Irrigation Scheduling

Michiana Irrigated Corn & Soybean Conference
February 26, 2024
Shipshewana, IN

Stephen Boyer
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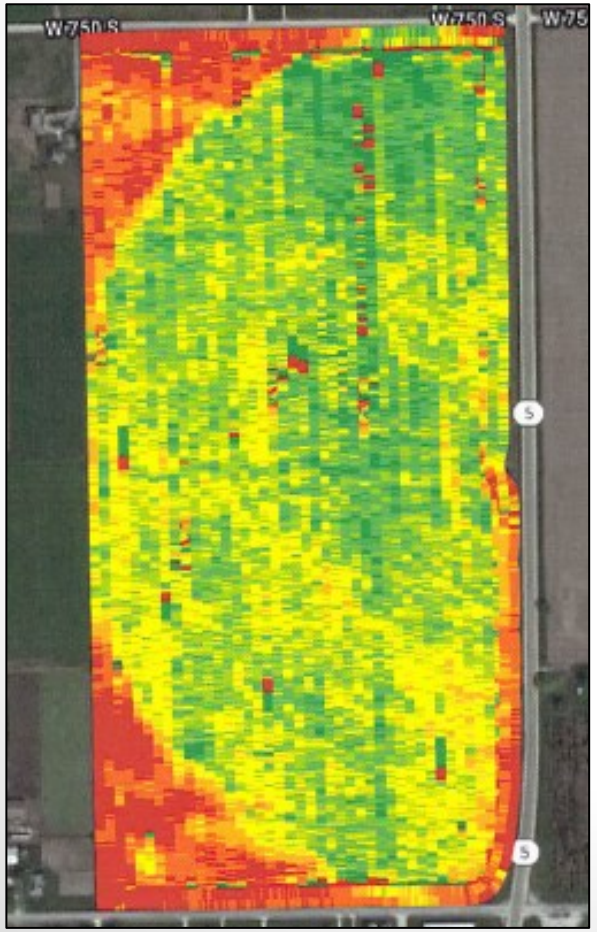
Pinney Purdue Ag Center
Wanatah, IN



The Purdue Ag Centers

- There are 8 PACs spread across the state
  - Each PAC is unique and offers different research opportunities
- The PACs are primarily used by West Lafayette Researchers to conduct animal and crop experiments and demonstrate new production practices and technology
  - Agronomy, Horticulture, Weed Science, Entomology, Livestock, Forestry, etc….
  - In 2023, the PACs conducted 422 experiments (PPAC 113 projects 27%)

PPAC Field Day on August 21, 2024 8am – 1pm

PPAC Field Day Twilight Program on August 21, 2024 6pm – 8pm

NEPAC Field Day – more info to come – 2023 it was in early September

1320’ Pivot located at the Mary S Rice Farm outside of Lacrosse, IN. Irrigates around 130 acres between a North and South 80 acre fields.

Irrigation Scheduling

- How do we know when to water?
- How much water should I put down?
- Should I do multiple smaller irrigation events OR one larger event?
- Can the crop utilize 100% of the water we irrigate?
- Are we getting enough rainfall?
- Can I overwater?
- What affects how much water the crop needs?
- Do corn and soybeans need irrigated differently?

"Hey the neighbors are running their pivot!" is not a good way to manage our irrigation resources!

MSU and Purdue have developed multiple resources to schedule your irrigation events. Some scheduling tools are very simple and others will require some recordkeeping.

Keep it simple! Corn daily water needs chart.

Average water use for CORN in inches/day –adapted From " Irrigation Scheduling Checkbook Method, Jerry Wright, University of Minnesota, 2002

	Week after emergence																	
Temperature	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
50-59	.01	.02	.03	04	.05	.06	.08	.09	.09	.10	.10	.10	.09	.07	.06	.05	.04	.03
60-69	.02	.03	.04	.06	.08	.09	.11	.12	.13	.15	.14	.14	.13	.11	.09	.07	.06	.04
70-79	.03	.04	.05	.07	.10	.12	.15	.16	.17	.19	.19	.18	.17	.14	.11	.09	.07	.05
80-89	.03	.05	.07	.09	.13	.15	.18	.20	.22	.24	.23	.22	.21	.17	.14	.11	.09	.06
90-99	.04	.06	.08	.11	.15	.18	.21	.24	.26	.28	.27	.26	.25	.20	.17	.13	.11	.07
Corn growth stages		3 leaf			8 leaf			1st tassel	silk		blis-ter ker-nel			ear-ly dent	dent			

Example… Corn emerged on May 12, It is now July 14, 2024 (10th week)
Temps are forecasted in the 80s this week.
Corn is going to need .24 inches of rainfall EACH DAY!!

