

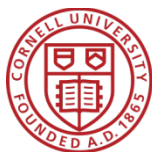
Cornell Climate Smart Farming: Integrating Research, Stakeholder Engagement, Modeling and Outreach for Climate Resilient Farming and Rural Communities

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Cornell Institute for Climate Change and Agriculture

Presentation for the NRCC Monthly Webinar

June 30, 2016



Cornell University



Climate Smart Farming in New York and the Northeastern US

The Northeast region is home to:

- @ 22% of US population
- 175,000 farms
- Comprising 21% of the region's landmass
- Urban and rural, varied geography
- Producing agricultural commodities worth more than \$21 billion/year
- Increasing risks & potential opportunities: need to help farmers prepare.



Climate Change and Northeast Agriculture

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



- Cornell Institute: Formed 2013
- 140+ Cornell researchers working on climate change
- 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 and Extension Team: Launched 2015
- Partnerships, Research & Information Clearinghouse

climateinstitute.cals.cornell.edu/

STAKEHOLDER-DRIVEN RESEARCH AND OUTREACH

CUTTING-EDGE RESEARCH

- Climate Change Data and Impact Assessments
- Agroecological Research
- Stakeholder Surveys & Interviews

DECISION SUPPORT TOOLS

- AgroClimate Models & Forecasts
- Web-based Tools
- Adaptation & Mitigation Practices

EXTENSION PROGRAM OUTREACH

- Climate Smart Farming Extension Team
- Training and Outreach
- Farmer Videos and Case Studies
- Farmer Forum to Share practices

FARMER-COMMUNITY ENGAGEMENT

- Farmer Advisory Panel
- Pilot Testing Materials & Tools
- Partnerships with Agencies and NGOs

CLIMATE SMART FARMING

- Increased Agricultural Resiliency
- Reduced GHG Emissions
- Increased Sustainable Agricultural Productivity

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)
 - 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).



Program Goals

Cornell Climate Smart Farming

- Increase farm resiliency to extreme weather and climate variability through adoption of BMPS for climate change adaptation.
- Increase energy efficiency and renewable energy capacity to reduce operating costs and GHG emissions.
- Sustainably increase agricultural productivity, farming incomes, and food security.

CLIMATE CHANGE & AGRICULTURAL IMPACTS

- 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

Infrastructure @ Cornell


- **Data & Models:** Northeast Regional Climate Center (NOAA)
- **Climate Change, Agriculture, Ecosystem, Community & Extension Expertise:** CALS Researchers, CSF Extension Team, Farmer Advisory Committee
- **Computer Programmers & Website Design**
- **Support:** Small, Short-Term Funds (USDA Federal Formula Hatch & Smith Lever Funds, and the New World Foundation funds): Need for long-term, core funding!

How is the changing climate affecting your farm?

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

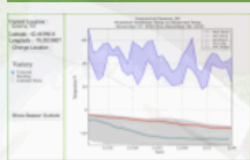
See more Tools

CSF Growing Degree Day Calculator



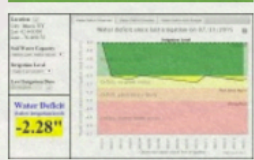
Growing Degree Days (GDD) are a measure heat accumulation used to predict plant development and pest/disease outbreaks.

CSF Freeze Risk Tools



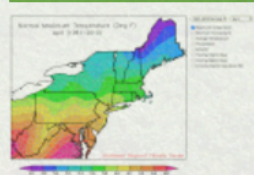
Graphs hardiness vs. observed temperature for several crop varieties over a specific date range to determine freeze risk.

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.

Climate Smart Farming Extension Team

Let us help you increase your farm's resiliency and sustainability.

[Read about the Team](#)

A photograph showing a group of people outdoors. A woman in a red shirt is in the foreground, gesturing with her hands as if speaking to a group. Several other people, including men and women, are visible in the background, some wearing hats and casual clothing.

Dr. Kimberley Morrill, Dairy Management

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

Jesse Strzok, Agricultural Economics

Laura McDermott, Small Fruit

Dr. Darcy E.P. Telenko, Vegetables and Integrated Pest Management

Luke Haggerty, Viticulture & Enology

Resources and Best Management Practices

Reduce emissions. Increase resiliency and profitability. Realize opportunities.

