WELCOME!

Little Rock Creek

Resolving Water Use Conflict

Stakeholder Engagement Meeting

March 13, 2025 02:00 PM

Stakeholder Survey

Today's Presentation Outline

- Activities Performed Since Last Stakeholder Meeting
  - In-Person Small Group Meetings
  - Virtual Stakeholder Meetings
  - Modeling of Options
  - Conversations w. NRCS
- Evaluation and selection Process of Water Management Approaches
- Detailed Discussions of Feasible Water Management Approaches
- Next Steps/Schedule
- Open Discussion

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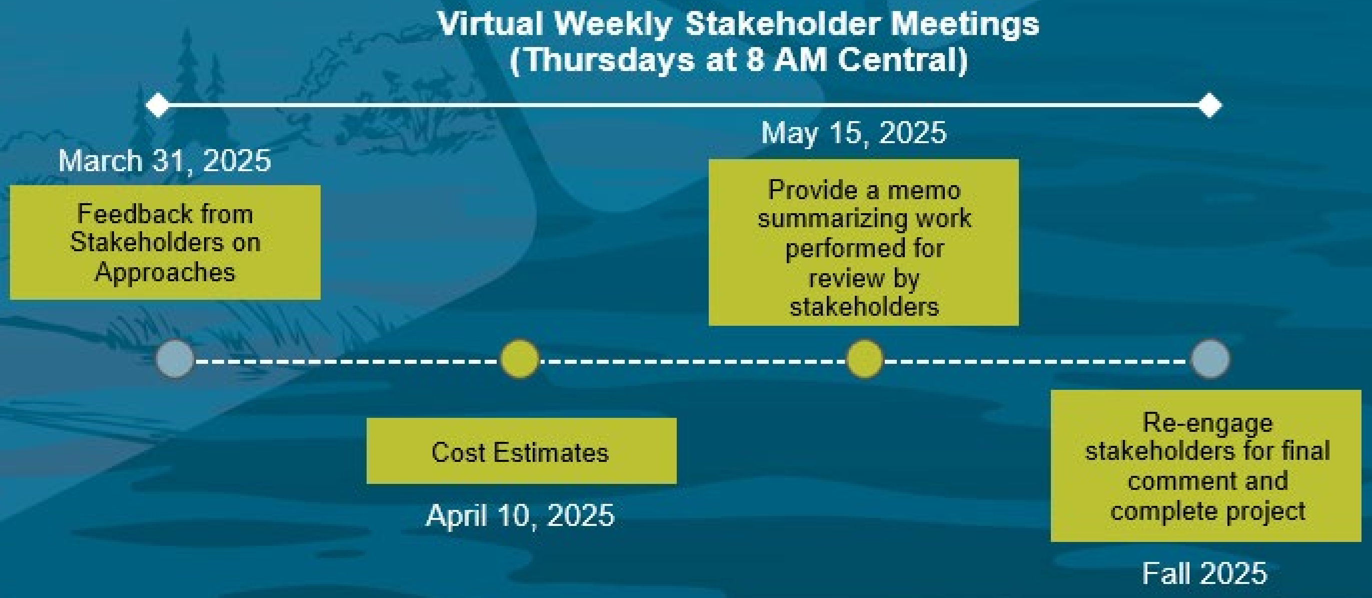
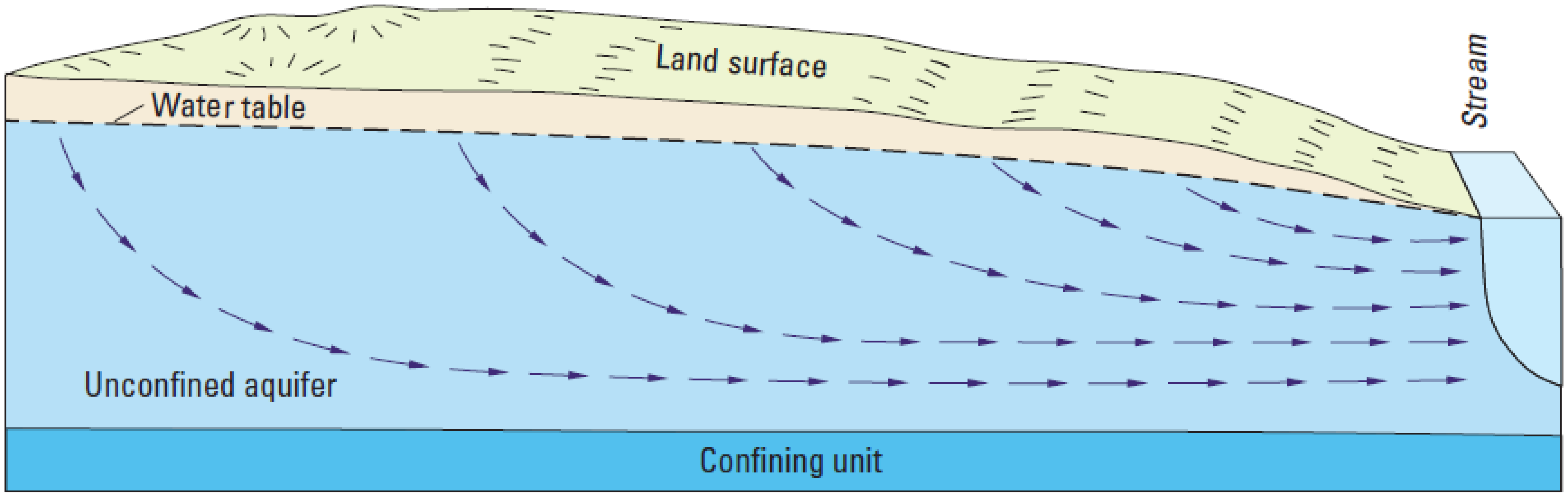
Schedule

- What is needed for the stakeholders to give feedback or input on Approaches?



Groundwater and Streamflow Mechanics 101

IN RECHARGE	-	OUT GW TO SW EXCHANGE (“baseflow”)	=	0 CHANGE IN STORAGE



Under natural conditions, recharge at the water table is equal to discharge at the stream

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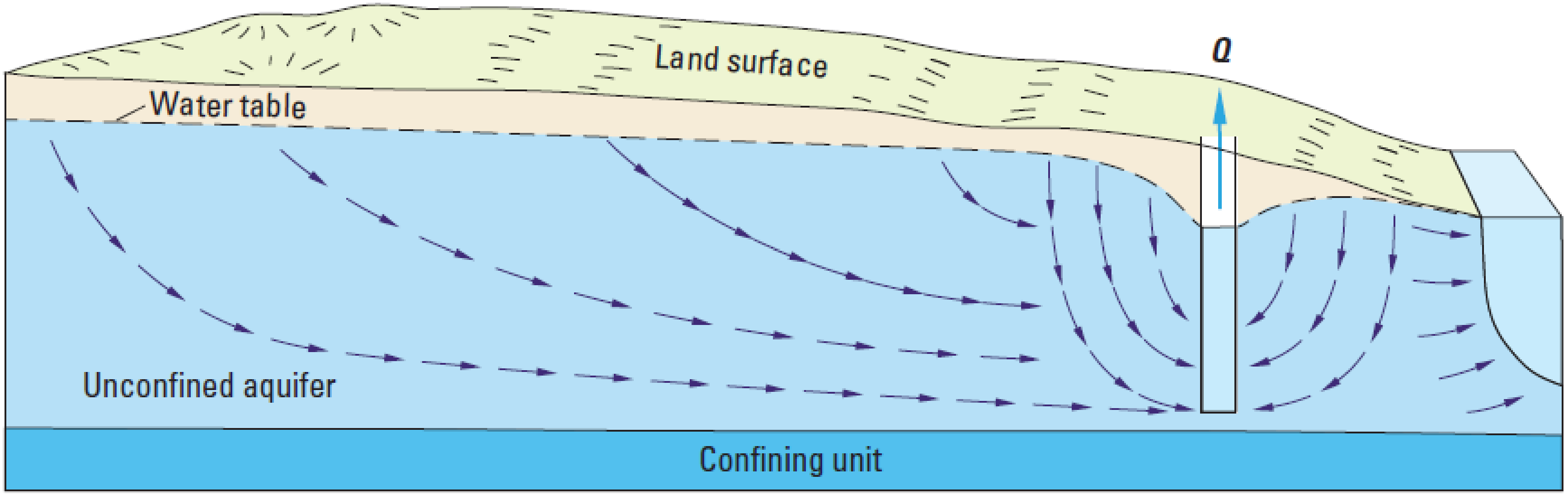
*Image adapted from USGS Circular 1376: Streamflow Depletion by Wells – Understanding and Managing the Effects of Groundwater Pumping on Streamflow

Groundwater and Streamflow Mechanics 101

RECHARGE - BASEFLOW PUMPING = DECREASED STORAGE



Soon after pumping begins, all of the water pumped by the well is derived from water released from groundwater storage