7 days x .24 = 1.68 inch of water this week

Soybean weekly water needs chart.

Average water use for Soybeans in inches/day –adapted From " Irrigation Scheduling Checkbook Method, Jerry Wright, University of Minnesota, 2002

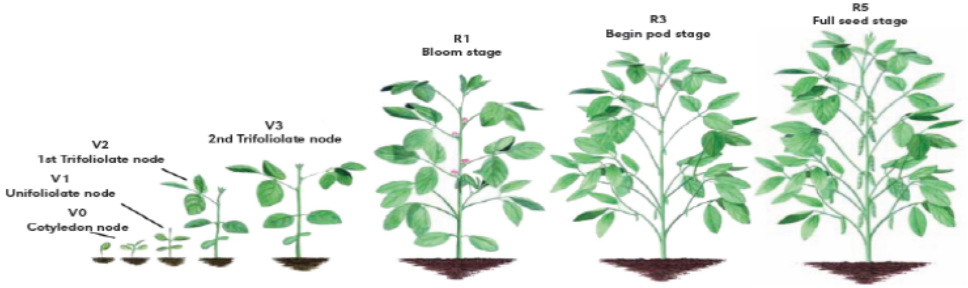
	Week after emergence																
Temperature	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
50-59	02	02	.04	.04	.06	.07	.08	.09	09	09	09	08	.07	.05	.05	.03	.02
60-69	.02	.03	.05	.07	.09	.10	.11	.13	.13	.13	.13	.11	.10	.08	.07	.04	.02
70-79	.03	.05	.07	.09	.12	.13	.15	.17	.18	.18	.17	.15	.13	.10	.09	.05	.03
80-89	.04	.06	.10	.13	.16	.19	.20	.21	.22	.22	.21	.18	.16	.13	.11	.06	.03
90-99	.05	.07	.11	.14	.17	.20	.22	.25	.26	.26	.25	.22	.19	.16	.13	.08	.05
Soybean growth stages				2nd trifoli-ate		1st flower **R1**			seed filling **R3**			leave s yel-lowin g					

Crop Water Use by Growth Stage — Soybeans

Nebraska Lincoln EXTENSION
Know how. Know now.

Soybean Growth Stages

- V0 Cotyledon node 0 — cotyledons extended
- V1 Unifoliolate node 1 — unifoliolate leaves expanded
- V2 1st Trifol node 2 — trifoliolate leaves expanded
- V3 2nd Trifol node 3 — trifoliolate leaves expanded
- R1 Begin bloom — one flower any node
- R2 Full bloom — flowers at top 2 nodes
- R3 Begin Pod — A pod 3/16 inch long in any of the top 4 nodes
- R4 Full Pod — A pod 3/4 inch long in any of the top 4 nodes
- R5 Full Seed — A seed 1/8 inch long in any of the top 4 nodes
- R6 Full Seed — A seed filling a pod cavity in 4 top nodes
- R7 Begin Pod Mature (leaf fall) — one brown pod anywhere on plant
- R8 95% pods mature
- Mature Harvest-ready

