

Cotton Water Use as Affected by Irrigation Application Method – Sprinkler vs. SDI

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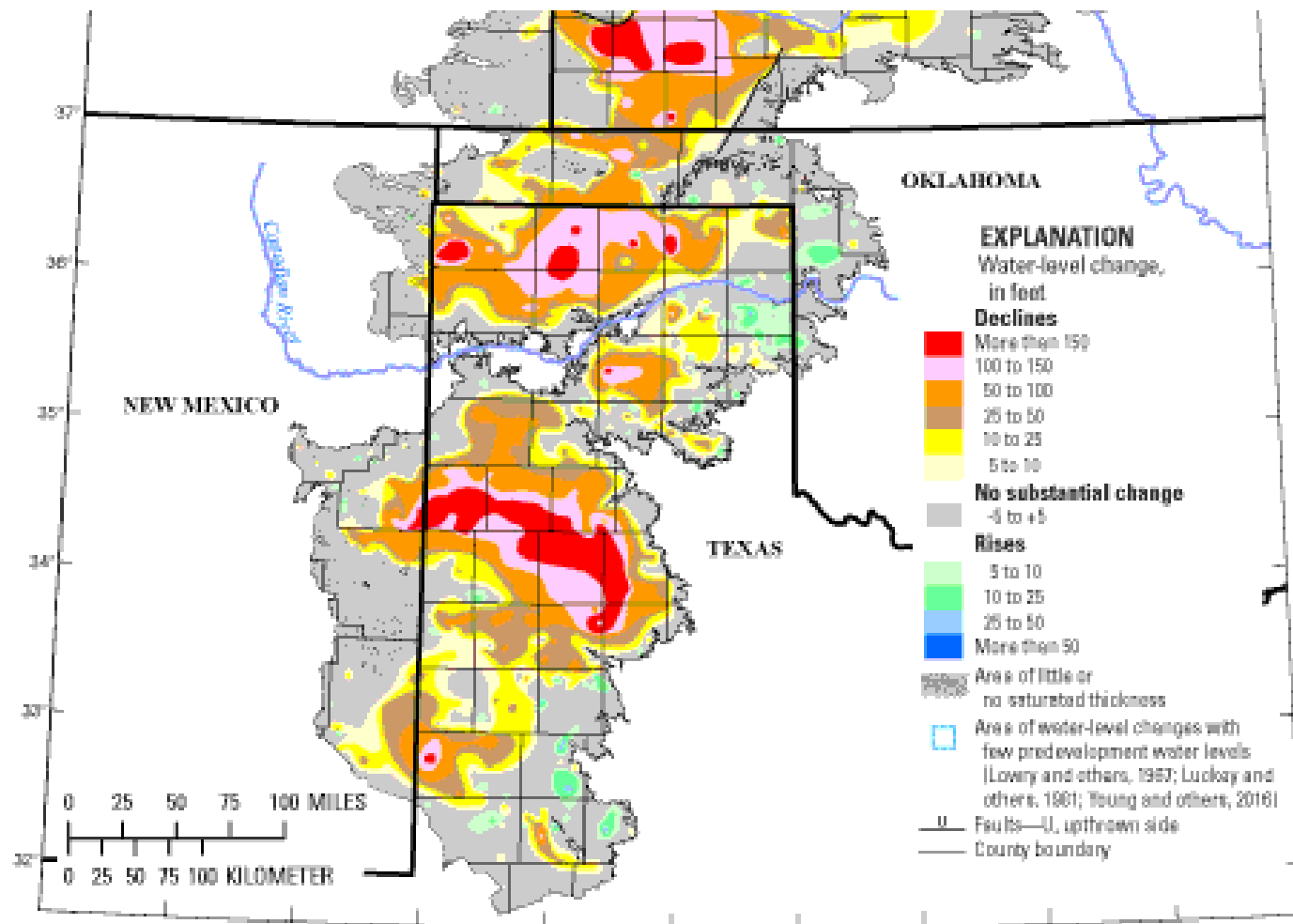
Agricultural
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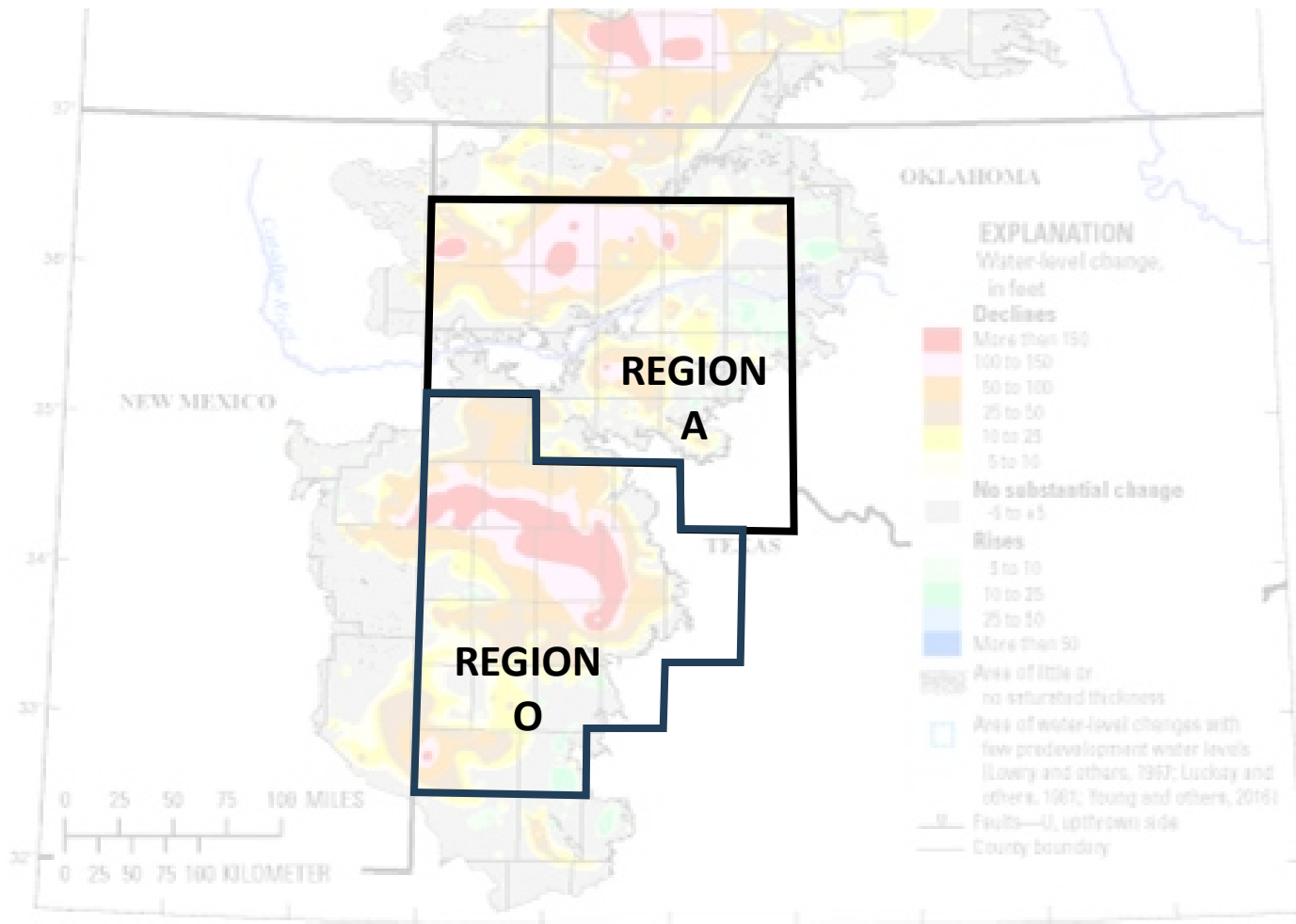
Ogallala Aquifer Program
2025 Research Planning Workshop
February 26-27, 2025
National Ranching Heritage Center
Lubbock, TX