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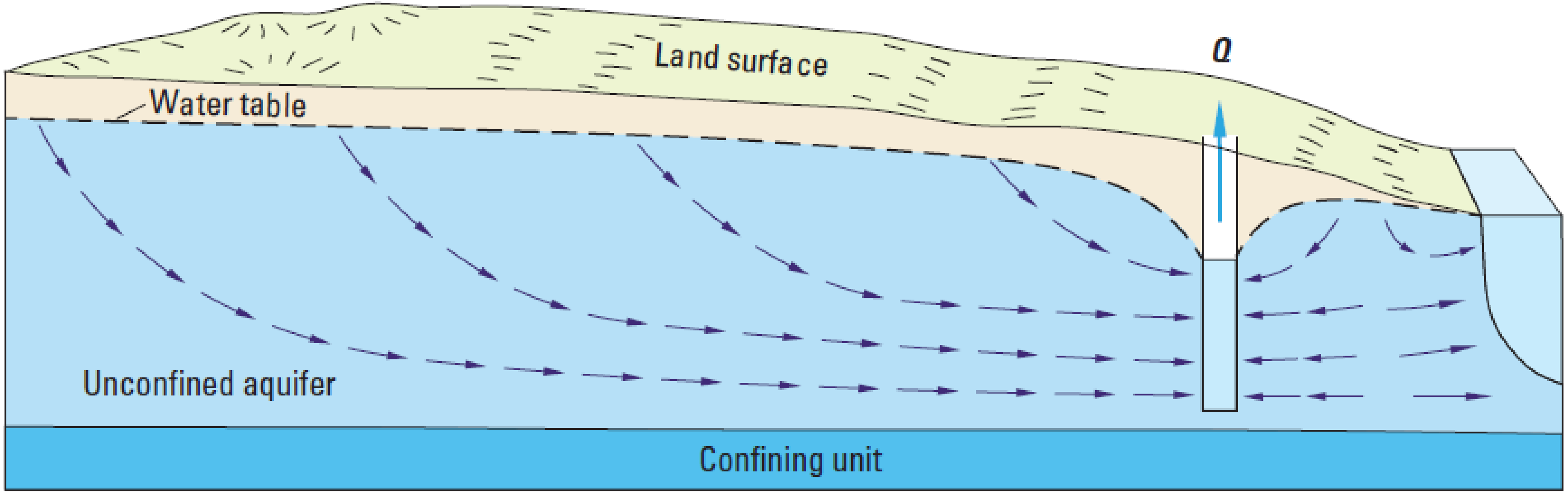
*Image adapted from USGS Circular 1376: Streamflow Depletion by Wells – Understanding and Managing the Effects of Groundwater Pumping on Streamflow

Groundwater and Streamflow Mechanics 101

RECHARGE - DECREASED BASEFLOW PUMPING = DECREASED STORAGE



As the cone of depression expands outward from the well, the well begins to capture groundwater that would otherwise have discharged to the stream

*Image adapted from USGS Circular 1376: Streamflow Depletion by Wells – Understanding and Managing the Effects of Groundwater Pumping on Streamflow

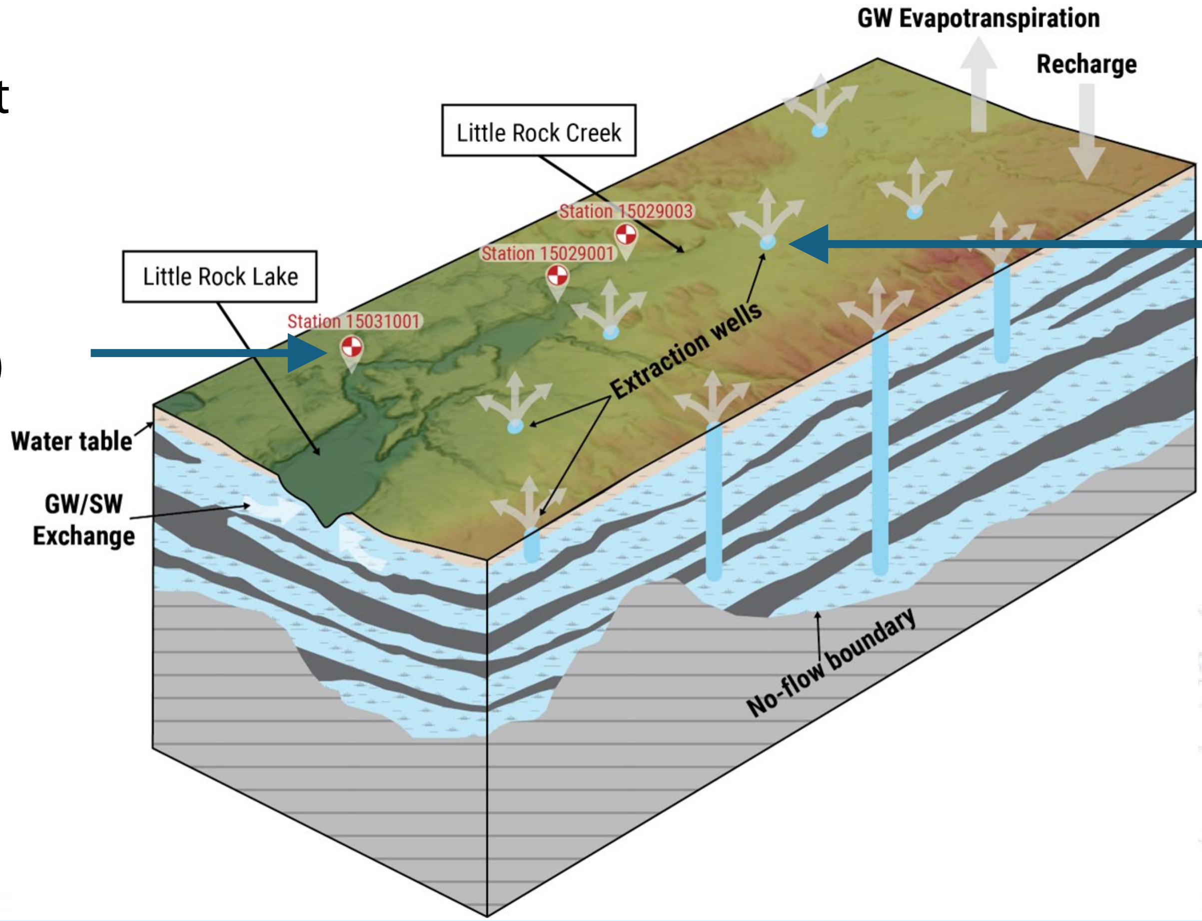
Little Rock Creek Example

Modeled diversion at downstream gage

92 MG or 4.6 cubic feet per second (cfs)

Sustainable Diversion Limit (SDL)

58 MG or 2.9 cfs



August pumped volume 2013

2,270 Million Gallons (MG)

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Effect of Timing and Distance of Pumping

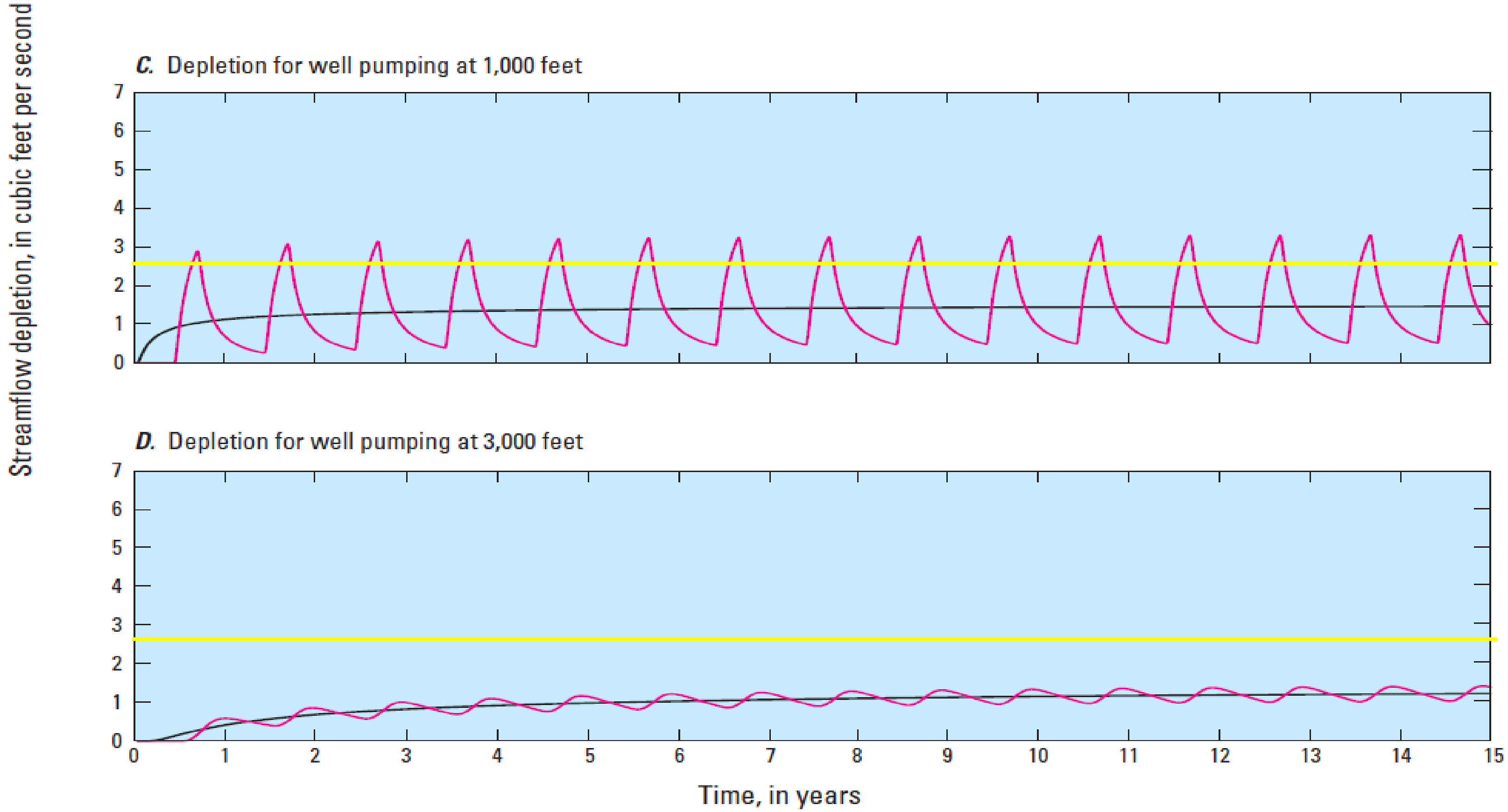

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*Image adapted from USGS Circular 1376: Streamflow Depletion by Wells – Understanding and Managing the Effects of Groundwater Pumping on Streamflow

