

# Chilling & Prunes

Katherine Pope

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*Yolo-Solano-Sacramento*

# TAKE AWAYS

- 1) Chill is not great, but not too bad
- 2) Chill portions is a better way to count chill
- 3) Follow chill portions at the UC Fruit & Nut Center website.

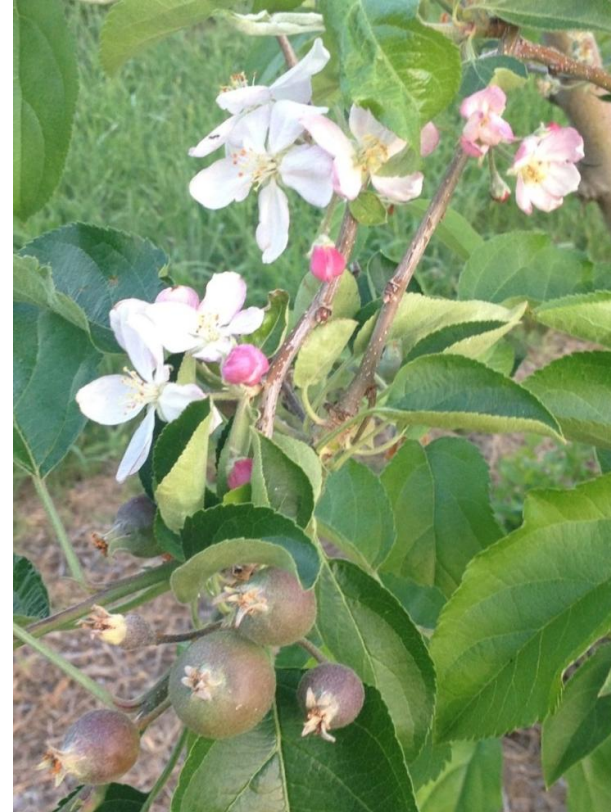
# Overview

- Why chill matters
- Why *how* you count chill matters
- Bonus complication: Fog
- What's under the hood of Chill Portions model
- How to count and use chill portions
- What to do *this* year

# Why Chill Matters – Poor, Erratic Bloom

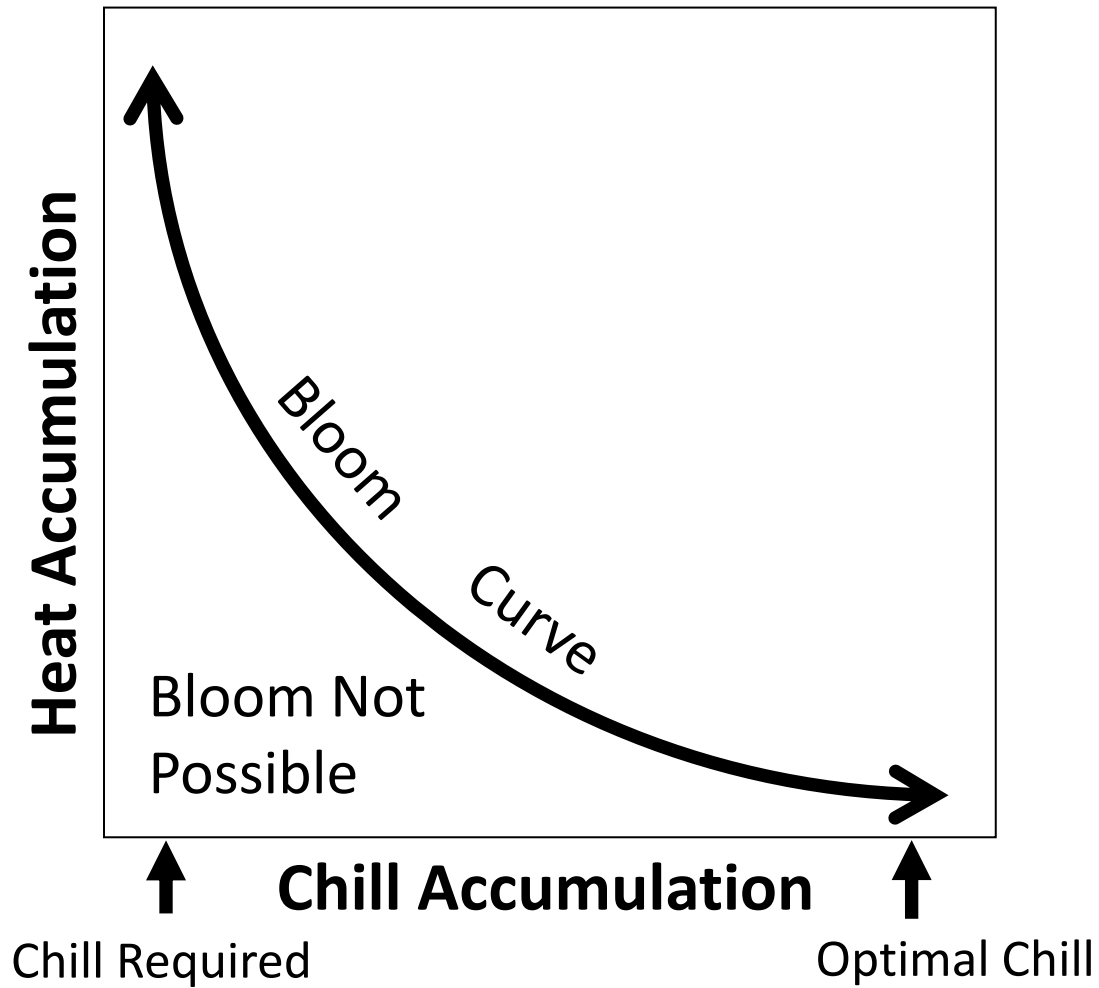


- Delayed, protracted, weak budbreak
- Bare shoots, spur shortage



- Poor fruit devel't, irregular ripening
- Underdeve'pd, abscising buds

# Why Chill Matters – Delayed Bloom



# Why how you count chill matters: Literature supporting chill portions

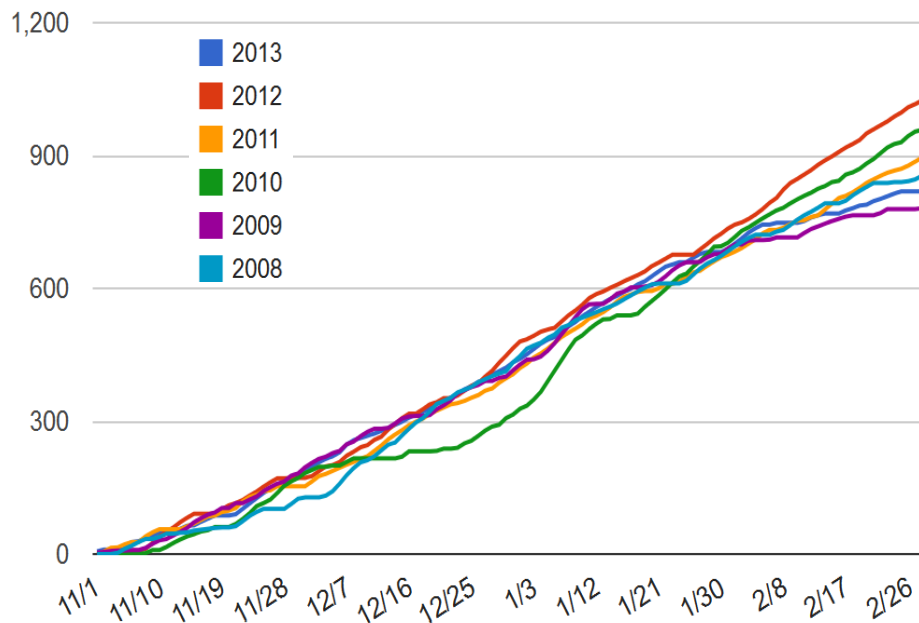
Lead Author	Year Pub'd	Crop	Location
Ramirez	2010	Almond	Chile
Viti	2010	Apricot	Spain, Italy
Gao	2012	Apricot	China
Ruiz	2007	Apricot	Spain
Alburquerque	2008	Cherry	Spain, Fr., Can., NY, CA
Glozer	2005	Cherry	California
Allan	1995	Peach	South Africa
Linsley-Noakes	1994	Peach	South Africa
Erez	1990	Peach	South Africa
Ghrab	2014	Peach	Tunisia
Maulion	2014	Peach	Argentina
Miranda	2013	Peach	Spain
Glozer	2008	Pear	California
Elloumi	2013	Pistachio	Tunisia
Zhang	2011	Pistachio	Australia
Glozer	2006	Prune	California
Luedeling	2009	Walnut	California

# Last Year's Experience: Chill Hours vs. Chill Portions

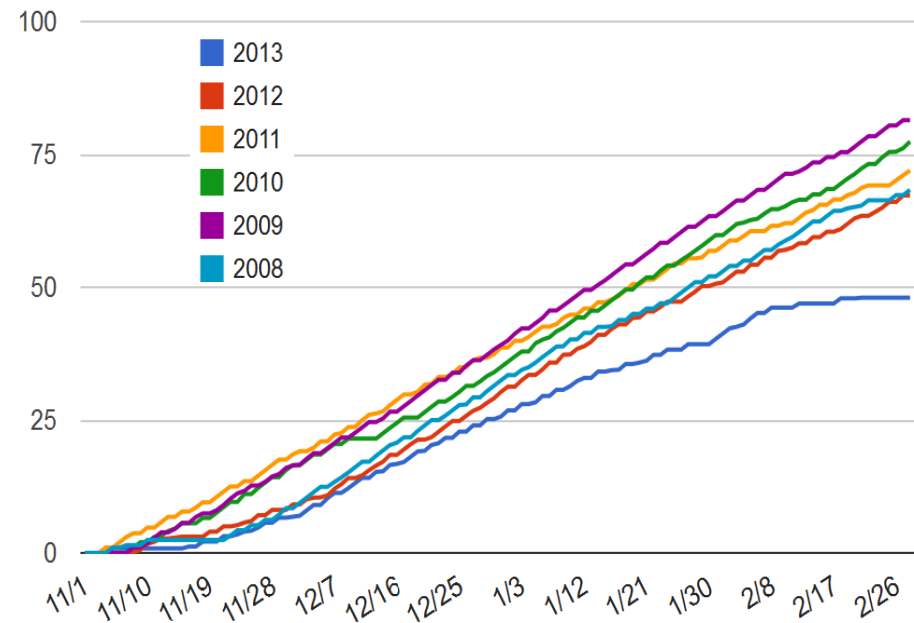
According to chill hours, 2013-2014 was an **average** winter.

According to chill portions, 2013-2014 was unusually warm.

