Picking Productive and Profitable Produce

Dr. Zach Miller-Assistant Professor & Director at MSU-Western Ag. Research Center

Fruit Grower Workshop: Laurel Sept 2018

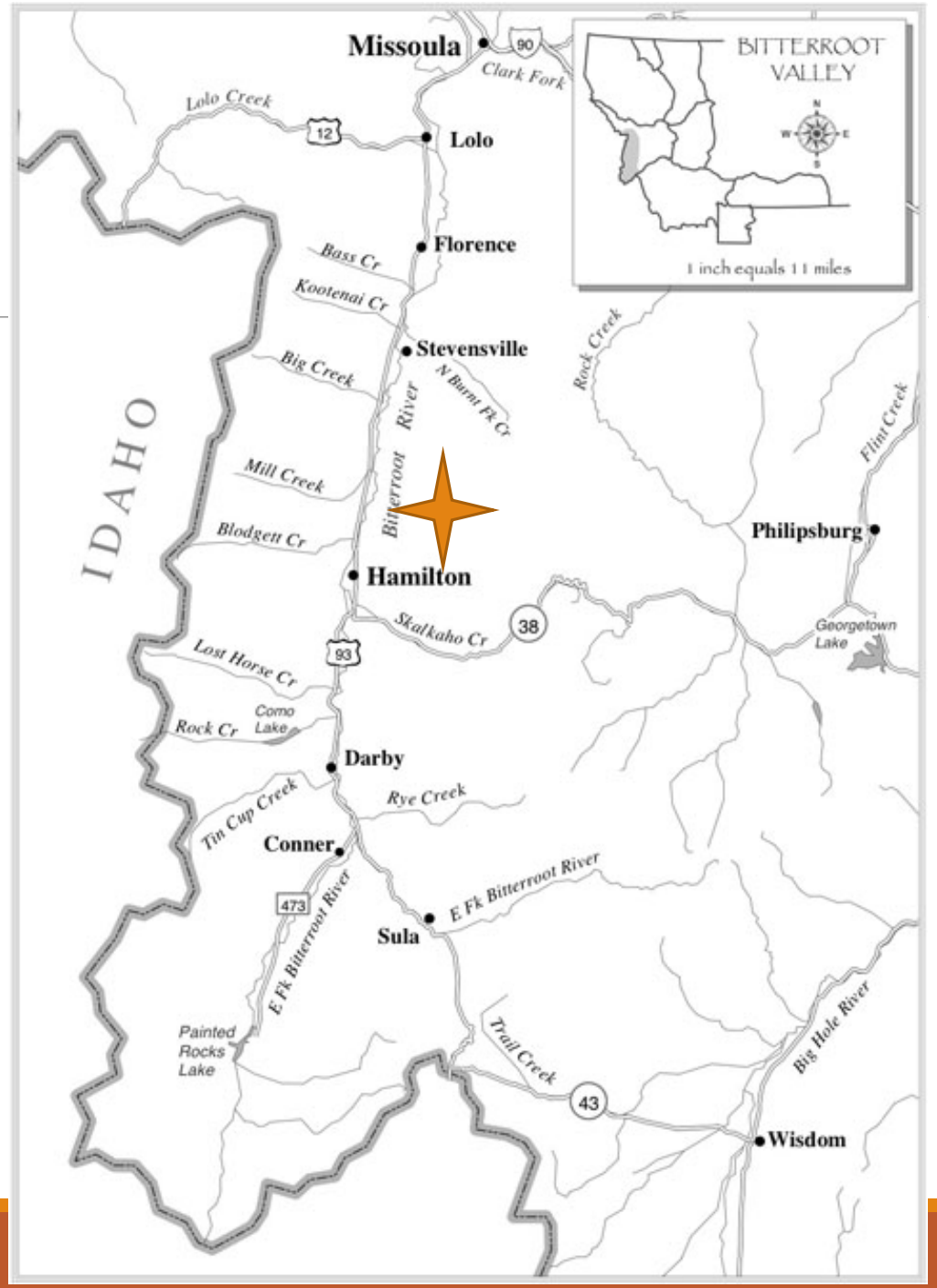
MONTANA STATE UNIVERSITY

Outline

- Western Agricultural Research Center (WARC)
  - History
  - Mission
- Goals, Opportunities, and Challenges for commercial fruit production
- Examples of what MSU-WARC does to help
  - Berries
  - Apples/Cider
  - Grapes

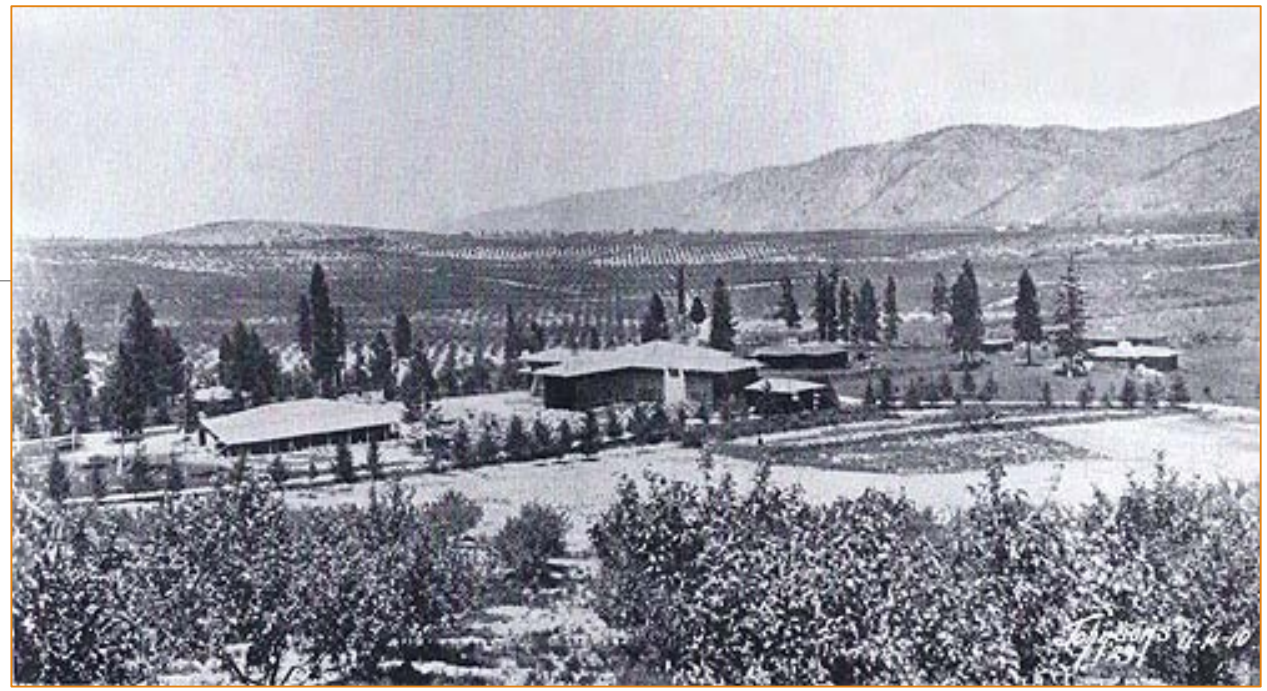
WARC

- Corvallis, Montana
- Excellent Growing Conditions
  - Zone 5a
  - >120 Frost Free Days
  - ~2000 Growing Degree Days
- Irrigated:
  - 11 Inches of Precipitation/Year

