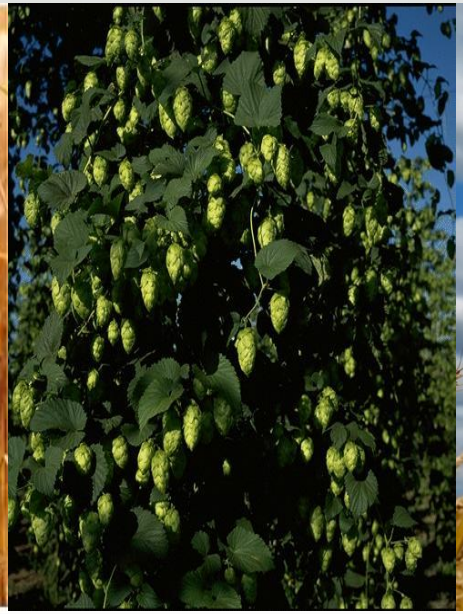
3rd Annual Hops Conference

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NORTHEAST SARE
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MASSACHUSETTS DEPARTMENT OF AGRICULTURAL RESOURCES

Northeastern IPM Center

RMA

NORTHEAST Hop Alliance

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

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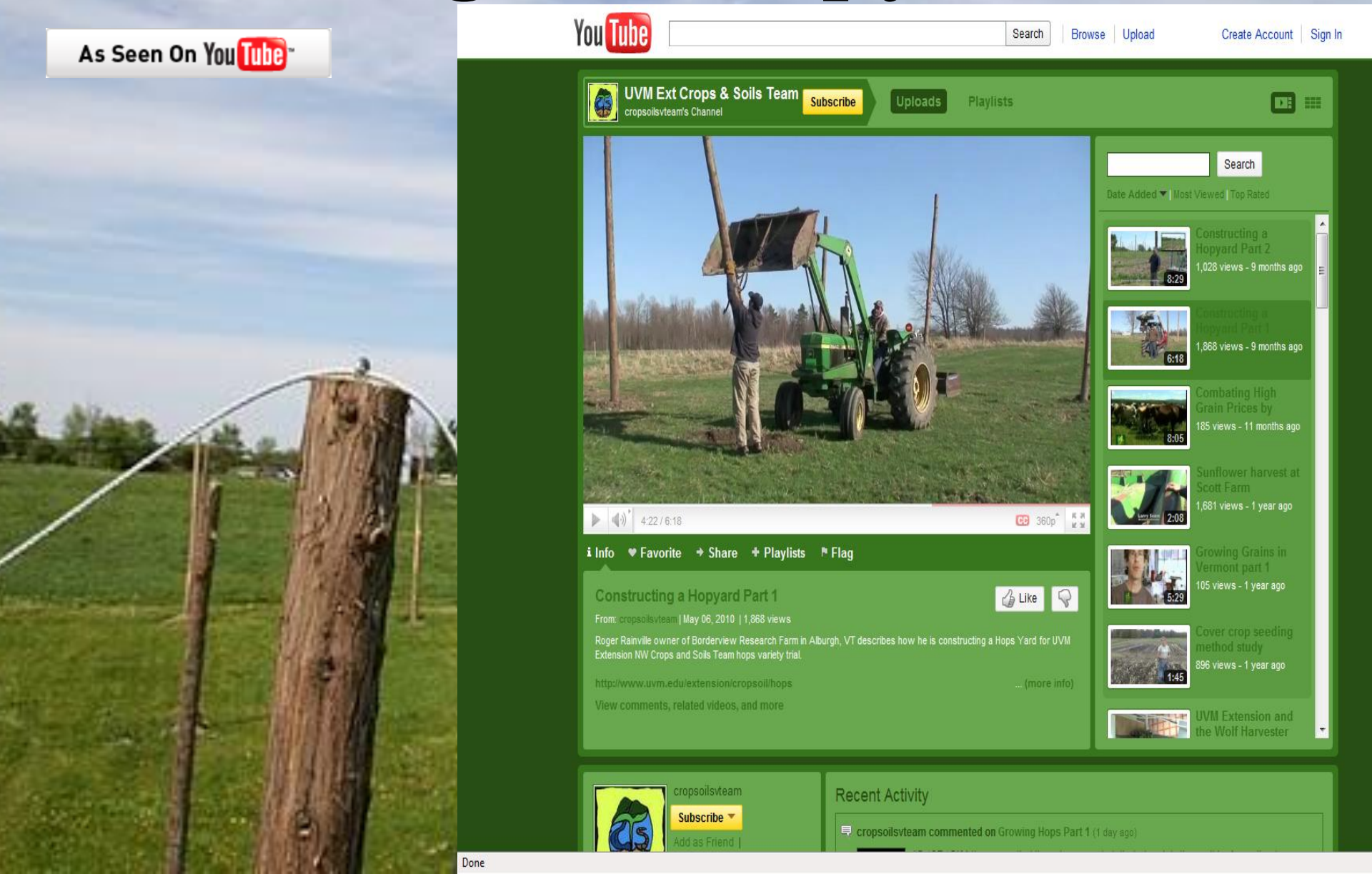
This project was funded in part by the Vermont Agricultural Innovation Center through the United States Department of Agriculture, Rural Development. These funds were secured through the efforts of Senator Patrick Leahy.

Organic Hop Yield and Quality in the Northeast

Heather Darby and Rosalie Madden

March 19, 2012

Building the hopyard



Site Selection & Preparation

- Well drained soils
- Well structured clay – ok
- Sandy soils – will be expensive
- Silty/Loamy soils

Influence of Soil Type

- Cascade
- Centennial
- Chinook
- Cluster
- Crystal
- Fuggle
- Galena
- Glacier
- ~~Hallertau~~
- Liberty
- Mt Hood 074
- Newport 055
- Nugget Teamaker
- Perle Mt Hood
- Saaz Mt Rainier
- Santiam
- Sterling
- Tettnang
- Vanguard
- Willamette

Plus some exciting new varieties from the USDA – ARS breeding program, courtesy of Dr. John Henning!!!

Planting timing

Late August, 2010

Spring, 2011: Root rot

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Fertility Management

- Take soil sample
- Correct major issues before plant
- pH 6.2 to 6.5
- Lime season before if necessary
- Make sure all nutrients