Cumulative Chilling Hours - Westlands



Cumulative Chilling Portions - Westlands

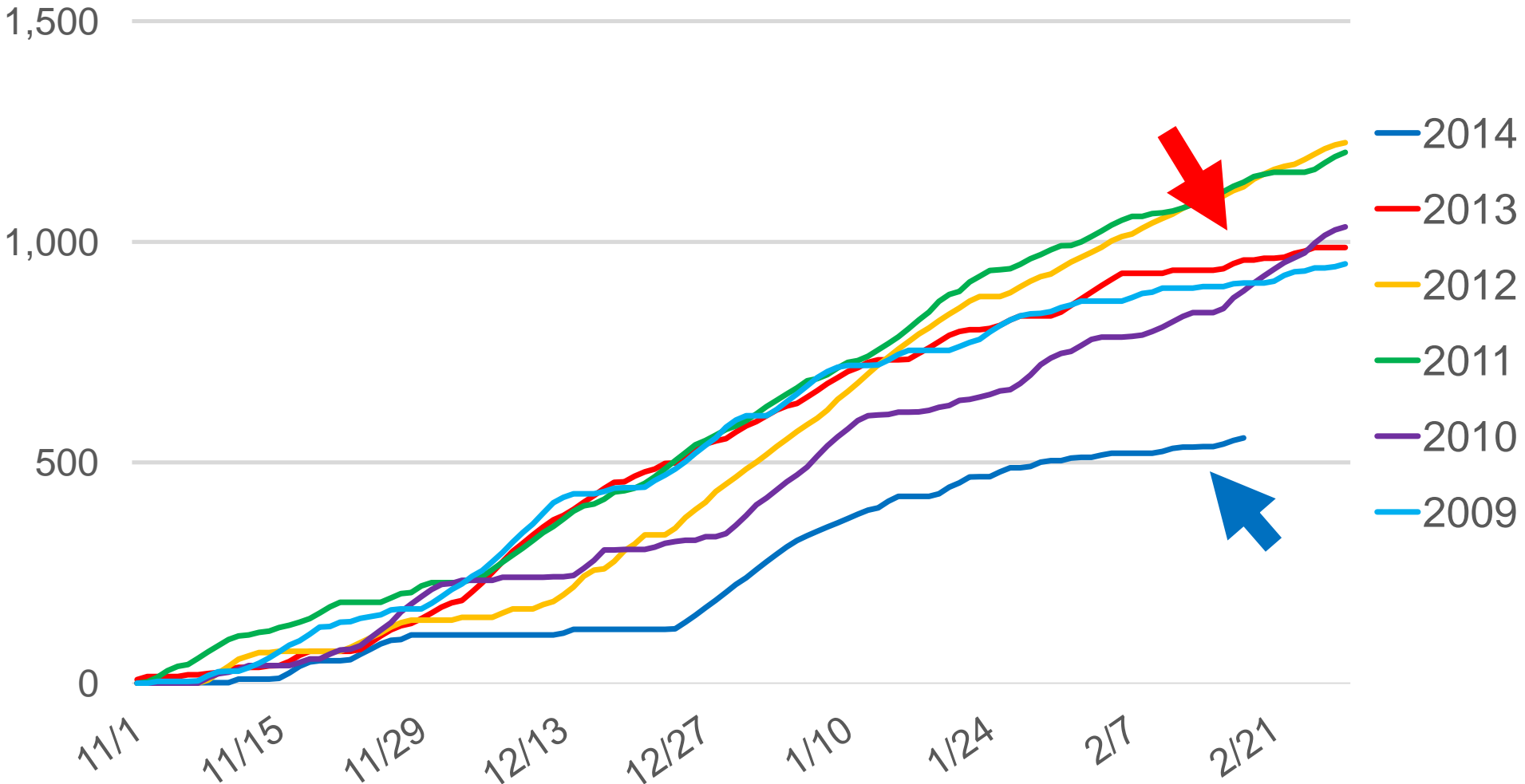


This year, chill hours look awfully low. But chill portions are on track with last year.



