WELCOME!

Little Rock Creek

Resolving Water Use Conflict

Stakeholder Engagement Meeting

November 13, 2025 2:00 PM

Project History and Purpose

MPCA Little Rock Creek Watershed Study
Indicated Creek Impairment
Dec 2015

Initiation of Stakeholder Meetings
Early 2016

DNR Sustainable Use Plan
Sept 2018

Stakeholder Meeting
June 2021

Stakeholder Meeting
March 2022

Stakeholder Meeting
March 2023

DNR Commissioner's Order
April 2024

Kimley-Horn Contract Start
October 2024

Progress Report and Stakeholder Feedback
Spring 2025

Scope Update & New Kimley-Horn Contract
July 2025

Modeling Updates
Fall 2025+

Meeting Agenda & Structure

10 Minutes	*Project History and Purpose*
10 Minutes	*Project Updates*
40 Minutes	*Model Updates*
45 Minutes	*Management Approaches*
10 Minutes	*Timeline & Next Steps*
15 Minutes	*Q&A and Open Discussion*
5 Minutes	*Closing Remarks*

Your Project Partners and Specialists

Uma Vempati, PE, PMP, ENV-SP
Project Manager

Hans Holmberg, PE (LimnoTech)
Senior Hydrologist

Jessica Laabs, AICP
Environmental Planner, Senior Engagement Specialist

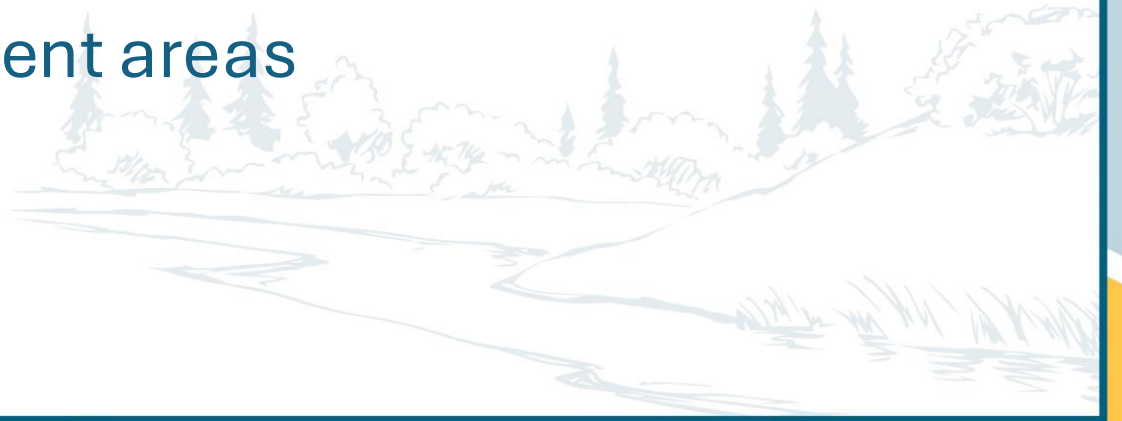
Mat Cox, PE
Water Resources Engineer

Emily Schabert
Project Engineer

Kimley»Horn

Project Progress Since May 2025

- Refining project scope based on stakeholder feedback
- Engaging stakeholders through biweekly calls
- Continuous engagement with the DNR
- Modeling updates
- Engaging Gary Johnson
- Investigating potential impoundment areas



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DEPARTMENT OF NATURAL RESOURCES

Model Updates and Revisions

Glen Champion | Hydrologist and Brent Beste | Water Planner

Analysis Needs

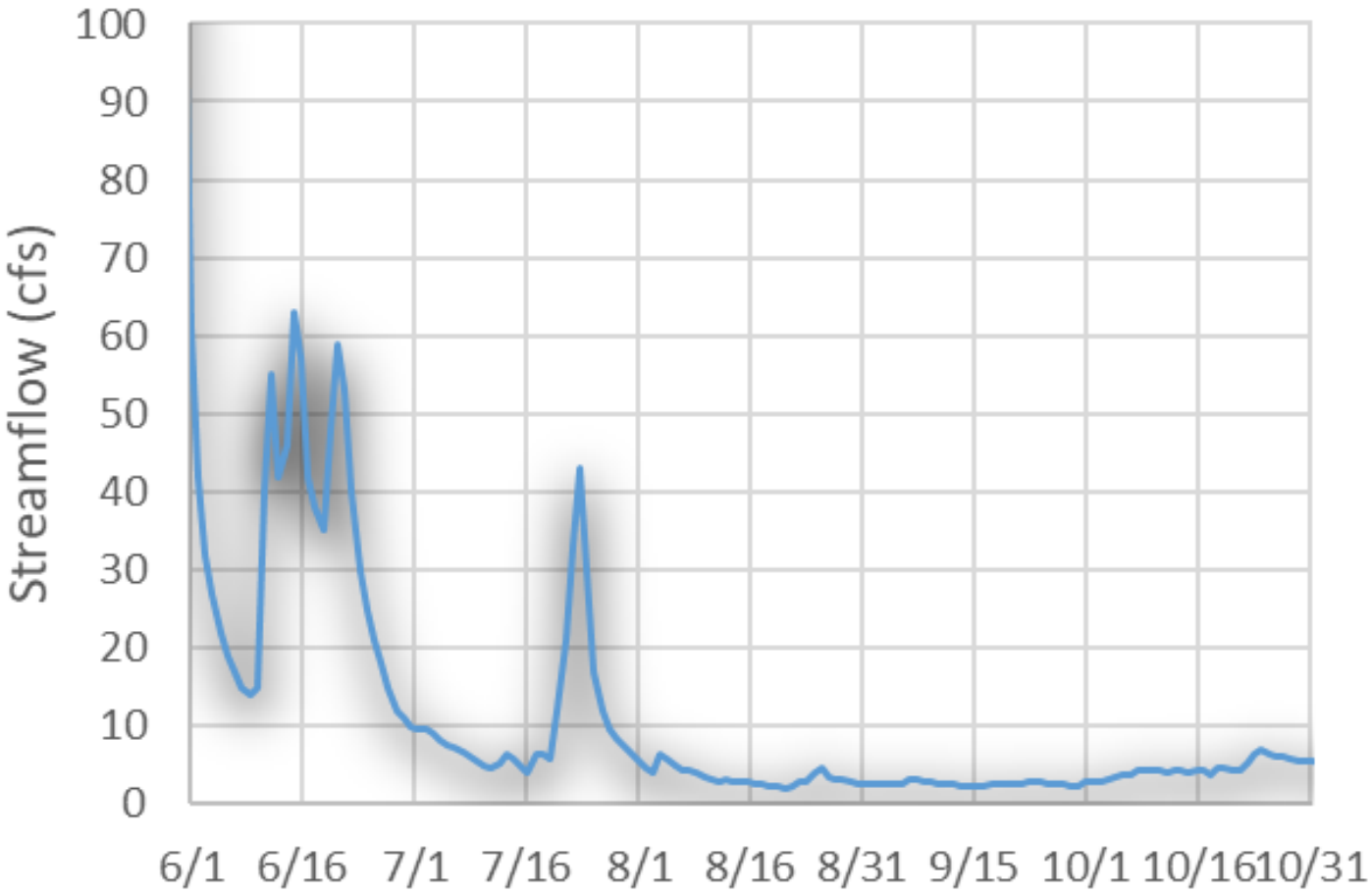
- Estimate streamflow diversions
  - Streamflow without groundwater uses => stream-habitat assessment
  - Stream habitat assessment => Sustainable Diversion Limits (SDL)
- Identify zones of irrigation influence
- Evaluate alternative scenarios

Stakeholder Concerns and Requests

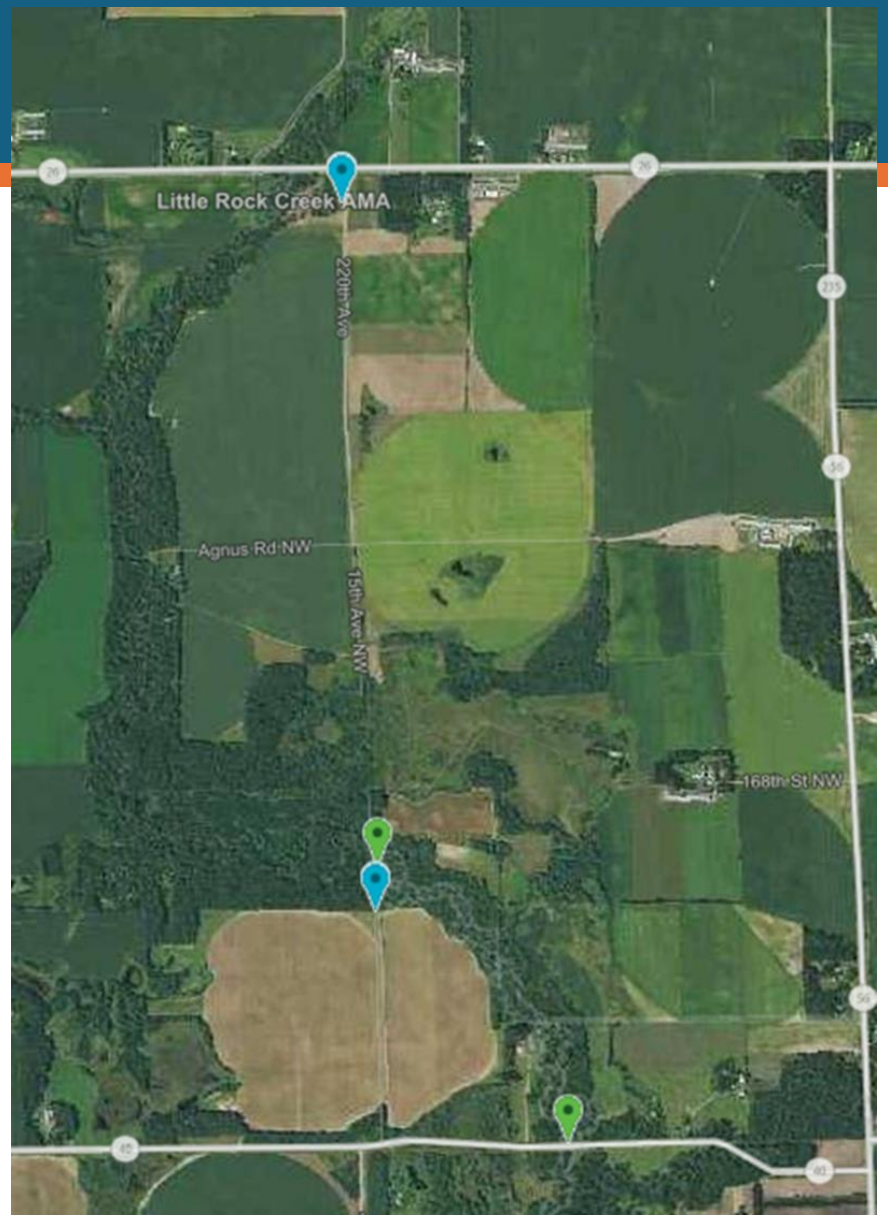
- Model fit to some data after initial model period (2006-14) during 2015-18
  - Opportunity to extend model period through 2024 and refine/improve
- Reported irrigation volumes larger than actual, on average
- Provide more detailed representation of crop rotations
- Use deciduous trees to represent irrigated fields in the no-use model instead of alfalfa
- Use satellite-based evapotranspiration (ET) models