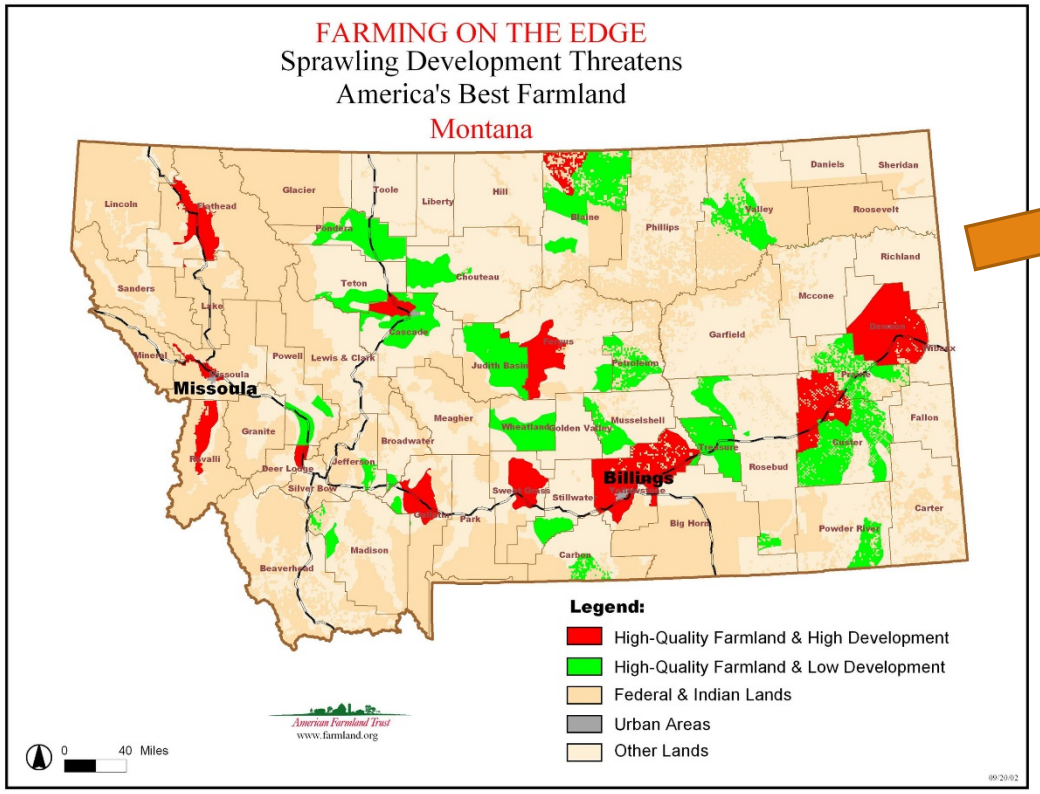


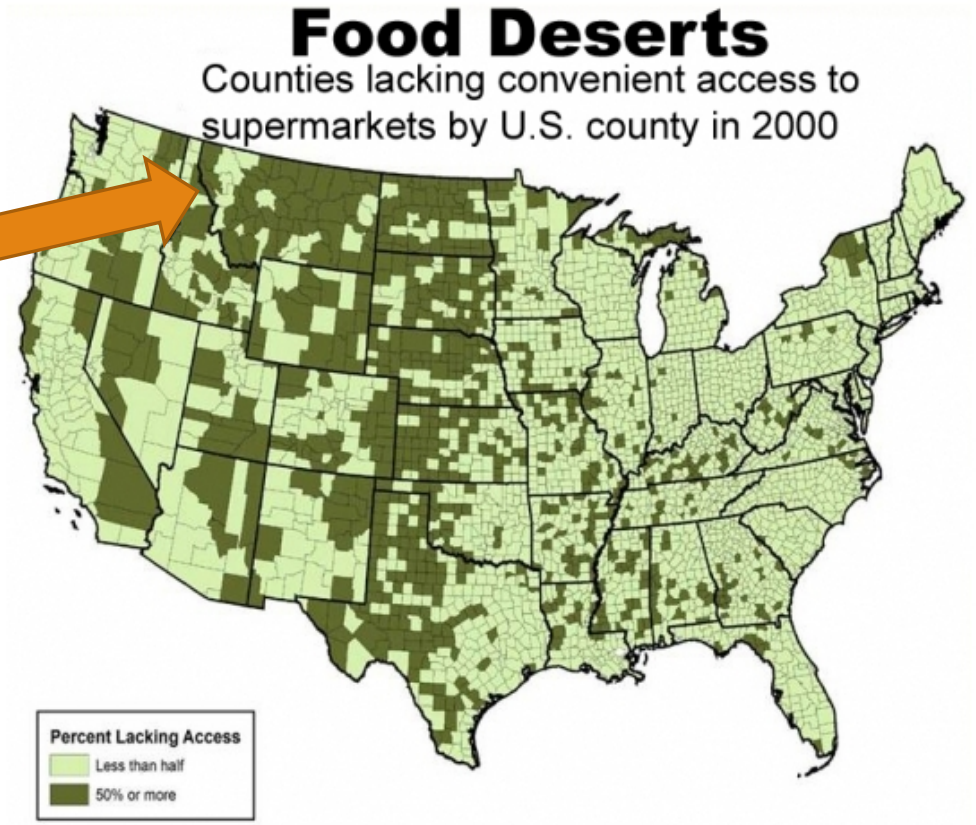
WARC-history

- Established in 1907 during a Bitterroot Apple Boom
- Major production region
  - 10-15,000 ac
  - 750,000 trees
- Emphasis on horticultural crops



Mission-Specialty Crops





Goal

Growing Fruit for profit

Opportunities:

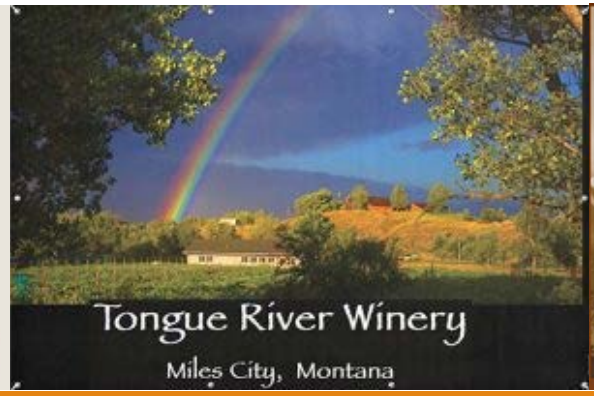
- Growing demand
- High value per acre
- Adapted cultivars
- Favorable climates

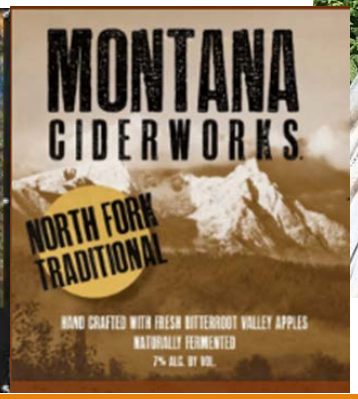
Challenges:

- Marketing/Market access
- High start-up and labor costs
- Slow return on investment
- New and untested cultivars
- Variable climates
- Steep learning curve- less forgiving, more risk than annual crops

Growing Demand: Local Food (and Drinks)

- Supporting local community
- Connection to food system
- Supporting sustainable practices
- #2 in microbreweries per capita

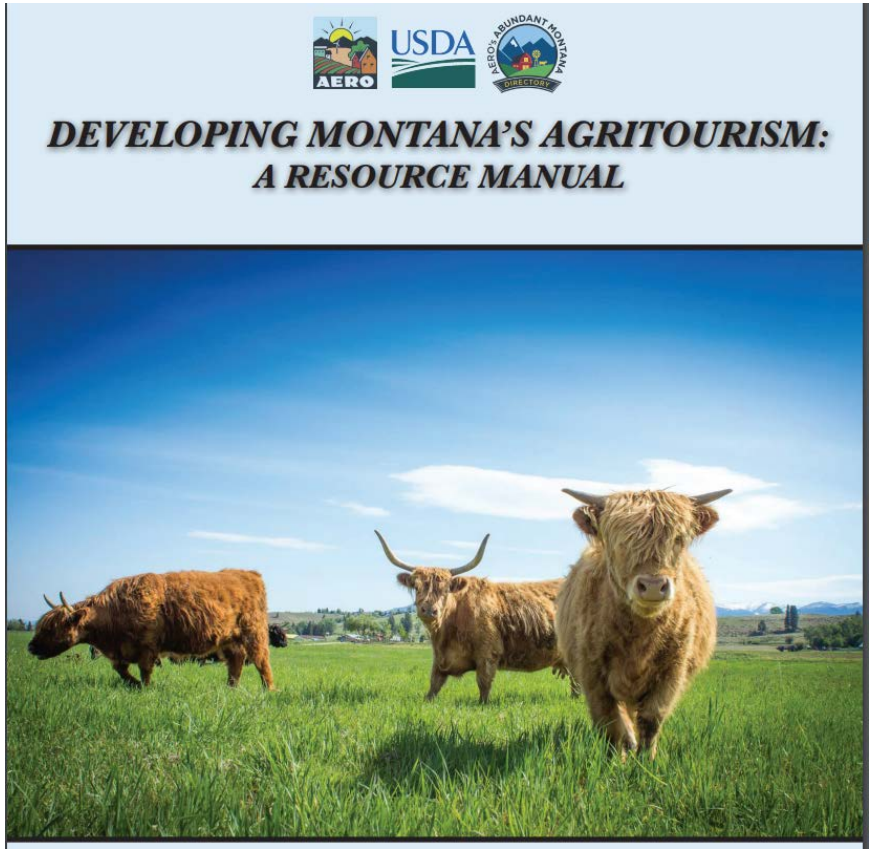




Growing Demand: Agrotourism

Synergizing the two largest segments of the states economy:

- in 2016:
- $4.3 billion in ag. production
- $3.0 billion from tourism
- 12.4 million visitors
- MT economic development report 2017



http://aeromt.org/wp-content/uploads/2017/09/Agritourism-Manual.pdf

Growing Demand: Wellness-Superfoods

- Annual consumption of Blueberries has increased 4X over 20 years:
  - ~0.25 billion lbs. in 1995
  - Over 1 billion lbs. today

Marketing/Market access

- **Business-Marketing as or more important than what/how you grow**
- Access to markets/consumers is your responsibility
- Diversify: identify multiple markets/buyers
- Explore value-added processing
- Establish pricing
- Learn from peers/leaders

Community Food & Agriculture Coalition
OF MISSOULA COUNTY

High value crops (>$5,000/ac)

Fruit	Lbs./Plant	Lbs./Acre
Haskaps	4-9	4,000-9,000
Aronia	10-15	12-15,000
Currants	5-10	4,500-9,000
Saskatoons	3-6	3,000-6,000
Dwarf Sour Cherries	10-20	7,000-14,000
Apples	15-25	20,000-36,000
Grapes	10-15	4,000-8,000

High Start-up Costs

- >$10,000/ac
- Fencing: $2,500
- Bird Protection: $1,800-3,500
- Weed Control, Irrigation, Etc.: $1,000
- Plants: $4,000+
- Trellis: $1,500-2,500
- Does not include labor (2-3x)
- **Slow Return**