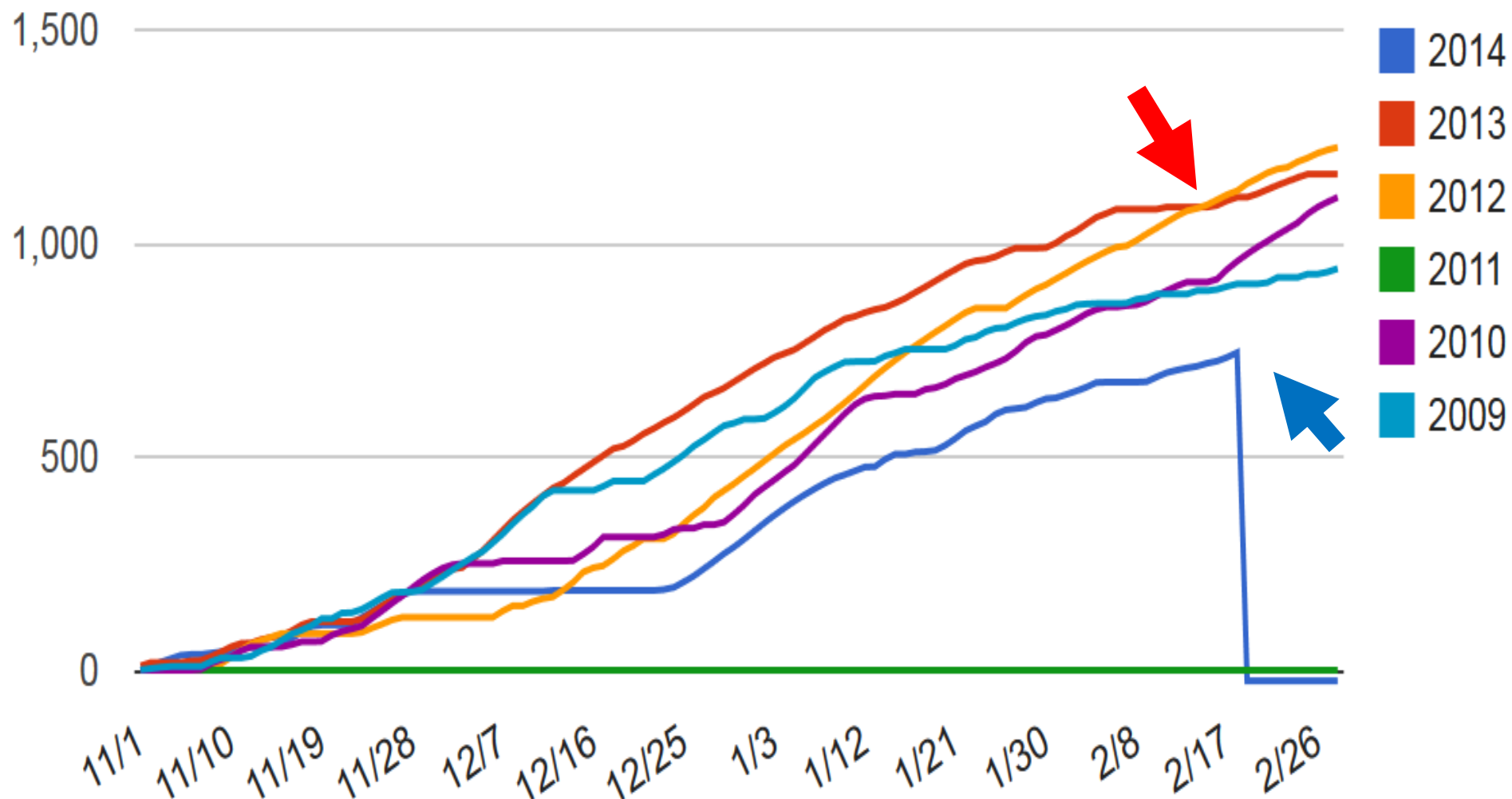
# Cumulative Chilling Hours

# Gerber



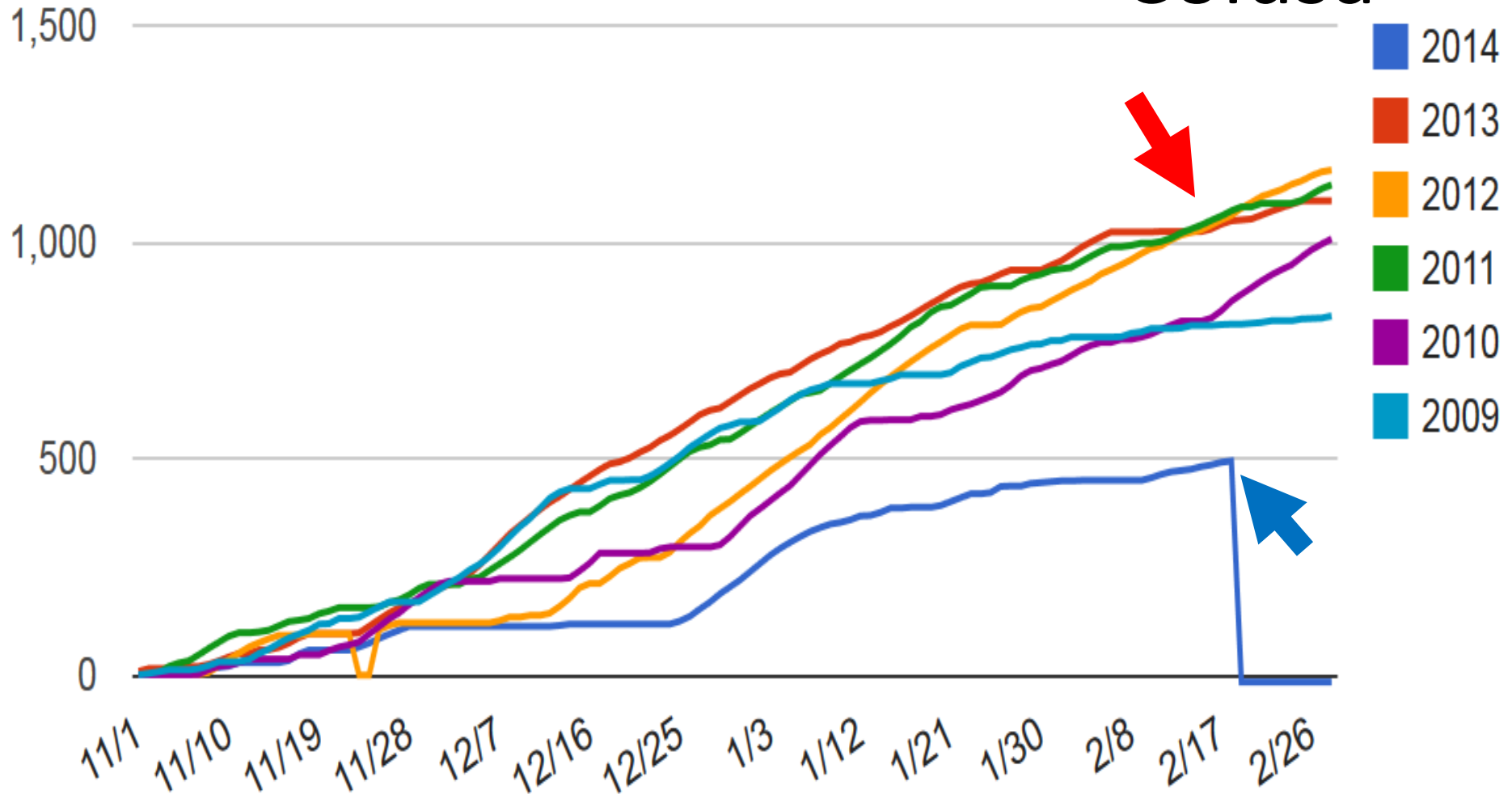
# Cumulative Chilling Hours

# Durham



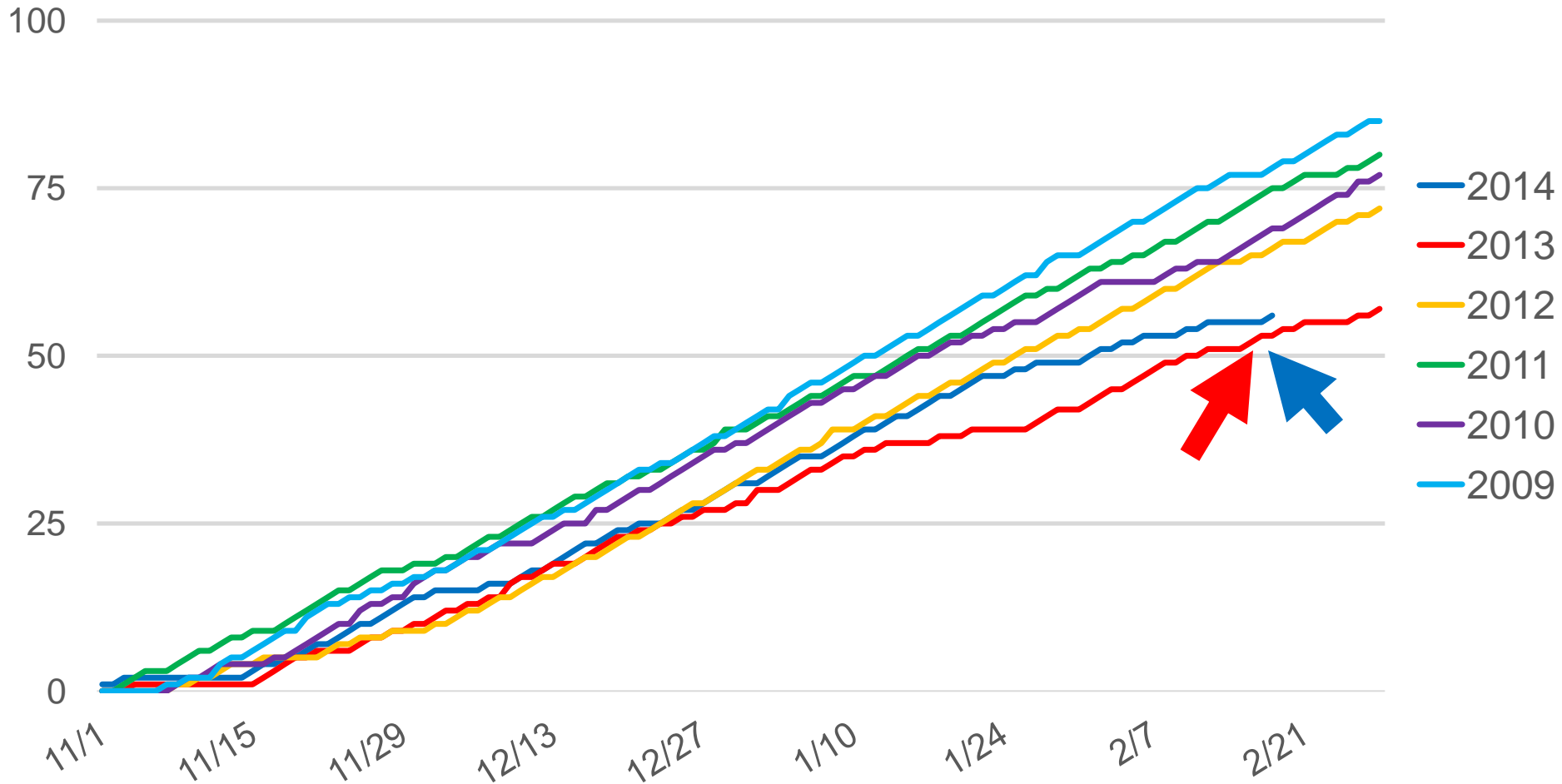
# Cumulative Chilling Hours

# Colusa



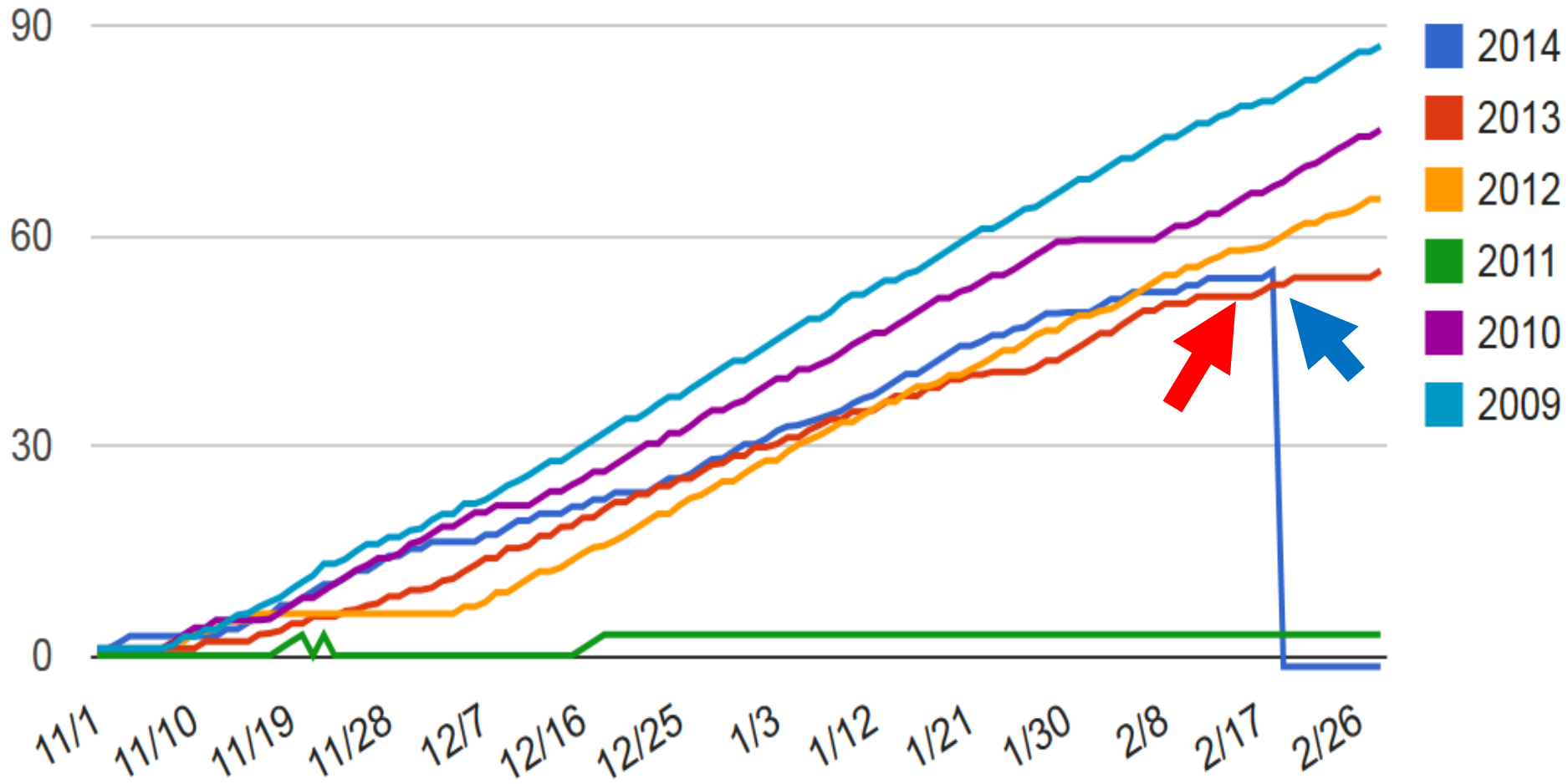
# Gerber

## Cumulative Chilling Portions



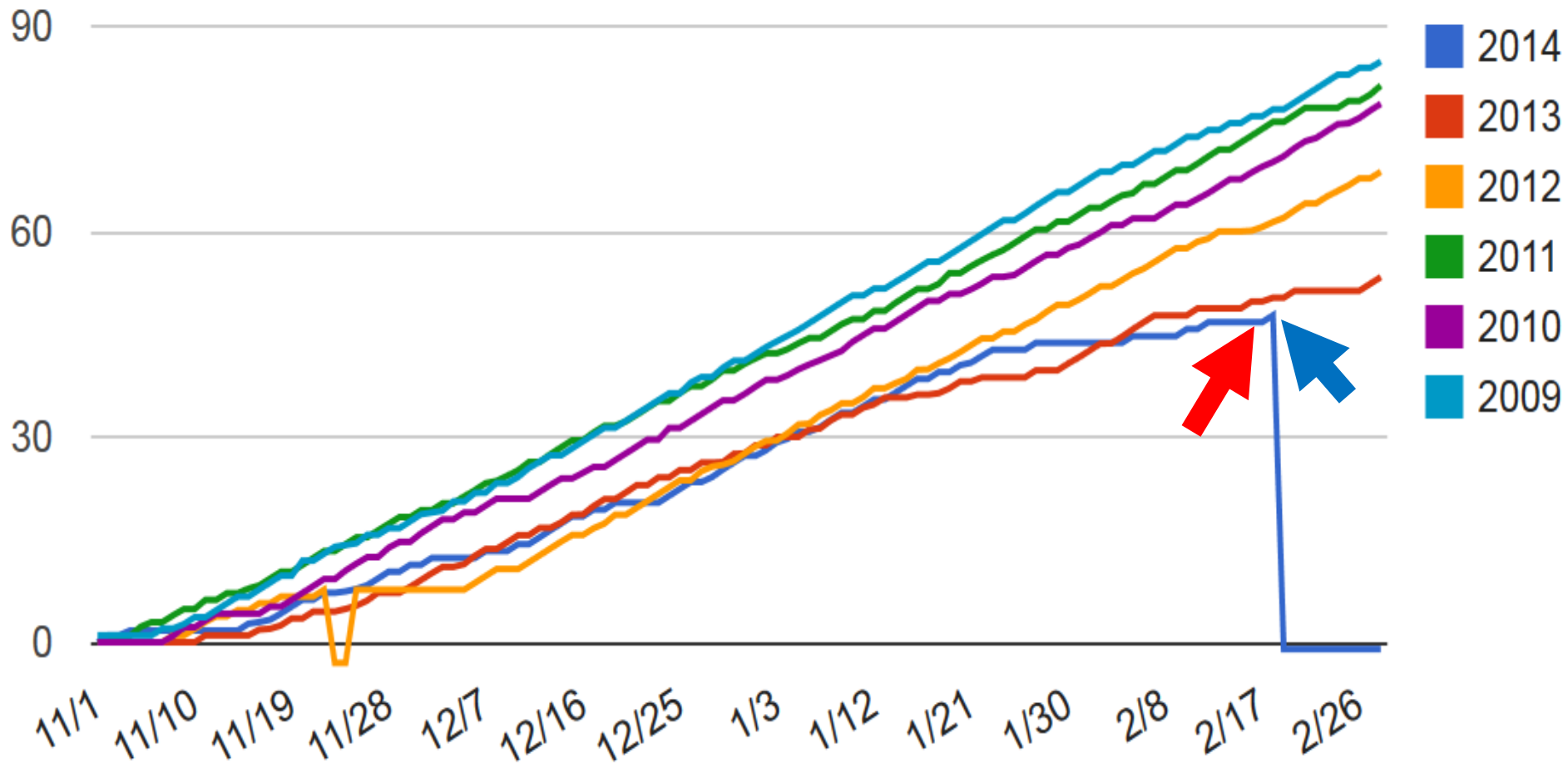
# Durham

## Cumulative Chilling Portions



# Colusa

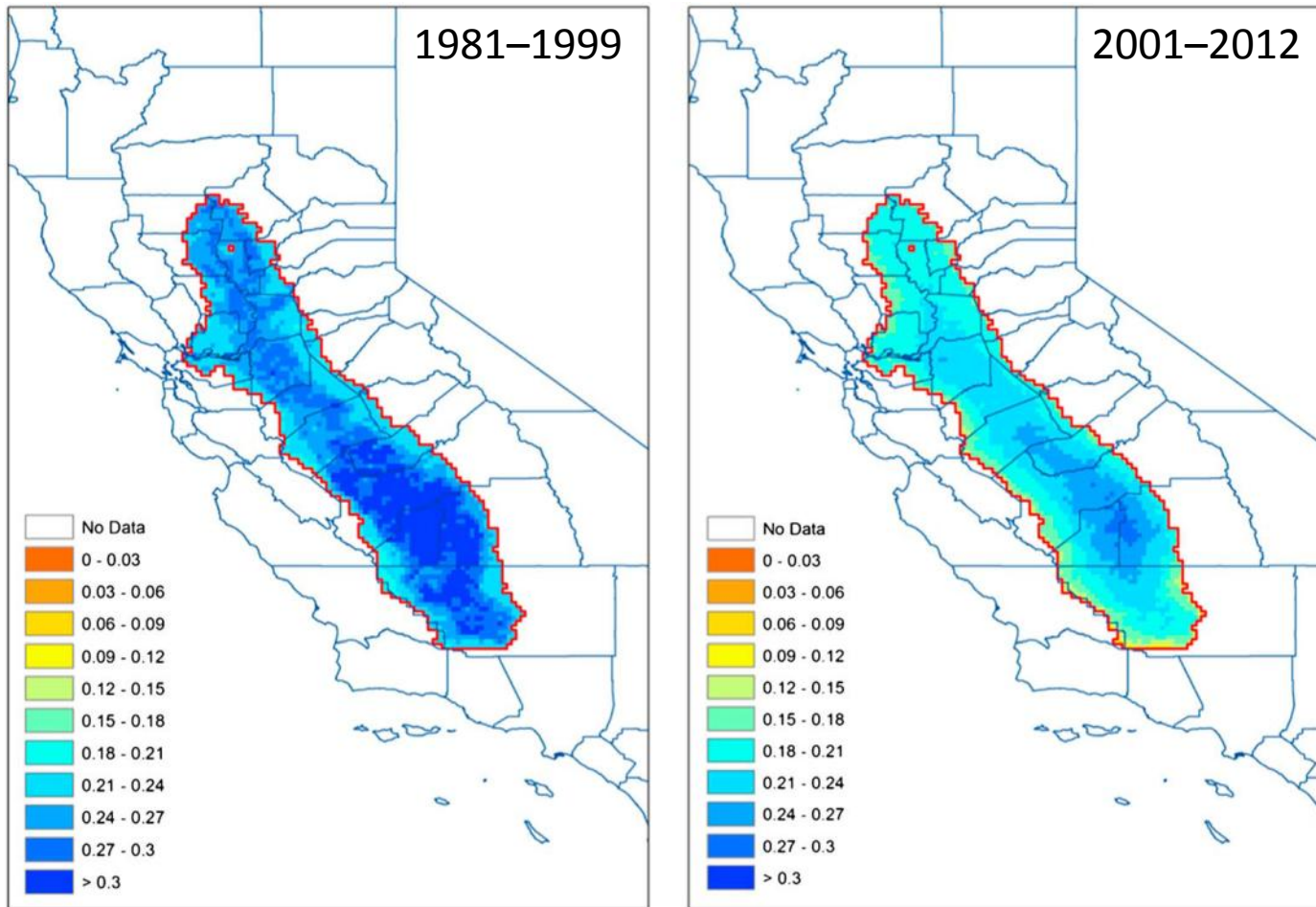
## Cumulative Chilling Portions



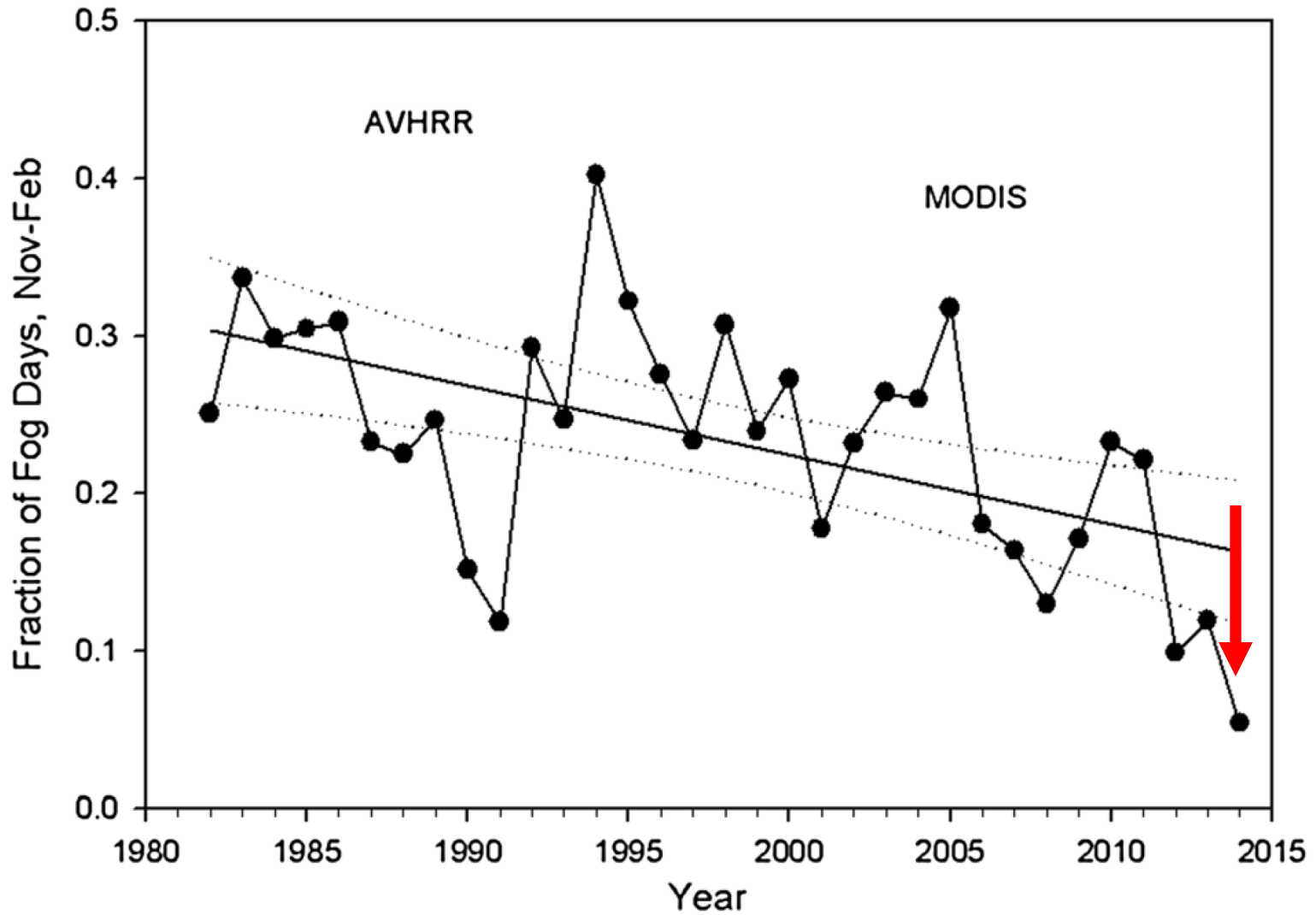
