Hazen

Environmental Protection Agency

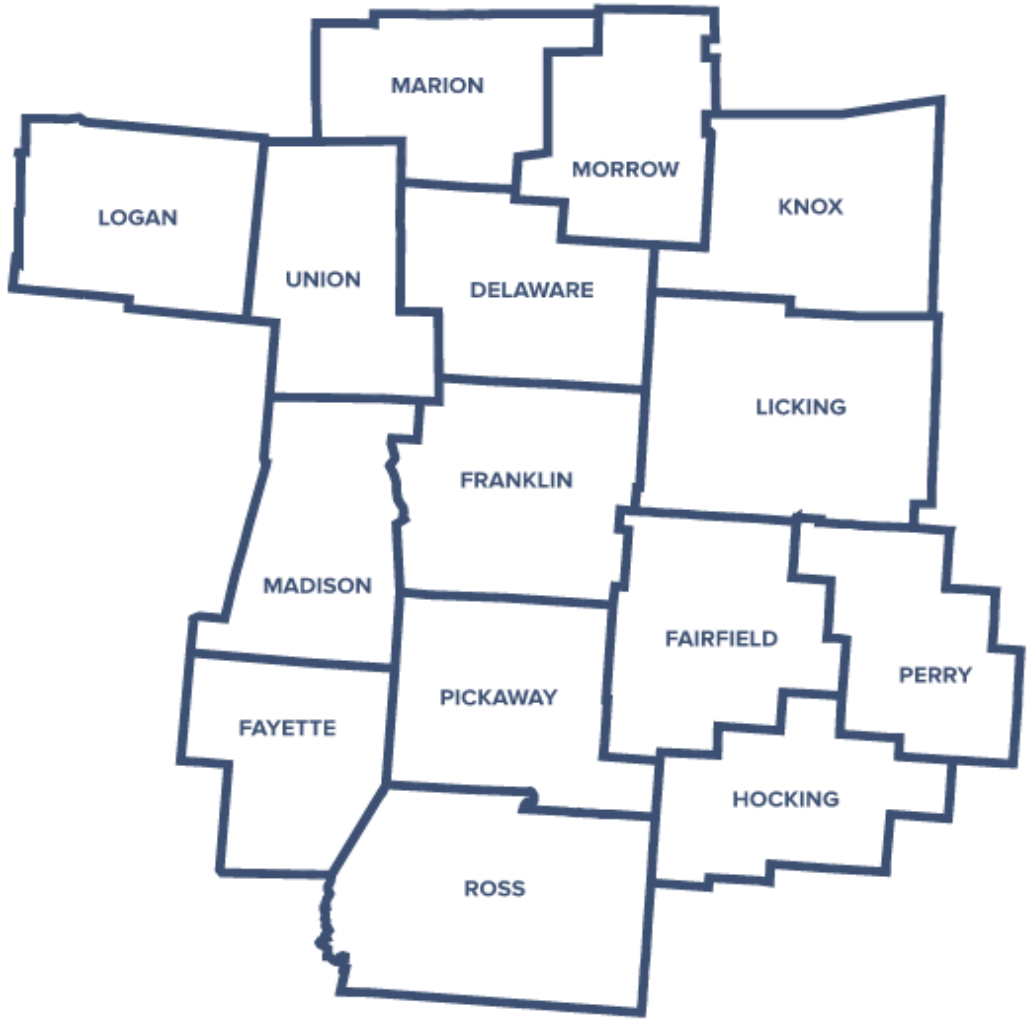
Water Development Authority

Central Ohio Regional Water Study: Logan County

March 1, 2025

Agenda

- Introduction
- Current Conditions
- Future Conditions
- Needs Analysis
- Resource Gaps and Potential Project Options
- Areas of Opportunity
- Water Quality



Introduction

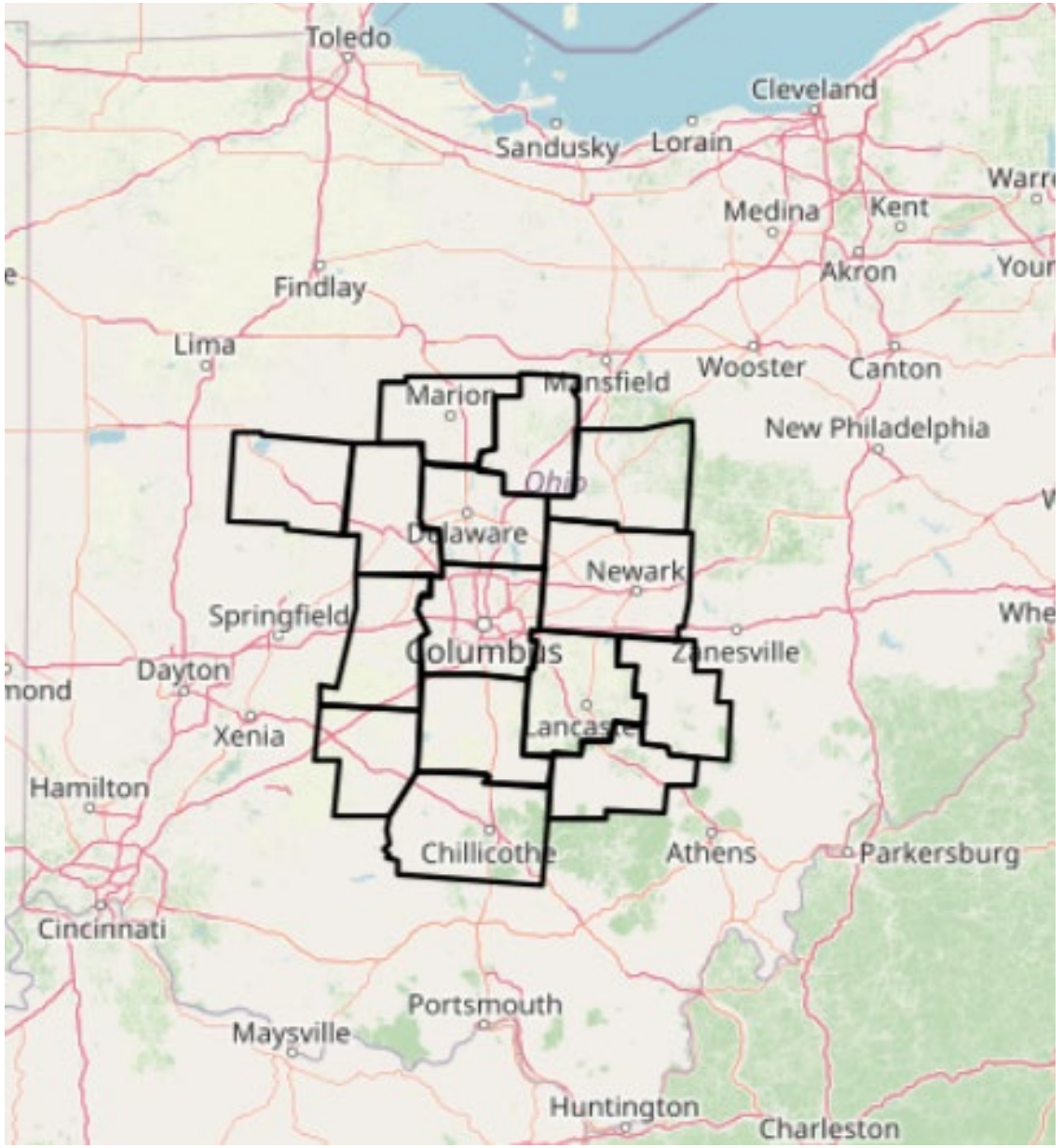
Central Ohio Regional Water Study

Overview

Integrated water resources and infrastructure model

15-county area

Goal: Identify opportunities and gaps in system's ability to meet local and regional water needs under potential future conditions (2030, 2040, 2050)



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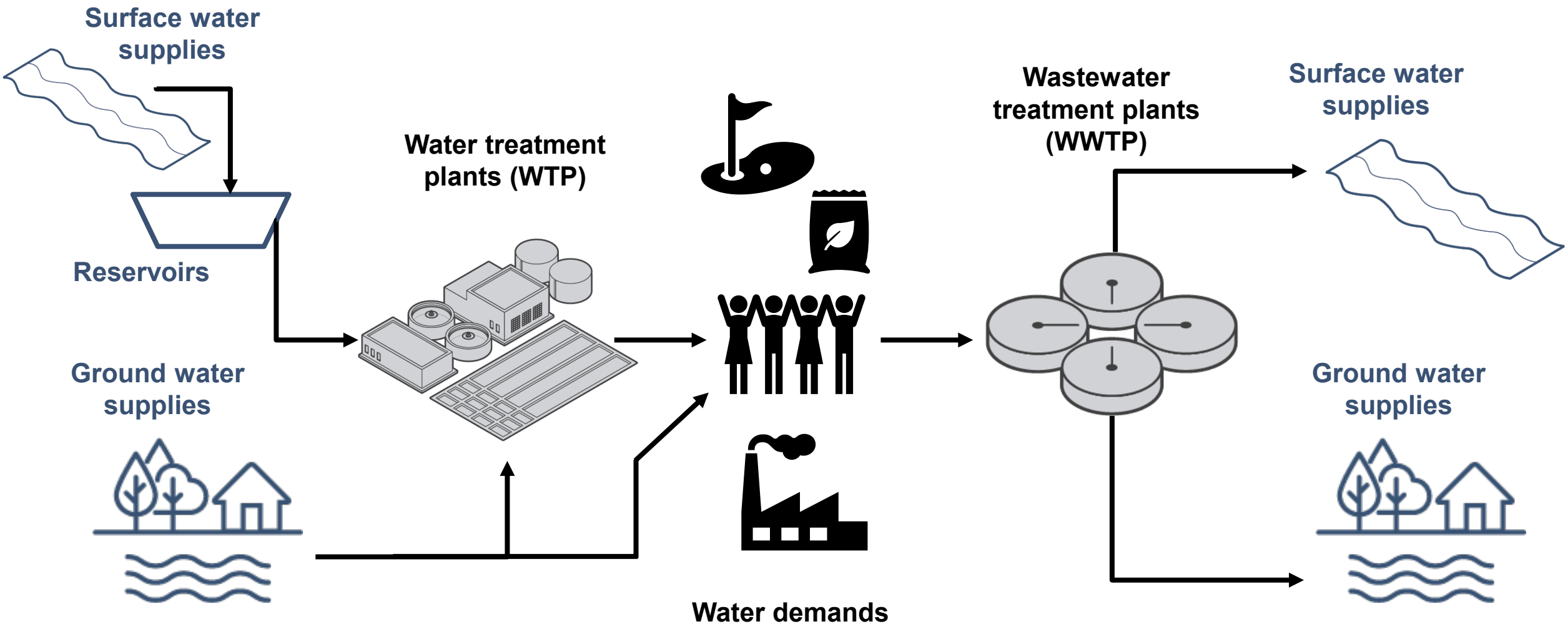
Project Objectives