High start-up costs: slow return

Fruit	Years to Mature Yields	Plants/Acre	$/Acre
Haskap	4-6	1000	5,000-10,000
Aronia	4-6	1000	
Currants	4-6	1000	
Saskatoons	6-8	800	
Dwarf Sour Cherries	8-10	800	
Apples	4-10	400-1600	10,000-20,000
Grapes	4-5	800	3,000-5,000

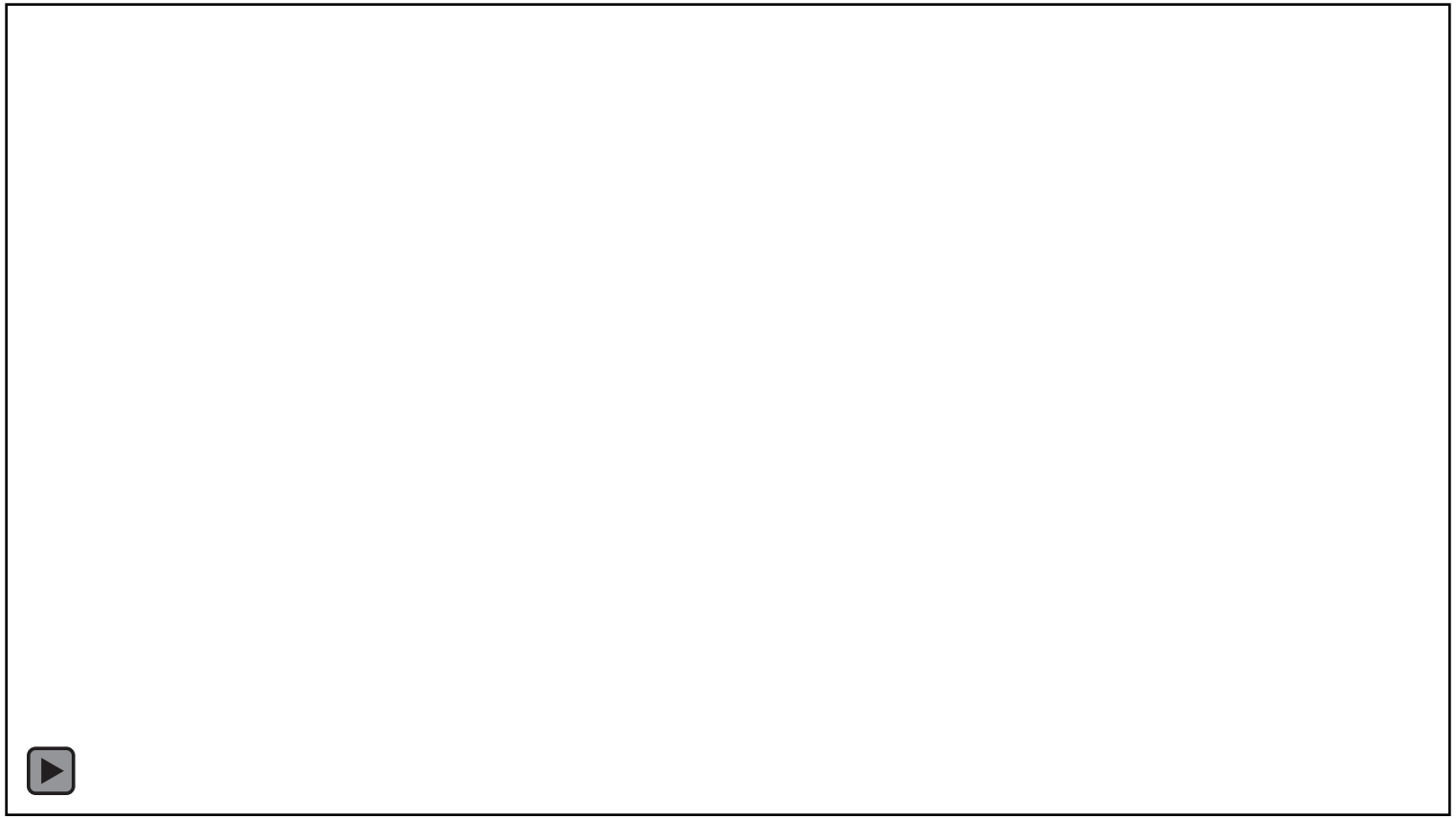
Labor and Harvesting

Hand harvest (at $8/hr.)

	Hours/acre	$/acre
Haskap	900	$7,200
Aronia	720	$5,800
Currants	450-500	$3,600-4,000

