

Customized growing degree day (GDD) status and forecasting

Betsy Verhoeven, Mid-Willamette Valley Field Crops Extension, prepared Dec. 30th 2019

Review: What are GDD and how are they calculated?

- Also known as 'heat units'
- Used to predict the growth and development of organisms: plants, insects, fungal pathogens
- Can be calculated a number of ways, but the simply averaging method is most common.

$$GDD = \frac{(\max T + \min T)}{2} - \text{lower threshold}$$

- Where, max T = maximum observed daily temp and min T = minimum daily observed temperature
- The lower threshold is the temperature below which the organism stops growing or developing. This varies between crops. Most weather stations use a lower threshold of 50°F, this is the standard for corn and warm season annual crops. **This is not accurate for many of our crops.** For grass seed GDD, we use 0°C or 32°F. T-sum 200 or the 200 GDD mark for grass seed fertilization is based on 0°C as the lower threshold. This is what is reported on the Hyslop weather station. <https://agsci.oregonstate.edu/hyslop-weather-station>
- Units of °C or °F matter. Again, for grass seed we use 0°C as a base and Celsius units.
- GDD models of development are a simplification. We know that day length, precipitation, humidity, food sources and preceding weather patterns also affect development and growth.

Customizable GDD calculations using the uspest.org website:

- Combines US weather and climate data (29,000+ locations) with numerous models to support a wide range of agricultural decision making needs

Instructions:

NOTE: This works best on a laptop or desktop computer. Some features, i.e. the data quality checking are not easily accessible on a iPad or phone.

1. Go to uspest.org
2. Select the second option, https://uspest.org/dd/model_app

Welcome to the USPEST.ORG
web server at the Integrated Plant Protection Center
of Oregon State University

The following web sites/resources are hosted here:

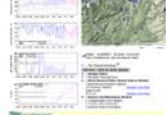
1. uspest.org/ycv Online IPM Pest and Plant Disease Models and Forecasting • for agricultural, pest management, and plant biosecurity decision support in the US, including:



- https://uspest.org/dd/model_app Mobile-enabled interface to over 125 degree-day/phenology models and calculator.



- <https://uspest.org/multimodels> First to "investigate" multiple plant disease and phenology models and degree-day calculations.



- <https://uspest.org/cgi-bin/usmapmaker.pl> Custom degree-day mapping calculator for 48 US states.



- Main index to online tutorials, daily DD maps, models linked from weather stations (tables)

2. <https://uspest.org/ycv> Spotted Wing Drosophila ipmPIPE website.

3. <https://uspest.org/mint> NEW ADDRESS: IPMP 3.0 Insect Pest Management in Peppermint Decision Support System (mint.ippe.orst.edu) is working again; but the new address is preferred; so please change yc

4. <https://uspest.org/potato> Identification and Management of Major Pest and Beneficial Insects In Potato.

5. <https://uspest.org/ipm/mcalc.html> Release calculator and guidelines to use a predator mite, *Neoseiulus fallacis* for biological control two-spotted spider mites in strawberry.

6. Note that the Pacific Northwest Insect and Weed Management Handbooks have moved and are no longer hosted here.

3. Go to “station” tab. Type in your zip code and hit “search for stations”. Click on “MAP” for one the stations. This will pull up a map and allow you to better identify a station that is a good fit for you.

4. Hover over the blue icon for a station and you can see the data quality. Select a station with good quality weather data (QA > 85% is a good threshold). Click on blue icon to select the station. It will turn purple and you should see the station name appear in the search box.

The screenshot shows a web browser with two tabs: "01 Jan-Feb - Google Drive" and "IPPC Degree-day calculator (FOG)". The address bar shows "uspest.org/dd/model_app". The website has a navigation bar with tabs: "Intro", "Station", "Model", "Output", and "Graph". The "Station" tab is active. Below the navigation bar, the text "Weather Station" is displayed. A search box contains the text "FOGO" and a button "search for stations". Below the search box, the text "Selected station: FOGO FOREST GROVE OR" is shown. A map of the region around Forest Grove, Oregon, is displayed. A tooltip for the selected station "FOGO FOREST GROVE" shows "Network: AGRIMET 180" and "Quality score 97%".

