Photo: Tori L. Jackson

Weather Tools
show-n-tell

Erin Roche

Sonja Birthisel

UMaine Climate & Ag Network

Maine Climate and Ag Network

1865 THE UNIVERSITY OF
MAINE
Climate and Agriculture Network

Our Mission:
To increase communication and identify challenges, opportunities, and potential solutions for climate change and Maine agriculture.

www.umaine.edu/climate-ag/

Tools inform our response to changing weather!

THE UNIVERSITY OF MAINE

Maine Climate and Agriculture Network
umaine.edu/climate-ag

Farm Response to Changing Weather

Changes in average and extreme weather are affecting Maine agriculture, bringing both risks and potential opportunities. Here are some observations of how Maine weather is now different from the past, what may lie ahead, and examples of farmer choices and actions that can minimize risk and help ensure productivity.

Temperature

Longer Growing Season and Plant Hardiness Zone Shift
- The average length of Maine's frost-free growing season is now 12−14 days longer than in 1930, and is expected to further increase by 2−3 days per decade.
- Winter minimum temperatures that define plant hardiness zones are increasing faster than daily highs or temperatures in other seasons.

Potential Response Actions
- Choose longer season crops or varieties, or be flexible with earlier or later planting dates for current selections.
- Double cropping, inter-cropping, and greater use of cover crops.

**Early Spring Warm-up Increases Frost/Freeze Risk**
- Late winter/early spring temperature variability has caused early crop development before the last spring freeze date. Spring frosts affected Maine apple, blueberry, and peach crops in 2012 and 2016.

Potential Response Actions
- Consider spring frost risk in site/crop/variety, and planting date decisions.
- Minimize frost risk (hoop houses, mulch, row covers, inter-cropping, no-till).
- Enhance emergency response capacity (freeze forecasts, wind machines, irrigation, heaters, frost protectants).
- Diversify farm enterprise. Consider crop insurance to spread risk.

(**Above**) Recent, current, and future projected plant hardiness zones. Zone numbers labeled in top map. *Data Source: PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu.*

1971-2000

2001-2015

ca. 2035
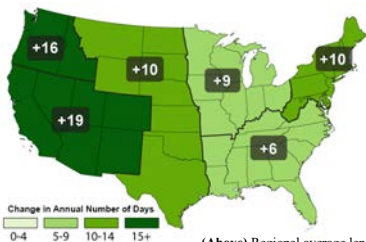
Change in Annual Number of Days
0-4   5-9   10-14   15+

(**Above**) Regional average length of frost-free season for 1991-2012 compared to 1900-1960. *Adapted from Melillo et al. (2014), Climate Change Impacts in the United States.*

- Longer growing season

- Higher average temperatures

- More frequent/intense downpours

Outline

- In-the-field tools
- Computer-based / apps
- What do you use?
- Looking to the future

Nothing replaces going out into the field...

The modified growing environment

When to vent the high tunnel?

Big-faced thermometers

-> Mount one high up, one lower when plants are young

Amazon

What's the temperature under the row cover?

Soil thermometer

-> When to remove row cover

-> Loose pollen at high 80's – 90°F

Johnny's Selected Seeds

What's the humidity?

Hygrometer

-> Measures moisture content of air

-> When to open vents

-> Diseases management
 (i.e. mildews, botrytis)

Hygro-thermometer, FarmTek

How much rain did we receive?

Rain gauge

-> Measures: cumulative precipitation

-> Field workability

-> Pesticide applications

Gempler's

How much moisture is in my soil?

NRCS "feel/appearance method"

-> sample at the root depth of crop at 3+ sites per field

Sandy Clay Loam, Loam, Silt Loam

Figure 1 - 25 to 50% Available Moisture

1.6 to 0.8" per foot depleted

25 to 50 percent available 1.6 to 0.8 inches per foot depleted

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.

50 to 75 percent available 1.1 to 0.4 inches per foot depleted

Moist, forms a ball, very light staining on fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger.

75 to 100 percent available 0.5 to 0.0 inches per foot depleted

Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger.

Source: NRCS

How much moisture is in my soil?