Project Task

- Find solutions which address the Commissioner's Order establishment of a sustainable diversion limit for Little Rock Creek
- Identify a combination of these approaches feasible to achieve SDL consistently
  - Streamflow augmentation
  - New wells and conveyance
  - Enhancing groundwater recharge
  - Water conservation
  - Modifying appropriations
- The model is the best available tool to show creek reaction and sensitivity to any approaches

Streamflow Augmentation

Streamflow Augmentation by direct pipe discharge is not receiving further consideration because it does not provide the benefits of baseflow:

- **Water Quality**: Nitrates are primarily broken down in the anoxic conditions of upwelling GW near the surface.
- **Habitat**: Upwelling GW areas are “hotspots” for stream species and provide conditions for developing eggs and small fish.
- **Refuge**: Upwelling GW provides refuge from extreme temperatures and anchor ice.
- **Stream Productivity**: Upwelling GW provides chemicals and habitat for microbes which are a critical link in the food web.
- **Stable Streams**: GW flow through the floodplain benefits vegetation growth leading to bank stabilization and sediment buffering.

Make Wells Deeper

As an alternative to new wells and conveyance systems, we evaluated making some existing wells deeper

- Wells to be made deeper were selected based on:
  - Currently pumping from shallow aquifer
  - Proximity to stream
  - Pumping rate
  - Deeper aquifers exist at current location
- Model results indicated no improvements in attaining the SDL

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Make Wells Shallower

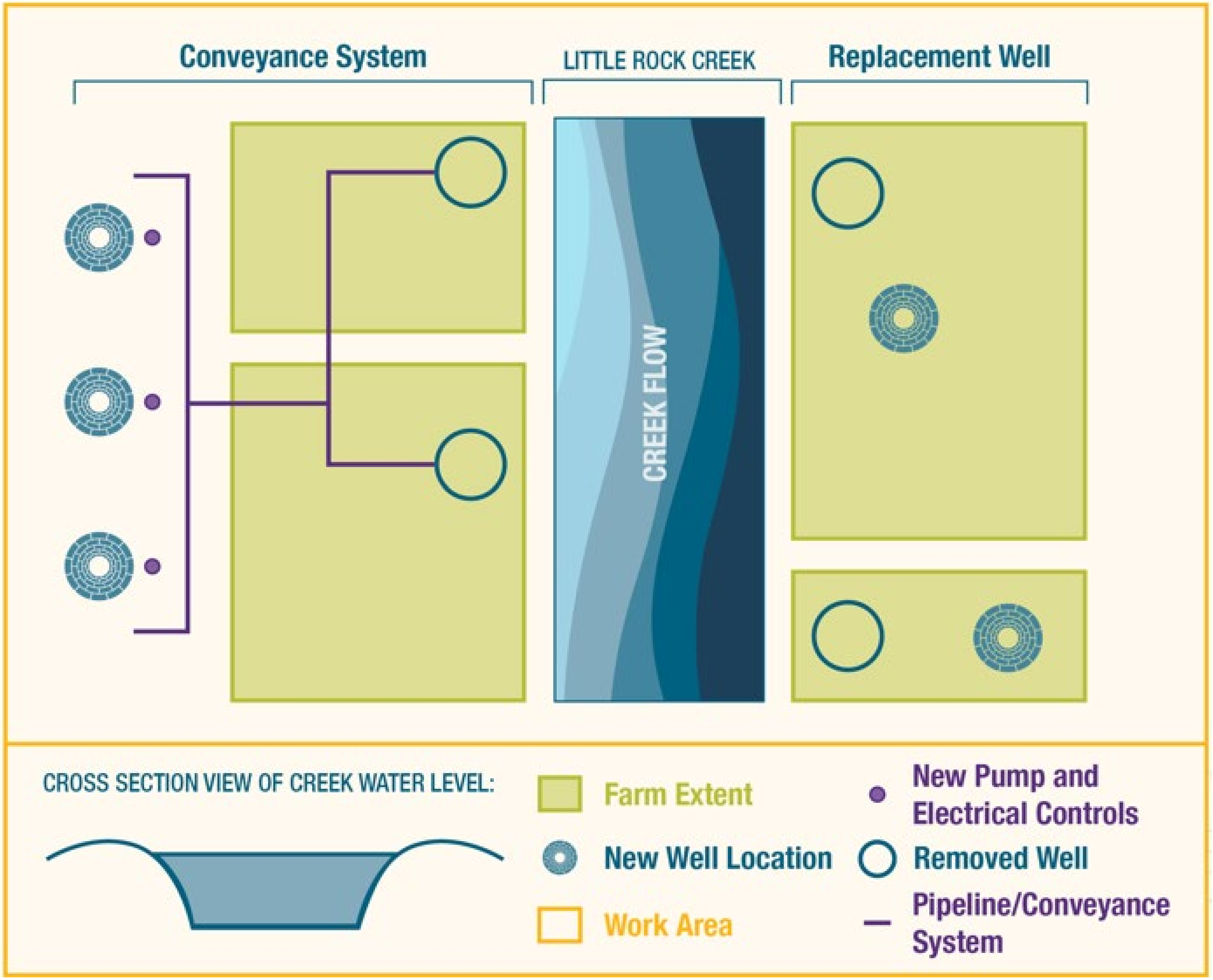
In response to the results of our assessment of making some existing wells deeper, we tried making some wells shallower

- Wells to be made shallower were selected based on:
  - Currently pumping from deeper aquifer
  - Proximity to stream
  - Pumping rate
- Model results indicated shallow aquifer depletion and wells going dry

Water Management Approaches

1. Streamflow Augmentation
2. New Wells and Conveyance Systems
3. Enhancing Groundwater Recharge
4. Water Conservation
5. Modifying Appropriations

1. New Wells and Conveyance Systems
2. Streamflow Augmentation by Enhancing Groundwater Recharge
   a. Infiltration Zones
      i. New wells and conveyance
   b. Impoundments
      i. Capture surface water runoff and supplement with new wells and conveyance
3. Water Conservation