Mechanical Harvesting

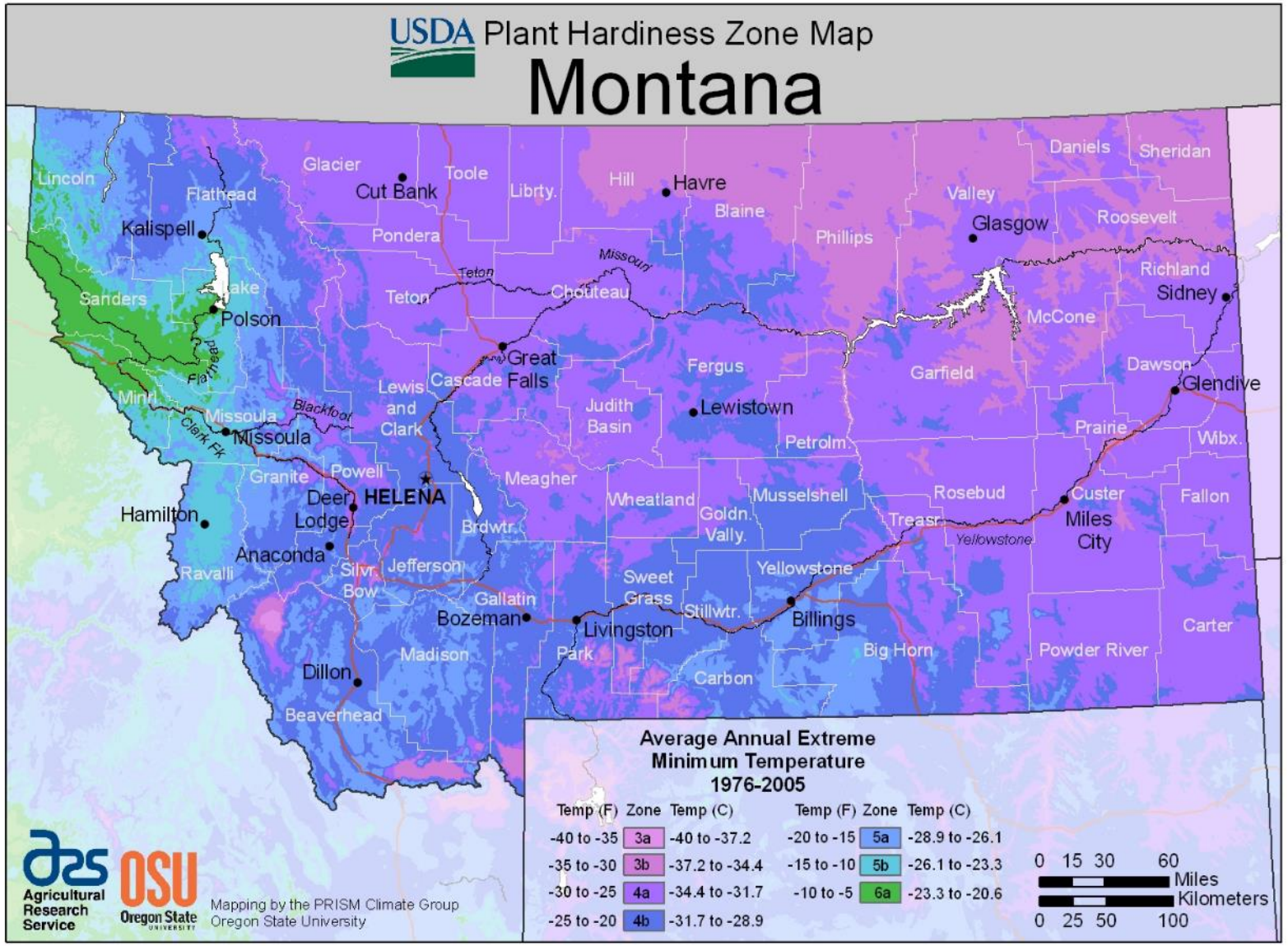
~$45,000, Harvests one acre in 3 hours

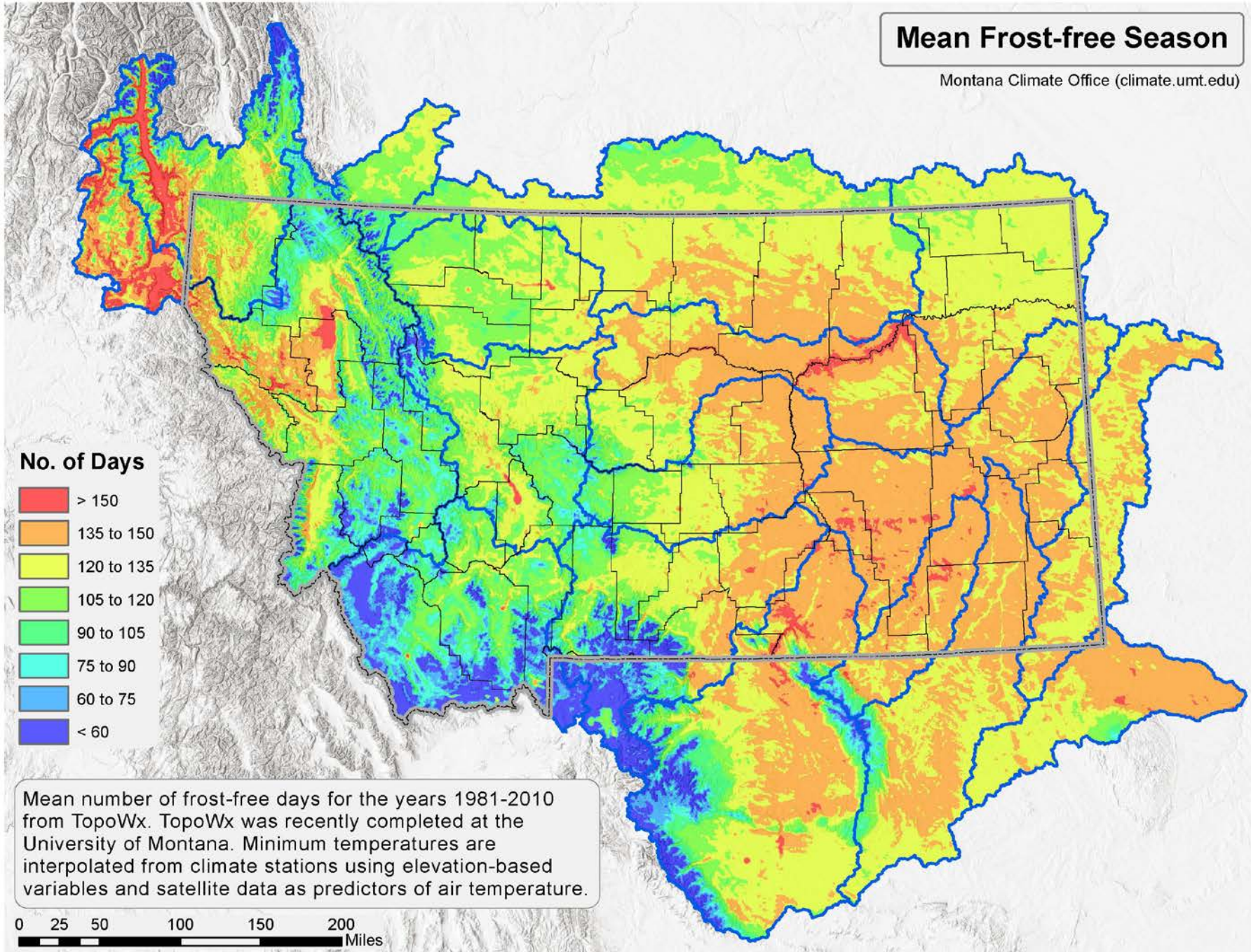


Adapted varieties

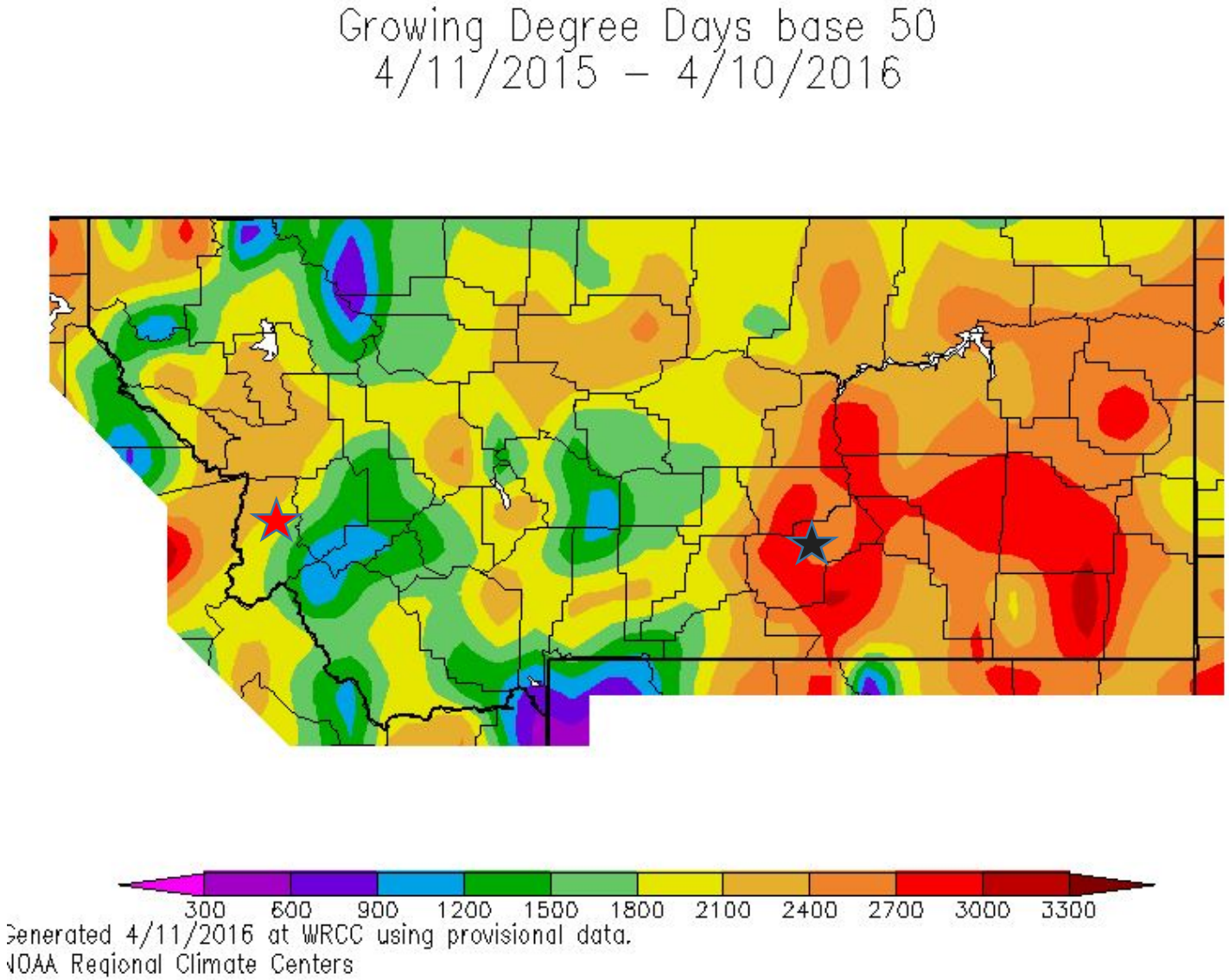
- Many new and old options
  - Often untested or being tested
- Winter temperatures
- Growing season length/heat
- Frost during bloom
- Disease