Soil moisture sensors

-> when to turn irrigation water "on" and "off"
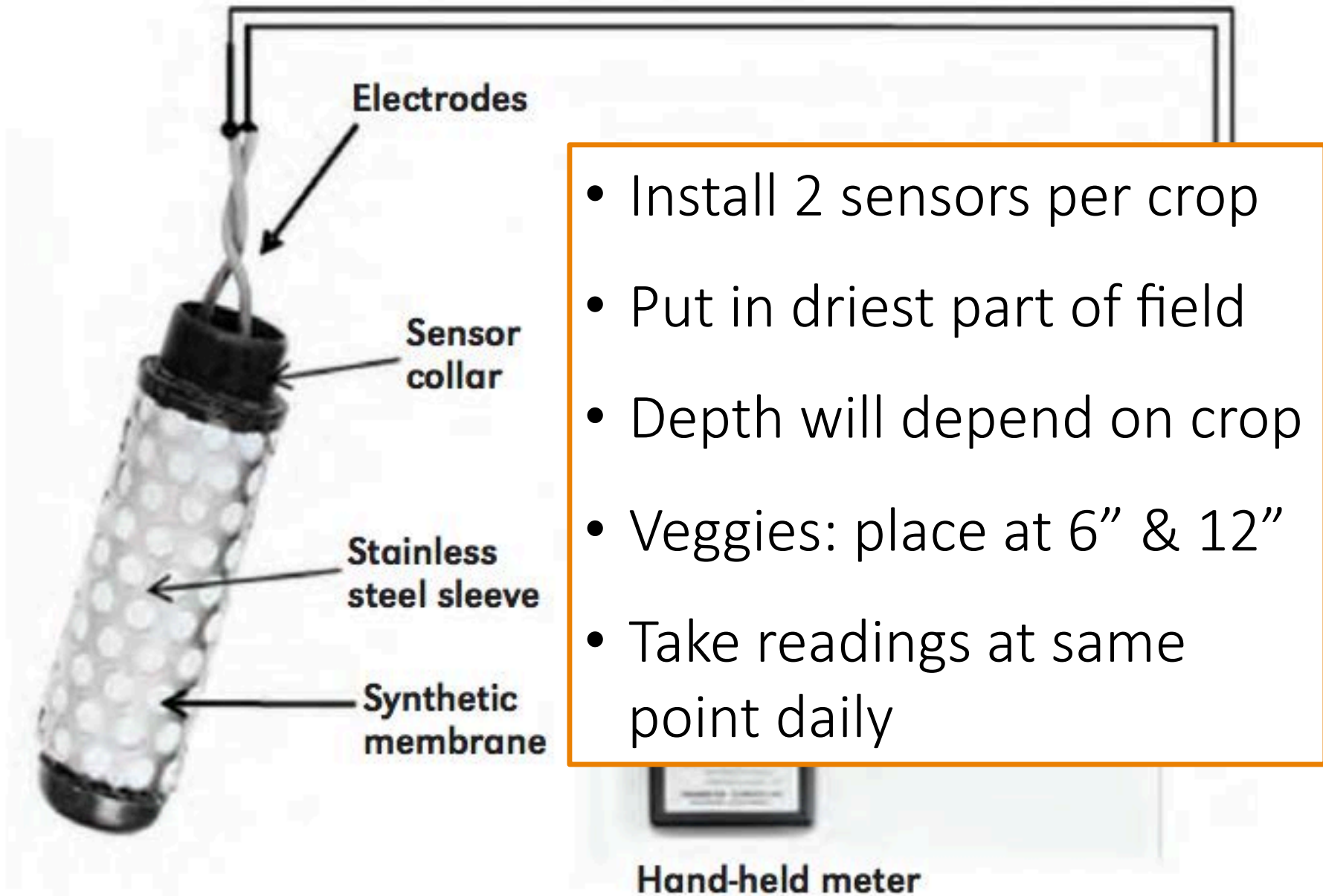
-> measure soil water tension
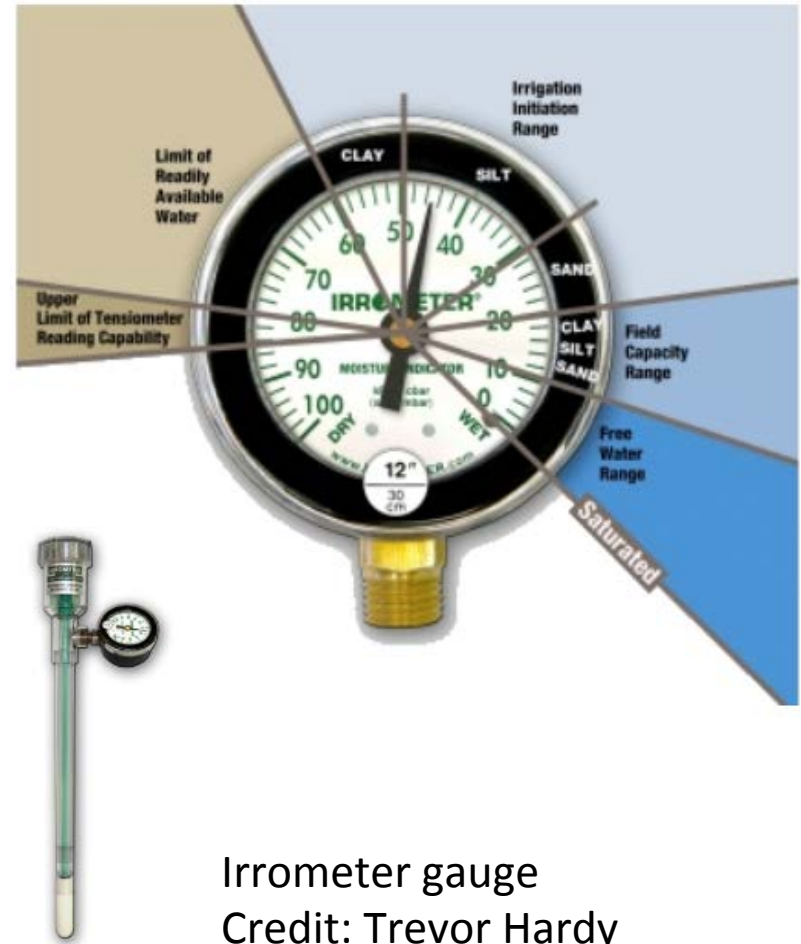