- Improve, Maintain and Optimize Resources While Planning for Growth
- Identify Opportunities for Collaboration and Regionalization
- Maximize Funding Impacts through Sustainable Infrastructure Improvements
- Identify Future Needs

Introduction

Central Ohio Regional Water Study

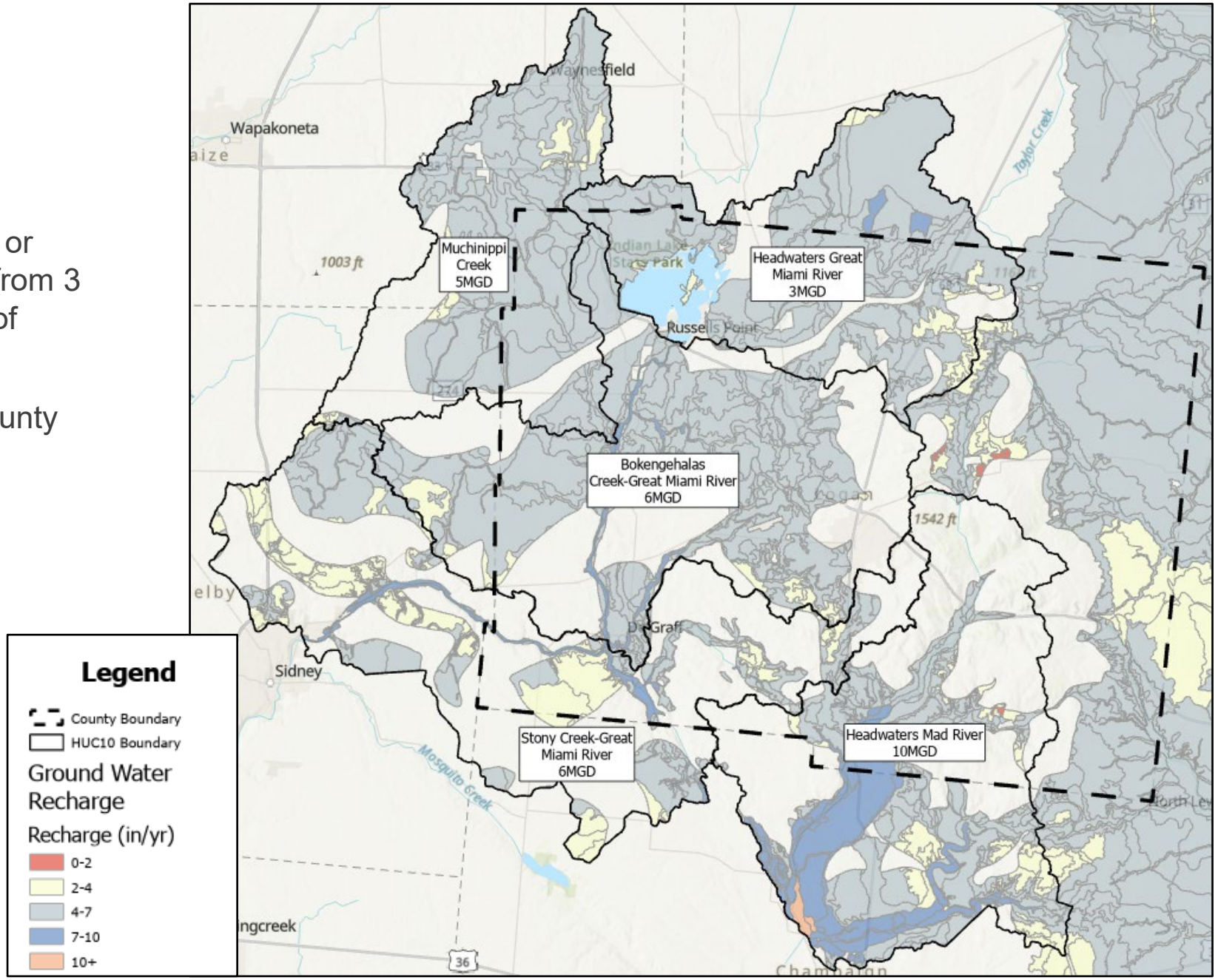
Model Components



Logan County

Ground Water Availability

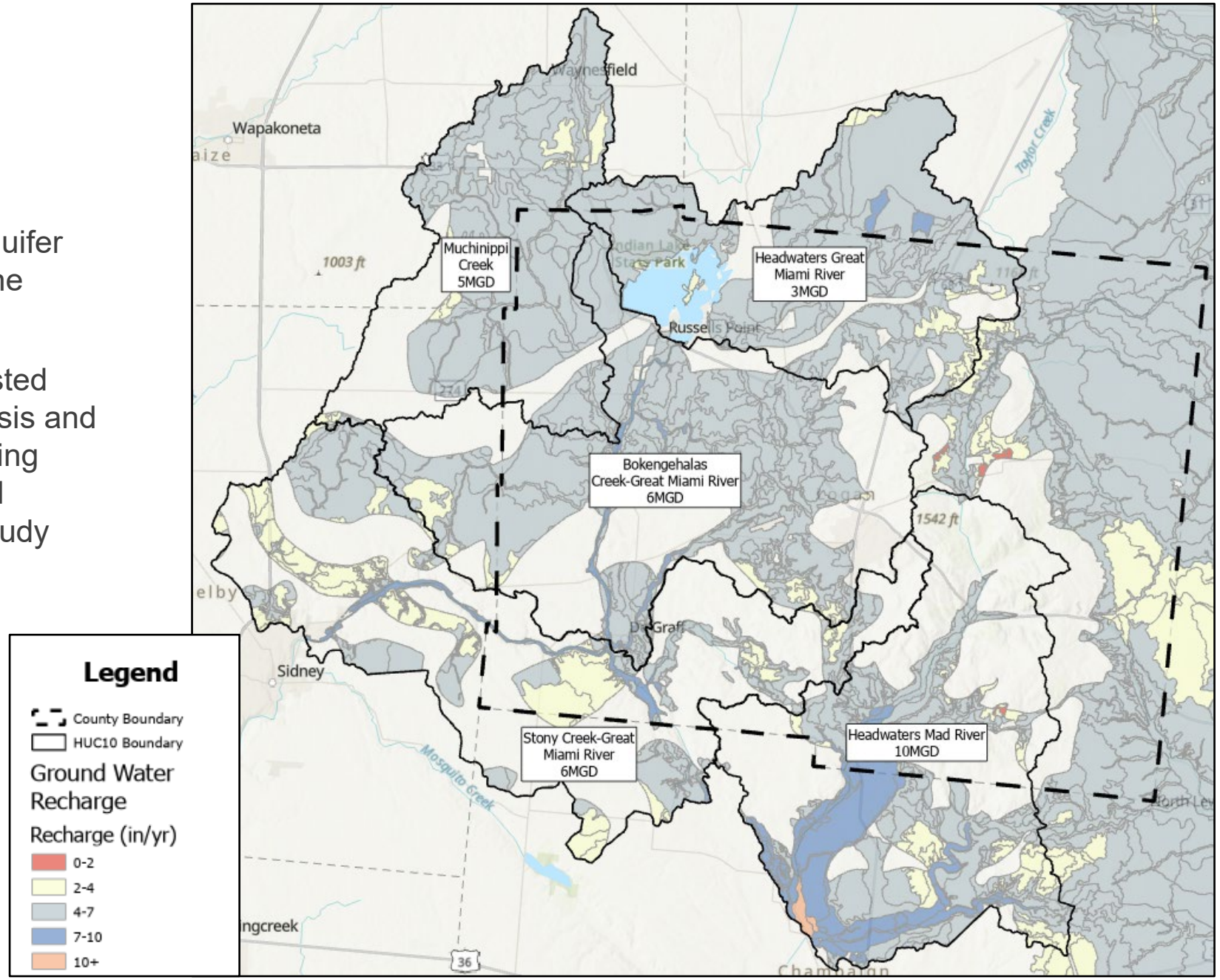
- Ground water supplies within or nearby Logan County range from 3 to 10 million gallons per day of availability per HUC10
- Total of 30 MGD in Logan County



Logan County

Ground Water Availability

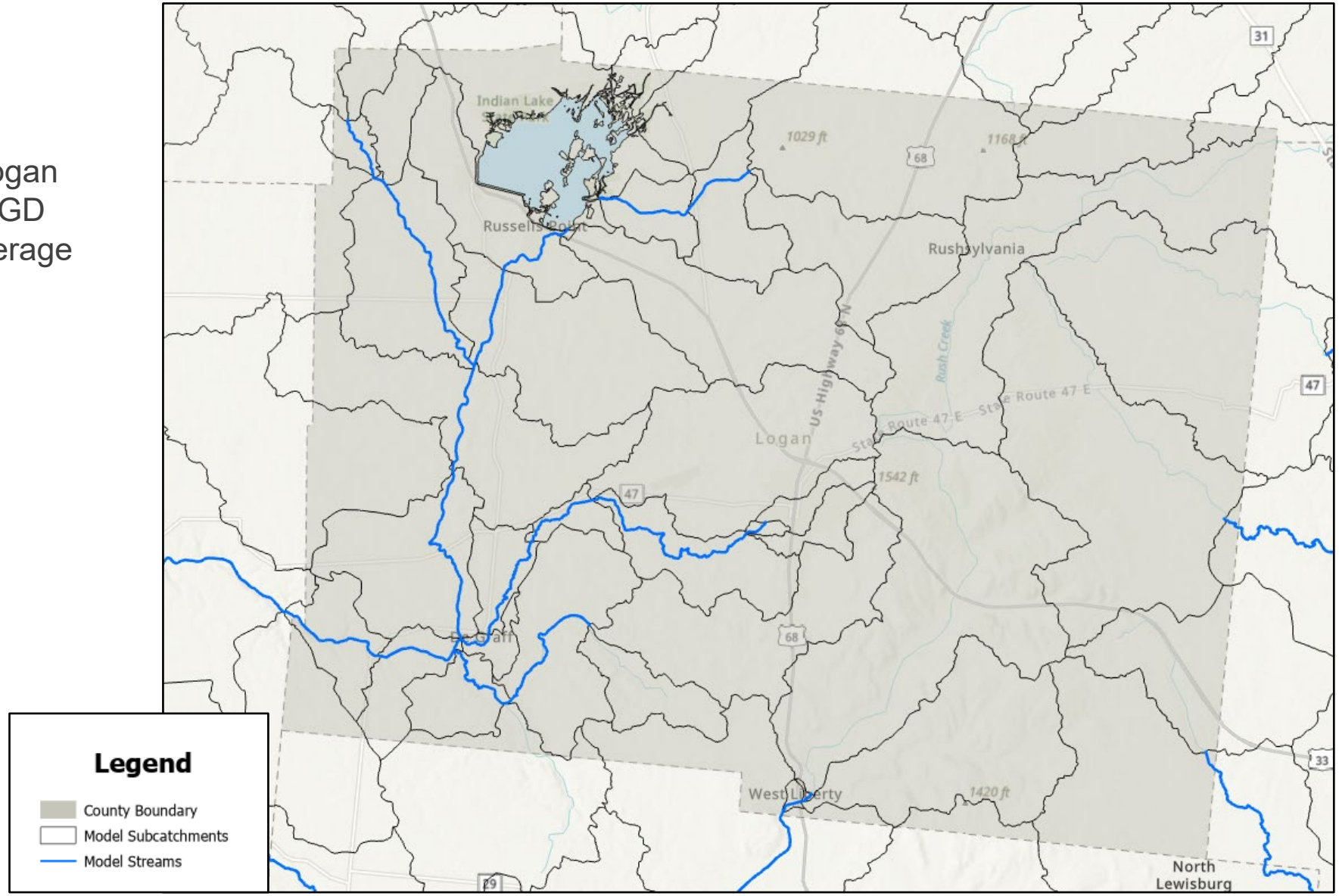
- Each HUC10 has unique aquifer characteristics that determine ground water availability.
- Eagon and Associates assisted with the ground water analysis and provided information regarding ground water resources and conditions throughout the study area.