in optimum range

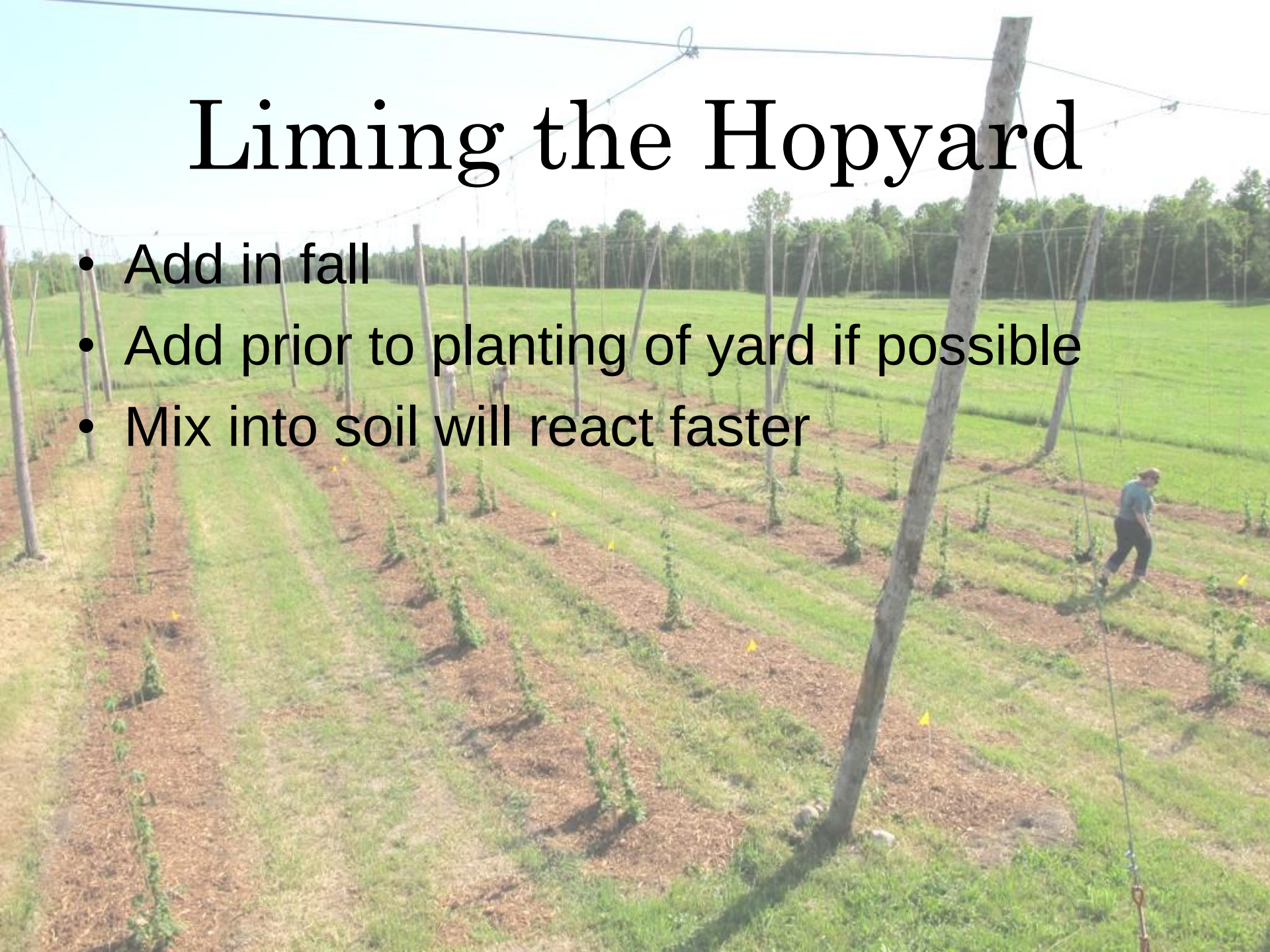
Soil pH and Nutrient Availability

Table 1. Soil pH and Interpretation

5.0	5.5	6.0	6.5	7.0	7.5	8.0
Strongly Acid	Medium Acid	Slightly Acid	Slightly Acid	Neutral	Mildly Alkaline	Moderately Alkaline
			Best Range for Most Crops			

Liming the Hopyard

- Add in fall
- Add prior to planting of yard if possible
- Mix into soil will react faster



Hop Requirements

VARIES SLIGHTLY BY VARIETY

- 3% Nitrogen
- 2% Potassium
- 0.50% Phosphorus

- Other important nutrients
  - Boron
  - Zinc

Hop Requirements

PRODUCE 5000 LBS DM/acre

- 3.0% Nitrogen = 150 Lbs
- 2.0% Potassium = 100 Lbs
- 0.50% Phosphorus = 25 lbs

CONES 1/3 to 1/2 of DM/acre

- 3.0% Nitrogen = 75 Lbs
- 2.0% Potassium = 50 Lbs
- 0.50% Phosphorus = 12.5 lbs

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First Year Hop Requirements

PRODUCE 1750 LBS DM/acre

- 3.0% Nitrogen = 55 Lbs
- 2.0% Potassium = 35 Lbs
- 0.50% Phosphorus = 9 lbs

My Yields?

You Should Know Cone Yields

1000 lbs dry cones per acre

30 to 50% of total weight

2000 to 3000 lbs total

60 to 90 lbs of N removed

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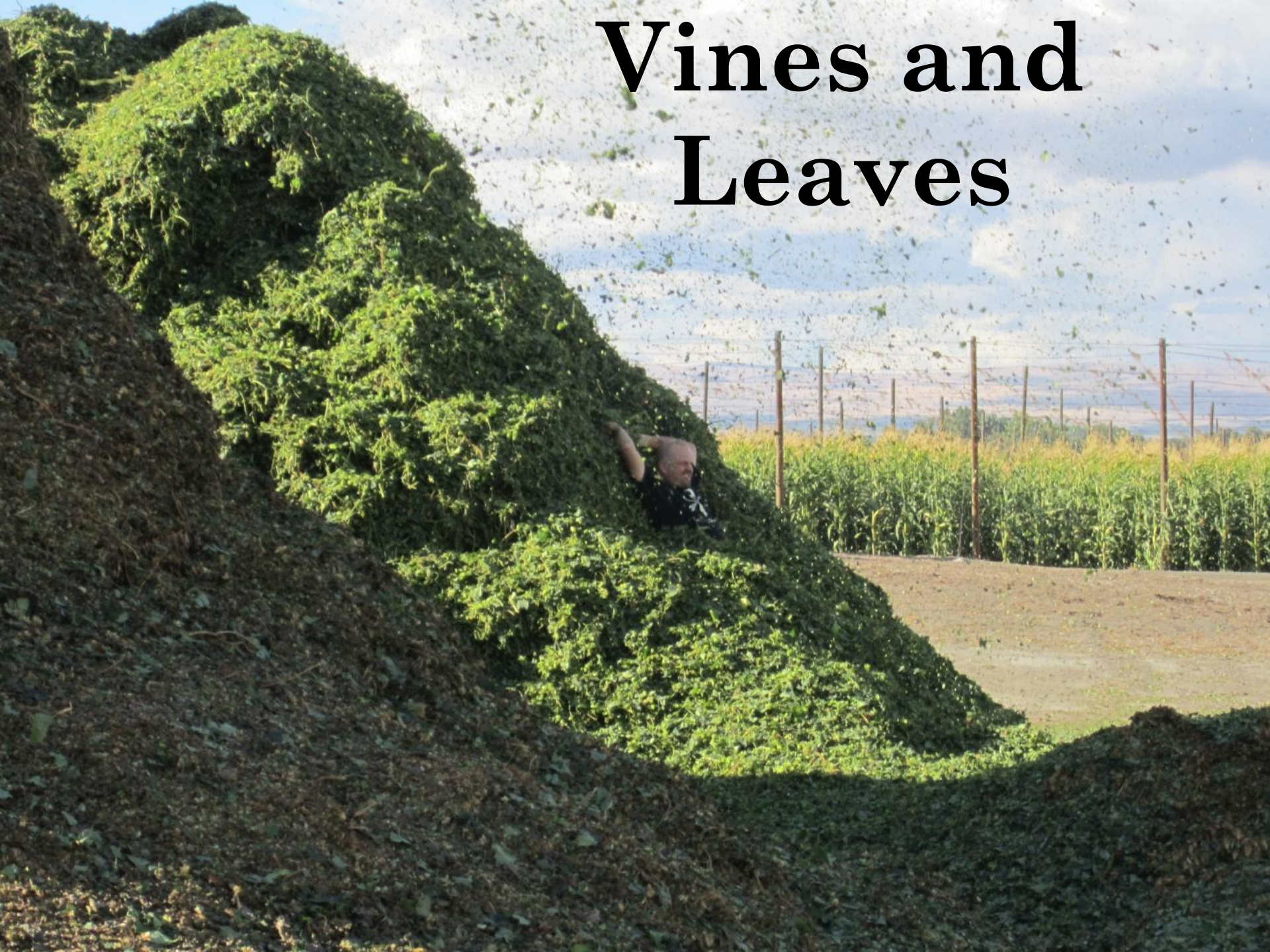
Vines and Leaves