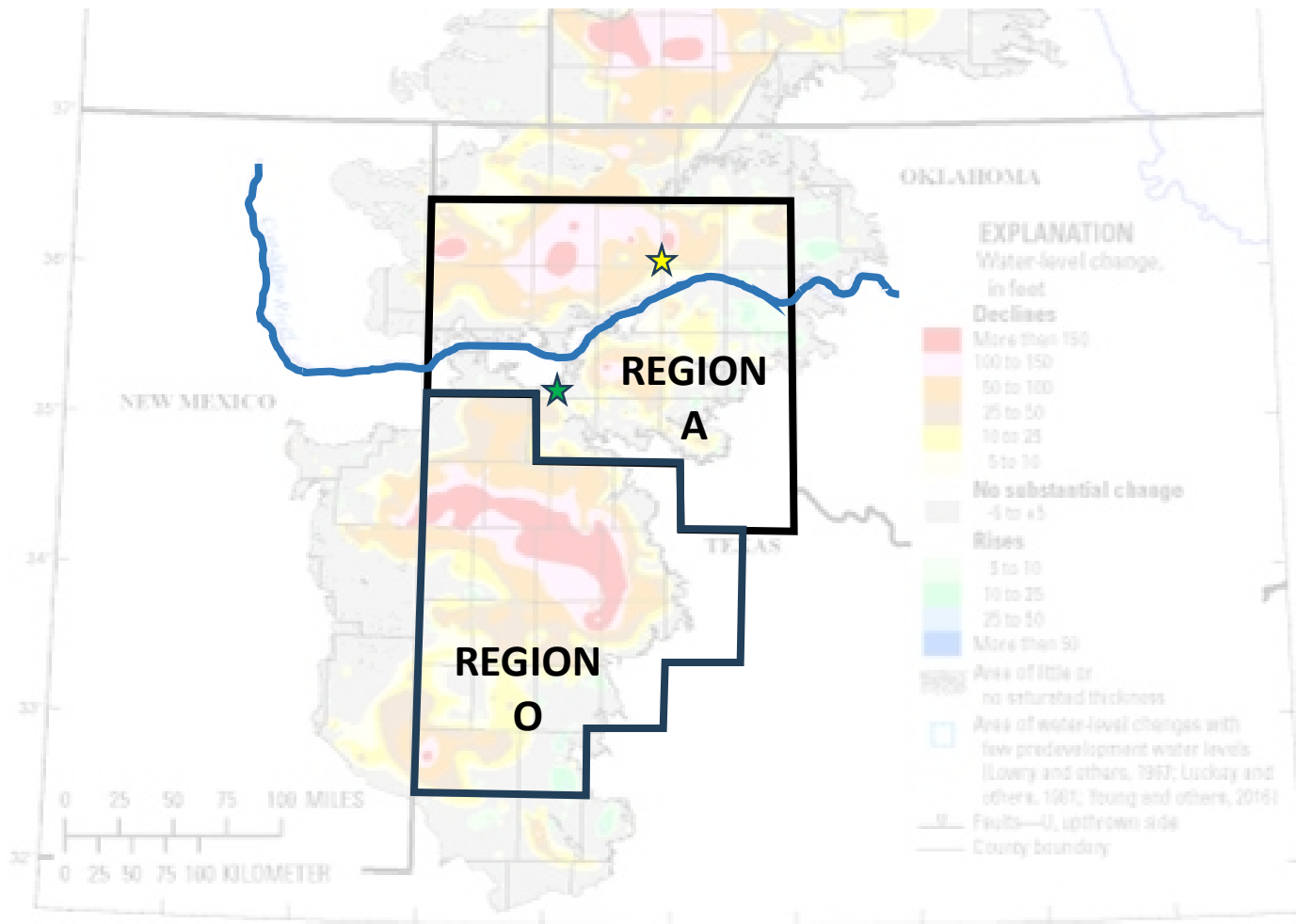
Irrigation and Aquifer Depletion in the Texas High Plains



