

## Water Use by Crops and Pines in Central Sands Wisconsin



**Prof. Ankur Desai, University of Wisconsin-Madison  
(Department of Atmospheric and Oceanic Sciences)**

**WPVGA Meeting July 30<sup>th</sup> 2020**

# Study Site





# Heartland Farm Study Sites



Data/Analysis Updates

Tower Installed on June  
29<sup>th</sup> 2018

**~7 feet Tall**

# Tri County Forest Site



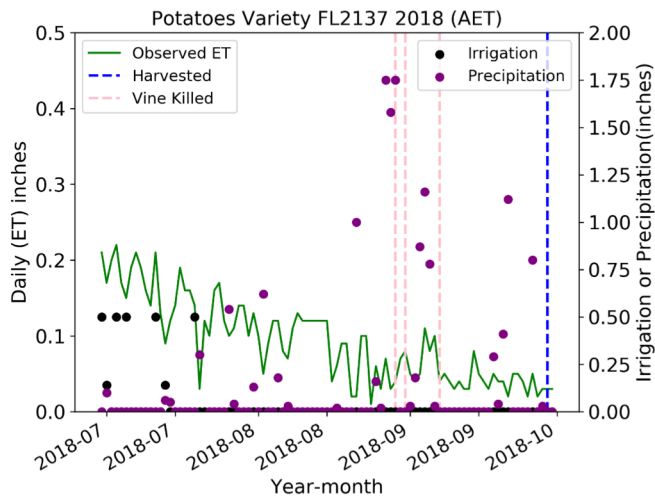
Located at Tri-County Area  
School District School Forest  
About 25 miles from Plover  
river and 5 miles from  
Heartland Farm

- ~100 feet Tall
- 20 times a second
- H<sub>2</sub>O, Co<sub>2</sub>, vertical winds,  
and associated  
meteorology (temperature,  
humidity, winds,  
longwave/solar radiation).



