

## **Small Forest Openings Impact Nest Predation at the Forest Edges**

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Habitat edges alter the diversity of songbird communities and are often associated with higher rates of predation. However, many of the previous studies on habitat edges have been conducted along linear corridors or at the transition between field and forest patches in agricultural systems. In these systems, predators that generally utilize more open habitats gain greater access to songbirds nesting along forested edges. Less is known about the persistence of these effects when the habitat edge is the result of a small forest opening. In this scenario, small openings may not support the additional predatory species dependent upon more open habitats, due to limited space and the lack of more typical open field prey species. But, empirical tests are lacking, and if small openings are associated with increased predation rates in nearby forests, the proliferation of oil pad sites in places like Northern Michigan may impact songbird diversity beyond what is predicted by habitat loss alone. We assessed predation rates on artificial nests mimicking ground and shrub nesters in Northern Michigan forests perforated by several relatively small clearings used previously for oil and gas extraction.

I was hosted at the Au Sable Institute for the study, which was done in northern Lower Michigan, near Mancelona and Oak Grove. Real and artificial eggs were placed within artificial nests to mimic that of 3 local bird species; a ground nester with clay eggs, shrub nester with clay eggs, and a ground nester with real eggs. This allowed analysis of edge effects possibly impacting egg- and nest-types differently. These nests were placed at varying distances from oil pad edges and in similar spatial arrangements in fragmented forest plots. Placement of the nests varied 5m, 20m, and 35m away from the pad or control site in order to observe if edge effects are dependent upon distance. A point count method was used to analyze the local avian community at both sites by identifying the quantity of individuals for each species using sight and sound.

We found that predation was significantly higher near the oil pad edges. Overall, both ground nesting models experienced higher predation than the shrub nests. However, shrub nesting proved to be the most susceptible to edge effects and experienced much higher predation near the edges. No observable differences in the magnitude of the effects by distance were observed within 35m from the edge, but it may have been observable if we had studied even further distances. There was also no observable difference in the avian community between the two sites, supporting that songbirds do not avoid forest edges even if it may now be an unsafe environment.

I have truly been thankful to have this research experience. Under the guidance of a great mentor, I have been able to connect with my project on a personal level and invest a lot of myself into it. I have greatly appreciated actively working to be a steward of God's creation and to seek a deeper understanding of the amazing world He has created. It has been a blessing to be constantly surrounded by the beauty of creation and have it serve as a reminder of what I'm working to protect, preserve, and restore. This has been especially true because the Au Sable Institute campus itself is in the woods, and my office every day is the beautiful hardwood forests of Michigan. Throughout this research I have also been able to practice good research methodology, literature review, and scientific writing, all of which will be essential skills in my future career.