Calculating dahlia water needs using free weather station data

Chloe Seeborg, Melanie Stock, Claudia Nischwitz

Research Technician – Small Farms Lab

Urban and Small Farms Conference
Zoom Webinar
February 18, 2026 @ 11:20 am

Goal: determine irrigation needs of dahlia

Study Purpose

- Lack of research into cut-flower irrigation
- Need for research to determine rates that balance stem production and water conservation

Why Dahlia?

- Popular
- Profitable
- Sensitive to stress (water, temperature, nutrients, virus)

Source: Stock et al. 2022

Field Trials: 2023-2024

Greenville Research Farm

North Logan, Utah

- 0.2-acre field, Silt loam soil
- 250 ‘Boom Boom White’ plants
- 250 ‘Café au Lait’ plants

5 Irrigation rates

- The same amount as alfalfa, 100%
- 80% and 60% of alfalfa
- 80% and 60% until bloom, then 100%


‘Boom Boom White’


‘Café au Lait’


Greenville Farm

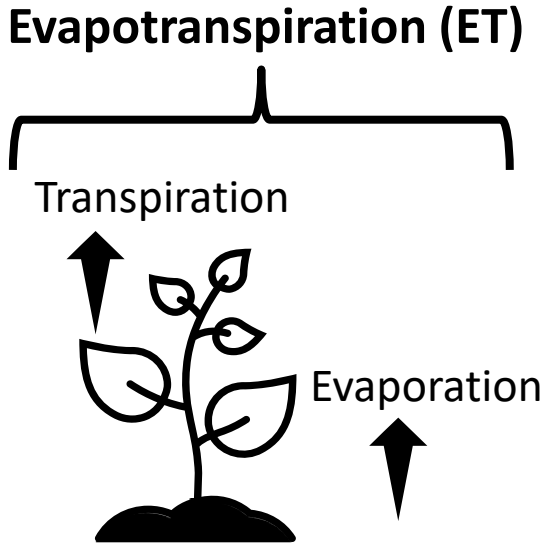
Measuring Water Use

Soil Water Content

- 30 sensors at 3” depth, 10 sensors at 8” depth
- Soil water content, irrigation, and rain were used to determine plant water use, called evapotranspiration (ET)

Crop Coefficients

- A number to adjust water requirements of alfalfa to any crop
- Determined for each growth stage: establishment, vegetative, reproductive



Source: FAO 56 (1998)

Example Weather Station Use

It's free! Access at climate.usu.edu

Weekly ET of alfalfa, by month (10-year average)							
Station	**April**	**May**	**June**	**July**	**August**	**September**	**October**
Murray	1.3"	1.6"	2.2"	2.2"	1.9"	1.4"	0.8"

Divide by 7 to get daily ET

- ≈ 0.2" for April and May
- ≈ 0.3" for June-August
- 0.2" in September
- ≈ 0.1" in October

Results – Growth Stages

Late spring to summer (≈ first 3 weeks),
Lowest water needs: 70% of alfalfa

Summer until bud,
Water need increases: 100% of alfalfa

Flowering to end of season,
Highest water need: 115% of alfalfa

Source: FAO 56 (1998)

Results – Yield Timing

More water → earlier blooming

- 2023: Fully irrigated plants bloomed up to **two weeks sooner** than the lowest irrigated plants.
- 2024: Smaller differences in timing between irrigation levels, with the well-watered plants blooming **3-7 days sooner**.

