

# Proof of Concept - Chestnuts on Moltke Ridge

## September, 15<sup>th</sup> 2018



Ox Heights & Brege Farms with support from USDA, MDNR, and MSUE



# Outline

- Why Chestnuts? –Abby
- Why on Moltke Ridge? – Nick
- What did we do? - Abby
- What did we find? – Nick
- What are we doing next? – Nick





# We are talking about edible chestnuts

Sweet Chestnut



Tails on edible chestnut nuts.

Horse Chestnut

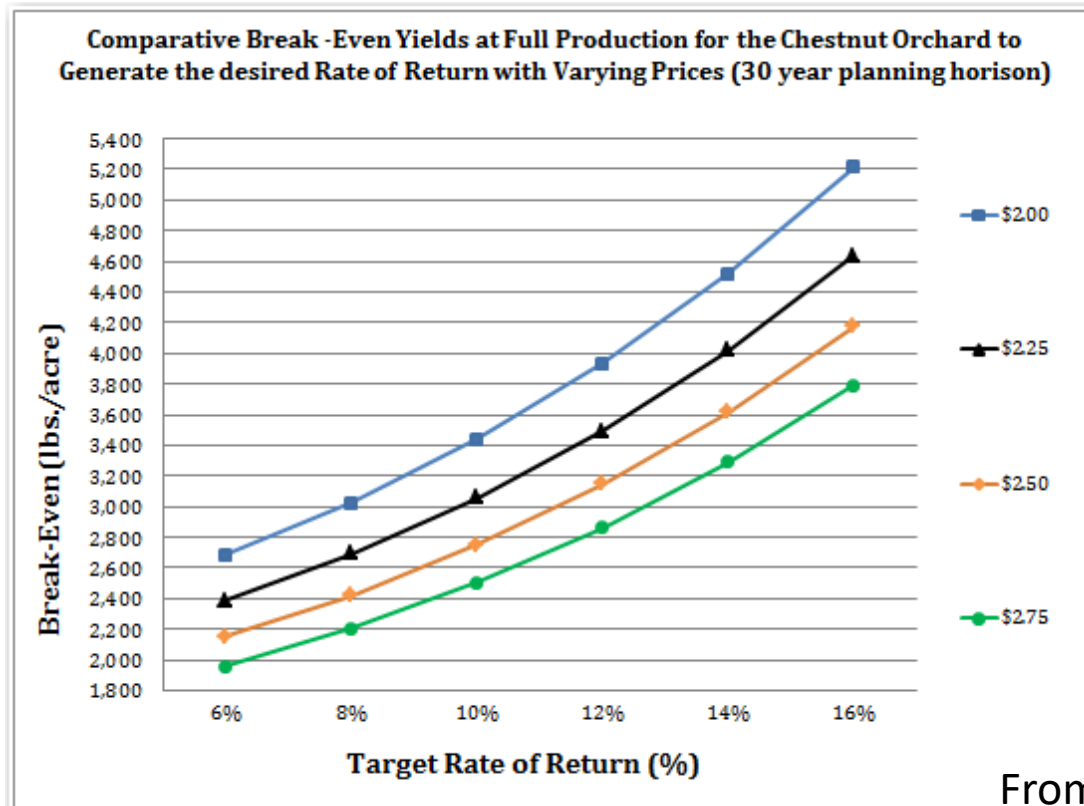


Two non-edible horse chestnuts in burs.

# I. Why Chestnuts?

- **Profitable:**

- Equally or more profitable than sweet cherry or hops.
- Profits up to \$2-6,000 per acre per year possible.
- MSU economic analysis



From: [www.chestnuts.msu.edu](http://www.chestnuts.msu.edu)



# Why Chestnuts?

- **Major Import Crop:**

- China, turkey and Italy produce 70% of the world supply with China producing north of 7 billion pounds in 2015 (apple production in the US of ~10 billion pounds)
- U.S. chestnut production is less than 1% of total world production.
- The U.S. imported \$20M of chestnuts in 2014
- Domestic production of quality nuts could replace imports.

# Why Chestnuts?

- **Michigan has most acreage and has a cooperative:**

- ~600-700 acres in Michigan growing shy of 1M pounds
- Production is concentrated in the “fruit belt” and southern Michigan
- Novel crops offer growers the chance to capitalize on new and underserved markets, innovate, and diversify
- Chestnut Growers Incorporated:
  - Coop that markets nuts for growers: growers receive about \$1.50-3/lb.
  - Estimated cost to produce and harvest a lb of nuts is \$0.89
  - A tree in 8 years can produce 30-50 lbs per year - \$30-100 of profit per tree year?
  - Sells out each year in 1 to 2 months.





# Why Chestnuts?

- **Michigan is home to several chestnut experts:**
  - Erin Lizotte: MSU Educator – Specialty chestnuts and hops
  - Dr. Dennis Fulbright: Chestnut Orchard Solutions
  - Dr. Josh Springer: Easy Chestnuts
  - Midwest Chestnut Producers Council
  - Dr. Dan Guyer and Mario Mandujano – Michigan State University
  - Roger Blackwell – Chestnut Growers Inc.



MSU Extension  
Chestnuts

Midwest Nut Producers Council

EasyChestnuts.com

Supporting Chestnut Growers from Establishment to Harvest



FALL/WINTER 2016 | Volume 34, Nos. 3 & 4

# FUTURES

Michigan State University • AgBioResearch

CRACKING  
OPEN THE  
CHESTNUT:  
Growers take





# Why Chestnuts?

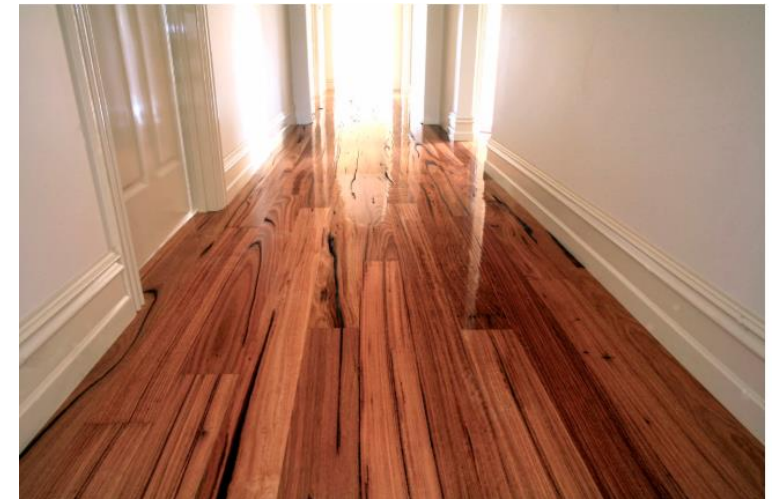
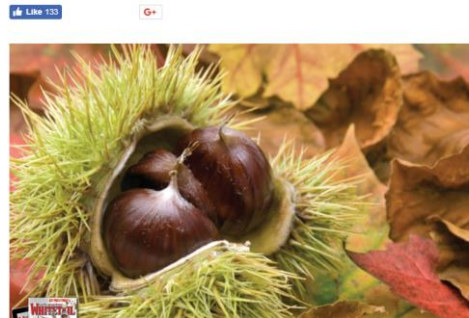
- **Care and establishment costs relatively low.**
  - Relatively little pruning, nuts fall to ground in October.
- **Trees could live for 200 years+:**
  - A crop for the 7<sup>th</sup> generation
  - Majestic trees
- **Excellent tree for wildlife like deer.**
- **Timber value**

Chestnut Magic Is The Potent, Portable Deer Attractant In A Bag!



## Is This the Perfect Whitetail Food?

by Don Higgins | March 16th, 2016



Questions?



