyze the Oregon coast eco-region because of the availability and abundance of data, as well as our familiarity with the region and knowledge of some of the ecosystems involved in this research. Due to large amounts of logging and this regions ability to quickly undergo the processes of succession. The coast offers a wide variety of forest types ranging from small single story conifer forests which would be your typical growth after an area has been cut up to old and Large multistory which are characteristics of old growth.

Methods

To create a better unit of analysis we merged habitat polygons together into regions. Regions were delineated using a HUC8 watershed layer. After reclassifying our raster data set we ran zonal statistics to get area coverage on our data. Once running statistics we calculated percent area cover of all classes except our blank class which was no data. Next we ran tabulate area to see how much of each land cover class from our raster data set made up each habitat polygon. This gave us an idea of what land cover trends commonly occur in marbled murrelet habitats. Our next step in our model was to calculate the closest distances to cities with populations of 2,500 more by using the Near tool between our habitat layer and a cities layer that was clipped to our study area. 2,500 was used as a population because in literature from the American Bird Conservancy, human settlements attract predators that predate marbled murrelet nests. Further, the US Census Bureau states that "Urban" is defined as places of 2,500 or more persons incorporated as cities, villages, boroughs, and towns. Once we had this statistical analysis we generated a map that included a DEM and hillshade to visualize areas of higher elevation which is known limitation in this species nesting ability.

Research model

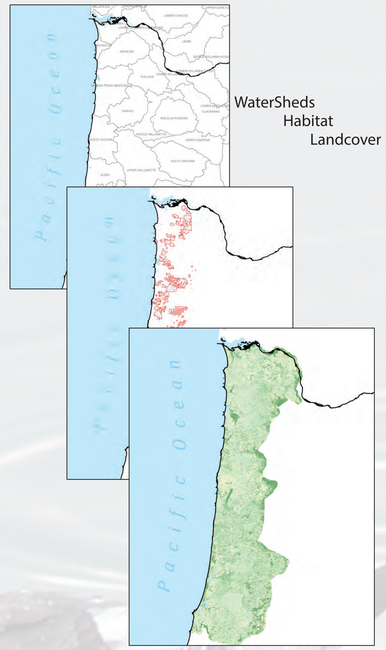
Step one : Data Collection and optimization.
Clip appropriate data to study site.
Reclass raster land cover/forest type.

Step 2 : Determine hypothesis and study criteria
Relationship to habitat preference and land cover
Identify factors in the research
Consult published literature

Step three : Run statistical models.
Percent land cover type per study site
Distance from urban areas using near tool

Step four : analyze results
Generate tables and histograms displaying statistical information.

Step five : create final maps & discuss results
Map areas of habitat with forest type overlayed
Look at other potential factors in habitat preference
Look at some flaws in research and propose further research ideas



Results

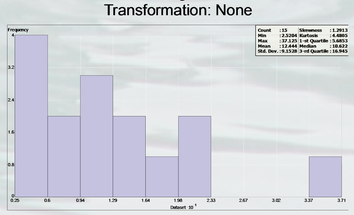
Figure 1

FID	Other	Small Single Story Conifer	Medium Multi Story Conifer	Large Multi Story Conifer	Urban	Agriculture	Total Count
Study Site 1	63566250	7538125	3348750	7108750	195625	0	81757500
Study Site 2	343572500	45428125	13284375	19539375	157500	402500	422384375
Study Site 3	7810000	1130625	903750	2320000	70000	0	12234375
Study Site 4	467324375	19578125	37609375	76979375	151250	734375	602376875
Study Site 5	1469375	198750	92500	216875	0	0	1977500
Study Site 6	57333125	11204375	3113750	5238375	3125	105000	76998750
Study Site 7	2893750	785625	75625	65625	0	0	3820625
Study Site 8	72263750	6796875	8020000	25879375	112500	12500	113085000
Study Site 9	853367500	56025625	82476875	219150000	148125	110625	1211278750
Study Site 10	511583750	33261250	52060625	150241875	15000	211875	747374375
Study Site 11	382907500	30596875	50968750	133403750	625	93125	597970625
Study Site 12	83096250	5868125	8073125	14325000	0	0	111362500
Study Site 13	19605625	1502500	2723750	4248125	0	0	28080000
Study Site 14	231161875	16860000	15430625	38951250	15000	33750	302452500

