Mapping Headwater Streams in Southeastern New Hampshire from LiDAR using Morphological Filters

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Headwater streams underrepresented in the maps

- Benstead and Leigh (2012) NHD underestimates by 64% in NC
- Colson et al. (2008) NHD underestimates by 56% in NC study
- Brooks and Colburn (2011) NHD underestimates 21% of the field-verified steams in MA study
National Map standard:
Horizontal accuracy of 40 ft for 90% of streams
Morphological Filters

From Cho et al 2010 and Rodriguez 2007

Original DEM

Dilation (maximum)

Closing (min(max))

BotHat (closing-DEM)
Methods

- BotHat 3x3, threshold
- BotHat 11x11, threshold
- Flow Accumulation >500
- Coincident from steps 1,2&3
- Group step 4, threshold
- Accumulate step 5, convert to vector
Both 11x11 and 3x3
Grouped and Thresholded
Accumulated and converted to vector
## Preliminary Results

<table>
<thead>
<tr>
<th></th>
<th>NHD</th>
<th>1 SD</th>
<th>2 SD</th>
<th>Flow Acc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage Density (mi/mi^2)</td>
<td>1.84</td>
<td>6.58</td>
<td>4.88</td>
<td>53.74</td>
</tr>
<tr>
<td>% increase or decrease*</td>
<td>-62</td>
<td>256</td>
<td>164</td>
<td>2816</td>
</tr>
<tr>
<td>sites</td>
<td>--</td>
<td>18</td>
<td>28</td>
<td>34</td>
</tr>
</tbody>
</table>

*relative to 2SD set
Field Site Scores

0 = No water
1 = Water in pools only
2 = Water present, no flow
3 = Interstitial flow
4 = Continuous flowing water

Avg. Score

1 SD only
2 SD
1 SD and 2 SD
Flow Acc
Permanance

• Two streams were fitted with simple state sensors per Bhamjee and Lindsay 2011
What’s Old is New Again
Questions?

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References

• Bhamjee, R and Lindsay, JB, 2011 Ephemeral stream sensor design using state loggers. Hydrology and Earth Systems Science 15 pp1009-1021
• Rodriguez, F., Maire, E., Courjault-Rade, P., and Darrozes, J., 2002. The Black Top Hat Function applied to a DEM: A tool to estimate recent incision in a mountainous watershed (Estibere Watershed, Central Pyrenees), Geophysical Research Letters v29 no.6 1085