# II. Why Here on Moltke Ridge?

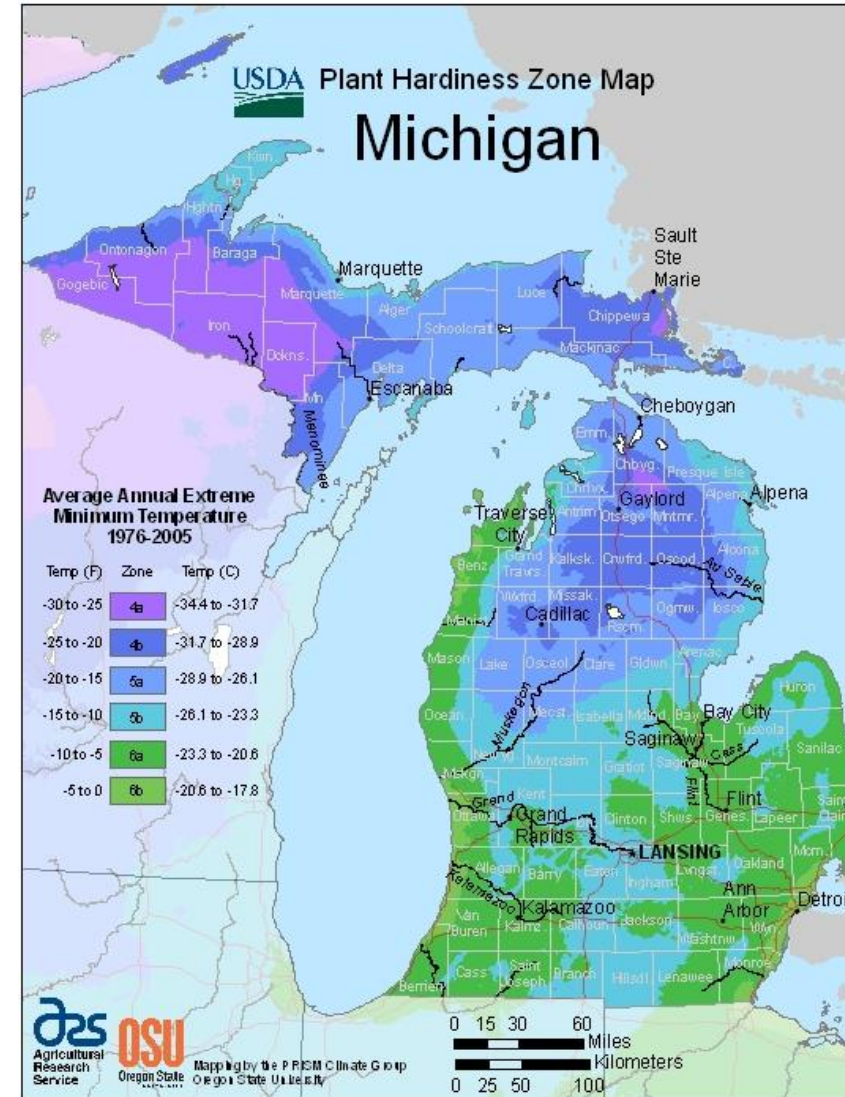
## Site requirements:

- **Well drained**, relatively fertile soil (sandy loam with some organic matter)
- pH range of 5.5 to 6.5
- Planting on hills is better than on flat land
  - Better water drainage
  - Cold air drainage

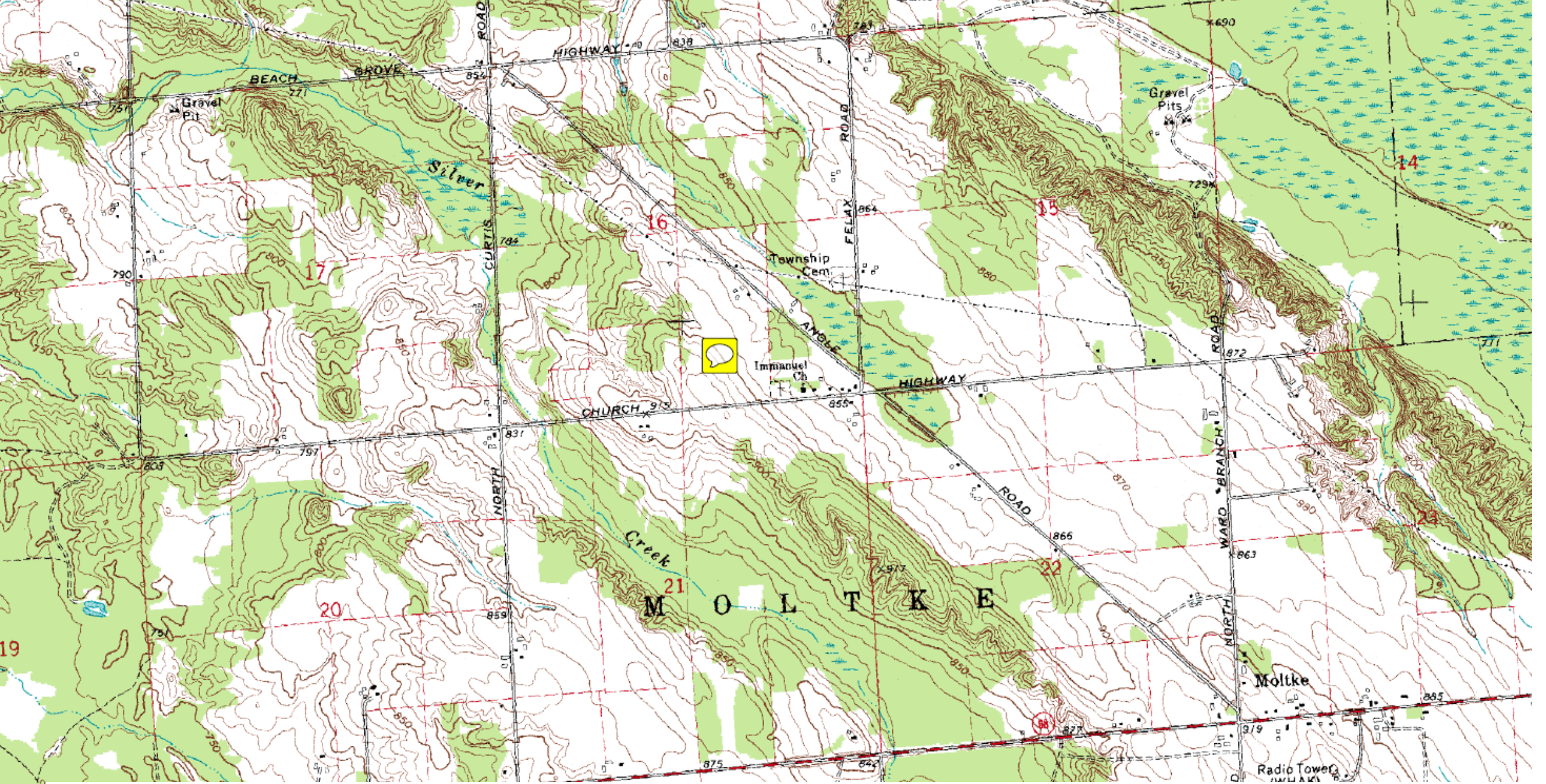


# Site requirements

- Chestnuts are arguably more cold tolerant than early blooming hort crops
- Still can be damaged by fluctuating winter temperatures
- Individual sites vary, a lake Michigan view isn't a ringer