Watermark sensors

Irrometer

Electrodes

Sensor collar

Stainless steel sleeve

Synthetic membrane

- Install 2 sensors per crop

- Put in driest part of field

- Depth will depend on crop

- Veggies: place at 6" & 12"

- Take readings at same point daily

Hand-held meter

Figure 2. Model 200SS Watermark sensor with stainless steel sleeve and a handheld meter.

Credit: UNL Extension

When to irrigate?

- Take the difference of two sensors to determine length of irrigation cycle

- Above 40, turn water on

- At 20, turn water off

- Combine with forecasts and field knowledge

Irrometer gauge
Credit: Trevor Hardy

Sensors in the field/tunnel

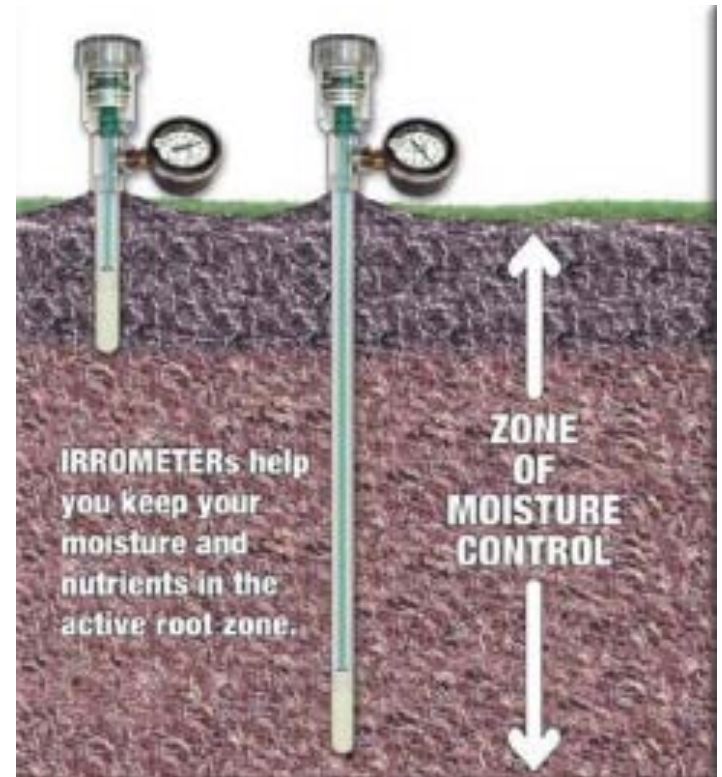Credit: Trevor Hardy

Caragh Fitzgerald

Soil Moisture Sensors

Watermark sensors

Sensor: $35 ea

Reader: $210

Upshot: Don't freeze

Irrometer

Sensor: $85 ea

Downside: Freeze

What are the conditions at my farm?

AgroMet (RainWise, Inc.)

  -> Records temp., leaf wetness, RH, precip., solar radiation, wind speed

  -> Add on soil moisture/temp. sensors

  -> Can deliver data to smart phone

RainWise, Inc.