5. With your weather station selected, now click on the “Model” tab

The screenshot shows the same web browser with the "IPPC Degree-day calculator (FOG)" tab. The address bar shows "uspest.org/dd/model_app". The website has a navigation bar with tabs: "Intro", "Station", "Model", "Output", and "Graph". The "Model" tab is active. Below the navigation bar, the text "(no model selected) at FOGO, FOREST GROVE OR, 2019" is displayed.

6. In the "Model" drop down menu, select, "degree-day calculator (general purpose).
7. For calculation method, select: "simple average/growing dds"
8. Set lower to '0', upper to '65'
9. DO NOT CHANGE THE START DATE. The default of Jan. 1st is correct.
10. Select "Celsius" as the degree units.

01 Jan-Feb - Google Drive x IPCC Degree-day calculator (FOG x +

uspest.org/dd/model_app

Apps Gmail The New York Time... Google Scholar Bookmarks OSU Outlook Web... Outlook Web App 7-Day

Online Phenology and Degree-day Models for agricultural and pest management decision making in the US

Intro | Station | **Model** | Output | Graph

Degree-day calculator at **FOGO, FOREST GROVE OR, 2019**

Species / Model

Select a model or species. (see list of models) To choose your own calculation method and threshold temperatures, chose "degree-day calculator".

Model category: all models

Model: **degree-day calculator (general purpose)**

calculation method: **simple average/growing dds** lower: 0 °C upper: 65 °C

Dates

Set the start date to: Date based on your own determination

Start: Jan 1 2019

End: Dec 31


Options

Forecast type: after 7 days, use NMME extended seasonal forecast

Celsius: Celsius Upper and lower thresholds are now in Celsius.

Next

That's all the necessary input. From here, you can study the model details below, or go to the "Output" and "Graph" tabs for your model output.



Degree-Day Calculator
generic model - calculator general introduction

11. Now go to the output tab. Check the boxes next 'show model inputs table', 'show Date Comparison Table' and 'show full table' to see the full output.

01 Jan-Feb - Google Drive x IPPC Degree-day calculator (FOGO x +

← → ↺ ⌂ ⚠ Not secure | uspest.org/dd/model_app

Apps Gmail The New York Time... Google Scholar Bookmarks OSU Outlook Web... Outlook Web App 7-Day Fc

Online Phenology and Degree-day Models for agricultural and pest management decision making in the US

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Degree-day calculator at FOGO, FOREST GROVE OR, 2019

Model Inputs

☒ show model inputs table

Date Comparison







☒ show Date Comparison table

Model Output

☒ show full table

Temperatures (and degree-days) are in F; rain in inches.

date	max	min	rain	DDs today	DDs cumu	QA	events
1-1	42	28	0.01	34.9	35		* START *
2-1	47	36	0.21	41.4	1341		February 1st
3-1	51	34	0.02	42.2	2382		March 1st
4-1	63	45	0.02	53.8	3778		April 1st
5-1	69	36	0.00	52.0	5339		May 1st
6-1	81	52	0.00	61.1	7132		June 1st
7-1	80	55	0.25	62.3	8922		July 1st
8-1	88	55	0.00	62.5	10858		August 1st
9-1	82	58	0.00	63.3	12806		September 1st
10-1	63	33	0.00	48.2	14575		October 1st
11-1	62	28	0.00	45.1	16105		November 1st
12-1	40	32	0.13	36.3	17443		December 1st



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This app is produced by uspest.org at the Integrated Plant Protection Center at Oregon State University with support from the USDA National Plant Diagnostic Network, The OSU Agricultural Experiment Station, various USDA CSREES/NIFA grants, USDA SARE, USDA RMA, and USDA IPM Centers - Western Region. Climate map data provided by OSU PRISM Group, real-time public weather data provided by U. Utah Mesowest and other networks including WVSU AgWeatherNET, AGRIMET, CPS Adcon Networks, IFPNet Automata, California CIMIS, California PestCast, and others. Geo-coding (location search using place names) by OpenCage, using data© OpenStreetMap contributors.