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Irrigation and Aquifer Depletion in the Texas High Plains



Cotton as an Alternative Crop – TX Panhandle

Advantages

- ***Less water intensive than corn (~30% less)***
- ***Drought (heat) tolerant***

Disadvantages

- ***Thermally limited environment***
- ***Plant growth regulator***
- ***Germination (can be as low as 50%)***
- ***Harvest equipment***

Challenges

- ***Variety selection – climate & herbicide readiness***
- ***MANAGEMENT!***
 - ***Irrigation and fertility management***
 - ***Irrigation Scheduling - Fully irrigated cotton?***

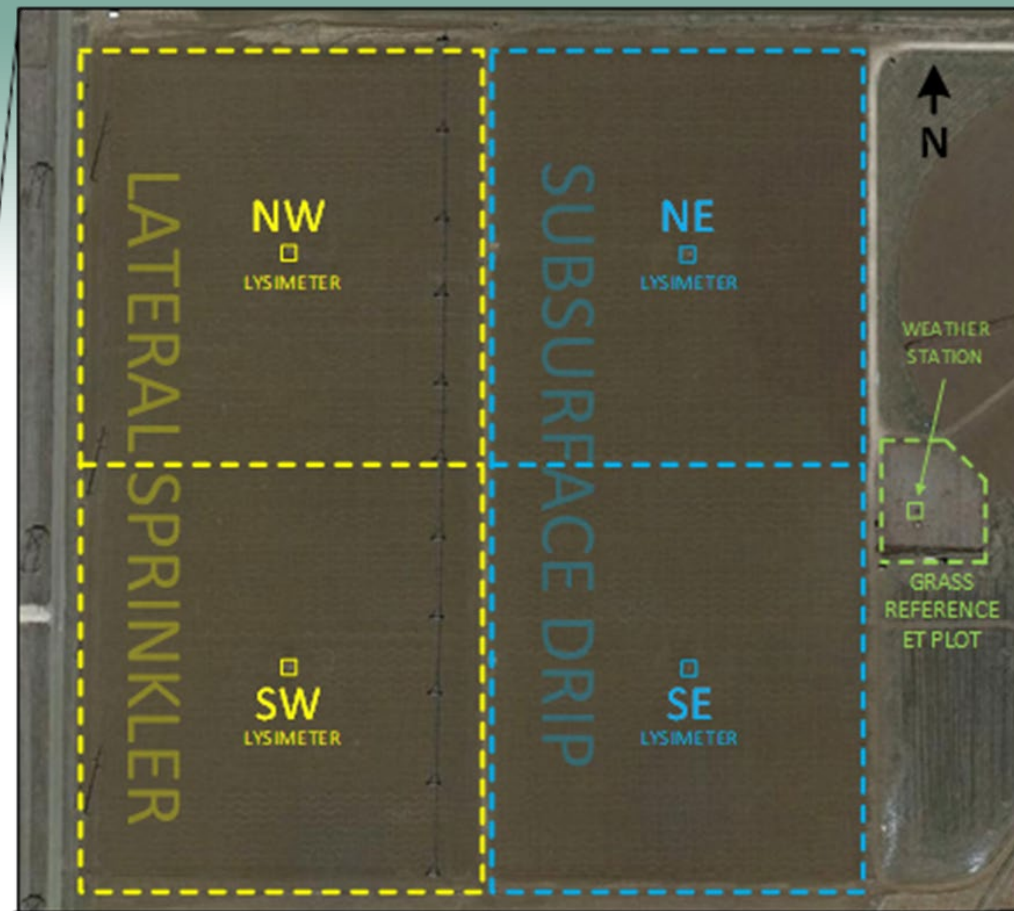
Calculating K_c ...