**The 'Moltke Hills', 'Moltke Wind', 'Moltke doesn't have mosquitos'**

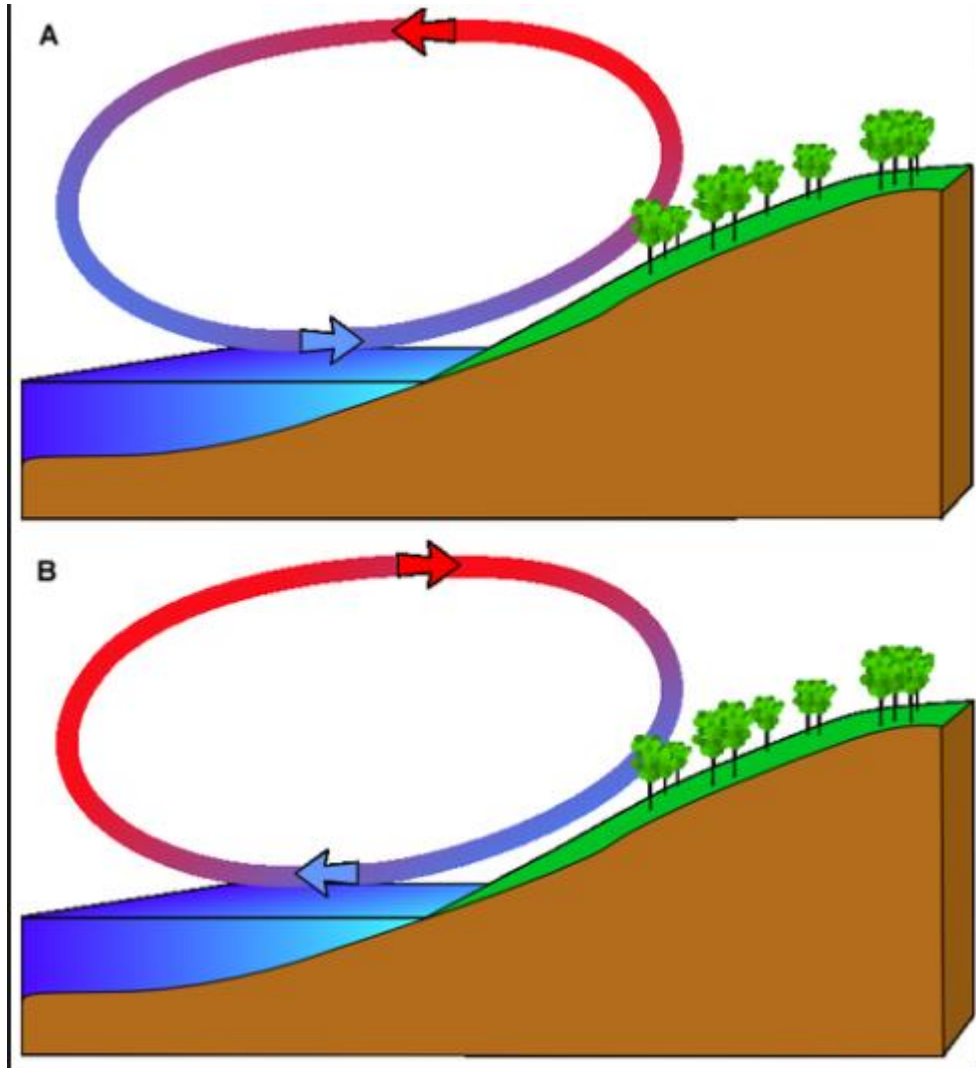


Offshore wind off Moltke Ridge on coldest nights

Onshore wind up Moltke Ridge on warm days during spring



**Proximity to Lake Huron causes south wind to develop on coldest nights**



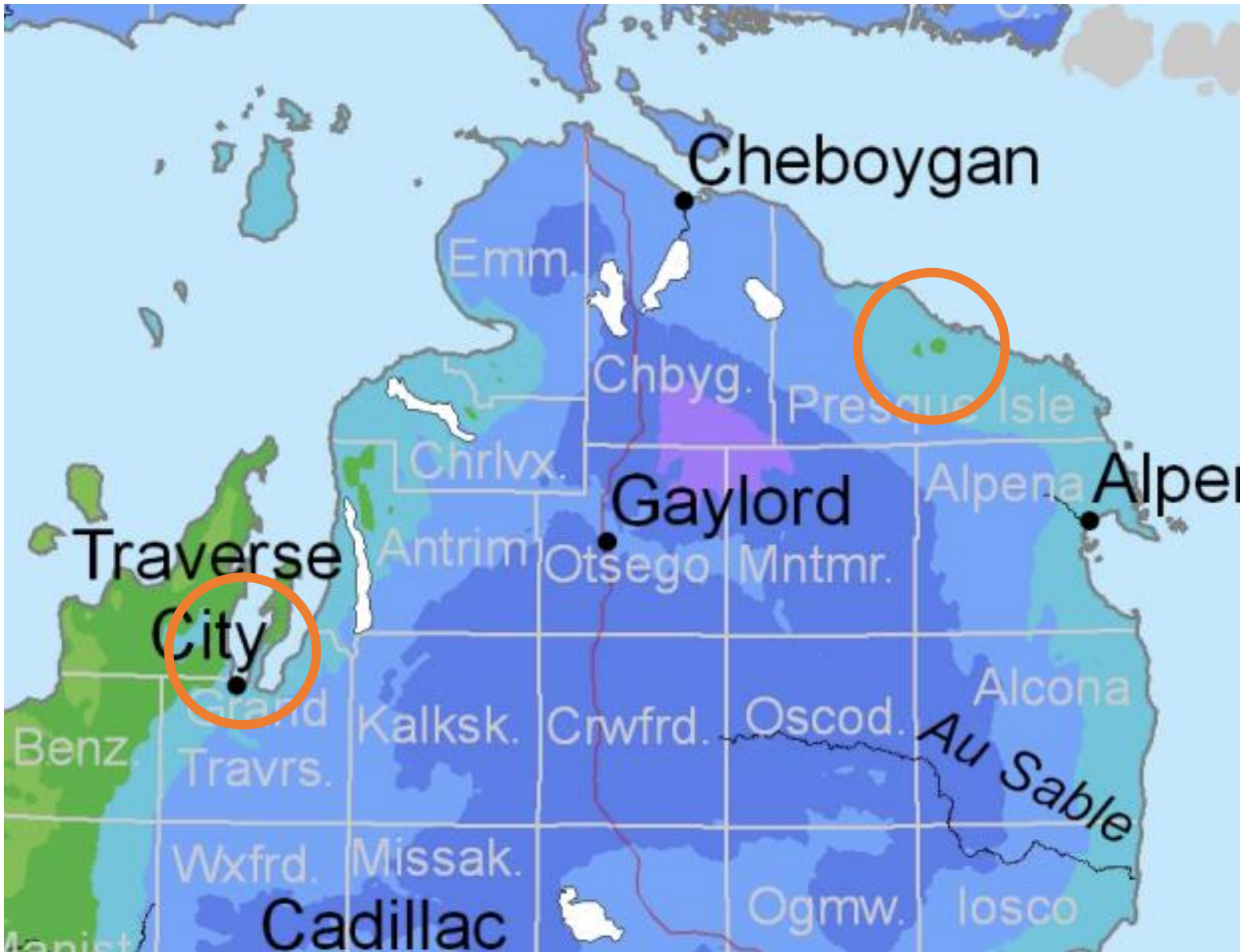
**Warm spring day- onshore wind**

**Cold winter night- offshore wind**

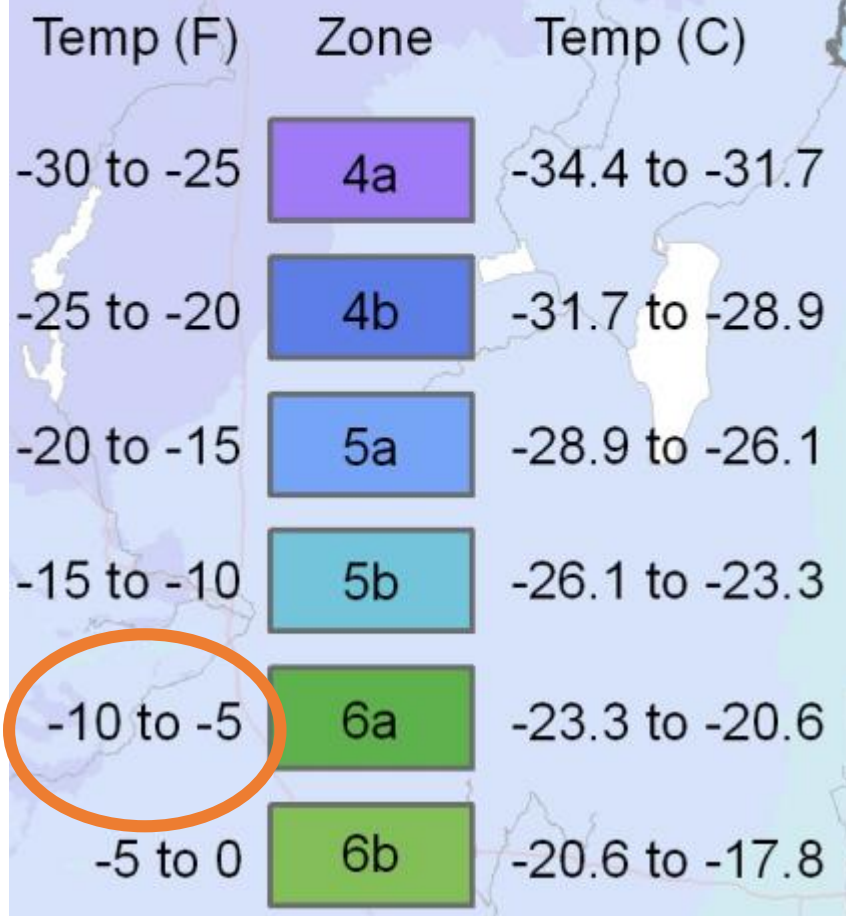
Air movement is critical to keeping night time temperatures moderate





