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

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Cornell Institute for Climate Change and Agriculture

Presentation for the
USDA NE Climate Hub Webinar Series
May 18, 2016

Cornell University

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Climate Smart Farming

How is Climate Variability and Change Affecting Farmers in the Northeast?

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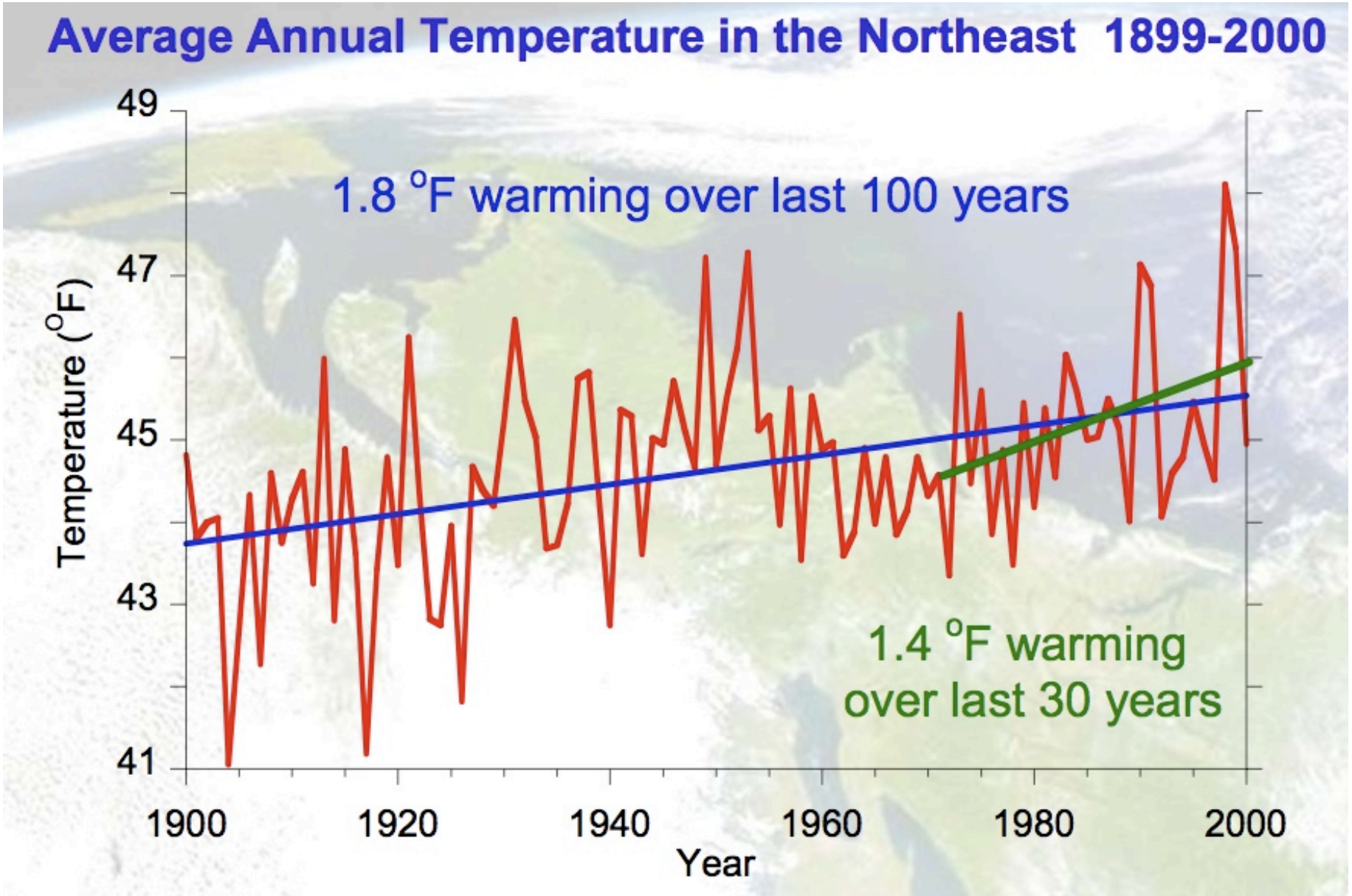
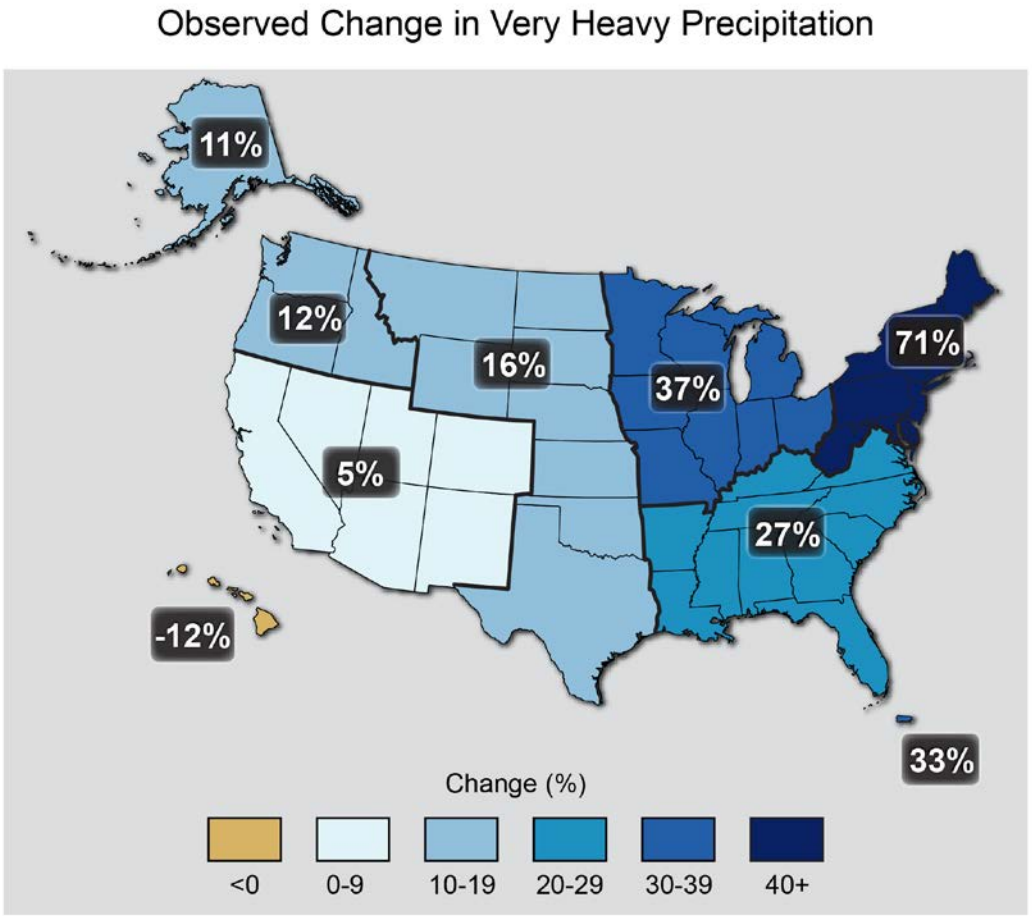


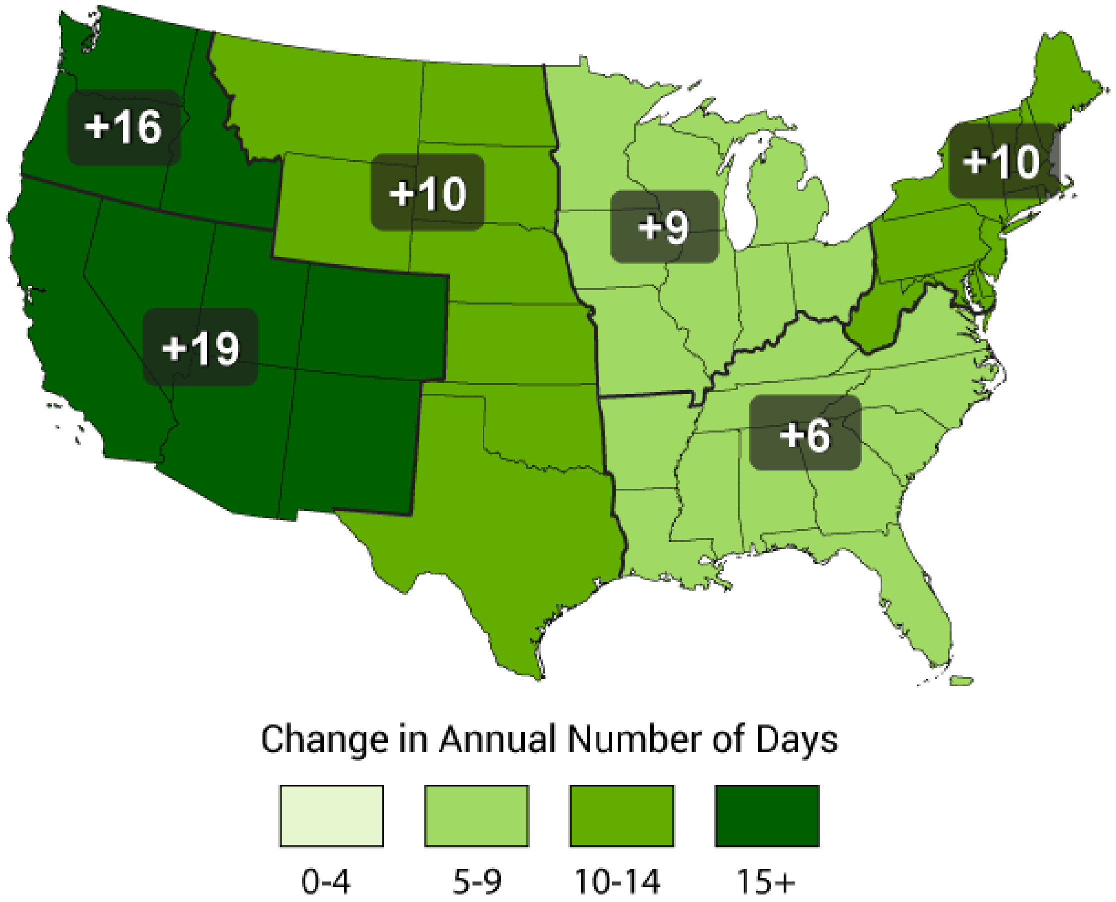
Observed Trends in 1-day Very Heavy Precipitation (1958 to 2012)

The Northeast has had the greatest increase in heavy precipitation in the United States.