$$K_c = \frac{ET_c}{ET_o}$$

*Lysimeter-derived K_c

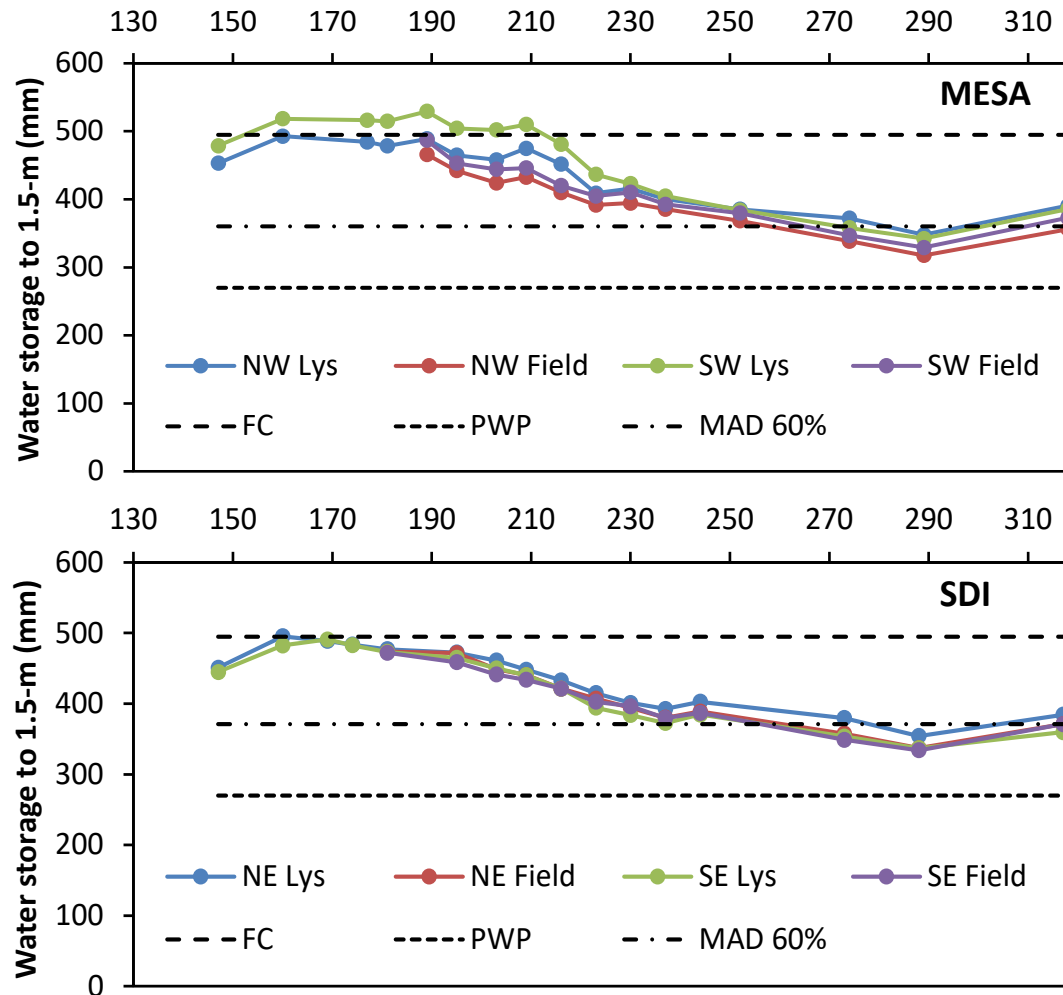
USDA-ARS CPRL large weighing lysimeters at Bushland, TX

- Pullman clay loam monoliths
- 3m × 3m × 2.3m dimensions
- accuracy > 0.05 mm water
- intensive management
- sprinkler vs. drip irrigation