# Bonus Complication: Fog

## Fog has been decreasing

Time fogged in



# Central Valley, AVHRR



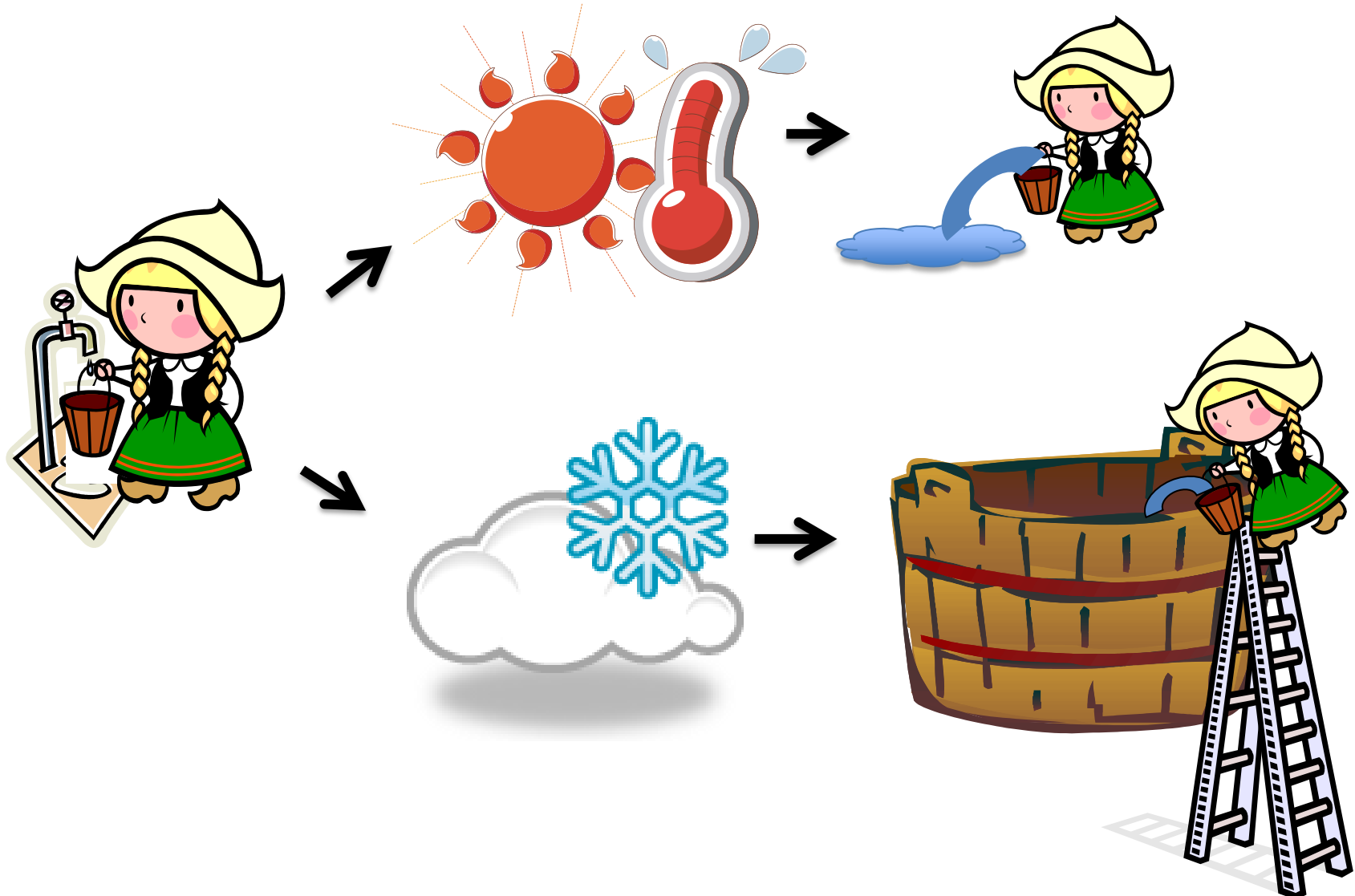


# What's “under the hood” of the Chill Portions model?

# Dynamic Model – Chill Portions

- Different temps have dif. 'chill value.'
  - Max: hours at 43-47° F.
  - No chill value at 32° F and 54° F.
- Rather than saying, 'We had X chill hours but they were warm chill hours.'
- Expands the range of temps considered effective for chill accumulation.