Cold hardy

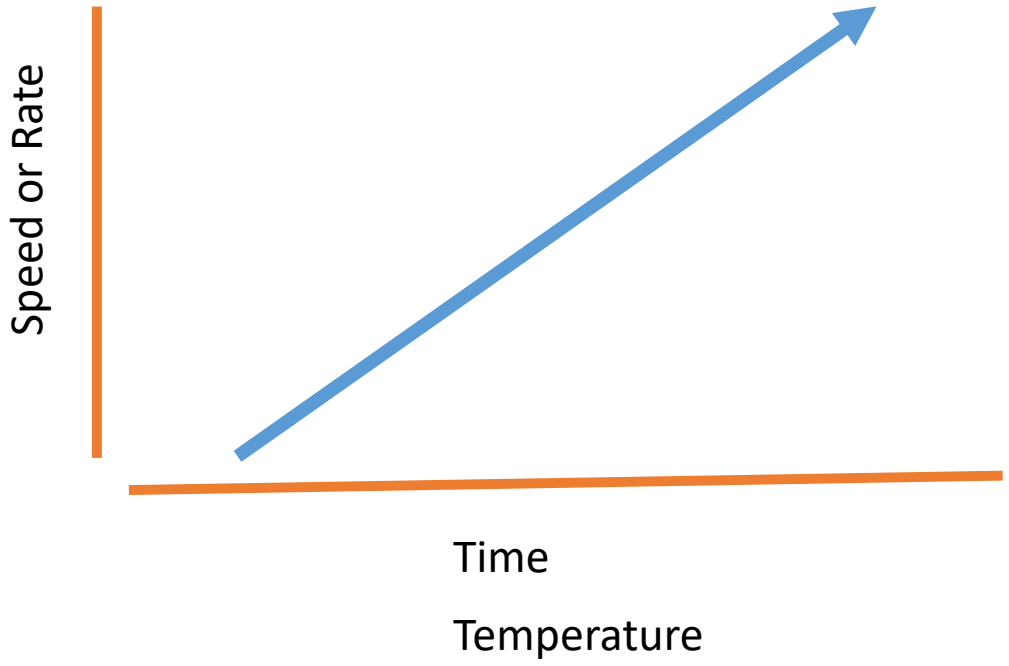

USDA Plant Hardiness Zone Map
Montana
Lincoln
Flathead
Kalispell
Glacier
Cut Bank
Toole
Librty.
Hill
Havre
Blaine
Daniels
Sheridan
Valley
Glasgow
Roosevelt
Pondera
Phillips
Missouri
Teton
Richland
Sidney
Sanders
Lake
Polson
Choteau
McCone
Great Falls
Fergus
Garfield
Dawson
Glendive
Mineral
Flathead
Lewis and Clark
Cascade
Judith Basin
Lewistown
Missoula
Blackfoot
Clark Fk
Petrolm
Prairie
Wibx.
Granite
Powell
Meagher
Deer Lodge
HELENA
Wheatland
Musselshell
Rosebud
Custer
Fallon
Hamilton
Brdwtr.
Goldn. Vally.
Treasr.
Miles City
Yellowstone
Anaconda
Ravalli
Silvr. Bow
Jefferson
Sweet Grass
Yellowstone
Gallatin
Stillwtr.
Bozeman
Billings
Livingston
Carter
Madison
Park
Big Horn
Powder River
Dillon
Carbon
Beaverhead
Average Annual Extreme Minimum Temperature 1976-2005
Temp (F) Zone Temp (C)
-40 to -35 3a -40 to -37.2
-35 to -30 3b -37.2 to -34.4
-30 to -25 4a -34.4 to -31.7
-25 to -20 4b -31.7 to -28.9
Temp (F) Zone Temp (C)
-20 to -15 5a -28.9 to -26.1
-15 to -10 5b -26.1 to -23.3
-10 to -5 6a -23.3 to -20.6
0 15 30 60 Miles
0 25 50 100 Kilometers
Agricultural Research Service
OSU Oregon State University
Mapping by the PRISM Climate Group
Oregon State University


Mean Frost-free Season
Montana Climate Office (climate.umt.edu)
No. of Days
> 150
135 to 150
120 to 135
105 to 120
90 to 105
75 to 90
60 to 75
< 60
Mean number of frost-free days for the years 1981-2010 from TopoWx. TopoWx was recently completed at the University of Montana. Minimum temperatures are interpolated from climate stations using elevation-based variables and satellite data as predictors of air temperature.
0 25 50 100 150 200
Miles

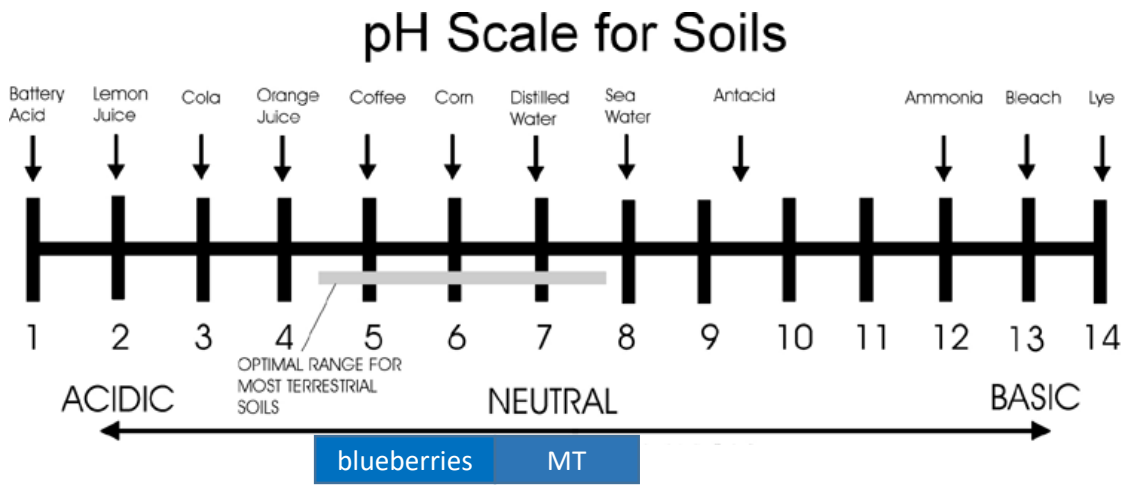
Limited growing season



Ripening Fruit: Growing Degree Days



Adapted to neutral-alkaline soils



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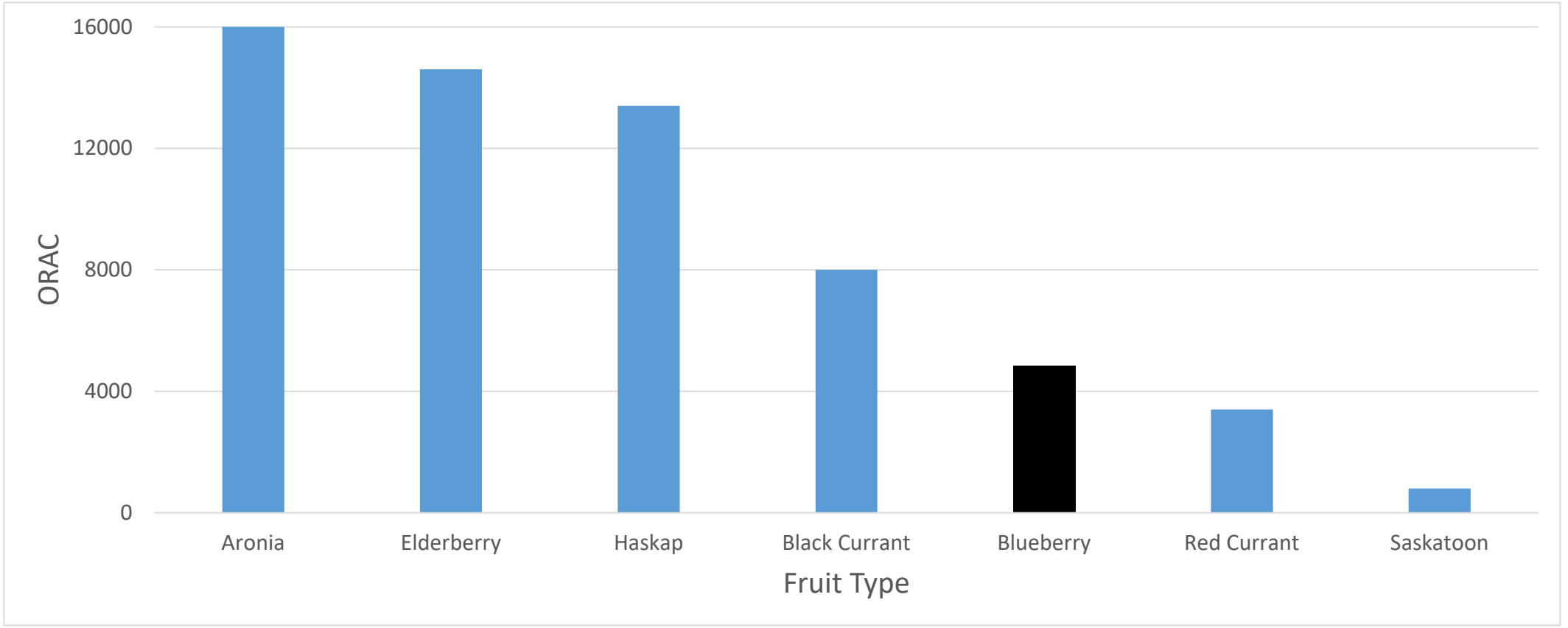
  - Grapes
  - Apples/Cider

Berries/small fruits

- Opportunity to capture growing market for Superfoods
- Dark colored=antioxidant rich
- Cold-Hardy Dark Fruit-Tolerate of Neutral to Alkaline Soils
  - Growing industry
  - Includes Sour cherries, Haskaps, Saskatoons, Currants, Aronia, Elderberry

Antioxidant potential (ORAC)




Superberries
aroniaberry
freshly frozen berries
MEGA ANTIOXIDANTS*


haskapa
2013
haskapa
500 ml


SASKATOON
BERRY
SPREAD
CONFITURE


Bob's Red Mill
SWEET AND TANGY
BLACK
CURRANTS
NET WT 16 OZ (1 LB) 453g

A Team Effort

Montana-Grown Superfood berries

- Objectives:
  - Identify suitable varieties
  - Evaluation productivity/flavor
  - Educate producers, processors, consumers
- Planted 2015 at 4 locations
- Other resources:
  - Kathy Wiederholt's Fruit Research at North Dakota-Carrington
  - University of Saskatchewan Fruit program

Montana-Grown Superfood berries

Approach/Methods

- Evaluate ~50 varieties of 6 fruit types
- Across varying growing condition: Orchards in Corvallis, Kalispell (Organic), Helena, and Bozeman
- Measure winter hardiness, pests, production, and flavor

Dwarf sour cherries

- Prunus cerasus X fruiticosa
- Developed by University of Saskatchewan
- Short stature-easy to harvest by hand/machine
- Great flavor/color
- Productive: up to 30 lbs/plant
- Evaluating Crimson Passion, Carmine Jewel, Romeo, and Juliet
- Requires pest management

Currants

- Black (*Ribes nigrum*) and Red (*R. rubrum*)
- Productive: ~10-20 lbs/plant
- Popular in Europe, but less known in US
- Evaluating 8 types of black and 3 reds
  - Blacks: Titania, Blackcomb, Stikine, Tofino, M12, Cheakamus, Tahsis, and Whistler
  - Reds: Jonkeer van Tets, Rovada, HRON
- Requires pest management

Haskaps/Honeyberries

- Edible Honeysuckle (*Lonicera caerulea*)
- Native to Boreal region, around the globe- Super Cold Hardy
- Traditionally grown in Russia/Japan
- Growing production in Canada/Europe
- Very diverse: variable flavor/form
- Need 2 varieties
- Evaluating: 8 lines from Oregon State, Indigo Gem, Aurora, Borealis, Boreal Blizzard, Blue Corn, Blue Goose, and Wild Treasure.