Source: NOAA/NCDC

Observed Increase in Frost-Free Season Length



The period between the last occurrence of 32° F in the spring and the first occurrence of 32° F in the fall, has increased in each U.S. region during 1991-2012 relative to 1901-1960. NOAA/NCDC / CICS-NC.

Climate Change and Northeast Agriculture

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Challenges:

- Temperature: Increased frequency of high temperature causes heat stress for both livestock and crops
- Water: Too much or too little; lack of efficient water management
- Pest, Disease & Weed Pressure
- Climate change much more complicated than just “warming”: Uncertainty, Variability & Extremes

But Also Opportunities:

- Heat stress challenges less severe than some other regions
- Relative to other regions: we have water!
- Longer growing seasons allow farmers to explore with different crop varieties and double-cropping
- Close proximity to many markets: 22% U.S. population

CICCA

Cornell Institute for Climate Change & Agriculture

- Formed 2013
- Vision: Empower farmers and their communities to respond to increasing climate variability and change, take advantage of opportunities, and lessen their impacts on the climate.
- Climate Smart Farming Program: Launched 2015
- Farmer, Extension and Stakeholder Input.
- Partnerships @ the state, regional, federal, and international level, including the USDA NE Climate Hub.
- Information Clearinghouse: Decision Tools, Training, Policy Recommendations

climateinstitute.cals.cornell.edu/

Cornell Climate Change Capacity

Strengths in Research, Teaching, and Extension/Outreach:

- New/Adapted Crops
- Pests and IPM
- Animal Agriculture
- Climate Modeling/Extreme Weather
- Communicating Climate Change
- Crop Yield Risks
- Carbon Sequestration & Policy
- Economics
- Northeast Regional Climate Center
- Politics and Policy
- Renewable/Bioenergy
- Stakeholder Assessment & Engagement
- Water Management
- Teaching: Climate change minor and many courses
- Extension: Trusted partners across New York

- Nutrient Management

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.

STAKEHOLDER-DRIVEN RESEARCH AND OUTREACH

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http://climatesmartfarming.org/

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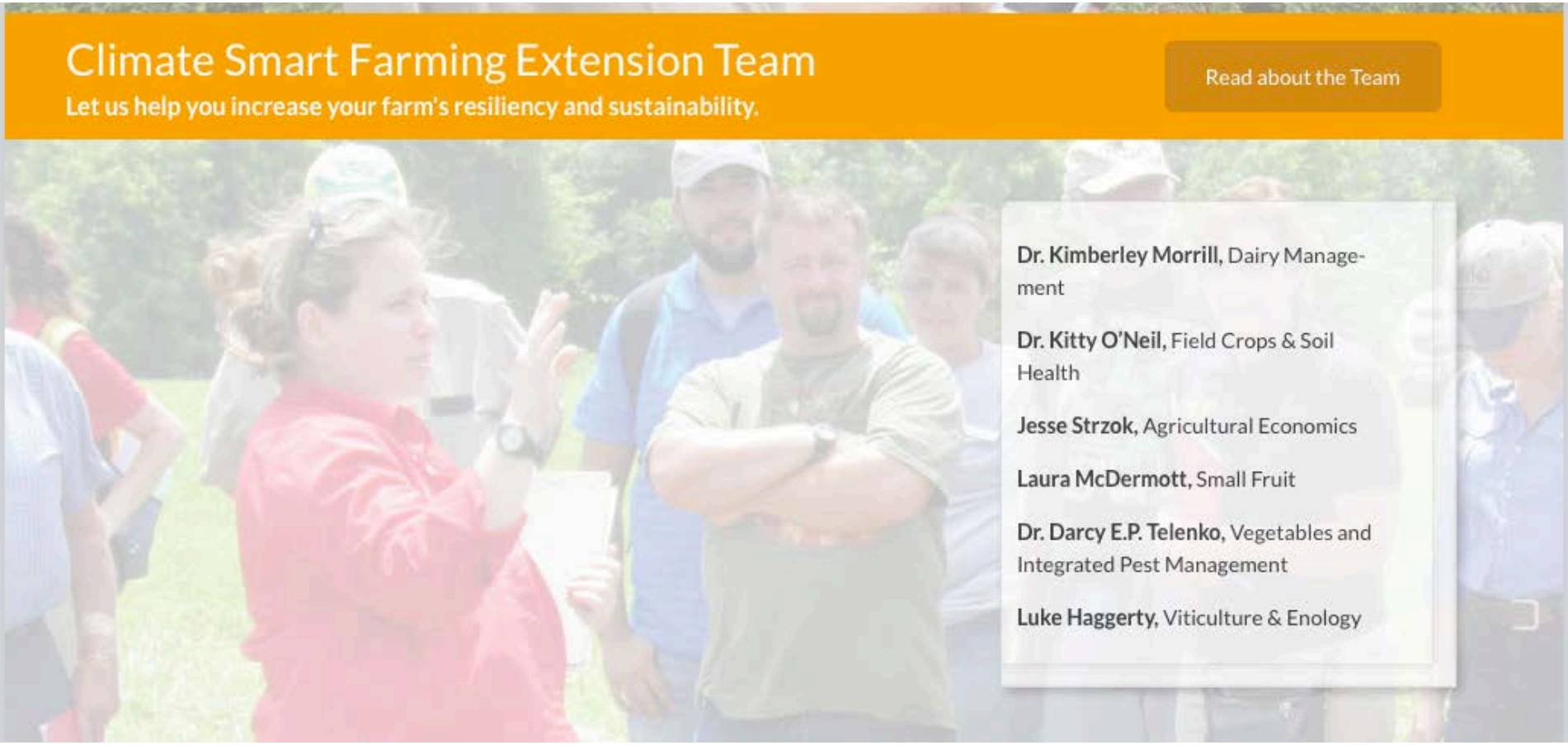

http://climatesmartfarming.org/climate-smart-farming-extension-team/

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Extension Team

Dr. Kitty O'Neil, Field Crops & Soil Health

Dr. Kim Morrill, Dairy Management

Luke Haggerty, Viticulture

Laura McDermott, Small Fruit

Dr. Darcy Telenko, Vegetables & IPM

Jesse Strzok, Ag Economics

Currently NYS: Could Expand CSF Extension Team Model to Northeast/Other Regions

http://climatesmartfarming.org/resources/

CLIMATE CHANGE & AGRICULTURAL IMPACTS

CSF Climate Smart Farming

- Agriculture in the Northeast is characterized by a diversity of products and production systems, scales of operations, and landscapes.
- Farmers need a variety of specific practices and tools to help them with climate change adaptation and mitigation.

Agricultural Products	Climate Change Impacts	Toolkit of Adaptation & Mitigation Practices
Dairy and Livestock	Heat stress, water impacts from heavy precipitation	Increased cooling, energy efficiency and renewables, water management
Vegetables and Field Crops	Disease, weed and pest pressure, flooding and short-term drought, longer growing seasons, heat stress	Integrated pest management, drainage or irrigation, soil health, cropping systems, shifting dates and new varieties
Tree Fruit, Berries, and Grapes	Unexpected freeze, short-term drought, reduced winter chill	Monitoring weather and protecting crops, siting, soil health and cropping systems, new varieties
Maple Syrup	Changing seasons, variable weather, contamination, tree health	Earlier tapping, new technologies, shifting production

