Background

The hooded warbler, *Wilsonia citrine*, is a wood-warbler species native to the eastern United States. The hooded warbler breeds from lower New England to South Carolina. This small, bright yellow warbler prefers mature, mixed hardwood forest with a shrubby midstory. It is a state-listed endangered species for Delaware, which makes it a perfect candidate for research. It is know that hooded warblers nest in shrubs 1-2m in height, and that they make their nests from grasses, leaves, and fibrous plant material. They lay 2-4 cream and brown spotted eggs, and are a common brown-headed cowbird nest host. Nest parasitism and lack of suitable habitat both have caused a significant decline in hooded warblers in Delaware. Locating nest sites in Delaware and then analyzing the habitat in which these birds are successful is the key to their future survival in the first state.

Literature Review

Many of the prior studies of hooded warbler focus on the mechanics of next survival or breeding behavior. Two studies, both conducted in Pennsylvania, interfere directly with nests which can be very damaging to the birds. Interaction with or disruption of the birds should be minimized for the greatest chance of nest survival. Other studies, conducted in South Carolina and Ontario, Canada, map out the locations of hooded warbler nests, and then use that GPS data to identify
the qualities of that habitat in ArcGIS. This is the best option for both gathering information and the safety of the warblers on the nest. GPS locations can be taken discretely with minimal disruption.

Hypothesis

Hooded warblers are more easily parasitized by brown-headed cowbirds in fragmented areas. I will find more successful and non-parasitized nests in core habitat areas. By locating nests within these cores, I will be able to map out these cores using ArcGIS to better understand the qualities of the habitat most suitable to hooded warbler success.

Data

This study will require nest locations taken by research technicians listening for hooded warbler calls and taking down GPS coordinates for the nests. Technicians will also take vegetation data for the nest sites, such as species of host plant, basal area, and canopy cover. Nest locations will then be brought back into the ArcGIS lab to be analyzed over layers of Delaware counties, DEM, and land use maps. We will be able to record all information about nest habitat from ArcGIS to better understand the requirements of this warbler.

Methods

Nests will be found by sight and sound. All other information will be found using vegetation sampling techniques and ArcGIS spatial analysis tools. We will identify core habitat surrounding warbler nests using the focal statistics – neighborhood tool, and rank all core habitat by number of successful breeding pairs. Using the ranking system, we can then see which cores were most successful; draw conclusions about the vegetation found during sampling, and make suggestions for future habitat modification for this species.

Anticipated Results

I anticipate finding that the most successful areas for hooded warbler success are large, mature patches of forest with very little success in edge forest or fragmented forest. Due to the proclivity of brown-headed cowbirds to parasitize hooded warbler nests in fragmented areas, these habitats will be avoided by the most competitive birds.

Policy Applications

The point of this study is to discover what habitat makes for a successful nest of hooded warblers. Hopefully, we will be able to identify habitat qualities that can be replicated through programs like CREP (Conservation Reserve Enhancement Program). CREP and government sponsored programs like it create incentives for private land owners to modify their land to better suit native species like the hooded warbler.

Budget
The total budget, including ArcGIS software and salaried employees, is an estimated $92,700.

<table>
<thead>
<tr>
<th>Service</th>
<th>Cost</th>
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<tr>
<td>Technicians</td>
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<td>ArcGIS software</td>
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<td>GPS units and Misc. equipment</td>
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<td><strong>total cost</strong></td>
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</table>

**Time Frame**

Field season will begin in May of 2015 and will continue into July of 2015. In August, GPS and ArcGIS data analysis will continue for a month, at which point a proper report will be written and findings will be published.

**Literature Cited**