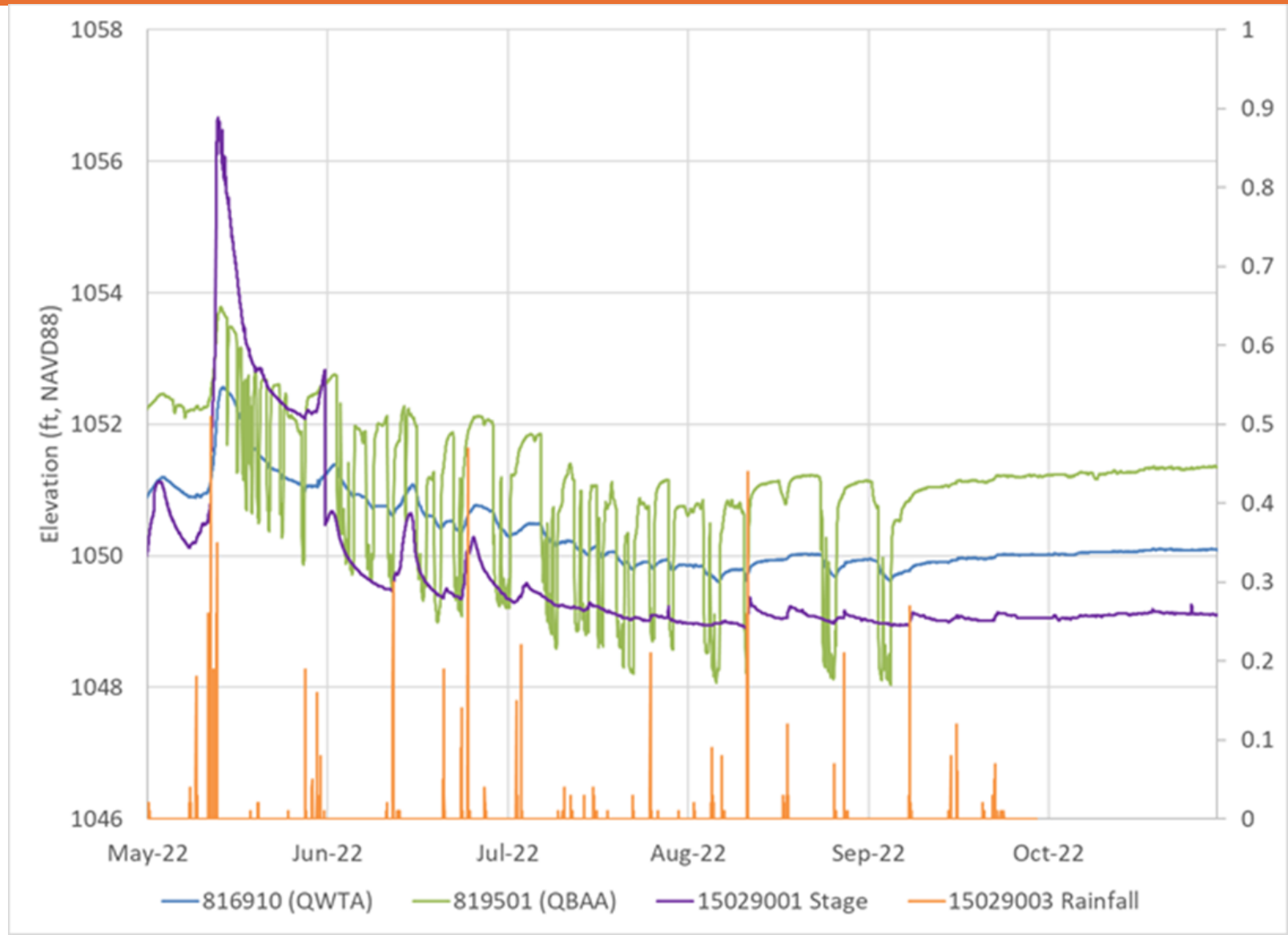
Why a Numerical Flow Model

- Many factors affect streamflow
- Concern is cumulative effects of multiple groundwater users on streamflow and stream habitat
- What would flows have been without any groundwater use?