Weed control

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Mulch

- Expensive
  - $1200 for 110 yards of hardwood mulch (including delivery)
  - Covered ½ acre, 6” deep, 4’ wide
- Fertility trade offs
- Moisture retention

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Training

- Easier to do earlier in the season before bines twist around weeds
  - Risk breaking off growing point
- Later training can affect maturity and yields

Broken tip during training

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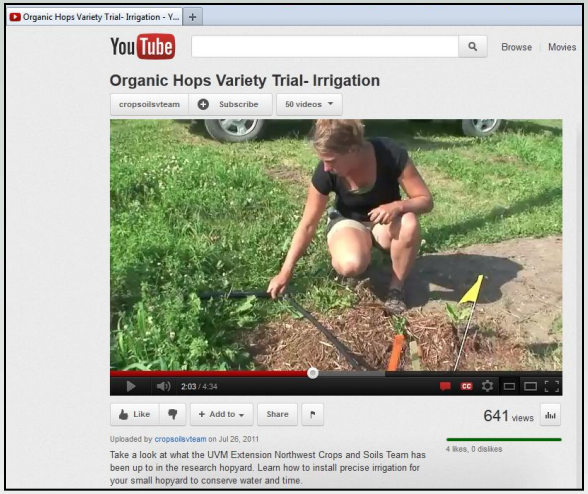
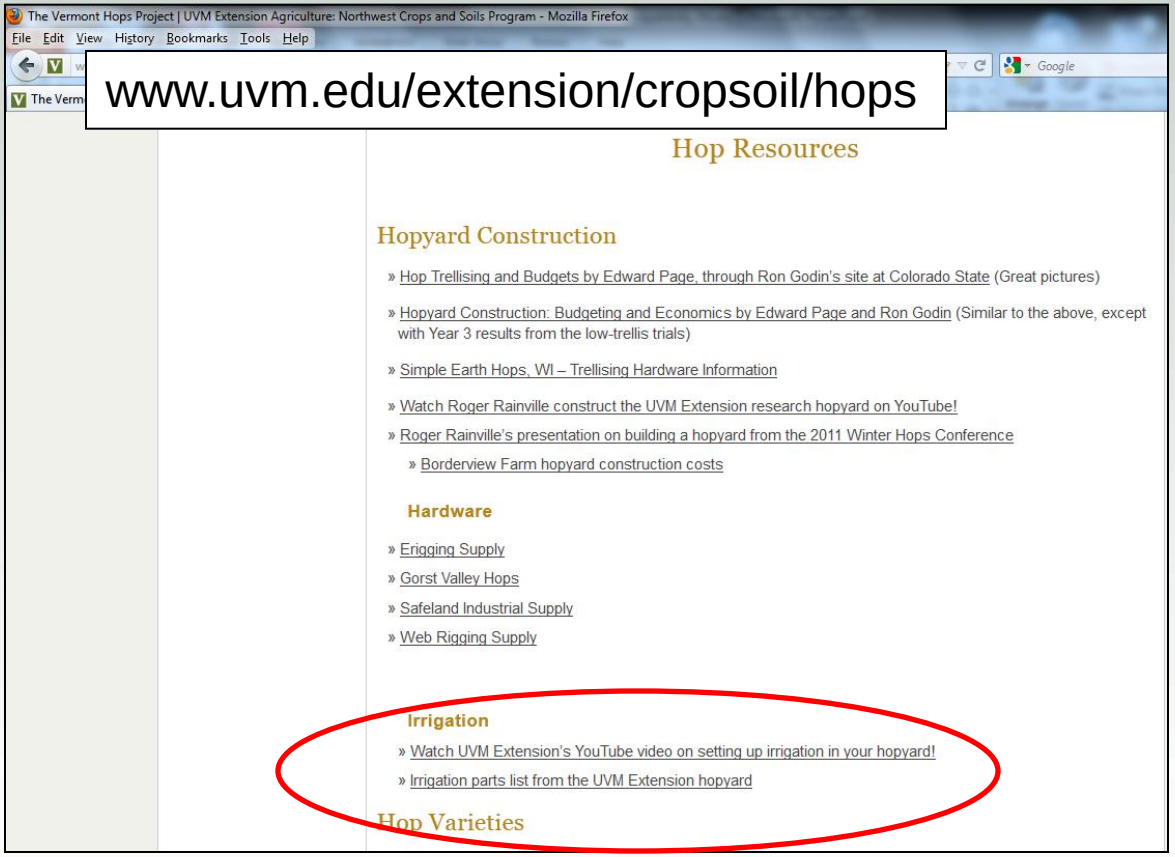
Watering/Irrigation





$1,200 to $1,500 per acre

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Aroostook Hops –

www.aroostookhops.com

Wet season, above average rainfall, but irrigation still improved yields dramatically.

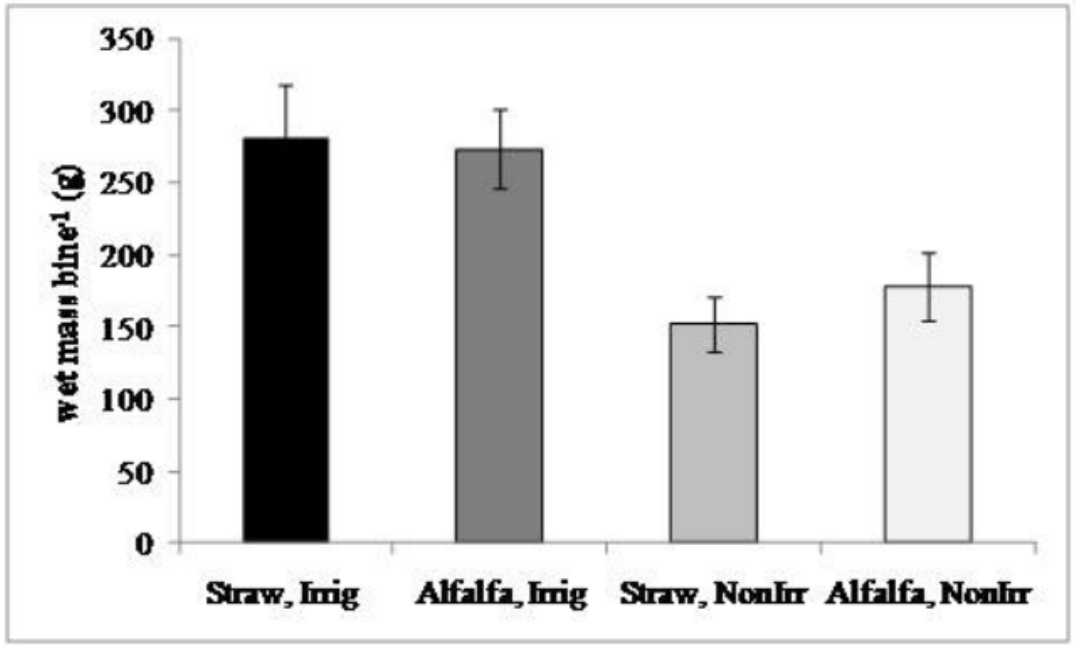

Figure 1: Irrigated plants produced more hops yield than non-irrigated plants for all varieties and ages combined.