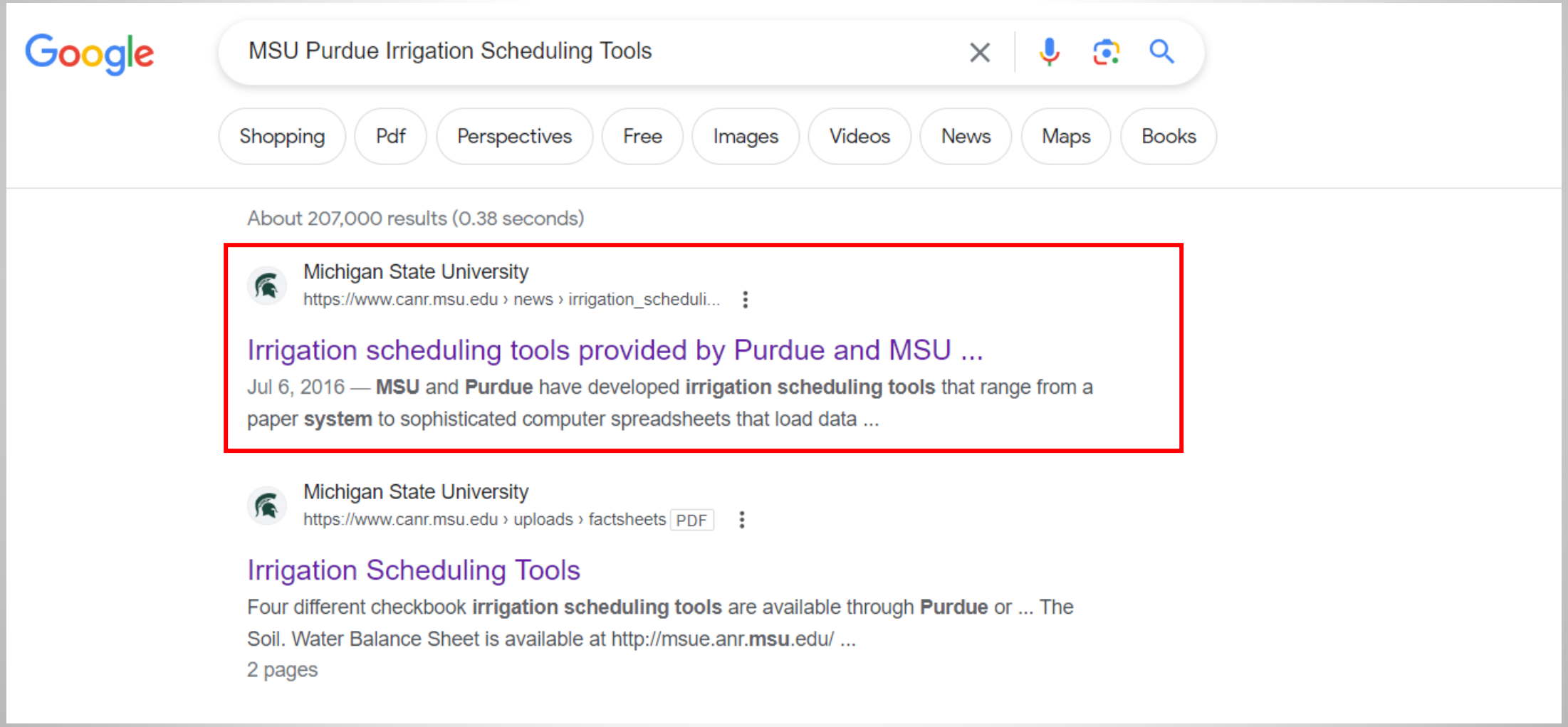


Crop Stage	Crop coeffient Kc	Root Depth (in)	% of Growing Season
V0 Cotyledon	0.2	6	0
V1 1st Node	0.3	9	4
V2 2nd Node	0.5	12	8
V3 3rd Node	0.6	16	11
R1 Begin Bloom	1.0	24	26
R2 Full Bloom	1.1	24	32

Crop Stage	Crop coeffient Kc	Root Depth (in)	% of Growing Season
R3 Begin Pod	1.2	24	41
R4 Full Pod	1.2	24	50
R5 Begin Seed	1.2	24	63
R6 Full Seed	1.2	24	80
R7 Begin Pod Mature	1.0	24	89
R8 95% Pods Mature	0.2	24	100

Irrigation Scheduling Spreadsheet Based on Weather Data, Crop Growth Stage, Water Needs and Rainfall Data

Google search for “MSU Purdue Irrigation Scheduling Tools”