Climate Hubs Tool Shed

About Feedback Smart Search

search

Sector

☑ Agriculture ☐ Climate ☐ Ecosystem Services
☐ Forestry ☐ Grazing Land ☐ Livestock

Region

☐ Caribbean ☐ Midwest ☑ Northeast ☐ Northern Plains
☐ Pacific Northwest ☐ Southeast ☐ Southern Plains
☐ Southwest ☐ Southwest - Pacific Islands

Search Clear Search

Tools found: 64

Agriculture Climate Ecosystem Services Forestry Grazing Land Livestock

Adapt-N

Precision management of nitrogen inputs for grain, silage, and sweet corn production, provides daily updates of N status, and recommendations, uses re More ...

http://www.adapt-n.com/

Ag Weather Tools

Ag Weather Tools provides GPS-based roaming alerts, as well as forecasts, touch screen interactive weather displays, and ag commentary. The app also g More ...

http://www.farms.com/agriculture-apps/weather/ag-weather-tools

AgFleet

64 unique tools, apps, models for the northeast

Farms.com™

Search

Sign-Up | **Login** (you are not logged in)

Fri, Jan 4, 2019

🏠 **Farms.com Agriculture Apps**

Modify Your Search

Enter Keywords

Weather ⌄

All Sub-Categories ⌄

All Languages ⌄

All Countries ⌄

All Prices ⌄

All Devices ⌄

New Search

22 App(s) Listing found for Weather

Sort by: App(s) A-Z ⌄ | Per Page: 10 ⌄ | « Page 1 of 3 »

Ag Weather Tools

♥ Add to favorite | ⬇ **Free** Go to Store | ✉ Send to email

Developed by : **Telvent DTN, LLC**

★ ★ ★ ⯪ ☆

Countries : Canada,US Introducing the agricultural industry's first weather application, which delivers exclusive GPS-based roaming alerts, as well as top-rated forecasts, touch screen interactive weather...

AgroClimate

♥ Add to favorite | ⬇ **Free** Go to Store | ✉ Send to email

Developed by : **AgroClimate**

☆ ☆ ☆ ☆ ☆

Countries : Canada,US The AgroClimate application centralizes on the advancement of climate and weather-based solutions for the agricultural industry.

AgruWeather

♥ Add to favorite | ⬇ **Free** Go to Store | ✉ Send to email

Developed by : **Booster, Inc.**

★ ★ ★ ★ ☆

Countries : Canada,US AgruWeather is the ultimate weather App for farmers. AgruWeather uses the best reliable data sources worldwide,NOAA GFS2 , World Meteorological Organization, Weather...

CLIMATE FIELDVIEW

Digital agriculture's leading farm software platform

Analyze your farm's data in one place with the Climate FieldView app

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climate.com/static/dmb/

Help   Settings   Logout

CLIMATE **FIELDVIEW**   Fields   Prescriptions   Data   Import   Notifications   Buy

Field Summary   BETA   Edit Field   Close
Field 1

Weather

Planting

---   ---
Planted   Avg Population

Harvest

---   ---   ---
Avg Yield   Moisture   Harvested

Past Weather:

Past Weather | Weather Forecast

Date Range: 1/1/2019 - 1/16/2019 📅   Harvest Year: 2019   Compare: None
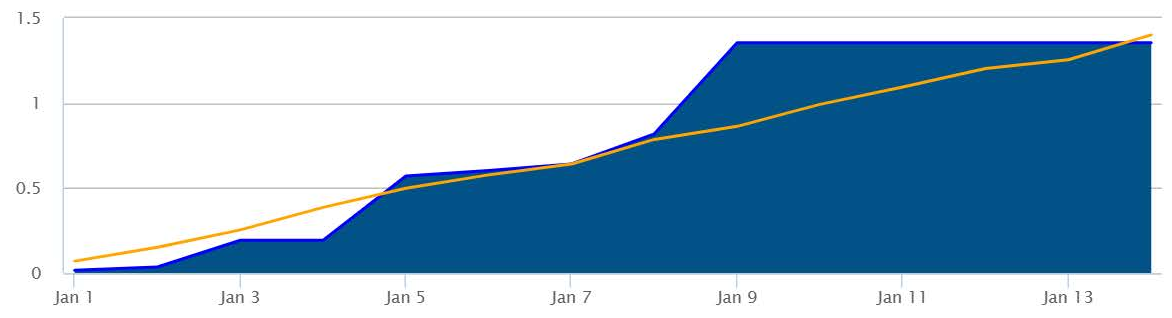
Precipitation   Help ❓

Accumulated Precip

1.5

1

0.5

0

Jan 1   Jan 3   Jan 5   Jan 7   Jan 9   Jan 11   Jan 13

Type here to search

7:29 PM
1/16/2019

CSF
Climate Smart Farming
A program of Cornell University

Powerful and user-friendly climate
tools for farmers in the Northeast

Climate Smart Farming Tools
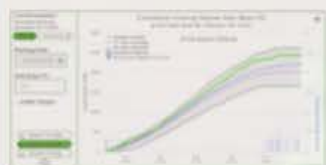
Climate | Tools | Team | Resources | Videos

The Cornell Climate Smart Farming online toolkit is designed to help farmers from the Northeast US improve their productivity and resiliency in the face of a changing climate. These decision support tools are used when making informed decisions about production systems based on location-specific climate data, weather forecasts, and future outlooks. All CSF tools allow for selection of multiple locations, at the field level, in order to receive the most local and relevant data. Tools produced by other organizations, including NOAA and USDA, are also provided.

