

# Importance of Eastern Hemlock In Acadian Flycatcher Home Range Use

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## Introduction

The Eastern Hemlock (*Tsuga canadensis*) is a coniferous tree species that ranges across the eastern United States<sup>1</sup>. However, most of its range is being impacted by an invasive aphid, the Hemlock Woolly Adelgid (*Adelges tsugae*)<sup>1</sup>. The Hemlock Woolly Adelgid feeds on Eastern Hemlocks by attaching itself to the base of a needle and sucking all the starch from the needle<sup>3</sup>. The Eastern Hemlock defoliates, and the tree limbs begin to die, with tree death occurring in as little as 4 years<sup>2</sup>. To combat the infestation of Eastern Hemlocks, the systematic chemical imidacloprid is used because it helps to slow down the infestation of the Hemlock Woolly Adelgid<sup>2</sup>. The decline of Eastern Hemlock has many implications for wildlife that are believed to rely upon it including the Acadian flycatcher (*Empidonax vireescens*)<sup>1</sup>.

In this study, the importance of Eastern Hemlocks to Acadian flycatchers will be analyzed. The expected results of this study are that Eastern Hemlocks are important to Acadian flycatcher home ranges and they will have larger home ranges in areas where there are no Eastern Hemlocks.

## Field Sites

Three sites were visited for data collection during June and July 2019 with all of them having a mix of treated and untreated

Eastern Hemlock. The main site was Lilley Cornett Woods, an old growth forest in Letcher County, Kentucky. The two secondary sites were Maywoods Environmental and Educational Laboratory and Cumberland Falls State Resort Park.

## Methods

**Spot Mapping-** Observers located and then followed individual birds around their home range for at least an hour per bird for several days each. An iPad with ArcGIS Online was used to record their perch locations as well as the species of trees used for perching, vocalizations, and any other behaviors the bird was exhibiting, such as feeding.

**Home range analysis-** When bird observations were completed, shapefiles of the bird points were created and uploaded to ArcMap 10.3. Geospatial Modeling Environment (GME) was used to analyze calculate the kernel density estimator of each bird using a cell size of 1 and an SCV bandwidth. Isopleth analysis was also conducted at 50 and 95 quantiles to represent core and full home ranges. The center of the territory was found using the 50 quantile isopleth polygon.

**Vegetation survey-** The center of the territory for each bird was visited and using a 10-factor wedge prism, vegetation data was collected. Based on the wedge prism, trees determined “in” were measured for diameter at breast height (dbh) and tree

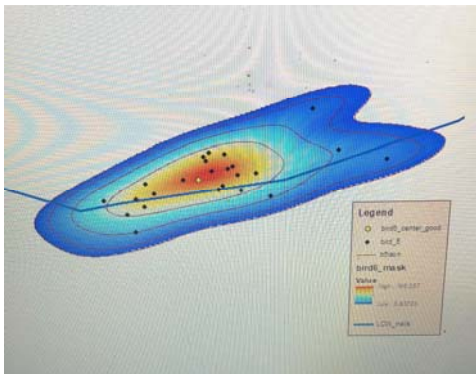
species was recorded. Any hemlocks recorded were noted for whether they had been treated with imidicloprid or not based on the presence or absence of a spray paint mark, and given a vigor ranking of 1-5, with 1 being healthy and 5 being dead.

**Analysis-** RStudio was used to run t-tests, and create box plots to test whether the presence or absence of Eastern Hemlocks affected the home range area and perch height of Acadian Flycatchers.

## Results

Home ranges tended to occur along creeks and many were had an elliptical shape (Figure 1).

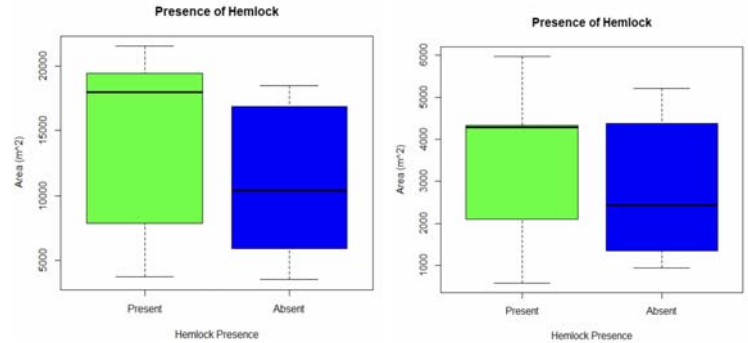
There was no significant difference in 50% or 95% home range area based on the presence or absence of Eastern Hemlock. (50%:  $T_8 = 0.46$ ,  $P = 0.65$ ; (95%:  $T_8 = 0.67$ ,  $P = 0.52$ ).



**Figure 1.** Home range for a bird a Lilley Cornett Woods (95% area: 19,441 m<sup>2</sup>).

## Discussion

Most of the Eastern Hemlocks in the territories that had Hemlocks received a vigor ranking of 4. This suggests that the Hemlock Woolly Adelgid is gradually



**Figure2.** Box plot showing the presence and absence of Eastern Hemlock in the 95 and 50 quantiles.

changing the composition of the forest. Acadian Flycatchers prefer perching on trees with midstory branches such as Hemlocks, American Beech maples. For instance, if Tulip poplar and Beech was present flycatchers perch on Beech due to them having lower branches. Based on this study it appears that Acadian Flycatchers can adjust to use habitats without abundant hemlock, as they do across much of their distribution. However, studies of nesting success and survival that compare areas that are treated and untreated for Eastern Hemlock are still needed.

## References

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3. Toenies, M., et al. (2017). Shifts in vegetation and avian community structure following the decline of a foundational forest species, the eastern hemlock. Volume 120: 489–506