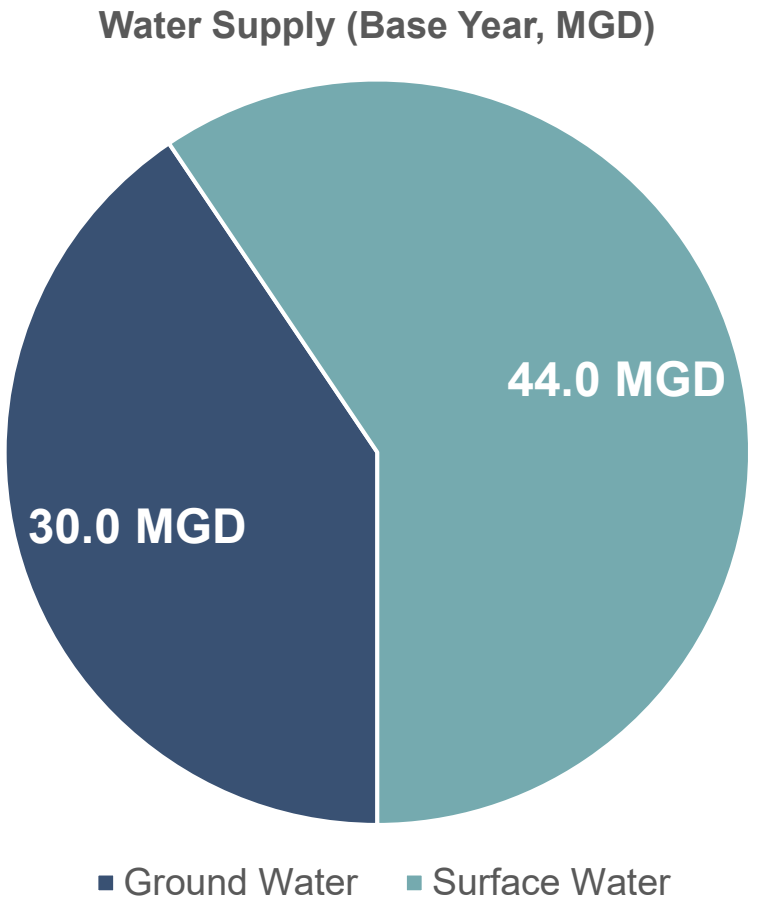
Logan County

Surface Water Availability

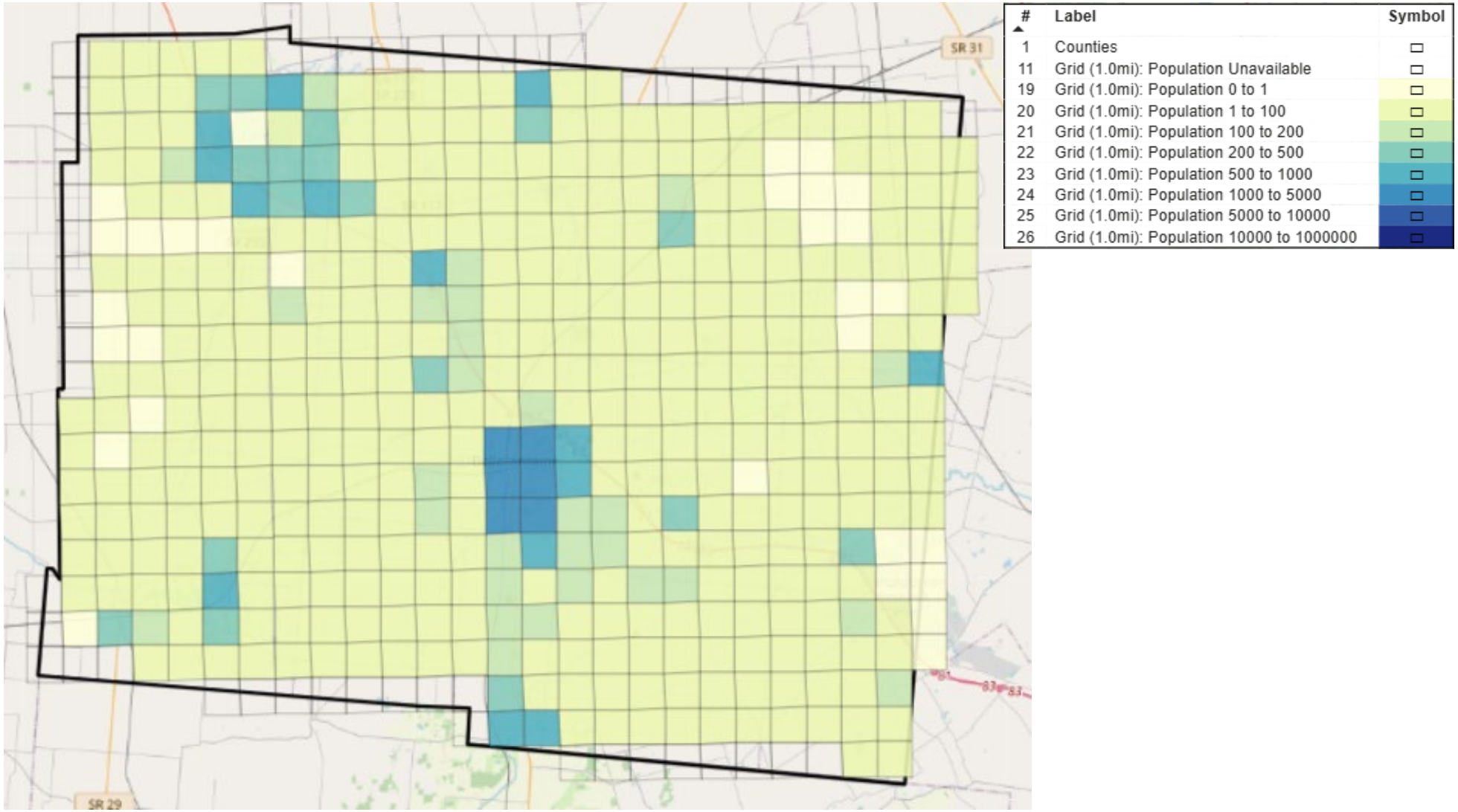
- Surface Water supplies in Logan County total to roughly 44 MGD for the minimum monthly average



Current Conditions: Supply Availability



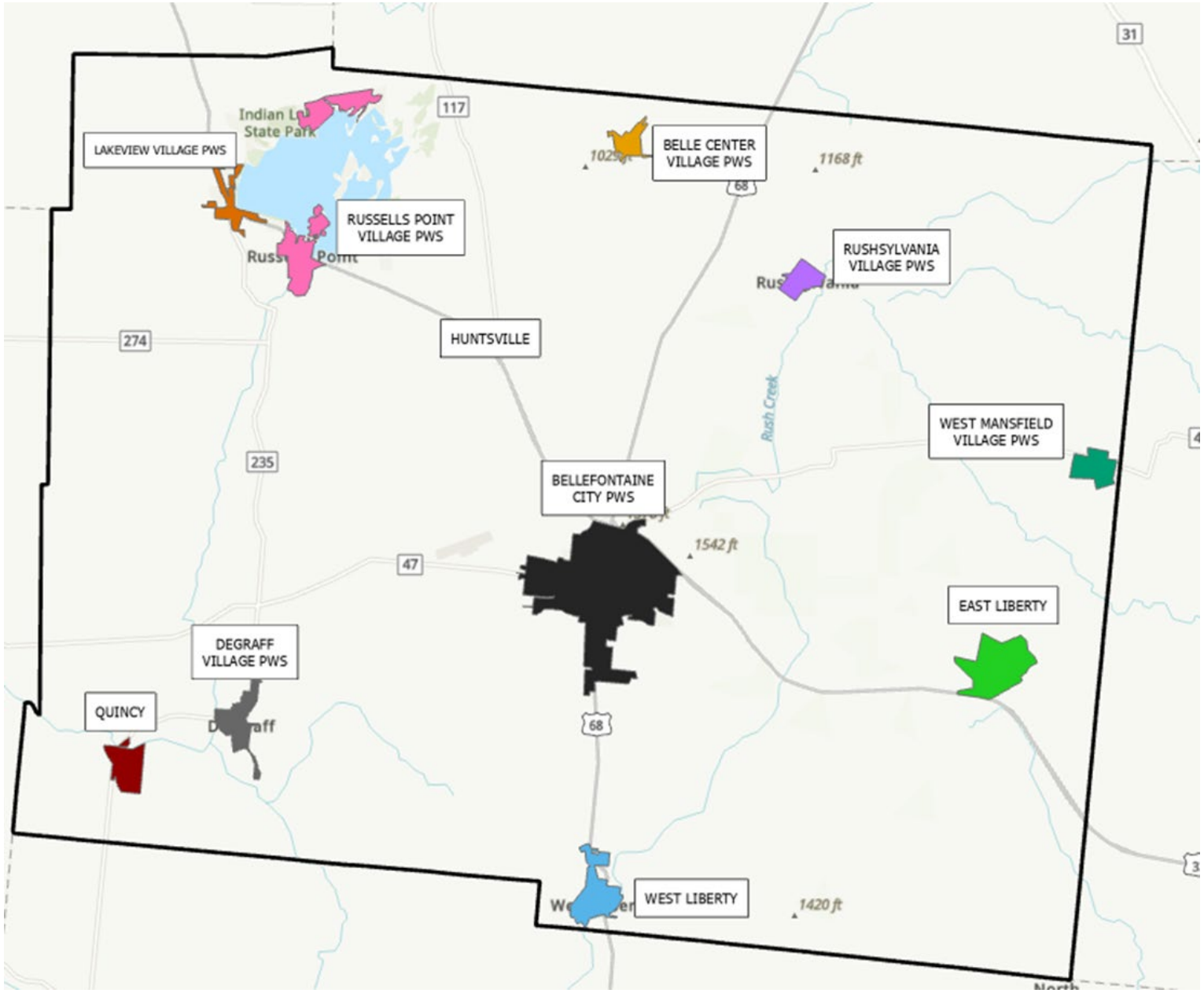
Current Conditions: Community Composition