Days from transplant to first harvest

- 82 days for ‘Boom Boom White’
- 97 days for ‘Café au Lait’

‘Café au Lait’ in bloom

Results – Marketable Yield

More water → more marketable stems

- 2023: Fully irrigated plants produced **6 more stems per plant** compared to the lowest irrigated plants
- 2024: **3 more stems per plant**
- ‘Boom Boom White’ produced more stems than ‘Café au Lait’

Other factors impacted yield

- ‘Boom Boom White’ plants struggled with virus infection in 2024
- Extreme temperatures were a problem for both cultivars in 2024

Harvested ‘Boom Boom White’

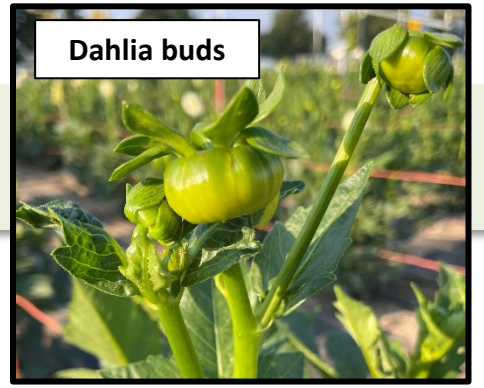
Harvested ‘Café au Lait’