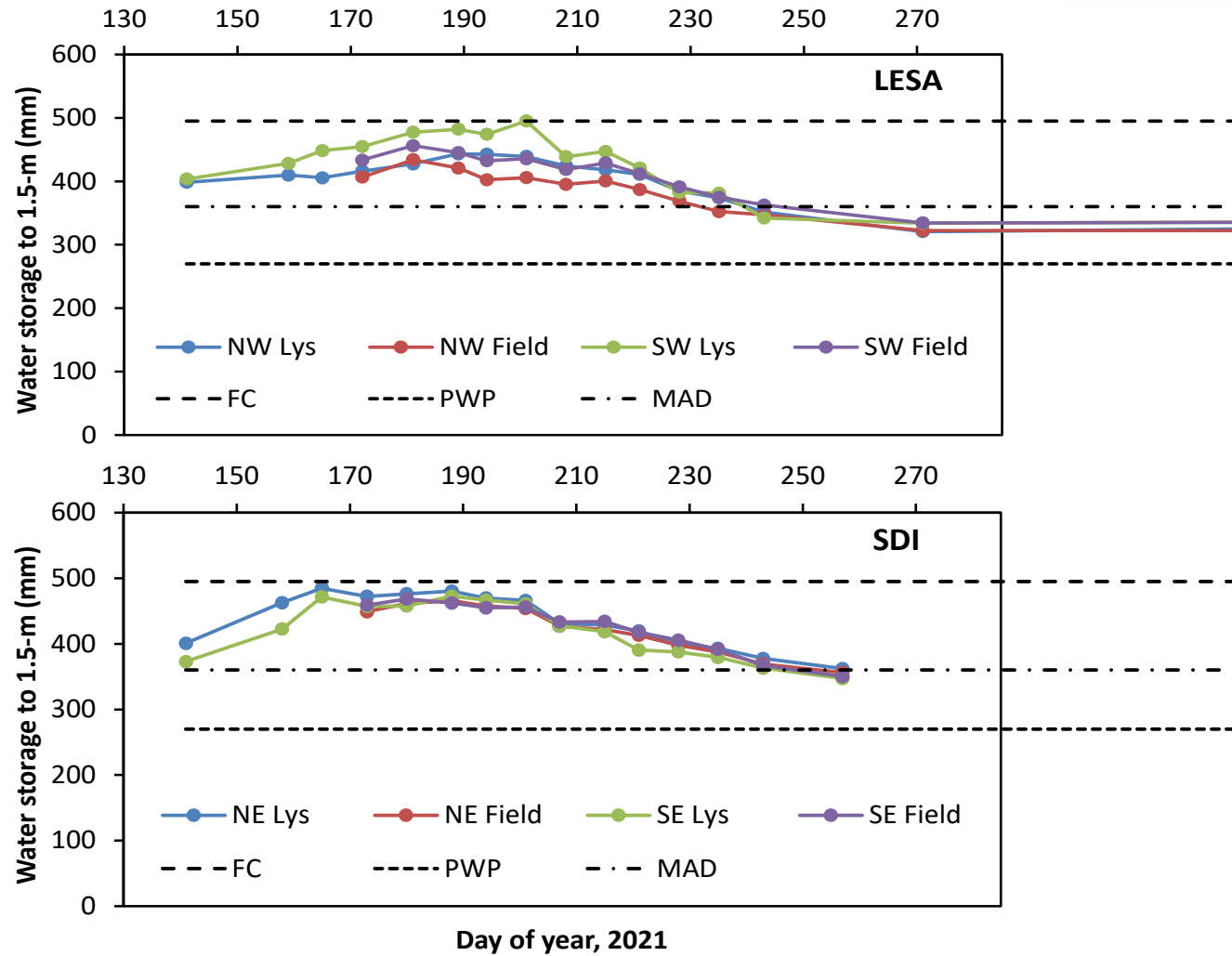




Soil Water Depletion 2020

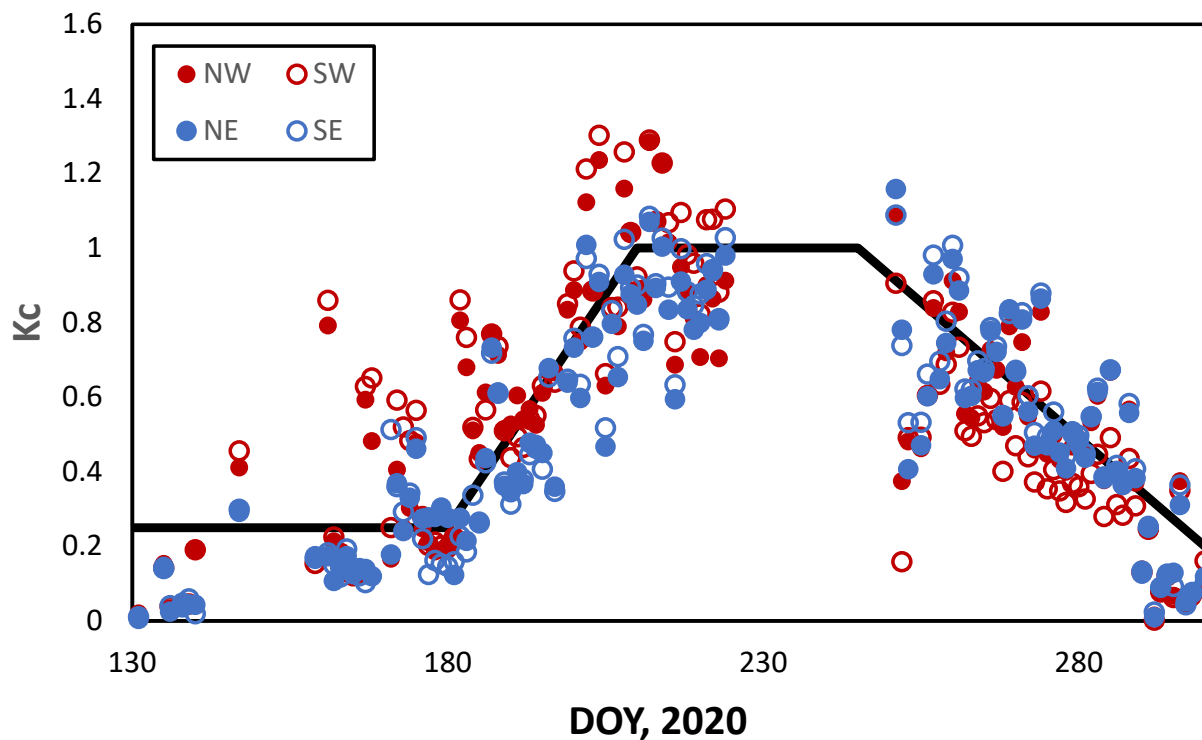


Soil Water Depletion 2021



Kcs for DP 1820 B3XF in 2020

82,000 plants/ac
SPRINKLER (WEST)
Planted 5-22 (DOY 143)
14.8" irr