Base Year (2021) Population

Logan County

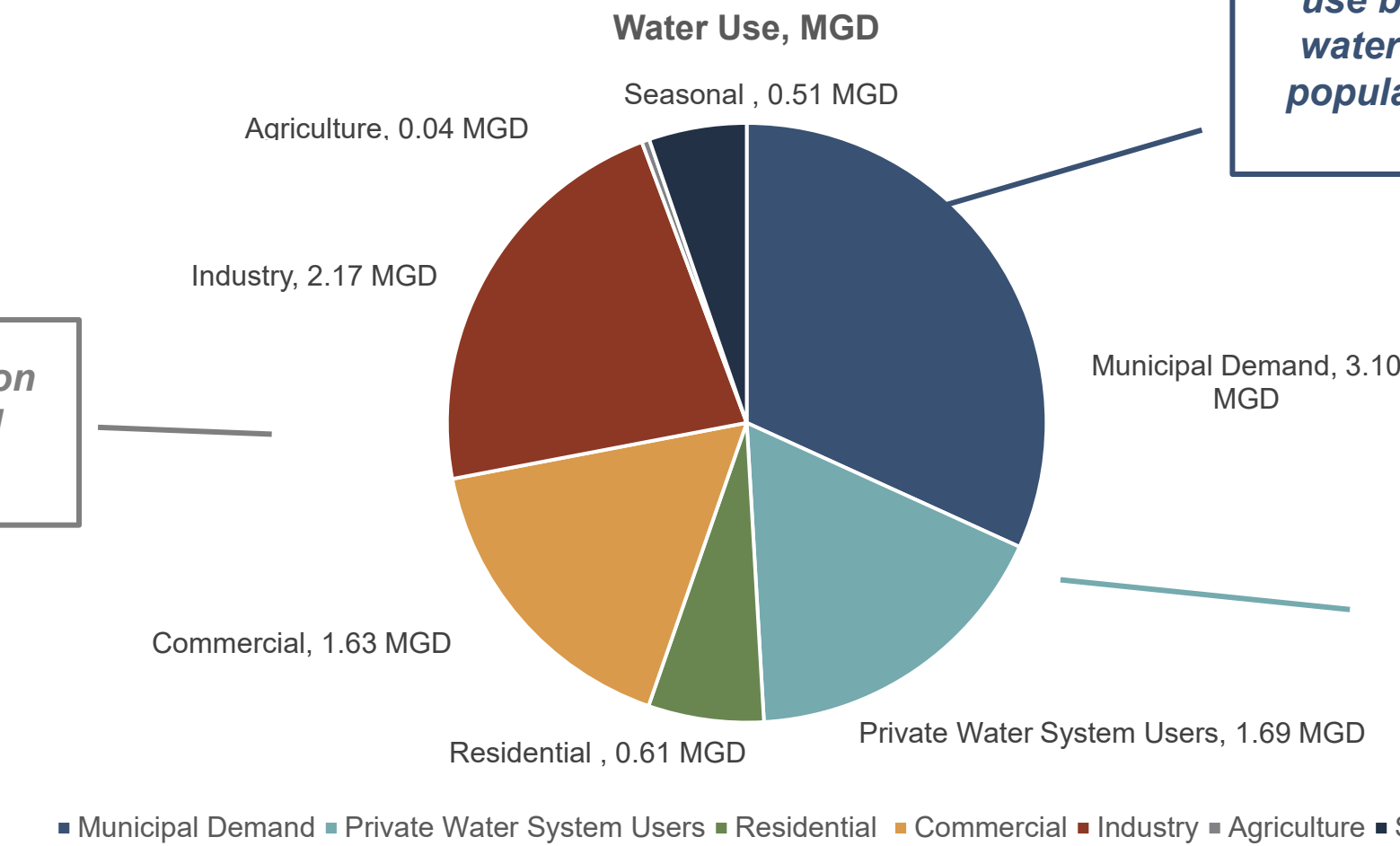
Assumed Water/Wastewater Service Areas



Current Conditions: Water Demands

Max Month, 9.75 MGD Total

Estimated per capita water use based on current water production and population served by a utility



Estimated based on recent historical withdrawals

Estimated using population x 70 gal/person/day (Well Users)

Current Conditions: Wastewater Flows

Max Annual Average Wastewater Flow = 4.7 MGD

Current Conditions: Infrastructure

Water Treatment Plant Capacity
7.5 MGD
(100% ground water)

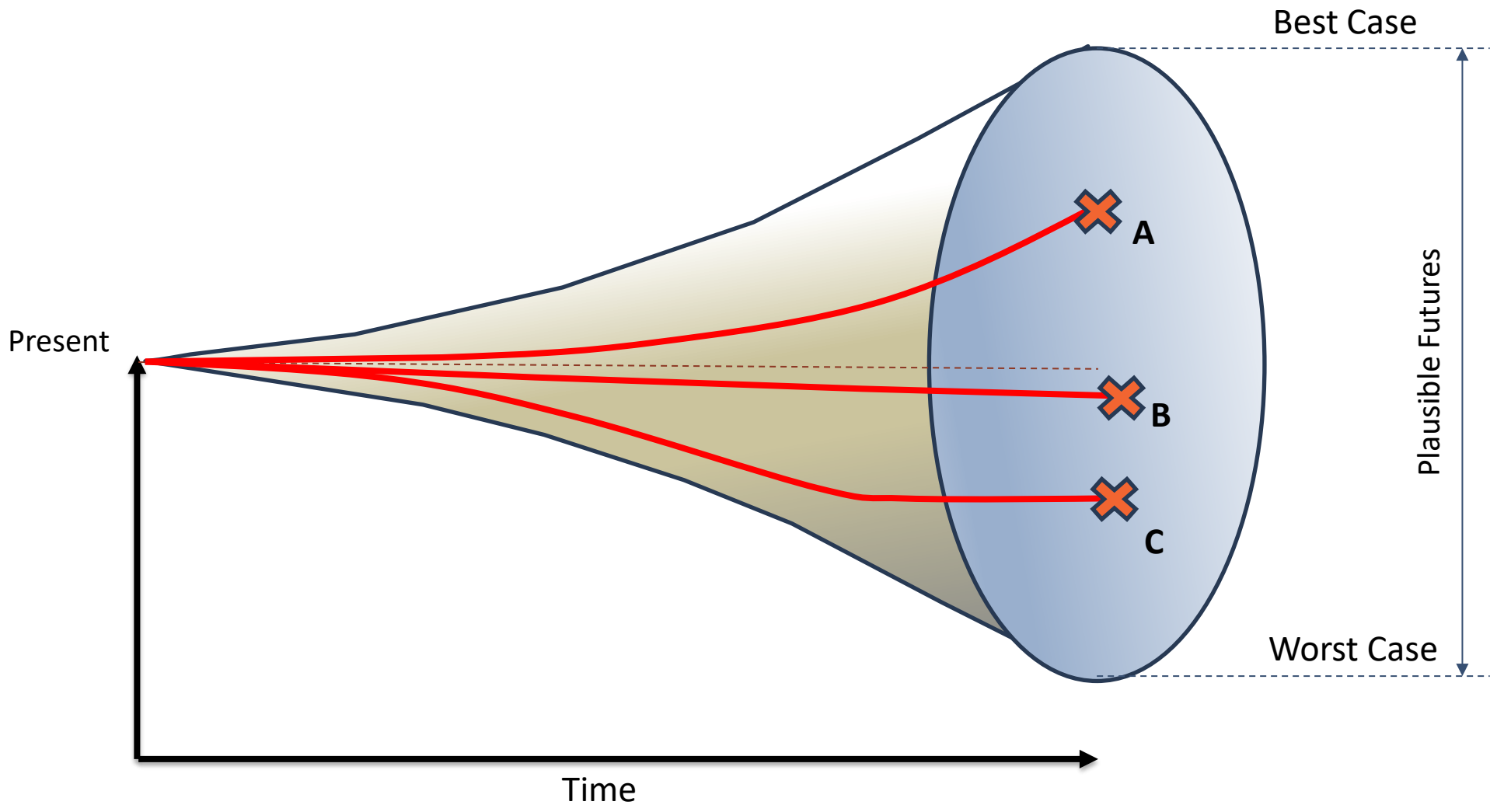
Wastewater Treatment Plant Capacity
10.2 MGD