Key Observations





Model

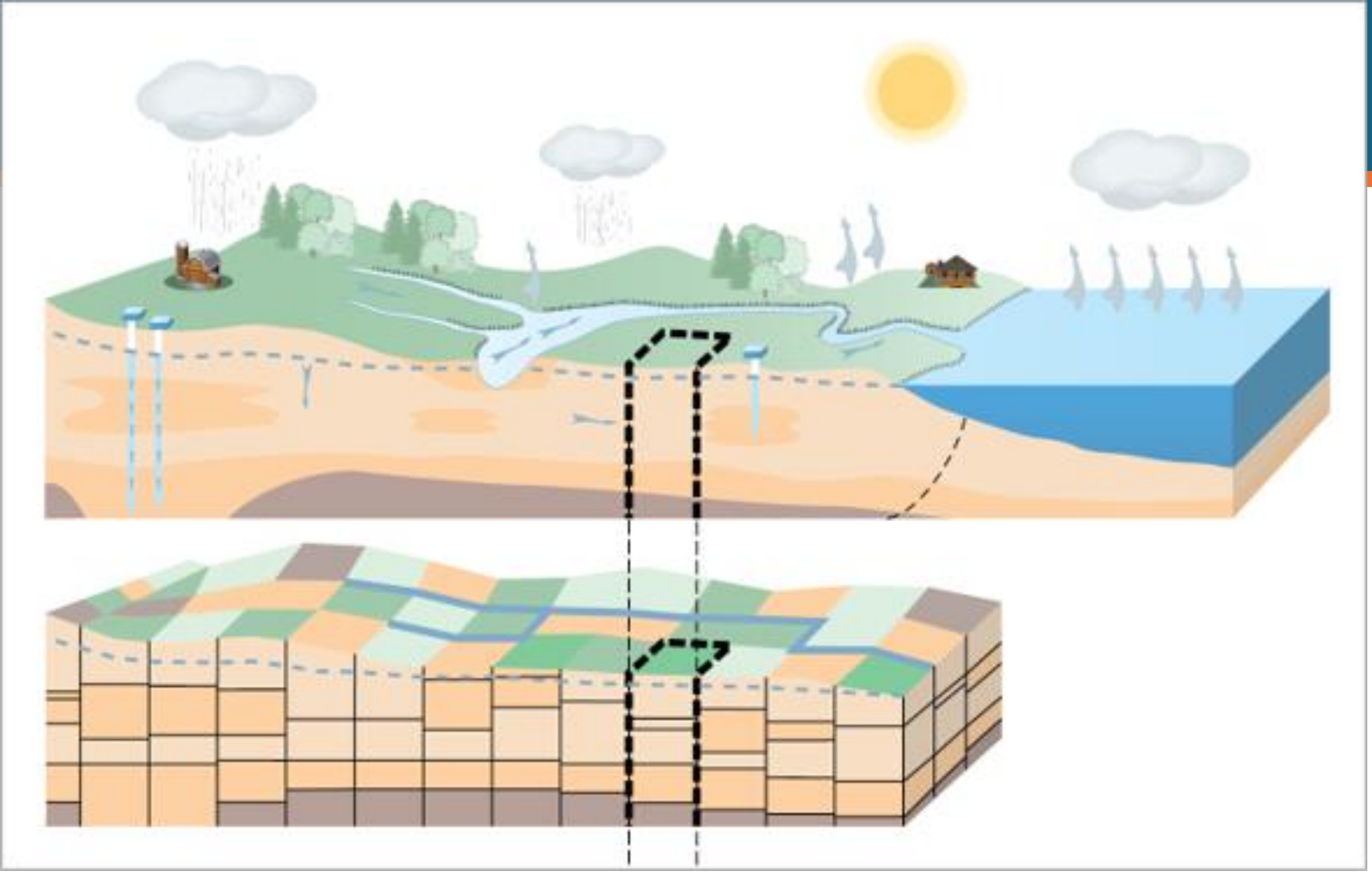


Image from Geological Survey of Denmark and Greenland

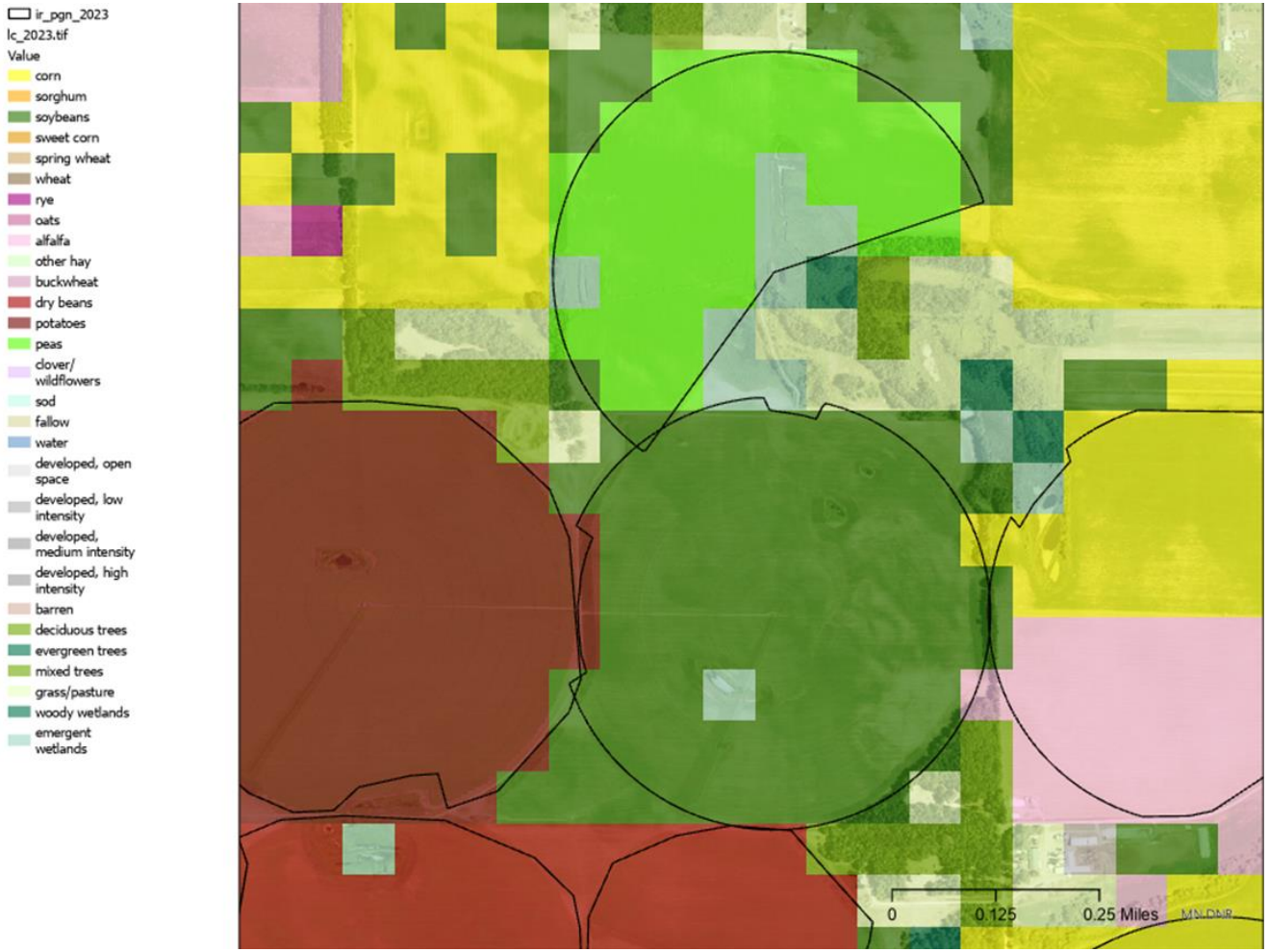
Model Updates and Revisions - Goals

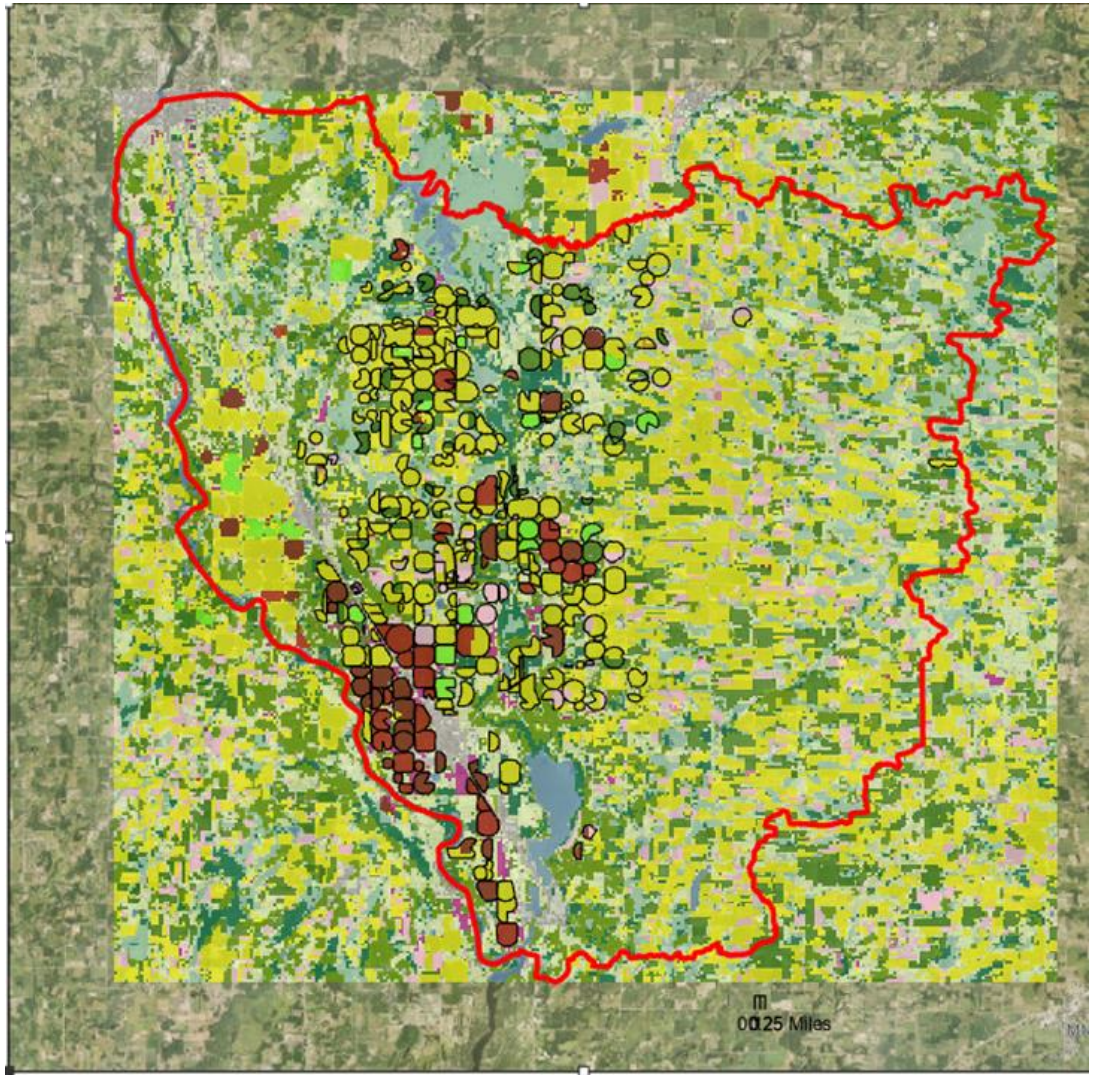
- Extend the model-analysis period from 2006-18 to 2006-24
- Refine model inputs and parameters using data collected since original model development
- Adjust reported irrigation-use volumes
- Use deciduous trees as a reference (no use) crop instead of alfalfa
- More detailed representation of land-cover variations
- Get feedback/ideas from stakeholders on assumptions and methods during model re-development

Model Updates and Revisions – Crops / Recharge

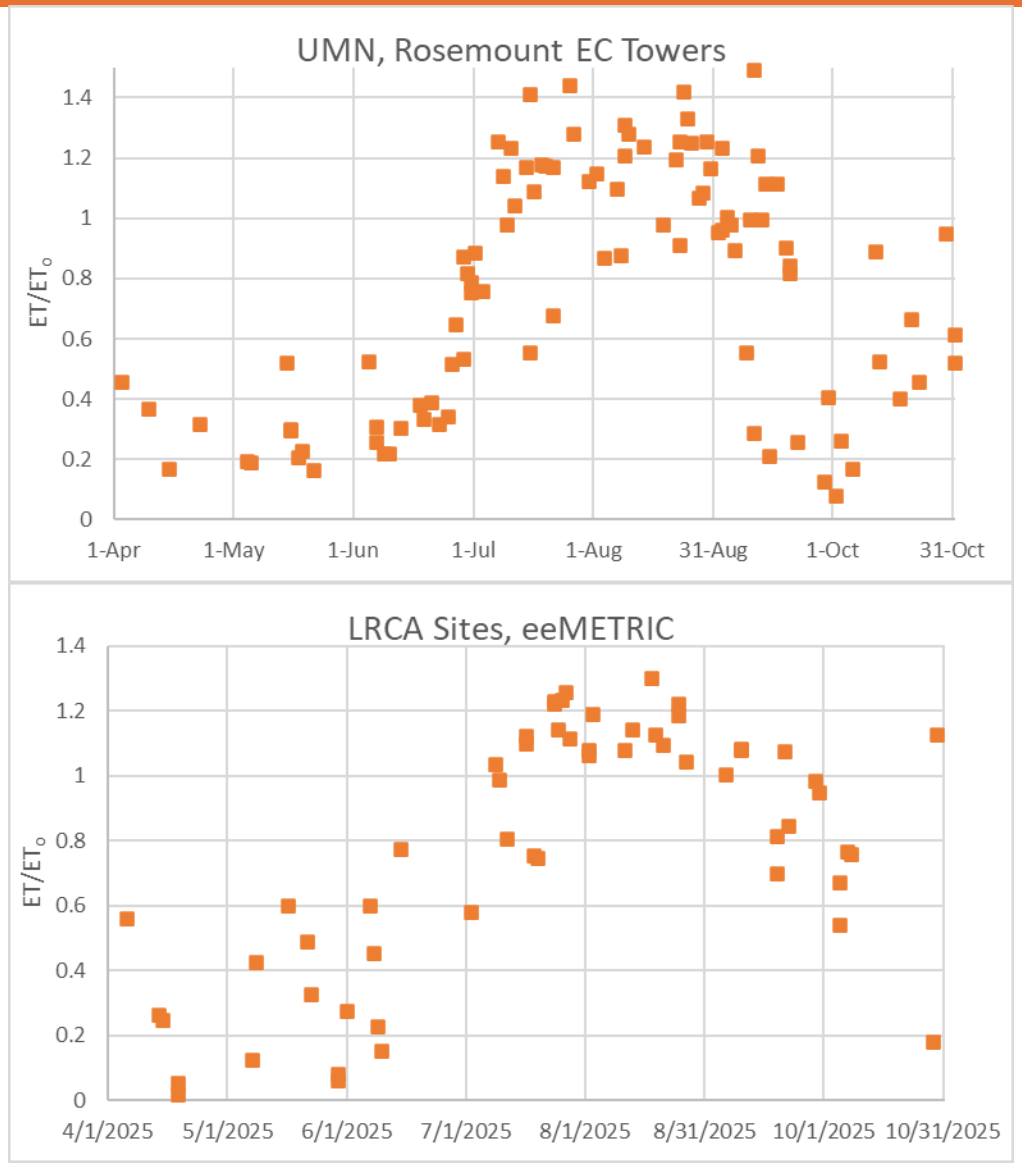
- Switch from Gridded Surface Subsurface Hydrologic Analysis (GSSHA) model to Soil Water Balance (SWB) model
- Annual maps of land cover
- Root depths and basal crop coefficients vary seasonally by crop
- Uniform grid for SWB (100 m = 2.47 ac)
- Could model alternative crop rotations (i.e., change land-cover maps)