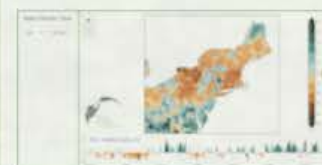| CSF Climate Change in Your County	CSF Growing Degree Day Calculator	CSF Water Deficit Calculator	CSF New York State / Northeast Drought Atlas
Find out how the climate has changed in your county since 1950, and what is projected over the next century.	Plots Growing Degree Days (GDD) to help predict plant development and pest/disease outbreaks, and provides a climatological context.	Monitors current and forecasted soil water deficit at your location to allow efficient water management and smart scheduling of irrigation.	This brand new product, courtesy of Dr. Toby Ault and his research group, is designed to portray drought and drought risk in new and useful ways to agriculturalists.

UMaine Cooperative Extension Disease/Pest Forecasting

Ag-Radar: Weather-based pest management tool for apples.

Maine Potato IPM: Blight forecasting.

Wild Blueberry: Mummy berry forecasting method.

*** MAINE	*** CONNECTICUT
ME-Monmouth (UMaine Highmoor Farm)	CT-Southington
ME-Auburn	*** MASSACHUSETTS
ME-Cumberland Center	MA-Amherst
ME-Fairfield	MA-Belchertown (UMass Cold Spring Orchard)
ME-Gorham	MA-Belchertown (Phoenix)
ME-Hebron	MA-Brookfield
ME-Hope	MA-Deerfield
ME-Levant	MA-Easthampton
ME-Limerick	MA-Groton
ME-New Gloucester	MA-Leominster – halted 11/1
ME-Newport	MA-Northboro
ME-Old Town (UMaine Rogers Farm)	MA-Westhampton
ME-Presque Isle	*** NEW BRUNSWICK
ME-Sabbatus	NB-Fredericton – halted 10/3
ME-Sanford	*** NEW YORK
ME-Skowhegan	Private sites: Geneva and Highland
ME-South Bridgton	*** RHODE ISLAND
ME-Sweden	RI-Greenville
ME-Thorndike	RI-Middletown
ME-Vassalboro	*** VERMONT
	VT-Cornwall
	VT-Dummerston
	VT-South Burlington – halted 11/1 (UVM Hort. Farm)

extension.umaine.edu/ipm/ag-radar-apple-sites/

Network for Environment & Weather Applications (NEWA)

newa.cornell.edu/

What tools do you use?

What resources might help you better plan for current and changing weather?

- Weather data for your records or ag software?
- Short-range forecasts tuned for farmers?
- Long-range, or seasonal weather outlooks?
- Management tools?
- Workshops or educational events?
- Policy work with ME Dept. Ag, etc.?

Apps

Ag Weather Tools: First ag industry weather app. Gives month-to-date precip. vs 10 year avg and % of normal.

ColdSnap!: Frost Alarm, high/low temp warnings

WeatherSentry: Weather monitoring, patented PrecipTimes estimates for snow/rain

Weather Underground: Hyper-local forecasts, interactive radar, satellite maps, crowd-sourced data

Apps

Pocket Rain Gauge: Records rainfall based on GPS.

Climate: Field workability, soil moisture, crop tracker

Credit: Farms.com

Climate Smart Farming
A program of Cornell University

CSF

Powerful and user-friendly climate
tools for farmers in the Northeast

CSF Water Deficit Calculator

Current Location:
Cornell University, Ithaca, NY

Change Location

Soil Water Capacity
Medium (Loam, med text▼)

Crop Type ⓘ
Roots and Tubers ▼

Planting/Budbreak
06/01/2018 📅

Last Irrigation Date
NONE 📅

📈 Season to Date
📈 30-Day Outlook
📈 Climate Change
ⓘ Info

Water deficit for 2018

@ Cornell University, Ithaca, NY

No deficit for plant

Planting

Field Capacity

Deficit, no plant stress

Deficit, plant stress likely

Plant Stress Begins

Deficit, severe plant stress

Wilting Danger Exists

CLICK & DRAG TO ZOOM

Water Deficit (in/ft soil)