http://climatesmartfarming.org/resources/

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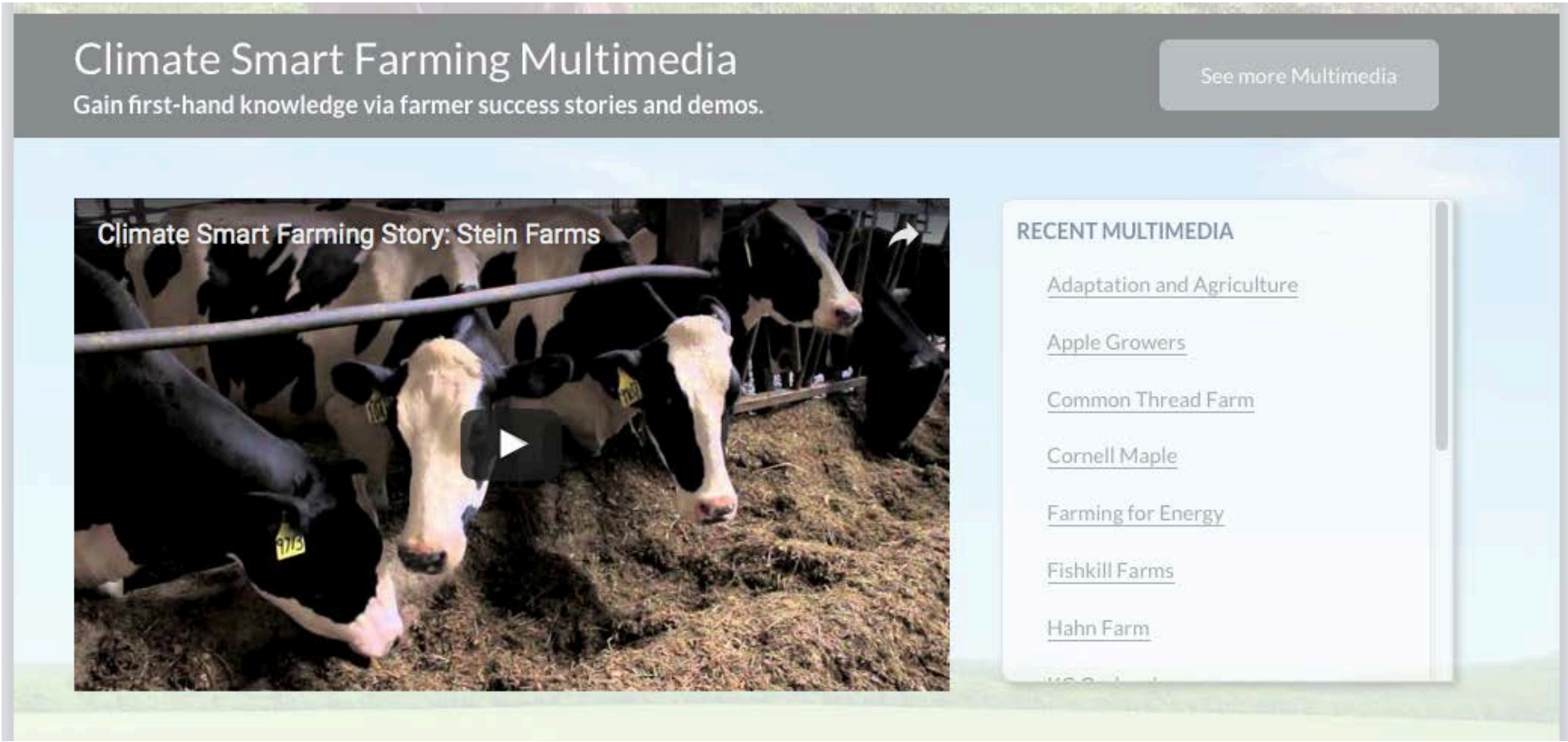
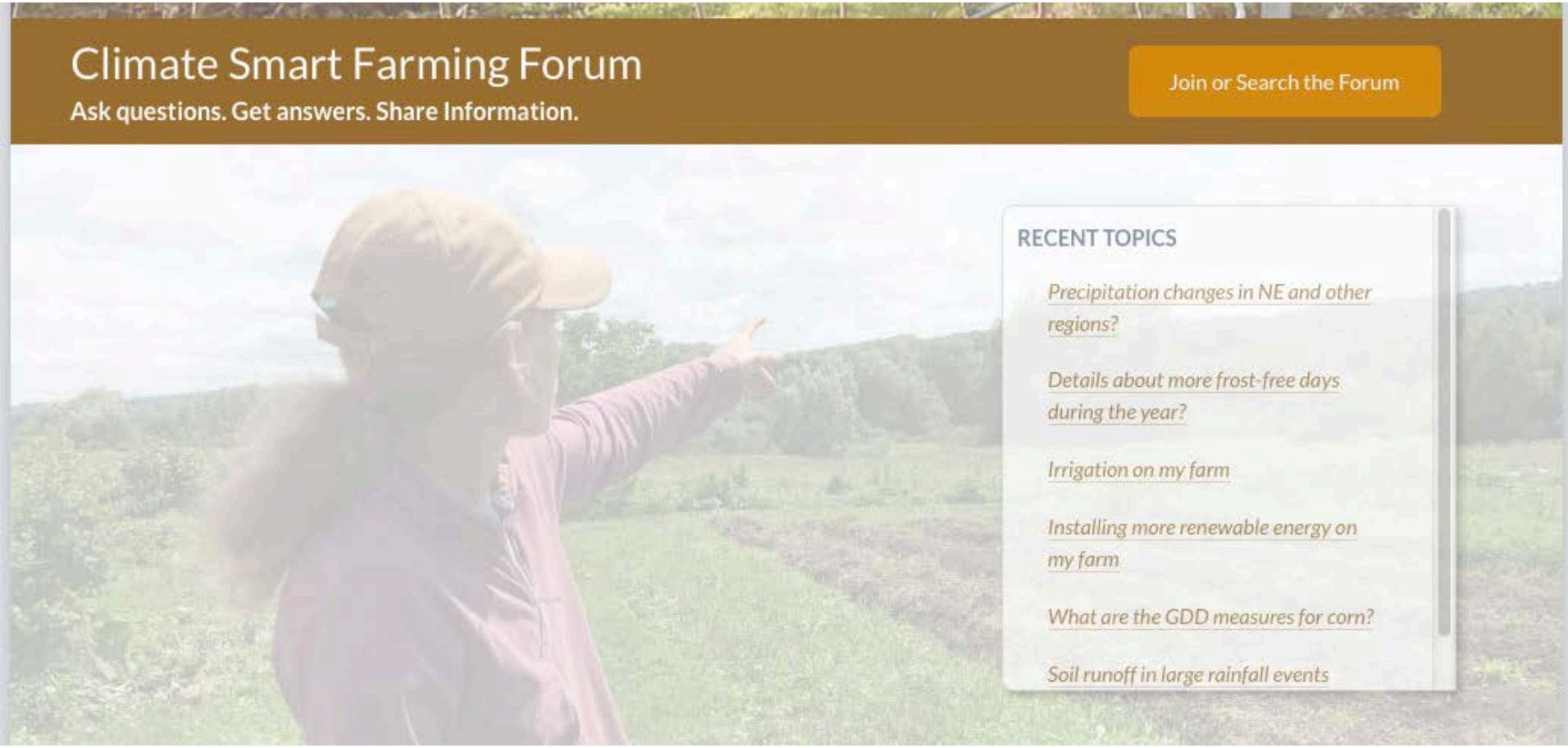


http://climatesmartfarming.org/videos/



Create a Free Account: Get Answers, Share Information!

climatesmartfarming.org/forum/

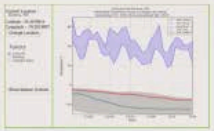
Climate Smart Farming Tools

Climate | Tools | Team | Resources | Forum | Videos

CSF Growing Degree Day Calculator

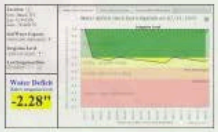
Growing Degree Days (GDD) are a measure heat accumulation used to predict plant development and pest/disease outbreaks.

CSF Freeze Risk Tools



Graphs hardiness vs. observed temperature for several crop varieties over a specific date range to determine freeze risk.

CSF Irrigation Scheduler



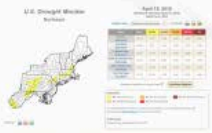
Monitor current and forecasted soil water deficit at your location to allow smart scheduling of irrigation.

Climate Normals - Northeast Regional Climate Center

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

1 2 →

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.

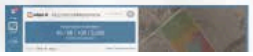
NOAA Seasonal Outlook - Temperature

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



COMET-Farm GHG Accounting Tool

http://climatesmartfarming.org/tools/

CSF Growing Degree Day (GDD) Tool

- GDD:
  - Measures heat accumulation (development in plants is temperature-dependent). GDD Calculation: Average of Daily Min and Max Temp – Base Temp.
- Farmers/Advisors use the tool to:
  - Predict important stages in plant growth
  - Predict pest and disease outbreaks
  - Help with planning for and response to seasonal variability

CSF GDD Tool

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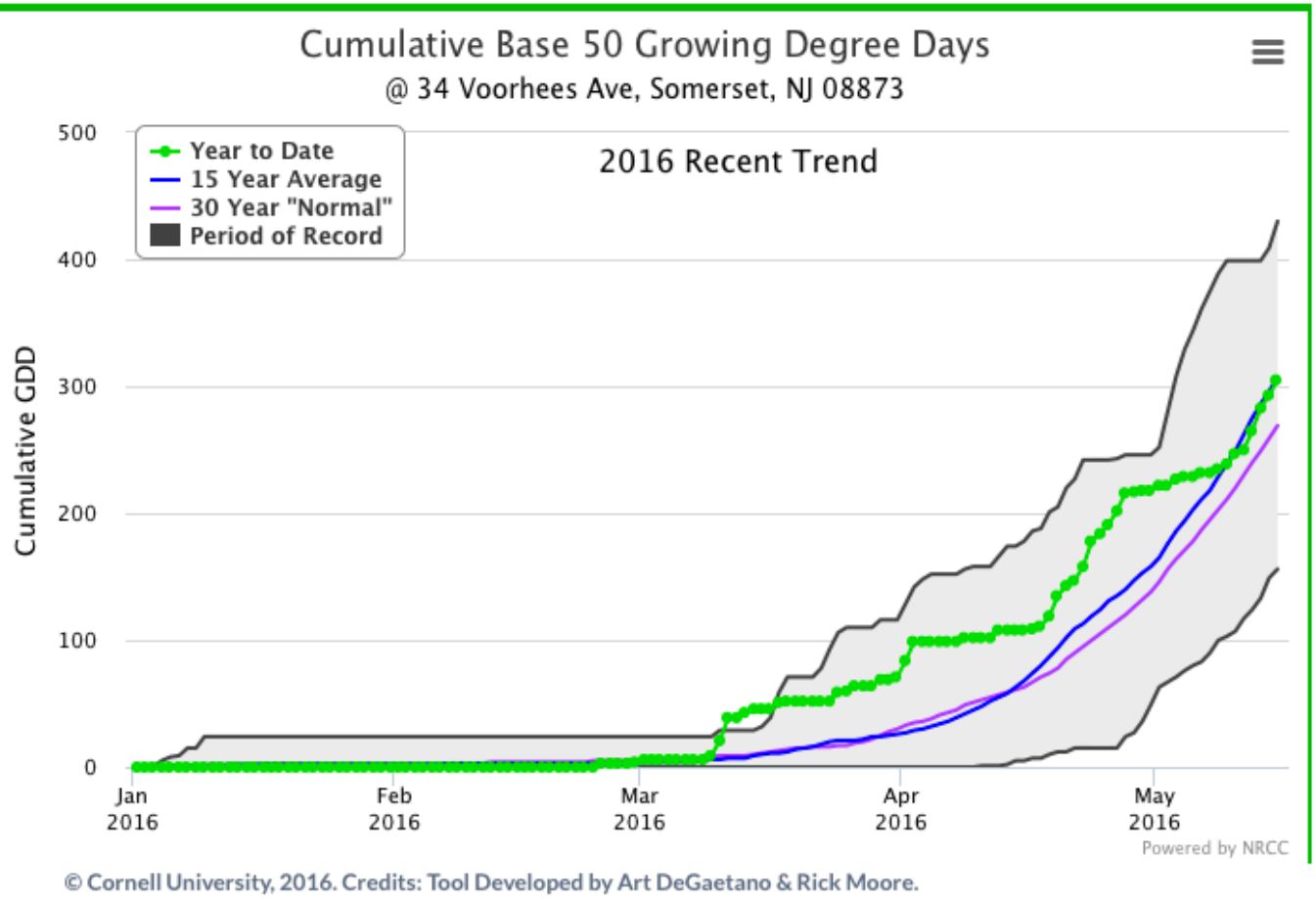
Current Location :
34 Voorhees Ave
Somerset, NJ 08873
Latitude : 40.4832016
Longitude : -74.4841461