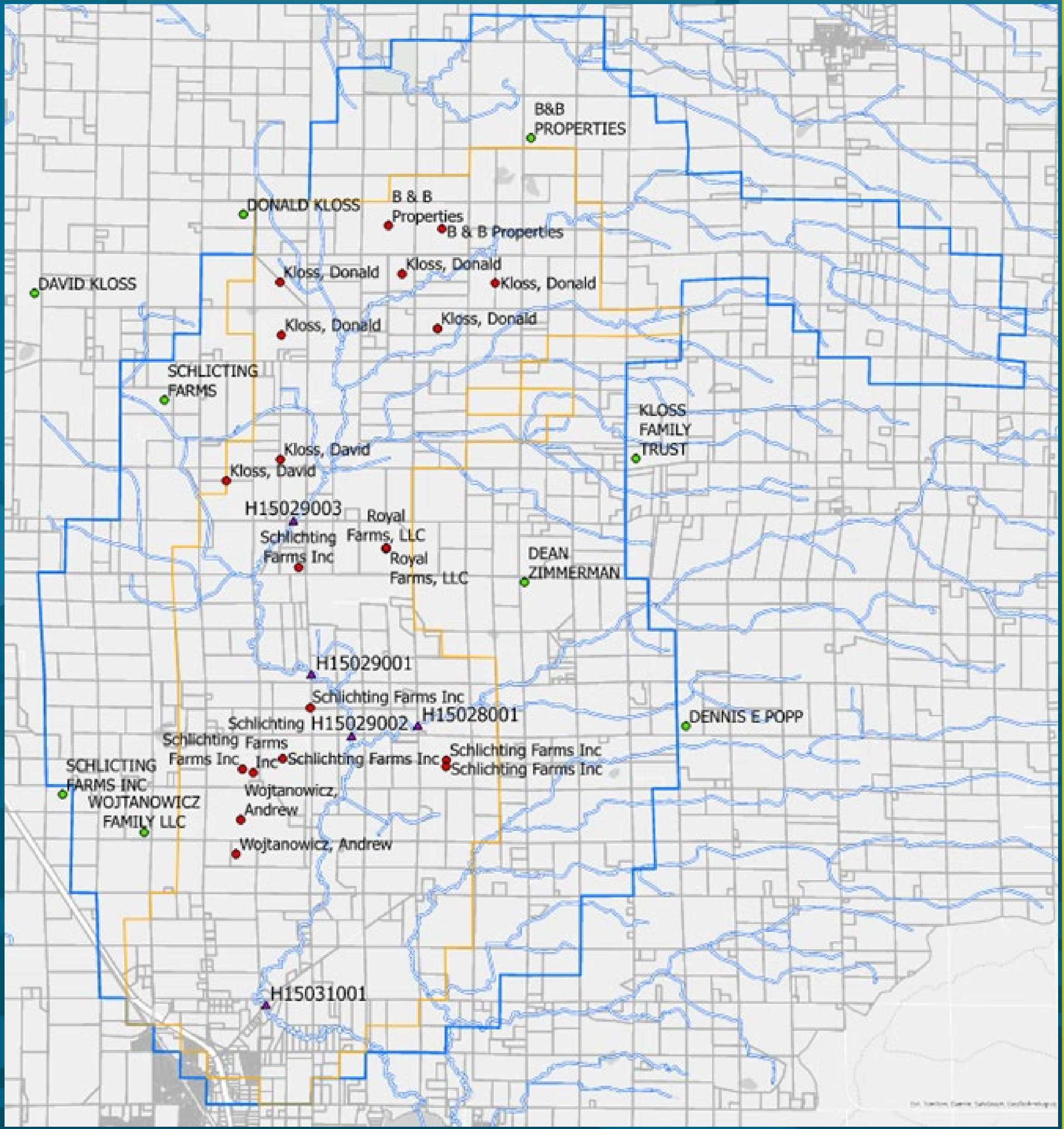


Approach:

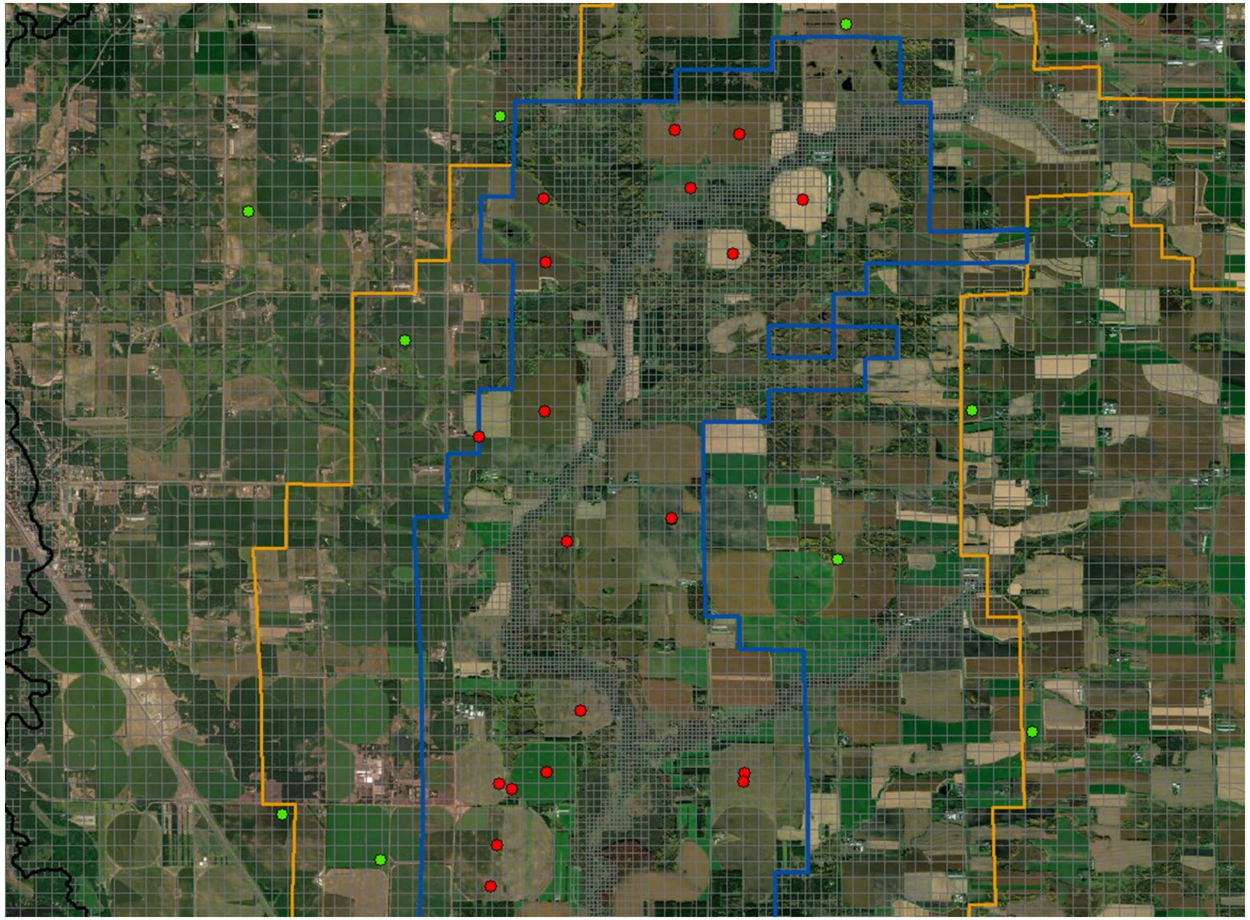
Replacement of Wells w/ More Distant Wells (Remove and Replace)

Preliminary Well Removal and Replacement Locations

- Preference to same business or family
- Amount of pumped water 2014-2023
- Wells closer / closest to the creek
- Wells on both east and west sides of creek
- Wells replace permitted capacity 1 to 1
- Conveyance routes do not cross LRC



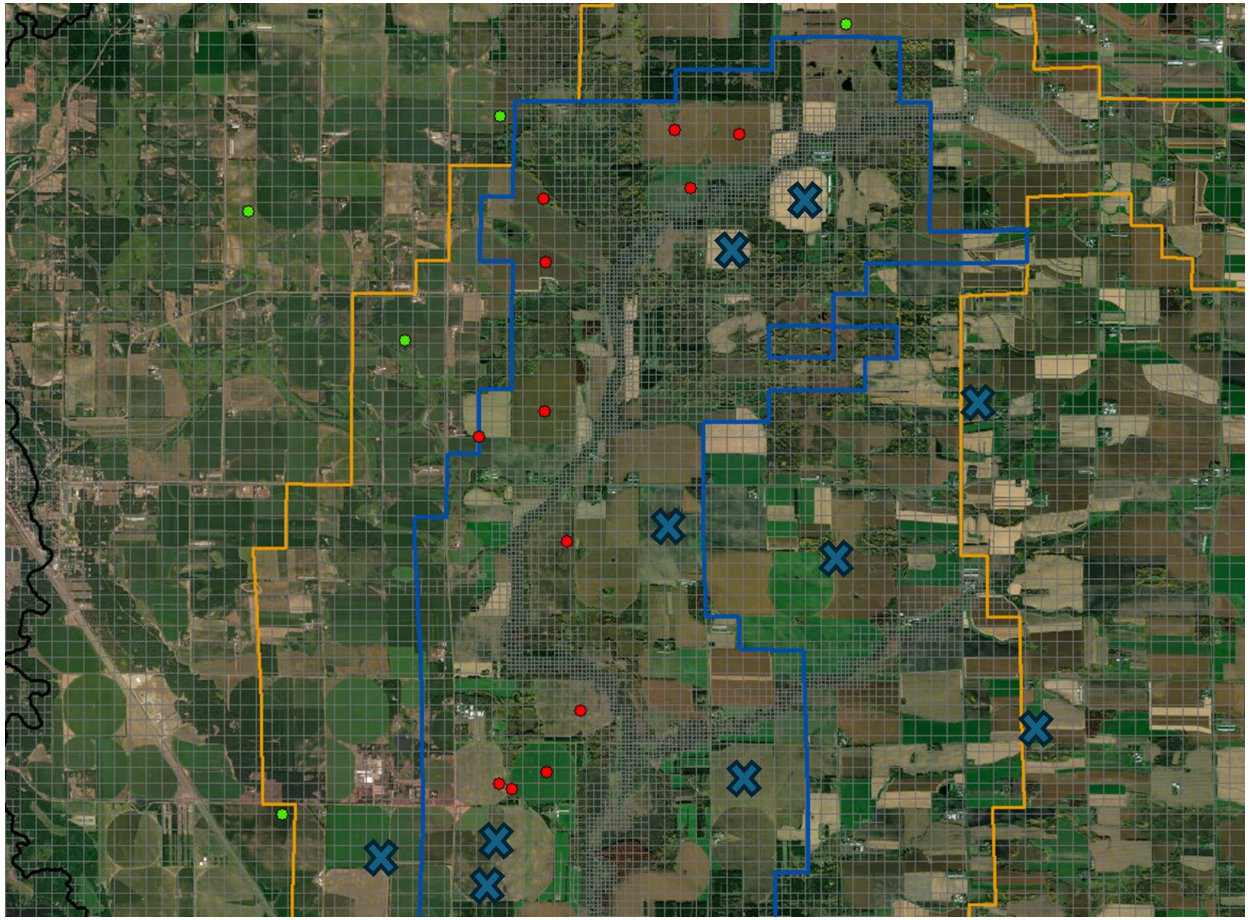
Model Results: New Wells and Conveyance



Remove 20 wells
9 new well locations
Conveyance systems to removed well locations