# Dynamic Model: Filling the Chill Tank



# How to count and use chill portions

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## HOME

### Extension Classes & Meetings

**Principles of Fruit & Nut Tree Growth, Cropping & Management**  
Next offering: November 10 - 20, 2014, UC Davis Campus plus Field Tour  
This annual course is focused on fruit and nut tree biology, and how it relates to orchard management. Taught by UC Faculty, Extension Specialists and Farm Advisors. [Class Details](#)

**Advances in Pistachio Production**  
Next offering: November 18 - 20, 2014, Visalia Convention Center  
The topics for this 3-day course span the full range of pistachio production. Taught by UC Faculty, Extension Specialists and Farm Advisors. [Class Details](#)

**Understanding & Preparing for the Threat of Plum Pox Virus Spreading to California & the Western States:**  
September 29 - 30, 2014, UC Davis. [Videos & abstracts](#)


### Fruit & Nut Information


Sections on management and biology for individual crops, articles & websites by UC experts in crop production. [Fruit & Nut Information](#)


### Weather-Related Models


Chill accumulation models; irrigation scheduling; prediction models for stonefruit harvest, almond & pistachio N, almond hullsplit. [Weather-Related Models](#)

### Fruit & Nut Center Updates

**New Resources Help Identify Light Brown Apple Moth**  
Added October 28, 2014  
Nursery workers are our first line of defense in detecting light brown apple moth when growing ornamental plants in commercial nurseries. A new brochure and video can help those in the field distinguish light brown apple moth from several look-alike...

**Plum Pox Virus Conference Update**  
Added October 23, 2014  
The international conference, Understanding and Preparing for the Threat of Plum Pox Virus Spreading to California and the Western States, was held on the UC Davis campus on September 29-30 2014, organized by the Fruit & Nut Research and...

**An inside look at the Department of Plant Sciences at UC Davis**  
Added September 23, 2014  
I come from a small, agricultural town in the Central Valley of California where, from a young age, I learned the importance of agriculture. I have been working for the Fruit and Nut Research and Information Center at UC Davis for a year while...

**Recognition for Research in Pedestrian Orchard Systems**  
Added September 11, 2014  
In a pedestrian orchard mature trees are

# Tracking chill portions on FNRIC

The screenshot shows a web browser window displaying the University of California Davis Fruit & Nut Research & Information website. The browser's address bar shows the URL [http://fruitsandnuts.ucdavis.edu/Weather\\_Services/](http://fruitsandnuts.ucdavis.edu/Weather_Services/). The website header includes the University of California logo and the UC Davis Fruit & Nut Research & Information logo. A navigation menu on the left lists various categories, with "WEATHER-RELATED MODELS" highlighted. The main content area is titled "Weather-Related Models & Services" and contains a paragraph explaining that these programs provide timely weather-related tree crop information for California fruit and nut growers, researchers, and industry. Below this paragraph, several links are listed, including "Chilling Accumulation Models", "Prune Chilling Prediction Model", "Nitrogen Prediction Models for Almond & Pistachio", "Irrigation Scheduling Using Stem Water Potential (SWP) Measurements", "Harvest Prediction Model", "Almond Hull-Split Prediction Model", and "Pistachio Bloom Forecast". A red oval highlights the "Chilling Accumulation Models" link and its associated text. The page footer indicates the page was last updated on September 11, 2013.

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WEATHER-RELATED MODELS

- Chilling Accumulation Models
- Prune Chilling Prediction
- Nitrogen Prediction Models for Almond and Pistachio
- Irrigation Scheduling
- Harvest Prediction for Peaches, Plums & Nectarines
- Almond Hull-Split Prediction
- Pistachio Bloom Cast
- About CIMIS Weather Stations

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## Weather-Related Models & Services

These programs provide timely weather-related tree crop information specifically for California fruit and nut growers, researchers, and industry. Air temperatures, collected from the [California Irrigation Management Information System](#) (CIMIS) weather stations, are used for model calculations.

[Chilling Accumulation Models](#)  
Calculation, Explanation & Comparison

[Prune Chilling Prediction Model](#)  
(Fall 2009)

[Nitrogen Prediction Models for Almond & Pistachio](#)  
based on early season leaf sampling

[Irrigation Scheduling Using Stem Water Potential \(SWP\) Measurements](#)  
Temp., RH & SWP values for almond, prune, walnut & grape

[Harvest Prediction Model](#)  
for Peaches, Plums and Nectarines

[Almond Hull-Split Prediction Model](#)  
(in beta test stage: Fall 2011)

[Pistachio Bloom Forecast](#)  
based on combined chill and heat accumulation  
(in beta test stage: Winter 2011)

### Related Information

- [About CIMIS Weather Stations](#)
- [About Weather-Related Models](#)
- [Weather Links](#)
- [Dormancy, chill accumulation, rest-breaking & freeze damage](#)

Page Last Updated: September 11, 2013

[http://fruitsandnuts.ucdavis.edu/Weather\\_Services/chilling\\_accumulation\\_models](http://fruitsandnuts.ucdavis.edu/Weather_Services/chilling_accumulation_models)

# Tracking chill portions on FNRIC

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## Chilling Accumulation Models: Their Calculation, Explanation, & Comparison

### Using Various Models

- Calculations of Current and Historic Chilling Accumulation at California CIMIS Sites

[Cumulative Chilling Hours:](#)  
**Cumulative Chill Hours and Modified Chill Hours**  
Hours below 45° F  
Hours between 32° F and 45° F  
November 1 through February 28/29

[Chilling Hour & Unit Accumulations:](#)  
**Historic Accumulation of Chill Hours, Modified Chill Hours, & Chill Units (Utah Model)**  
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[Cumulative Chilling Portions:](#)  
**Dynamic Model**  
September 1 through August 31

### Chill Model Updates Email List


The Fruit & Nut Center is closely monitoring Chill Portion calculations for the following stations: Shafter, Parlier, Brentwood, Modesto, Arvin-Edison, San Benito, Famoso, Patterson, Lodi, Porterville, Delano and Madera. If you would like to be notified if specific issues arise which are related to these stations, subscribe to our [Chill Model Updates email list](#).

### Dynamic Model & Chill Portions Accumulation Guide

- A how-to guide (pdf) by Kitren Glozer, retired Project Scientist, Dept. of Plant Sciences, for calculating chill portions (including converting 10 and 30 minute data to hourly data for the model), using weather data from a data logger in your orchard, and the Dynamic Model (Excel file). [Both available for download](#).

# Tracking chill portions on FNRIC

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[Harvest Prediction Model:](#)  
for Peaches, Plums and Nectarines

[View Station Map](#)

### Cumulative Chilling Portions - Select Station from List

County	Station	Portions
Alameda	191 <a href="#">Pleasanton</a>	1
	171 <a href="#">Union City</a>	0
	227 <a href="#">Plymouth</a>	1
Butte	012 <a href="#">Durham</a>	2
Colusa	032 <a href="#">Colusa</a>	1
Contra Costa	047 <a href="#">Brentwood</a>	0
	170 <a href="#">Concord</a>	0
	213 <a href="#">El Cerrito</a>	0
El Dorado	178 <a href="#">Moraga</a>	2
	013 <a href="#">Camino</a>	6
	228 <a href="#">Diamond Springs</a>	3
Fresno	205 <a href="#">Coalinga</a>	0
	007 <a href="#">Firebaugh/Telles</a>	0
	190 <a href="#">Five Points South West</a>	0
	003 <a href="#">Five Points/WCCFC UCDA</a>	0

# Tracking chill portions on FNRIC

The screenshot shows the website interface for the University of California Fruit & Nut Research & Information Center. The main navigation menu on the left includes categories like HOME, WEATHER-RELATED MODELS, and FIND AN EXPERT. The 'Chill Calculators' link is highlighted in the menu. The main content area features a 'Chill Calculators' section with links to various models and a 'Cumulative Chilling Portions' form. The form is for the 'CIMIS weather station: Coalinga (#205 - Fresno County)' and includes fields for 'Reporting Dates' (Current Season selected), 'Start Date' (9/1/2014), and 'End Date' (10/29/2014). A 'View Data' button is located at the bottom of the form.

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**Chill Calculators**

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[Cumulative Chilling Portions: Dynamic Model](#)  
September 1 through August 31

[Harvest Prediction Model:](#)  
for Peaches, Plums and Nectarines

**Cumulative Chilling Portions**

**CIMIS weather station: Coalinga (#205 - Fresno County)**

**Reporting Dates**  Current Season  
 Historical Accumulations

Start Date

End Date



# Tracking chill portions on FNRIC

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### Cumulative Chilling Portions

**CIMIS weather station: Coalinga (#205 - Fresno County)**

**Reporting Dates**  Current Season  Historical Accumulations

Start Date: 11/01/2013 **← Start Nov. 1**

End Date: 10/29/2014 **← End Feb. 15**

Calendar: Feb 2014

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

# Tracking chill portions on FNRIC

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Cumulative Chilling Portions - Station #205 Coalinga - Sep 1 2014 - Oct 29 2014

**Cumulative Chilling Portions**

Date	Daily Portions	2014	2013	2012	2011	2010	2009
11/01	0	0	0	0	0 N	0 N	0 N
11/02	0	0	0	0	0 N	0 N	0 N
11/03	0	0	0	0	0 N	0 N	0 N
11/04	0	0	0	1	0 N	0 N	0 N
11/05	0	0	0	2 M	0 N	0 N	0 N
11/06	1	1	0	2	0 N	0 N	0 N
11/07	0	1	0	3	0 N	0 N	0 N
11/08	0	1	0	4	0 N	0 N	0 N
11/09	0	1	1	4	0 N	0 N	0 N
11/10	0	1	2	5	0 N	0 N	0 N