Change Location

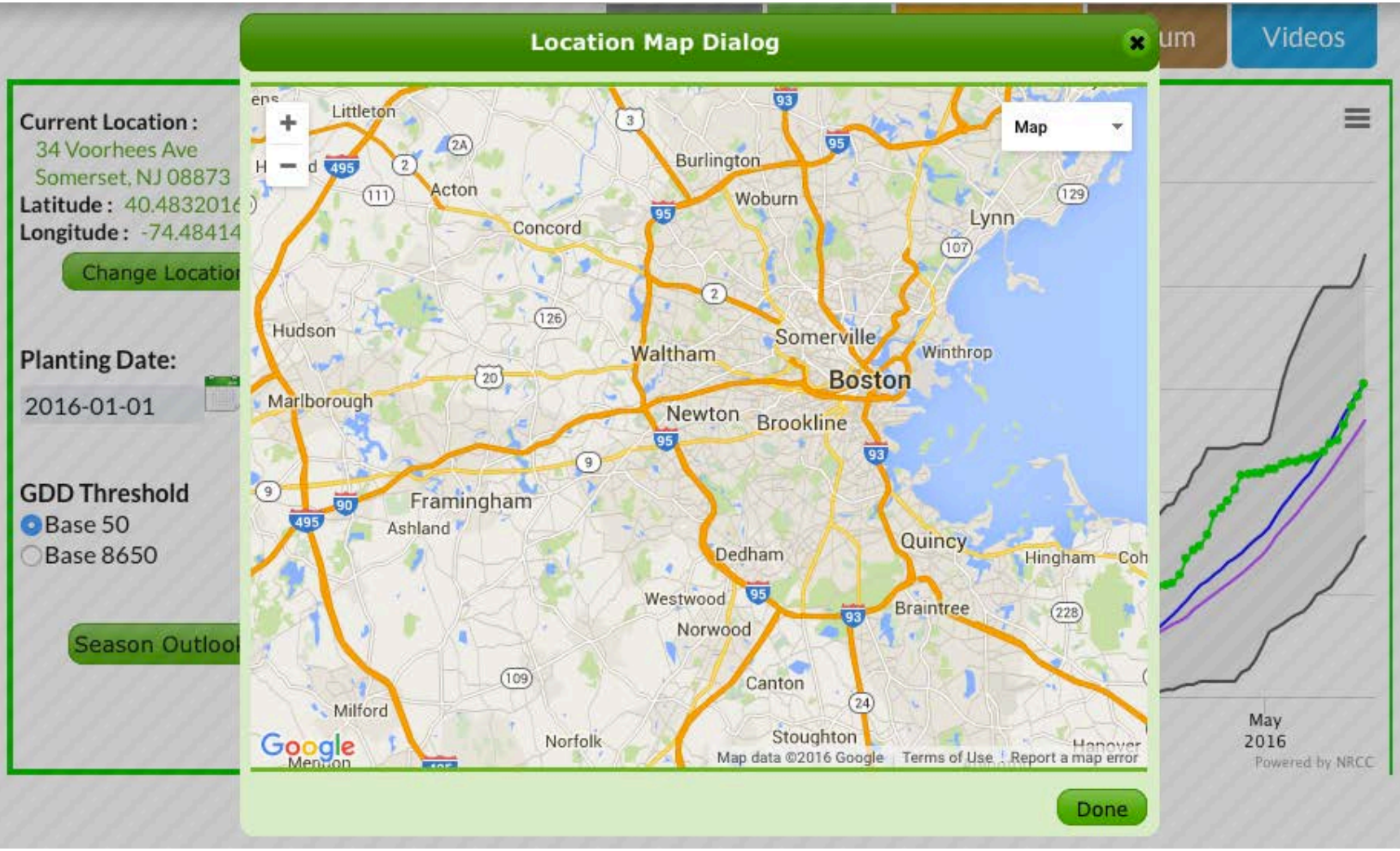
Planting Date:
2016-01-01

GDD Threshold
- (•) Base 50
- ( ) Base 8650

Season Outlook



CSF GDD Tool


Location Map Dialog
Videos
Current Location :
34 Voorhees Ave
Somerset, NJ 08873
Latitude : 40.4832016
Longitude : -74.48414
Change Location
Planting Date:
2016-01-01
GDD Threshold
Base 50
Base 8650
Season Outlook
Map
Littleton
Burlington
Acton
Woburn
Concord
Lynn
Hudson
Waltham
Somerville
Winthrop
Boston
Marlborough
Newton
Brookline
Framingham
Ashland
Dedham
Quincy
Hingham
Westwood
Braintree
Norwood
Canton
Milford
Norfolk
Stoughton
Google
Map data ©2016 Google
Terms of Use
Report a map error
Done
May
2016
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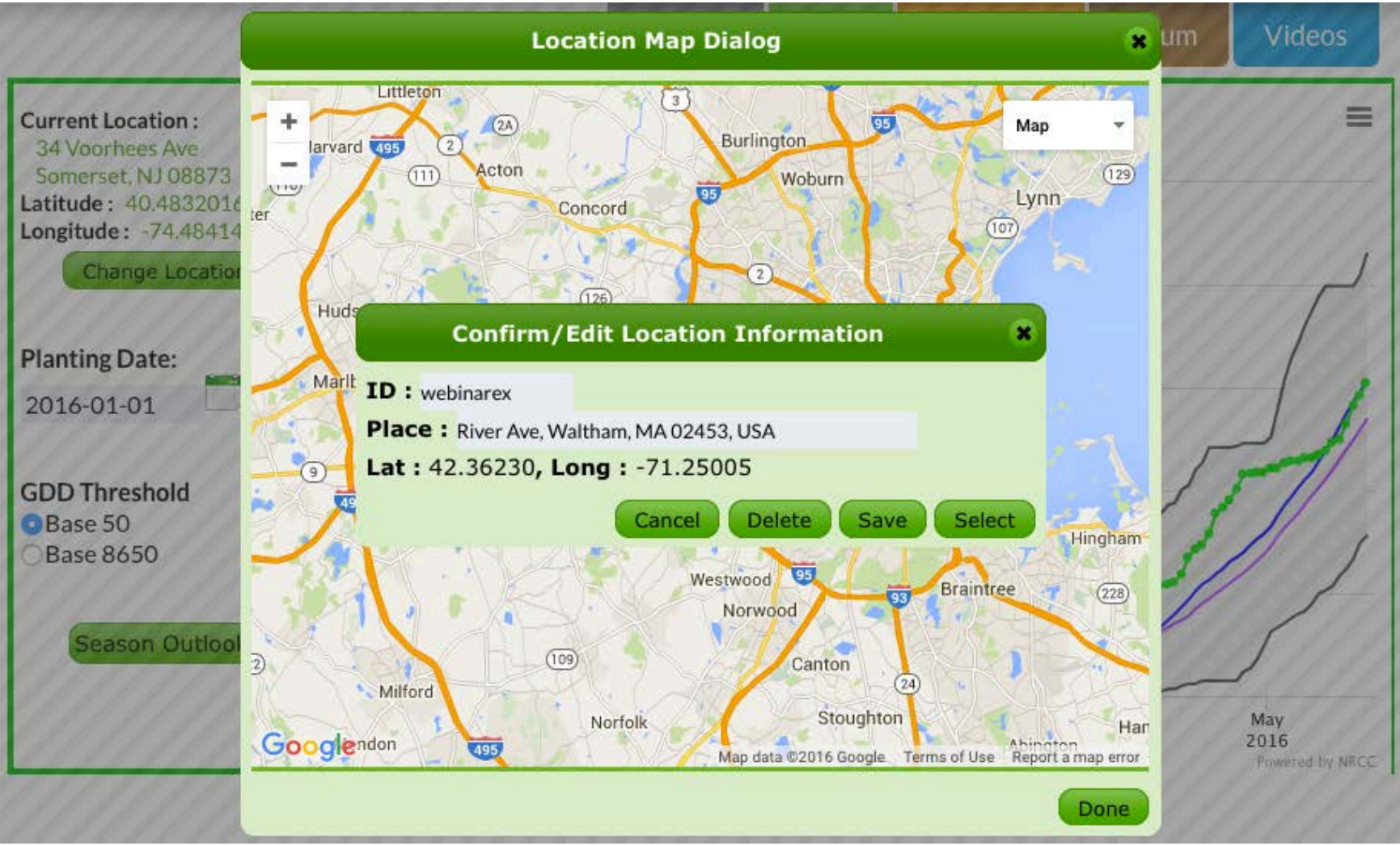
CSF GDD Tool