Aronia

- *Aronia* (*Photinia*) *melanocarpa*
- Half Native to US
- Pure native Aronia (black chokeberry) **is not the same**
- Many commercial cultivars but not much difference
- Very high in Tannins and Anthocyanin's- for processing/blending
- Not preferred by birds
- Evaluating Viking and McKenzie

Saskatoons/Serviceberries

- *Amelanchier alnifolia*
- Native but commercial varieties are much better
- >$20 million/year industry for Canada
- Some varieties can be machine harvested
- Evaluating: Smoky, Martin, Northline, Lee 3, Lee 8, and JB30.

Elderberry

- *Sambucus canadensis/nigra*
- Many health benefits
- Large industry in Europe
- Comparing Commercial European Varieties to 6 New North American Varieties: Wyldewood, Ranch, Johns, Adams, Samdal, Samyl.

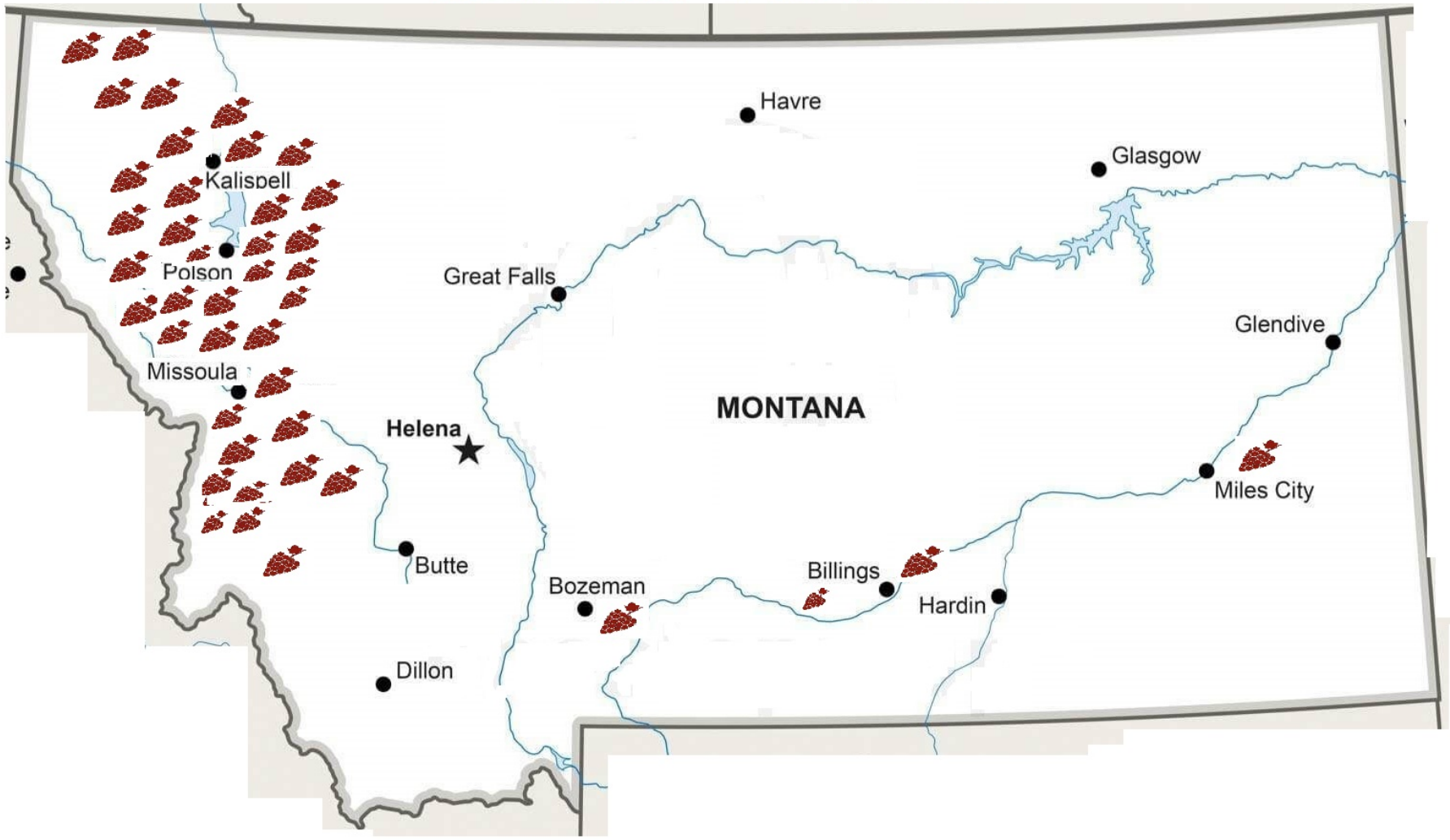
Fruits Work Well Together

	June	July	August	September
Haskaps				
Saskatoons				
Sour cherries				
Currants				
Aronia				

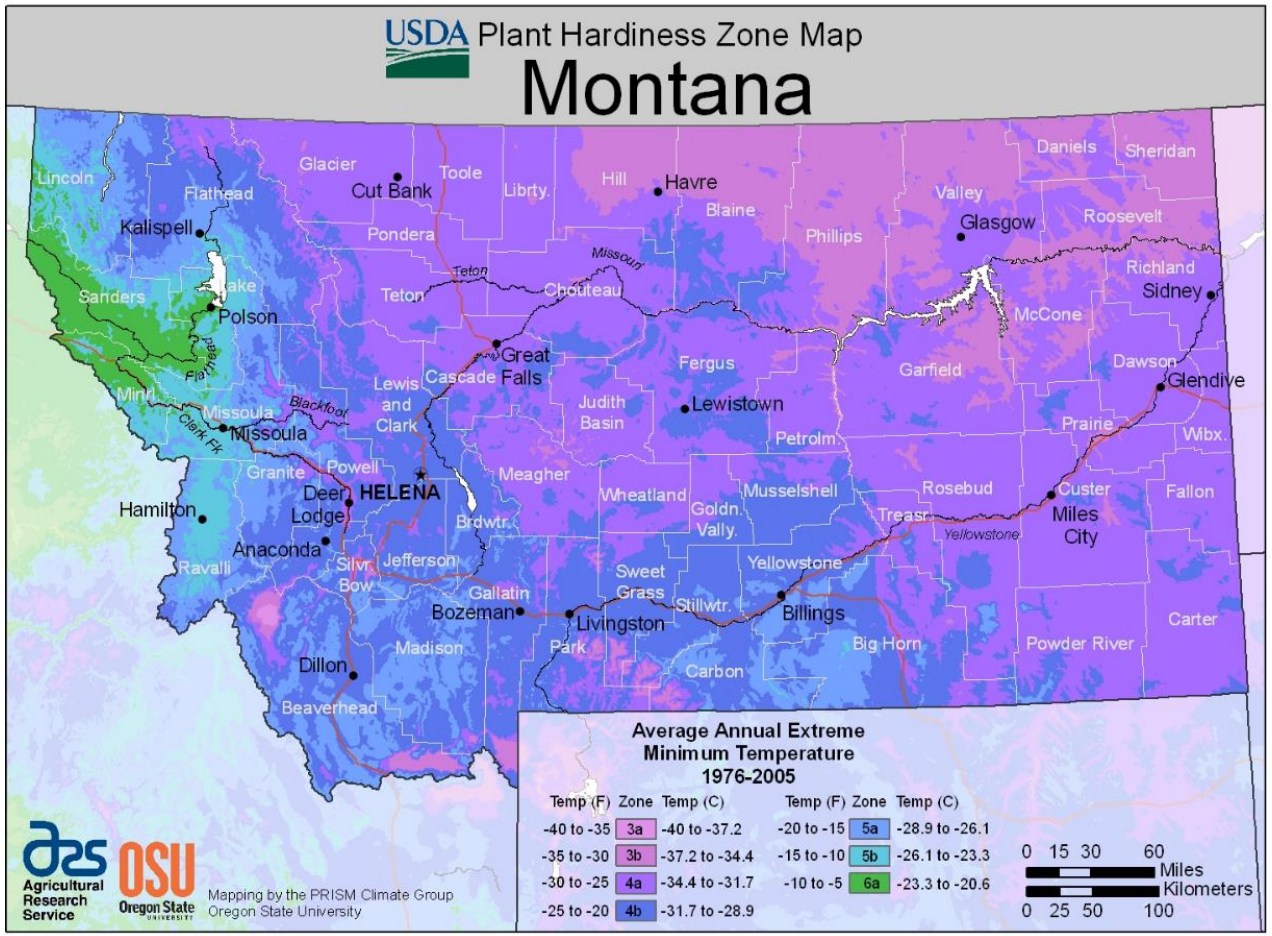
Supporting the growth of Montana vineyard and wineries