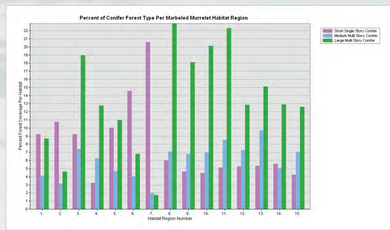
Figure 2

FID	% Other	% SSS_C	% MMS_C	% LMS_C	% Urban	% Agriculture
Study Site 1	77.750	9.220	4.096	8.695	0.239	0.000
Study Site 2	81.341	10.755	3.145	4.626	0.037	0.095
Study Site 3	63.837	9.241	7.387	18.963	0.572	0.000
Study Site 4	77.580	3.250	6.243	12.779	0.025	0.122
Study Site 5	74.305	10.051	4.678	10.967	0.000	0.000
Study Site 6	74.460	14.551	4.044	6.804	0.004	0.136
Study Site 7	75.740	20.563	1.979	1.718	0.000	0.000
Study Site 8	63.902	6.010	7.092	22.885	0.099	0.011
Study Site 9	70.452	4.625	6.809	18.092	0.012	0.009
Study Site 10	68.451	4.450	6.966	20.103	0.002	0.028
Study Site 11	64.035	5.117	8.524	22.309	0.000	0.016
Study Site 12	74.618	5.269	7.249	12.863	0.000	0.000
Study Site 13	69.821	5.351	9.700	15.129	0.000	0.000
Study Site 14	76.429	5.574	5.102	12.878	0.005	0.011

Histogram
Transformation: None

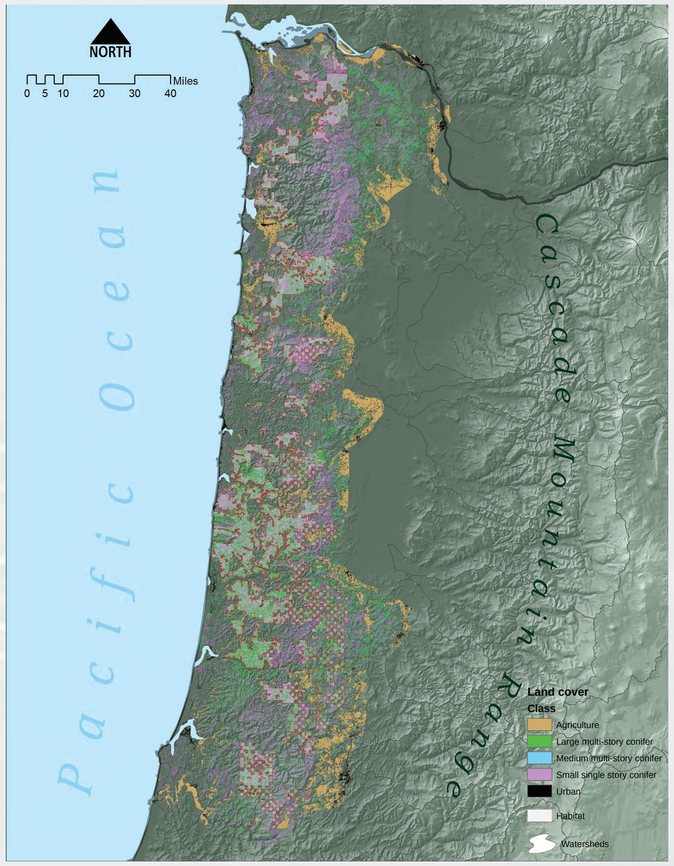


Histogram representing the distance between 15 polygon regions and cities with population above 5000.
x – axis = distance in miles
Y – axis = frequency of polygons in that distance range.



The verticle bar graph compares the percentage cover of each Marbeled Murrelet Habitat Region between three different forest types: Short Single Story Conifer, Medium Multi Story Conifer, and Large Multi Story Conifer. This was created from our tabulated area table represented in figure 2 and helps visualize the distribution of forest type within the habitat.

Forest type and habitat



Conclusion

After running our statistical models we found that out of the three forest types used in our data set that are appropriate for murrelet nesting we saw high percentages in the large multi-story conifer forests (refer to figure two, column LMS_C). According to the literature published on this species nesting habits this is the most preferred forest ecosystem and our data seems to support this preference. The analysis did not end here though. Urban areas and developed areas can easily impact the existing habitat for the marbled murrelet. As areas become more urbanized predetorial birds or birds that otherwise wouldn't survive in natural conifer forests increase. As more human produced food sources for birds such as the stellar jay become available there will be an increase in overall jay numbers in the area. The jay populations will then move into surrounding forest ecosystems and predate on murrelet nests and chicks. This is a factor that should not be overlooked when trying to develop a habitat restoration plan for this endangered species. We found that of the 14 delineated murrelet habitat regions on the Oregon coast that there was a high frequency of habitat zones within approximately 2.5 miles from an "urbanized" area. Our research model wasn't able to identify all of the variables in this species nesting preference. Due to time constraints we were unable to figure out why certain areas of old growth were not also delineated as proper habitat. Some possible variables we did discuss and look at that address this were distance from coast and visualizing possible changes in elevation. We hope that with the continued analysis of the ever threatened habitat of this species projects like this will support restoration and preservation efforts.

Literature Cited

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