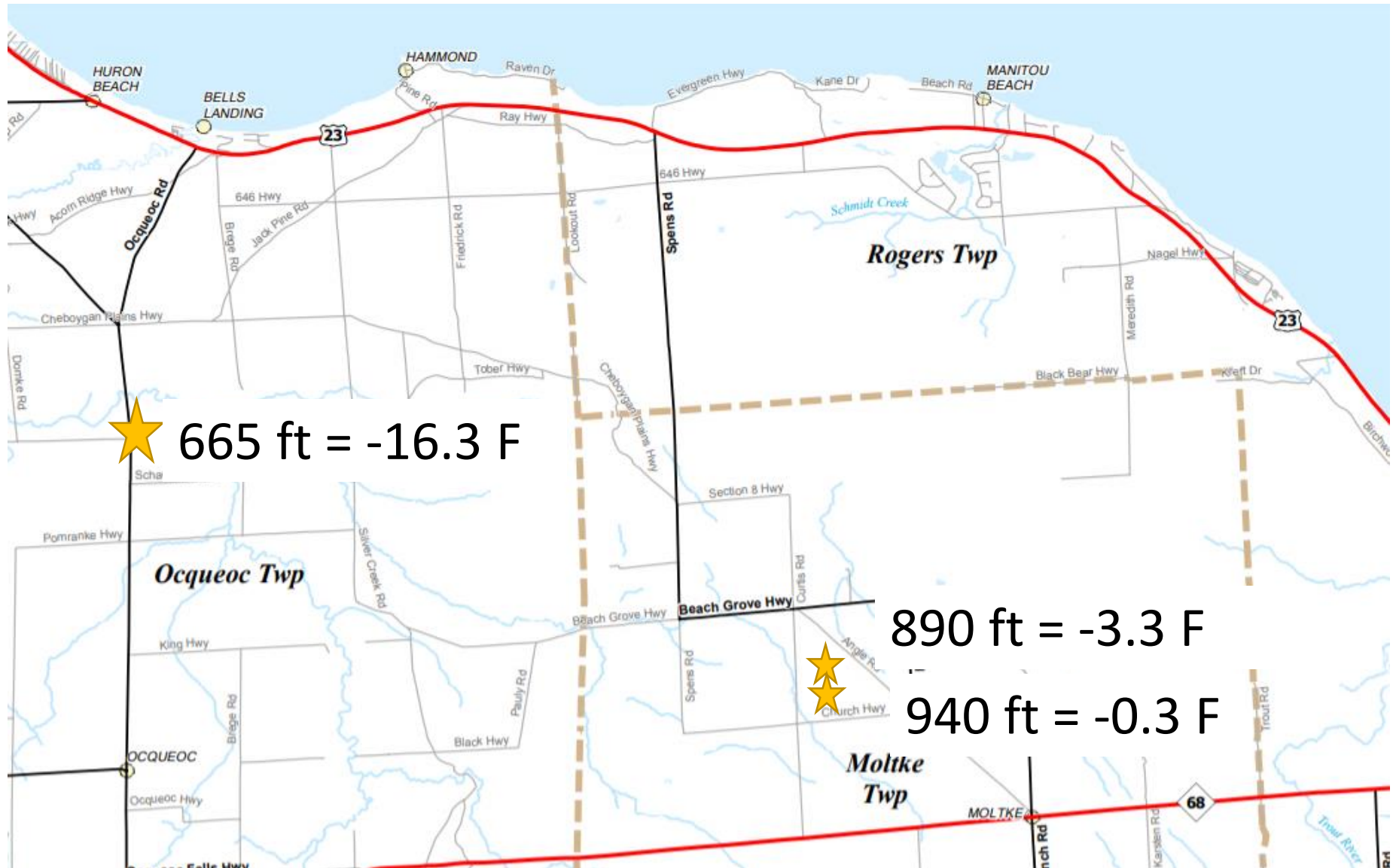


### Average Annual Extreme Minimum Temperature 1976-2005

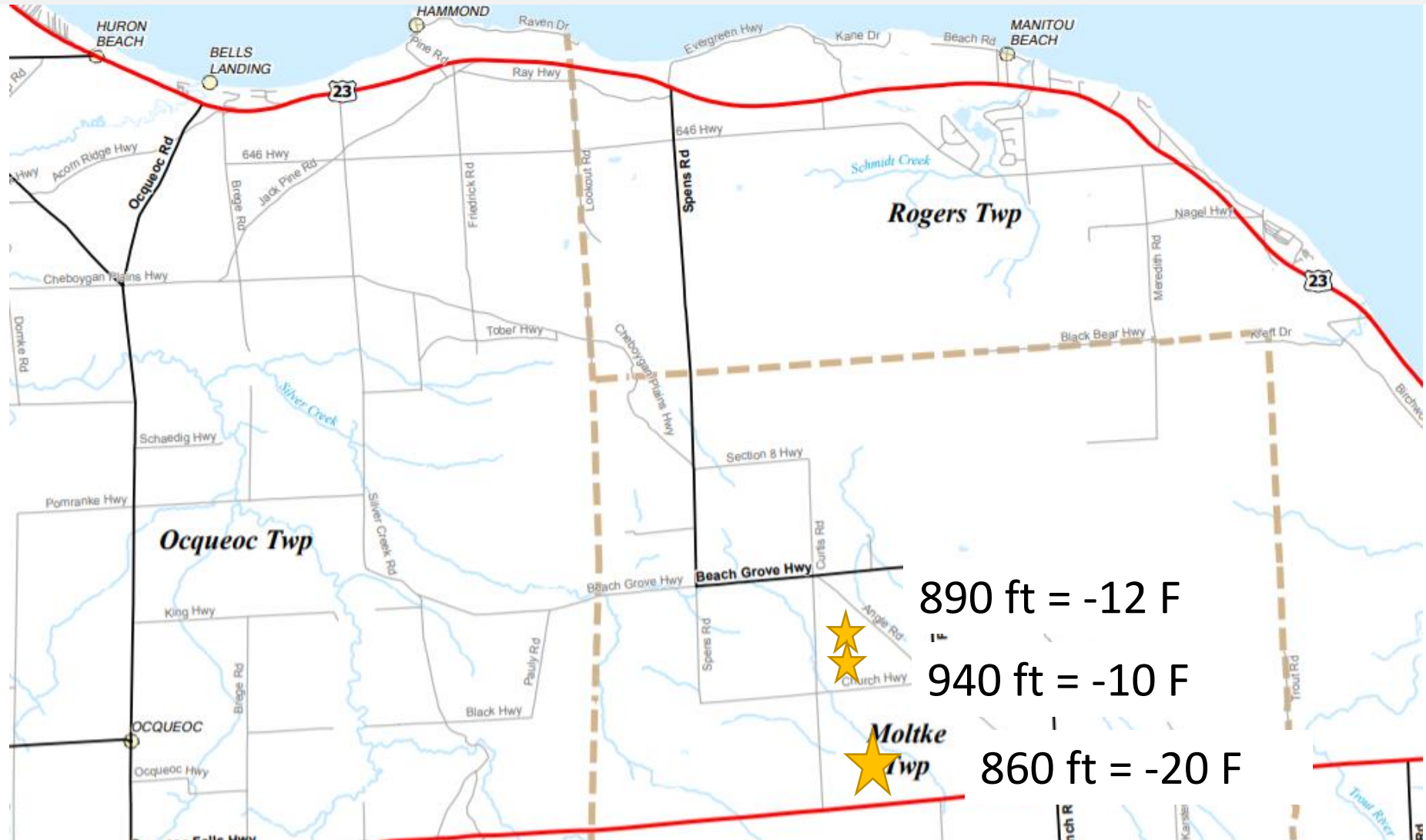




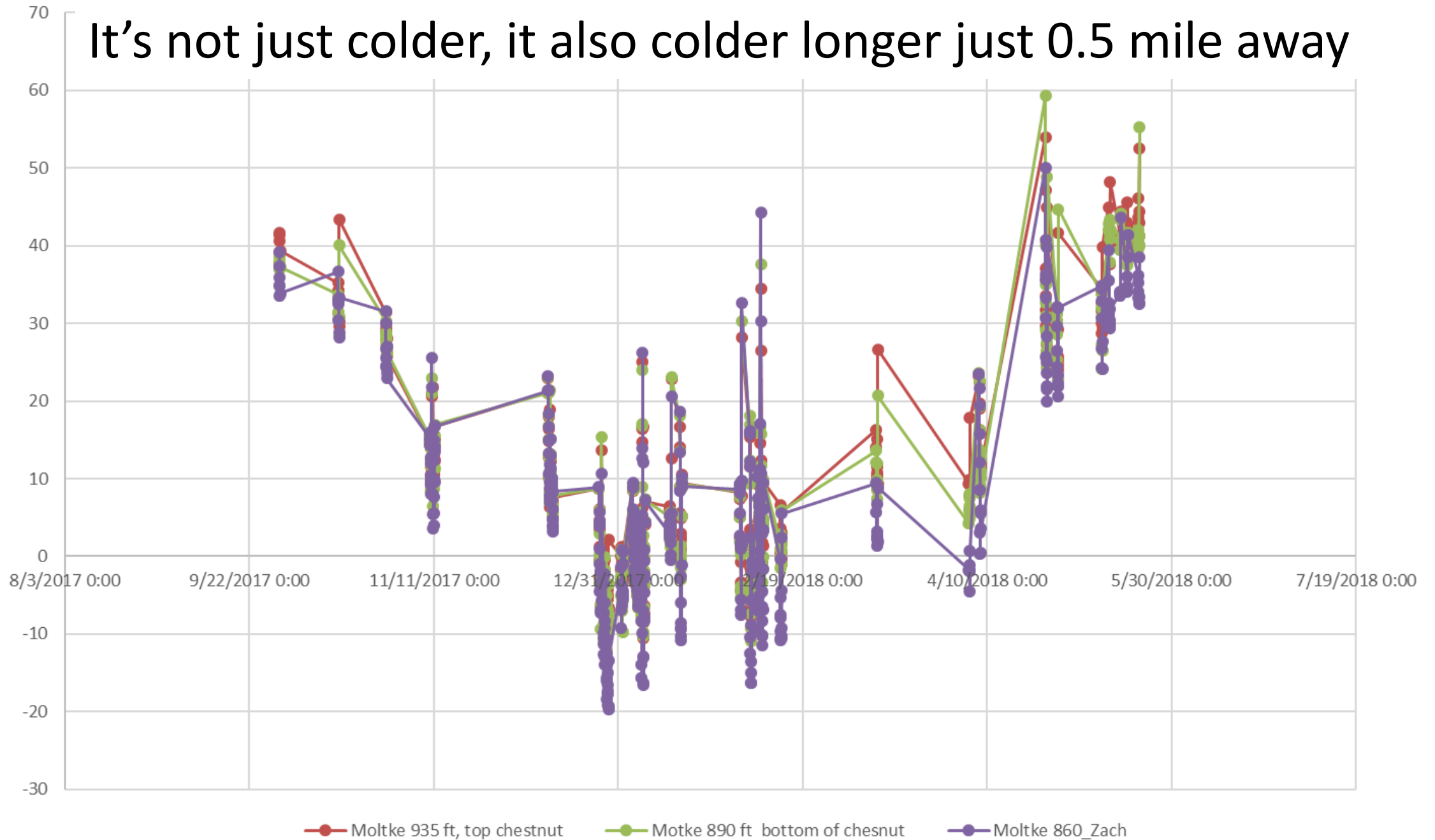