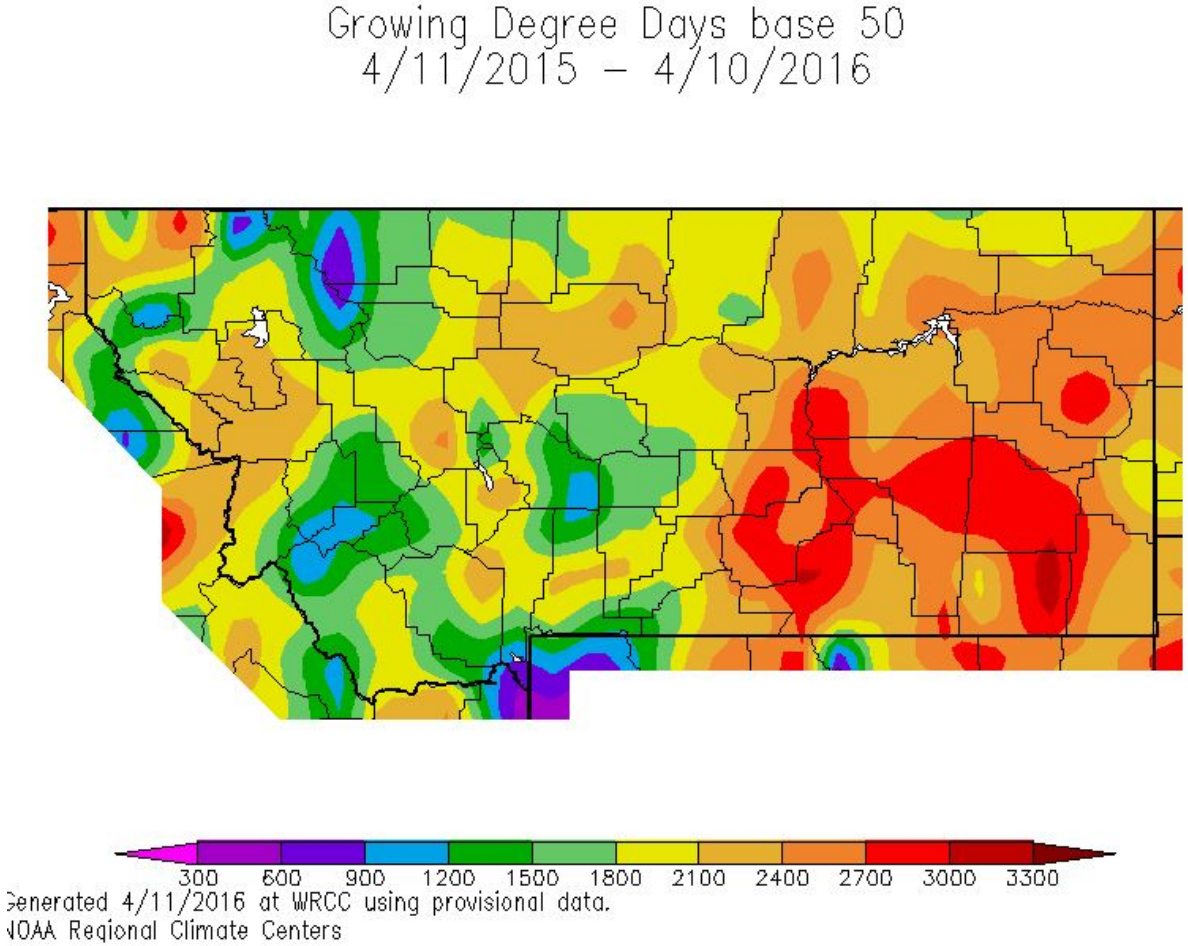
Group effort: thanks to Dan Getman, Steve Cummings, Larry Robertson, Rich Torquemada, Rod and Linda Allen, Al Putnam, Brian and Roxanne Austin, Bob Thaden for your input.

Montana Vineyards



Great Potential for the Yellowstone





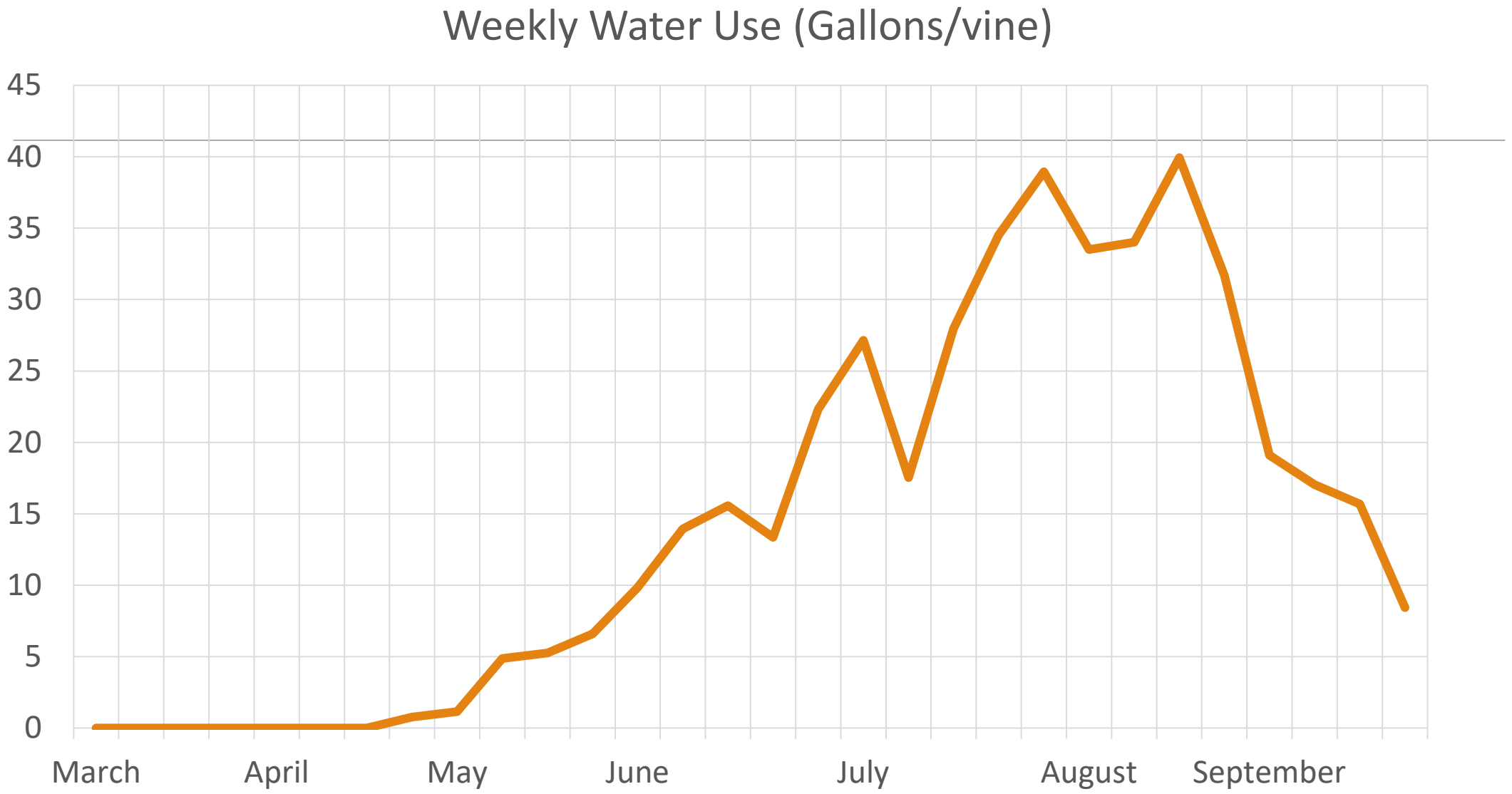
Improving yields and quality of wine grapes and other fruits used for wine.

Partnering with vineyards to evaluated relationships between plant nutrition and crops load on grape quality and yield

- MSU will provide petiole testing and juice quality testing
- Growers provide information on management practices and yields.
- ~10 vineyards in MT.

Optimizing irrigation practices for cold-hardy, hybrid grapes.

- Survey current practices
- Evaluate evapotranspiration (ET) models of water use/needs developed for *V. vinifera* wine grapes in California and Washington.
- Determine effects of regulated deficient irrigation on grape yields and quality
- On-vineyard trials to compare grower irrigations practice to ET-based practices


Weekly Water Use (Gallons/vine)
45
40
35
30
25
20
15
10
5
0
March
April
May
June
July
August
September

Fruit Wines

Identify which cold-hardy fruit cultivars best-suited for wine making

Compare juice chemistry and wine quality for ~35 cultivars:

- Haskap
- Aronia
- Red/Black Currants
- Cherries

Research and outreach for commercial apple production.