Results – Tuber Weight

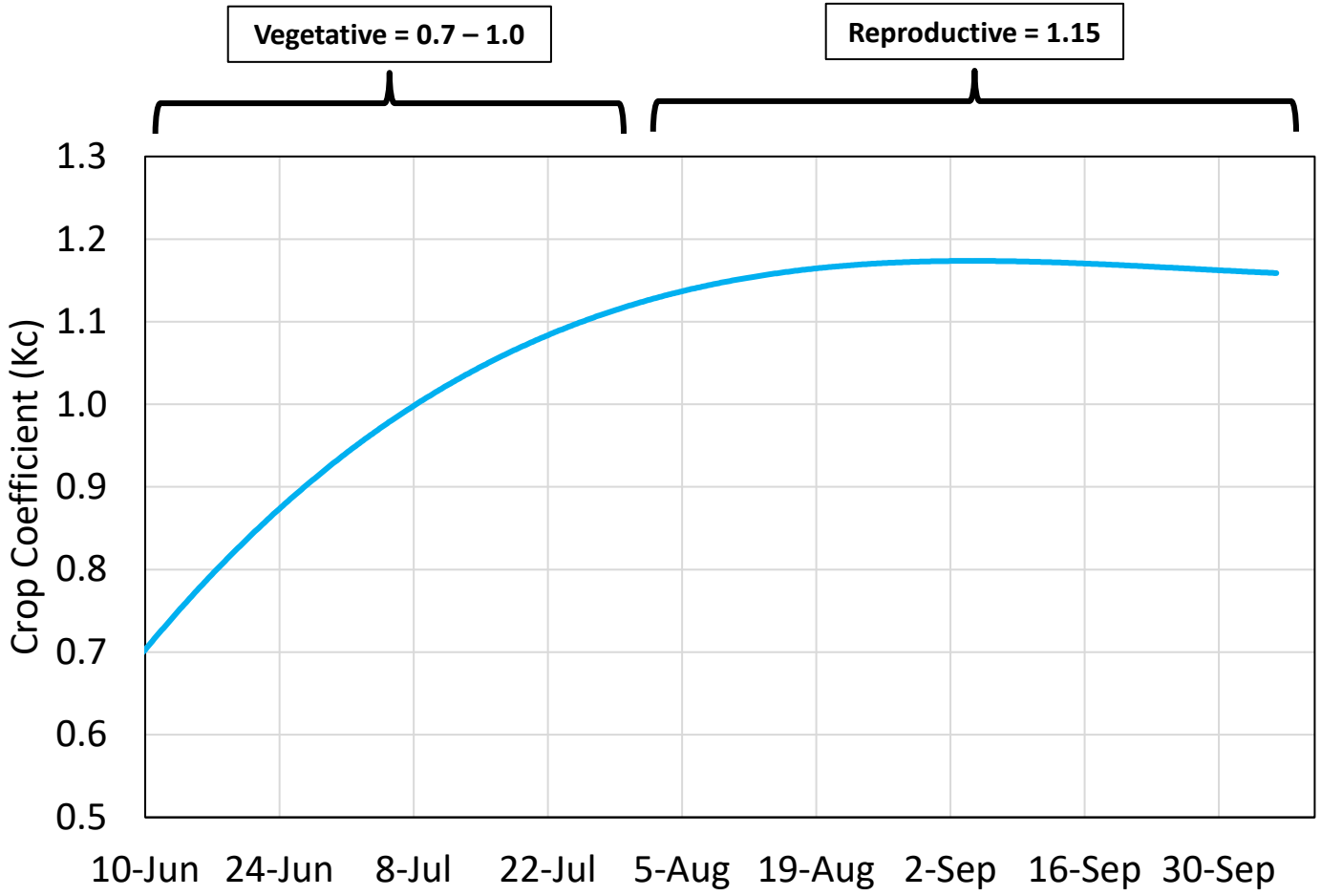
More water → greater tuber weight

- Tubers irrigated at 100% were **0.4 to 0.6 lb (14%-44%) heavier** than those irrigated at 60%
- The tubers produced by ‘Boom Boom White’ were **twice the weight** of ‘Café au Lait’

Results – Crop Coefficients (Kc)



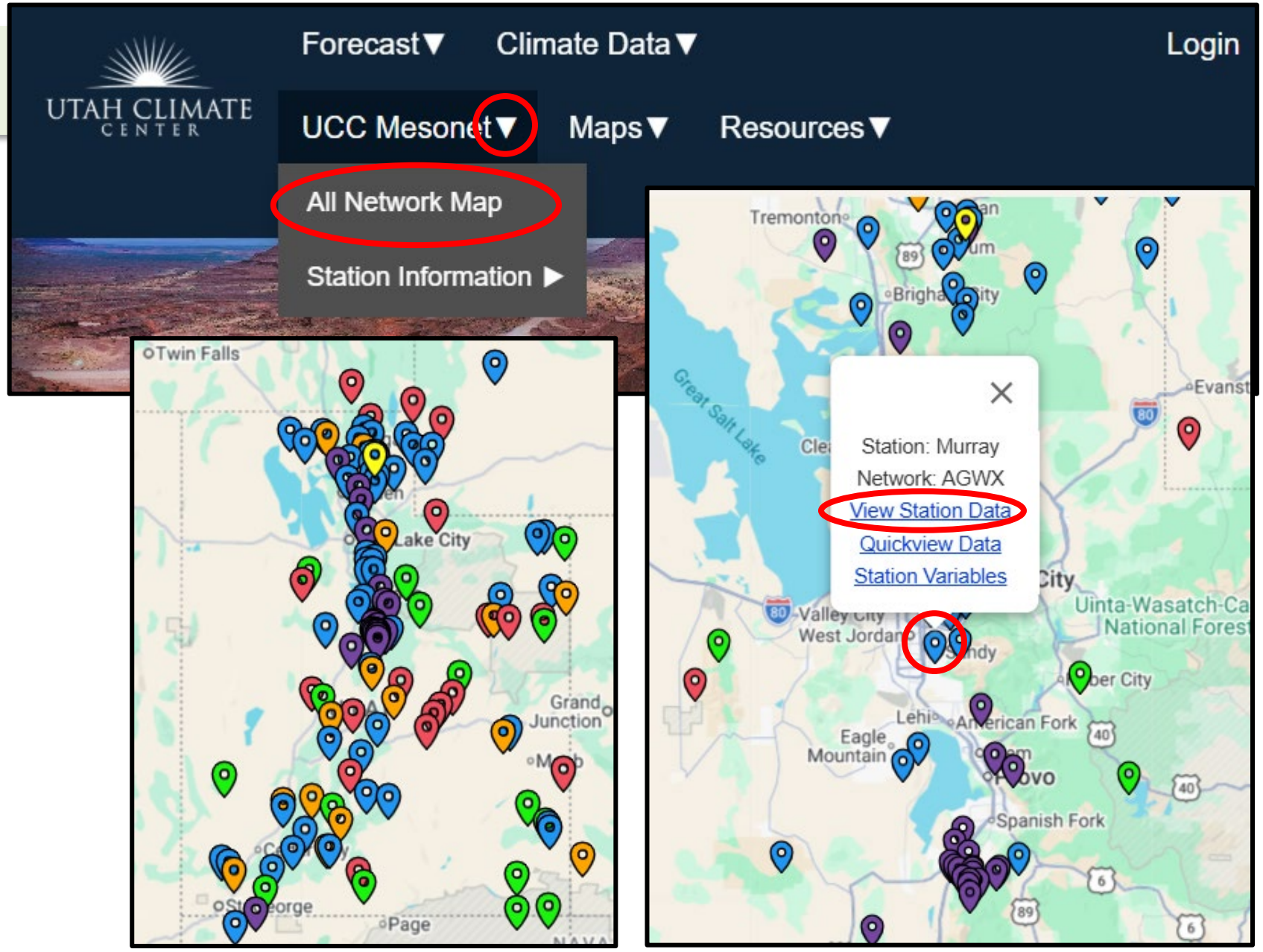
- Water need increases throughout season, reaching its max and maintaining that level until the end of the season
- Transplant stage not shown, has a Kc value of 0.7. Transplant dates:
  - 2023: May 22nd and 23rd
  - 2024: May 30th