3.2 ba/ac
SDI (EAST)
Planted 5-21 (DOY 142)
16.5" irr
3.1 ba/ac



Kcs for DP 1820 B3XF in 2021

49,000 plants/ac

SPRINKLER (WEST)

Planted 5-21 (DOY 143)

12.5" irr

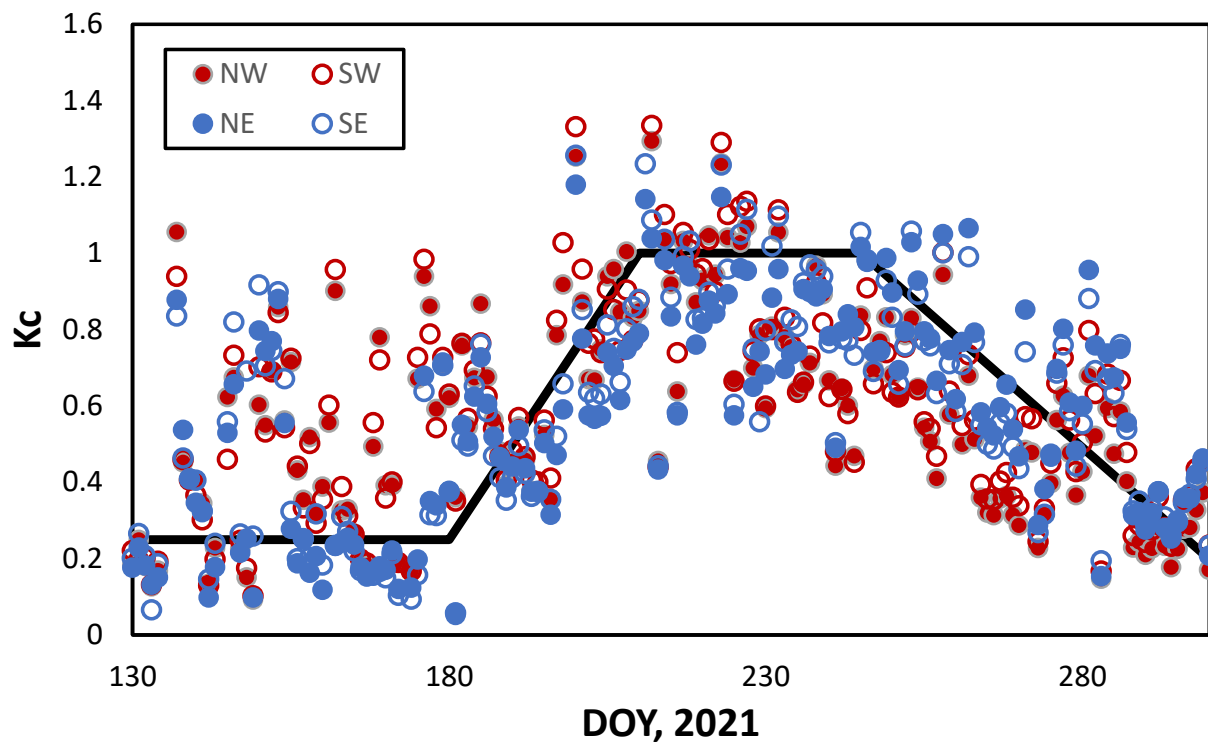
1.6 ba/ac

SDI (EAST)