MSU Irrigation Scheduler Program -- Michigan State University Extension

(Version 4.0 - August 1, 2020) For Excel 2007-2016 & Office 365

- Set Up This Irrigation Schedule (Field ID, Crop, Soil Type, Etc.)
- View Plant Available Water By Plant Growth Stage in This Field
- Download Weather Data From Enviroweather Station
- Print Soil Moisture Graph For This Schedule
- Enter Your Irrigation and Rainfall Data
- Generate a Water Use Report for This Field
- Generate Detailed Soil Moisture Report for Last 7 Days and 5 Day Forcast ET Outlook
- Enter Your Irrigation and Rainfall Data-Easy Sytem

Filename:	O:\Shared\Presentations\2024 Michiana Irrigation Conference\[2024 Rice Schedule Presentation Demo.xlsm]
Field ID:	2023 North/South Pivot

Irrigation Scheduling Spreadsheet

Field Identifier	**2023 North/South Pivot**
Purdue Mary S. Rice Farm	**Lacrosse, IN**

Available water (AW) holding capacity of soil - (inches water/inch soil). See Table 1 or Soil Survey.

Depth Range (in)	0 - 6	6 - 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48
AW (in/in)	0.160	0.180	0.140	0.140	0.050	0.080	0.050	0.050
Initial Capacity filled (%)	85	85	85	85	85	85	85	85
	0.960	1.080	0.840	0.840	0.300	0.480		4.50

Do you plan to download weather data from the Internet? Yes

User fills out the data in **brown**

Select Soil Type (ie. Bronson or Oshtemo)	Gilford
Crop Being Grown (and anticipated rooting depth)	Corn36
Length of Growing Season (days):	150
Emergence Date (mm/dd/yyyy): Earliest 4-15	5/17/2023
Closest MSU Enviroweather Station to Field:	Berrien Springs
Irrigated Acres in the Field (for Water Use Reporting)	130.0
Enter the RM of the Corn Hybrid Planted	104
Enter the GDD's to Blacklayer if Available	2470

Irrigation increment/amount per application (inches) **1**

Irrigate at this % of Available Soil Water in Root Zone **60** **60** Soybeans - 40 of avail until R-3

Ready to Initiate Soybean Schedule

Ready to Initiate Corn Schedule

Ready to Initiate Other Crop Schedule

Return to the Scheduler Setup Sheet

Date	Week After Emergence	2023 North/South Pivot					O:\Shared\Presentations\2024 Michiana Irrigation Conference\[2024 Rice Schedule Presentation Demo.xlsm]						
		Root Depth (inches)	Rainfall (inches)	Irrigation added (inches)	Et	% Canopy Cover (Kc)	ET modified for crop & deficit (inches)	Capacity of root zone (inches)	Available Water in root zone (inches)	% capacity filled	Drainage (inches)	Additional capacity of root zone (inches)	Grower Entered Growth Stage
5/17/23	1	6.00	0.00		0.121	0.15	0.00	0.96	0.82	✓ 85	0.00	0.16	VE
5/18/23		6.70	0.00		0.207	0.16	0.02	1.09	0.89	✓ 82	0.00	0.20	VE
5/19/23		7.40	0.10		0.082	0.18	0.04	1.21	1.05	✓ 87	0.00	0.16	VE
5/20/23		8.10	0.00		0.094	0.19	0.02	1.34	1.13	✓ 84	0.00	0.21	VE
5/21/23		8.80	0.00		0.191	0.20	0.02	1.46	1.20	✓ 82	0.00	0.26	VE
5/22/23		9.46	0.00		0.211	0.20	0.04	1.58	1.25	! 79	0.00	0.33	V1
5/23/23		9.94	0.00		0.224	0.21	0.04	1.67	1.28	! 76	0.00	0.39	V1
5/24/23	2	10.42	0.00		0.191	0.22	0.05	1.76	1.29	! 74	0.00	0.46	V1
5/25/23		10.91	0.00		0.186	0.23	0.04	1.84	1.31	! 71	0.00	0.53	V1
5/26/23		11.39	0.00		0.199	0.23	0.04	1.93	1.34	! 69	0.00	0.59	V1
5/27/23		11.87				0.24	0.05	2.02	1.35	! 67	0.00	0.66	V1
5/28/23		12.35				0.25	0.00	2.09	1.35	! 65	0.00	0.74	V1
5/29/23		12.92				0.25	0.00	2.17	1.35	! 62	0.00	0.82	V2
5/30/23		13.35				0.26	0.00	2.23	1.33	✗ 60	0.00	0.90	V2
5/31/23	3	13.79				0.28	0.00	2.29	1.32	✗ 58	0.00	0.97	V2
6/1/23		14.22				0.29	0.00	2.35	1.33	✗ 57	0.00	**1.02**	V2
6/2/23		14.65				0.30	0.00	2.41	1.30		0.00		V2