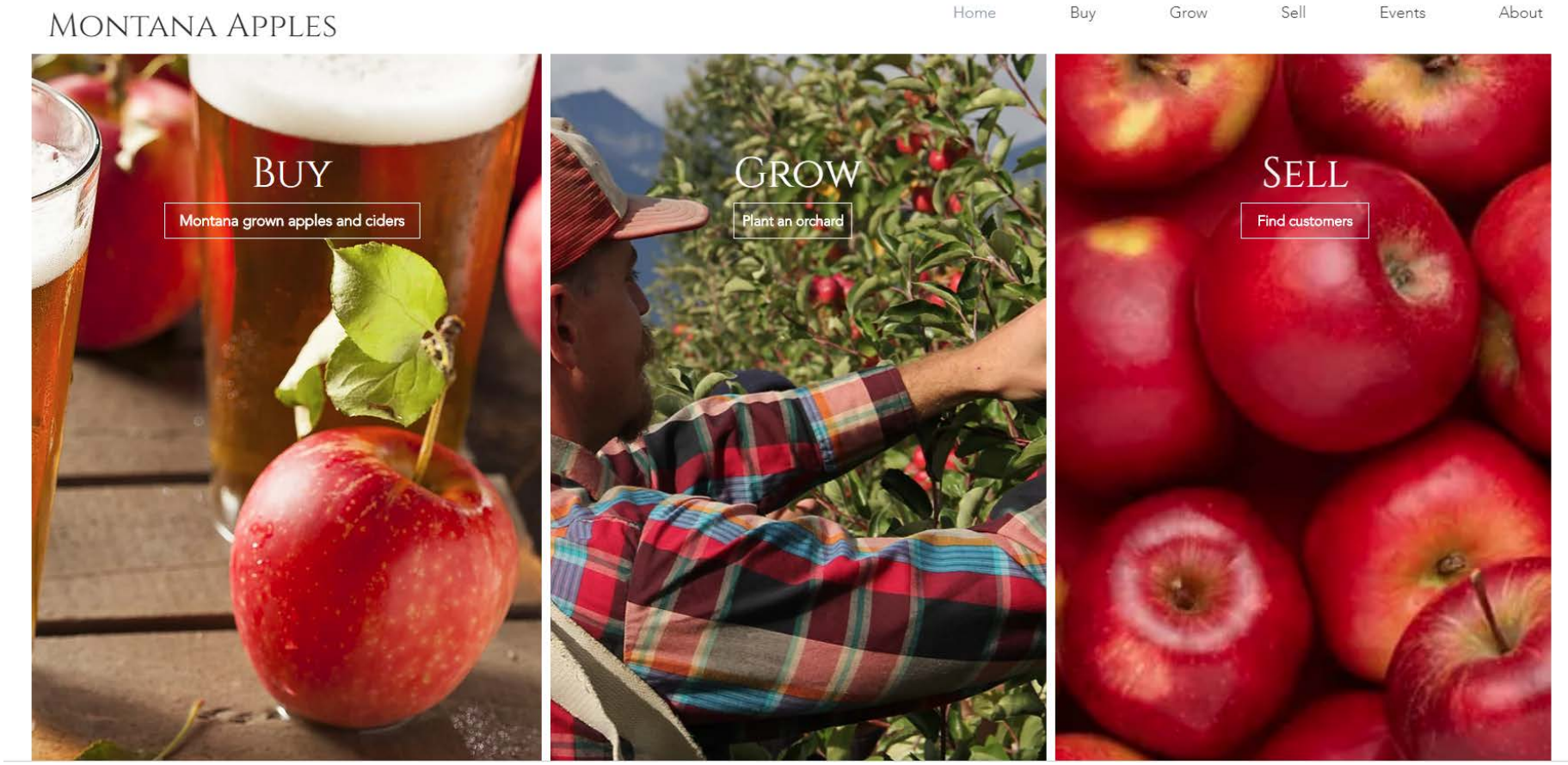
Adding to the team:

New MSU faculty specializing in fruit production

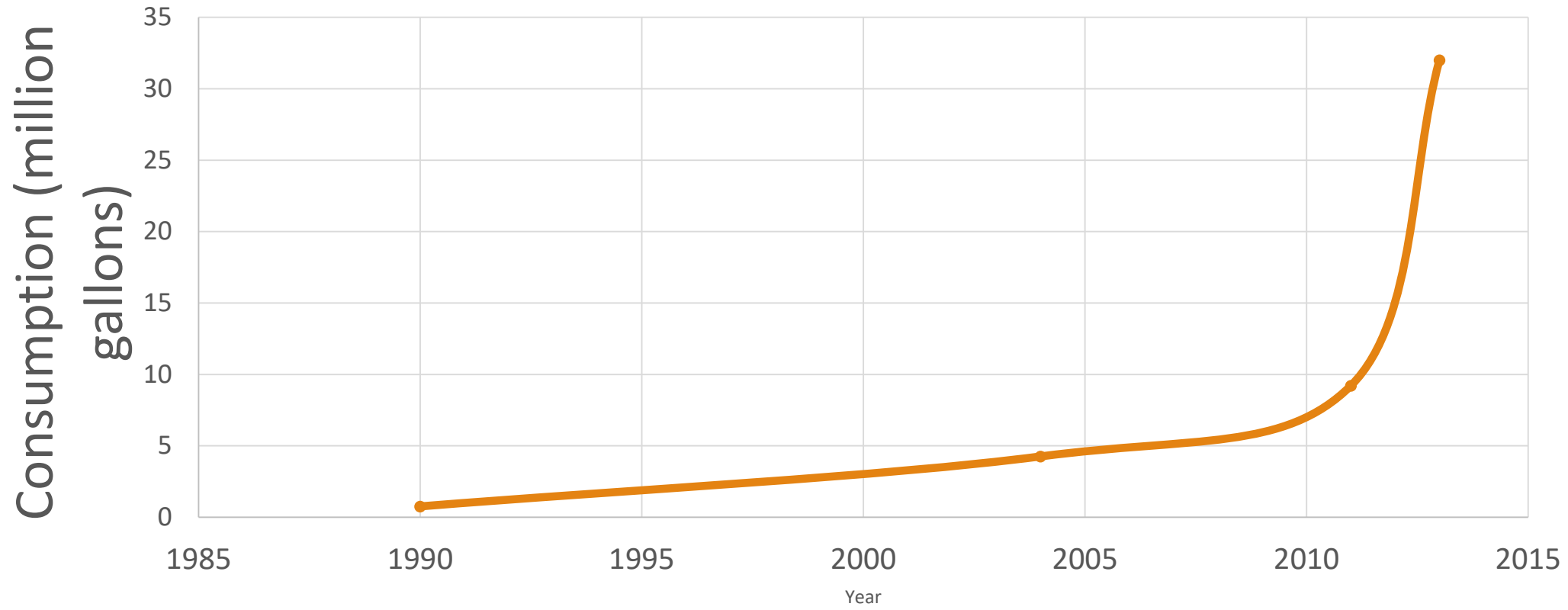
Dr. Rachel Leisso

- ARS –Wenatchee
- WSU-Wenatchee
- MSU
- Plant Disease
- Pruning and Training in Tree Fruits

mtapples.org



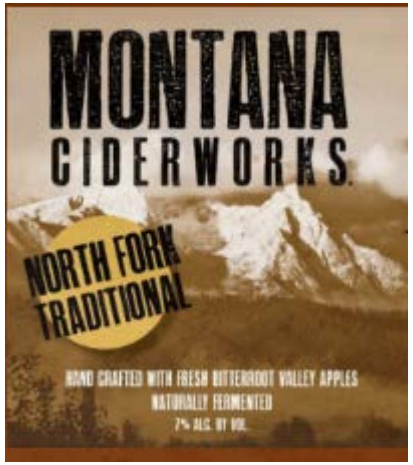
Apples for Hard Cider

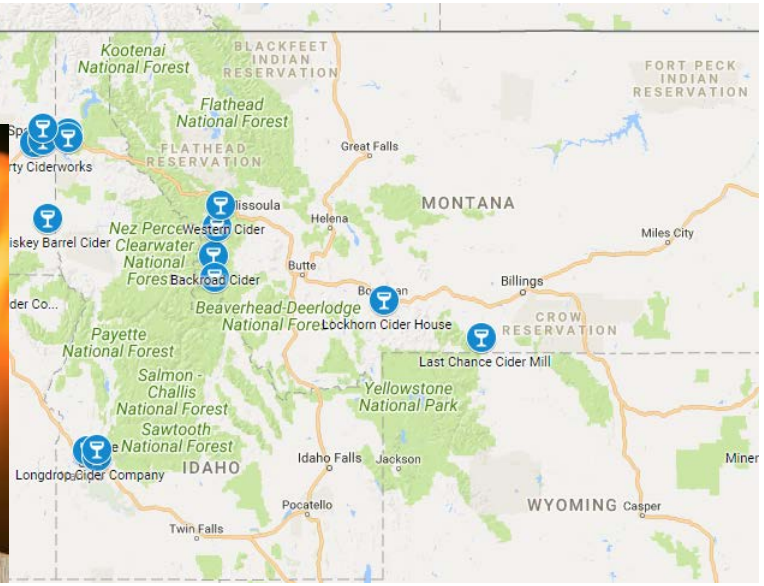


Opportunities for Montana Growers

- Huge demand-Especially for cider specific varieties
- Local production/Value-add (farm to bottle)
- Production-low input, less labor

LOCKHORN HARD CIDER





Orchards/Cider

Major

Dabinette

Harrison

Unique management objectives

Old and Ugly Apples

Unique management objectives

Harvest and storage

Goal

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Thank you-Questions?

MONTANA STATE UNIVERSITY

Pest Control

Most pests affect appearance-less to worry about

Even less to worry about in the Rocky Mountains

Main concerns are treats to tree health

- Mammals large and small
- Weeds
- Insects-Codling Moth
- Diseases-Fire Blight

Vineyard production/quality

Variety	Yields(lbs./ac.)	Avg. Brix	Avg%TA
Frontenac	5990	23.8	1.9
Marquette	4160	23.7	1.7
Petite Pearl	4960	19.1	1.0
Frontenac Gris	4780	25.5	2.0
LaCrescent	5870	24.4	1.8
St. Pepin	4810	21.3	1.2