Model Updates and Revisions – Annual Land Cover



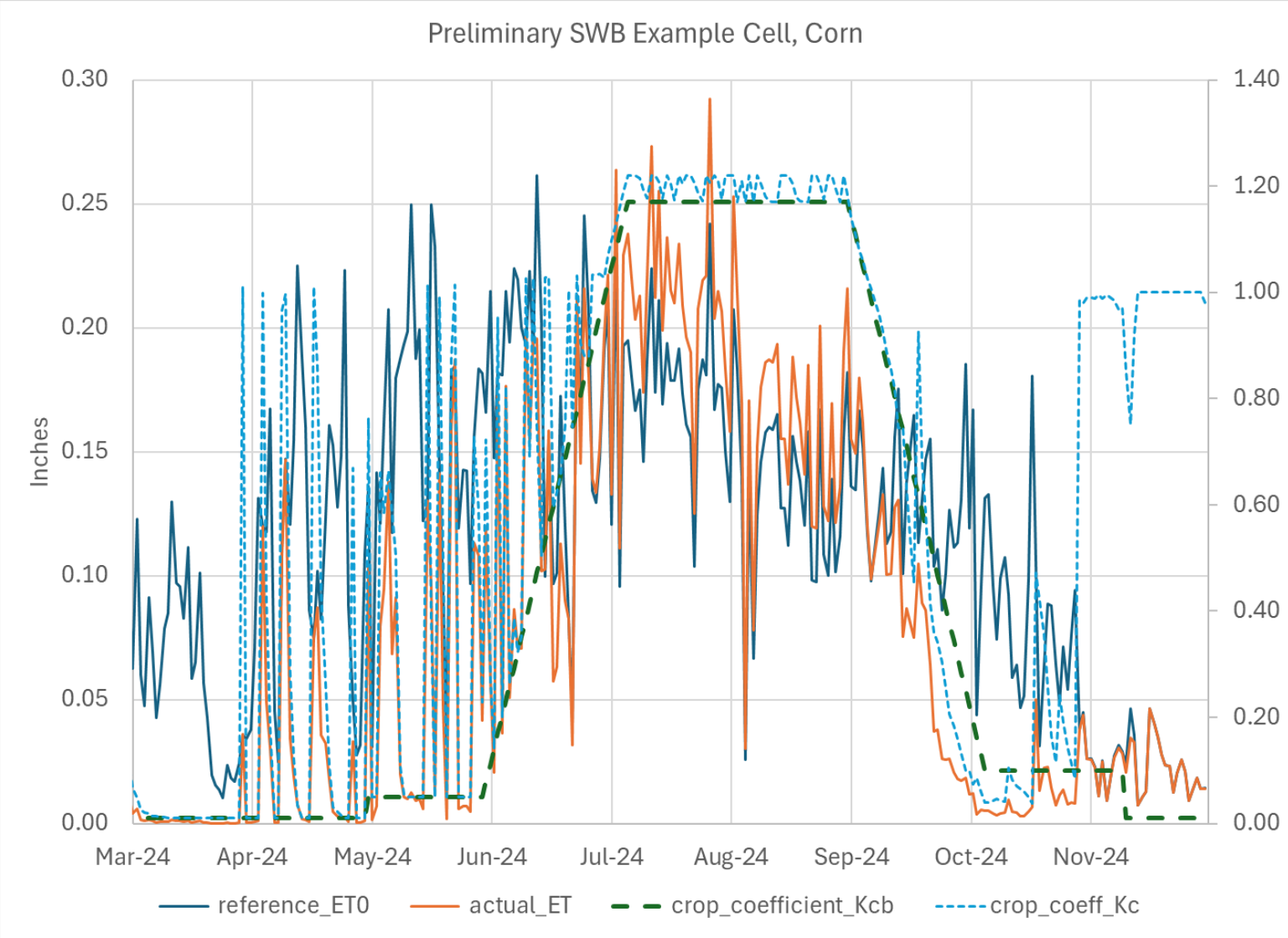


Model Updates and Revisions – Crop Coefficients

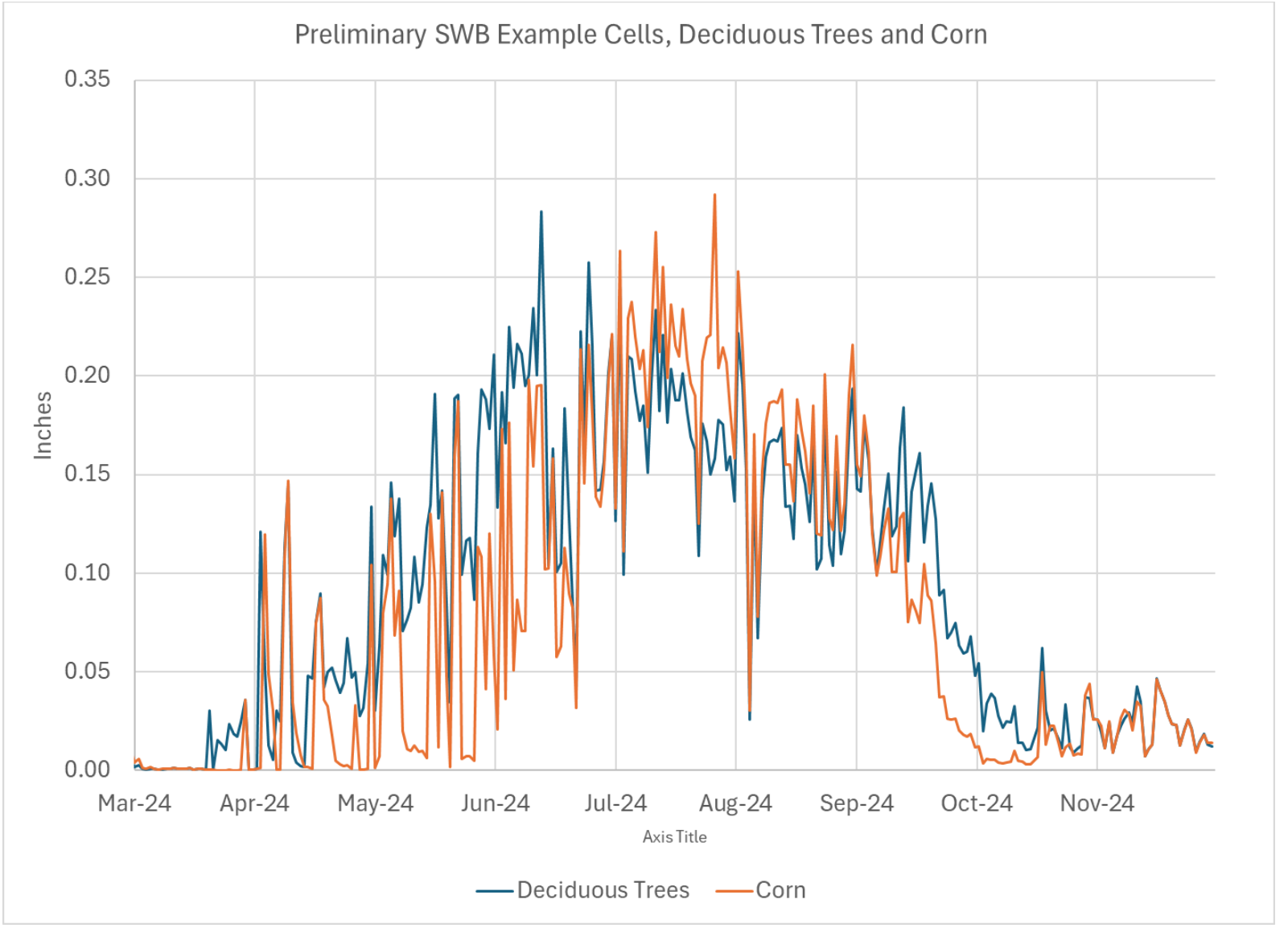


- Use satellite-based models from OPENET to derive crop coefficients
- Compare to field measurements at the U of M (Rosemount)
- Compare to published values (i.e., FAO 56)