Log Scale / Normal Scale

# Tracking chill portions on FNRIC

01/24	0	42	46	57	0 N	0 N	0 N
01/25	0	42	46	58	0 N	0 N	0 N
01/26	0	42	46	59	0 N	0 N	0 N
01/27	1	43	47	59	0 N	0 N	0 N
01/28	0	43	48	59	0 N	0 N	0 N
01/29	0	43	49	60	0 N	0 N	0 N
01/30	1	44	50	61	0 N	0 N	0 N
01/31	0	44	50	61	0 N	0 N	0 N
02/01	1	45	51	62	0 N	0 N	0 N
02/02	1	46	51	63	0 N	0 N	0 N
02/03	1	47	52	64	0 N	0 N	0 N
02/04	0	47	53	64	0 N	0 N	0 N
02/05	1	48	54	65	0 N	0 N	0 N
02/06	0	48	54	65	0 N	0 N	0 N
02/07	1	49	54	65	0 N	0 N	0 N
02/08	0	49	55	66	0 N	0 N	0 N
02/09	0	49	56	66	0 N	0 N	0 N
02/10	0	49	57	66	0 N	0 N	0 N
02/11	1	50	57	66	0 N	0 N	0 N
02/12	0	50	58	67	0 N	0 N	0 N
02/13	0	50	59	68	0 N	0 N	0 N
02/14	0	50	59	69	0 N	0 N	0 N
02/15	0	50	60	69	0 N	0 N	0 N
02/16	0	50	60	70	0 N	0 N	0 N
02/17	0	50	61	70	0 N	0 N	0 N
02/18	1	51	61	71	0 N	0 N	0 N
02/19	0	51	62	72	0 N	0 N	0 N
02/20	1	52	63	73	0 N	0 N	0 N
02/21	0	52	64	73	0 N	0 N	0 N
02/22	0	52	65	74	0 N	0 N	0 N
02/23	0	52	65	74	0 N	0 N	0 N
02/24	0	52	66	74	0 N	0 N	0 N
02/25	0	52	67	74	0 N	0 N	0 N
02/26	0	52	67	75	0 N	0 N	0 N
02/27	0	52	67	76	0 N	0 N	0 N
02/28	0	52	68	77	0 N	0 N	0 N

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# DIY Spreadsheet Chill Portions

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### Chilling Accumulation Models: Their Explanation and Comparison

- Chilling Unit & Chill Portion: Model Comparison
- Fruit & Nut Crop Chill Portion Requirements: Chill Requirements in Chill Portions, calculated using the Dynamic Model. Because the Dynamic Model is still unfamiliar to many, to provide a frame of reference, a list of chilling requirements for many temperate tree crops has been compiled from the literature. (compiled by Katherine Jarvis-Shean, Dept. of Plant Sciences, UC Davis)

[http://ucanr.org/sites/fruittree/How-to\\_Guides/Dynamic\\_Model\\_-\\_Chill\\_Accumulation/](http://ucanr.org/sites/fruittree/How-to_Guides/Dynamic_Model_-_Chill_Accumulation/)

# DIY Spreadsheet Chill Portions

University of California, Division of Agriculture and Natural Resources

## Growth Regulators in Orchard Management



Fruit & Nut Research & Information Center

### Dynamic Model & Chill Accumulation

An illustrated step-by-step guide for calculating Chill Portions (CP) using weather data collected from personal data loggers and the Dynamic Model. Available here: The guide, a PowerPoint presentation: [Dynamic Model & Chill Accumulation Guide - Glozer \(.pdf\)](#) and The Dynamic Model, an Excel file: [Dynamic Model \(excel file\)](#)

- California often provides too little chilling for optimum dormancy and rest breaking for some chill-requiring crops. Research to overcome lack of chilling includes developing methods to measure chill accumulation under California's conditions.
- Chill accumulation can be calculated using various mathematical models. UC Davis researchers, with the cooperation of many growers, have tested the Dynamic Model as a way of calculating chill accumulation. The model calculates chilling accumulation as 'chill portions' using a range of temperatures from ~35-55°F, and accounts for chill cancellation due to fluctuating warm temperatures.

Hourly data is needed for Dynamic Model calculations. For those who collect temperature data every 1-0 minutes is provided: Information and calculation instructions are provided here: [Sorting Temperature Data to Get Hourly Data](#)

Department of Plant Sciences | UC Davis | College of Agricultural & Environmental Sciences

# DIY Spreadsheet Chill Portions

49319.xls [Read-Only] [Compatibility Mode] - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Acrobat

Clipboard Font Alignment Number Styles Cells Editing

Times New Roman 10

Number

Normal Bad Good Neutral Calculation Check Cell

Insert Delete Format

AutoSum Fill Clear Sort & Find & Filter

G17

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
1		e0	4.15E+03																
2		e1	1.29E+04	DYNAMIC MODEL CHILLING PORTIONS - EREZ, A. and FISHMAN, S.															
3		a0	1.40E+05	The Volcani Center, Bet Dagan, ISRAEL															
4		a1	2.57E+18																
5		slp	1.6	Add hourly data in column B from row 13 down. Do not erase rows 11, 12.															
6		tetmlt	277	copy data from row 12 columns C to L till the last entry in column B.															
7		aa=a0/a1	5.43E-14	total cumulative chilling portions will appear in column L.															
8		ee=e1-e0	8.74E+03																
9																			
10	date	Temp(C)	Temp (K)	fmprrt	sr	xi	xs	ak1	Inter-S	Inter-E	delt	Portions							
11	12/4/1999 16:45	15	288.00	16.93	22471935.51	1.00	0.81	0.09	0.00	0.07	0.00	0							
12	12/4/1999 17:45	12	285.00	12.44	252887.94	1.00	1.11	0.06	0.0726043	0.13	0.00	0							
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!DYNAMIC model with data inserted Fahrenheit to Celsius conversio

Ready 130%

# DIY Spreadsheet Chill Portions

The screenshot shows a Microsoft Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1		e0	4.15E+03															
2		e1	1.29E+04	DYNAMIC MODEL CHILLING PORTIONS - EREZ, A. and FISHMAN, S.														
3		a0	1.40E+05	The Volcani Center, Bet Dagan, ISRAEL														
4		a1	2.57E+18															
5		slp	1.6	Add hourly data in column B from row 13 down. Do not erase rows 11, 12.														
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9																		
10	date	Temp(C)	Temp (K)	fmprrt	sr	xi	xs	ak1	Inter-S	Inter-E	delt	Portions						
11	12/4/1999 16:45	15	288.00	16.93	22471935.51	1.00	0.81	0.09	0.00	0.07	0.00	0						
12	12/4/1999 17:45	12	285.00	12.44	252887.94	1.00	1.11	0.06	0.0726043	0.13	0.00	0						
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**1<sup>st</sup>: Copy-paste hourly temperature data into this column.**  
Data must be hourly, and in Celsius. If your data is in Fahrenheit, use Tab 3 to convert from Fahrenheit to Celsius.  
*For prune, use hourly temperature from Nov. 1 to Feb. 15*

# DIY Spreadsheet Chill Portions

The screenshot shows a Microsoft Excel spreadsheet titled "DYNAMIC Mod\_Alm.xls [Compatibility Mode] - Microsoft Excel". The spreadsheet contains a table with columns labeled "Temp(C)", "Temp (K)", "ftmprt", "sr", "xi", "xs", "ak1", "Inter-S", "Inter-E", "delt", and "Portions". Row 12 is highlighted in blue, and a yellow callout box with an arrow points to it, containing the text: "2<sup>nd</sup>: Highlight Row 12, Columns C-L. Copy this section for all temperatures, down to the last hour." The spreadsheet also includes a title block with the text "DYNAMIC MODEL CHILLING PORTIONS - EREZ, A. and FISHMAN, S. The Volcani Center, Bet Dagan, ISRAEL" and a note: "Add hourly data in column B from row 13 down. Do not erase rows 11, 12. copy data from row 12 columns C to L till the last entry in column B. total cumulative chilling portions will appear in column L."

	Temp(C)	Temp (K)	ftmprt	sr	xi	xs	ak1	Inter-S	Inter-E	delt	Portions	
11	12/4/1999 16:45	15	288.00	16.93	22471935.51	1.00	0.81	0.09	0.00	0.07	0.00	0
12	12/4/1999 17:45	12	285.00	12.44	252887.94	1.00	1.11	0.06	0.0726043	0.13	0.00	0
13	13.9											
14	13.5											
15	12.6											
16	12.8											
17	14.3											
18	15.4											
19	15.6											
20	17.9											
21	20.1											
22	22.6											
23	24.4											
24	25.9											
25	27.2											
26	28.2											
27	28.9											
28	29.2											
29	28.8											
30	27.4											
31	25.1											
32	23.2											
33	21.8											
34	20											
35	19.9											
36	20.2											
37	20											
38	18.4											
39	17.9											
40	16.9											
41	17.5											
42	17.1											
43	16.7											

2<sup>nd</sup>: Highlight Row 12, Columns C-L. Copy this section for all temperatures, down to the last hour.



# DIY Spreadsheet Chill Portions

49319.xls [Read-Only] [Compatibility Mode] - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View Acrobat

Clipboard Font Alignment Number Styles Cells Editing

Normal Bad Good Neutral Calculation Check Cell

AutoSum Fill Clear Sort & Find & Filter & Select

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55

A B C D E F G H I J K L M N O P Q R S T U V W X

e0 415E+03  
e1 1.29E+04  
s0 1.40E+05  
s1 2.57E+10  
slp 1.6  
tehmkt 277  
aa=00a1 5.43E-14  
ee=e1e0 8.74E+03

DYNAMIC MODEL CHILLING PORTIONS - EREZ, A. and FISHMAN, S.  
The Volcani Center, Bet Dagan, ISRAEL

Add hourly data in column B from rows 13 down. Do not erase rows 11, 12.  
copy data from rows 12 columns C to L. fill the last entry in column B.  
total cumulative chilling portions will appear in column L.