0.5 — 0.0 — -0.5 — -1.0 — -1.5 — -2.0

Mar 2018 | Apr 2018 | May 2018 | Jun 2018 | Jul 2018 | Aug 2018 | Sep 2018 | Oct 2018 | Nov 2018

Powerful and user-friendly climate
tools for farmers in the Northeast

CSF Growing Degree Day Calculator

Climate | Tools | Team | Resources | Videos

Current Location:
Orono, ME 04473

Edit 📍 | Summary 📍

Planting Date:

01/01/2018 📅

GDD Base (°F)

50°F ∨

☐ **enable Targets**

📈 Season To Date
📈 Season Outlook
📈 Climate Change
ⓘ
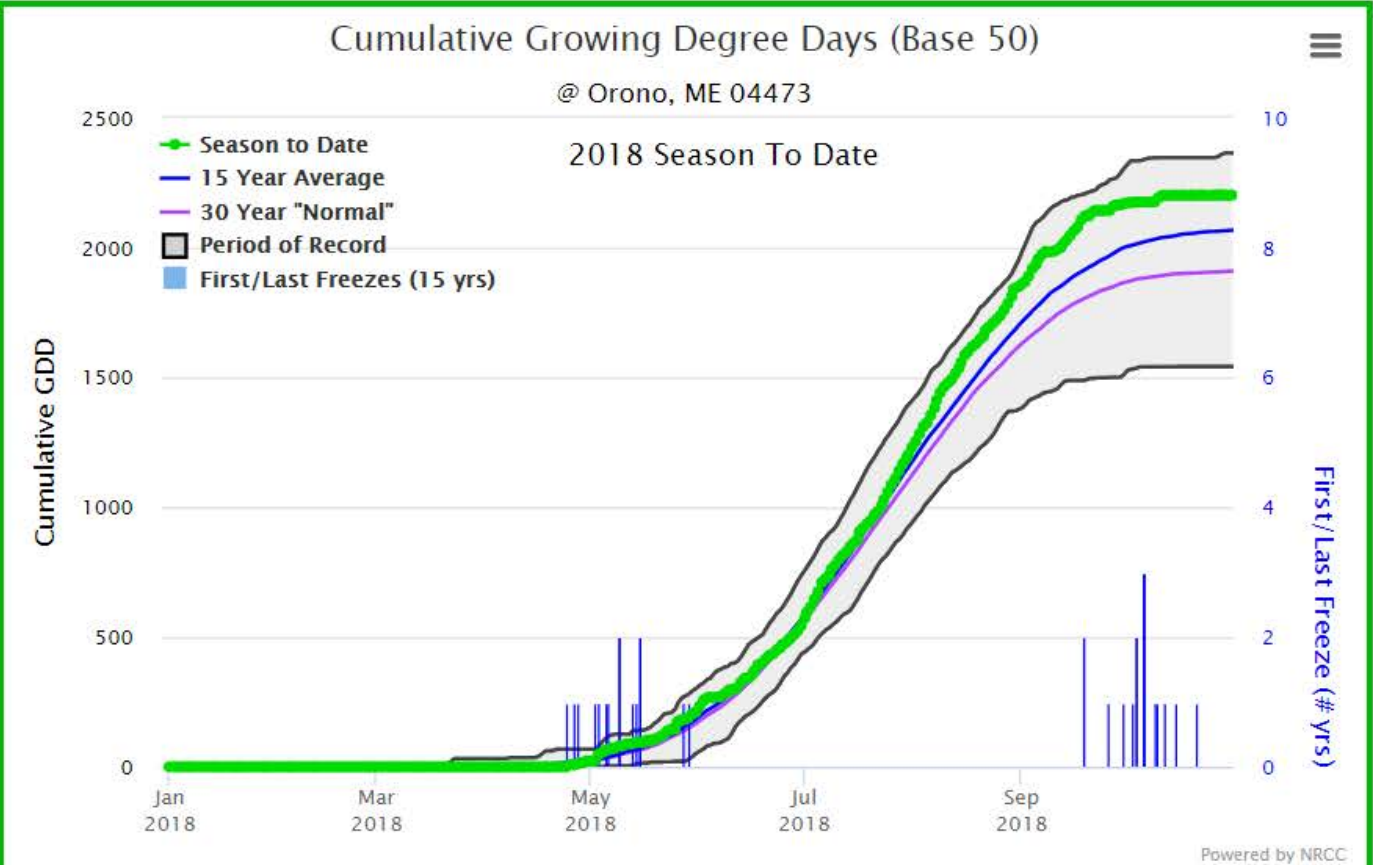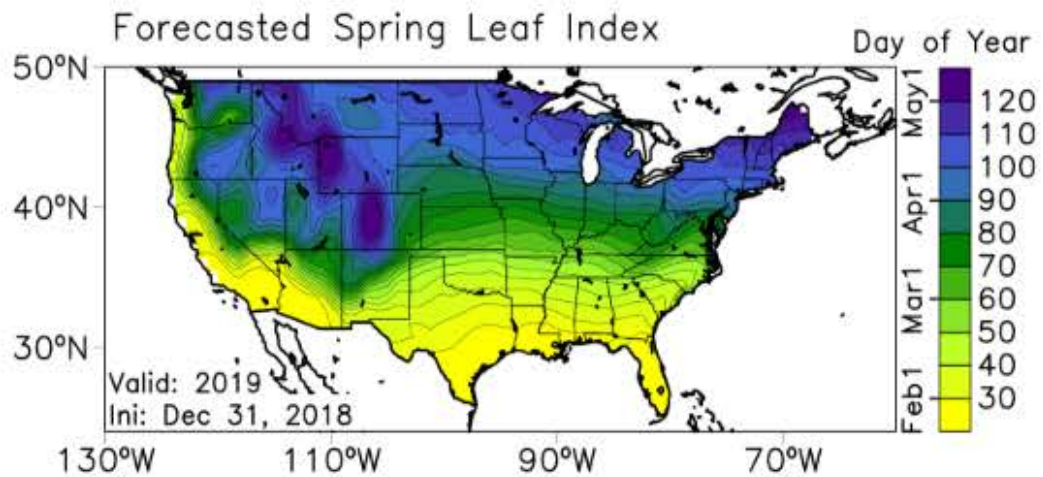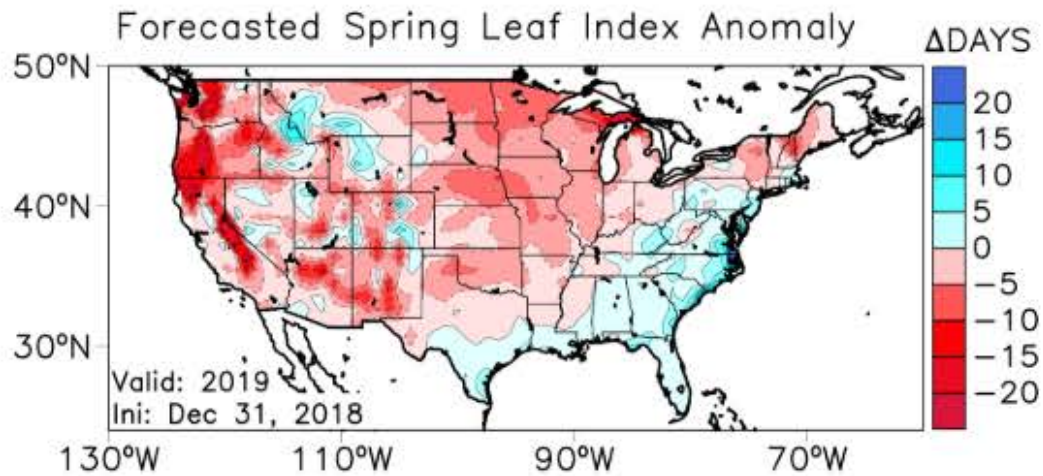
Cumulative Growing Degree Days (Base 50)

