Abstract

Flash flood warnings issued by the Austin/San Antonio forecast office of the National Weather Service from 1986 to 2006 were spatially evaluated to find possible trends related to population growth and change in government severe weather warning policy. It was found that almost three times the number of warnings were issued in the five year time period of 2001 to 2006 compared to the decadal time period of 1986 to 1995, with the highest number of warnings trending to center on urban areas and the location of the National Weather Service office. When the warnings are compared to actual flash flood reports, a strong statistical correlation exists suggesting a low false alarm rate for the area. Results indicate that National Weather Service modernization, technological upgrades in flood monitoring, public awareness of flood dangers and population growth may be factors contributing to the spatial distribution of warnings.

Purpose

The purpose of this study is to spatially analyze flash flood warnings issued by the National Weather Service office in New Braunfels, Texas to determine if there are patterns related to population and government severe weather warning policy.

Study Area

The study area is the 33 county warning area (CWA) covered by the National Weather Service Office located at New Braunfels, Texas. The most populated counties are Bexar (1,392,931) and Travis (812,280). Population data are from the United States Census Bureau 2000 census.

National Weather Service Modernization

The above map comparison illustrates the drastic increase in the number of flash flood warnings issued after the National Weather Service modernization effort.

Statistical Analysis

<table>
<thead>
<tr>
<th>Comparison</th>
<th>N°</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warnings 95-01 &amp; Population</td>
<td>0.17</td>
<td>0.001</td>
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<tr>
<td>Warnings 96-05 &amp; Population</td>
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<tr>
<td>Reports 95-01 &amp; Population</td>
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<td>Reports 96-05 &amp; Population</td>
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<td>Warnings 95-01 &amp; Population</td>
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<td>Warnings 96-05 &amp; Population</td>
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<td>Reports 95-00 &amp; Population</td>
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<td>Warnings 01-06 &amp; Reports 01-06</td>
<td>0.73</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Statistical comparisons show a very high correlation between warnings and reports.

Graph Comparison

More than four times the number of warnings were issued from 1996-2005 compared to 1986-1995. There is also an increase in the number of warnings issued between 2001-2006 compared to 1996-2000.

Findings

• National Weather Service modernization corresponds to an overall increase in the number of flash flood warnings issued.
• The strong statistical correlation between flash flood warnings issued and flash flood reports suggest a low false alarm rate.
• The spatial pattern of flash flood warnings suggests the warning forecast favor counties with higher populations.
• Extreme rainfall events in 2002 and 2004 exaggerate the findings for the later time period of this analysis.

Further Study

• Compare flash flood warnings and reports to physiographic features known to have an influence on flash flooding.
• Compare the spatial distribution of flood monitoring stations to flash flood warnings and reports.
• Determine exact false alarm rates for each county in the study area.
• Test the theory that the population of certain counties can tolerate a higher number of false alarms.
• Compare correlations of population demographics to flash flood warnings and reports.
• Build a warning systems computer model that can test various influences on flash flood warning forecast decisions.

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