Cornell's Climate Smart Farming Program: Research, Tools, and Extension Support for Farmers in New York & the Northeast

Luke Haggerty

CRAVE 2016
How is Climate Variability and Change Affecting Farmers in the Northeast? & What are the Resources that can Help?
CLEREL Phenology Data

- **Veraison**: 5 Days in 49 Years
- **Bloom**: 7 Days in 49 Years
- **Bud Break**: 7 Days in 35 Years
- Formed in 2013
- Working toward resilient and sustainable agricultural, ecological, and social systems in the face of a rapidly changing climate
- Launched Climate Smart Farming (CSF) Program and CSF Extension Team in 2015

climateinstitute.cals.cornell.edu/
Climate Smart Farming
Program Goals

• Sustainably increase agricultural productivity, farming incomes, and food security

• Increase energy efficiency and renewable energy capacity to reduce operating costs and GHG emissions

• Increase farm resiliency to extreme weather and climate variability through adoption of BMPS for climate change adaptation.
Currently NYS: Could Expand CSF Extension Team Model to Northeast/Other Regions
http://climatesmartfarming.org/
How is the changing climate affecting your farm?

Climate Smart Farming Decision Tools
Cutting-edge tools to help farmers manage climate risk.

CSF Growing Degree Day Calculator
Growing Degree Days (GDD) are a measure of heat accumulation used to predict plant development and pest/disease outbreaks.

Grape Hardiness & Freeze Risk
Charts hardiness temperature vs. daily observed/forecast temperatures for several varieties of grapes.

CSF Irrigation Scheduler
Monitor current and forecasted soil water deficit at your location to allow smart scheduling of irrigation.

Climate Normals - Northeast Regional Climate Center
Climate normals are an arithmetic average of a variable such as temperature over a prescribed 30-year period.

http://climatesmartfarming.org/
Climate Smart Farming Tools

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- **Network for Environment and Weather Applications**
  - NEWA makes it possible for farmers to share resources for weather data collection, analysis, distribution, and archiving.

- **U.S. Drought Monitor**
  - The map is based on measurements of climatic, hydrologic, and soil conditions as well as reported impacts and observations from more than 350 contributors around the country.

- **NOAA Seasonal Outlook - Precipitation**
  - A seasonal forecast is the best available prediction of what our climate will be like in the next few months.

- **NOAA Seasonal Outlook - Temperature**
  - A seasonal forecast is the best available prediction of what our climate will be like in the next few months.

- **USDA Plant Hardiness Map**
  - The USDA Plant Hardiness Zone Map is the standard by which gardeners and growers can determine which plants are most likely to thrive at a location.

- **Adapt-N Nitrogen Management Tool**
  - Adapt-N is an online tool that will help you precisely manage your N inputs for grain, silage, or sweet corn.

http://climatesmartfarming.org/tools
Water Deficit Calculator

- Estimates effective root zone soil water content to inform decision makers about current and forecasted water deficits
- Uses precipitation, evapotranspiration, drainage, and runoff

Location:
City: Portland, NY
Lat: 42.371704
Lon: -79.485596

Soil Water Capacity:
Low (Sand, coarse texture)

Crop Type:
Grapes (wine)

Plant/Greenup Date:
05/01/2016

Last Irrigation Date:
NONE

Water Deficit Calculator

- Can be used to plan water applications to minimize plant stress and maximize water conservation
- Assesses the probability of naturally reaching certain levels of soil water content over the next month

30-day water deficit outlook based on historical probabilities

<table>
<thead>
<tr>
<th>Water Deficit Results</th>
<th>Next 30 days</th>
</tr>
</thead>
</table>

Location
City: Ithaca, NY
Lat: 42.443300
Lon: -76.449170

Soil Water Capacity
High (Clay, fine texture)

Crop Type
Grass Reference

Plant/Greenup Date
05/01/2016

Last Irrigation Date
NONE

Valid Date: 10/26/2016 @ 8AM
Probability: 10% 25% 50% 25% 10%
Water Deficit: -1.20" -0.79" -0.23" -0.03" 0.01"

Probability of deficit category on 10/26
None 18%
Small Stress 15%
Severe Stress 66%

03 Oct 10 Oct 17 Oct 24 Oct

0 0.5

0.0 0

-0.5 0.1

-1.0 10%

-1.5 25%

-2.0 50%

-2.5 75%

GREEN: Probability that water deficit will be at or above these lines
BLACK: Equal chance that water deficit will be above or below this line
BROWN: Probability that water deficit will be at or below these lines

Deficit, no plant stress
No deficit for plant

Deficit, plant stress likely

Deficit, severe plant stress

Plant Stress Begins

Field Capacity

Plant Stress

Wiltting Danger Exists
Grape Hardiness Tool

- Spring frosts not receding as quickly as flowering is advancing
- Can be used to determine level of freeze injury to grapes as a product of weather conditions and stage of plant development
Growing Degree Day Tool

- GDD Measures heat accumulation over the season
- Tool can be used to predict important stages in plant growth and predict pest and disease outbreaks
U.S. Drought Monitor
Northeast

September 6, 2016
(Released Thursday, Sep. 8, 2016)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>D0-D4</th>
<th>D1-D4</th>
<th>D2-D4</th>
<th>D3-D4</th>
<th>D4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>40.48</td>
<td>59.52</td>
<td>27.78</td>
<td>13.70</td>
<td>3.86</td>
<td>0.00</td>
</tr>
<tr>
<td>Last Week</td>
<td>41.51</td>
<td>58.49</td>
<td>27.29</td>
<td>12.82</td>
<td>2.52</td>
<td>0.00</td>
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<tr>
<td>3 Months Ago</td>
<td>56.82</td>
<td>43.18</td>
<td>2.17</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Start of Calendar Year</td>
<td>62.10</td>
<td>37.90</td>
<td>6.60</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Start of Water Year</td>
<td>42.41</td>
<td>57.59</td>
<td>9.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>One Year Ago</td>
<td>51.55</td>
<td>48.45</td>
<td>4.39</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
David Simral
Western Regional Climate Center

http://droughtmonitor.unl.edu/
Network for Environment and Weather Applications or NEWA

NEWA Grape Forecast Models

Select a disease or insect: Grape Diseases
State: New York
Weather station: Portland
Ending Date: 05/23/2016
[Calculate]

Grape Disease Infection Events for Portland

<table>
<thead>
<tr>
<th>Disease</th>
<th>Past</th>
<th>Past</th>
<th>Current</th>
<th>Grape Disease 5-Day Forecast</th>
<th>Forecast Details</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>May 21</td>
<td>May 22</td>
<td>May 23</td>
<td>May 24</td>
<td>May 25</td>
</tr>
<tr>
<td>Phomopsis</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Powdery Mildew</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Black Rot</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- **Phomopsis** - calculates when weather conditions may allow spores to infect susceptible tissue.
- **Powdery Mildew** - runs from bud break until early bloom; calculates when weather conditions may allow overwintered, primary spores (ascospores) to infect susceptible tissue.
- **Black Rot** - calculates when weather conditions may allow spores to infect susceptible tissue.

Phenological stage: 10 inch shoot

Choose the phenology stage for the grape variety of interest to display management messages. Concord grape phenology is estimated by the model from historical records for this variety.

http://newa.cornell.edu/
Questions? Thank You!

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