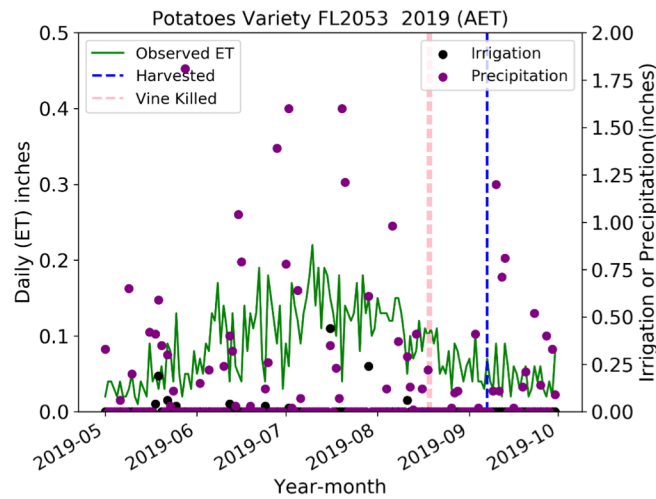
# Water use by Potatoes

Warm summer, wet Aug



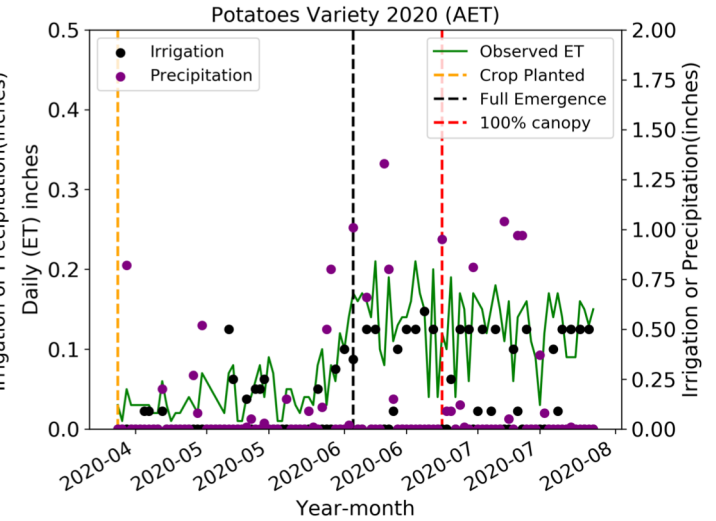
Potatoes Variety: FL2137

Cool summer, wet July



Potatoes Variety: FL2053

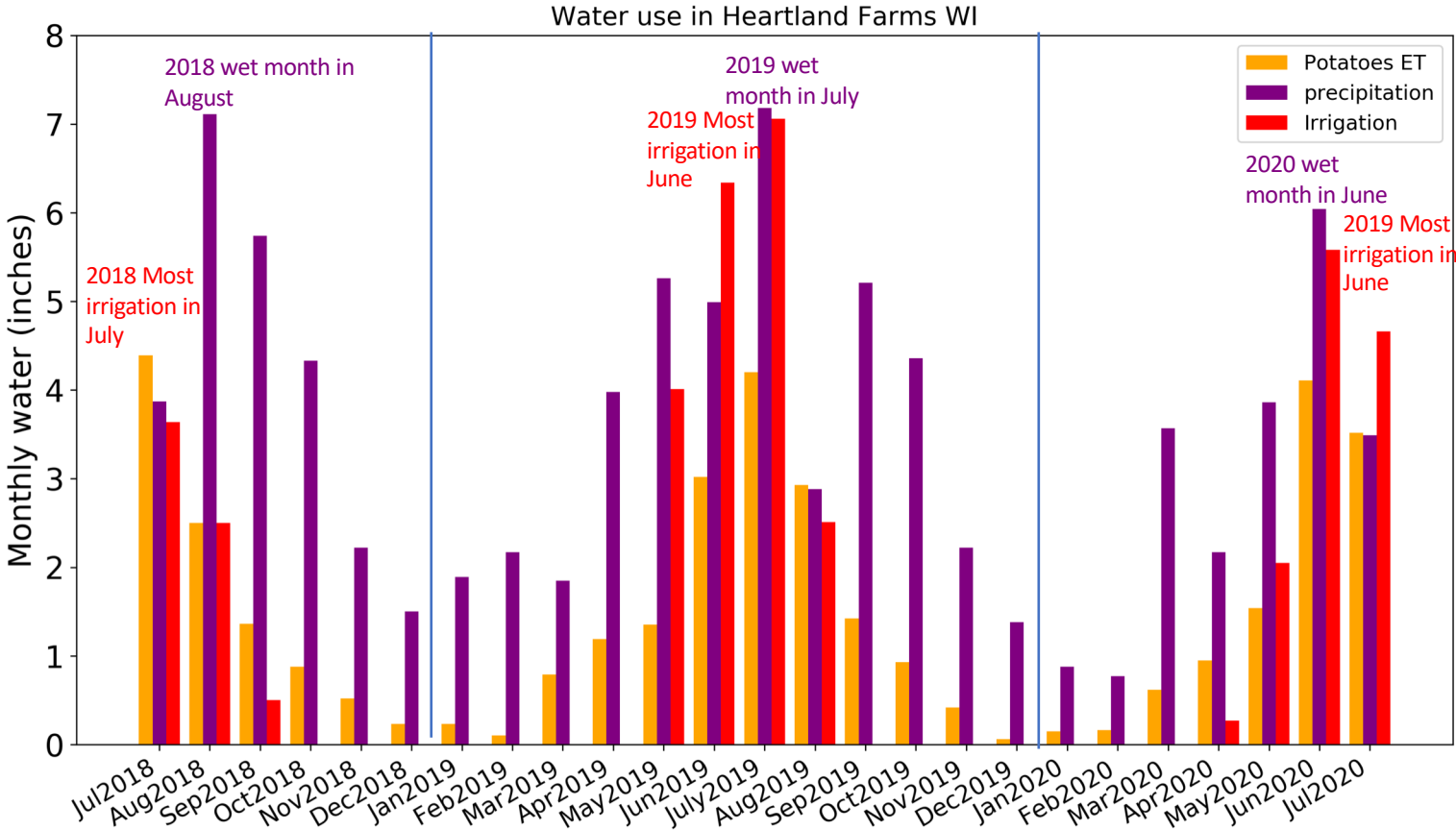
Avg/warm summer, wet June