# 2016 –Low Temp: Location matters!



# 2017 –Low Temp Data: Temps over 0.5 mile much different



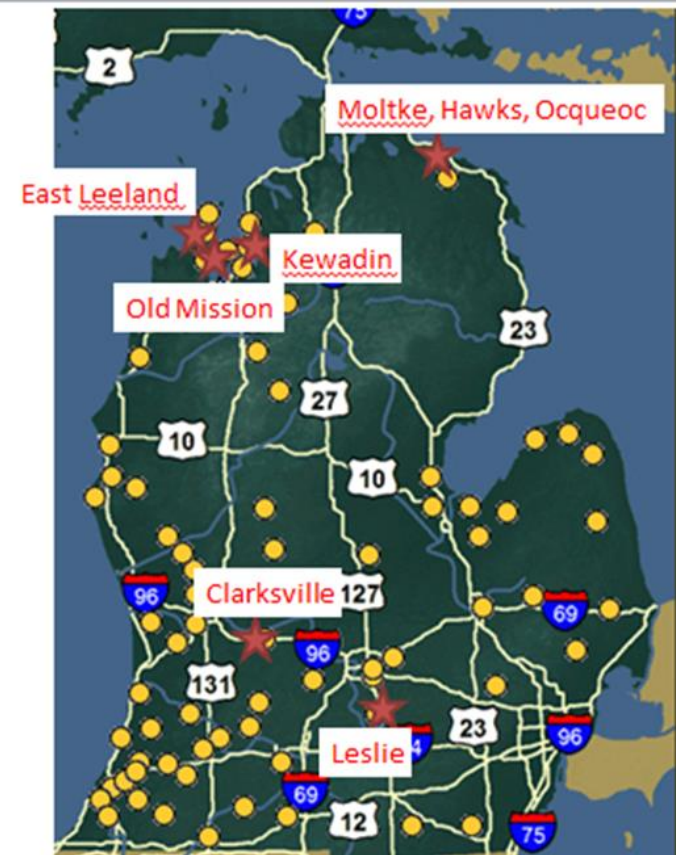
It's not just colder, it also colder longer just 0.5 mile away