Model Baseflow and SDL Exceedances			
Gaging Station	SDL (cfs)	Maximum Monthly Diversion (cfs)	# Months > SDL
Upstream	0.8	0.4	0
Long Term	1.1	0.7	0
Downstream	2.9	2.6	0

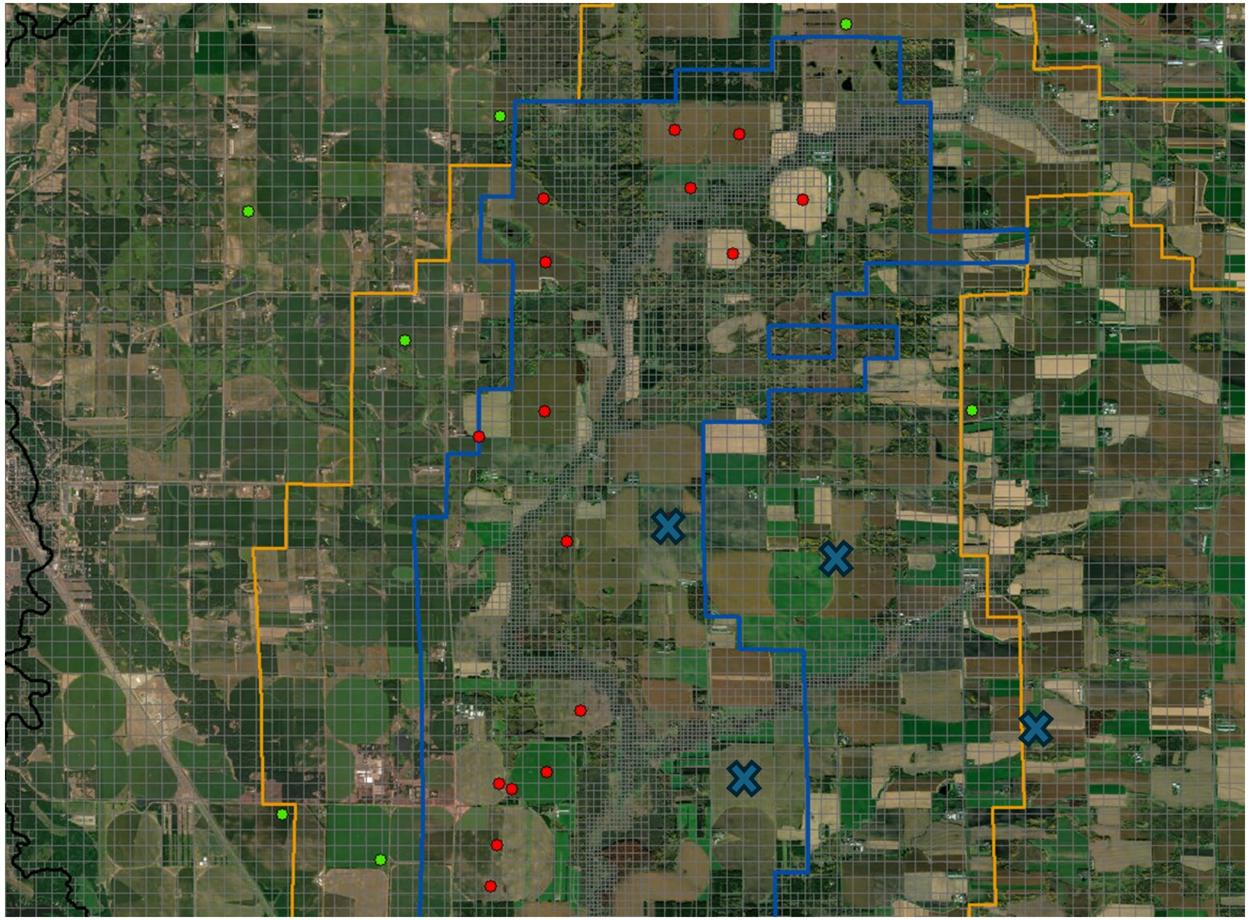
Model Results: New Wells and Conveyance



Remove 12 wells
6 new well locations
Conveyance systems to removed well locations

Model Baseflow and SDL Exceedances			
Gaging Station	SDL (cfs)	Maximum Monthly Diversion (cfs)	# Months > SDL
Upstream	0.8	0.6	0
Long Term	1.1	0.9	0
Downstream	2.9	3.2	1

Model Results: New Wells and Conveyance



Remove 16 wells
7 new well locations
Conveyance systems to removed well locations

Model Baseflow and SDL Exceedances			
Gaging Station	SDL (cfs)	Maximum Monthly Diversion (cfs)	# Months > SDL
Upstream	0.8	0.5	0
Long Term	1.1	0.8	0
Downstream	2.9	3.2	1

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New Wells and Conveyance – Next Steps

- Assess need for potential future wells/appropriations
- Refine number and location of wells for removal
- Refine number and location of new wells
- Using the model, confirm new wells have capacity and do not interfere with nearby wells
- Verify conveyance corridors
- Refine cost estimates