Planted 5-21 (DOY 142)

16.5" irr

2.5 ba/ac



Kcs for DP 1820 B3XF in 2023

72,000 plants/ac

SPRINKLER (WEST)

Planted 5-8 (DOY 128)

12.5" irr

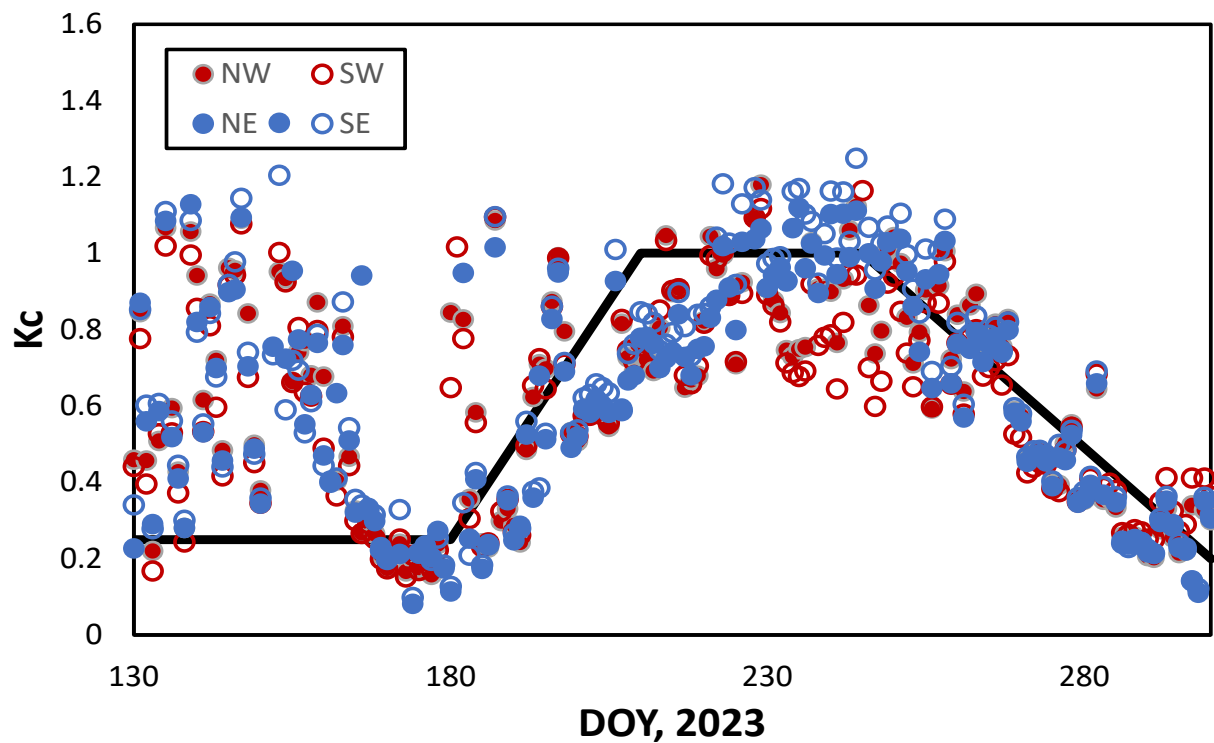
1.4 ba/ac

SDI (EAST)

Planted 5-9 (DOY 129)

11.1" irr

1.5 ba/ac

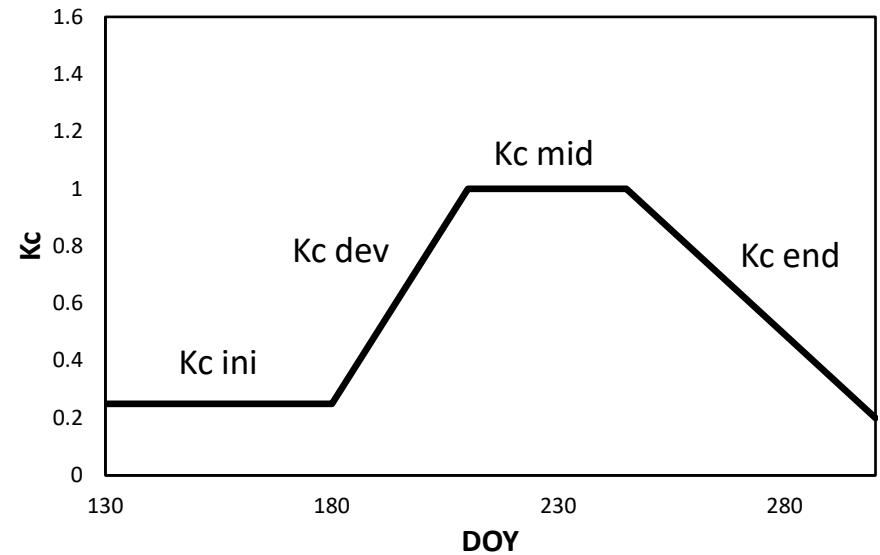


Average Kc by FAO Growth Stage

		SDI	LESA	% Δ
2020	Kc ini	0.19	0.27	-31.7%
	Kc dev	0.56	0.73	-23.2%
	Kc mid	0.88	0.97	-8.9%
	Kc end	0.53	0.45	16.6%