Potatoes Variety: FL2053

Plantation date	vine kill	vine kill	vine kill	Harvest date
5/18/2018	8/29/2018	8/31/2018	9/7/2018	9/29/2018
4/25/2019	8/18/2019	8/19/2019		9/7/2019
4/11/2020				

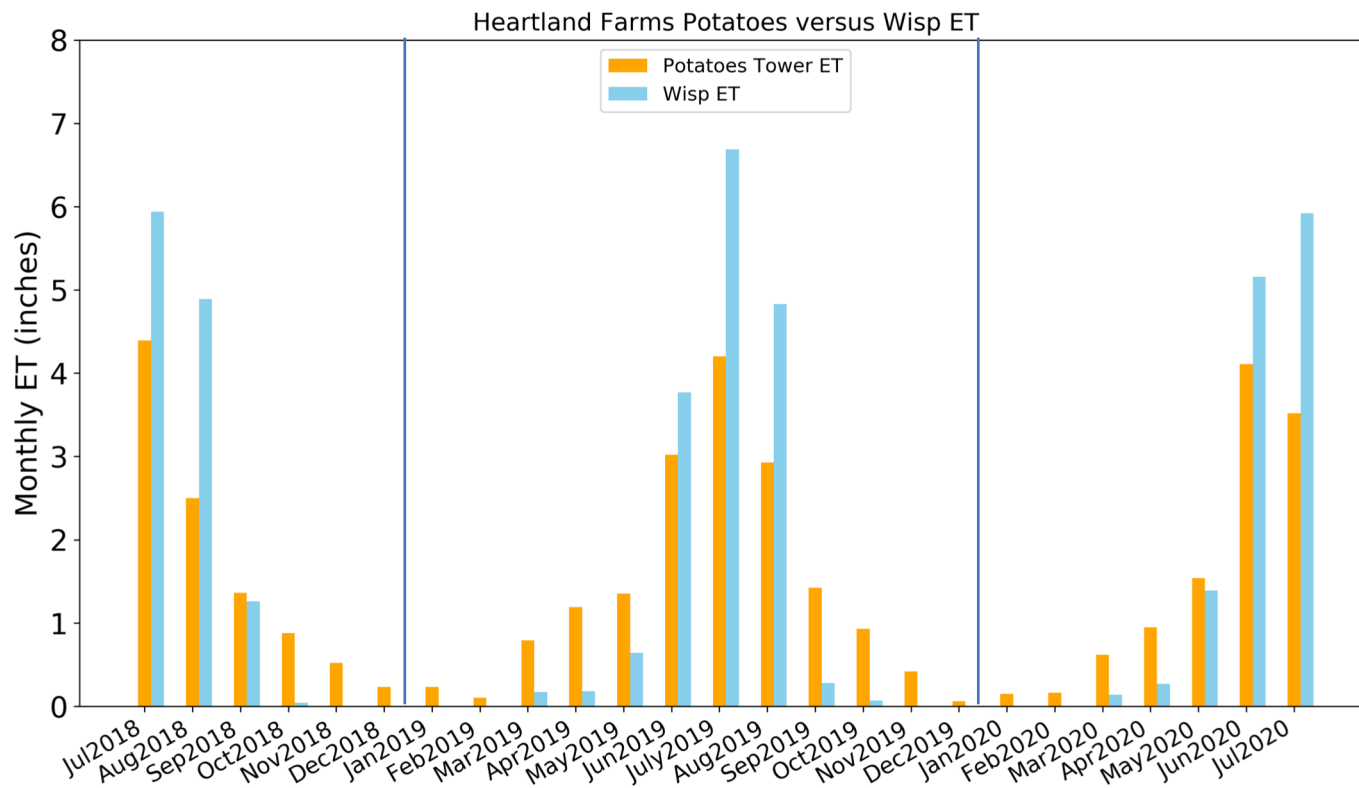
# Water demand versus water supply for Heartland Farms