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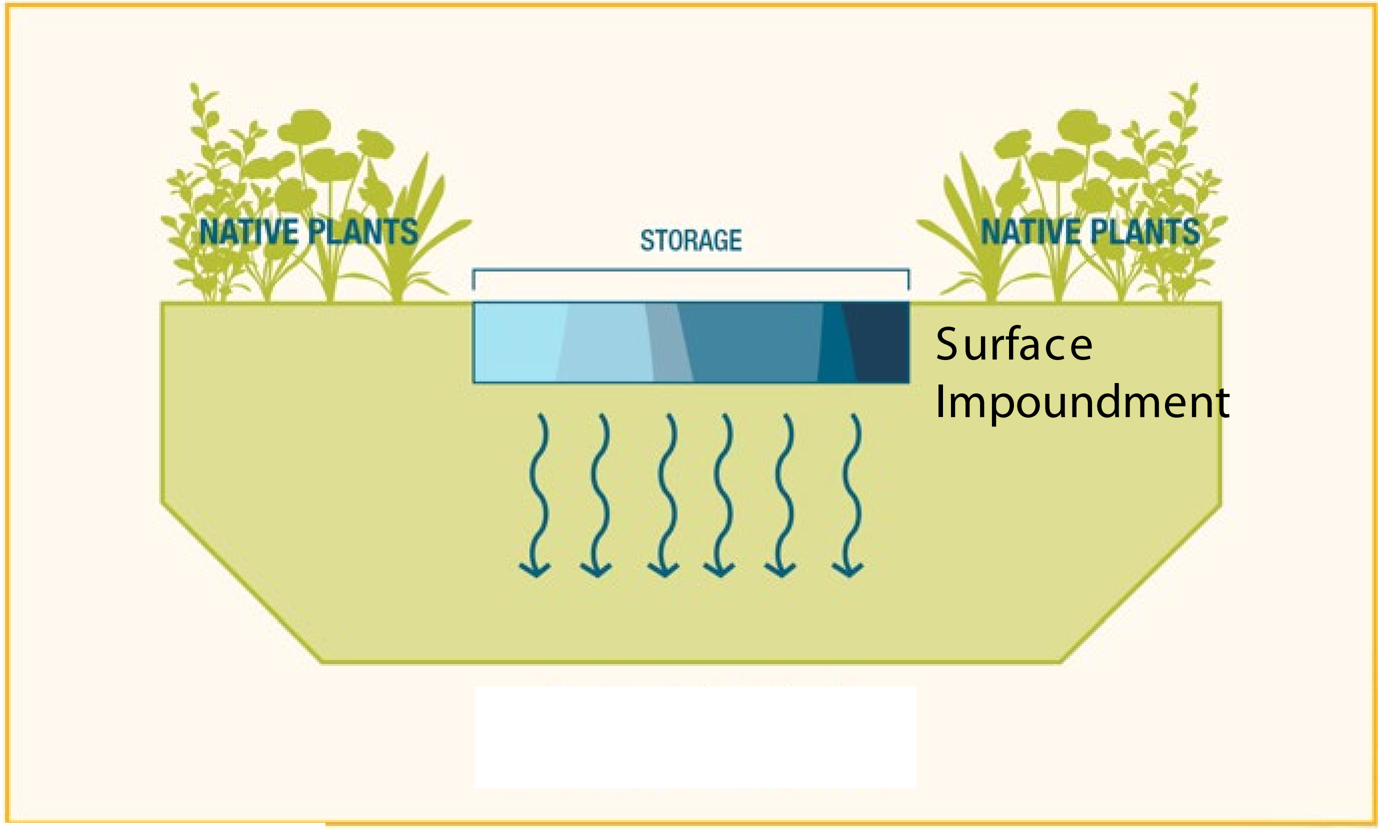
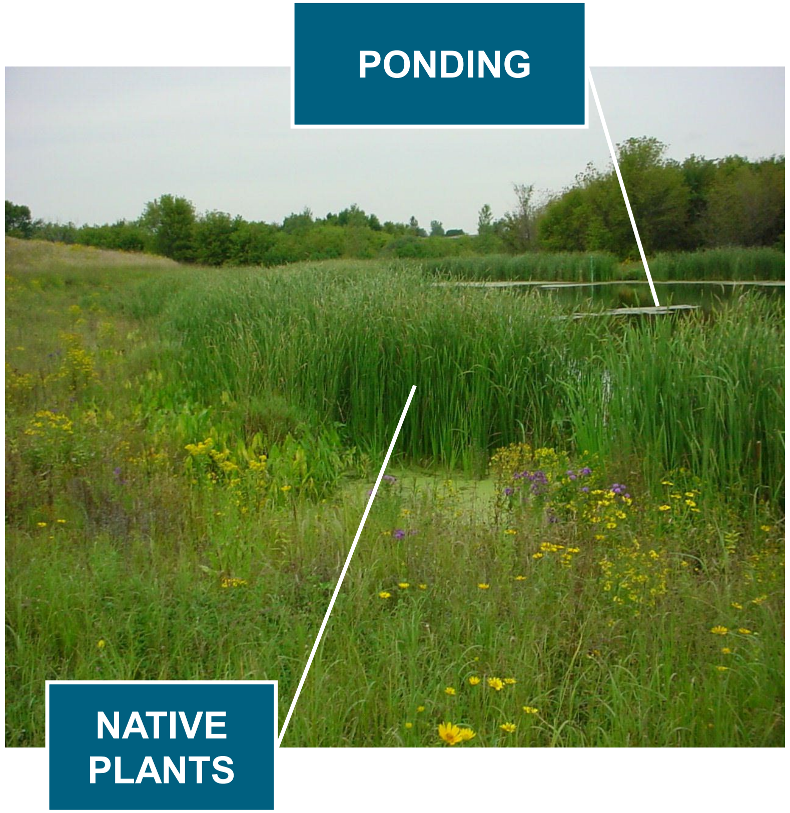
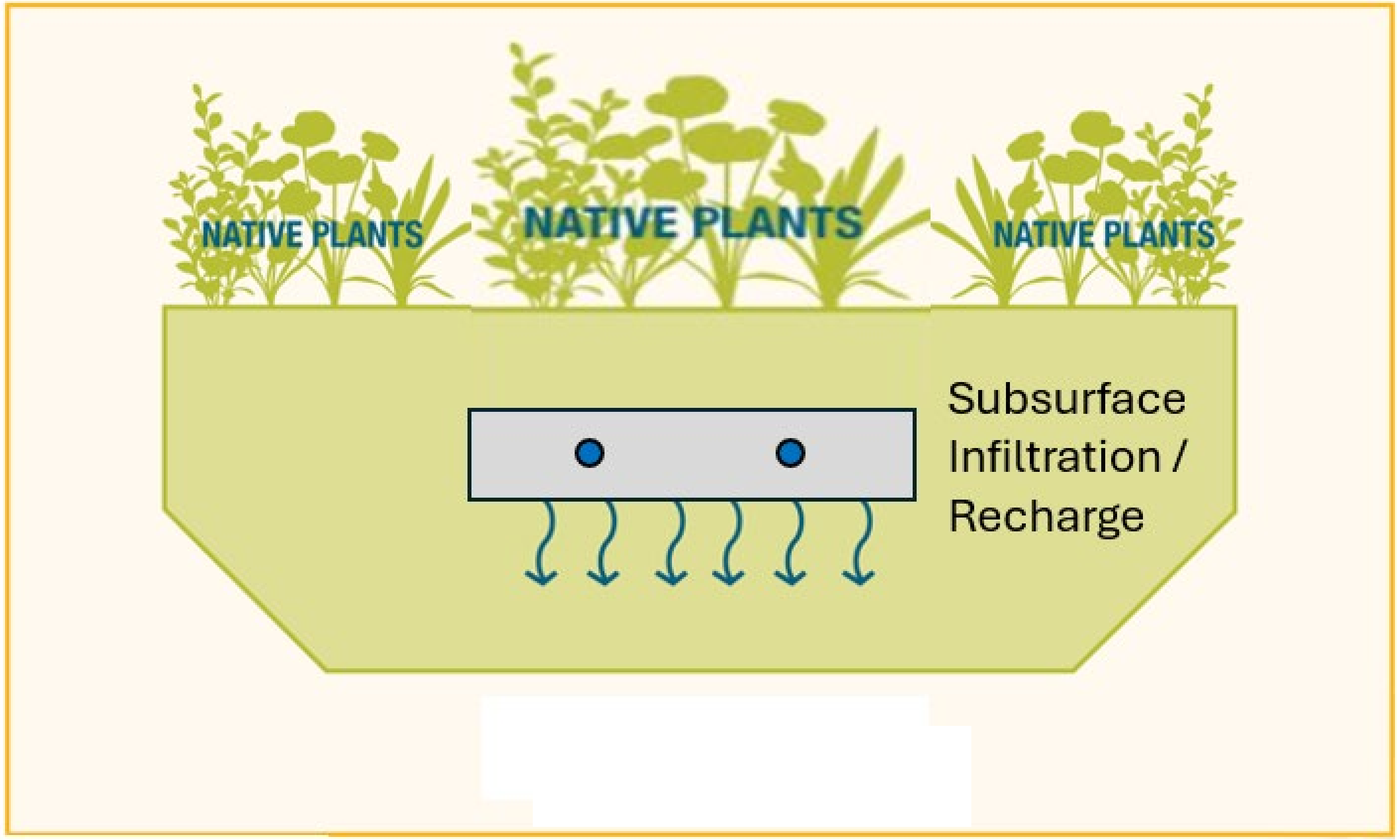
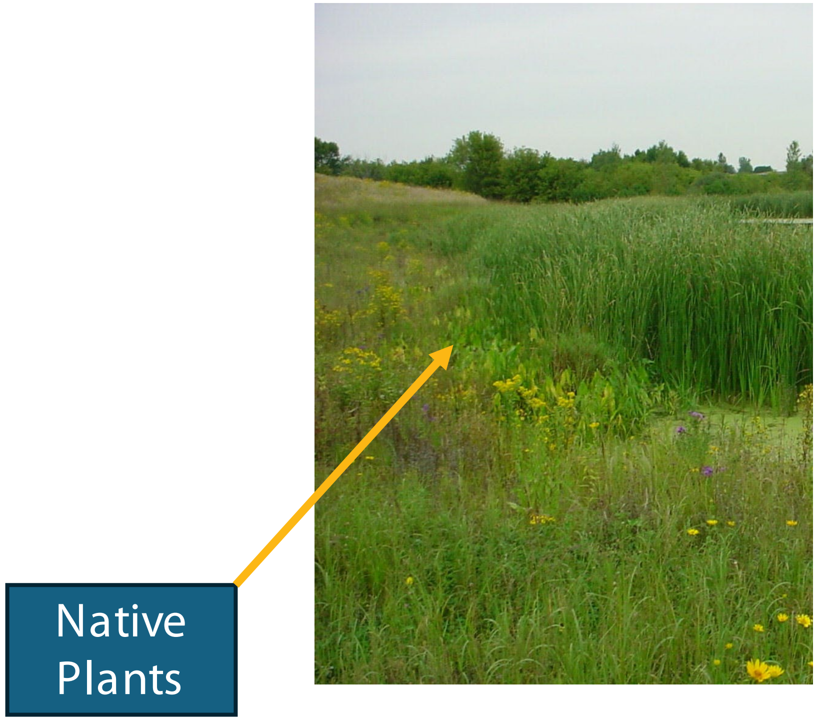
Approach: Enhanced Groundwater Recharge