Location Map Dialog
Videos
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34 Voorhees Ave
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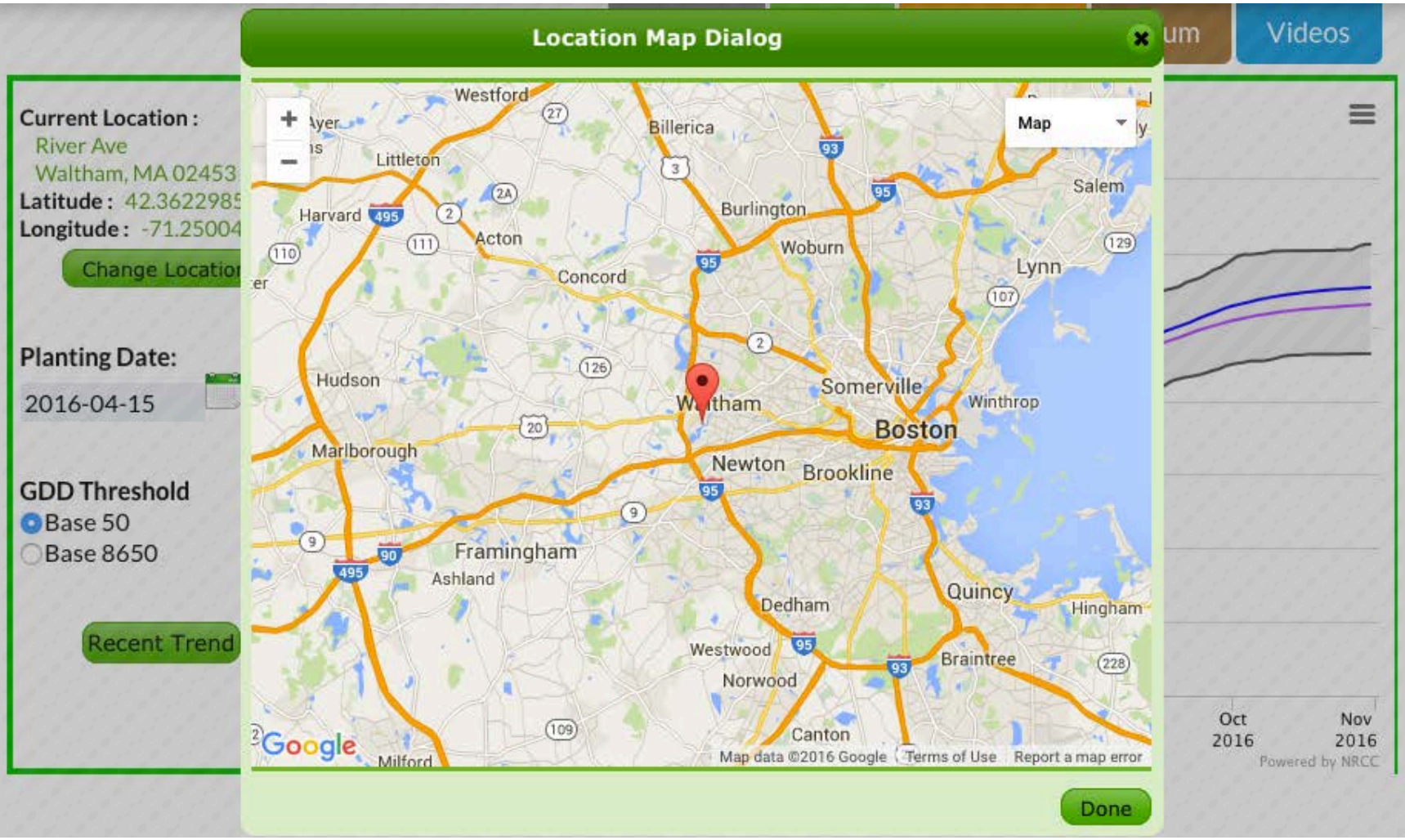
Latitude : 40.4832016
Longitude : -74.48414
Change Location
Planting Date:
2016-01-01
GDD Threshold
Base 50
Base 8650
Season Outlook
Confirm/Edit Location Information
ID : webinarex
Place : River Ave, Waltham, MA 02453, USA
Lat : 42.36230, Long : -71.25005
Cancel
Delete
Save
Select
Map
Littleton
Burlington
Woburn
Lynn
Concord
Acton
Westwood
Norwood
Braintree
Hingham
Canton
Milford
Norfolk
Stoughton
Map data ©2016 Google
Terms of Use
Report a map error
Done
May
2016
Powered by NRCC

CSF GDD Tool


Location Map Dialog
Videos
Current Location :
River Ave
Waltham, MA 02453
Latitude : 42.3622985
Longitude : -71.25004
Change Location
Planting Date:
2016-04-15
GDD Threshold
Base 50
Base 8650
Recent Trend
Map
Westford
Billerica
Littleton
Harvard
Acton
Concord
Burlington
Woburn
Salem
Lynn
Hudson
Waltham
Somerville
Winthrop
Boston
Marlborough
Newton
Brookline
Framingham
Ashland
Dedham
Quincy
Hingham
Westwood
Braintree
Norwood
Canton
Milford
Google
Map data ©2016 Google
Terms of Use
Report a map error
Done
Oct 2016
Nov 2016
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CSF GDD Tool

Climate Smart Farming

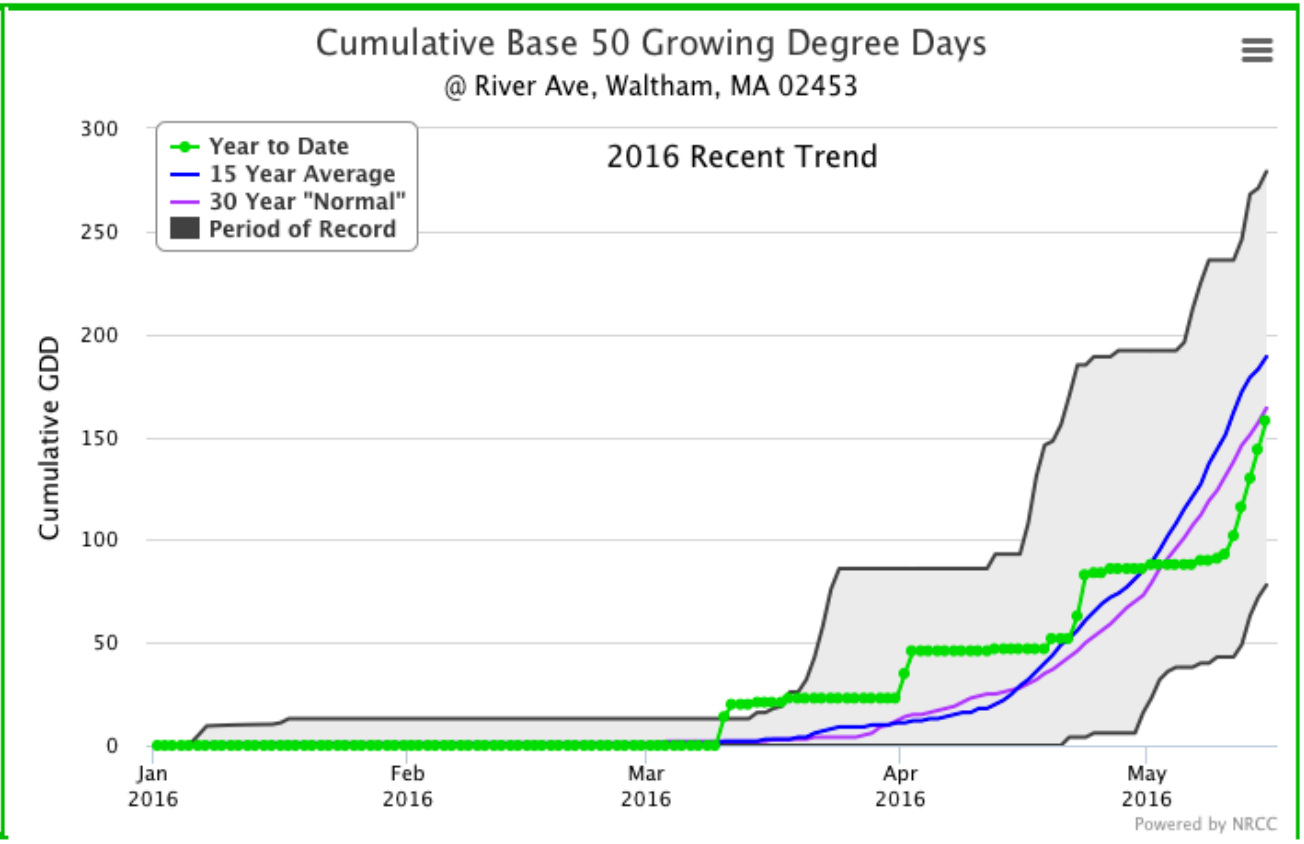
Current Location :
River Ave
Waltham, MA 02453
Latitude : 42.3622985
Longitude : -71.2500457