date	Temp(C)	Temp (K)	thmrgt	sc	xi	xs	ak1	Inter-S	Inter-E	delt	Portions	
12/4/1999 16:45	15	288.00	16.93	22471935.51	1.00	0.81	0.09	0.00	0.07	0.00	0	
12/4/1999 17:45	12	285.00	12.44	252887.94	1.00	1.11	0.06	0.07260431	0.13	0.00	0	
10/1/2008	100	14.7	287.70	16.48	14407813.13	1.00	0.83	0.09	0.13193829	0.19	0.00	0
10/1/2008	200	13.8	286.80	15.14	3776136.65	1.00	0.92	0.08	0.13227851	0.25	0.00	0
10/1/2008	300	13.1	286.10	14.10	1324955.19	1.00	0.99	0.07	0.24674292	0.30	0.00	0
10/1/2008	400	12.3	285.30	12.99	397780.57	1.00	1.08	0.06	0.23684991	0.34	0.00	0
10/1/2008	500	12.6	285.60	13.35	625094.59	1.00	1.04	0.06	0.34347991	0.33	0.00	0
10/1/2008	600	12.9	285.90	13.80	901377.17	1.00	1.01	0.07	0.38725372	0.43	0.00	0
10/1/2008	700	12.5	285.50	13.20	537721.65	1.00	1.05	0.06	0.42805479	0.47	0.00	0
10/1/2008	800	18	291.00	21.32	1820426715.75	1.00	0.59	0.15	0.46664657	0.48	0.00	0
10/1/2008	900	22.1	295.10	27.18	639360520682.31	1.00	0.39	0.28	0.48394444	0.46	0.00	0
10/1/2008	1000	24.5	297.50	30.54	1833498194524.40	1.00	0.31	0.39	0.46120998	0.41	0.00	0
10/1/2008	1100	27.8	300.80	35.07	1695953096607430.00	1.00	0.22	0.63	0.41109703	0.32	0.00	0
10/1/2008	1200	29.7	302.70	37.63	21977759389044300.00	1.00	0.19	0.83	0.32272037	0.25	0.00	0
10/1/2008	1300	31.3	304.30	39.76	185399287025163000.00	1.00	0.16	1.03	0.24544222	0.19	0.00	0
10/1/2008	1400	32.9	305.90	41.87	1523482721869320000.00	1.00	0.14	1.29	0.18989423	0.15	0.00	0
10/1/2008	1500	32.5	305.50	41.35	904347586761999000.00	1.00	0.14	1.22	0.15158765	0.15	0.00	0
10/1/2008	1600	31.1	304.10	39.50	142192089006867000.00	1.00	0.16	1.01	0.14501999	0.16	0.00	0
10/1/2008	1700	28.9	301.90	36.55	7503085707671290.00	1.00	0.20	0.74	0.15597499	0.18	0.00	0
10/1/2008	1800	26.9	299.90	33.84	498295340987133.00	1.00	0.24	0.56	0.17900757	0.21	0.00	0
10/1/2008	1900	24.8	297.80	30.96	27785644899427.80	1.00	0.30	0.41	0.20614258	0.24	0.00	0
10/1/2008	2000	23.2	296.20	28.73	29971915809972.99	1.00	0.35	0.32	0.23085972	0.27	0.00	0
10/1/2008	2100	20.6	293.60	25.06	76328277542.66	1.00	0.45	0.22	0.26814589	0.30	0.00	0
10/1/2008	2200	19.8	292.80	23.92	24951200680.88	1.00	0.49	0.20	0.30486054	0.34	0.00	0
10/1/2008	2300	19.6	292.60	23.63	18283919082.78	1.00	0.50	0.19	0.33811896	0.37	0.00	0
10/1/2008	2400	18.8	291.80	22.48	5787453313.27	1.00	0.54	0.17	0.36647757	0.39	0.00	0
10/2/2008	100	17.4	290.40	20.45	7614146397.69	1.00	0.63	0.14	0.39411584	0.42	0.00	0
10/2/2008	200	17.6	290.60	20.74	1018541959.74	1.00	0.62	0.14	0.42405627	0.45	0.00	0
10/2/2008	300	16.7	289.70	19.43	274154568.36	1.00	0.68	0.12	0.44925018	0.48	0.00	0
10/2/2008	400	18.1	291.10	21.47	2104328202.08	1.00	0.59	0.15	0.4754426	0.49	0.00	0
10/2/2008	500	18.2	291.20	21.61	2432262940.26	1.00	0.58	0.15	0.49089686	0.50	0.00	0
10/2/2008	600	17.7	290.70	20.89	1177856978.43	1.00	0.61	0.14	0.50351048	0.52	0.00	0
10/2/2008	700	17.5	290.50	20.60	880687512.95	1.00	0.62	0.14	0.51766415	0.53	0.00	0
10/2/2008	800	18.6	291.60	22.19	4336779267.12	1.00	0.56	0.16	0.53123999	0.53	0.00	0
10/2/2008	900	20.2	293.20	24.49	43146110757.27	1.00	0.47	0.21	0.53497311	0.52	0.00	0
10/2/2008	1000	21.3	294.30	26.05	206356526272.48	1.00	0.42	0.25	0.52319346	0.50	0.00	0
10/2/2008	1100	22.3	295.30	27.47	847445798233.05	1.00	0.38	0.28	0.50125066	0.47	0.00	0
10/2/2008	1200	23.4	296.40	29.01	3964366049206.03	1.00	0.34	0.33	0.47172633	0.43	0.00	0
10/2/2008	1300	23.9	296.90	29.71	7963536017771.44	1.00	0.32	0.36	0.43493897	0.40	0.00	0
10/2/2008	1400	24.5	297.50	30.54	1833498194524.40	1.00	0.31	0.39	0.40191603	0.37	0.00	0
10/2/2008	1500	24.6	297.60	30.68	21062064002649.80	1.00	0.30	0.40	0.37106452	0.35	0.00	0
10/2/2008	1600	24.3	297.30	30.26	1389050082134.60	1.00	0.31	0.38	0.34899532	0.34	0.00	0
10/2/2008	1700	23.6	296.60	29.29	5241664142810.18	1.00	0.34	0.34	0.33793889	0.34	0.00	0
10/2/2008	1800	21.6	294.60	26.48	315575764141.01	1.00	0.41	0.26	0.33700038	0.35	0.00	0
10/2/2008	1900	19.7	292.70	23.77	21101288283.84	1.00	0.50	0.19	0.35346958	0.38	0.00	0

Ready

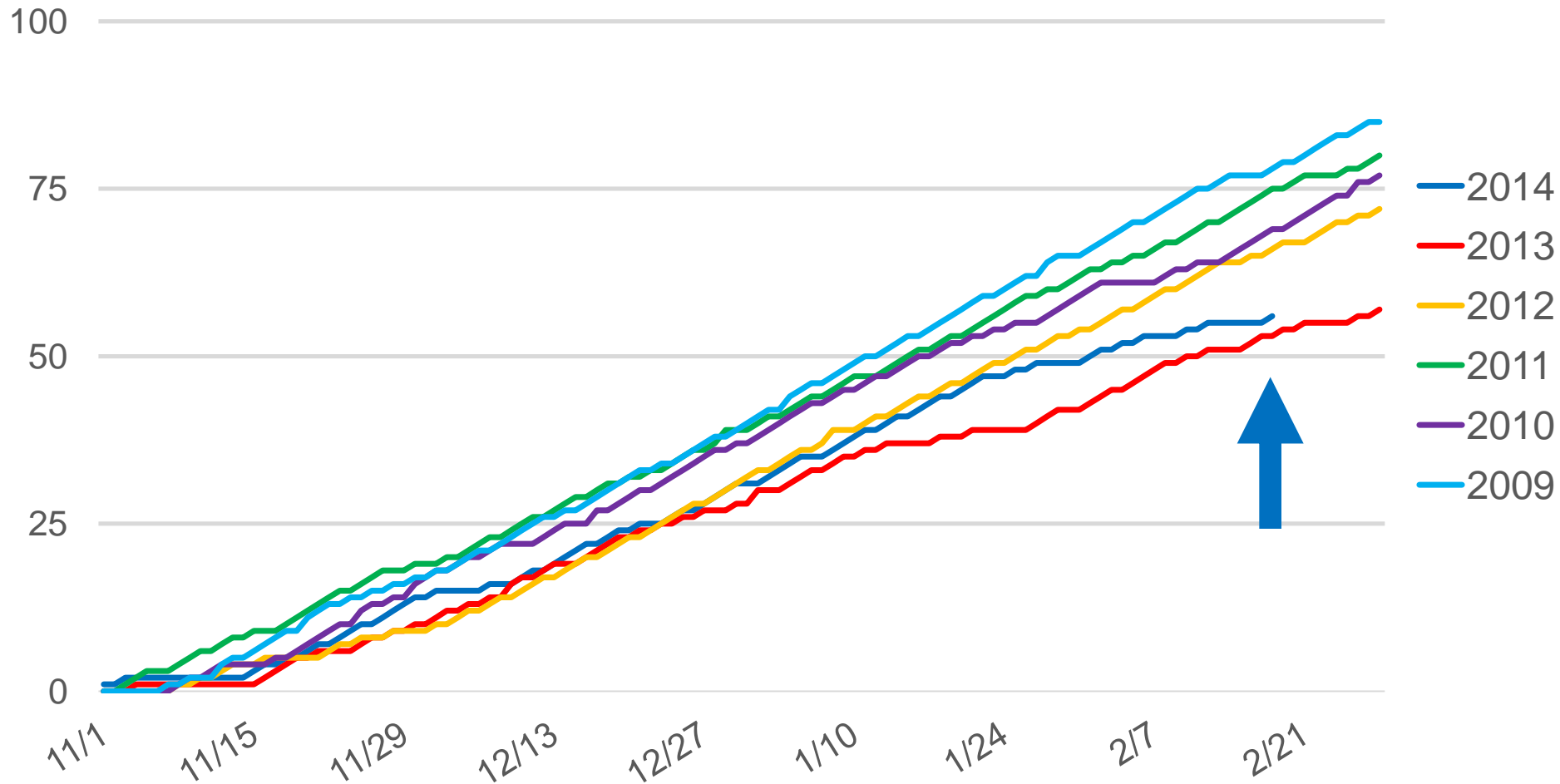
# What to do *this* year?

- Watch chill accumulation in January and compare with last few years. Are you on track with previous 'good chill' years?
- Based on last year French appears to need ~55-60 Chill Portions

# What can be done if chill looks low?

Cumulative Chilling Portions

Gerber



# What can be done if chill looks low?

- Count chill better – Chill Portions
- Wake trees up early
  - CAN17 & Horticultural Oil have had mixed results.
  - CAN17 moved bloom but decreased set in warm winters.
  - Best results for earlier bloom with improved set: 4% oil at 40-50 chill portions (~Jan) → 1.6-2.4 days early
  - White washing delays bloom.

# What can be done if chill looks low?

- Count chill better – Dynamic model/Chill portions
- Wake trees up early
- Cool orchard at bloom
  - Trees on dry soil wake up later
  - Risk is when flowers get 10+ hours >80 F.
  - Running irrigation can decrease temps 1-2° F.  
Start mid-AM before it gets hot.
- Keep a temperature recorder in your orchard
- Support on-going UC research



## HOME

### Fruit & Nut Information



Sections on management and biology for individual crops, articles & websites by UC experts in crop production.  
[Fruit & Nut Information](#)

### Weather-Related Models



Chill accumulation models; irrigation scheduling; prediction models for stonefruit harvest, almond & pistachio N, almond hullsplit.  
[Weather-Related Models](#)

### Annual Extension Class

#### Principles of Fruit & Nut Tree Growth, Cropping & Management

Next offering: Feb. 2016, UC Davis Campus plus Field Tour

This annual course is focused on fruit and nut tree biology, and how it relates to orchard management. [Class Details](#)

### Tree Biology & Orchard Management

New content: Flower Anatomy & Pollination, Tree Growth

### Events Calendar

Event Name	Date
<a href="#">Pomology Extension Continuing Conference (PECC)</a>	3/23/2015
<a href="#">Advances in Walnut Production Short Course</a>	11/16/2015
<a href="#">Walnut Research Conference</a>	1/27/2016
<a href="#">Pomology Research Coordination Mtg (PAC)</a>	2/2/2016
<a href="#">Principles of Fruit &amp; Nut Tree Growth Cropping &amp; Management</a>	2/22/2016

[View More Events](#)



### Fruit & Nut Center Updates

#### A History of UC Research

Added February 13, 2015

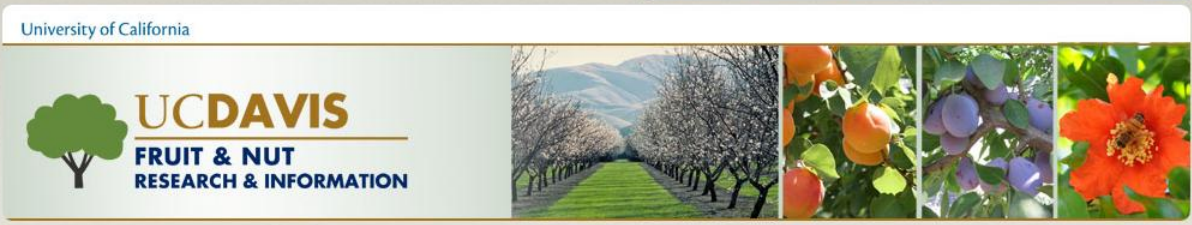
The UC Fruit & Nut Research & Information Center (FNRIC) website, <http://fruitsandnuts.ucdavis.edu>, has been around for about twenty years and in that time, gone through several formatting updates and expansions. The website provides...