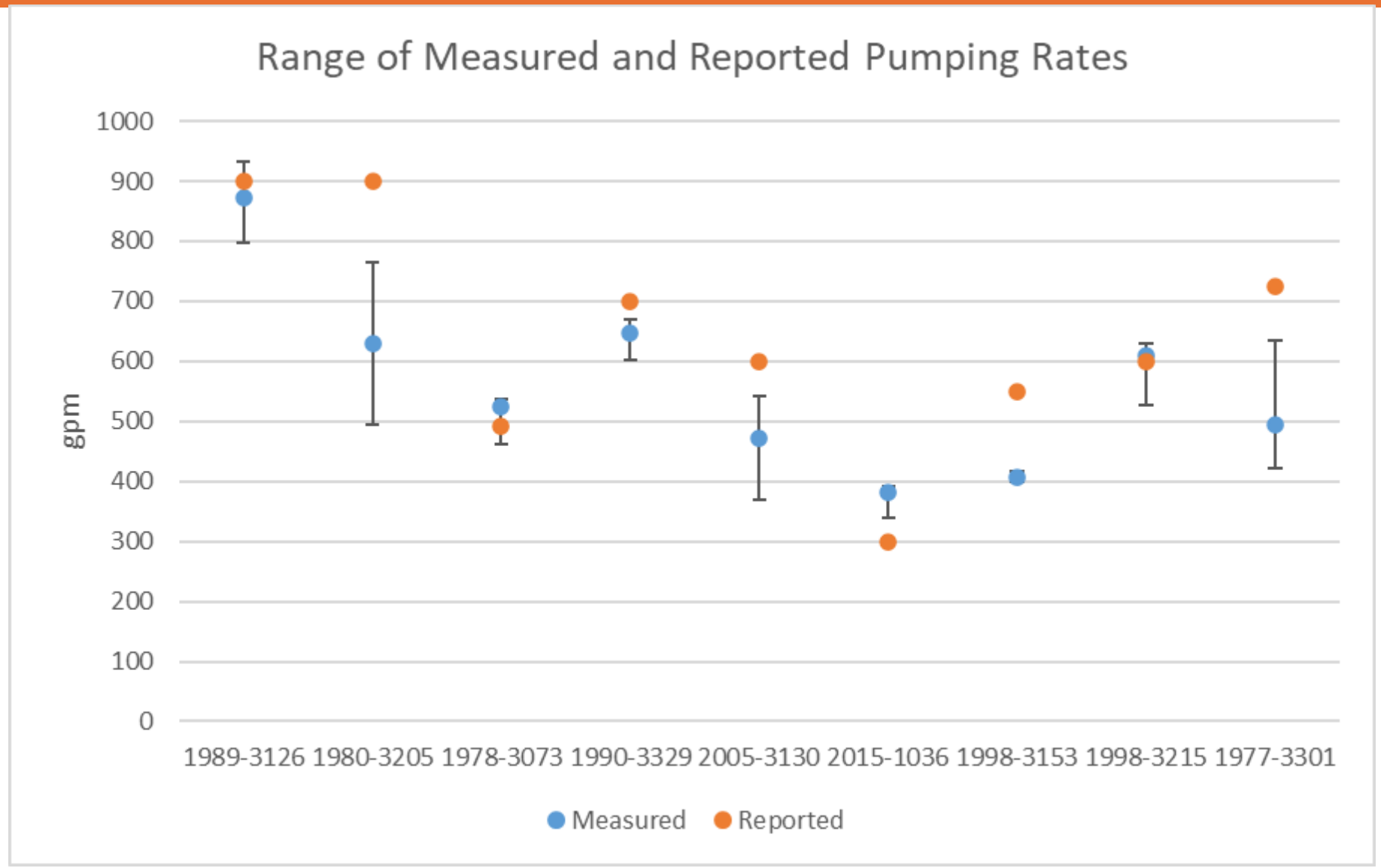
Model Updates and Revisions – ET



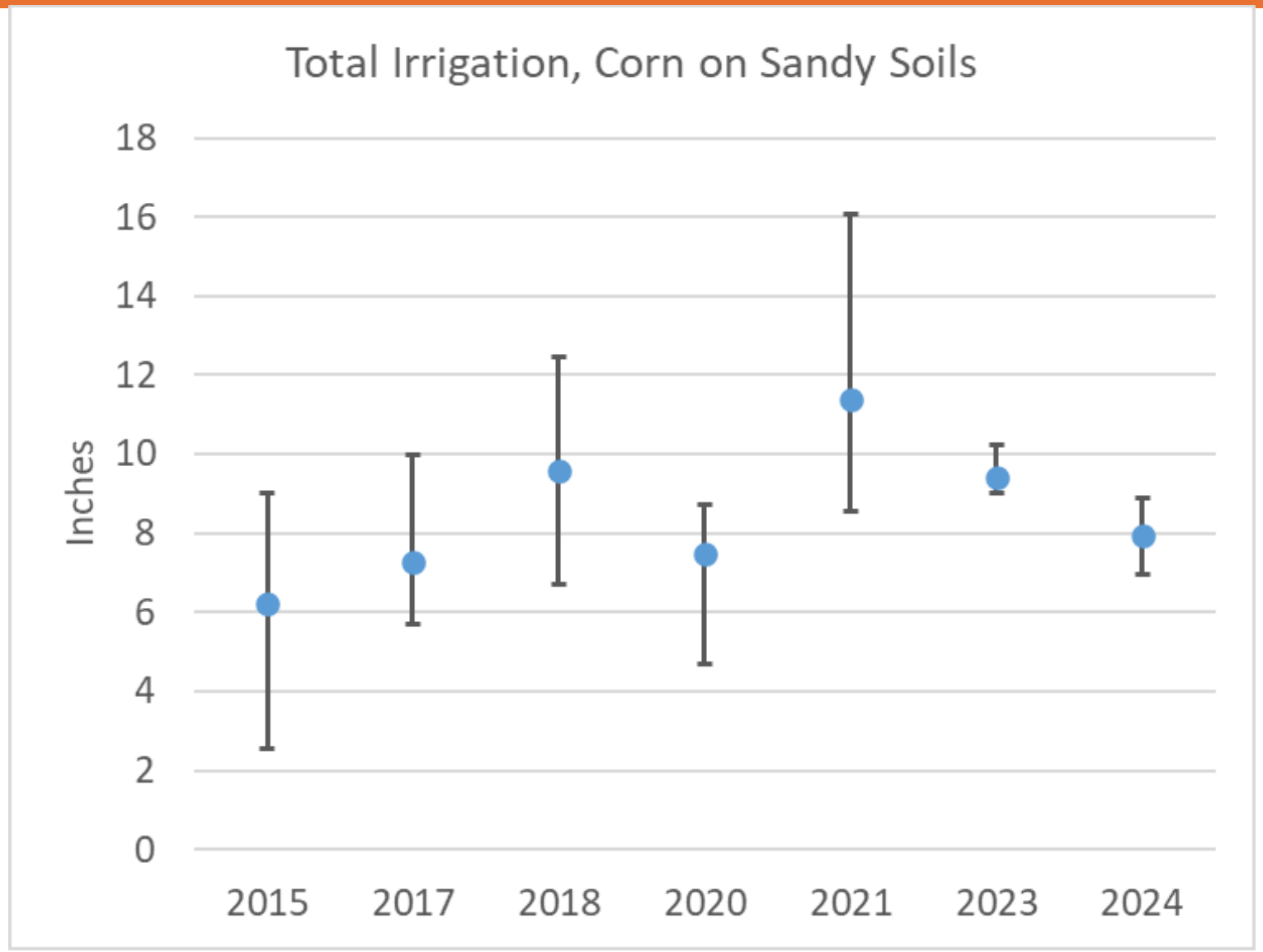
Model Updates and Revisions – ET and Land Cover



Irrigation Water Use - Metering Study, 2018-19



Irrigation Variability – Metering Study Systems



Survey Background

- Water use reporting specifics
  - Address known variability
  - Better understand where over reporting occurs
  - Better understand “how” water use is calculated
- Operational decisions that affect use and reporting
  - System design/type
  - Variability in pumping rates

Assumptions

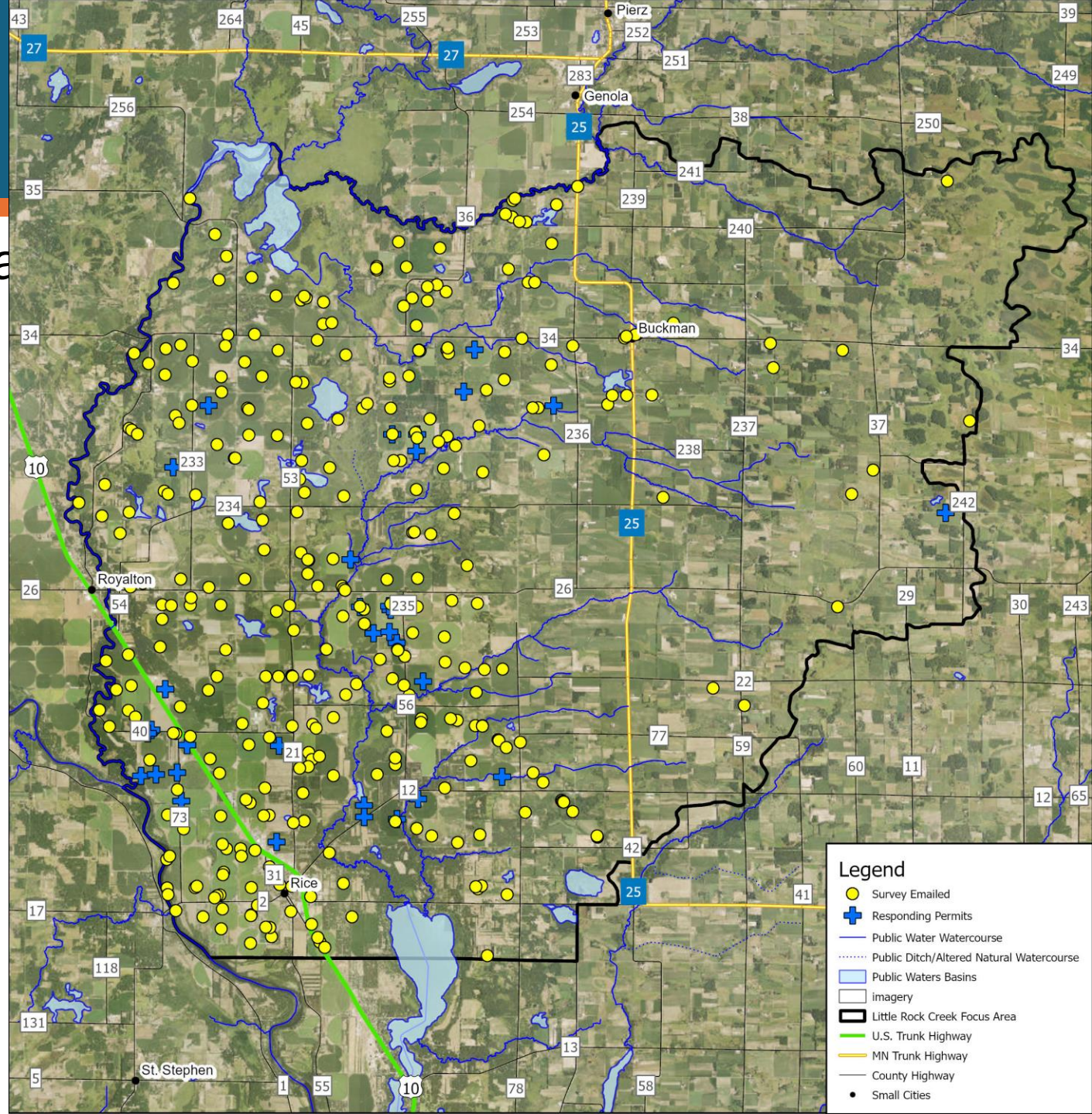
- New wells/irrigation systems are efficient and likely have accurate reporting
- Wells that have been repaired/upgraded are more efficient and more likely to have accurate reporting
- Older equipment is likely less efficient and has less accurate reporting

Goal

- Determine a method to adjust water use inputs
- Ensure that there is confidence in the adjustments being made
- DNR and stakeholders can defend the adjustments based on available information

Who was contacted

- 208 Total Permits – “Focus Area
  - Email to permit contact/agent
- 13 Individual Email
  - Representing 141 permits
- Initial Message Sent 9/8/2025
- Follow up sent
  - 9/10/2025 (GovDelivery)
  - 9/19/2025
  - 9/23/2025
  - 11/5/2025 (GovDelivery)