Irrigated 3-year old Nugget yielded **3 times** more than non-irrigated 3-year old Nuggets.

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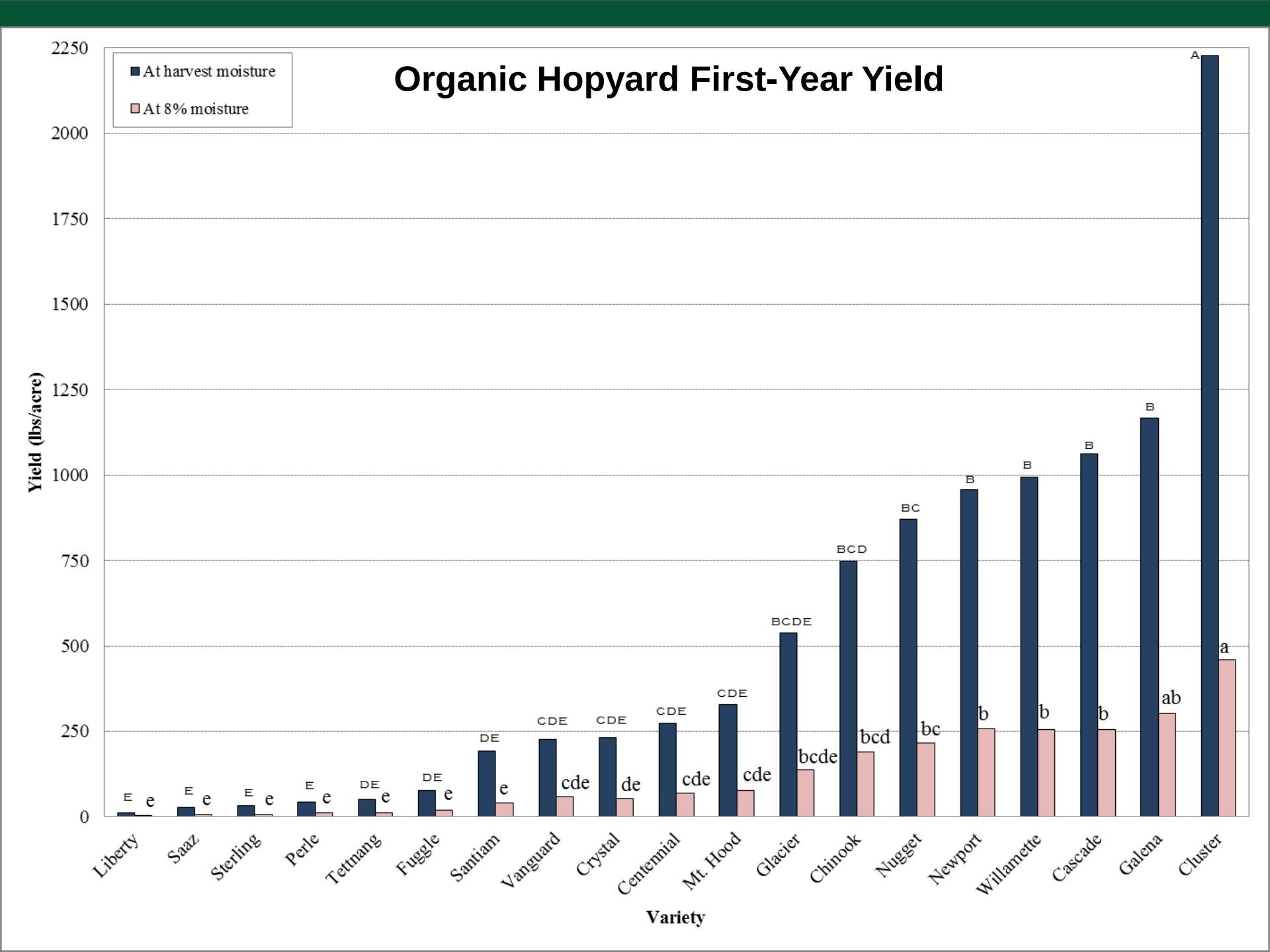
NORTHEAST SARE
Sustainable Agriculture Research & Education

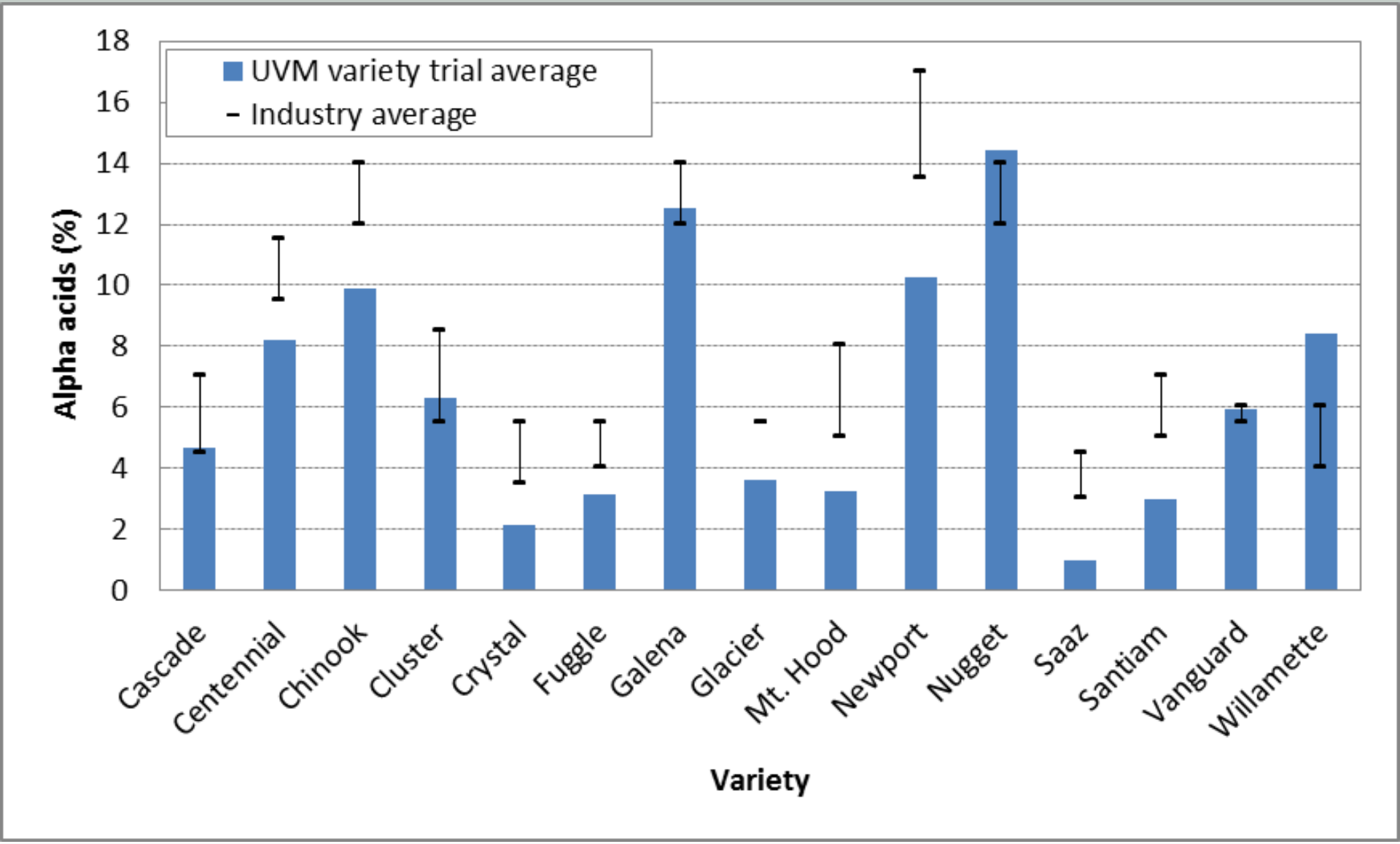
About a one month window of harvest depending on variety