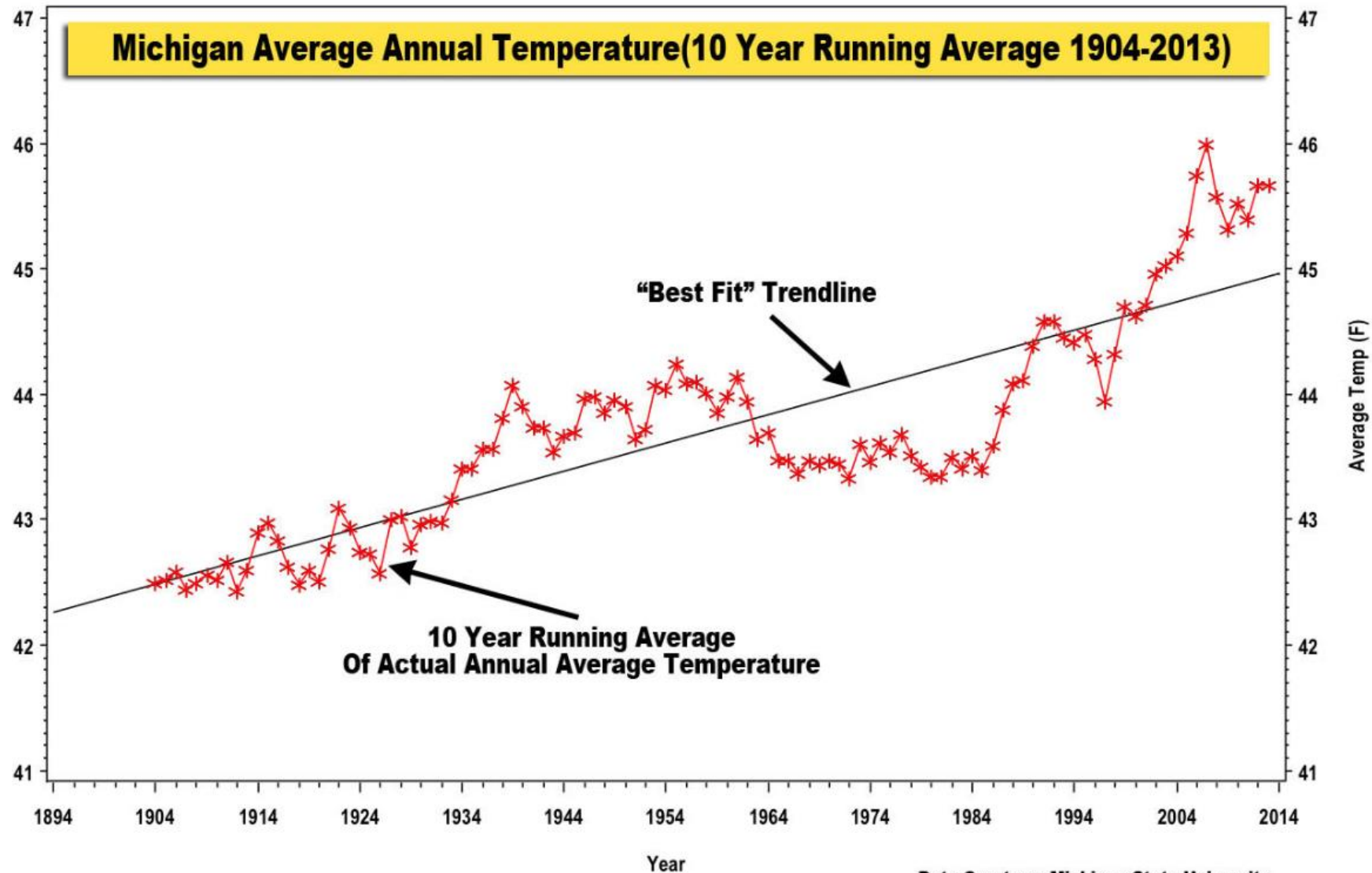
# Moltke Ridge is comparable to other fruit growing regions– but you must be near the top of the ridge!

**Enviroweather**  
Weather-based pest, natural resources,  
and production management tools



Location	Lowest Temp 2014	Lowest temp 2016-2017	Lowest temp 2017-2018
Moltke 940 ft	-17.5	0.325	-10.5
Motke 890 ft	-19.3	-3	-12.1
Moltke 860 ft	NA	Na	-19.7
Ocqueoc 665 ft	NA	-16.4	NA
Hawks	-25.6	-7.8	-16
East Leeland	-22.9	-0.2	-6
Kewadin	-13.3	7.6	-7.1
Old Mission	-18	8	-0.7
Clarksville	-12.9	-2.4	-9.8
Leslie	-22.1	-4.1	-21.9

# Michigan is getting warmer, and may get warmer....

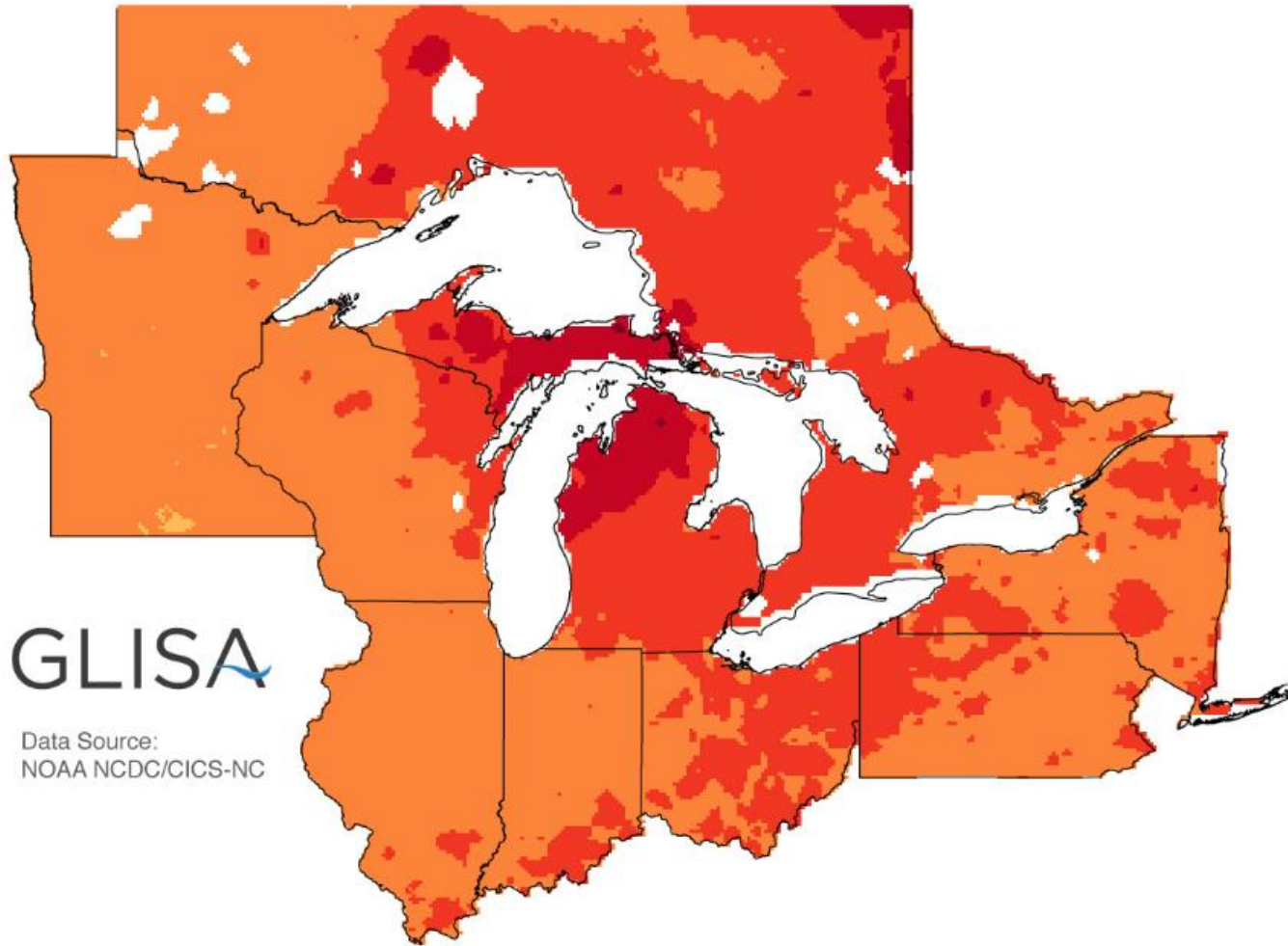


895 through 2013: Average Temp =  $42.26 + 0.023 \cdot (\text{Year} - 1894)$  (r-square = 0.73)

Data Courtesy: Michigan State University  
Data Analysis Courtesy: Margie Bell  
Statistician, Clindata Services, Inc.

# Projected Change in Frost-Free Season Length

Period: 2070-2099 | Higher Emissions: A2



GLISA

Data Source:  
NOAA NCDC/CICS-NC

Change In Number of Days Per Year



- Conditions may get better for chestnuts in northern Michigan.
  - Longer, warmer growing seasons.
  - Great Lakes act as heat sink.

