

FINAL PROJECT REPORT

Project Title: Model reporting

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Total Project Request: Year 1: 31,416 Year 2: 31,416

Other funding sources
none

Budget 1

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Item	2017	2018	
Salaries	20,000	20,000	
Benefits	11,416	11,416	
Wages			
Benefits			
Equipment			
Supplies			
Travel			
Miscellaneous			
Plot Fees			
Total	31,416	31,416	

OBJECTIVES

Provide a predictive model of bud hardiness throughout floral bud development because real-time analysis requires two or three days--after the information was desired.

Use relative water content of floral buds as a measure of phenology and freeze tolerance.

METHODS

Models were constructed in Excel spreadsheets that contain extensive phenology measurements including DTA, visual bud assessment, relative water content, bloom progression, fruit size, weight, color. This year leaf out and specific gravity were included.

The VFB model was coded in PHP programming language by Sean Hill and Otari Iosliani. The programming is currently running in beta-testing mode for use by researchers and any potential grower/cooperators. We hope to enlist more growers.

Further sampling was done this year to follow vernalization of Sweetheart at Cooper Barn, The Dalles. Mid-winter to awakening for Regina also at Cooper Barn, and for Chelan and Bing at Pyles, The Dalles. Attika, Benton, Bing, Lapins, Rainier and Skeena at MCAREC were assessed from awakening to the loss of low temperature exotherms in DTA. Dormancy to bloom phenology data was taken using the 30-spur method for Bing, Regina, Skeena and Sweetheart at MCAREC.

Temperature data were from AgriMet, IFPnet and recently from Columbia Gorge Fruit Growers Weather provided by the Rainwise Net.

RESULTS & DISCUSSION

Results of the FTEED model were presented with weekly updates for the 2016-17 season from 56 weather stations across Washington and the Columbia Gorge ([blogs/Oregonstate/gdavs](https://blogs.oregonstate.edu/gdavs)). A graphical presentation of the average temperature and predicted lethal temperature was presented. Temperature and lethal temperature values for the individual weather stations were also tabulated on this site.

Extensive rewriting and additions to the VFB modelling prevented timely updates in 2018.

Visual assessment of floral bud phenology is too subjective for modelling purposes. A standard method is required. The relative water content of buds used in DTA assessments was plotted vs the determined lethal temperature. A plot comparing the actual values and those predicted by VFB show good correlation (Fig. 1).

The IFPnet weather stations are located in orchards in the Columbia Gorge; whereas, AgriMet stations are not. Users should be aware of any temperature offset values they may presently use when evaluating the model results.

In 2017 (fig 2.), no dangerous cold events in winter were predicted in the Columbia Gorge; however, some sites including MCAREC experienced a late-October light frost that may have caused some damage. While assessing phenology at MCAREC I observed a small percentage of pistil damage in some border trees.

In 2018 (fig. 2), warming in early February was sufficient to begin bud swelling. Swelling was followed by a long period of chill weather that slowed bloom progression to near normal timing in

Hood River and The Dalles. There was a potentially lethal freeze in late February depending on the bud stage. At MCAREC we experienced about 10% damage to floral primordia.

We have begun to collect and analyze temperature data for the 2018-19 season.