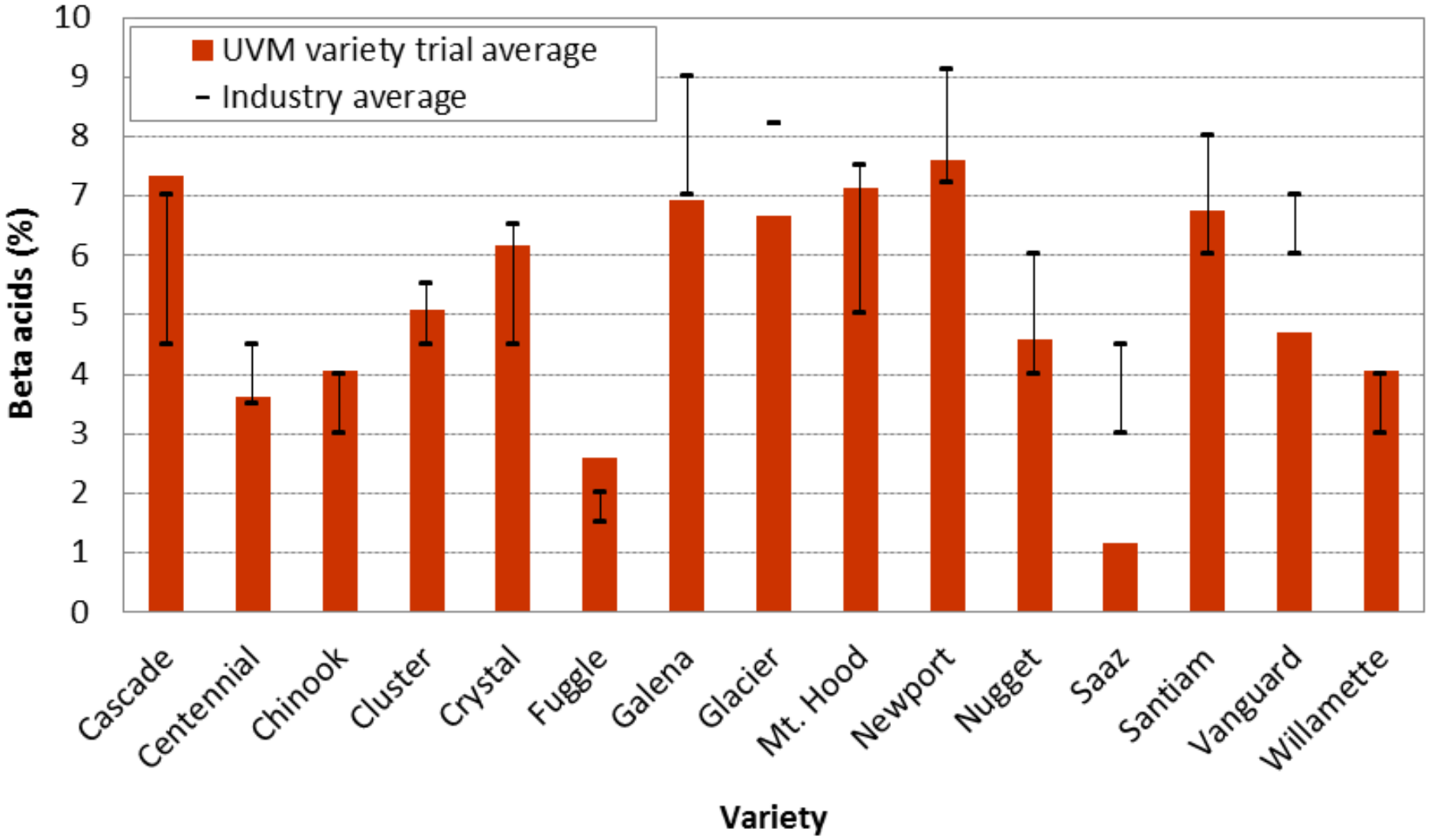
Variety	Date harvested	Dry matter %
Cluster	11-Aug-11	19.1
Cluster	12-Aug-11	18.9
Cascade	24-Aug-11	22
Fuggle	24-Aug-11	23.6
Saaz	24-Aug-11	23.7
Cascade	26-Aug-11	22.6
Galena	31-Aug-11	24
Tettnang	31-Aug-11	24.3
Vanguard	31-Aug-11	26.5
Willamette	31-Aug-11	25.6
Centennial	2-Sep-11	23.7
Chinook	2-Sep-11	23.3
Liberty	2-Sep-11	*
Mt. Hood	2-Sep-11	21.4
Perle	2-Sep-11	25.3
Tettnang	2-Sep-11	23.2
Vanguard	2-Sep-11	21.9
Chinook	6-Sep-11	23.5
Fuggle	6-Sep-11	22
Glacier	6-Sep-11	22.1
Nugget	6-Sep-11	22.7
Santiam	6-Sep-11	19.2
Glacier	8-Sep-11	23.1
Crystal	12-Sep-11	21.2
Sterling	13-Sep-11	21.4
Crystal	14-Sep-11	21.4
Glacier	14-Sep-11	25.8
Newport	14-Sep-11	25.1
Santiam	14-Sep-11	22.5
Sterling	14-Sep-11	23.6