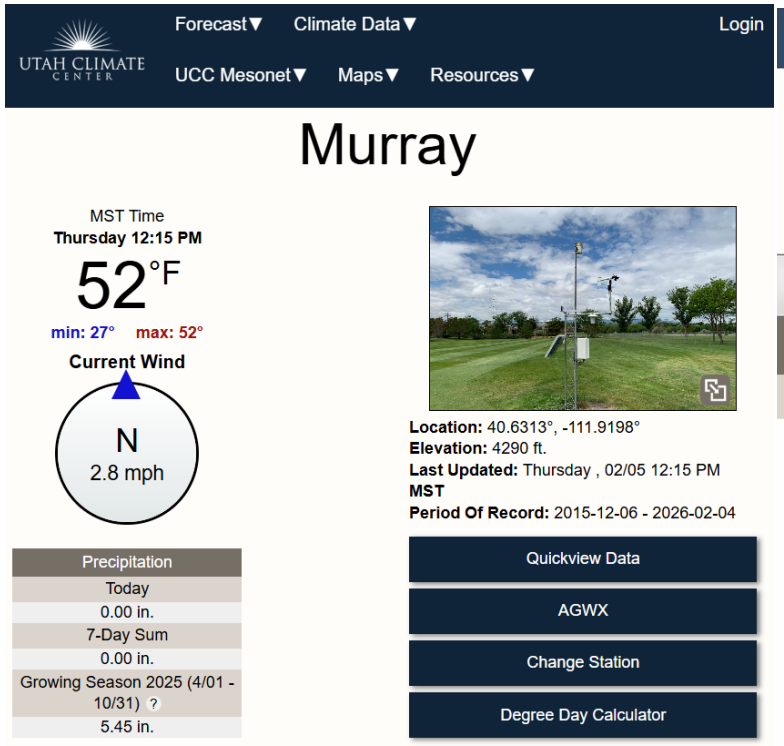
Your turn!