Change Location

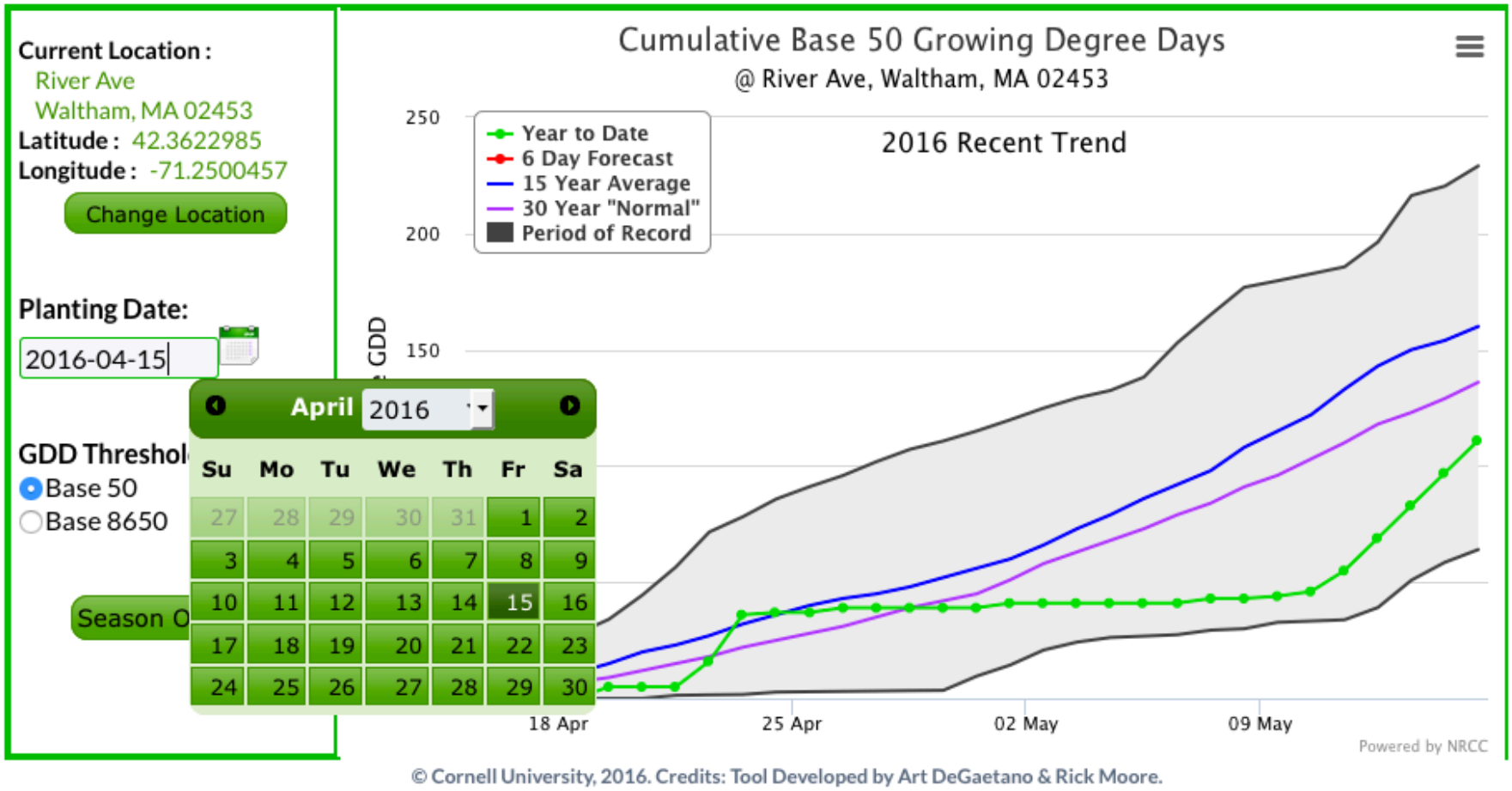
Planting Date:
2016-01-01

GDD Threshold
- (•) Base 50
- ( ) Base 8650

Season Outlook



CSF GDD Tool



CSF GDD Tool

Climate Smart Farming

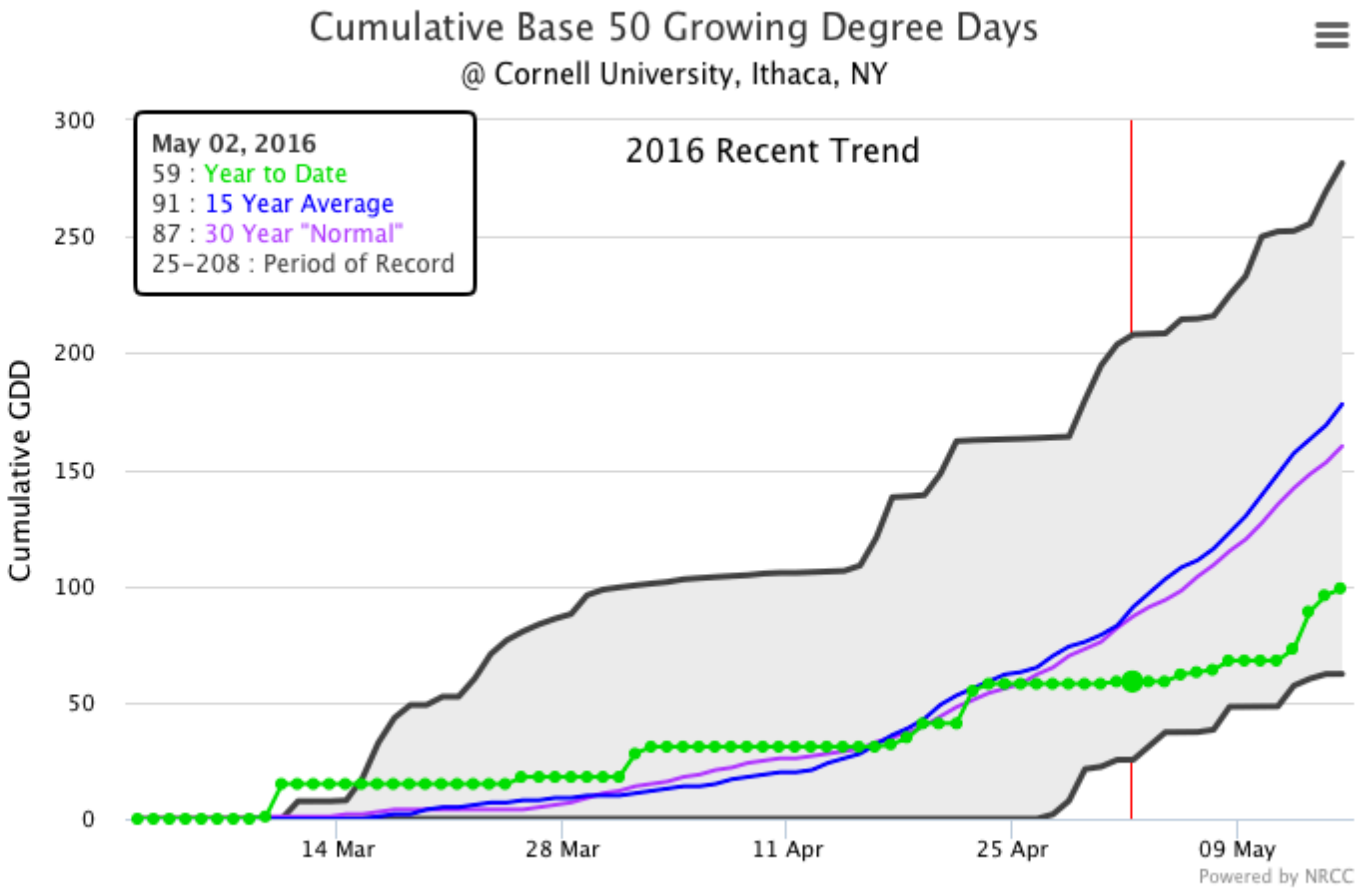
Current Location :
Cornell University
Ithaca, NY
Latitude : 42.4500000
Longitude : -76.4800000