Recall that max annual average wastewater flows are ~4.7 MGD

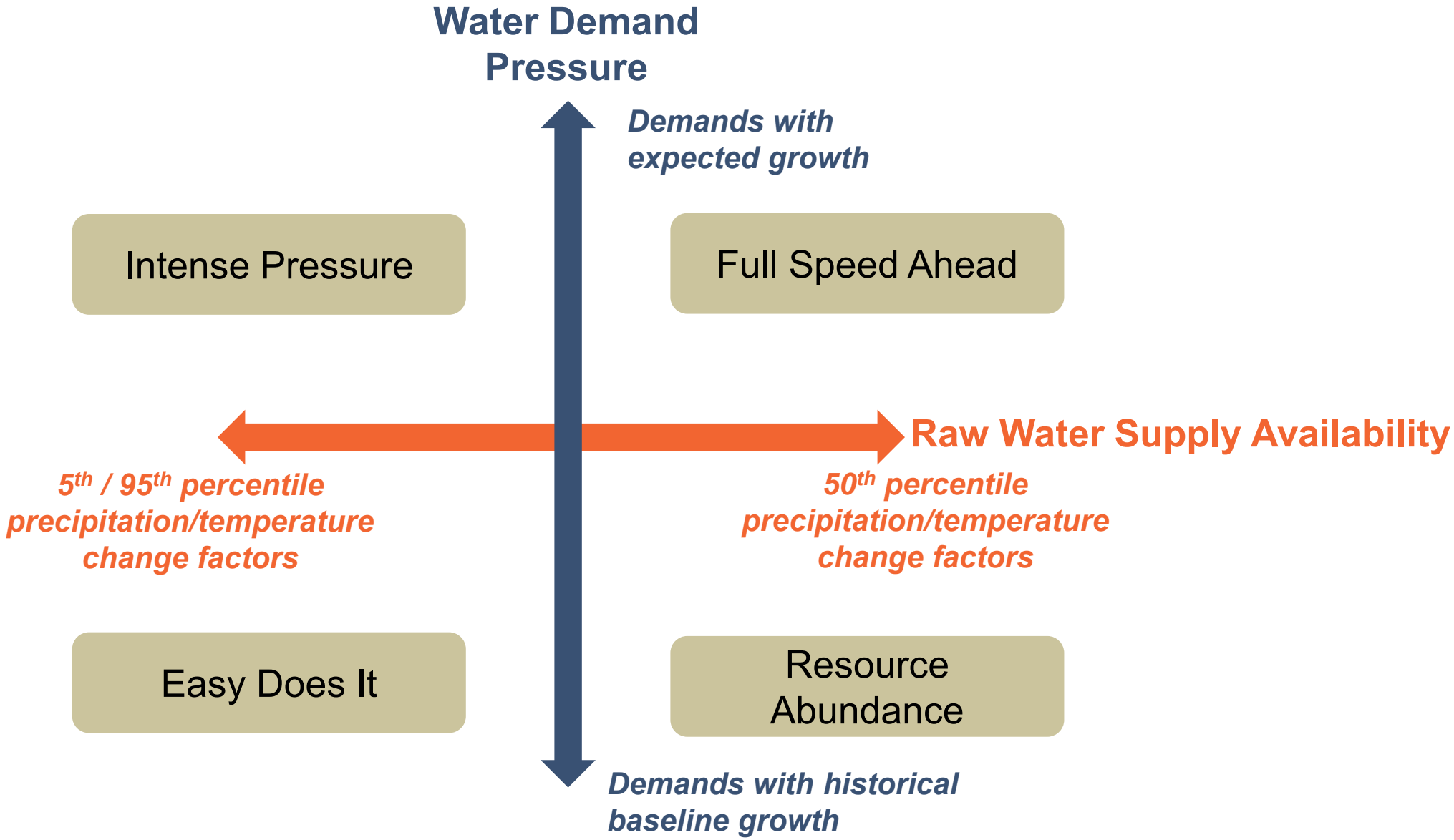
Recall that total max water demands are ~9.8 MGD

Future Conditions

Scenario Planning

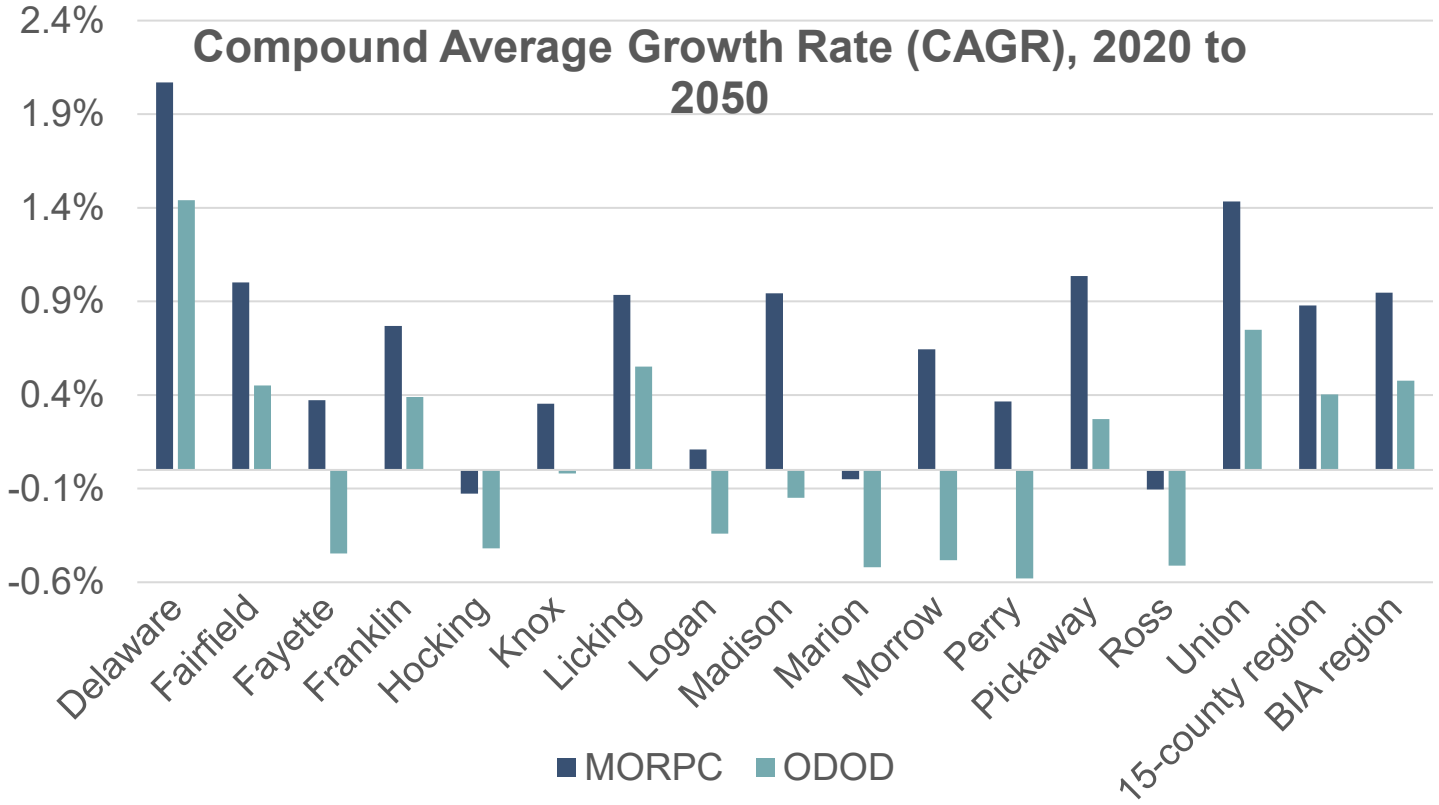


Model Scenarios



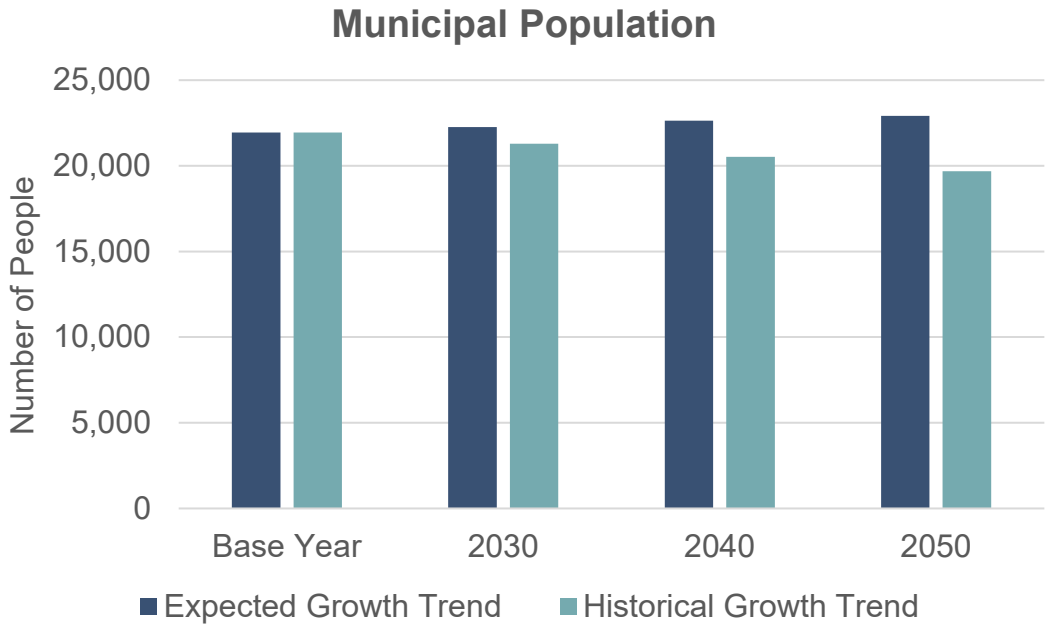
MORPC vs ODOD Population Data

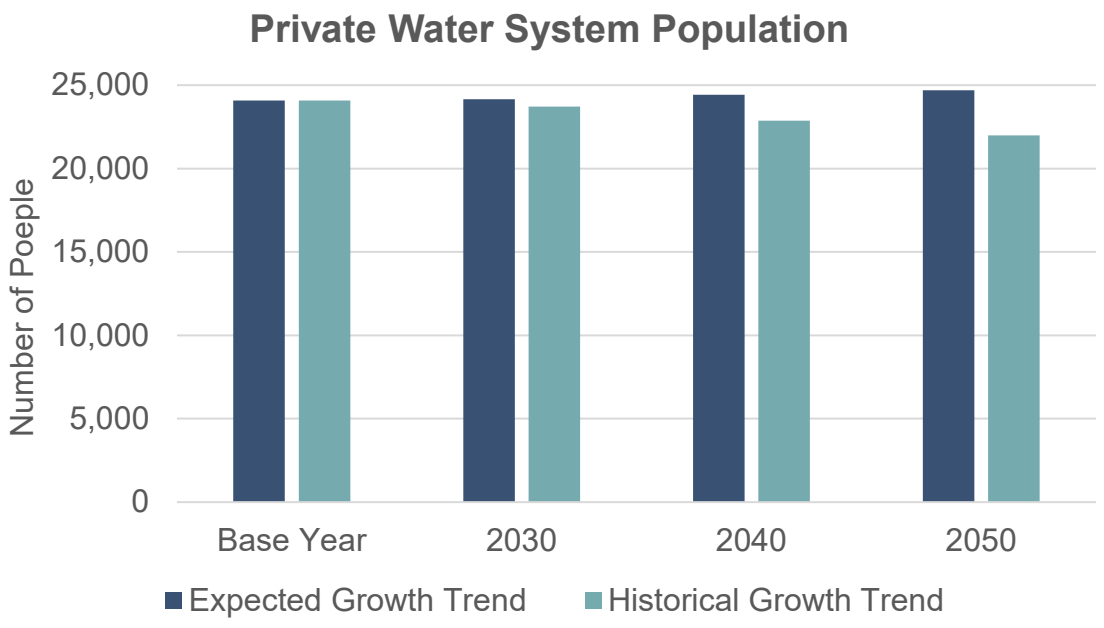
Logan County



	2021 County Population	2050 County Population
MORPC (Expected Growth Trend)	46,035	47,616
ODOD (Historical Growth Trend)	46,035	41,661