2023 North/South Pivot

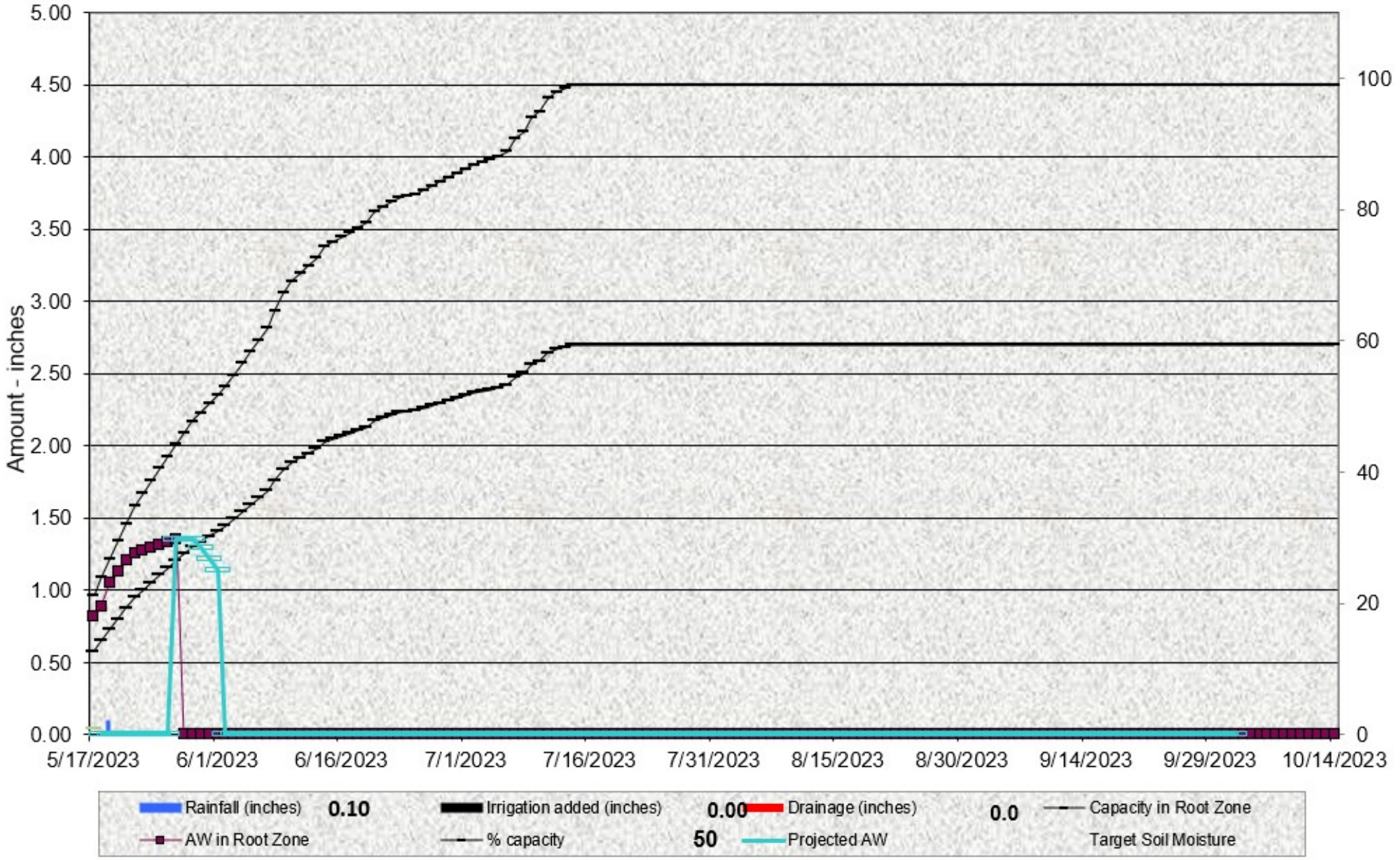
Station: Berrien Springs

Available Plant Water

Corn36

Soil Series: Gilford

MSU Irrigation Scheduler