[See more Resources](#)

TOP RESOURCES

[About My Woods](#)

[Adaptation Workbook for Forest Management and Conservation](#)

[Anaerobic Digester Business Model and Financing Options](#)

[Animal Agriculture in a Changing Climate](#)

[Annual Phosphorus Loss Estimator](#)

[Building soils for better crops](#)

CSF Resources and Best Management Practices

Climate

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Categories

Agricultural Sectors

- Dairy, Poultry, and Livestock
- Field Crops
- Grapes
- Greenhouse, Nursery, and Sod
- Maple
- Specialty Crops
- Tree Fruit and Berries
- Vegetables

Media Types

- Decision Support Tool
- Fact Sheet
- Online Courses
- Reports and Studies
- Videos
- Weather Map
- Workshop Presentations

Vulnerability Types

- Drought
- Flooding
- Frost Risk
- Heat Stress
- Insects
- Multiple Vulnerabilities
- Weeds

Adaptation Strategies

- Conservation Tillage
- High-Residue Cover Crops
- Irrigation

Science for a Hungry World



The NASA, "Science for a Hungry World" video series covers the challenges surrounding feeding an ever growing population and how [Read more »](#)

Maine's Climate Future: Assessment Report



Published by the University of Maine, Maine's Climate Future is a comprehensive assessment of climate change in Maine. The report [Read more »](#)

NRCS Technical Publications



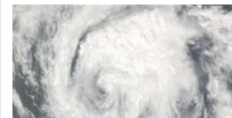
The Plant Materials Program is an extensive listing of technical publications organized by topics such as Climate Change, Cover Crops and [Read more »](#)

Connecticut Ag Impact Report



Published by the Connecticut Governor's Steering Committee on Climate Change, this report analyses the potential impacts of climate change on [Read more »](#)

New Jersey Ag Impact Report



Published by Rutgers Climate Institute, this report examines the potential impacts of climate change on agriculture, aquaculture and fisheries throughout [Read more »](#)

Vermont Ag Impact Report



Published by the Vermont Agency of Natural Resources, this report provides an overview of potential climate change impacts on agriculture [Read more »](#)

Building soils for better crops manual



The third edition of Building Soils

Small Farm Adaptation Guidebooks



Preparing smallholder farm

Cool Farm Tool



Developed by the University of

Climate Smart Farming Tools

Climate

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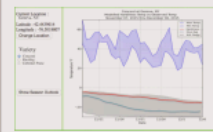
Videos

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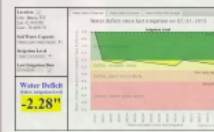
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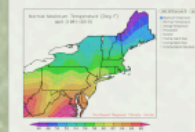
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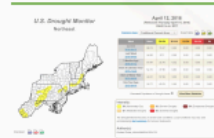
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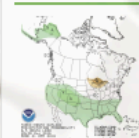
1 2 →

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



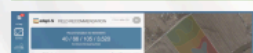
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USDA Plant Hardiness Map



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



CSF Growing Degree Day (GDD) Tool

- GDD:
 - Measures heat accumulation (development in plants is temperature-dependent)
- GDD Calculation:
 - $(\text{Average of Daily Min and Max Temp}) - (\text{Base Temp})$
- You can use this tool:
 - To predict important stages in plant growth
 - To predict pest and disease outbreaks
 - In planning for and response to seasonal variability

CSF GDD Tool

- Using the Tool:
 - Input location, planting date, and GDD threshold
 - Toggle between graphs of observed data and seasonal outlooks

CSF Growing Degree Day Calculator

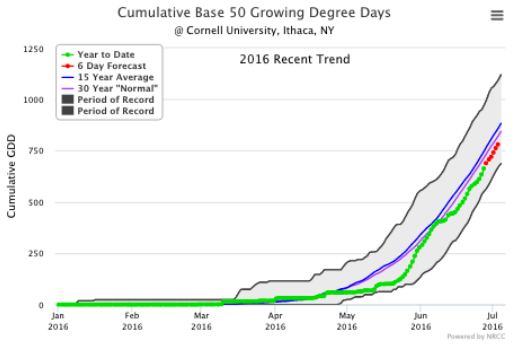
Climate
Tools
Team
Resources
Forum
Videos

Current Location:
 Cornell University
 Ithaca, NY
 Latitude: 42.450000
 Longitude: -76.480000
[Change Location](#)

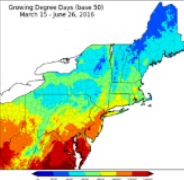
Planting Date:
 2016-01-01

GDD Threshold
 Base 50
 Base 8650
[Season Outlook](#)

Cumulative Base 50 Growing Degree Days
 @ Cornell University, Ithaca, NY



© Cornell University, 2016. Credits: Tool Developed by Art DeGaetano & Rick Moore.