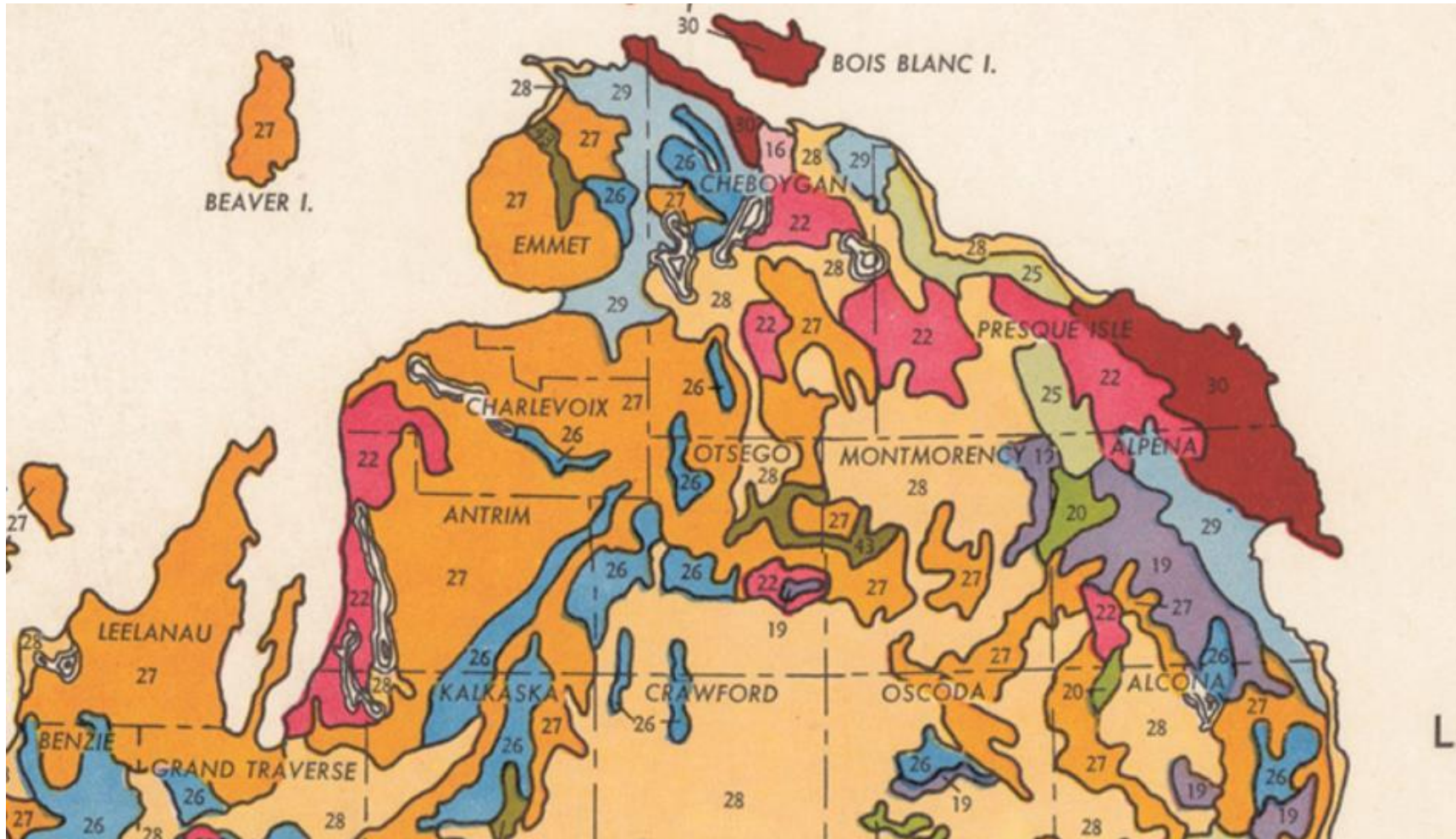


Good dirt: Moltke's deep loamy sand grows high value hardwood





# Same soil classification as orchard land near Traverse City – Emmet Sandy Loam



<http://www.geographer-miller.com/wp-content/gallery/old-maps/Soil-Associations-of-Michigan-1954.JPG>

# Why Moltke Ridge?

- Much lower opportunity cost:
  - Land is about 5 to 10 times less expensive than on west side of Michigan.
  - Marginal yields of cash crops: Yields of corn and soybeans averaged 100 bu/acre and 29 bu/acre respectively during the past 10 years in Presque Isle County (USDA, NASS).
  - Cattle ranching is threatened by Bovine Tuberculosis.



Questions?

# III. What did we do?

Planted 440 chestnuts fall 2017 as a proof of concept.

- (1) Determine if proven varieties of grafted chestnuts can be grown on Moltke Ridge.
- (2) Determine if forage crops can be harvested between rows of chestnut trees – keep the land in production while trees are growing.



# III. What did we do?

- Planted Grafted European/Japanese Chestnut variates



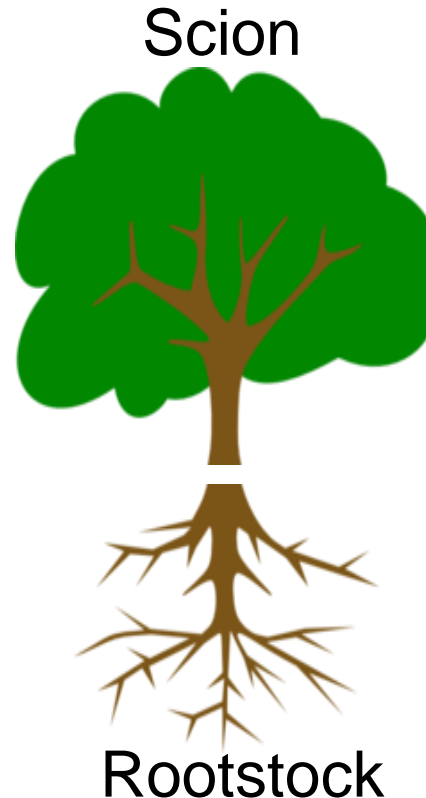
Chestnut tree in second summer since grafting



# Seedlings or grafted trees?

## Seedlings

- Often Chinese
- Trees grown from a nut
- Genetically different
- Variable bloom and harvest
- Variation in yields



## Grafted trees

- Almost exclusively hybrids
- Selected for superior characteristics
- Genetically identical
- Reliable characteristics
- Bear earlier