Organic Hopyard First-Year Yield
At harvest moisture
At 8% moisture
Yield (lbs/acre)
2250
2000
1750
1500
1250
1000
750
500
250
0
Liberty
Saaz
Sterling
Perle
Tettnang
Fuggle
Santiam
Vanguard
Crystal
Centennial
Mt. Hood
Glacier
Chinook
Nugget
Newport
Willamette
Cascade
Galena
Cluster
Variety
E e
E e
E e
E e
DE e
DE e
DE e
CDE cde
CDE de
CDE cde
CDE cde
BCDE bcde
BCD bcd
BC bc
B b
B b
B b
B ab
A a

	Wet Yield	Dry Yield
	lb/acre	
•Cascade	1,061	254
•Chinook	747	189
•Cluster	2230	459
•Galena	1170	303
•Glacier	539	138
•Newport	959	257
•Nugget	870	217
•Willamette	993	256

First Year Yields – Can expect 2 to 4 x more yield


UVM variety trial average
Industry average
Alpha acids (%)
18
16
14
12
10
8
6
4
2
0
Cascade
Centennial
Chinook
Cluster
Crystal
Fuggle
Galena
Glacier
Mt. Hood
Newport
Nugget
Saaz
Santiam
Vanguard
Willamette
Variety


UVM variety trial average
Industry average
Beta acids (%)
10
9
8
7
6
5
4
3
2
1
0
Cascade
Centennial
Chinook
Cluster
Crystal
Fuggle
Galena
Glacier
Mt. Hood
Newport
Nugget
Saaz
Santiam
Vanguard
Willamette
Variety

Hop Oast = 80% to 8-12%

- Proper drying moisture
- Loss of quality during and after drying
- Proper packaging

Downy Mildew

- Most difficult to control
- Promoted by wet conditions
- Obligate parasite specific to hops
- Attacks leaves and cones
- In the wood of the plant
  - Persists in crown from year to year

Downy mildew

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Powdery Mildew Did not observe

- Good sanitation
- Prune bottom 3 – 4’ of bine
- Good airflow
- Resistant varieties
- Make sure to scout

Eastern Comma Butterfly

Pests

Japanese beetle

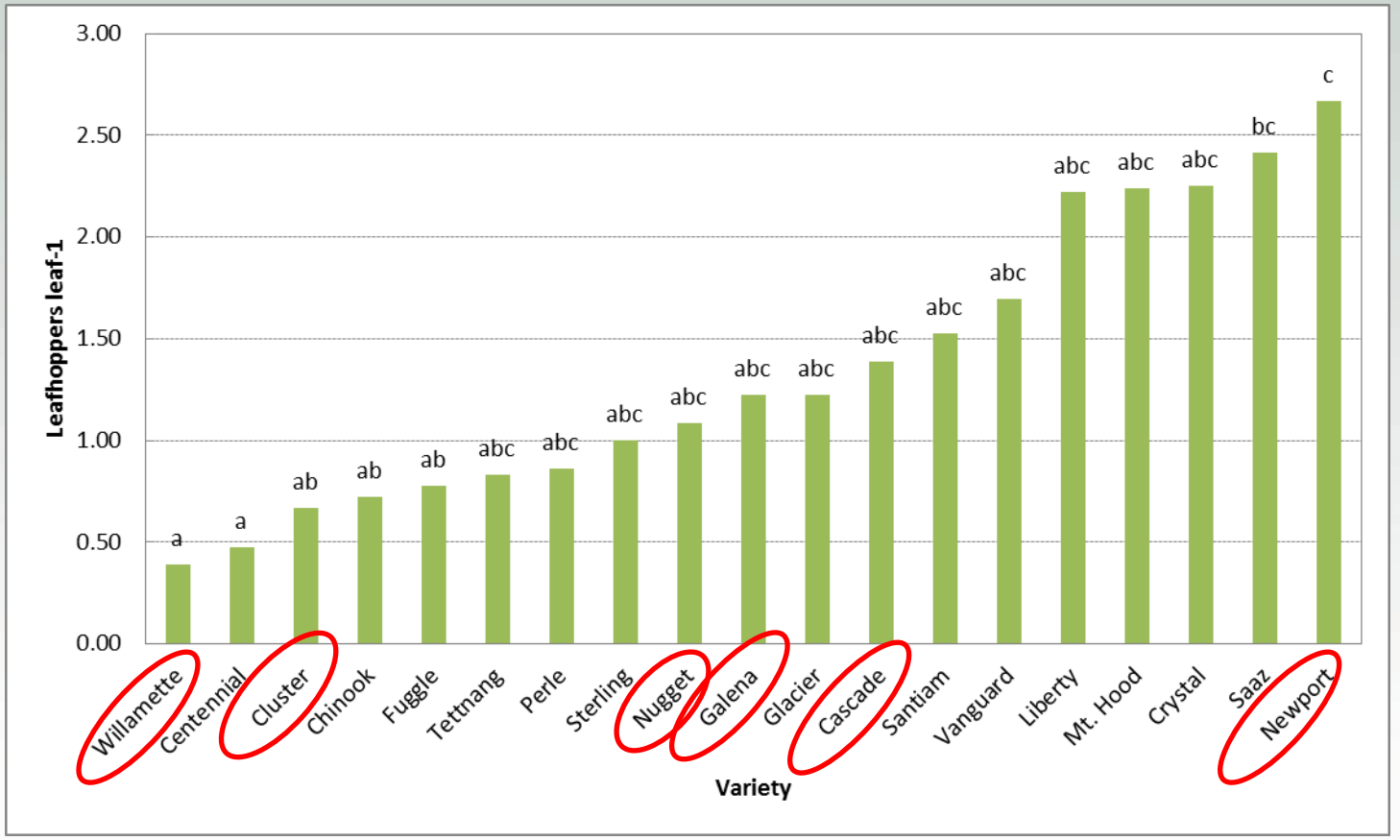
Aphids

Potato leafhoppers

Corn borer

Green cloverworm

Potato leafhoppers



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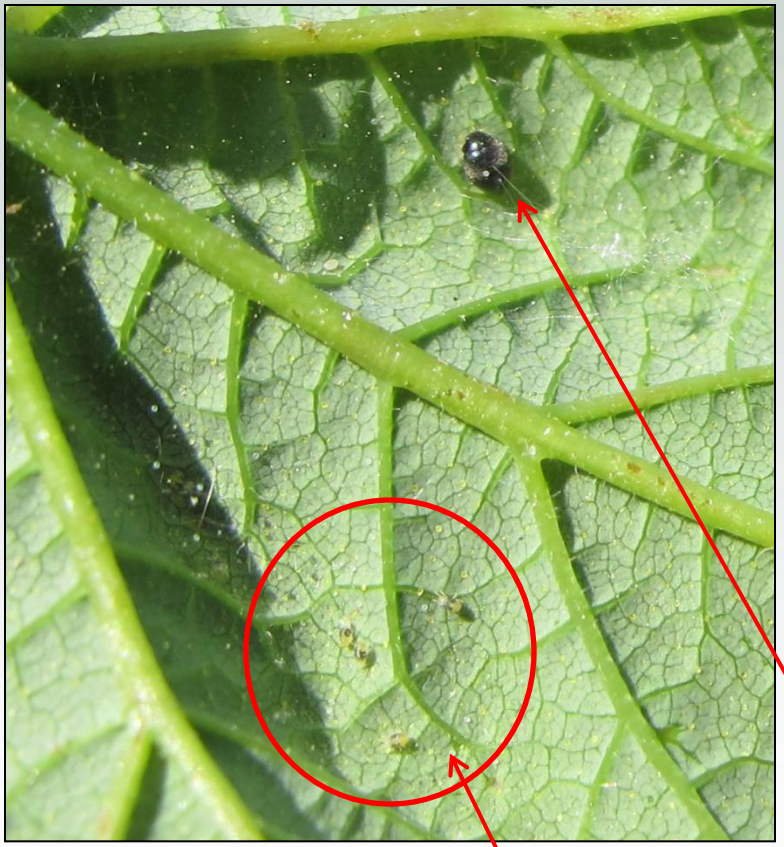
Two-spotted spider mites, spider mite destroyer lady beetles