Future Conditions: Community Composition

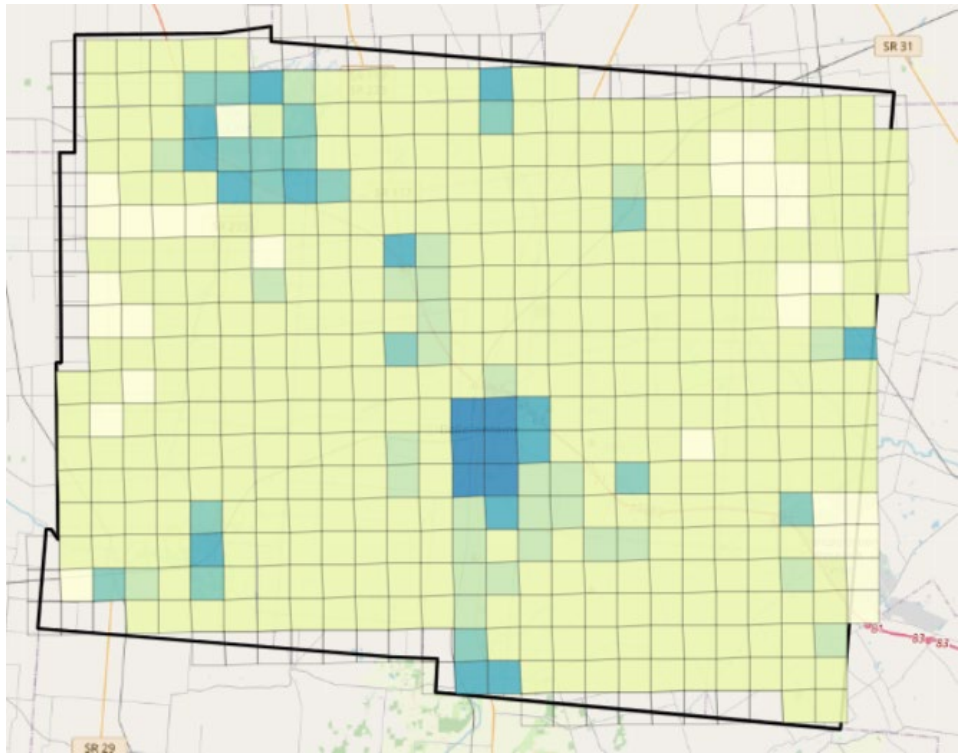




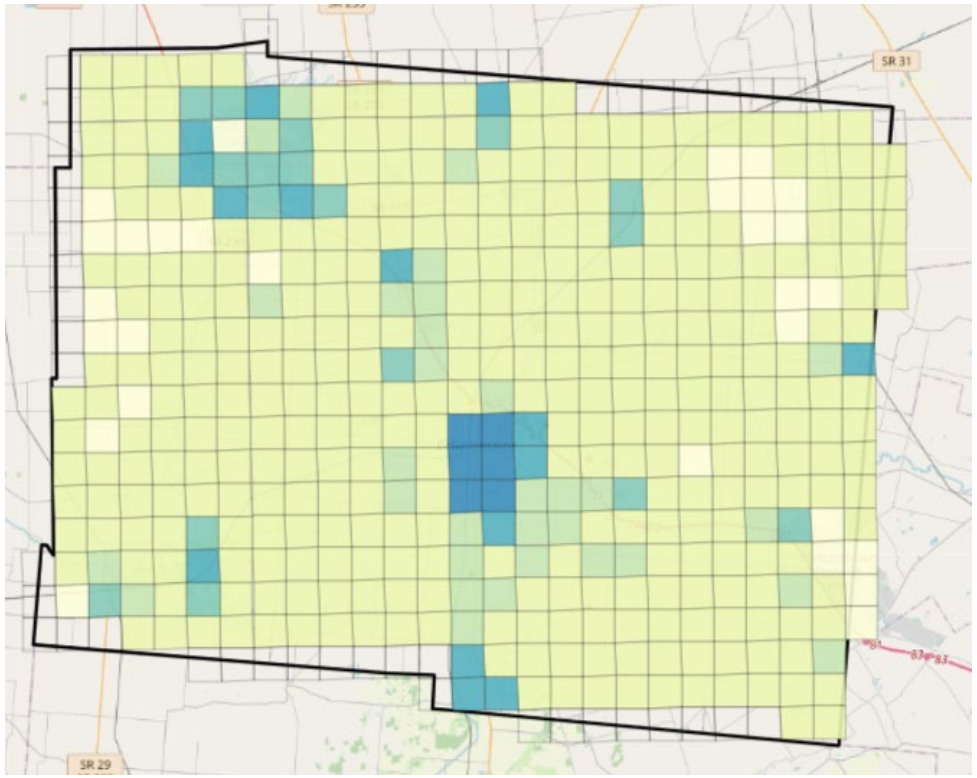
Future Conditions: Community Composition

Logan County

#	Label	Symbol
1	Counties	
11	Grid (1.0mi): Population Unavailable	
19	Grid (1.0mi): Population 0 to 1	
20	Grid (1.0mi): Population 1 to 100	
21	Grid (1.0mi): Population 100 to 200	
22	Grid (1.0mi): Population 200 to 500	
23	Grid (1.0mi): Population 500 to 1000	
24	Grid (1.0mi): Population 1000 to 5000	
25	Grid (1.0mi): Population 5000 to 10000	
26	Grid (1.0mi): Population 10000 to 1000000	