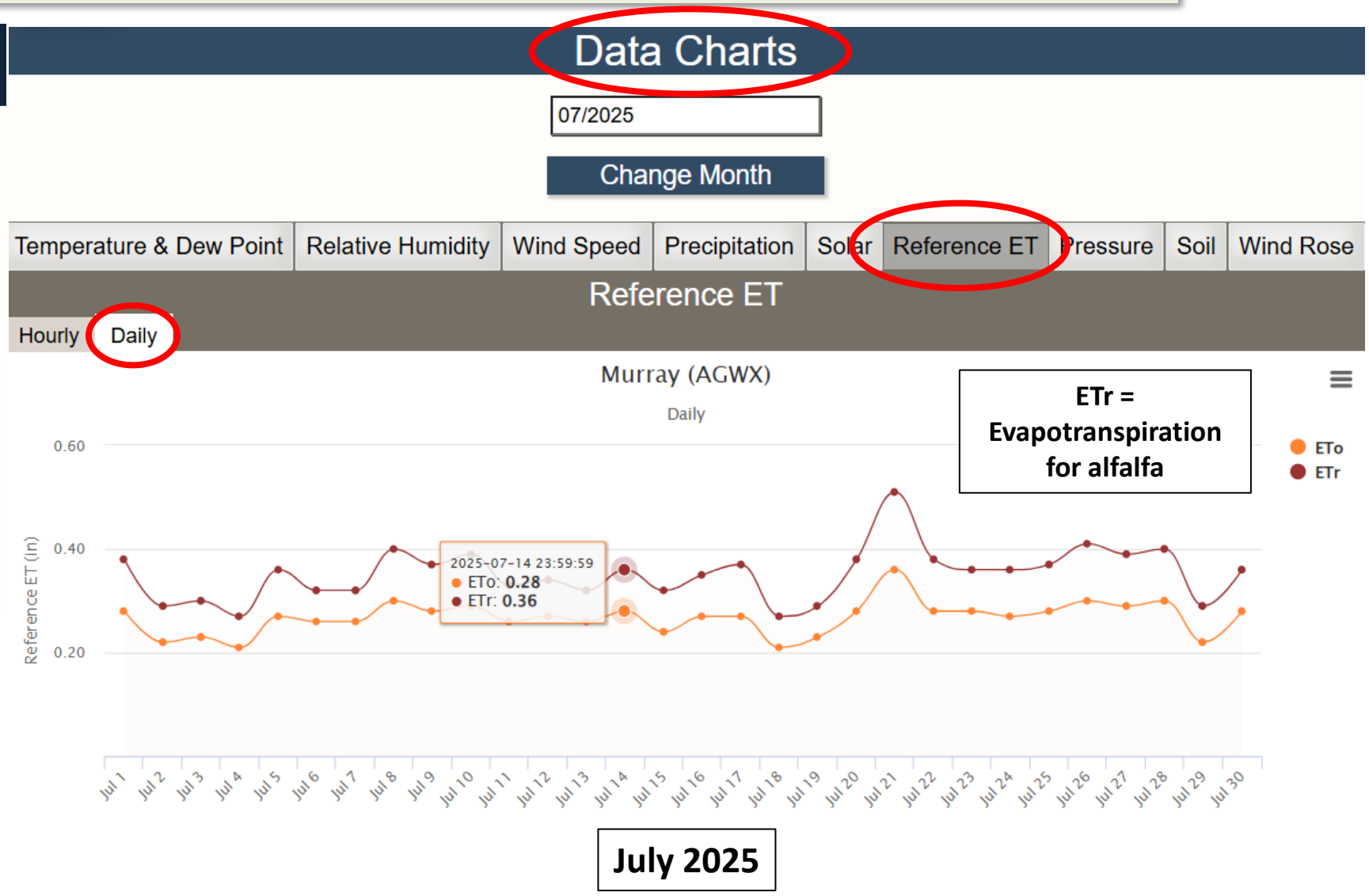
climate.usu.edu

1. UCC Mesonet
2. All Network Map
3. Choose the station closest to you
4. Click ‘View Station Data’



Viewing Daily ET





5. Scroll to ‘Data Charts’
6. Select ‘Reference ET’
7. Select ‘Daily’

July 2025

Use the weather forecast to estimate ET

Use your favorite weather service to look ahead for the week

- If the forecast is similar to last week, you can assume the next week's ET will be about the same.
- If the forecast shows more than a 5-10°F difference, rain, or a lot of wind, then ET will be different