Mite destroyer larva

Mite destroyer pupa

Mite destroyer adult

Two-spotted spider mites

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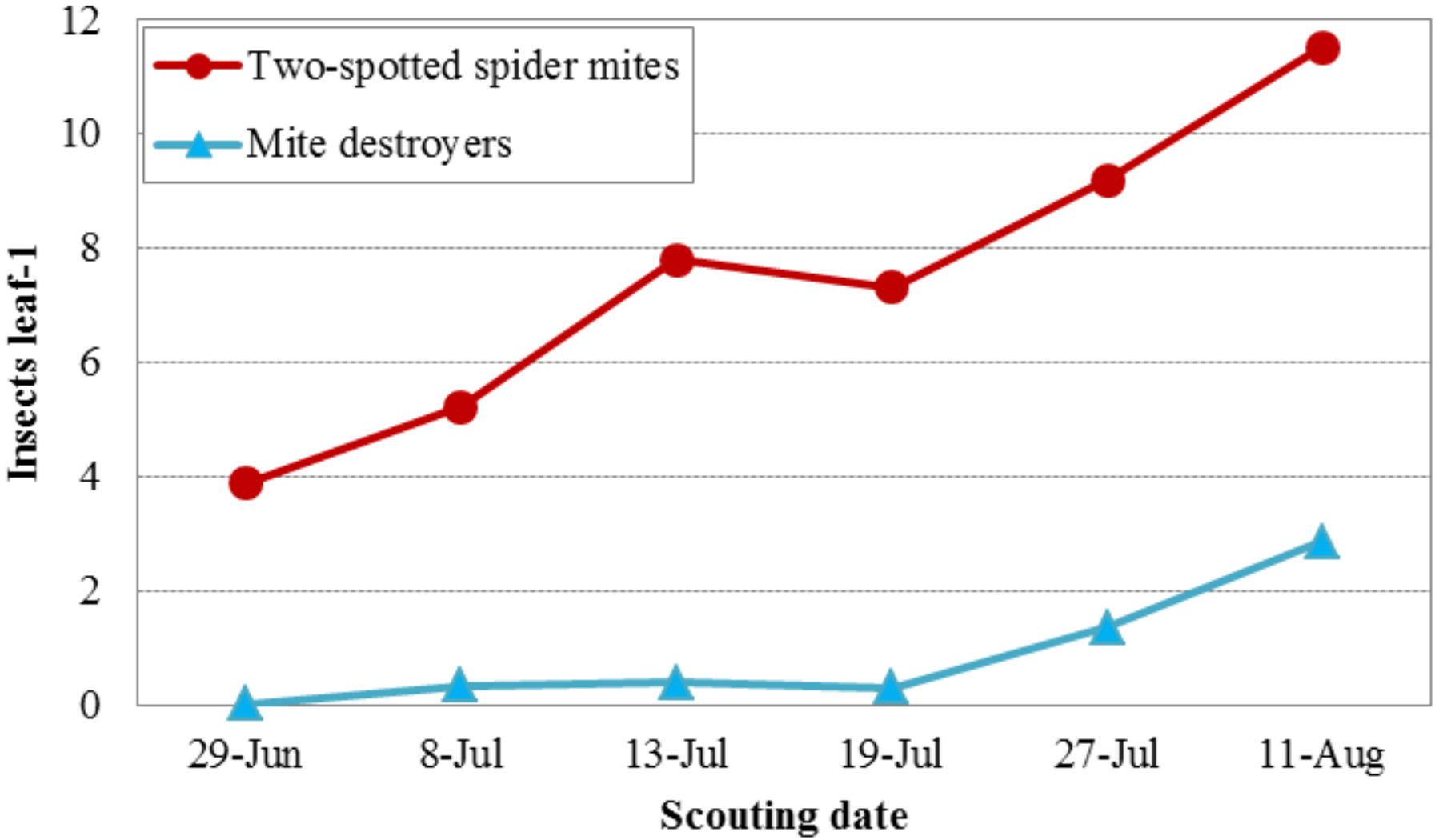
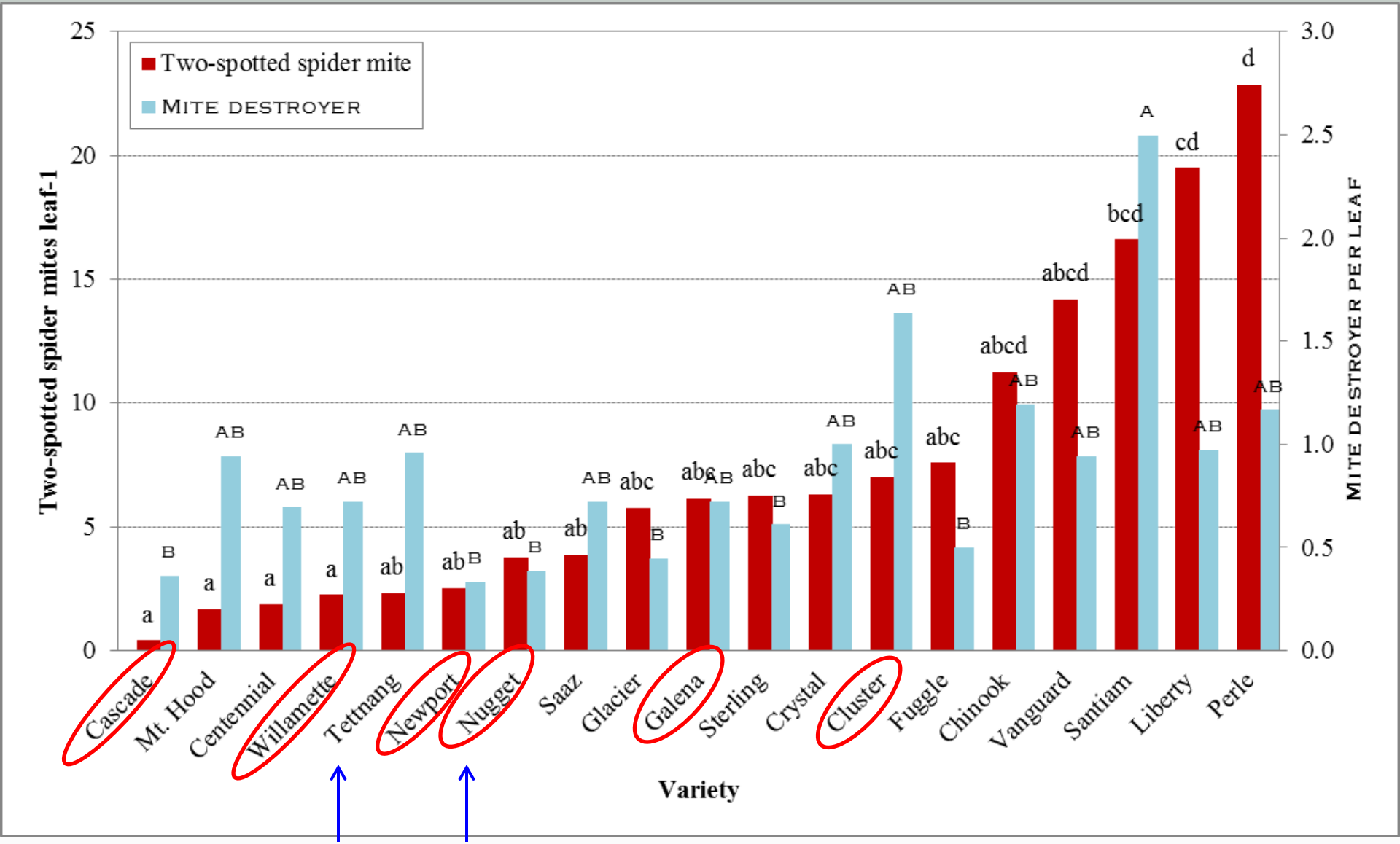
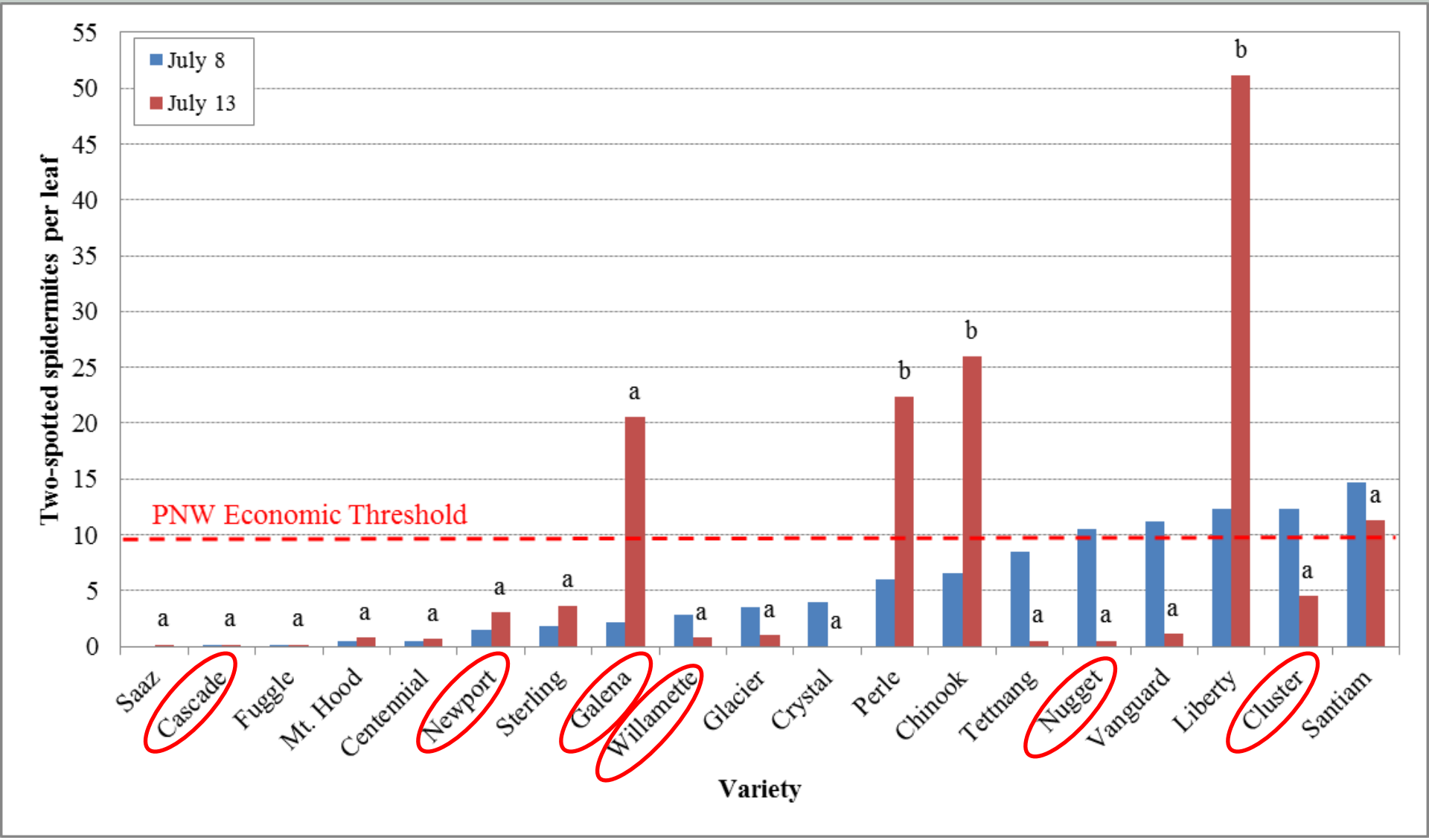