Change Location

Planting Date:
2016-03-01

GDD Threshold
- (•) Base 50
- ( ) Base 8650

Season Outlook



CSF GDD Tool

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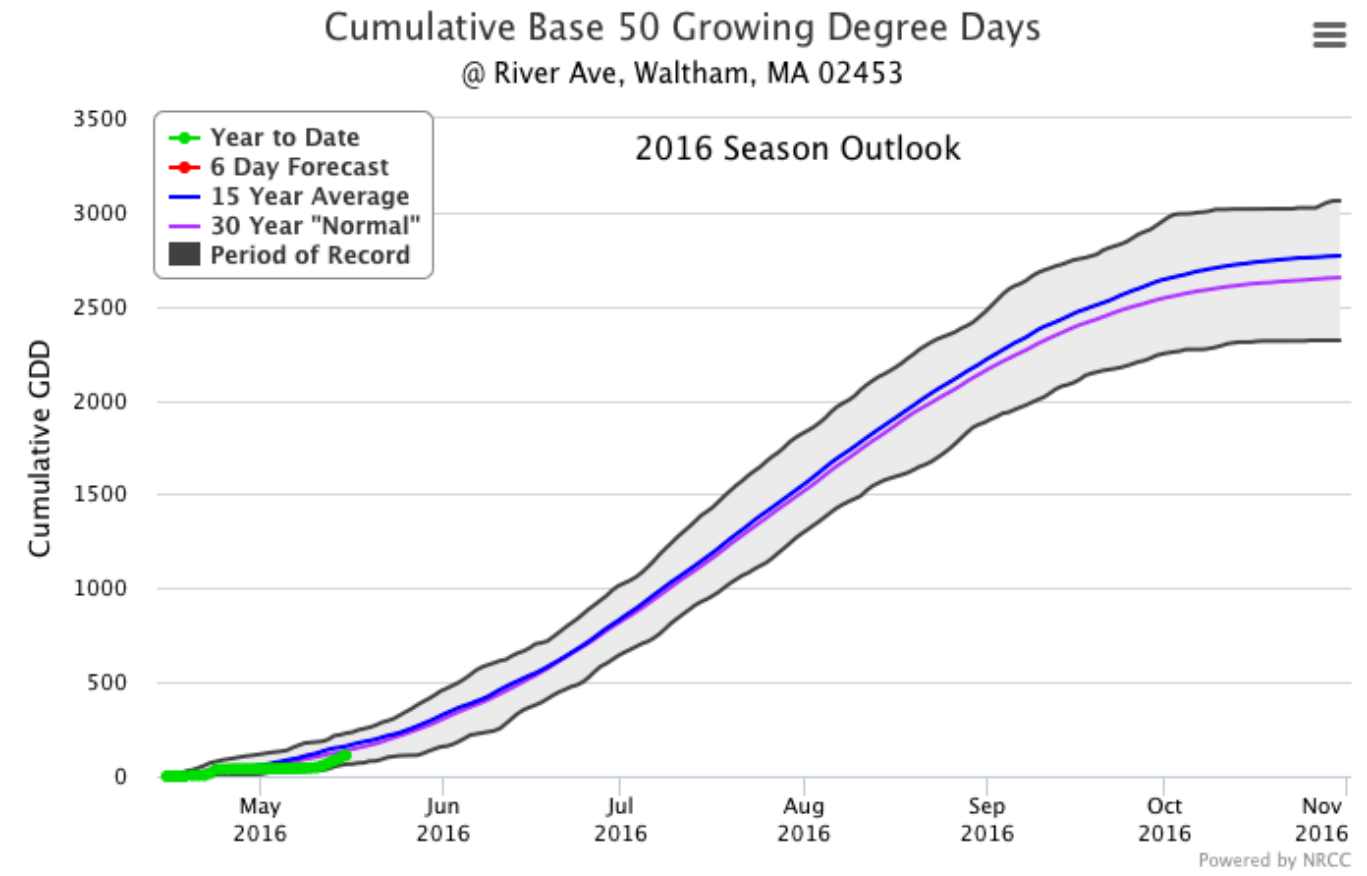
Recent Trend

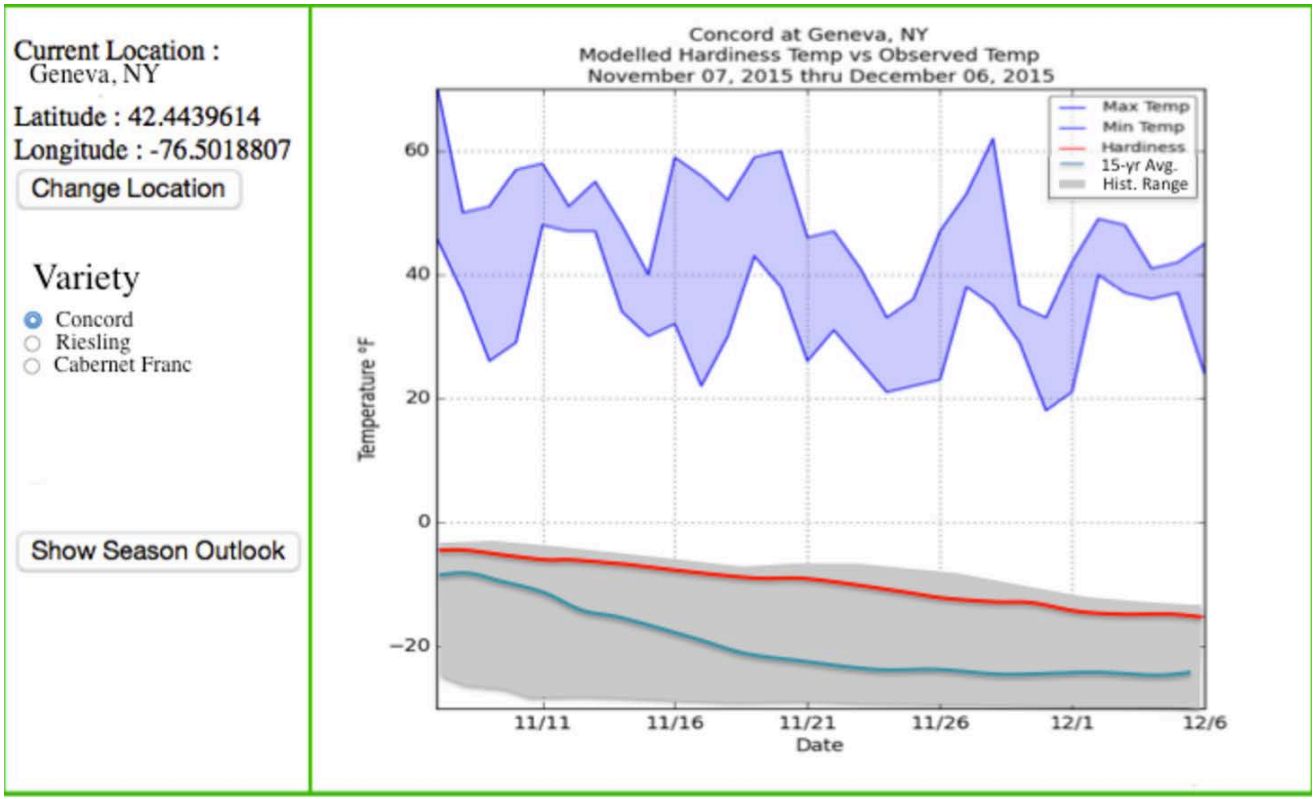


CSF Freeze Risk Tools

- Spring frosts are not receding as quickly as flowering is advancing, with climate change: Increased risk of frost/freeze damage
- Farmers/Advisors Use the Tools to:
  - Determine the level of freeze injury to crops due to sub-freezing temperatures
  - Monitor the level of freeze tolerance of crops through time
  - Track the phenological stage of development

CSF Freeze Risk Tools

- Using the Tools:
  - Input crop variety and location
  - Toggle between seasonal outlook and observed temperature graphs of hardiness vs temperature