Previous versions online since May 16, 1997; this is app version 0.93, updated 28 Dec 2018

Contact Len Coop at coopl@science.oregonstate.edu or 541-737-5523 if you have any questions about this program.

12. Review the output. You can also go to “Graph” tab and view a graph of GDD.

01 Jan-Feb - Google Drive

IPPC Degree-day calculator (FOGO) x

+

uspest.org/dd/model_app

AppsGmailThe New York TimesGoogle ScholarBookmarksOSU Outlook WebAppOutlook Web App

Online Phenology and Degree-day Models

for agricultural and pest management decision making in the US

IntroStationModelOutputGraph

Degree-day calculator at FOGO, FOREST GROVE OR, 2019

Model Inputs

☒ show model inputs table

Model species/general links	Degree-Day Calculator
Type	generic
Model source/other links	calculator general introduction
Calculation method	simple average
Lower threshold	0°F
Upper threshold	65°F
Directions for starting/BIOFIX	Date based on your own determination
Starting date	(default date) 1-1 2019
Ending date	default date 12-31 2019
Model validation status	in regular use
Region of known use	USA
Extended forecast type	After 7 days, use 7-month NMME based seasonal climate forecast

Date Comparison

☒ show Date Comparison table

Accumulation for FOGO from 1-1-2019 through 12-29: 19251 DDs(F)
data quality is ok.

This year is about	versus	QA	
10 days behind	2018	ok	Lets you see where you are at relative to last year, the year before that and the 30 year historical average
same day	2017	ok	
DDs exceed full year	30-yr normals	ok	

Model Output

☒ show full table

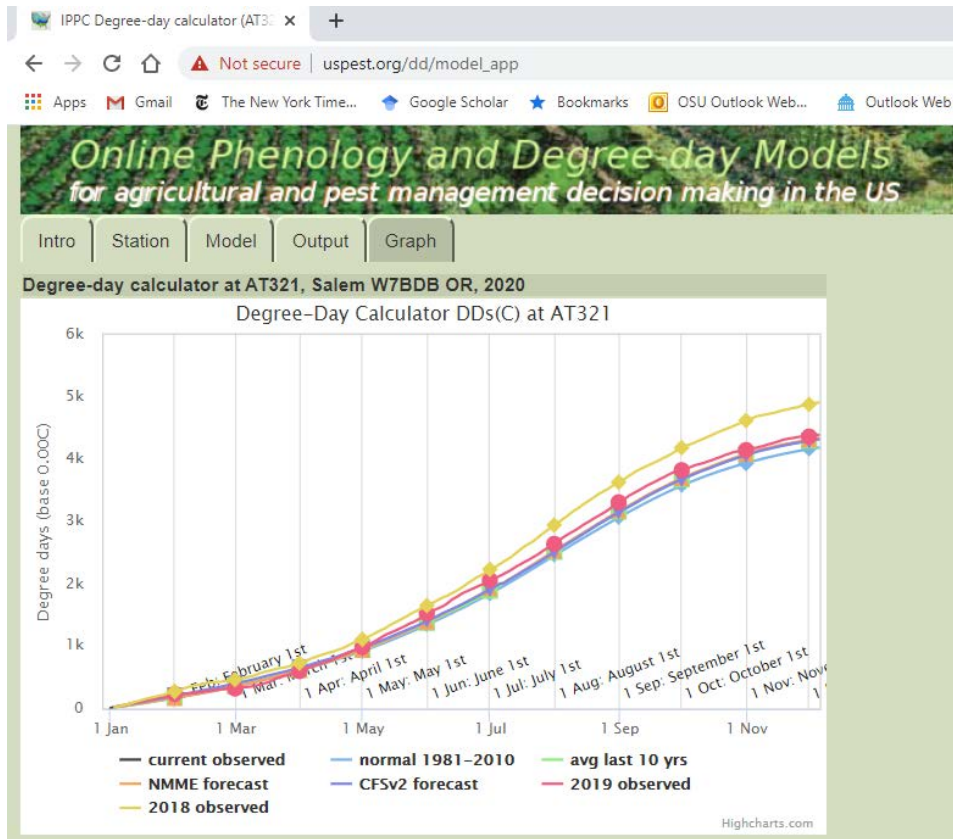
Temperatures (and degree-days) are in F; rain in inches.