Thu 12	**47°** / 30°		45%	↘ 4 mph
Fri 13	**47°** / 24°		19%	↘ 4 mph
Sat 14	**50°** / 31°		6%	→ 5 mph
Sun 15	**53°** / 32°		1%	↗ 7 mph
Mon 16	**53°** / 32°		61%	↑ 9 mph
Tue 17	**41°** / 23°		74%	↗ 9 mph
Wed 18	**36°** / 19°		59%	↗ 7 mph
Thu 19	**36°** / 21°		55%	↗ 6 mph
Fri 20	**35°** / 18°		48%	↗ 6 mph
Sat 21	**36°** / 17°		24%	→ 6 mph

10-day forecast from The Weather Channel

Source: The Weather Channel

Example use of crop coefficients

1. Add up your estimated ETr for the week:

   Ex: 0.3” per day x 7 days = **2.1”**

2. Multiply the **total** by the **crop coefficient** for the current growth stage. If the dahlias are in bloom, use the crop coefficient for the reproductive stage, **1.15**:

   Ex: **2.1”** x **1.15** = **2.4” ET**

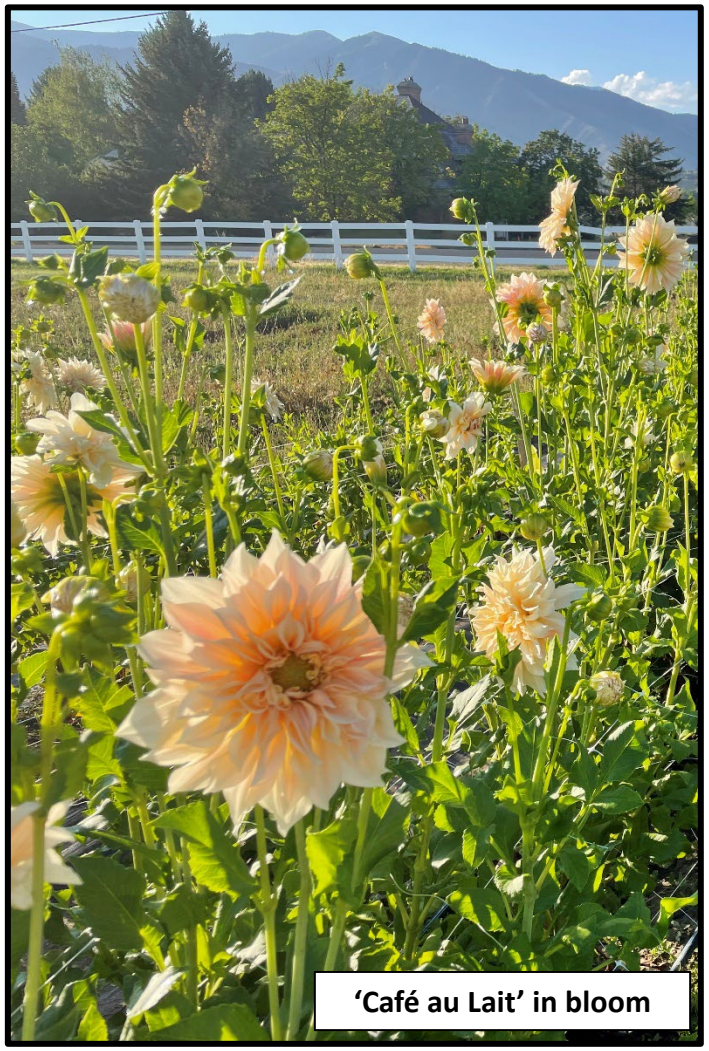
3. Voila! You now have the **number of inches of irrigation** to apply that week, which you can divide into individual irrigation events. If you **water 3 times per week**:

   Ex: **2.4”** ÷ **3** = **0.8” per irrigation**

4. Convert **inches** to **gallons**, using **bed area**. For a 4x10 ft bed (**40ft^2**):

   Ex: **40** x **0.8”** x **0.623** = **20 gallons of irrigation water**

(Conversion factor: **0.623 gallons** = 1 inch of water per square foot)



‘Café au Lait’ in bloom

Considerations for Irrigation

Establishment Period

Water more frequently to keep the surface moist – during this period, the plants have a shallow root system and are very sensitive to water stress.

