FORESTS IN NEED
Canadian Deforestation From 2005-2010

Introduction

Although Canada is often considered a leader in environmental sustainability, deforestation occurring across the country is of great concern to ecologists, biologists, and environmental advocates. The activities of many industries—i.e. agricultural, logging, mining, oil and gas, and hydroelectric—contribute to the problem. In this study, I examined a five-year snapshot (2005-2010) of Canadian deforestation through the lens of four key forest types: temperate or sub-polar needleleaf, sub-polar taiga needleleaf, temperate or sub-polar broadleaf deciduous, and mixed. Additionally, I wanted to understand how this deforestation may have affected bird species, so I created a small case study using data on the Snowy Owl (Bubo scandiacus).

Data and Methods

I first collected detailed land cover data from 2005 and 2010 from the Commission for Environmental Cooperation. I then clipped the raster files for each year to the size of Canada (since they originally spanned all of North America). I extracted the four forest types of interest from both the 2005 and 2010 datasets (through reclassification where 1 represented a given forest type and -1 represented another land cover type), and saved each forest type as its own layer. I then subtracted the 2010 from 2005 data for each forest layer using the raster calculator (where a result of 1 means an area was deforested and 0 means no change). I had to reduce the file size of these results before continuing, so I used ModelBuilder (below) to rapidly resample each layer to have a cell size of 2 kilometers (rather than the original 250 meters). Next, I converted these rasters into point vector data and ran the points through a Local Moran’s I cluster analysis. From the Moran’s I, I was most interested in “high-high” clusters, since these represent deforested clusters. I extracted the “high-high” data from the cluster analysis and put said point data into the Kernel Density tool. The results from this density analysis are shown to the right. I also used the raster calculator to create a cumulative deforestation density map, shown directly under the title of the poster.

Results and Conclusions

I began research expecting to see the most deforestation in Canadian boreal forests, in part because of the highly publicized National Resource Defense Council February 2019 report, “The Issue with Tissue: How Americans are Flushing [Canadian] Forests Down the Toilet.” However, as you can see from the left, the “Sub-Polar Taiga Needleleaf” (another name for boreal forest) map, in comparison to the others, proves this expectation wrong; it has significantly less deforested area. Mixed forest appears to have the highest amount of deforested area of the four, although this may be in part because of its nature as “mixed” - it encompasses conifer and broadleaf temperate forests. Even so, these results make sense considering the higher population density and urban development rates in more southern areas where mixed and temperate forests grow (rather than boreal). Further, from the cumulative deforestation density map, it is clear that northern Saskatchewan has the largest area of deforested land. The following case study demonstrates the ecological significance of deforestation in this province and beyond.

CASE STUDY: Snowy Owl

The International Union for Conservation of Nature classified the Snowy Owl (Bubo scandiacus) as a “vulnerable” species (one step before endangered) in their most recent 2017 study. Almost all of its North American habitat is in Canada, so Canadian deforestation, accompanied by infrastructure and urban development, poses a significant threat to the survival of the owl. The Snowy Owl is an important species in ecosystems ranging from meadow to wetland. As the map depicts, almost all of the deforested clusters are in Snowy Owl habitat. Canadian forestry and conservation policy must account for such cases to protect biodiversity.

Sources and Projections

The maps shown are all projected in WGS_1984_Lambert_Conformal_Conic. Data sources are as follows:

Land Cover: Commission for Environmental Cooperation
Canadian Province and National Boundaries: Statistics Canada
Snowy Owl: International Union for Conservation of Nature
Basemap: ESRI, HERE, Garmin, OpenStreetMap contributors

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