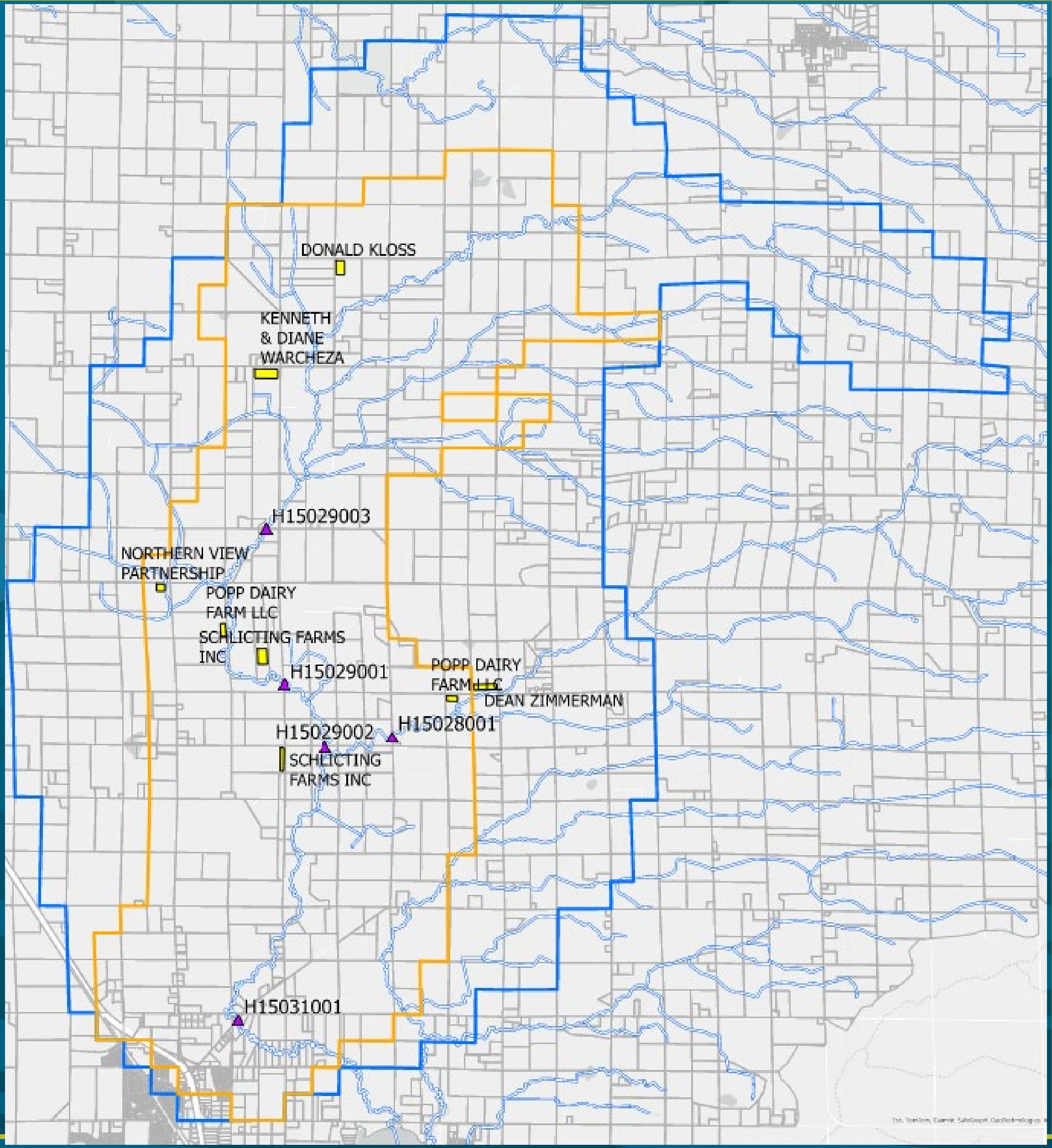
Approach: Enhanced Groundwater Recharge



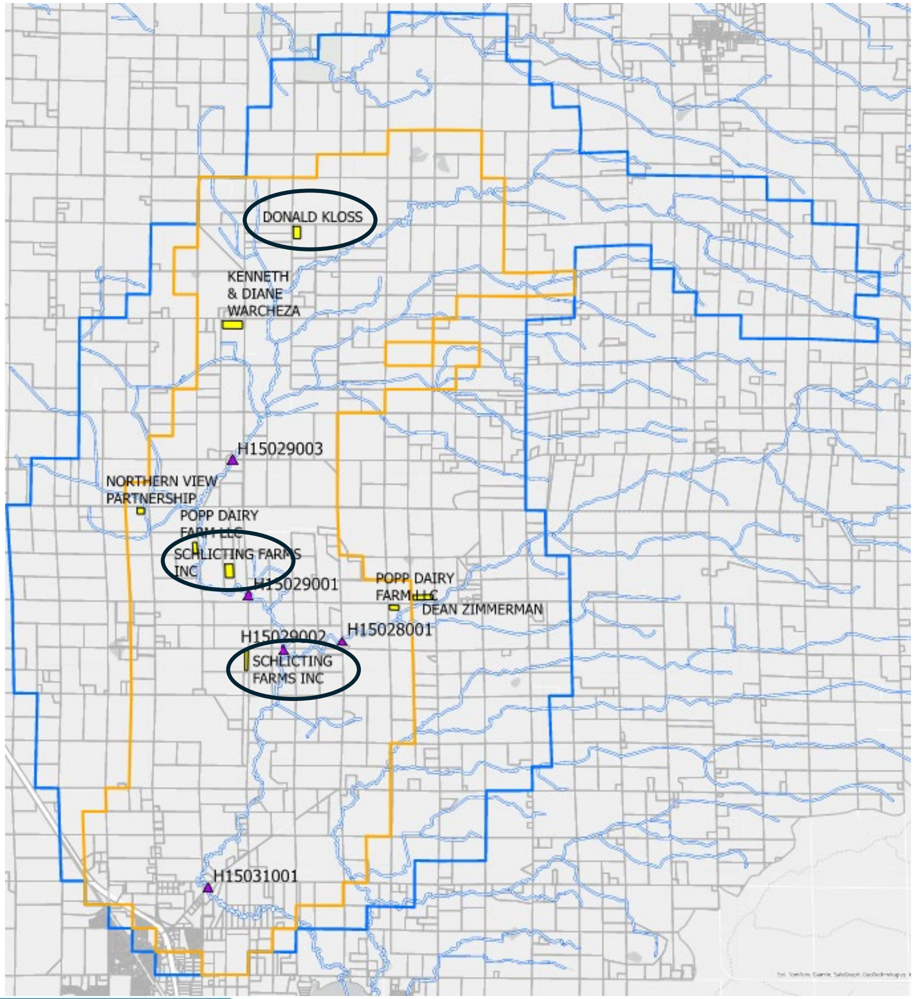


Preliminary Recharge Areas (Subsurface)

- Outside current buffer / conservation areas
- Greatest amount of pumped water 2014-2023
- Placed as close as possible to creek
- Cropland areas
- Contribute to baseflow throughout creek system
- New well locations not identified



Model Results: Recharge with Infiltration Zones



8 infiltration zones considered (~50 acres)
3 infiltration zones selected (~17 acres)
Install 7 new wells
Conveyance systems to infiltration zones

Model Baseflow and SDL Exceedances			
Gaging Station	SDL (cfs)	Maximum Monthly Diversion (cfs)	# Months > SDL
Upstream	0.8	0.6	0
Long Term	1.1	0.8	0
Downstream	2.9	2.7	0

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Recharge with Infiltration Zones – Next Steps

- Assess if distribution of baseflow achieves desired benefits to Little Rock Creek
- Assess need for potential future wells/appropriations
- Refine number, location, size and operation of infiltration zones
- Refine number and location of new wells
- Using the model, confirm new wells have capacity and do not interfere with nearby wells
- Verify conveyance corridors
- Refine cost estimates

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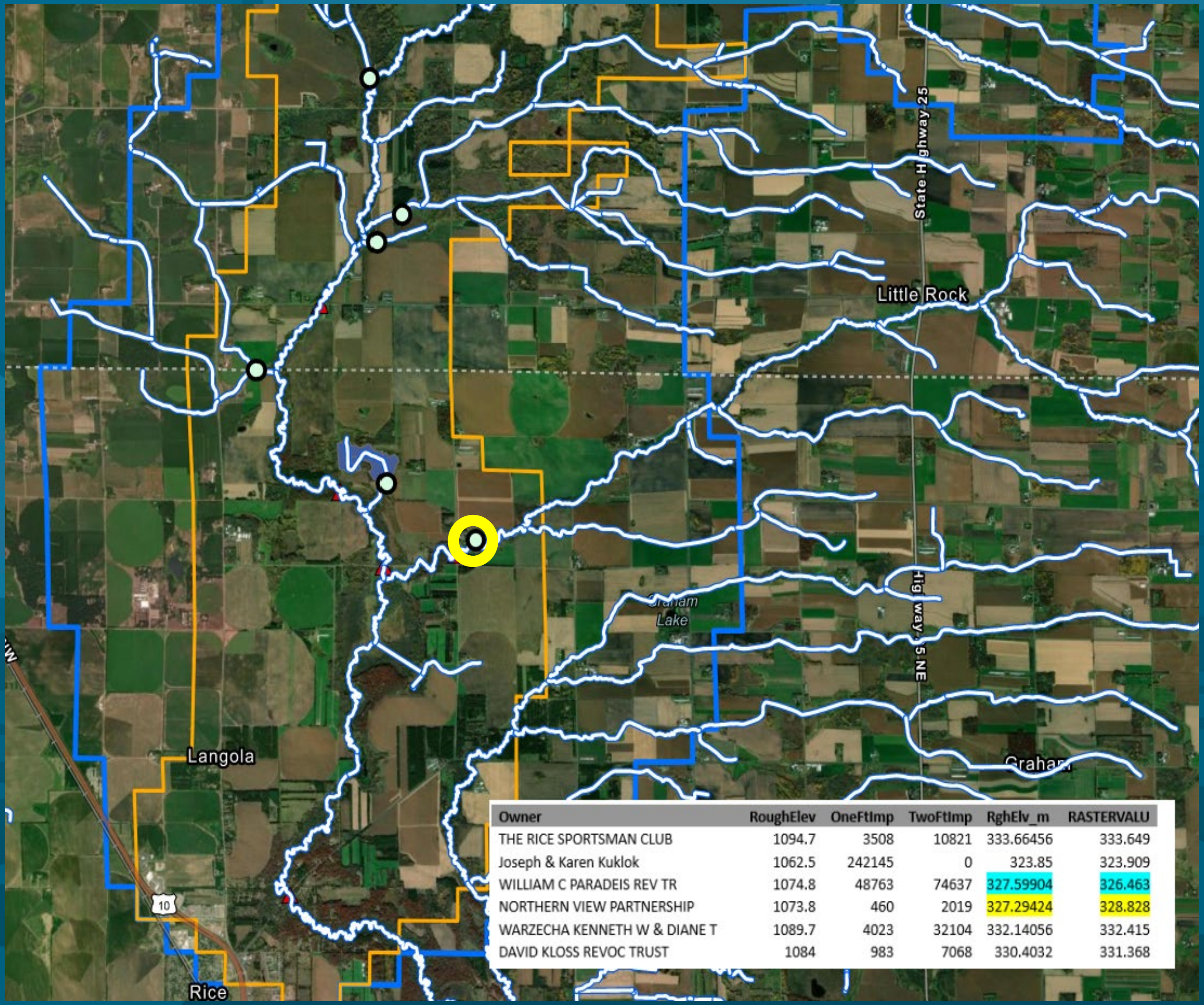
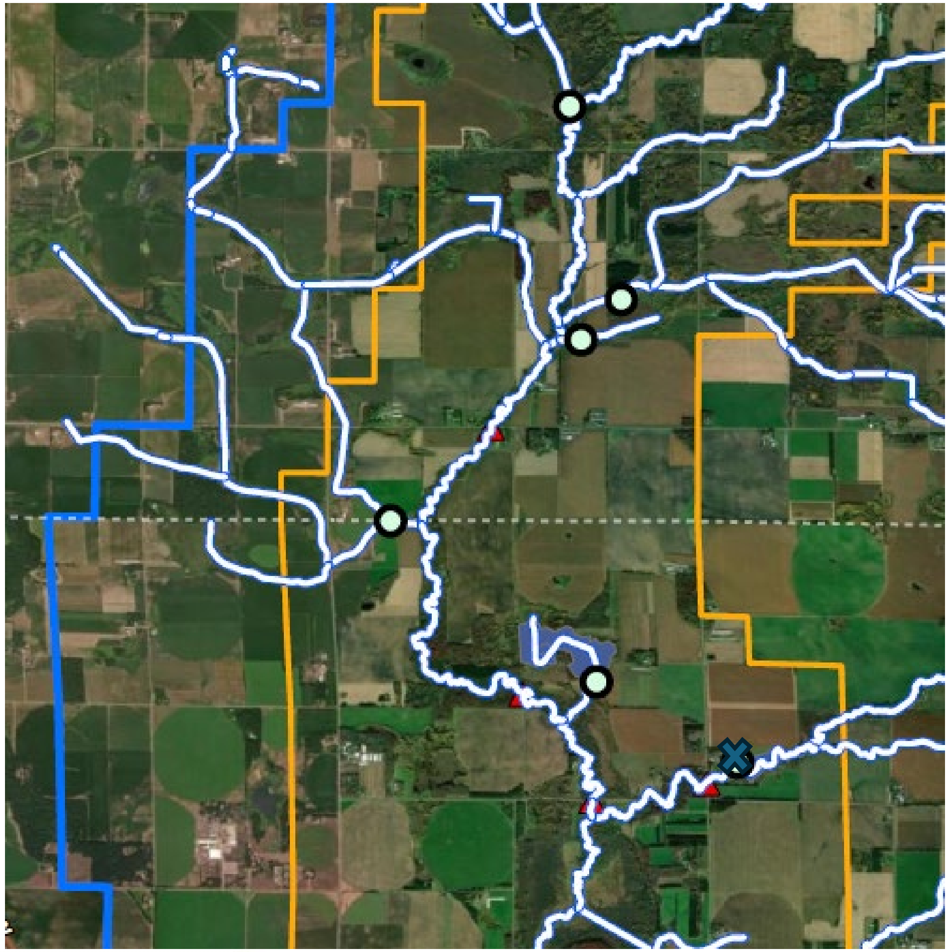
Preliminary Impoundment Locations (surface)