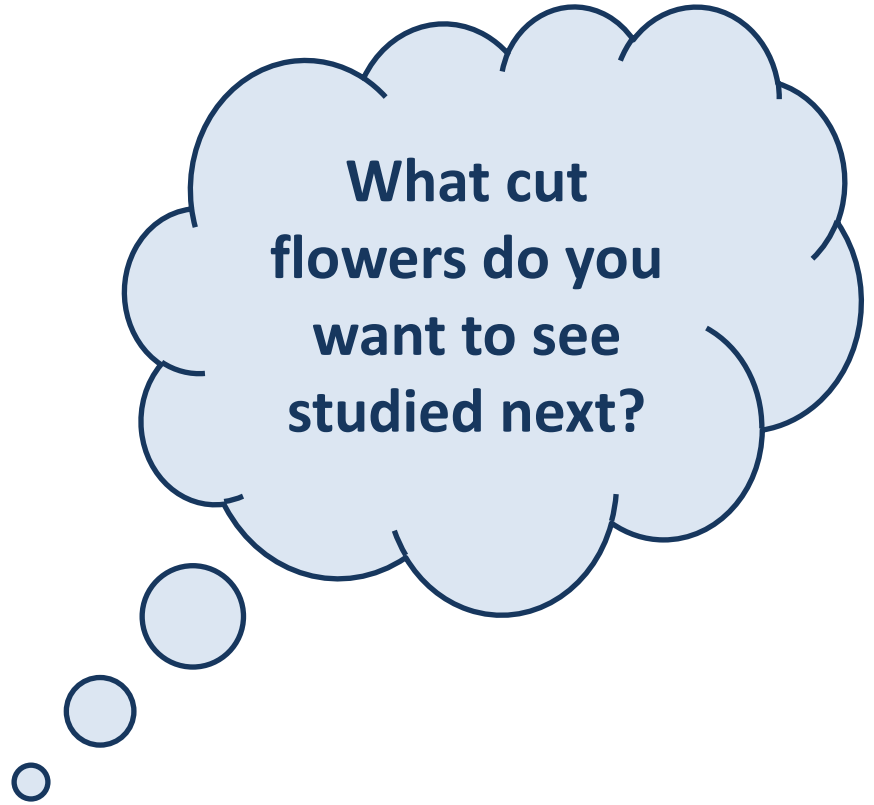
Soil Texture

In USU trials, we irrigated our silt loam soil 3 times per week, each Monday, Wednesday, and Friday.

- Water sandy soils more frequently
- Water clayey soils less frequently
- It's still the same amount of water, it's just the number of irrigations that changes

Wrap-up

- Access local ET at **climate.usu.edu**
- Use ET and Crop Coefficients to take the guesswork out of dahlia irrigation
- Crop coefficients for dahlia are:
  - **0.7** for the first 3 weeks after transplant
  - **1.0** from 3 weeks post-transplant until bud
  - **1.15** during flowering
- Currently limited crop coefficients for other cut flowers, but alfalfa is a good place to start!



Thank you! Access slides at diverseag.org

Acknowledgements

- Cambry Adams
- James Frisby
- Xin Dai
- Olive Stewart
- Theresa Lara

Contact Info

a02352263@aggies.usu.edu

Bring irrigation specs to field day!