#### Happy Holidays!

Added December 22, 2014



It has been an honor serving our California clientele as the Director of the Fruit & Nut Research and Information Center (FNRIC) for one more active year. I am blessed to have great support from Ms. Janet Zalom, Ms.



- HOME
- ANNUAL EXTENSION CLASS
- WEATHER-RELATED MODELS
- FIND AN EXPERT
- FRUIT & NUT INFORMATION**
- ORCHARD MANAGEMENT
- FRUIT & NUT CENTER UPDATES
- VIDEO GALLERY
- ONLINE RESEARCH DATABASES

## Fruit & Nut Information

Your click on any of the fruits and nuts from the following list will access information in these areas: General Education, Specific articles in production economics and management, and links to centers, programs, and organizations. For up-to-date statistics on US and World production, see: USDA [NASS](#) and United Nations [FAOSTAT](#).

[Temperate Crops](#) | [Subtropical & Tropical Crops](#)

### Temperate Fruit & Nut Crops

 Almond	 Apple	 Apricot	 Caneberries	 Blueberry	 Sweet Cherry	 Chestnut
 Fig	 Kiwifruit	 Nectarine	 Olive	 Peach	 European Pear	 Pecan
 Persimmon	 Pistachio	 Plum	 Pomegranate	 Dried Plum/Prune	 Quince	 Strawberry
					 Table Grapes & Raisins	 Walnut

### Tropical & Subtropical Fruit & Nut Crops





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FRUIT & NUT INFORMATION

ORCHARD MANAGEMENT

FRUIT & NUT CENTER UPDATES

VIDEO GALLERY

ONLINE RESEARCH DATABASES

## Fruit and Nut Information

[Return to Main Fruit & Nut Information](#)

### All of the Categories by Fruits & Nuts: Prune/Dried Plum

#### General Sources

- [California Tree Fruit Agreement Research Reports Database](#)  
A database, currently under development, to archive research projects supporting the California stone fruit industry from 1939 to 2010.
- [Dried Plum Research Reports](#)  
A searchable database of annual reports of research in various aspects of dried plum/prune production. This database provides reports in pdf format from 1961 to the present.
- [Plum Pox Virus 2011 UC Davis Conference materials](#)  
'Understanding & Preparing for the Threat of Plum Pox Virus Spreading to California & the Western States'. Includes videos of presentations.

#### Production Management

- [Decision Support System for IPM of Prune Brown Rot](#)  
UC Kearney Agricultural Research and Extension Center
- [Dormant Spray Alternatives Calculator](#)  
UC IPM Online
- [Growing Prunes \(Dried Plums\) in California: An Overview](#)  
Maxwell Norton, UCCE Merced Co., and William Krueger, UCCE Glenn Co. & Tehama Co., 2005 (7 pp.) UC ANR Pub. 8264
- [Growth Regulators in Orchard Mgt: Technical Reports for Prune: 2003 to 2011](#)  
Kitren Glozer, Dept. of Plant Sciences, UC Davis. Topics include use of the Dynamic Model to time applications of defoliants, dormant oil and RBAs and impact of growth regulators on fruit quality
- [Integrated Prune Farming Practices Orchard Monitoring Calendar \(pdf\)](#)  
excerpt (1 p.) from: Integrated Prune Farming Practices (IPFP) Decision Guide, 2004
- [Introduction to Brown Rot of Stone Fruits](#)  
UC Kearney Agricultural Research and Extension Center
- [IPM-Based Guidelines for Replanting Prunus Orchards in 2002 without Methyl Bromide \(pdf\)](#)  
Michael McKenry, Nematology Dept., UC Riverside. 2002 (5 pp.)
- [Muir Beauty Dried Plum/Prune Description \(pdf\)](#)



# Dried Plum Research Reports Database



- Overview
- Reports by Year
- Reports by Category**
- Acknowledgments



## Reports by Category

### Categories

#### Cultivars & Rootstocks

[Varietal Improvement](#) | [Rootstocks](#)

#### Tree Nutrition

[Boron](#) | [Nitogen](#) | [Potassium](#) | [Sulfur](#) | [Zinc](#) | [Carbohydrate Partitioning](#) | [Foliar Fertilizers](#) | [Salt Tolerance](#)

#### Water & Soil Management

[Drip Irrigation](#) | [Sprinklers](#) | [Infiltration](#) | [Impact on Tree Growth](#) | [Soil Modification](#)

#### Flower & Fruit Development

[Crop Control](#) | [Fruit Set](#) | [Fruit Size](#) | [Indices of Fruit Quality](#) | [Maturity Advancement](#) | [Orchard Management](#) | [Preharvest Fruit Drop](#) | [Reference Date](#) | [Fruit Side Cracking](#)

#### Tree Growth & Development

[High Density Planting](#) | [Modified Tree Training](#) | [Alternate Year Pruning](#) | [General Pruning](#) | [Plant Growth Regulators](#)

#### Insects

[Aphids](#) | [Carob Moth](#) | [Honey Bee](#) | [Indianmeal Moth](#) | [Mealybug](#) | [Medfly](#) | [Oblique Banded Leafroller](#) | [Peach Twig Borer](#) | [Scale](#) | [Spotted Wing Drosophila](#) | [Insect Parasites](#) | [Insect Pathogens](#) | [Insect Monitoring](#) | [Chemical Applications](#) | [Insects: Other Topics](#)

#### Postharvest Insects

[Fumigation](#) | [Packaging](#) | [Temperature Treatments](#) | [Irradiation](#)

#### Disease

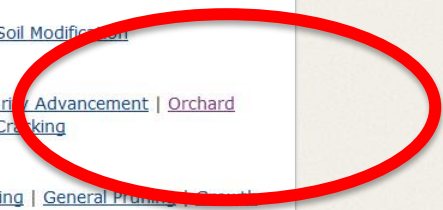
[Brown Rot](#) | [Canker](#) | [Crown Gall](#) | [Leaf Scorch](#) | [Prune Dieback](#) | [Russett Scab](#) | [Rust](#) | [Virus](#) | [Wood Decay Fungi](#) | [Postharvest Disease](#) | [Disease: Other Topics](#)

#### Postharvest

[Dehydration](#) | [Health Benefits](#) | [Juice](#) | [Moisture](#) | [Sorting](#) | [Postharvest: Other Topics](#)

#### Other Categories

[Mites](#) | [Nematodes](#) | [Weeds](#) | [Integrated Farming Practices](#) | [Harvest Topics](#) | [Food Safety](#) | [Miscellaneous Topics Including Literature References](#) | [Crops Other Than Dried Plums](#)



# TAKE AWAYS

- 1) Chill is not great, but not too bad
- 2) Chill portions is a better way to count chill
- 3) Follow chill portions at the UC Fruit & Nut Center website.

QUESTIONS?

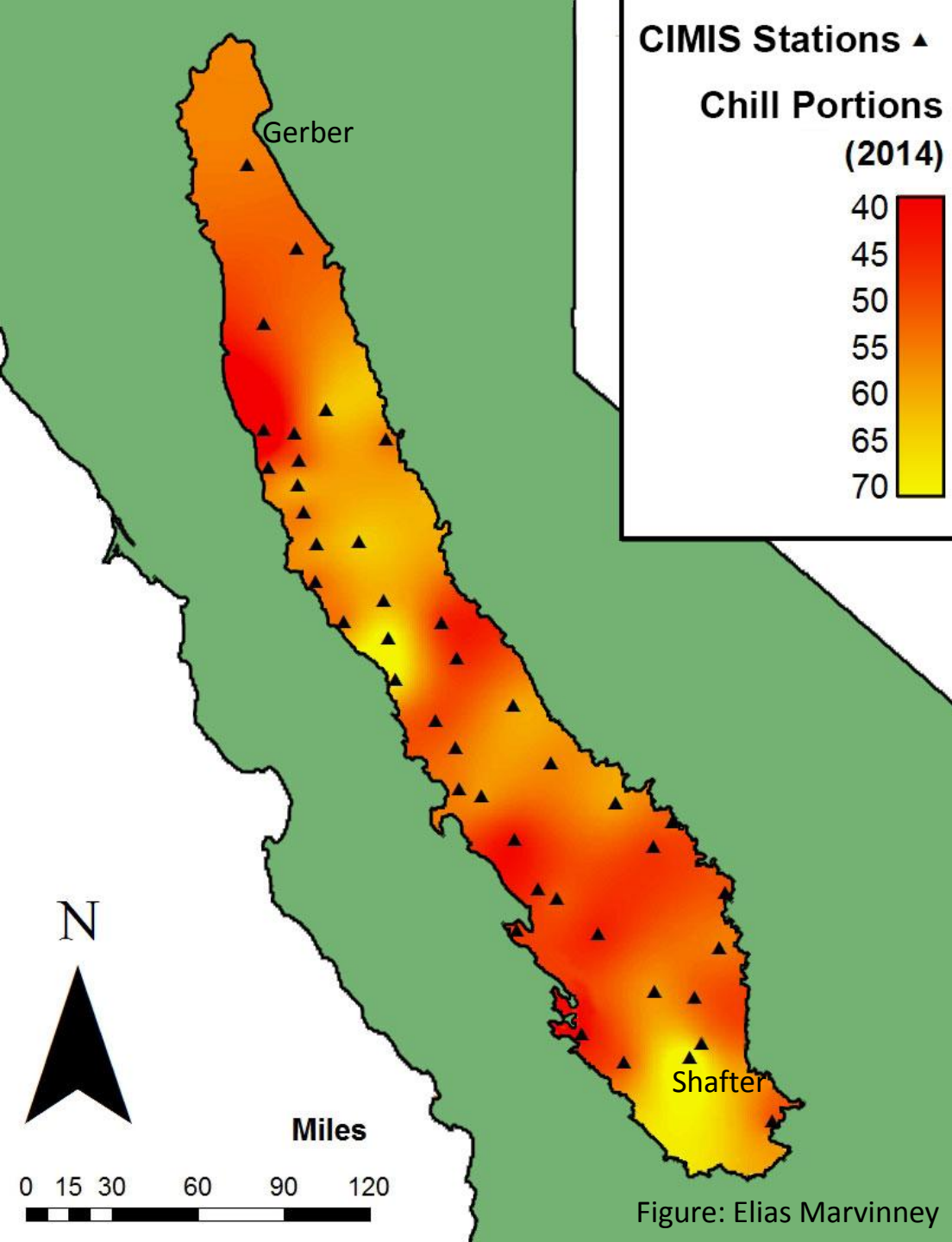


Figure: Elias Marvinney

Chill 2013:  
Down 25%  
across the  
Central Valley  
from 5-year  
average