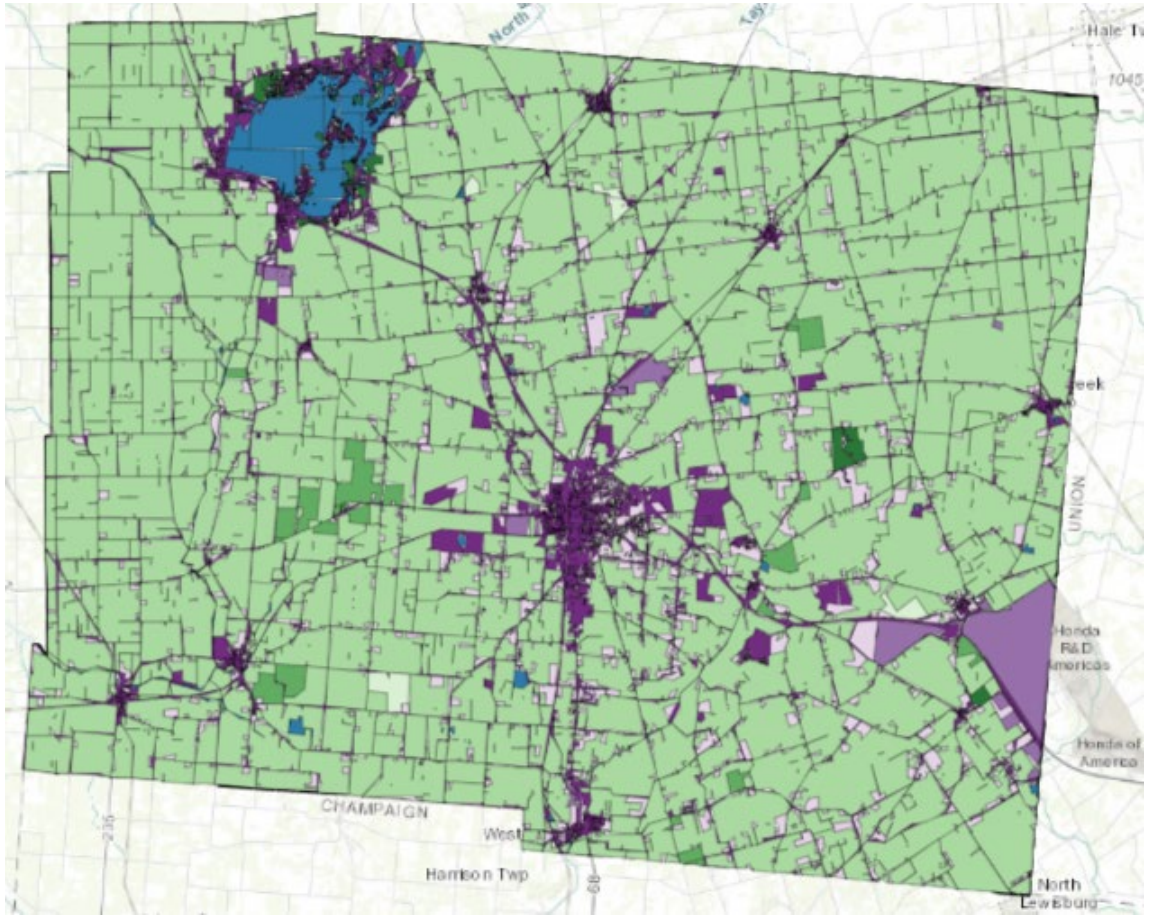
Base Year (2021) Population



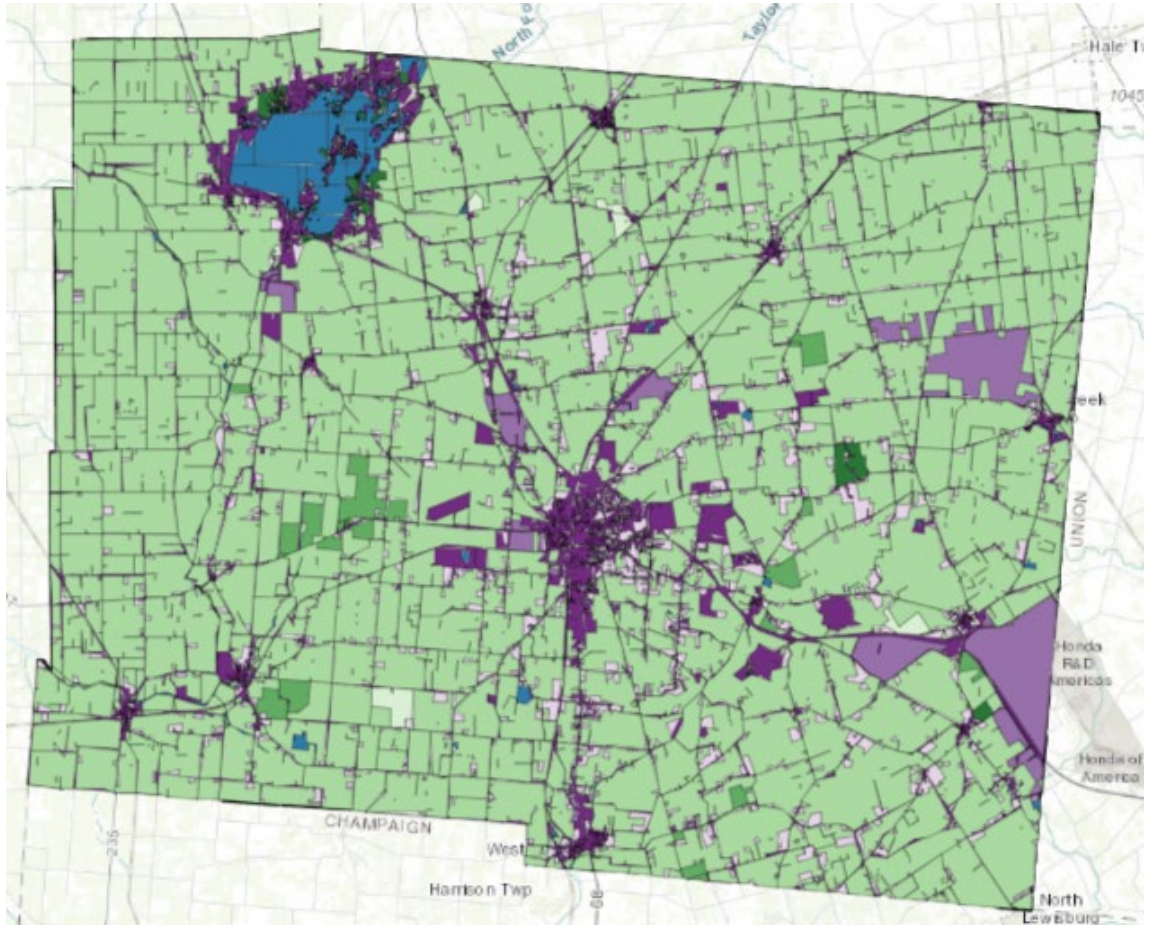
2050 Expected Growth Population

Existing and Future Land Use

#	Label	Symbol
1	Counties	
185	NLCD: 0 None Specified	
186	NLCD: 11 Water	
187	NLCD: 21 Developed Open Space	
188	NLCD: 22 Developed Low Intensity	
189	NLCD: 23 Developed Medium Intensity	
190	NLCD: 24 Developed High Intensity	
191	NLCD: 31 Barren	
192	NLCD: 43 Mixed Forest	
193	NLCD: 71 Grassland	
194	NLCD: 81 Pasture/Hay	

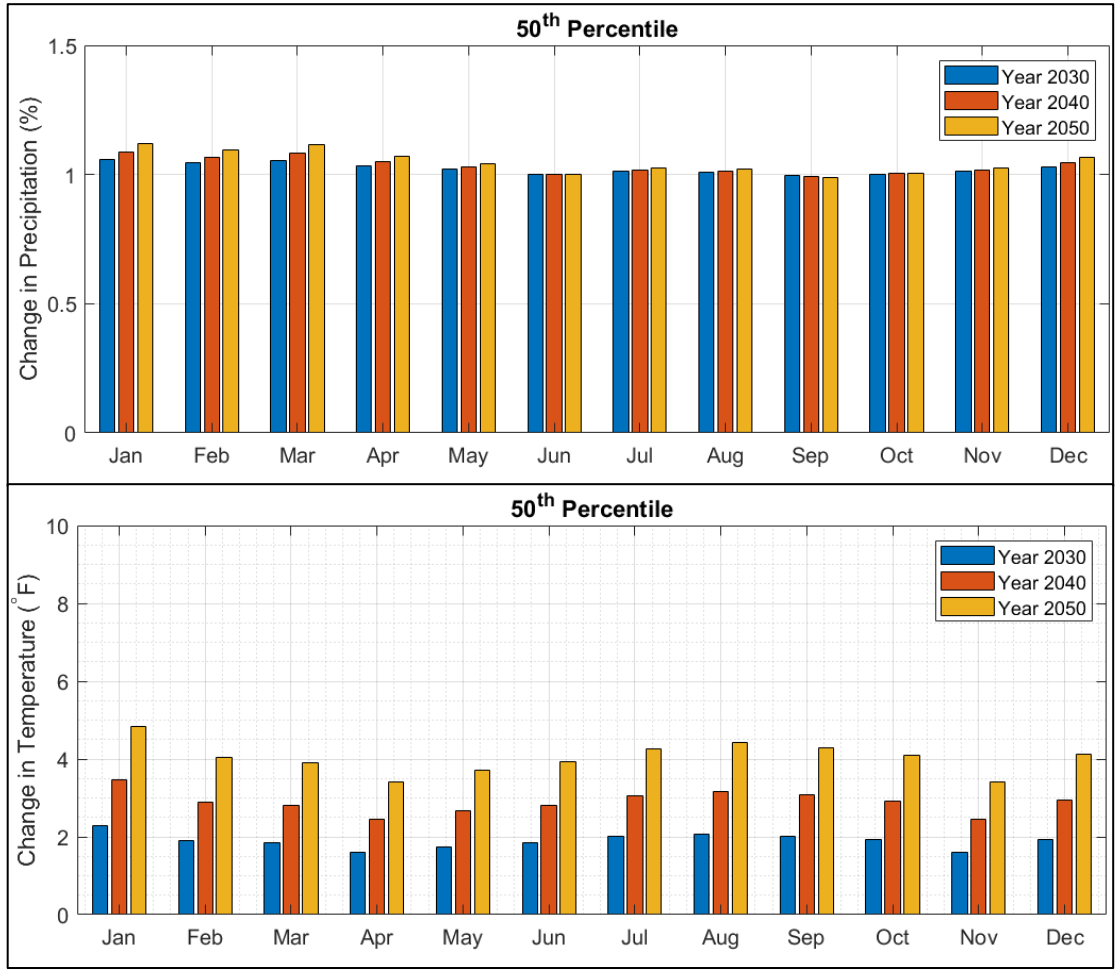


Existing (2021)

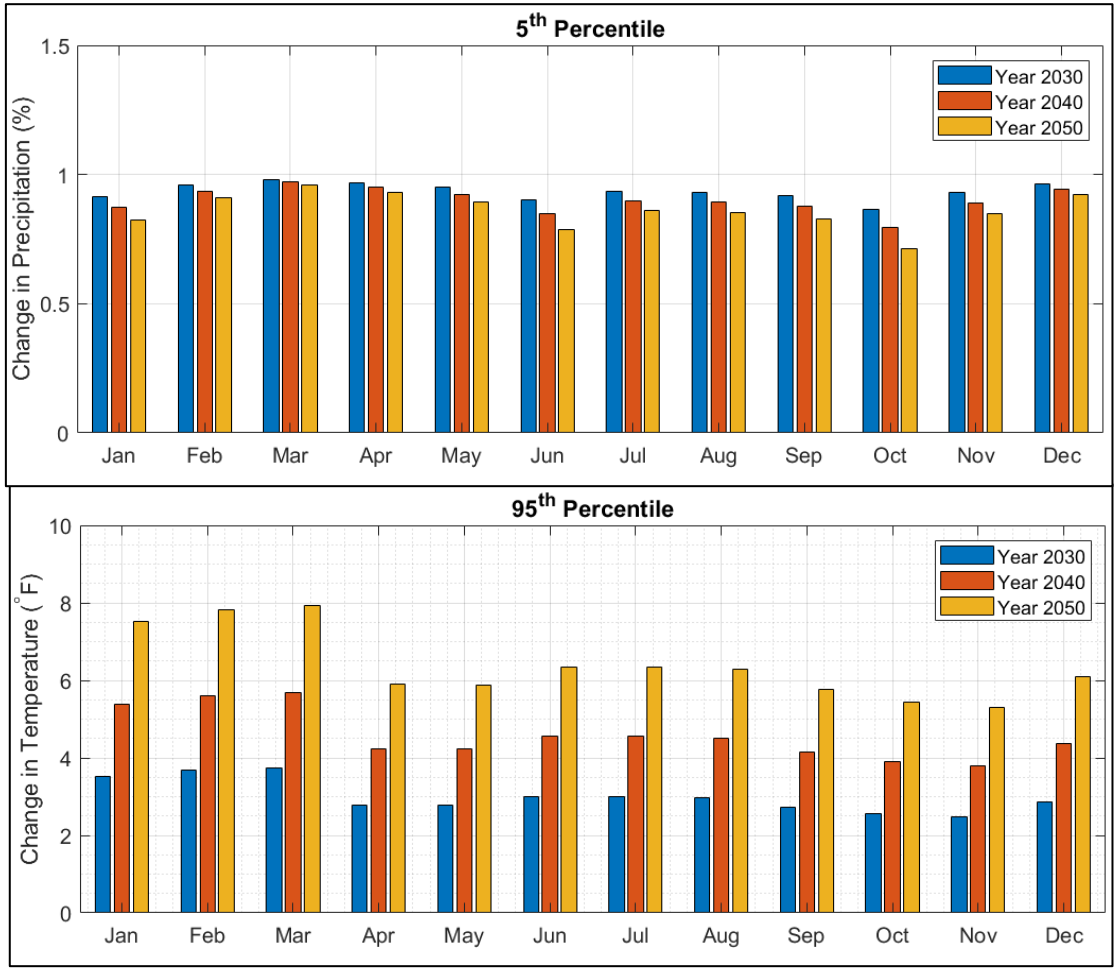


Future (2050)

