**2008:** More than 1.25 million homes lose power in Northeast

One half of NH’s homes are included in this figure.
Warmer Winter Temperatures
Increased Frequency of Larger Precipitation

Increased RUN-OFF
Flash Floods Hammer Lebanon; Rivermere Residents Evacuated
56% of the 3.6 inches fell within a 45 minute period
Map of monthly streamflow compared to historical streamflow for the month of the year (United States)

June 2013

Explanation - Percentile classes

<table>
<thead>
<tr>
<th>Low</th>
<th>&lt;10</th>
<th>10-24</th>
<th>25-75</th>
<th>76-90</th>
<th>&gt;90</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much below normal</td>
<td>Below normal</td>
<td>Normal</td>
<td>Above normal</td>
<td>Much above normal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Understanding What is Vulnerable

River and Lake dams: ~150

Number of stream crossings (maintained roads): 1,039
<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage</th>
<th>Study Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minneapolis, MN</td>
<td>12%</td>
<td>Minnehaha Watershed Vulnerability Study</td>
<td>Simpson &amp; Stack, 2013</td>
</tr>
<tr>
<td>Newbury, NH</td>
<td>14%</td>
<td>Lake Sunapee Basin Study</td>
<td>Simpson et al, 2012</td>
</tr>
<tr>
<td>Springfield, NH</td>
<td>14%</td>
<td>Lake Sunapee Basin Study</td>
<td>Simpson et al, 2012</td>
</tr>
<tr>
<td>Sunapee, NH</td>
<td>0%</td>
<td>Lake Sunapee Basin Study</td>
<td>Simpson et al, 2012</td>
</tr>
<tr>
<td>Stratham, NH</td>
<td>46%</td>
<td>Winnicut River Basin Study</td>
<td>Lawson &amp; Simpson 2011</td>
</tr>
<tr>
<td>Durham, NH</td>
<td>9%</td>
<td>Oyster River Basin Study</td>
<td>Stack &amp; Simpson 2010</td>
</tr>
<tr>
<td>Keene, NH</td>
<td>26%</td>
<td>White Brook Watershed Study</td>
<td>Simpson et al, 2006</td>
</tr>
<tr>
<td>Ottawa, Canada</td>
<td>21%</td>
<td>Ottawa 2001 Study</td>
<td>Waters et al, 2003</td>
</tr>
</tbody>
</table>
A Changing Landscape

Courtesy of UCONN Cooperative Extension
Recent conditions

With population growth

And more extreme rainfall
Understanding Why It Is Vulnerable

<table>
<thead>
<tr>
<th>TOWN</th>
<th>1 yr</th>
<th>2 yr</th>
<th>10 yr</th>
<th>25 yr</th>
<th>50 yr</th>
<th>100 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANCASTER</td>
<td>2.4</td>
<td>2.6</td>
<td>4.0</td>
<td>4.9</td>
<td>5.2</td>
<td>5.9</td>
</tr>
<tr>
<td>LANDAFF</td>
<td>2.4</td>
<td>2.5</td>
<td>3.9</td>
<td>4.8</td>
<td>5.1</td>
<td>5.8</td>
</tr>
<tr>
<td>LANGDON</td>
<td>2.3</td>
<td>2.7</td>
<td>4.1</td>
<td>4.8</td>
<td>5.4</td>
<td>6.1</td>
</tr>
<tr>
<td>LEBANON</td>
<td>2.3</td>
<td>2.6</td>
<td>4.0</td>
<td>4.7</td>
<td>5.2</td>
<td>5.8</td>
</tr>
</tbody>
</table>
Lake Sunapee watershed:
Results of precipitation modeling

Sunapee 25-year, 24-hour precipitation, regionalized shape parameter

<table>
<thead>
<tr>
<th>Data Source</th>
<th>SRES</th>
<th>Period</th>
<th>25-year precip (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-95%c.i.</td>
</tr>
<tr>
<td>Historic</td>
<td>Baseline</td>
<td>1971-2000</td>
<td>2.70</td>
</tr>
<tr>
<td></td>
<td>B1</td>
<td>2046-2075</td>
<td>2.63</td>
</tr>
<tr>
<td>PROJECED</td>
<td>A1b</td>
<td>2046-2075</td>
<td>3.23</td>
</tr>
<tr>
<td>Rainfalls</td>
<td>A1fi</td>
<td>2046-2075</td>
<td>4.34</td>
</tr>
</tbody>
</table>
25 year historic amount will come with 2-year frequency.
500 year historic amount will come with 25-year frequency in the most pessimistic (upper 95% confidence)
Understanding Who is Vulnerable
Deciding What to Do About It

Adaptation:
- Protect what makes us resilient
- Protect from impact
- Accommodate Impact
- Retreat from Impact
- Do nothing

“Drive, George, drive! This one’s got a coat hanger!”
Protect what makes us resilient
Possible Consequences of Doing Nothing

Road Crossing Upgrade
$ 56,000

FEMA Response: $ 28,000

Crossing & Road Repair
$ 93,000