- **Bed size (length, width)**
- **# Drip lines per bed**
- **Flow rate (gal/min/100 ft)**
- **# Irrigations per week**
- **# Minutes per irrigation**

Questions?

UDAF USDA NIFA

Bonus Slides

Results – Virus Effects

Lower yield

- Up to 4 fewer marketable stems per plant

Earlier bloom

- Up to 4 days faster

Smaller tubers

- Up to 1 lb lighter

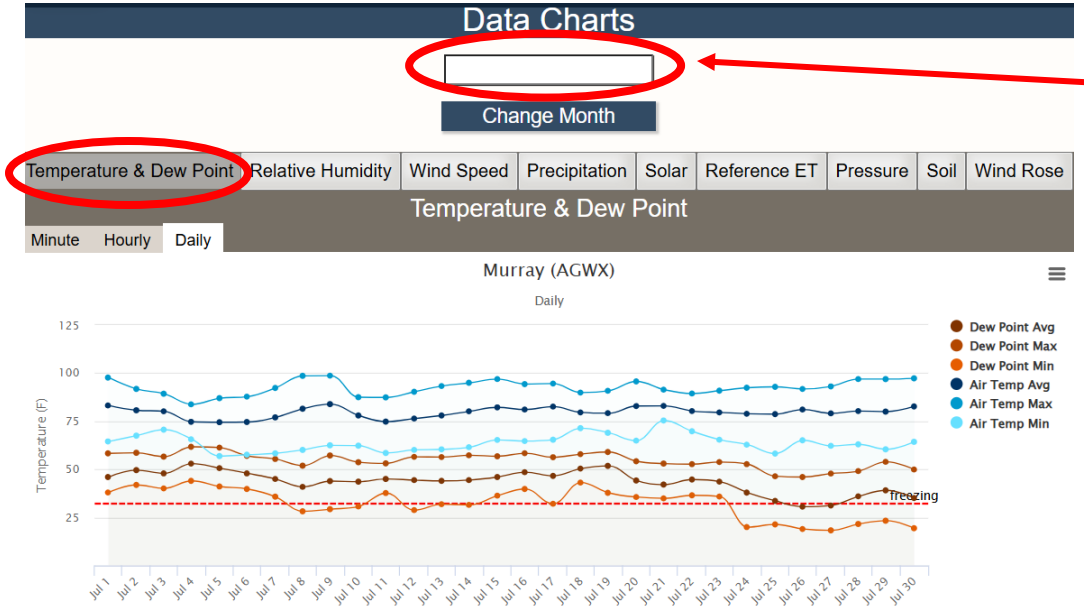
Conclusions

- Virus infection increases plant stress, initiating reproduction sooner but ultimately producing less flowers and smaller tubers

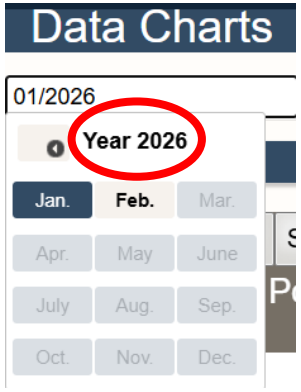
Use the weather forecast to estimate ET

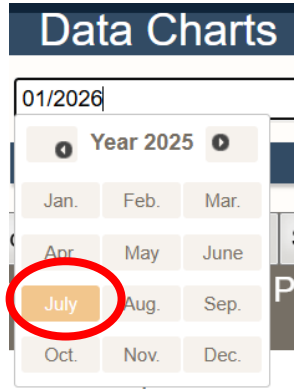
Use your favorite weather app to look ahead for the week

- Use the ‘Temperature and Dew Point’ chart to identify days with similar temperatures to the forecast – You may need to reference data from previous years.
- Switch back to ‘Reference ET’ and note the values of ETr for those days.



Click here to look at data from a different month/year. Click the year at the top, select year you want, then the month.





The pop-up will close, then, click the ‘Change Month’ button