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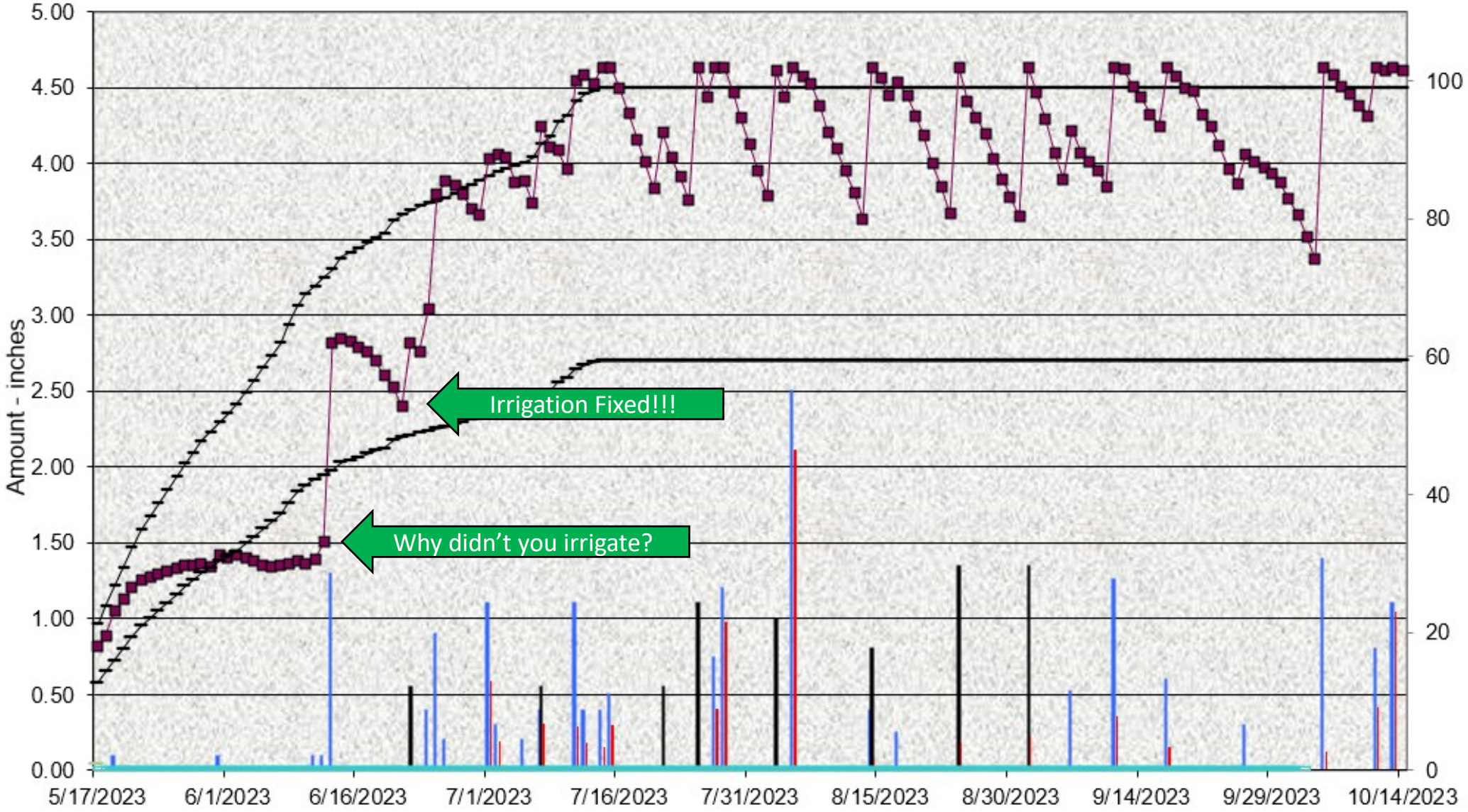

Rainfall (inches) **18.68** | Irrigation added (inches) **7.25** | Drainage (inches) **8.1** | Capacity in Root Zone

