Analysis of Priority Areas Along Vermont Highways For Wildlife Crossings

Overview
As development and demand for more infrastructure increases, we will continue to build roads and consequently fragment wildlife habitats. Animals will be forced to cross highways to access their entire habitat, putting their and our lives in danger. Thus, it is imperative that animal-vehicle collision mitigation plans are incorporated into transportation design projects. In this study, I assess priority areas along Vermont highways for wildlife crossing development based on roadkill, transportation, wildlife crossing values, and land use data. I feel that the best areas for wildlife crossing development are those with relatively high traffic and roadkill counts. In addition, these highways must be surrounded by forest, have a Wildlife Crossing Value ≥ 8, and should be a minimum of 500m from a water source.

Methodology
Step 1: Convert Vector to Raster Data
1. Selected roadkill for the years 2000-2006 to provide the most current analysis
2. Selected the top species of roadkill in Vermont: Deer, Moose, and Bear (the following analysis will be on these species only)
3. Created a density map of roadkill in Vermont

Step 2: Determining Roadkill/Traffic Relationships
1. Combined Roadkill Density map and Average Annual Daily Traffic Count raster data into a new layer called "TrafficKill." This layer showed the relationship between traffic and roadkill counts on each highway in Vermont and assigned a particular value to each possible combination. The results are reflected in the following matrix. Thus, areas with high traffic and high roadkill counts were given a value of 44, low traffic and low roadkill areas were given 11, etc.

<table>
<thead>
<tr>
<th>Traffic/Roadkill</th>
<th>44</th>
<th>43</th>
<th>24</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>High traffic/High roadkill</td>
<td>44</td>
<td>43</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>High traffic/Moderately high roadkill</td>
<td>32</td>
<td>32</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Moderately high traffic/Moderately high roadkill</td>
<td>11</td>
<td>31</td>
<td>31</td>
<td>11</td>
</tr>
</tbody>
</table>

I decided to focus on the highlighted values for the remainder of my analysis because wildlife crossings should be placed where there are relatively high roadkill counts. I found that roads with relatively high traffic experience higher rates of roadkill than roads with low traffic.

Step 3: Locating Forest Cover in Areas Surrounding Vermont Highways
1. Combined Vermont Land Cover with "TrafficKill" layer to determine where highways with selected traffic and roadkill relationships are surrounded by forest

Since most of the roadkill species in Vermont live in forests, they most likely died attempting to reach forest habitat on the other side of the highway. Therefore, these species would benefit the most from a wildlife bridge connecting two forests.

Step 4: Incorporating Wildlife Crossing Value (WCV) (see Marturano 2008 for detailed derivation)
1. Used WCV layer created by biologists in Vermont, which ranked highway segments in terms of animal migrations from 5 - 9, with 9 being the highest
2. Combined this layer with forested "TrafficKill" layer so that road segments in question were coded with their corresponding WCV

Step 5: Locating Water Supplies Near Previously Determined Priority Areas
1. Created a distance to water bodies map
2. Combined the map with the previous layer to determine where water bodies lie in the vicinity of Vermont highways

Animal habitats require a supply of water, and so more species will be found in areas near a water body. Thus, a wildlife crossing should be built connecting forested areas that contain a water source.

Step 6: Final Selection of Priority Areas
1. Selected for areas with High Traffic and Moderate to High Traffic surrounded by forest AND
2. With a Wildlife Crossing Value ≥ 8 AND
3. Within 500 m from a water body

Wildlife Crossing Priority Areas in Vermont

Limitations and Conclusions
Some limitations include data currency, as no layer includes data after 2006. In addition, the accuracy of the roadkill data is +/- 5 miles, which is a significant distance. If some the roadkill data points are off, it will affect real life applicability of my project, since roadkill may be represented in an area where it actually has not been found. Finally, there are other many important variables that should be considered in assessing wildlife crossing placement. These include deer wintering areas, roadway widths, elevation, and current bridge locations.

My final selection identified 62 potential areas for wildlife crossing development. These findings reveal that Vermont has ample sites to begin implementing conservation efforts into traffic design and policy.