When no crops on ground after harvest, ET represents soil evaporation

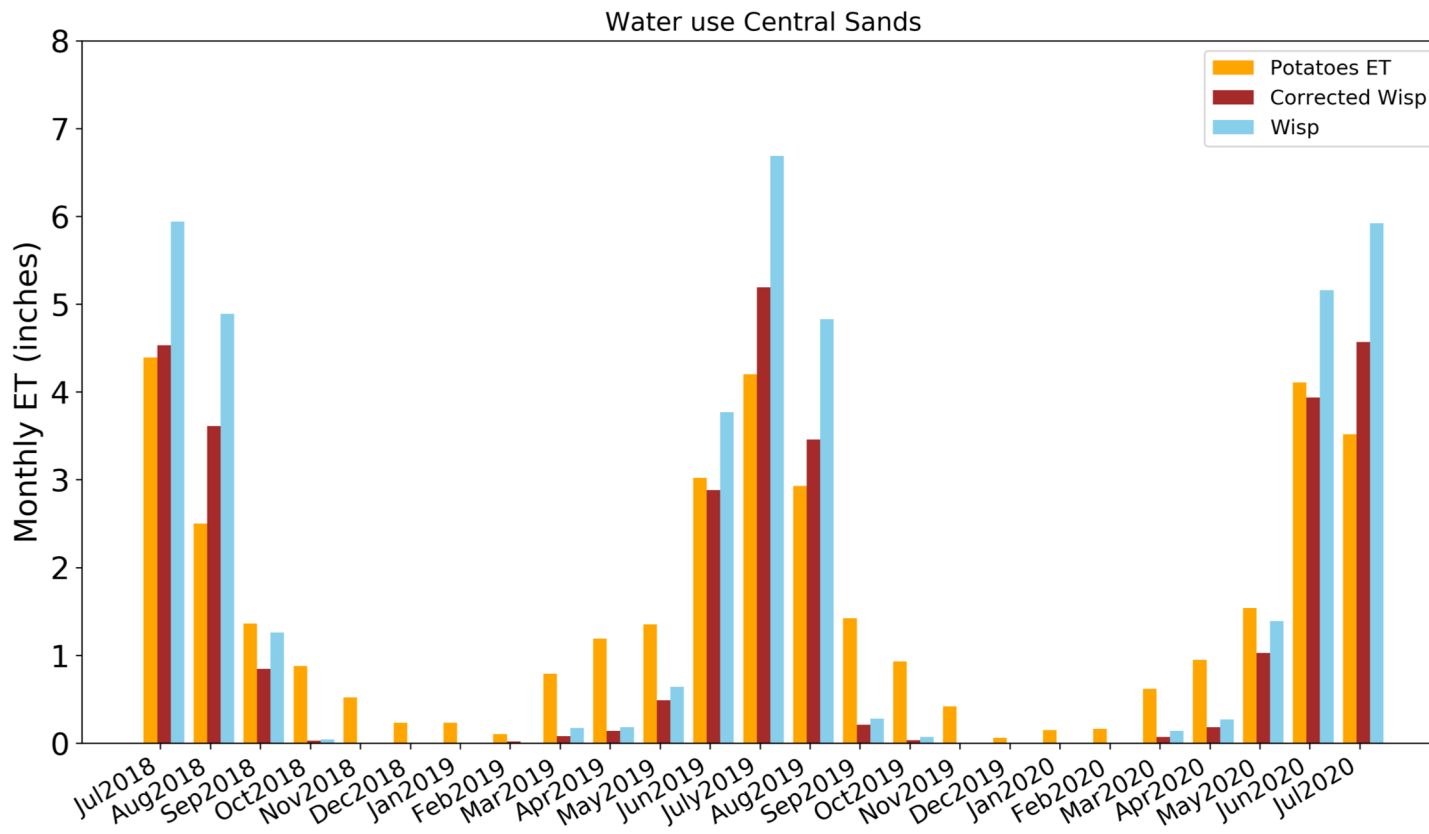


## Observed and Model Total Monthly ET comparison



- WISP overestimate ET and can not capture soil evaporation during shoulder months
- Most of the total ET is in June and July
- July 2018 ET was a bit higher than July 2019 and July 2020
- 2018: Frito lay
- 2019,2020: Lamoka