@ Orono, ME 04473

2018 Season To Date

Legend:
- **Season to Date** (green)
- **15 Year Average** (blue)
- **30 Year "Normal"** (purple)
- ☐ **Period of Record**
- **First/Last Freezes (15 yrs)** (blue)

Y-axis (left): Cumulative GDD — 0, 500, 1000, 1500, 2000, 2500
Y-axis (right): First/Last Freeze (# yrs) — 0, 2, 4, 6, 8, 10
X-axis: Jan 2018, Mar 2018, May 2018, Jul 2018, Sep 2018

Powered by NRCC

Credits: Tool Developed by Art DeGaetano, Rick Moore & Brian Belcher. Previous version available here.

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ECRL Springcasting

Climate | Tools | Team | Resources | Videos

Forecasted Spring Leaf Index Anomaly

ΔDAYS

Valid: 2019
Ini: Dec 31, 2018

Forecasted Spring Leaf Index

Day of Year

Valid: 2019
Ini: Dec 31, 2018

CLIMATE FIELDVIEW

Fields Prescriptions Data Import

Notifications Buy Now

Field Summary BETA Edit Field
Field 1

Close

Weather Forecast:

Past Weather Weather Forecast

Weather

Planting
--- ---
Planted Avg Population

Harvest
--- --- ---
Avg Yield Moisture Harvested

	TEMPERATURE	WIND	HUMIDITY	DEW POINT
	27 °F	8 mph	88 %	23 °F

Hourly Forecast

HOUR	9 AM	10	11	12	1	2	3	4	5	6	7	8 PM	9	10	11	12	1	2	3	4	5	6	7 AM	8
% PRECIP	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WIND (mph)	6	6	7	8	8	8	8	7	7	6	2	2	1	1	0	0	0	0	0	0	0	0	0	0
CONDITIONS																								

7 Day Forecast

THU Jan 3	FRI Jan 4	SAT Jan 5	SUN Jan 6	MON Jan 7	TUE Jan 8	WED Jan 9
Partly cloudy	Fog	Rain	Clear	Snow	Snow shower	Snow
36°F 23°F	37°F 21°F	37°F 19°F	23°F 10°F	23°F 5°F	27°F 16°F	28°F 12°F
SSW 5mph	N 1mph	NW 9mph	NNW 7mph	ENE 4mph	N 5mph	NNW 7mph
0% precip	60% precip	60% precip	0% precip	80% precip	50% precip	30% precip

CLIMATE FIELDVIEW

Fields   Prescriptions   Data   Import

Notifications   **Buy Now**

Field Summary   **BETA**   Edit Field
Field 1

Close

Weather

Planting

---   ---
Planted   Avg Population

Harvest

---   ---   ---
Avg Yield   Moisture   Harvested

Past Weather:

Past Weather | Weather Forecast

Date Range: 1/1/2018 - 12/31/2018 📅   Harvest Year: 2018 ⌄   Compare: None ⌄

Precipitation
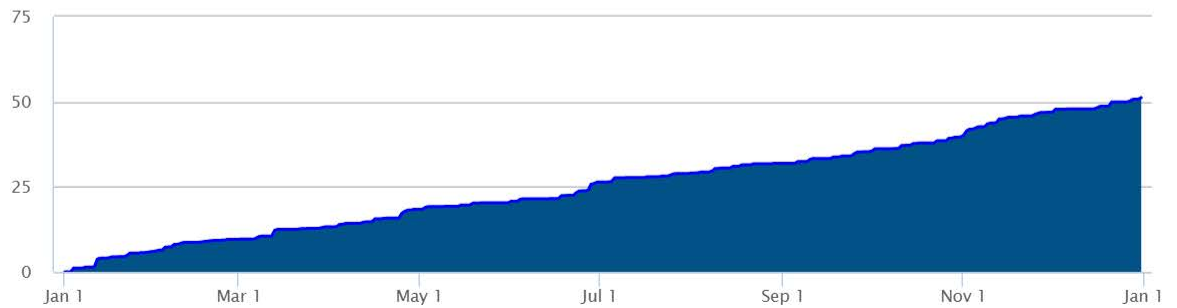
Help ❓

Accumulated Precip

75						
50						
25						
0	Jan 1	Mar 1	May 1	Jul 1	Sep 1	Nov 1	Jan 1

CLIMATE FIELDVIEW

Fields   Prescriptions   Data   Import

Notifications   Buy Now

Field Summary   BETA   Edit Field
Field 1

Close
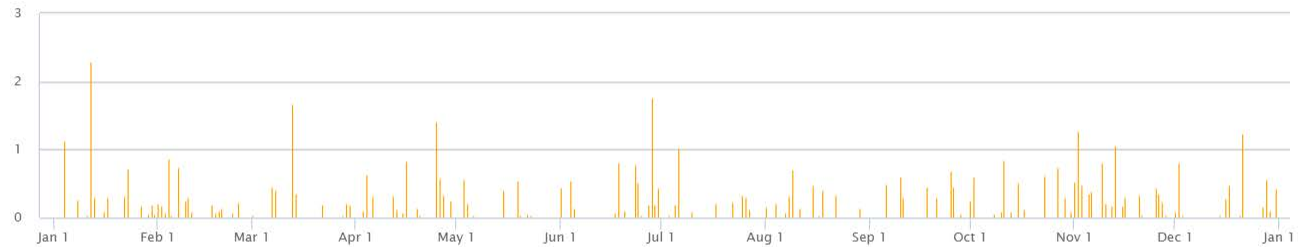
🌤 Weather ›

Planting

---   ---
Planted   Avg Population

Harvest

---   ---   ---
Avg Yield   Moisture   Harvested

Daily Amounts of Precip

Temperatures - High And Low

Help ❓