An Analysis of 100-Degree Heat in Nashville

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100-Degree Stats

- A 100-degree day occurs every 3-4 years (3.22 years, specifically)
- The most 100-degree days in a year is 20 days in 1954
- The most consecutive 100-degree days is 8 from June 23-30, 1952
- The hottest temperature on record is 109° on June 29, 2012
100-Degree Stats

- The most consecutive years with a 100-degree day is 4 years between 1951-1954.
- The most consecutive years without a 100-degree day is 12 years between 1882-1893.
- The most years in a decade with a 100-degree temperature is 5 years between 1951-1960.
- Slight upward trend in annual and decadal 100-degree days over period of record.
100-Degree Stats

• The average first occurrence of a 100-degree day is July 15
  – The earliest 100-degree temperature occurred on June 15, 1952

• The average last occurrence of a 100-degree day is August 5
  – The latest 100-degree temperature occurred on September 11, 1983
<table>
<thead>
<tr>
<th>Month</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>14</td>
<td>6%</td>
</tr>
<tr>
<td>July</td>
<td>37</td>
<td>16%</td>
</tr>
<tr>
<td>August</td>
<td>83</td>
<td>37%</td>
</tr>
<tr>
<td>September</td>
<td>94</td>
<td>41%</td>
</tr>
</tbody>
</table>
Temperature Distribution

- 100°-102°: 77% (175)
- 103°-105°: 3% (7)
- 106°-109°: 20% (46)
100-Degree Years vs. Long-Term Drought

Palmer Drought Severity Index
- Extreme Drought
- Severe Drought
- Moderate Drought
- Near Normal
- Unusually Moist
- Very Moist
- Extremely Moist

Neutral category ranges from -1.9 to +1.9
Annual 100-Degree Days
Decadal 100-Degree Days
Synoptic Pattern
500 hPa Heights

500 hPa Mean

500 hPa Anomaly
700 hPa Heights

700 hPa Mean

700 hPa Anomaly
700 hPa Omega

Sinking Air
(Adiabatic Compression)
850 hPa Heights

850 hPa Mean

850 hPa Anomaly
Composite Sounding

Well Mixed Boundary Layer

Surface wind 270°-360° in 88% of cases
Moisture & Rainfall
Soil Moisture

Shallow Soil Moisture Anomaly

Deep Soil Moisture Anomaly

Wetter

Drier
Rainfall

<table>
<thead>
<tr>
<th></th>
<th>Previous 30-Days Rain</th>
<th>30-Day Departure</th>
<th>Year-To-Date Departure</th>
<th>Days Since Last 1” Rain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.65”</td>
<td>-1.99”</td>
<td>-4.18</td>
<td>54</td>
</tr>
<tr>
<td>Highest</td>
<td>6.90”</td>
<td>2.99</td>
<td>11.75</td>
<td>170</td>
</tr>
<tr>
<td>Lowest</td>
<td>0.05”</td>
<td>-4.35</td>
<td>-15.52</td>
<td>7</td>
</tr>
</tbody>
</table>

The 30-day rainfall departure was only above normal 8 times out of 228 times. **96.5% of the time a 100-degree temperature occurred, the 30-day rainfall departure was below normal.**
Rainfall -- Isolated vs. Multiple 100-Degree Days

<table>
<thead>
<tr>
<th>Isolated 100 Days (≤ 4)</th>
<th>30-Day Departure</th>
<th>Year-To-Date Departure</th>
<th>Days Since Last 1&quot; Rain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-1.19”</td>
<td>-1.16</td>
<td>46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multiple 100 Days (&gt; 4)</th>
<th>30-Day Departure</th>
<th>Year-To-Date Departure</th>
<th>Days Since Last 1&quot; Rain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-2.01”</td>
<td>-4.48</td>
<td>54</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T-Test</th>
<th>30-Day Departure</th>
<th>Year-To-Date Departure</th>
<th>Days Since Last 1&quot; Rain</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-value</td>
<td>0.04</td>
<td>0.01</td>
<td>0.27</td>
</tr>
</tbody>
</table>

30-day & YTD rainfall departure are statistically significant between isolated 100 days and multiple 100 days.
Dew Points -- Isolated vs. Multiple 100-Degree Days

<table>
<thead>
<tr>
<th></th>
<th>Dew Point</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Isolated 100 Days (&lt; 4)</strong></td>
<td><strong>Mean</strong> 67.3°</td>
</tr>
<tr>
<td><strong>Multiple 100 Days (&gt; 4)</strong></td>
<td><strong>Mean</strong> 64.1°</td>
</tr>
</tbody>
</table>

**T-Test**

| P-value | 0.03 |

* Dew point is statistically significant between isolated 100 days and multiple 100 days.
100-Degree Decision Tree

30-Day Rainfall Below Normal?
- NO
  - 100° Temps Unlikely
- YES
  - Anomally Strong Low-/Mid-Level Ridge?
    - NO
      - 100° Temps Possible But Unlikely
    - YES
      - Dry Soils and Sinking Air?
        - NO
          - 100° Temps Possible
        - YES
          - 100° Temps Likely