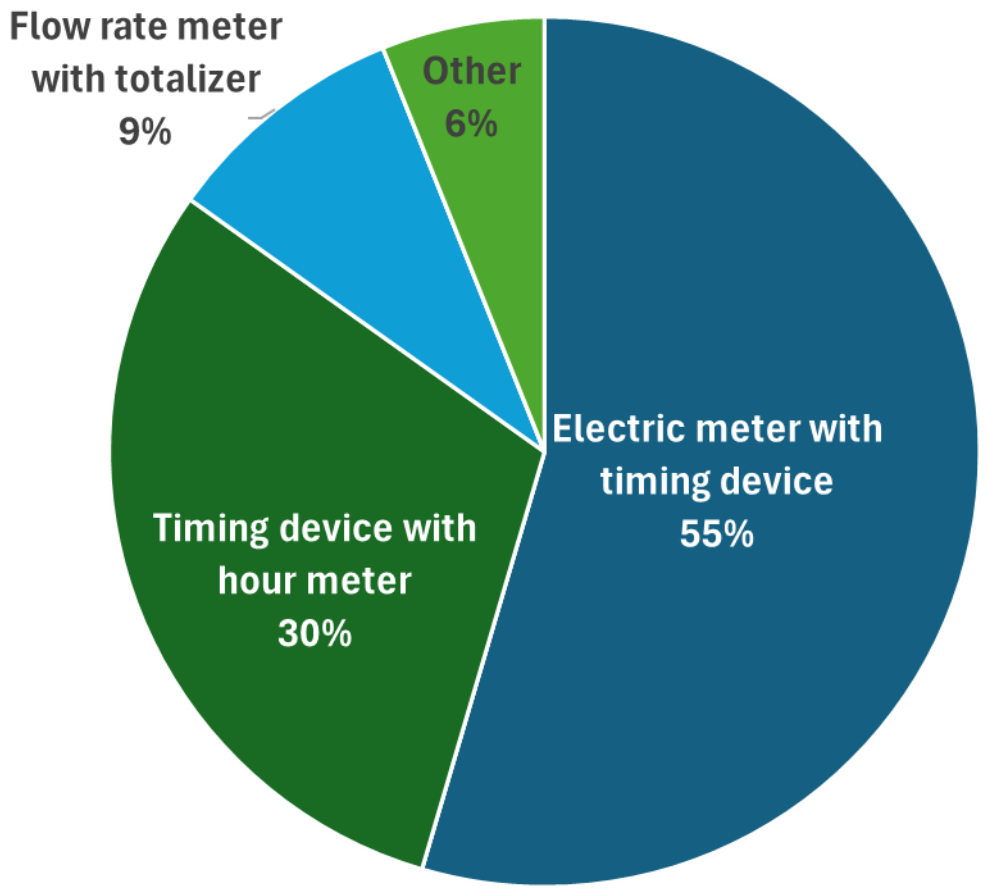


Results

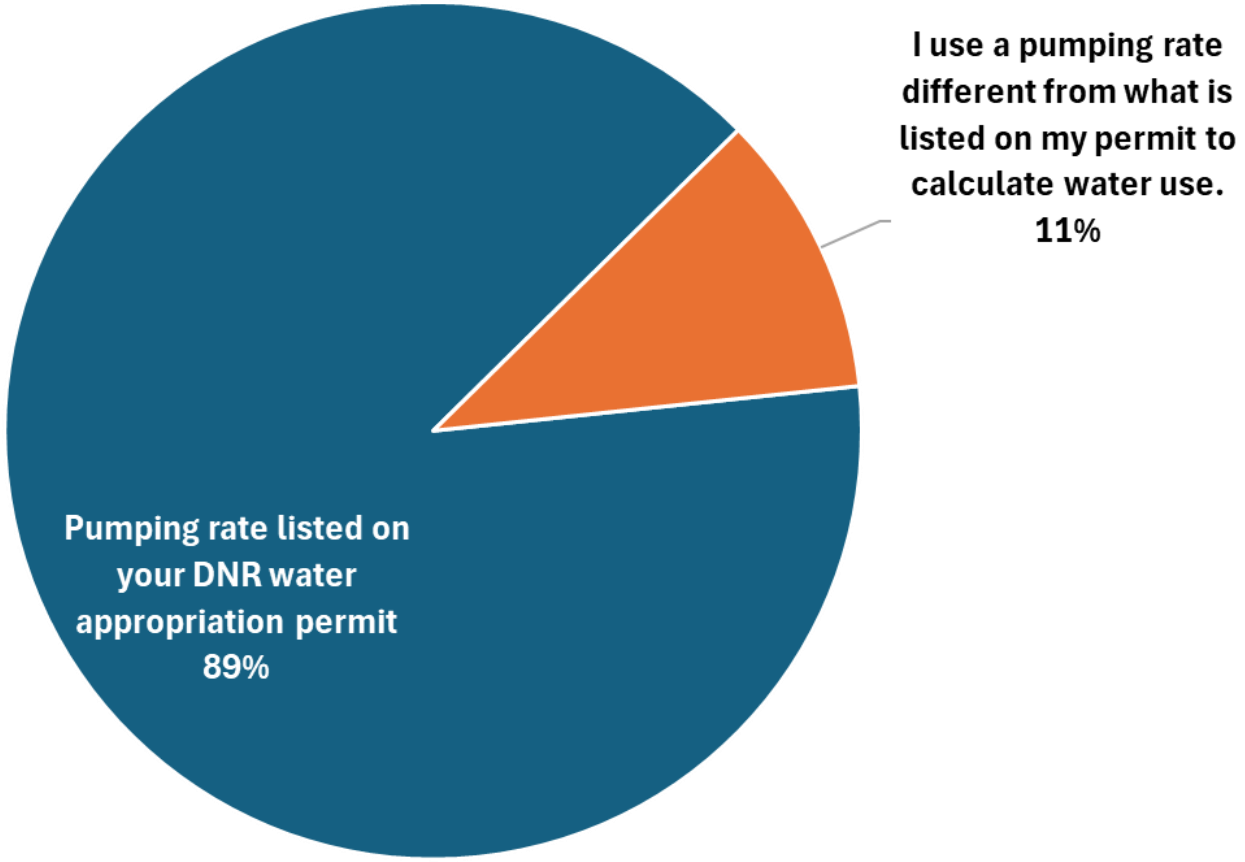
- 33 Responses (31 specific permits)
- 2 “multiple” permit responses
  - Information cannot be applied to specific permits
  - Information provides context to framing decisions on use input adjustments
- 17 Permit contacts responded
- 71 permits can be related to responses
  - Assumed based on “multiple” contacts provided
  - 35% of permits accounted for

Results

Measuring Device

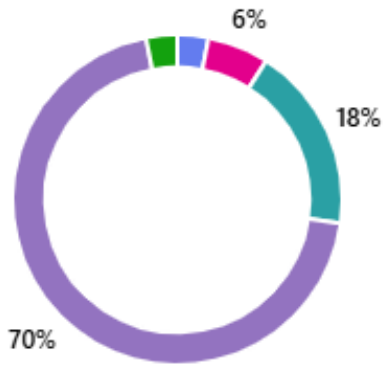


Reporting Pump Rate Used



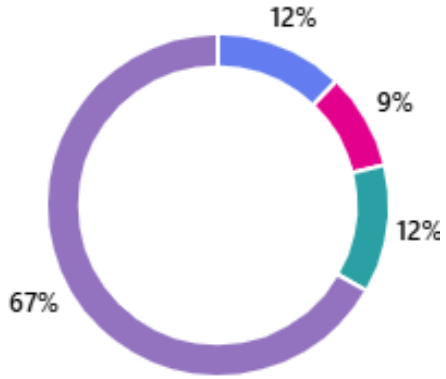
Results - General

Screen Cleaning



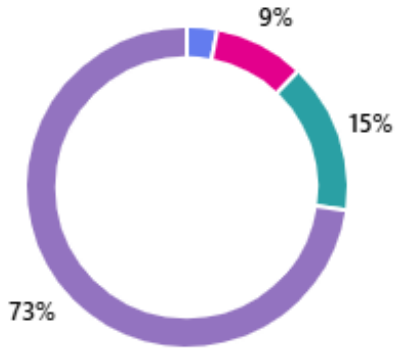
Less than 5 years ago	1
More than 5-years ago	2
More than 10-years ago	6
Never	23
Other	1

Pump Replacement



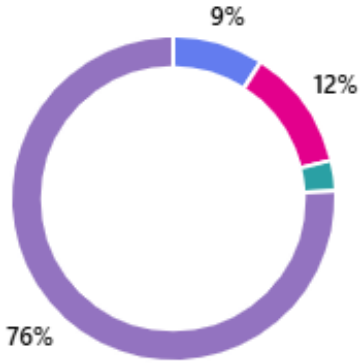
Less than 5-years ago	4
More than 5-years ago	3
More than 10-years ago	4
Never replaced	22

Major Repairs



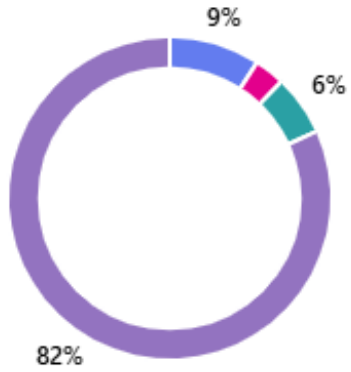
Less than 5-years	1
More than 5-years ago	3
More than 10-years ago	5
Never	24

IR System Replacement



Less than 5-years ago	3
More than 5-years ago	4
More than 10-years ago	1
Never replaced	25

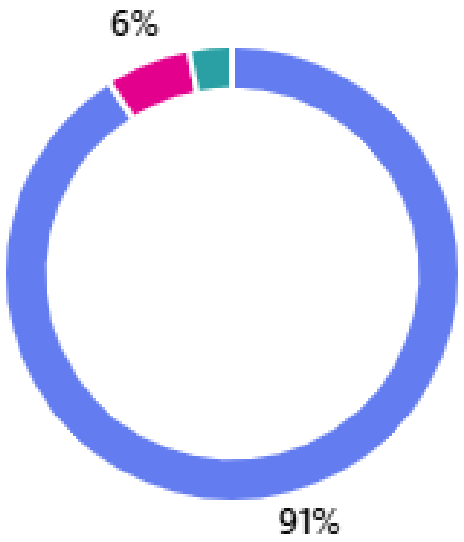
IR Control Replacement



Less than 5-years ago	3
More than 5-years ago	1
More than 10-years ago	2
Never replaced	27

Results

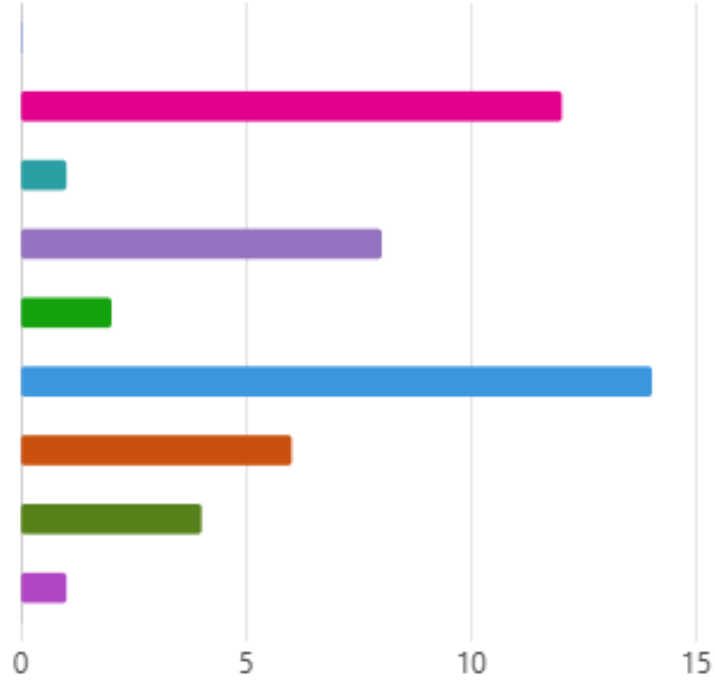
Irrigation Method



Center Pivot	30
Traveling Gun	2
Other	1

Special Considerations

No end gun	0
Extension arm	12
More than one well manifolded together	1
Multiple center pivots covered under one permit	8
High pressure system	2
Center pivot that only does a partial turn	14
Irrigate more than one crop under a single irrigation system	6
My irrigation system does not have any unique features	4
Other	1



Looking deeper

- Zone of Influence
- Reviewed air photos for swing arm sites
  - Angled arms
  - Trailing IR Paths
  - Used Circles to estimate time for partial extension
- 20 Permits with Swing Arm
  - Tied to 26 installations

Where are we headed with Water Use?