This map shows the accumulation of base 50°F growing degree days (GDD) from March 15 to the current date. This map is a product of the Northeast Regional Climate Center, and part of a set of GDD Maps developed for the turf grass industry.

CSF GROWING DEGREE DAY CALCULATOR

The Growing Degree Day (GDD) calculator measures heat accumulation to help agricultural producers predict when a crop will reach important developmental stages. It can also be used to help predict potential pest and disease threats. At this time, the GDD tool uses a threshold that was originally optimized for corn production, but it can be suitable for other agronomic crops as well. *This tool has recently been integrated into the site. If you are experiencing difficulty, please try the tool on another web browser.*

Please also take our [brief survey](#) to give us feedback on the GDD tool.

How do I use this tool?

1. Input your location by navigating to your desired spot on the pop-up map, after clicking "Change Location"
2. Use the control panel on the left to input your planting date
3. Select your "GDD Threshold" of either base 50 or 86/50
4. Once this information is set, your graph will appear
5. Toggle between "Seasonal Outlook" and "Recent Trend" graphs

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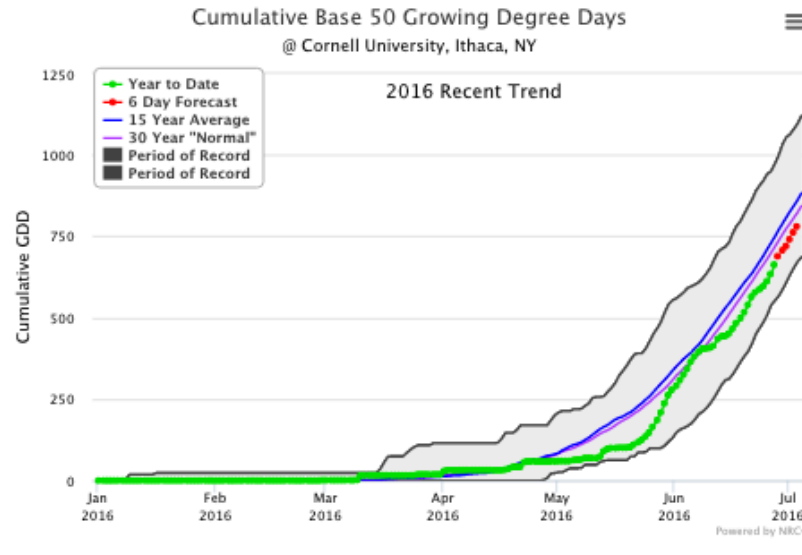
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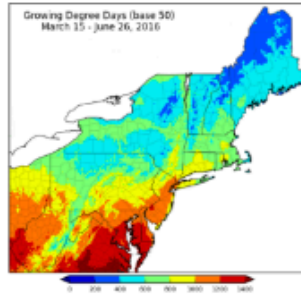
GDD Threshold

- Base 50
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[Season Outlook](#)



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If you use the GDD tool, please fill out the survey to give us your feedback:

https://cornell.qualtrics.com/jfe/form/SV_3y15GKX1SEzJAS9

CSF Irrigation Scheduler

Climate

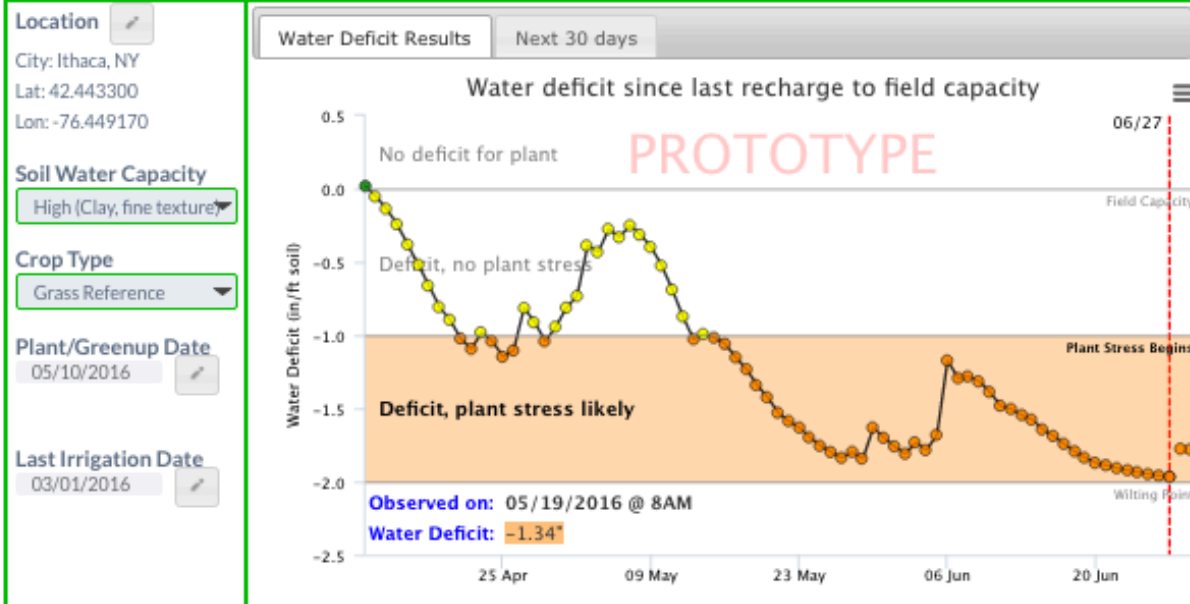
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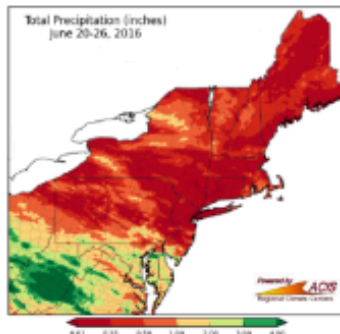
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© Cornell University, 2016. Credits: Tool Developer (Art DeGaetano), Programmer (Brian Belcher).



The above map is produced using approximately 700 rain gauge sites to show the total rainfall (inches) observed over the last 7 days in the Northeastern US. This map is a product of the Northeast Regional Climate Center, and part of a set of Moisture Maps developed for the turf grass industry.

CSF IRRIGATION SCHEDULER

Irrigation scheduling is used by farmers and irrigation system managers to determine the optimum frequency and duration of watering that is necessary to avoid plant stress. The Cornell Irrigation Scheduler estimates soil water content within a crop's effective root zone to inform decision makers about current and forecasted water deficits. *An initial prototype of this tool has recently been integrated into the site for the 2016 growing season. Additional features and enhancements are planned while advancing this tool out of the prototype stage. Your feedback is appreciated as the tool versions progress.*

How do I use this tool?

1. Input your location by entering your address or geographical coordinates.
2. Use the control panel on the left to input your soil type
3. Use the control panel on the left to input your crop type
4. Use the control panel on the left to provide your planting date (for annuals) or 'greenup' date (for perennials, when initiation of new leaves occurs).
5. Use the control panel on the left to provide your last irrigation date
6. Once this information is set, your water deficit charts will appear
7. Toggle between the tabs of "water deficit results" and "next 30 days" to view charts

Climate Smart Farming Forum

Ask questions. Get answers. Share Information.

Join or Search the Forum

RECENT TOPICS

[Precipitation changes in NE and other regions?](#)

[Details about more frost-free days during the year?](#)

[Irrigation on my farm](#)

[Installing more renewable energy on my farm](#)

[What are the GDD measures for corn?](#)

[Soil runoff in large rainfall events](#)

Create a Free Account: Get Answers, Share Information!

climatesmartfarming.org/forum/

Climate Smart Farming Multimedia

Gain first-hand knowledge via farmer success stories and demos.

[See more Multimedia](#)



RECENT MULTIMEDIA

[Adaptation and Agriculture](#)

[Apple Growers](#)

[Common Thread Farm](#)

[Cornell Maple](#)

[Farming for Energy](#)

[Fishkill Farms](#)

[Hahn Farm](#)

CSF Farmer Videos and Video Tutorials for Tools & the Site:

<http://climatesmartfarming.org/videos/>

Questions? Thank You!

Allison M. Chatrchyan, Ph.D.

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www.climatesmartfarming.org