AW in Root Zone | % capacity **50** | Projected AW | Target Soil Moisture

2023 North/South Pivot

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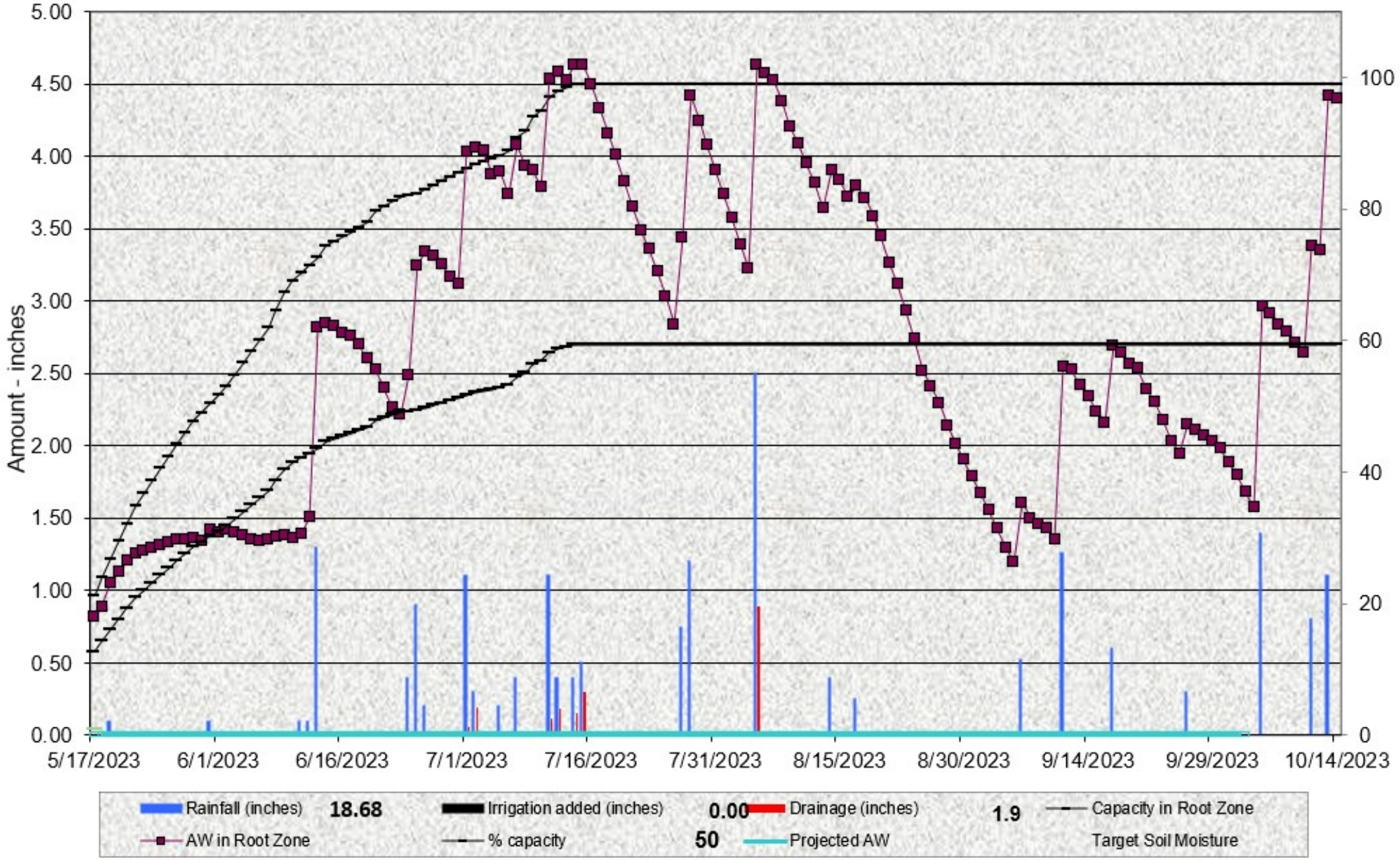
Available Plant Water

Corn36

Soil Series: Gilford

MSU Irrigation Scheduler



Thank you for having me!

Stephen Boyer
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