- DNR is considering a uniform adjustment to water use inputs data
- Split between corner arms and non-corner arm system
  - Corner in Metering Study: 1 accurate, 3 over reported
  - Non-corner in Metering Study: only 1 significantly over reported
- Variability in Pumping Rates for Calculating volumes
  - Not consistent information to broadly apply
- Age of system and equipment: inconclusive results
- Pump rate verification is important for water use calculations

Proposed Approach to Adjustments

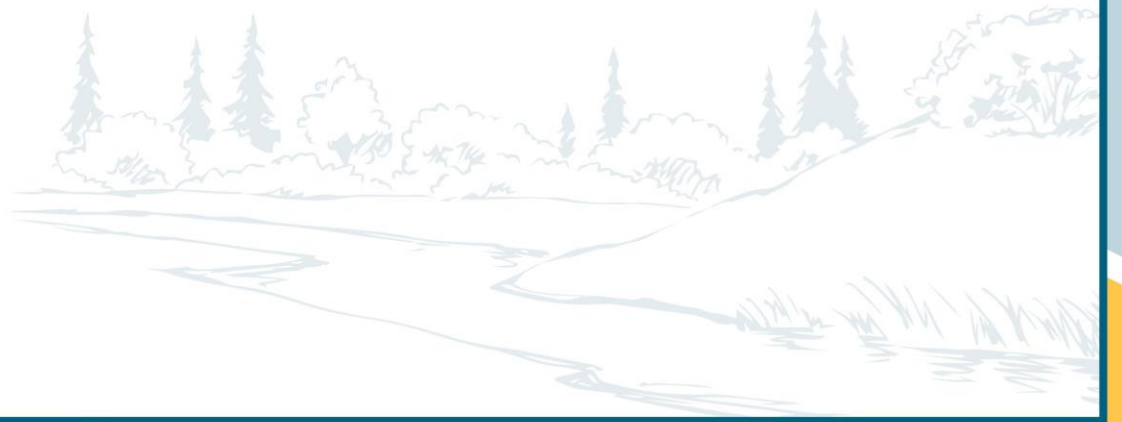
- If flow meter, no adjustment
- If corner/bending arm, adjust based on average for those systems in the metering study
- If no corner/bending arm, adjust based on average for all other systems in the metering study

Next Steps

- Apply new data and processes in model (near completion)
- Assess fit of model to observed data
- Review results with Gary Johnson and Kimley-Horn/LimnoTech team
- Consider further model adjustments
- Finalize the revised model
- Re-assess streamflow diversions and SDLs

Management Approaches

- Beaver Dams – Randy Klaphake
- Rice-Skunk Lake – Dean Zimmerman
- Crop Rotations – Kimley-Horn
- Water Conservation – Kimley-Horn
- Impoundment Areas – Kimley-Horn
  - Stakeholder Comments



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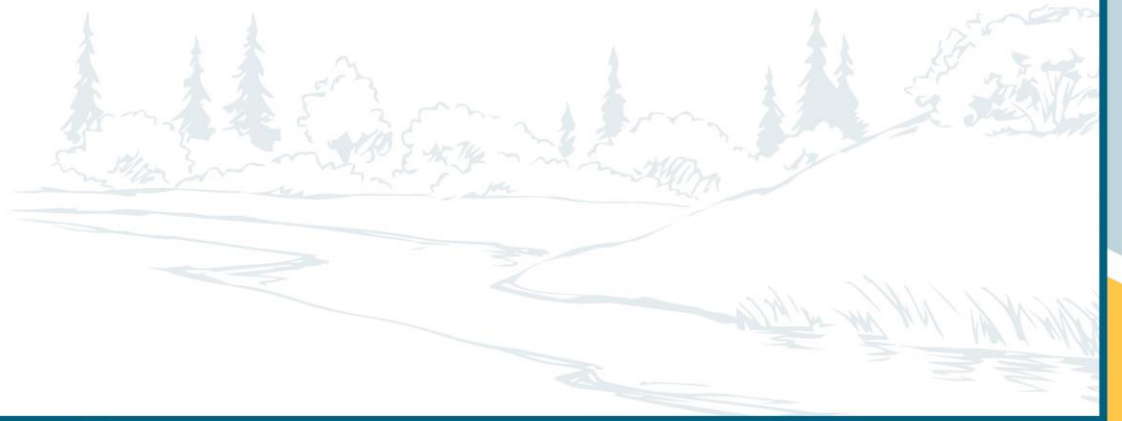
Beaver Dams



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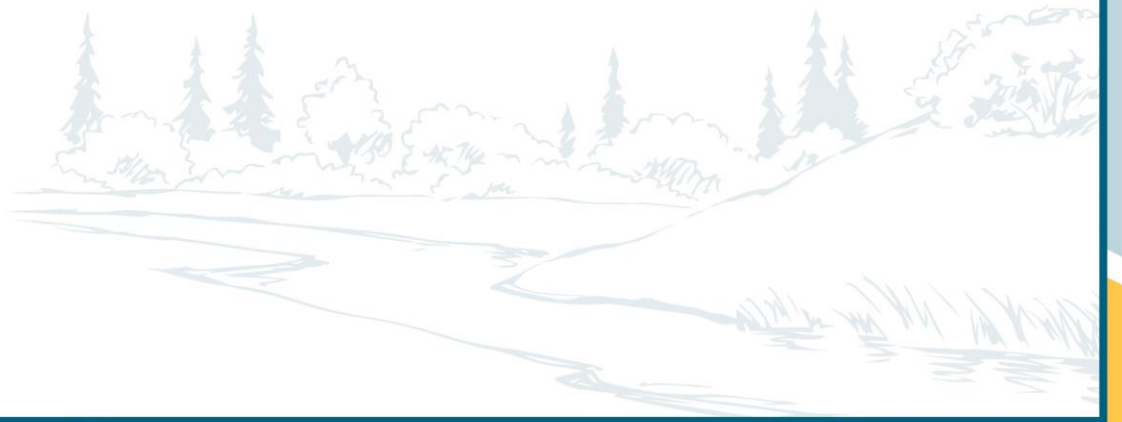
Rice-Skunk Lake



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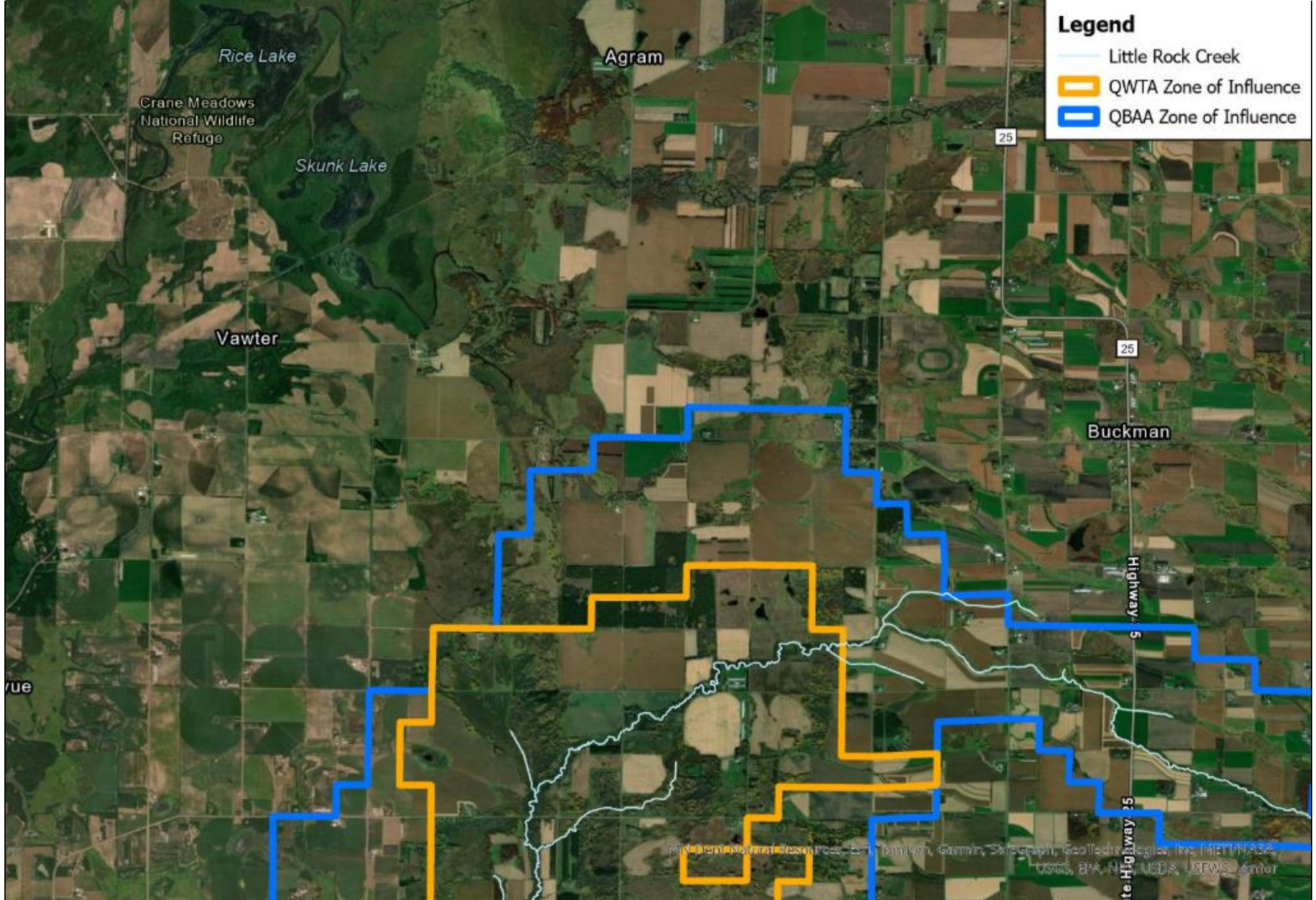
Legend
Little Rock Creek
QWTA Zone of Influence
QBAA Zone of Influence
Rice Lake
Agram
Crane Meadows
National Wildlife
Refuge
Skunk Lake
Vawter
Buckman
25
25
Highway 5
Highway 25

Crop Rotations

- Overview
  - Fields are planted with rotating crop types (including fallowing)
- Benefits
  - Non-infrastructure solution
  - May improve soil quality and reduce disease and pests
- Challenges
  - Likely needs to be paired with additional infrastructure solution
  - May require very specific cycles of crop rotation
  - Needs a system for accountability and verification

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Water Conservation

- Overview
  - Reduction in overall water usage within the Zone of Influence
  - Examples: irrigation equipment and practices, variable rate sprayers, fallowing of fields
- Benefits
  - Non-infrastructure solution
  - Distributed approach; can be adopted by multiple property owners
- Challenges
  - Permit-allocated irrigation volumes would need to match conservation plan
  - Drought years
  - Many landowners already practicing; how much room for additional reduction?

