Mapping out the Increasing Conflict between Humans and Black Bears in Massachusetts

Introduction

Interactions between humans and black bears (Ursus americanus) can create a great deal of conflict, and with more forests being converted into urban development, this can increase the amount of conflict. In the United States and Canada, 82% of the human and bear conflicts have become “common”, “increasingly common”, or developed into a “serious problem” for wildlife agencies (Don Carlos et al., 2009). In the state of Massachusetts, black bears have been a problem for many residents, turning into nuisance bears that wildlife biologist must manage. In 2006, Massachusetts reported an increase in human and black bear conflicts (Spencer et al., 2007). With land being developed at a rate of 13 acres per day, the distance is decreasing between humans and black bears (Lautzenheiser et al., 2014). Much of the conflict is due to bears associating human settlements as a location of a food resource. In fact, 69% of wildlife agency reported the most common human and black bear conflict is due to food attractants or garbage (Spencer et al., 2007). Garbage, fruit trees, and bird seed feeders consisted of 90% of the food attractants involved in human and bear conflict in a recent survey of reactive management actions (Merkle et al., 2011).

Methodology

Bear sightings were provided by the Massachusetts Division of Fisheries and Wildlife:
- Hot spot Analysis and Reclassify Tool based on total sightings were used
- Limitations on Bear sightings report data are that the reports are unstructured and not all individuals that see a black bear report their sightings
- Report data does not represent bear distribution, only reported sightings
Land cover from the US Geological Survey from the year 2001 and 2011 were used and the census data of 2000 and 2010 from the US Census Bureau was used.
- Reclassify Tool and Raster Calculator Tool were used on Land Cover
- Reclassify Tool was used on the census layer for population change

Areas with a high density of bird feeders will be visited more often by black bears. Bird feeder locations were provided by the Cornell Lab associated with Project FeederWatch.
- Kernel Density Tool and Reclassify Tool were used
- Limitation on the FeederWatch data is that it is collection is not random and is collected from websites with volunteer entries
- Raster Calculator was used to compute each factor listed in the table below.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Extremely Low Risk</th>
<th>Low Risk</th>
<th>Average Risk</th>
<th>High Risk</th>
<th>Extremely High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sightings/Year</td>
<td>0-1</td>
<td>1-5</td>
<td>6-10</td>
<td>11-18</td>
<td>19-46</td>
</tr>
<tr>
<td>Human Activity</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Density of Bird Feeders</td>
<td>0-0.001</td>
<td>0.001-0.003</td>
<td>0.003-0.006</td>
<td>0.006-0.009</td>
<td>0.009-0.04</td>
</tr>
<tr>
<td>Increase in Population</td>
<td>-1,000 to -500</td>
<td>-500 to -250</td>
<td>-250 to 0</td>
<td>0 to 250</td>
<td>250 to Max</td>
</tr>
</tbody>
</table>

Results

An unweighted analysis resulted in emphasizing areas with a large population change equal to emphasizing areas with bear sighting reports. For example, Boston had a large increase in its population size of more than 28,000 residents from 2000 to 2010. Therefore it was calculated as a high risk for human-bear conflict even though no bears had been sighted in the town boundary of Boston from 2010 to 2014. To counteract this, weighting bear sighting reports at a higher importance was needed to calculate risk accurately. However, because land cover and the density of bird feeders were not based on town boundaries only area, it was still unclear which towns would see an increase in human-bear conflict. Running zonal statistic, based on the town boundaries found in the census layer, averaged the risk calculation of the area within each town. This analysis better identified towns at greater risk of human-bear conflict.

Conclusions

The hot spot analysis best illustrates that distribution of black bear sightings can vary each year. What is well known is that black bears are heavily influenced by food availability and some are willing to travel 130 miles to find area with a food resource (Rogers, 1987). Loss of habitat and natural food can influence black bears to expand their range. More black bears can also learn to use food source within urban environments whether or not there is an abundance of their natural food.

Westfield, Belchertown, Northampton, Pittsfield, and Holden are the towns in Massachusetts with the highest ranking for an extremely high risk of human and black bear conflict. It would be beneficial for wildlife managers implement mitigation techniques within these areas and neighboring towns also at a high risk of human and black bear interactions. Acting quickly to mitigate and educate the public in areas predicted to be more at risk for conflict will help save communities from costly damages and encourage black bears to stay out of urbanized areas and away from their danger. Identifying how influencing factors on black bear behavior may be altered due to climate to increase human-bear conflict is the next step in black bear research.