USING A NOVEL METHOD TO MAP FLOOD SUSCEPTIBILITY OF THE LOWER CONNECTICUT RIVER REGION

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Introduction

1. Identify flood risk factors that apply to the region of interest.
2. Correlate these flood risk factors to flood inundation during a particular event.
3. Use resulting relationships to produce a flood susceptibility map.
Introduction: Case Study

- Lower Connecticut River Valley Region (LCRVR)
- River Council of Governments (River COG)
## Flood Risk Factors

<table>
<thead>
<tr>
<th>Flood Risk Factors</th>
<th>Source (year)</th>
<th>Resolution/Scale</th>
<th>URL for Data Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Cover (LAND)</td>
<td>USGS (2011)</td>
<td>30 meters</td>
<td><a href="https://www.mrlc.gov/">https://www.mrlc.gov/</a></td>
</tr>
<tr>
<td>Elevation (ELEV); Slope (SLOPE); Curvature (CURV)</td>
<td>USGS (2014; 2011)</td>
<td>30 meters</td>
<td><a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a></td>
</tr>
<tr>
<td>Distance from Water (DIST)</td>
<td>DEEP (2005)</td>
<td>1:24,000</td>
<td><a href="http://www.ct.gov/deep/cwp/view.asp?a=2698&amp;q=322898&amp;deepNav_GID=1707">http://www.ct.gov/deep/cwp/view.asp?a=2698&amp;q=322898&amp;deepNav_GID=1707</a></td>
</tr>
<tr>
<td>Soil Drainage (SOIL)</td>
<td>USDA-NRCS (current)</td>
<td>varies</td>
<td><a href="https://sdmddataaccess.nrcs.usda.gov/">https://sdmddataaccess.nrcs.usda.gov/</a></td>
</tr>
<tr>
<td>Vegetation density (VEG)</td>
<td>USGS (2011)</td>
<td>30 meters</td>
<td><a href="https://www.mrlc.gov/">https://www.mrlc.gov/</a></td>
</tr>
<tr>
<td>Impervious Surface (IMP)</td>
<td>USGS (2011)</td>
<td>30 meters</td>
<td><a href="https://www.mrlc.gov/">https://www.mrlc.gov/</a></td>
</tr>
</tbody>
</table>
Data Classification

- All continuous datasets split into classes based on the “QUANTILE METHOD.”
- Applies to elevation, slope, curvature, distance to water, vegetation, and impervious surface.
Flood Risk Factors
Select Flood Event(s)

- Satellite images could not be used:
  - Very poor quality over a 5 to 10 year period
  - Only available for events with < 25-year recurrence

- FEMA 100-year floodplain used

- Correlation between flood risk factors and flooding is what we want to obtain.

- Ideally 2 to 3 events would provide ability to interpolate.
Regionalization

*Land Cover (LAND)*

*Elevation (ELEV)*

*Land Slope (SLOPE)*

*Curvature (CURV)*

*Distance from Water (DIST)*

*Soil Drainage (SOIL)*

*Vegetation Density (VEG)*

*Percent Impervious Surface (IMP)*

*Surface Geology (GEO)*
Relative Contribution of each Factor

- Average magnitude of model coefficients for each sub-region.
- **Elevation & distance to water** contribute most in coastal & urban sub-regions. **Land Cover** is a close third in the more urban sub-region.
- **Surficial materials & distance to water** contribute most in rural sub-region.
Changes between Rural and Urban

- We are interested in how contribution changes due to urbanization.
- Difference between urban and rural contributions provides this info.
- **Elevation** and **Land Cover** experience the greatest change.
Flood Susceptibility Map

- Using logistic regression, the probability of inundation is obtained for every point in the “Area of Influence”, values are categorized according to the following:
  - Very Low Risk: 0 – 20%
  - Low Risk: 20 – 40%
  - Medium Risk: 40 – 60%
  - High Risk: 60 – 80%
  - Very High Risk: 80 – 100%
Comparison to FEMA Map (Urban)

- Large areas of susceptibility are not included in the FEMA map.
- It should be noted that the susceptibility map should not be used for regulatory or insurance purposes in place of the FEMA map, but is only a tool that can be used for planning purposes.
Summary

• Correlated several non-climatic flood risk factors to 100-year FEMA flood hazard area.

• Logistic regression showed that “Elevation” and “Distance to Water” contribute most to flood susceptibility in urban and coastal sub-regions.

• “Surficial Materials” and “Distance to Water” contribute most in rural sub-region.

• “Elevation” and “Land Use” show greatest increase between rural and urban sub-regions.

• Flood susceptibility map showed a wider area susceptible to flooding than FEMA flood map (though FEMA map should still be used for insurance purposes)