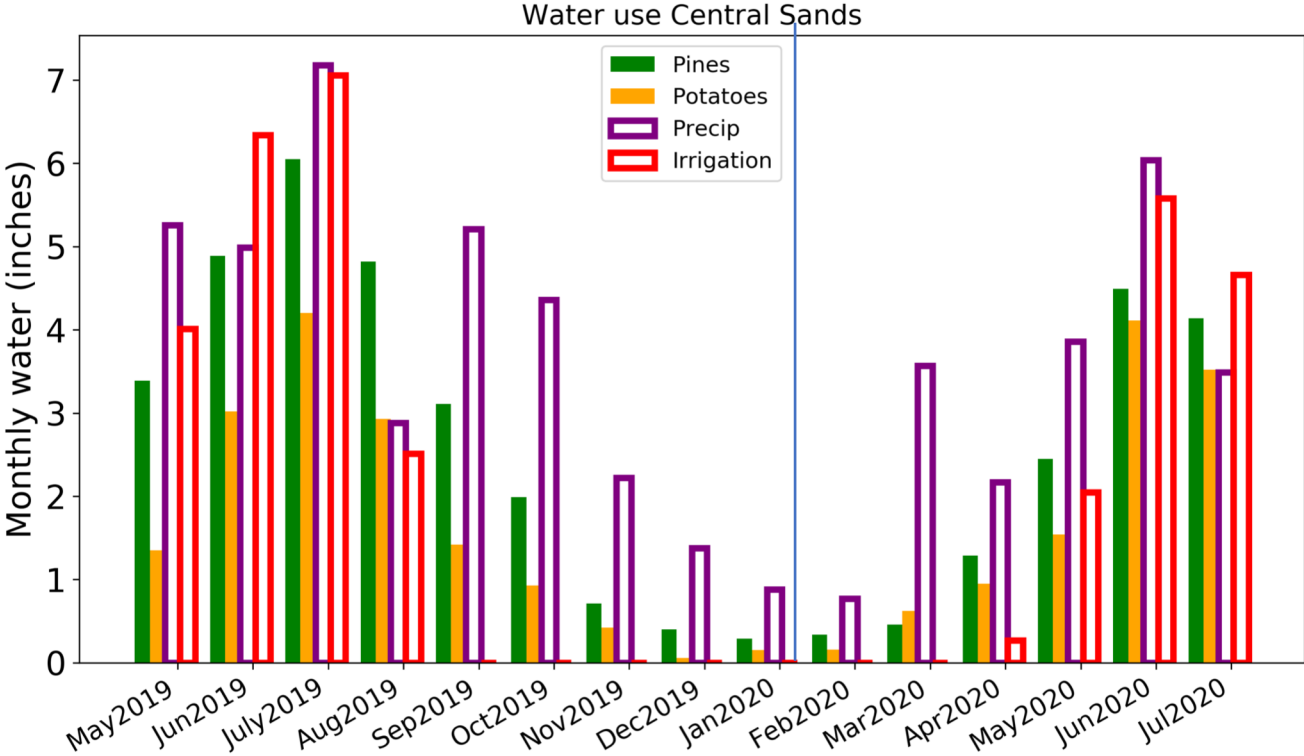
## Effect of WISP ET correction



**Corrected WISP ET is closer to observed ET**

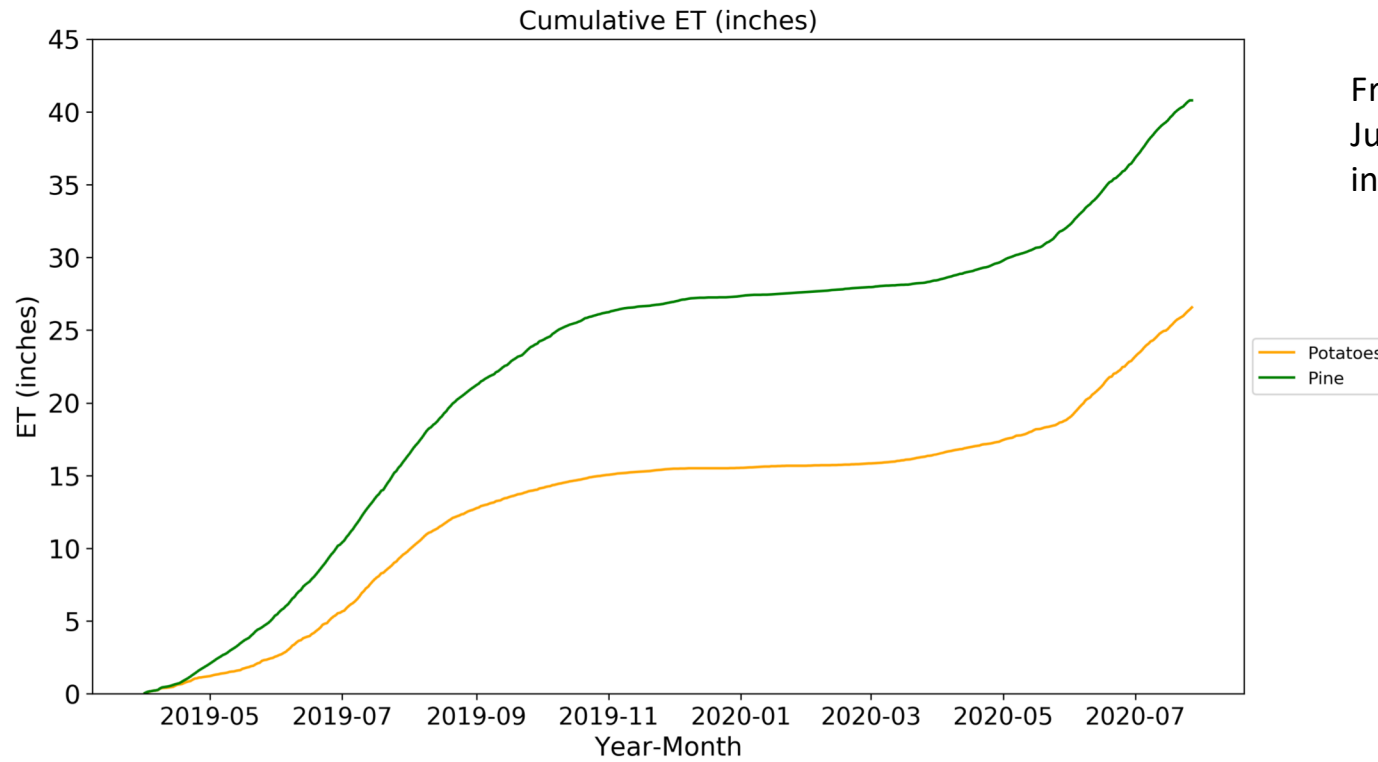


# Comparison between Pines and Potatoes ET



- July 2020 ET comparable between Pines and Potatoes
- Pines Total July 2020 ET: (4.49 inches)
- Potatoes Total July 2020 ET: (4.11 inches)