# Orchard Cultivars and layout

## Proven Main Cultivars

Colossal - C  
 Bouche de Betizac - BB

## Proven Pollinator

Labor Day - LD  
 Precoce Migoule - PM

## Test Cultivar

Marigoule - Mg  
 Maraval - Mv  
 Marsol - Mg

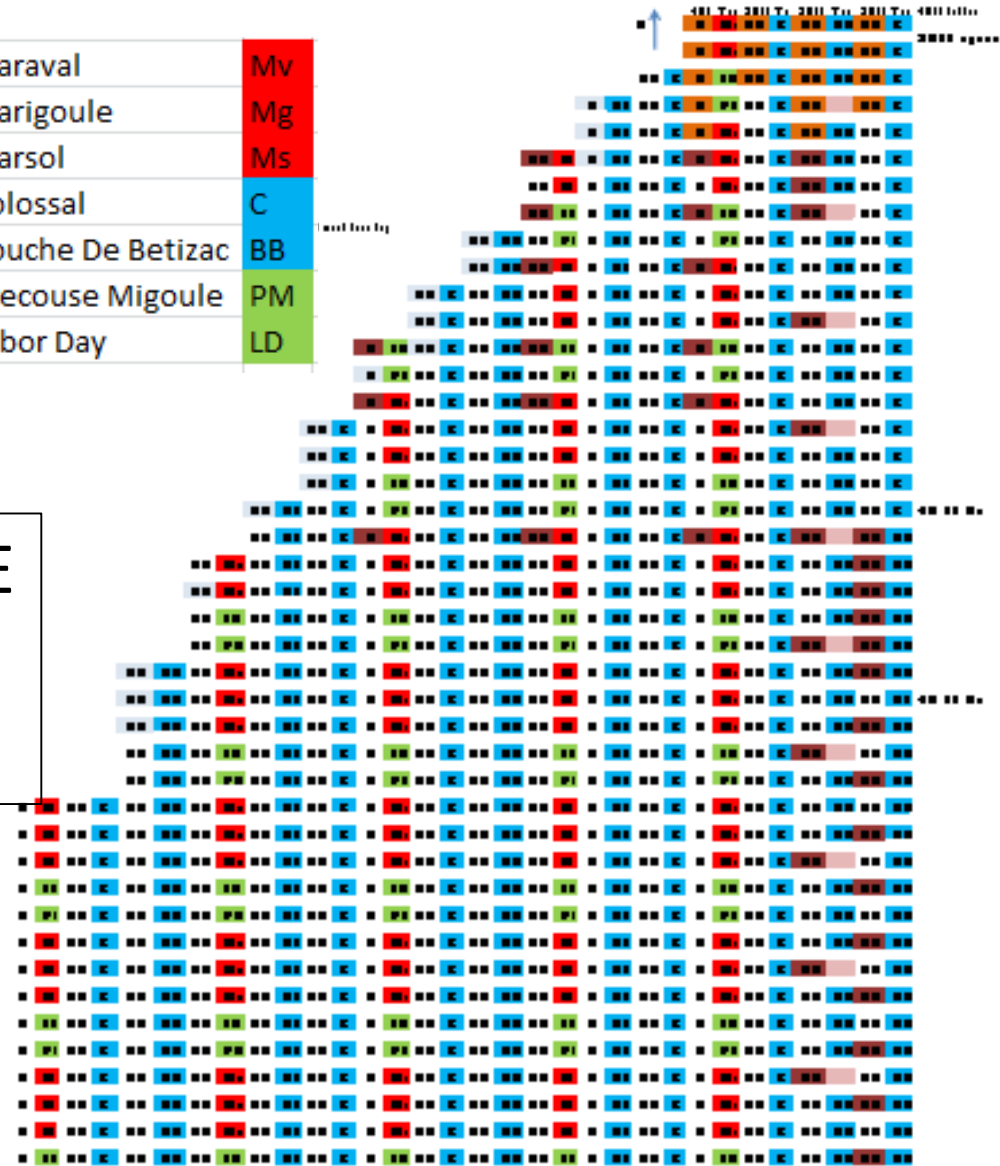


# 440 planted Fall 2017

Maraval	Mv
Marigoule	Mg
Marsol	Ms
Colossal	C
Bouche De Betizac	BB
Precouse Migoule	PM
Labor Day	LD



Funding from USDA – SARE  
and  
Michigan DNR





# Plant cover/hay crop – May 2017



# Install drip irrigation – May 2017



# Install drip irrigation – May 2017





# Install protection from deer- July 2017





# Dig holes and plant cover crop – August 2017





# Collect soil inoculant – Sept 2017





# Plant tree – September 2017





# Plant tree







Plant a lot of trees

Irrigation when planting





# Install weed, mouse, and sun guard



Trunk painted white to prevent sunscald

3 ft by 3 ft Weed-guard with drip irrigation

Tillage Radish for tillage, food, and aeration for roots growing summer 2018





# Measure trees – Oct 2017

<b>Variety</b>	<b>N</b>	<b>Height - Inches</b>	<b>Diameter - Inches</b>
Bouche de Betizac	175	35 (8)	0.32 (0.06)
Colossal	179	53 (11)	0.38 (0.08)
Labor Day	14	39 (14)	0.30 (0.09)
Marigoule	20	41 (15)	0.34 (0.11)
Marsol	28	52 (12)	0.39 (0.08)
Maraval	0	NA	NA
Precoce Migoule	26	46 (24)	0.38 (0.07)
	442		

Repeat October 2018

Winter worry: 10 F on Nov 10<sup>th</sup>



Trees were not dormant



Late December cold:  
Shovel snow on trees to insulate ground



# Shovel snow on a lot of trees



Coldest morning of  
the winter



# Winter Worry – ice storm, frozen standing water





# Winter Worry – Thaws and standing water





# Spring Worry – Coldest/Snowest April on Record



April 14<sup>th</sup> -17<sup>th</sup> snowstorm: 35-40 inches of snow



# Spring Worry-Blizzard of 2018



Spring worry – snow-blower broke...April 16<sup>th</sup>





# Spring Worry – April 21<sup>st</sup> 2018



Deep snow pack of dense snow



Ground still frozen



# Spring Hope - Remove Mouse Guards





# Did the Trees Survive???

- Chestnut survival

- 4 of 440 trees died above the graft.
- Highest survival of anyone planting in Michigan (of about 4,000 trees planted)
- Many orchards experienced losses greater than 50%

- Hay:

- 135 bails off the 7 acre orchard.
- High forage quality clover hay per MSUE analysis
- Time to cut and bail hay was about 30% longer than open field

Michigan chestnut update – June 5, 2018

Growers are reporting tree mortality around Michigan.

June 5, 2018 - Author: [Erin Lizotte](#)

# Spray for weeds and leafhopper and Rose Shaffer

- Assail for leafhopper and Roseshafter
  - 3 times during 2018: June 10<sup>th</sup>, June 25<sup>th</sup>, and July 10<sup>th</sup>
- Spray for weeds 2 times
  - Late May, Mid July





Adjust staking every two weeks





# Hay – Early June





# Hay – Early June





# Hay – Early June





# Irrigate

- During a drought year, we irrigated about once every 10 days for 1-2 hours.
- Plastic mats very effective for holding moisture





# Costs and Time

- Cost per tree with all accessories to age 1 = \$35
- Time per tree with all inputs to age 1 = 1 hour per tree
- 440 trees x \$35 = \$15,400
- 440 hours at \$15 per hour = \$6,600

**With labor and materials looking at about \$50 per tree to establish with our methods/materials.**



Questions?

# IV. What did we find?

- Hay:
  - 135 bails off the 7 acre orchard.
  - High forage quality clover hay per MSUE analysis
  - Time to cut and bail hay was about 30% longer than open field
- Chestnut survival
  - 4 of 440 trees died above the graft.
  - Highest survival of anyone planting in Michigan (of about 4,000 trees planted)
  - Many orchards experienced losses greater than 50%

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Photo time-lapse

# OX HEIGHTS FARM, COS 5- STAR ORCHARD, N45.41° 940 FEET -9°F 99% TREE SURVIVAL

🕒 JULY 14, 2018 👤 DENNIS FULBRIGHT

## Chestnut Orchard Solutions

### First 5 star-Rated Michigan Chestnut Farm

Latitude: N45.41° Altitude: 940ft Low temp: -9°F  
2017 tree planting survival: 99% Fall

You're looking at amazing numbers—surprisingly fascinating numbers. But if you knew this farm family you wouldn't be surprised at all. The Johnson's live and have planted a chestnut orchard farther north in Michigan than anyone I know. They know these numbers because they studied



So, is there a pot of gold under the chestnuts???  
Not yet...



# V. What are we doing next?

- Continue to address key uncertainties:
  - Will trees survive in future winters?
  - Is the growing season long enough to consistently produce and harvest nuts?
  - What yields and quality can this part of Michigan produce?
  - Which varieties produce the most nuts here?
- Plant 210 more trees on highest ridge – No red flags encountered yet...
  - Our tillable land may be able to support 2,000 trees.
- Brainstorm and test options for harvest, storage, and marketing. But we already know that....
  - Chestnut Orchard Solutions will harvest nuts (~\$0.30 per lb).
  - Chestnut Growers Inc. will market nuts and return ~\$2 per lb to growers.
  - Trees in Michigan can produce 30-50 lbs per year per tree within 10 years.
- Recruit new growers in Moltke?
  - Develop a Moltke Co-op to share equipment, harvesters, facilities, marketing?
  - Quarantine from other orchards in Michigan with emerging pest problems?

# Final Thoughts

- Not going to get rich quick...make an honest living?
- Many risks: Some known and unknown.
- Need cash upfront: \$50 per tree, 70 trees per acre = \$3,500/acre+
- Study your site before planting.
  - MUST be well drained!!!
  - MUST be on a very high ridge with good air drainage: over 900 ft best.
  - MUST be within 5-10 miles of Lake Huron
- Lots of physical labor involved in early years.

Not easy, but 'easier' than other specialty crops!  
Other specialty crops don't survive for 100+ years!



# Acknowledgements

- USDA, SARE
- Michigan Department of Natural Resources
- Erin Lizotte: [www.chestnuts.msu.edu](http://www.chestnuts.msu.edu); [taylo548@msu.edu](mailto:taylo548@msu.edu)
- James DeDecker: MSUE Presque Isle County
- Dennis Fulbright: Chestnut Orchard Solutions
- Josh Springer: Easy Chestnuts



EasyChestnuts.com

Supporting Chestnut Growers from Establishment to Harvest



**CHESTNUT**  
ORCHARD SOLUTIONS

Chestnuthelp.com