- Tributaries to LRC
- Minimal impacts to current production land
- 1 or 2 foot of surface ponding depth available
- Non cropland areas
- Avoid flooding of roads
- 5 of 6 areas modeled
- New well locations not identified



Owner	RoughElev	OneFtImp	TwoFtImp	RghElv_m	RASTERVALU
THE RICE SPORTSMAN CLUB	1094.7	3508	10821	333.66456	333.649
Joseph & Karen Kuklok	1062.5	242145	0	323.85	323.909
WILLIAM C PARADEIS REV TR	1074.8	48763	74637	327.59904	326.463
NORTHERN VIEW PARTNERSHIP	1073.8	460	2019	327.29424	328.828
WARZECHA KENNETH W & DIANE T	1089.7	4023	32104	332.14056	332.415
DAVID KLOSS REVOC TRUST	1084	983	7068	330.4032	331.368

Model Results: Recharge with Impoundments



6 impoundments considered (~91 acres)
5 impoundments selected (~73 acres)

- 4 at 2 feet depth
- 1 at 1 foot depth

Install 7 new wells
Conveyance systems to impoundments

Model Baseflow and SDL Exceedances			
Gaging Station	SDL (cfs)	Maximum Monthly Diversion (cfs)	# Months > SDL
Upstream	0.8	0.8	0
Long Term	1.1	0.6	0
Downstream	2.9	2.6	0

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Recharge with Impoundments – Next Steps

- Assess if distribution of baseflow achieves desired benefits to Little Rock Creek
- Assess need for potential future wells/appropriations
- Refine number, location, size, and operation of impoundments
- Refine number and locations of new wells
- Using the model, confirm new wells have capacity and do not interfere with nearby wells
- Verify conveyance corridors
- Refine cost estimates

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Summary of Model Results

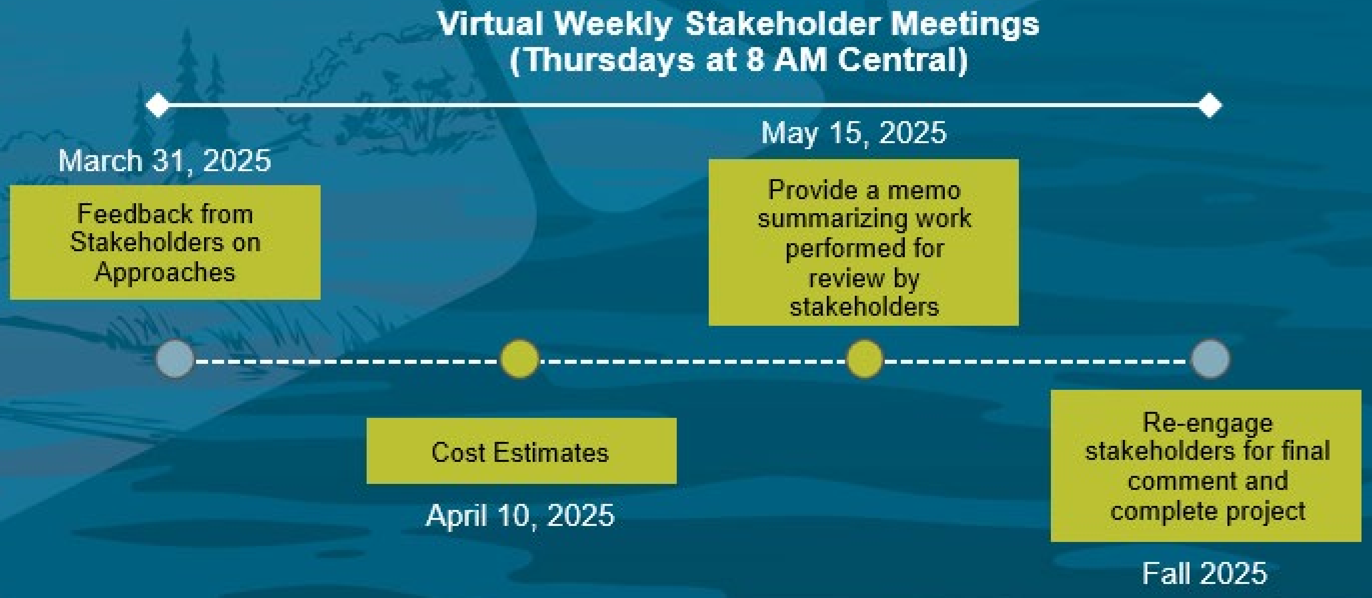
Model Baseflow and SDL Exceedances									
Approaches →		Remove 20 Wells		Remove 16 Wells		Infiltration Zones		Impoundments	
Gaging Station	SDL (cfs)	Max Diversion (cfs)	# Months > SDL	Maximum Monthly Diversion (cfs)	# Months > SDL	Maximum Monthly Diversion (cfs)	# Months > SDL	Maximum Monthly Diversion (cfs)	# Months > SDL
Upstream	0.8	0.4	0	0.5	0	0.6	0	0.8	0
Long Term	1.1	0.7	0	0.8	0	0.8	0	0.6	0
Downstream	2.9	2.6	0	3.2	1	2.7	0	2.6	0

Options Comparison Summary

Approach	Regulatory & Water Availability Certainty	Implementation Timeline	Implementation Costs (Capital & O&M)	Governance Complexity
Replacement of Wells w/ Distant Wells & Conveyance Systems	High certainty; clear regulatory pathway	Medium-term (2–5 years)	High capital; Moderate to high O&M	Moderate to High
Enhanced Recharge Using Infiltration Zones	Moderate to high certainty; dependent on soil conditions and land availability	Medium-term (2–4 years)	High capital; Moderate to high O&M	Moderate
Enhanced Recharge Using Impoundments	Moderate certainty; permitting and environmental considerations needed	Medium to Long-term (3–6 years)	Moderate to high capital; Low O&M	Low to Moderate

Schedule

- What is needed for the stakeholders to give feedback or input on Approaches?



Stakeholder Survey

Thank you!

Q&A

NRCS Meeting Outcomes

- Environmental Quality Incentives (EQIP) Program –
  - Funds structural, vegetative, management practices of agricultural operation which improve natural resources
  - Uses Field Office Tech Guide
  - Challenge:
    - competitive program needs to be targeted and planned at least a year ahead
- Regional Conservation Partnership Program (RCPP) Program –
  - Funds solutions to natural resource challenges on agricultural land
  - Challenge:
    - Need a sponsor
    - Money must be used towards current farm operations