## Comparison between Cumulative Pines and Potatoes ET



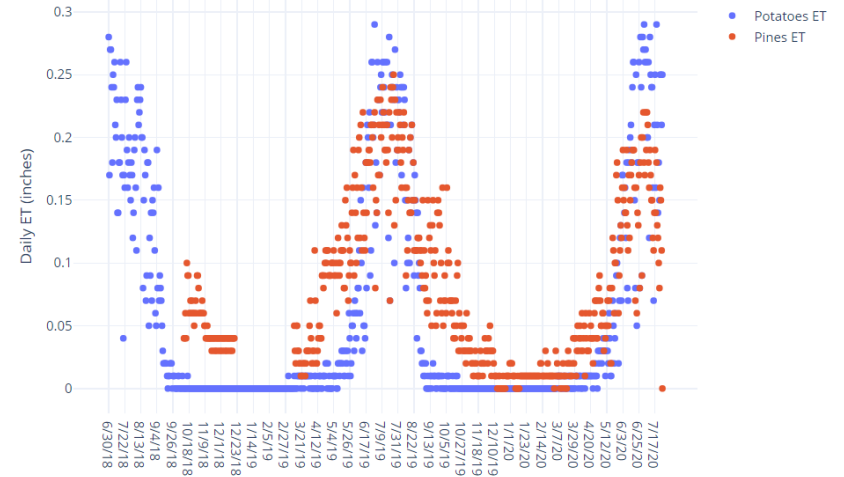
From May 2019 to July 2020. Winters included.



# Links to the data website

- <https://flux.aos.wisc.edu/potato>

<http://co2.aos.wisc.edu/data/potato/realtime.html>



US-CS3 Heartland Farms Potato Realtime Wed Jul 29 03:00:04 2020

Date	Potato ET (inches)	Air Temp (mean F)	Air Temp (max F)	Air Temp (min F)
07-25-2020	0.98	78.2	87.9	67.7
07-26-2020	N/A	78.5	83.8	72.3
07-27-2020	0.75	72.6	80.1	65.0
07-28-2020	0.75	69.3	81.1	59.1

Potato_ET_inches	airtemp_potatoes	Pine_ET_inches	airtemp_pines	wisp_AETIdso_corr
1	79.43			0.225970568
7	72.35			0.132605884
	71.3			0.205590082
2	74.52			0.200763101
7	78.13			0.190450648
5	72.11			0.13958545
9	66.49			0.185673463
1	67.55			0.179530988
9	70.53			0.191171467
6	74.12			0.162543034
4	71.66			0.156475974
1	72.71			0.17658321
1	74.01			0.107251563
	73.94			0.115724576
	75.38			0.148059785
	76.84			0.146265859
	72.46			0.197139872
	67.38			0.170450513

# Plans

- Two manuscripts being prepared for peer-reviewed publication – one on pine and potato ET (+ WISP model correction), and one on modeling/forecasting crop ET
- Continued collaboration with Dom Ciruzzi/Steve Loheide on pine water groundwater use, Malika Nocco and Logan Ebert on mapping ET, Jingyi Huang on soil moisture mapping, Yi Wang and John Panuska on yield models/WISP
- New collaboration funded by UW SSEC Jason Otkin, Paul Stoy, and Martha Anderson on new satellite ET model and drought forecasts (ALEXI)
- Article submitted to Common Tater for fall publication
- Continued update of web site and submission of data to repository
- Ammara Talib continuing dissertation and PhD – construct regional ET budget
- WPVGA WTF funding expires June 2021 – discussion on future plans

# Acknowledgements

- Desai lab & CEE Faculty Graduate students
- Jonathan Thom, UW-Madison Space Sciences and Engineering Center
  
- Tamas Houlihan, WPVGA Water Task Force
- Bob Smail, Wisconsin DNR
  
- Mallika Nocco, University of California Davis
- Jingyi Huang, UW-Madison Soil Science
- John Panuska, Biological Systems Engineering Dept. UW Madison
- Rick Wayne UW-Madison, Department of Soil Science
- Freihoefer, Adam T - DNR
  
- Jeremie Pavelski, Heartland Farms
- Joe Raboin, Tri-County School Forest
  
- Ameriflux

# Thank you

- UW CCR CPEP (Climate People Environment Program)
- METER Grant A Harris Fellowship
- Wisconsin Potatoes and Vegetable Growers Associations (WPVGA) Water Task Force
- State of Wisconsin DNR