		SDI	LESA	% Δ
2021	Kc ini	0.35	0.45	-23.3%
	Kc dev	0.58	0.69	-15.1%
	Kc mid	0.86	0.84	2.0%
	Kc end	0.60	0.48	23.8%

		SDI	LESA	% Δ
2023	Kc ini	0.58	0.57	1.2%
	Kc dev	0.57	0.62	-7.4%
	Kc mid	1.01	0.92	10.2%
	Kc end	0.57	0.55	2.8%

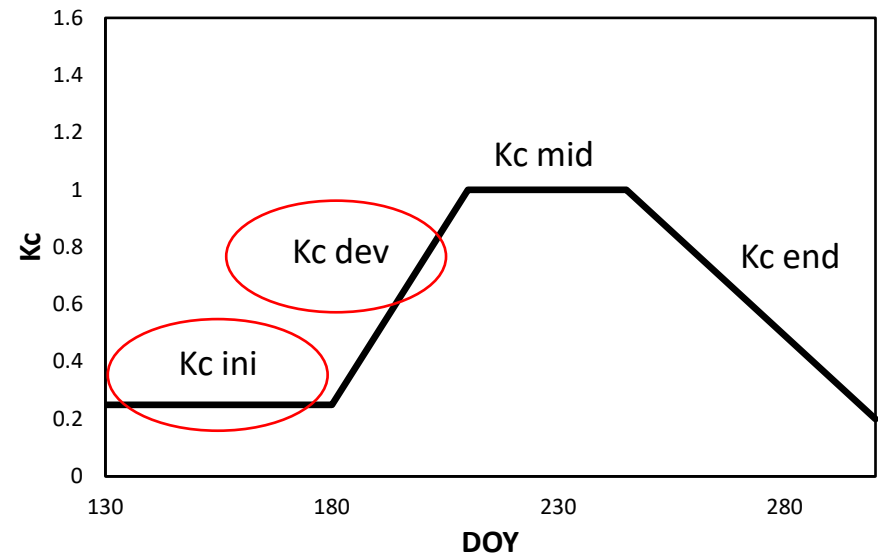


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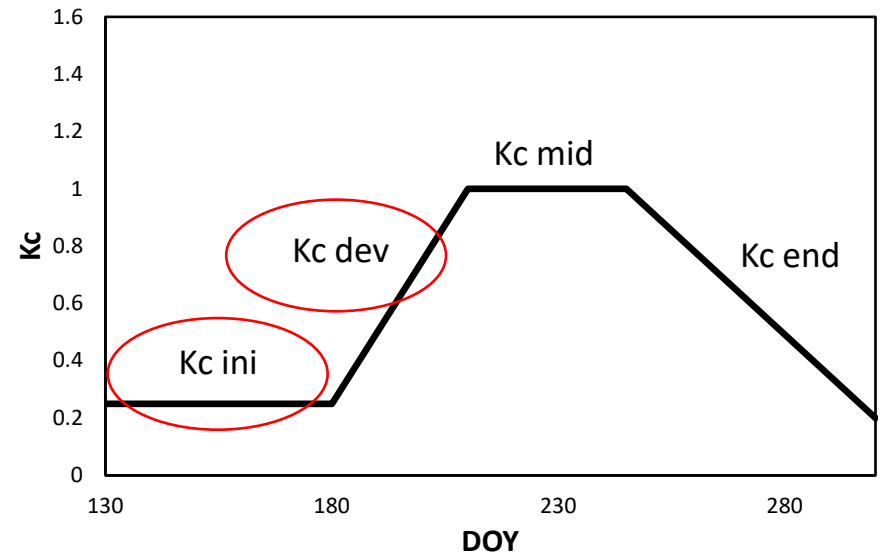


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Additional challenges for management

Managing for the conditions of the year

- ***Irrigation (timing and depth) vs. soil water depletion***
- ***Weed control – relatively slow to canopy closure***
- ***Fertigation complicated by rainfall***
- ***Wet vs. dry winter – initial soil water storage***
- ***Rainy year - Plant growth regulators***
- ***Plant damage***
 - ***Hail***
 - ***Herbicide drift***
- ***Replant or see it through? Crop Insurance issues?***

Summary

- ***Preliminary Data****
- ***Management and seasonal variations***
 - ***“It’s something new every year”***
 - ***Developing a universal strategy is difficult***
 - ***SDI can reduce evaporative losses in early season – increased crop water productivity***

However...

- ***Plant early, our biggest limitation is heat units***
- ***In general, research has shown it’s better to continue with a damage or reduced stand crop than to replant***

Thank You!

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