date	max	min	rain	DDs today	DDs cumu	QA	events
1-1	42	28	0.01	34.9	35		* START *
1-2	41	29	0.00	34.9	70		
1-3	52	39	0.04	45.8	116		
1-4	50	43	0.11	46.8	162		
1-5	49	36	0.06	42.6	205		
1-6	46	38	0.27	41.7	247		
1-7	40	33	0.02	36.6	283		
1-8	47	39	0.42	43.3	327		
1-9	51	39	0.48	45.0	372		
1-10	55	45	0.08	49.8	421		

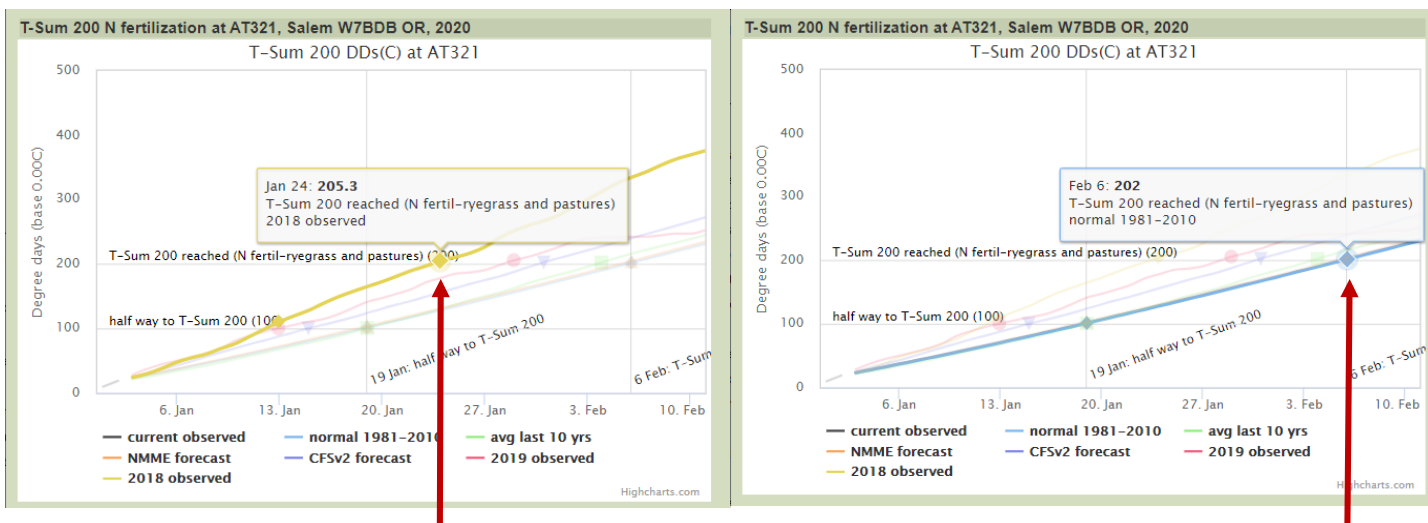
Good to double check your settings here

Lets you see GDD accumulation by day. You can also if you scroll the current month, you can also see the GDD forecast.

13. Example of graph generated



14. Another option is to use the model “T-Sum 200 N fertilization”. This model is designed specifically to calculate the 200 GDD mark using a base temp of 0°C to guide N applications to forage pastures and grass seed production. You have to go back to the “Model” tab and select this model in the drop down menu. You do not have to re-select your weather station. An example of the graphical output of this is below. These graphs are more detailed and allow you to really zoom in and look at the different predictions and past history of when we usually reach the 200 GDD point.



In 2018, 200 GDD was reached on Jan. 24th

30 year average is for 200 GDD to be reached around Feb 6th