Developing a GIS Based Habitat Suitability Model for the Spotted Turtle, *Clemmys guttata*

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Project Overview

- Background
- Model Development (Update of 2006 RIT MS Thesis)
  - Methodology
  - Parameters
  - Best Sites
- Model Issues (2001 LULC Classes, Wetlands, Water)
- Next Steps
The spotted turtle is a threatened species in NY

The study area is within the historic habitat range

Habitat requirements include multiple land covers

Habitat Suitability Model was part of a reintroduction project for captive bred turtles with NY Department of Environmental Conservation (NY DEC), the Seneca Park Zoo, and RIT

Model project goal was to identify and prioritize areas where captive bred spotted turtles could potentially be released, following field assessment

- Information from literature review and expert survey responses were used to create the GIS database and parameter ranges
An Analysis of Captive Bred Spotted Turtle Movements in a Natural Environment
Developing an Iterative Model

- **Union** 2006 NWI with NY Department of Environmental Conservation (DEC) wetland boundaries and **Intersect** with NRCS SSURGO hydric soils for initial seed sites
- **Buffer** initial seed sites by 255 and 310 meters to create 20 ha and 30 ha home range areas
- **Buffer** TIGER road network by 100 meters and then **Erase** overlapping areas of the 20 ha and 30 ha home ranges
- **Recalculate** area of modified home range polygons and remove those now less than 20 and 30 ha, respectively
- **Clip** 2001 land use land cover data with new home range layers to analyze percent land cover within home ranges
- **Definition Query** used to compare land use composition with values suggested by literature review and expert survey
## Expert Survey Land Cover Composition

<table>
<thead>
<tr>
<th>Land Cover</th>
<th>n</th>
<th>MEAN (%)</th>
<th>MIN (%)</th>
<th>MAX (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Forest</td>
<td>5</td>
<td>14</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Wetlands</td>
<td>5</td>
<td>43</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Meadows</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Still Water</td>
<td>5</td>
<td>18</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Running Water</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Transitional Area</td>
<td>5</td>
<td>15</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>
100 Meter Road Buffers used to Erase Overlap in the Seed Sites of the Nine County Study Area

Legend
- DEC Turtle Sightings
- 100 Meter Road Buffers
- Trimmed Seed Site (30 ha)
### Expert Survey Land Cover Composition

<table>
<thead>
<tr>
<th>Land Cover</th>
<th>2001 LULC</th>
<th>MEAN (%)</th>
<th>MIN (%)</th>
<th>MAX (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Forest</td>
<td>41,42,43</td>
<td>14</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>Wetlands</td>
<td>90,95</td>
<td>43</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td><strong>Meadows</strong></td>
<td>71</td>
<td>6</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Still Water</td>
<td>11</td>
<td>18</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Running Water</td>
<td>11</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td><strong>Transitional Area</strong></td>
<td>52</td>
<td>15</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Other</td>
<td>Variable</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

*Sensitivity analysis was performed on these variables due to known concerns about misclassification and uncertainty*
LULC Sensitivity Analyses and Results

- **Model 1** – 22-26 Viable Sites Based on LULC
  - Meadow = Grasslands (71)
  - Transitional = Shrub/Scrub (52)

- **Model 2** – 25-26 Viable Sites Based on LULC
  - Meadow = Grasslands (71) and Urban Grass (21)
  - Transitional = Shrub/Scrub (52)

- **Model 3** – 164-187 Viable Sites Based on LULC
  - Meadow = Grasslands (71), Urban Grass (21), Pasture/Hay (81)
  - Transitional = Shrub/Scrub (52)
Definition Query

- \((\text{"DECIDUOUS FOREST" } \geq 5 \text{ AND } \text{"DECIDUOUS FOREST " } \leq 30 ) \text{ OR } (\text{"EVERGREEN FOREST" } \geq 5 \text{ AND } \text{"EVERGREEN FOREST " } \leq 30) \text{ OR } (\text{"MIXED FOREST" } \geq 5 \text{ AND } \text{"MIXED FOREST" } \leq 30)) \text{ AND } (\text{"WOODY WETLANDS" } \geq 30 \text{ AND } \text{"WOODY WETLANDS" } \leq 60) \text{ OR } (\text{"EMERGENT HERBACEOUS WETLANDS" } \geq 30 \text{ AND } \text{"EMERGENT HERBACEOUS WETLANDS" } \leq 60) \text{ OR } (\text{"OPEN WATER" } > 0 \text{ AND } \text{"OPEN WATER" } \leq 40)) \text{ AND } (\text{"GRASSLANDS" } \geq 5 \text{ AND } \text{"GRASSLANDS" } \leq 15) \text{ OR } (\text{"DEVELOPED, OPEN SPACE" } \geq 5 \text{ AND } \text{"DEVELOPED, OPEN SPACE" } \leq 15) \text{ OR } (\text{"PASTURE/HAY" } \geq 5 \text{ AND } \text{"PASTURE/HAY" } \leq 15)) \text{ AND } (\text{"SHRUB/SCRUB" } > 0 \text{ AND } \text{"SHRUB/SCRUB" } \leq 30)\)
Future Analyses

- Seasonal Landsat classifications for the study area alone, focusing on wetlands and forests, and create a composite LULC layer from multiple sources
- Examine aerial photos and field check areas where the models miss current DEC turtle sightings (LULC, water, wetlands issues)
- Field check sites where model predicts good turtle habitat without DEC supporting data (potential missed turtle populations or possible release sites)
- Explore DEC data for more information on “missing” sites with historical populations, such as Mendon Ponds Park, which exist in hard copy only
- Interview additional experts to refine preferred LULC mixes and other parameters
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Spotted Turtle Using a Hybrid-Deductive Approach.  Unpublished Masters  
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