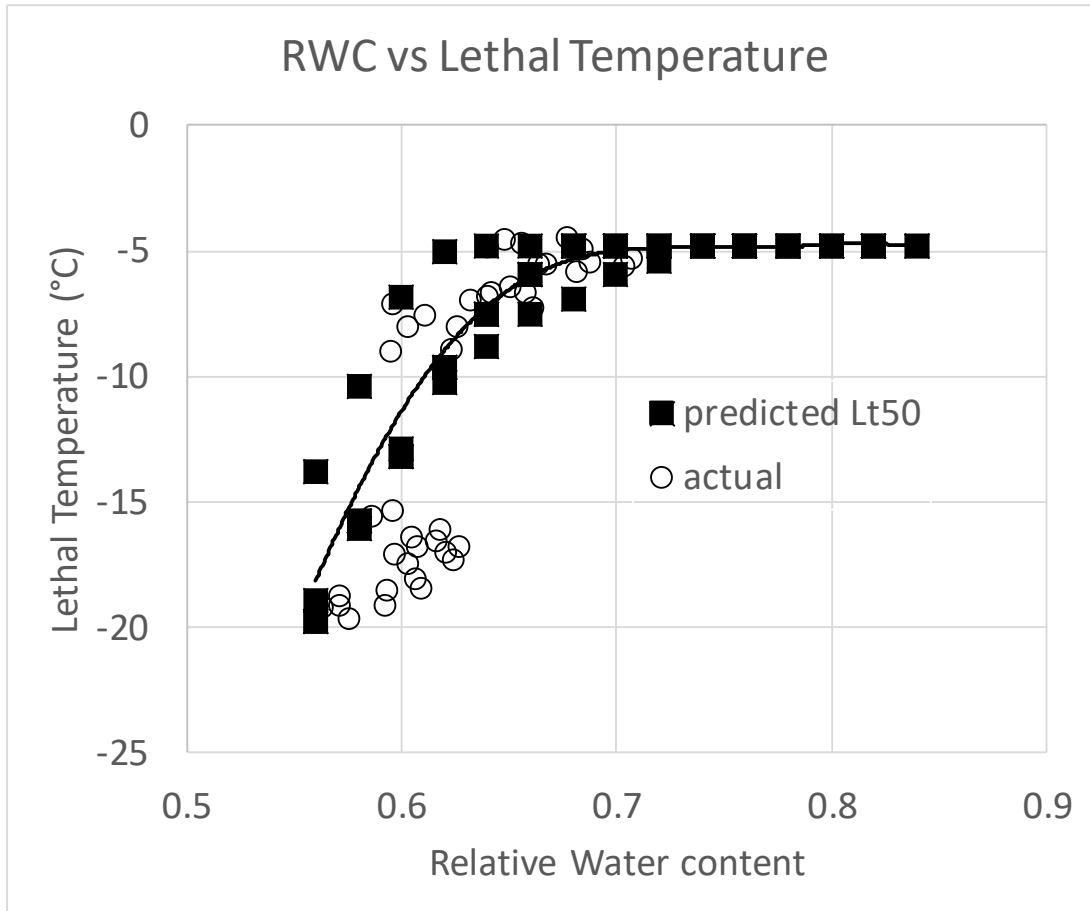


Figure 1. Phenology stage can be assessed as the relative water content of buds. Open circles are DTA estimates of the LT50. Closed squares are the VFB predictions of LT50. Note that at approximately 0.6 rwc buds are capable of acclimation and deacclimation. Once, over about 0.66 rwc, deacclimation is irreversible.

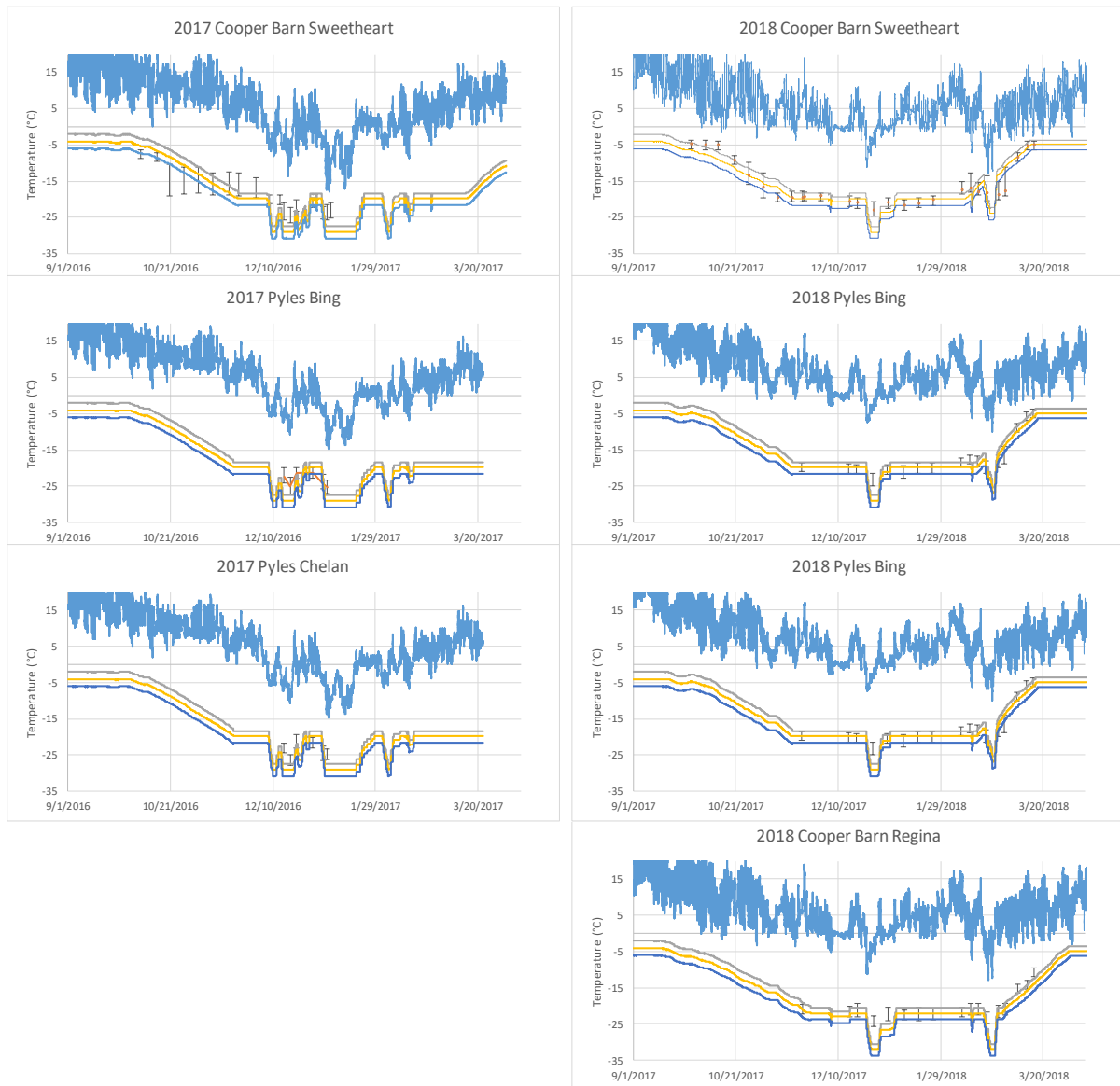


Figure 3. Years 2017 and 2018 at the same locations and cultivars. Air temperature (upper line), VFB predictions of lethal temperature (lines for Lt10, 50, 90%) and DTA assessment of lethal temperature (points with error bars).

EXECUTIVE SUMMARY

- Predictive modelling of Freeze Tolerance in Endo and Ecodormancy (FTEED) was published on website: blogs.oregonstate.edu/gdavs
- Vernalization modelling was added
- The awakening period after ecodormancy, was modelled by scaling the FTEED in relation to DTA assessments
- Relative water content is an objective measure of bud phenology and can be accurately related to FTEED predictions
- Three models; Vernalization, FTEED and Bloom, were combined to into one (VFB)
- PHP language coding was completed for use on the AgWeatherNet server
- I will bring full results of the VFB modelling to the meeting
- Growers, please bring any assessment of bud damage you may have from 2018