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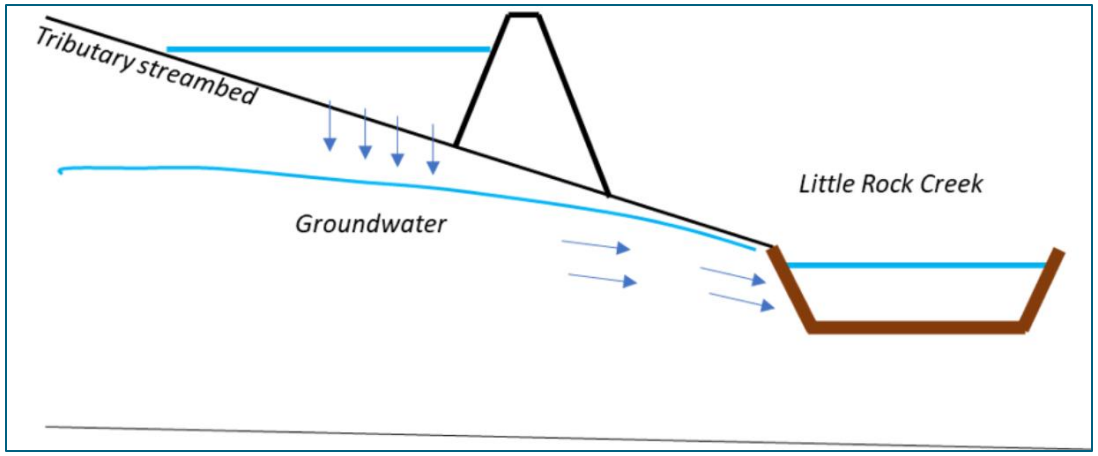
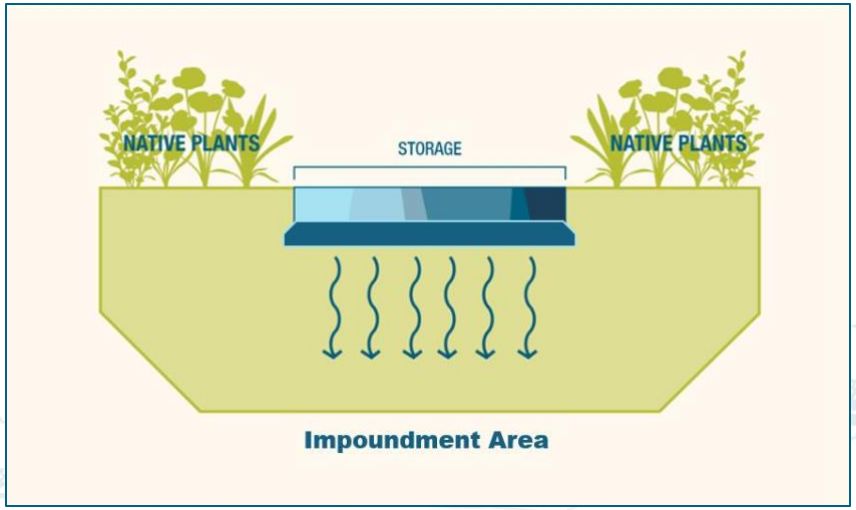
Impoundment Areas - Overview

- Water storage area – water seeps into groundwater and into creek
- Opportunity to create wildlife habitat



Schematic Profile View



Schematic Section View

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Impoundment Areas - Criteria

All parcels in project area assigned scores on 4 criteria:

- Aquifer Zone of Influence – whether the parcel is within the QWTA or QBAA
  - Determines the level of impact infiltrating water will have on LRC
- Whether the parcel contains a tributary where a dam could be placed
  - Parcels containing only mainline creek were excluded
- Which tributary watershed the parcel is primarily located in
  - Determines how much water (including rain) will flow through that area into the creek
- Primary soil type of the parcel
  - Determines the amount of water that will infiltrate from the impoundment into the groundwater

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Evaluation Criteria Scores

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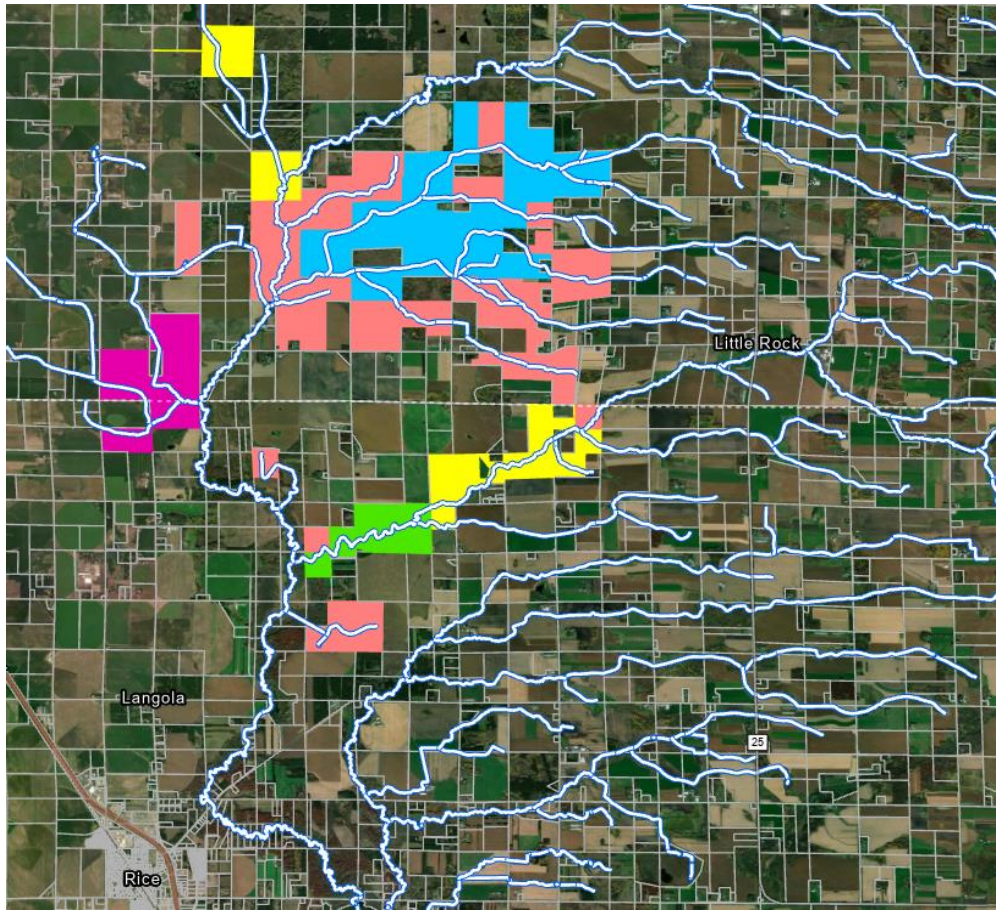
*No Soil Group B present in project area

Impoundment Areas – Heat Map



Legend:

- 4.0
- 3.71
- 3.5
- 3.211 - 3.34
- 3.0 - 3.21
- Less than 3.0

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Impoundment Areas – Future Criteria

Additional criteria that will be considered* in numerical ranking going forward (*not yet included)*:

- Groundwater level
  - Determines if the impoundment will have an impact on creek base flow
- Acreage of resulting impoundment
  - Desire to have fewer, larger impoundments instead of many smaller impoundments
- Ranking at multiple berm height levels
  - Larger berms would theoretically create larger impoundments and may change overall score of parcel
- Impact of offline impoundments
  - Currently only considering parcels that contain tributaries to put impoundment directly in the creek tributary

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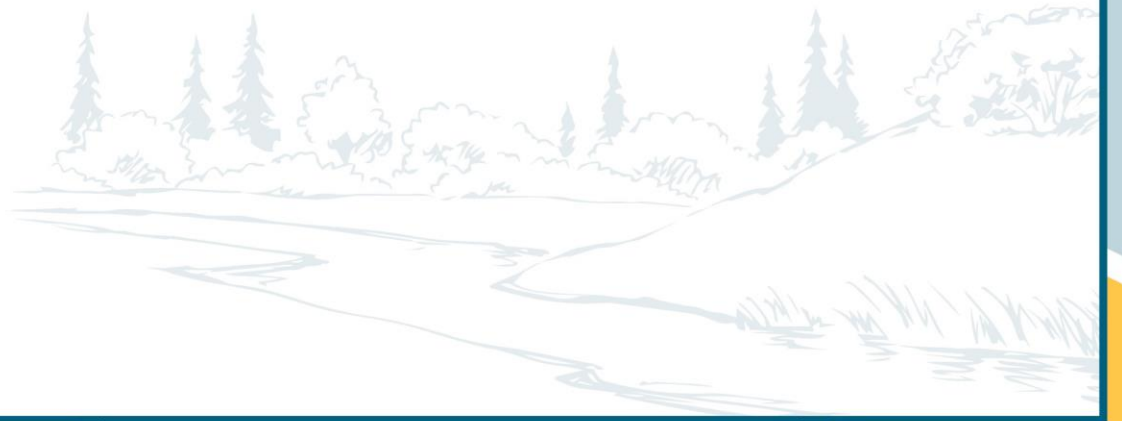
*Subject to data availability.

Impoundment Areas – Property Usage

- What questions do you have about how land would be used?
- What would you need to know before deciding to allow usage of your land?



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Next Steps & Project Timeline

- KHTT continuing to investigate solutions presented in the May 2025 progress report and this meeting
  - Model updates in December and more detailed results in January and March
- New progress report to be published in May 2026

Next Steps & Project Timeline

- December 18, 2025
  - Model recalibration results and revised SDL assessment
- January 22, 2026
  - Results of model analysis and scenario testing on potential solutions (crop rotations, water conservation, beaver dams, Rice-Skunk Lake)
- Late February or early March (potentially March 12)

Email List Updates

To be added to the list:

Contact LRCAprojectinfo@kimley-horn.com any time to request to be added or removed from the email list

Kimley»Horn

Thank you!

Q&A