Two-spotted spider mites
Mite destroyers
Insects leaf-1
12
10
8
6
4
2
0
29-Jun
8-Jul
13-Jul
19-Jul
27-Jul
11-Aug
Scouting date


Two-spotted spider mite
MITE DESTROYER
Two-spotted spider mites leaf-1
MITE DESTROYER PER LEAF
Variety
Cascade
Mt. Hood
Centennial
Willamette
Tettnang
Newport
Nugget
Saaz
Glacier
Galena
Sterling
Crystal
Cluster
Fuggle
Chinook
Vanguard
Santiam
Liberty
Perle


July 8
July 13
Two-spotted spidermites per leaf
55
50
45
40
35
30
25
20
15
10
5
0
PNW Economic Threshold
a a a a a a a a a a a a b b a a a b b a a a b a
Saaz
Cascade
Fuggle
Mt. Hood
Centennial
Newport
Sterling
Galena
Willamette
Glacier
Crystal
Perle
Chinook
Tettnang
Nugget
Vanguard
Liberty
Cluster
Santiam
Variety

Pest control

Date	Downy mildew control		Potato leafhopper control	TSSM control
	Regalia	Sonata	Pyganic	Aza-Direct
17-Jun	*All*			
30-Jun	*All*		*All*	*All*
14-Jul		*All*	*Select plots*	*Select plots*
20-Jul		*All*		*All*
2-Aug	*Select plots*			*Select plots*
12-Aug		*Select plots*		*Select plots*

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Beneficial Insects

Spined soldier bug

Syrphid fly

Ladybird beetle/Lady bugs

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Cover crops

Mechanization – interactive website coming soon!

Small-scale baler

Small-scale harvester

Small-scale oast

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What's next??

UVM Extension Crops and Soils website
www.uvm.edu/extension/cropsoil

UVM Extension Crops and Soils blog "What's Hoppening"
http://www.uvm.edu/extension/cropsoil/whats-hoppening

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