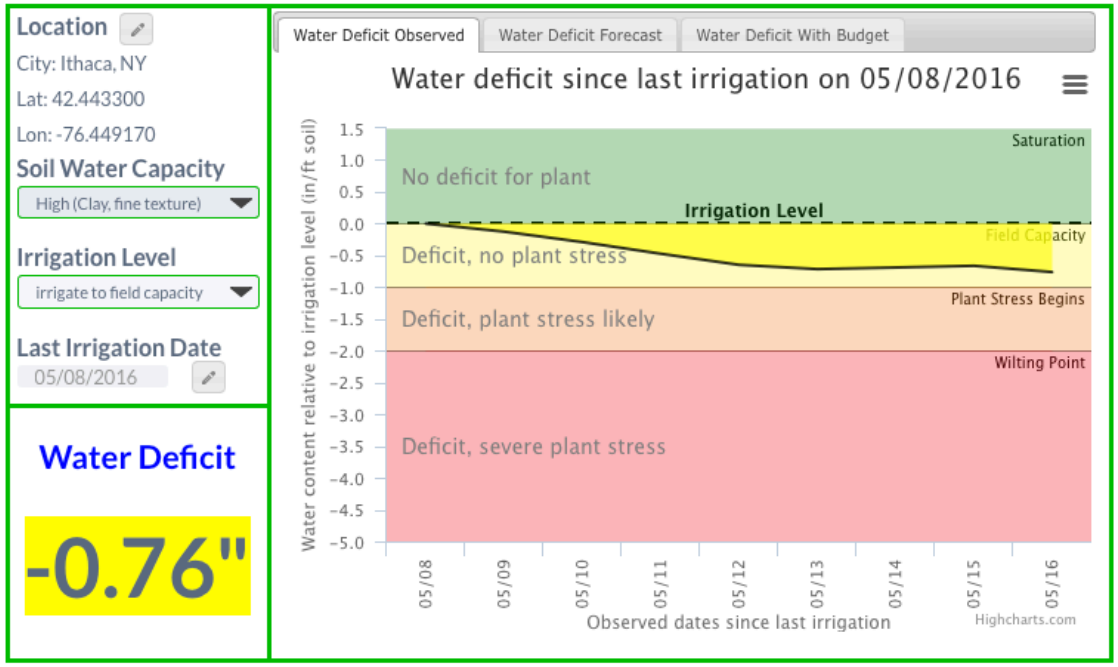


CSF Irrigation Scheduling Tool

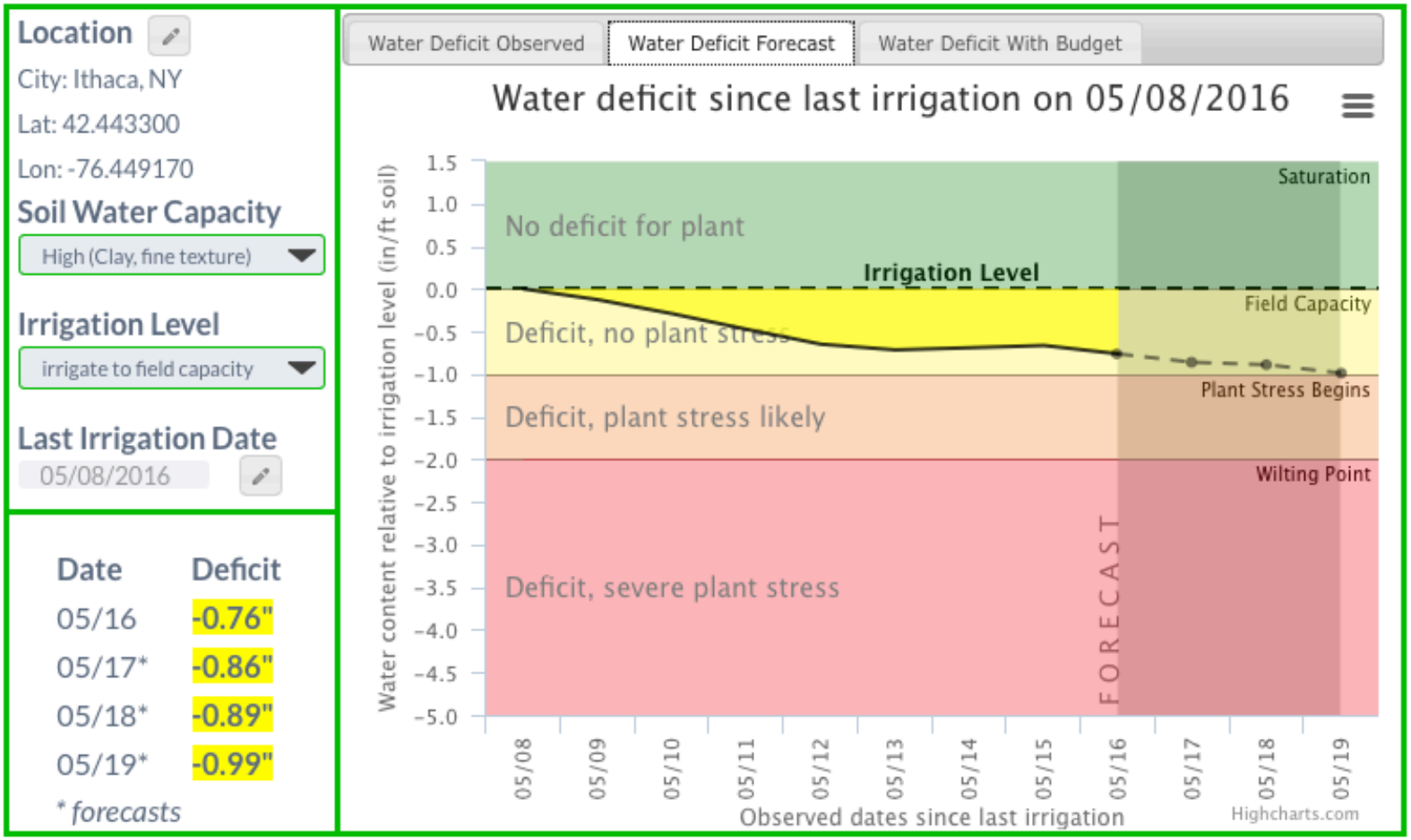
- Used to determine optimum frequency and duration of watering
- The tool estimates soil water content to create an outlook of current and future water deficits
- Farmers/Advisors use the tool to:
  - Optimize watering (minimize plant stress and conserve water)
  - Contextualize current water deficits, given historical data and climate change

CSF Irrigation Scheduler

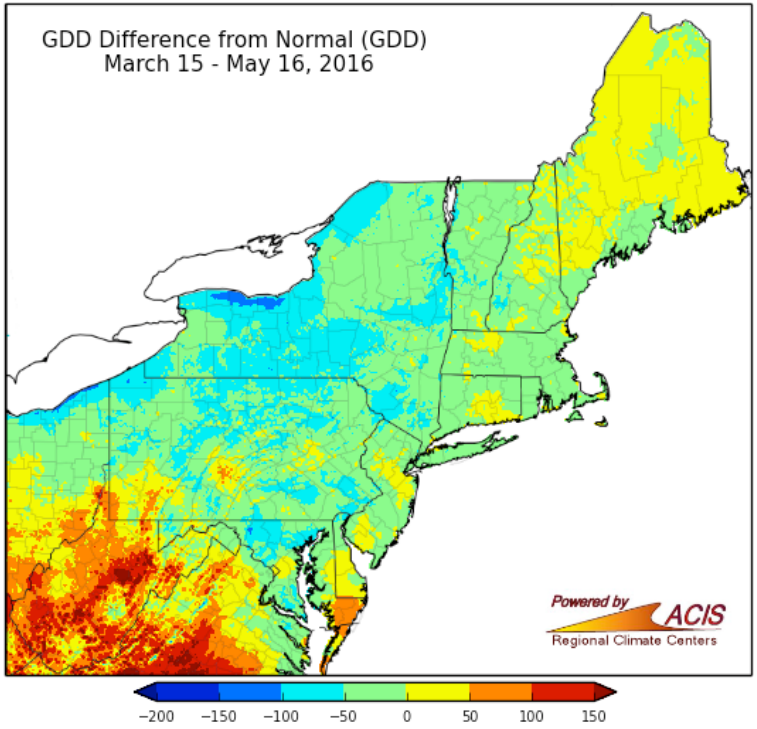
- Using the Tool:
  - Input location, soil type, and irrigation preferences
  - Graphs with water deficit, forecast, and budget will be created and shown

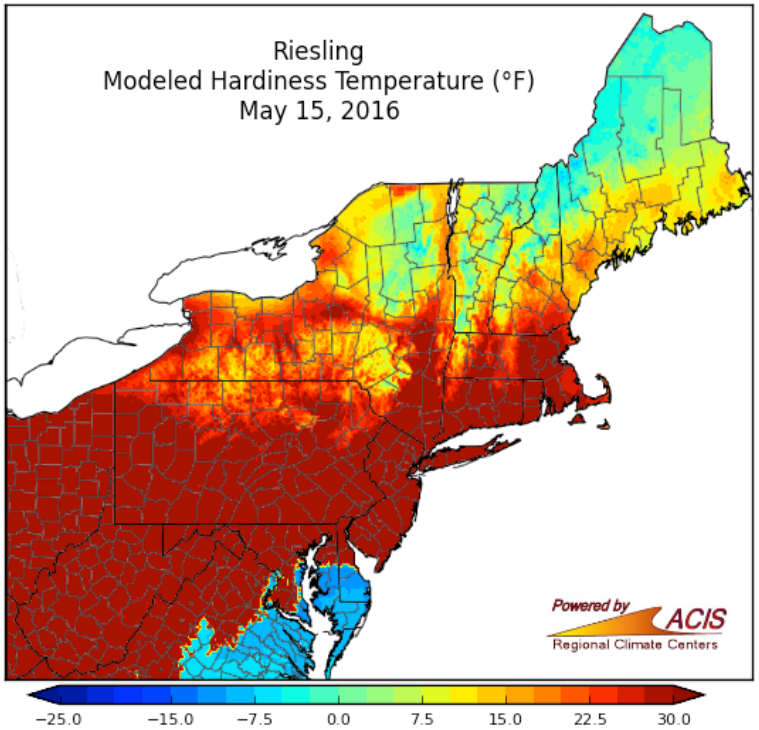


CSF Irrigation Scheduler



Regional Views

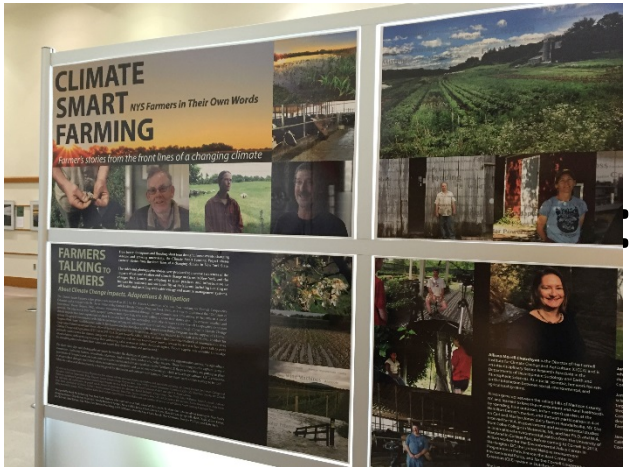




Training & Outreach

- 2015-2016: Building out the website functionality, tools, and resources
- 2016 spring: Introducing to extension and farmers at agriculture conferences
- 2016 fall/winter: Training for CSF extension team and ag extension specialists
- 2017: More in-depth training with farmers, building new tools

Listening to Stakeholders



- Farmer Advisory Committee
- Climate Smart Farming Stories:
  - Multimedia Project: NYS Farmers in their Own Words
- Focus Groups & Surveys:
  - Focus Groups with Producers & Advisors: with Penn State and UW Madison (2016/17 with USDA NE Hub and Dairy CAP)
  - Joining Multi-State Hatch Project: Food, Feed, Fuel, and Fiber: Security Under a Changing Climate: Enhance understanding of how ag stakeholders climate info and tools in their management decision processes (2017-2020).

Collaborative Infrastructure

- **Researchers, Staff & Students**: Allison Chatrchyan, Art DeGeatano, Jonathan Lambert, Trevor Partridge, Joana Chan, Toby Ault, Dave Wolfe, Mike Hoffmann
- **Data & Models**: Northeast Regional Climate Center & partners with NEWA: Art DeGaetano and staff
- **Agriculture & Extension Expertise**: CALS Faculty, CSF Extension Team, Farmer Advisory Committee
- **Computer Programmers**: Rick Moore & Brian Belcher
- **Website Design & Programming**: Knowledge Town
- **Support**: USDA Federal Formula Hatch & Smith Lever Funds, and the New World Foundation

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Questions & Answers?

Feedback from Farmers,
Extension Specialists, and Partners

Thank You!

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  Director, Northeast Regional Climate Center
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