Future Scenarios – Temperature and Precipitation Change

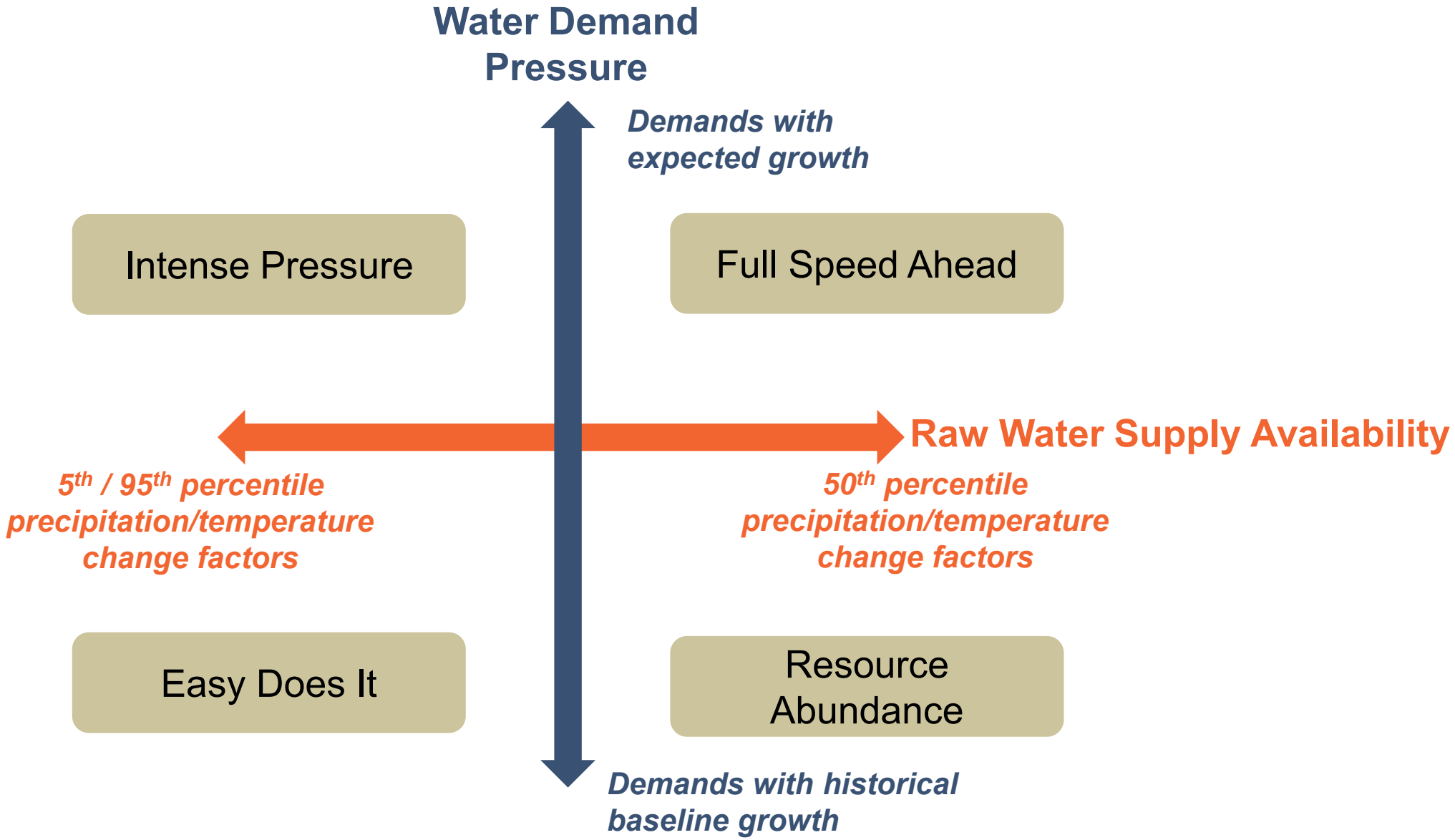


Moderate Change (50th Percentile Temperature and Precipitation)

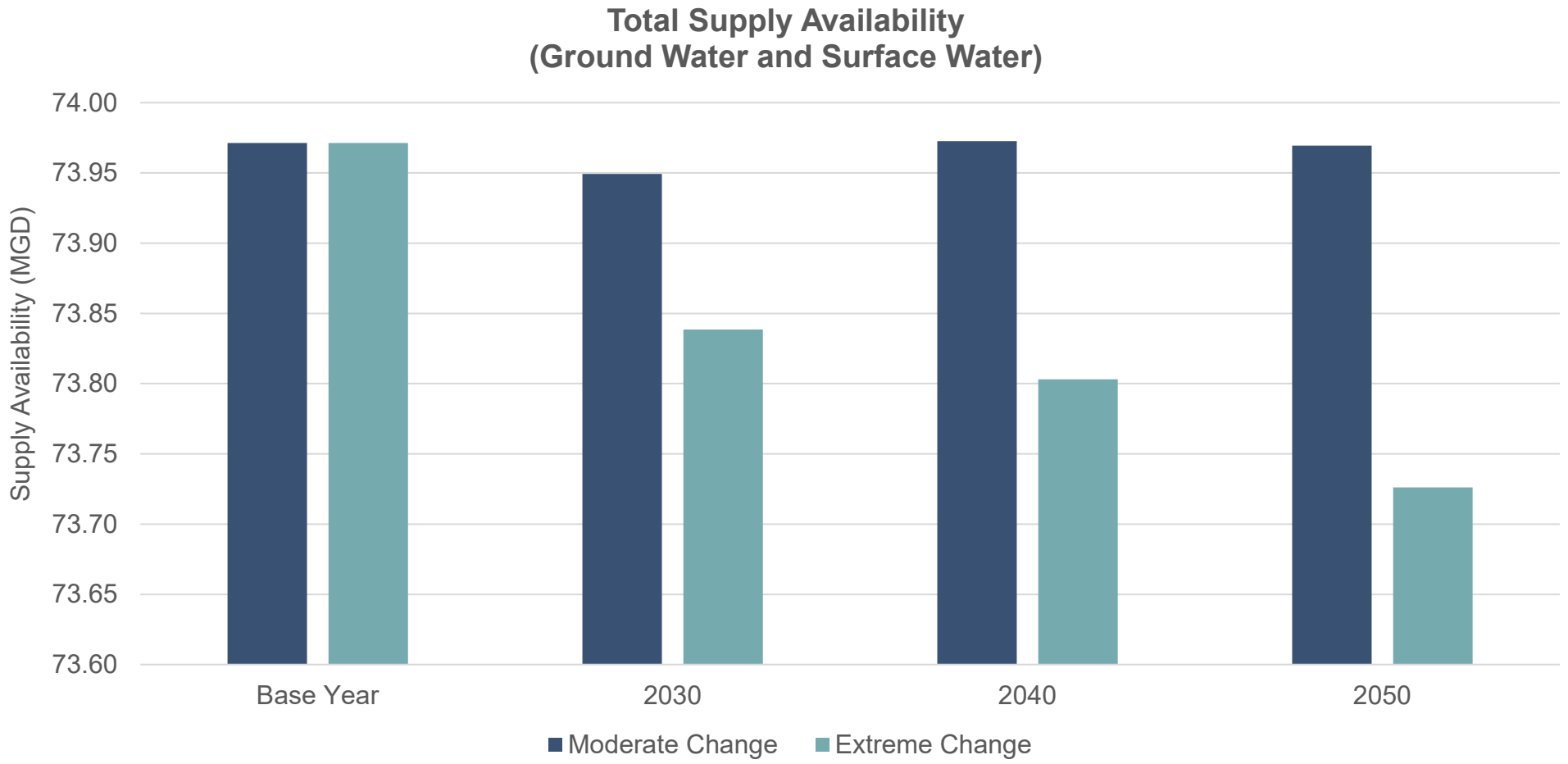


Extreme Change (5th Percentile Precipitation and 95th Percentile Temperature)

Model Scenarios

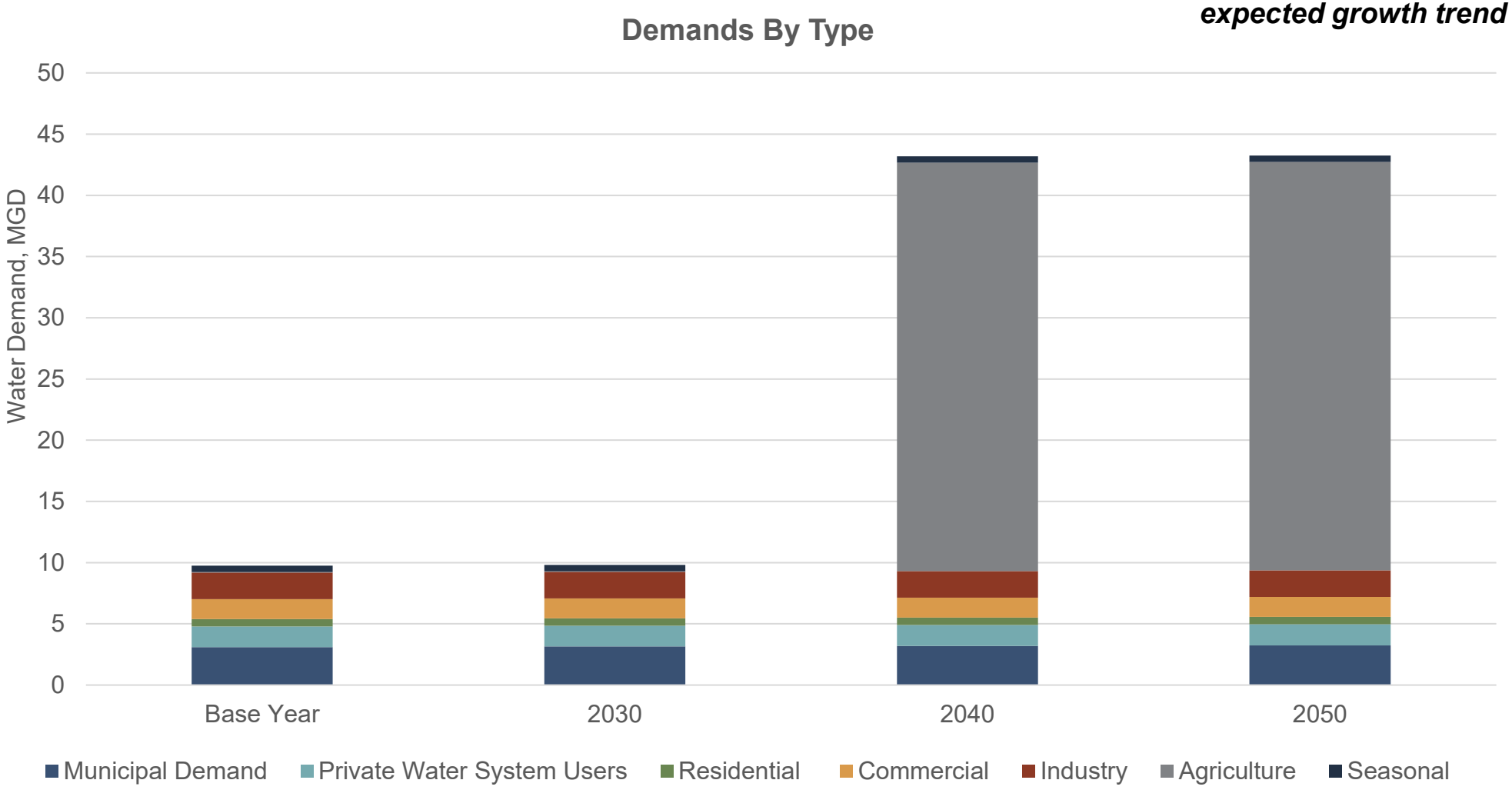


Future Conditions: Supply Availability



Future Conditions: Water Demands

Municipal and private water system growth shown in the graph are based on the expected growth trend



Agricultural Irrigation Demands

- OSU professor estimates that by 2040 irrigation will be more widespread, driven by increasing temperatures
- Estimated + 5-inches per year, supplemented in critical growing season (July / August / September)
- Increases annual ground water demand by 9.15 BG across the entire 15-county area (0.02 MG to 1.16 BG per year at HUC-10 level)

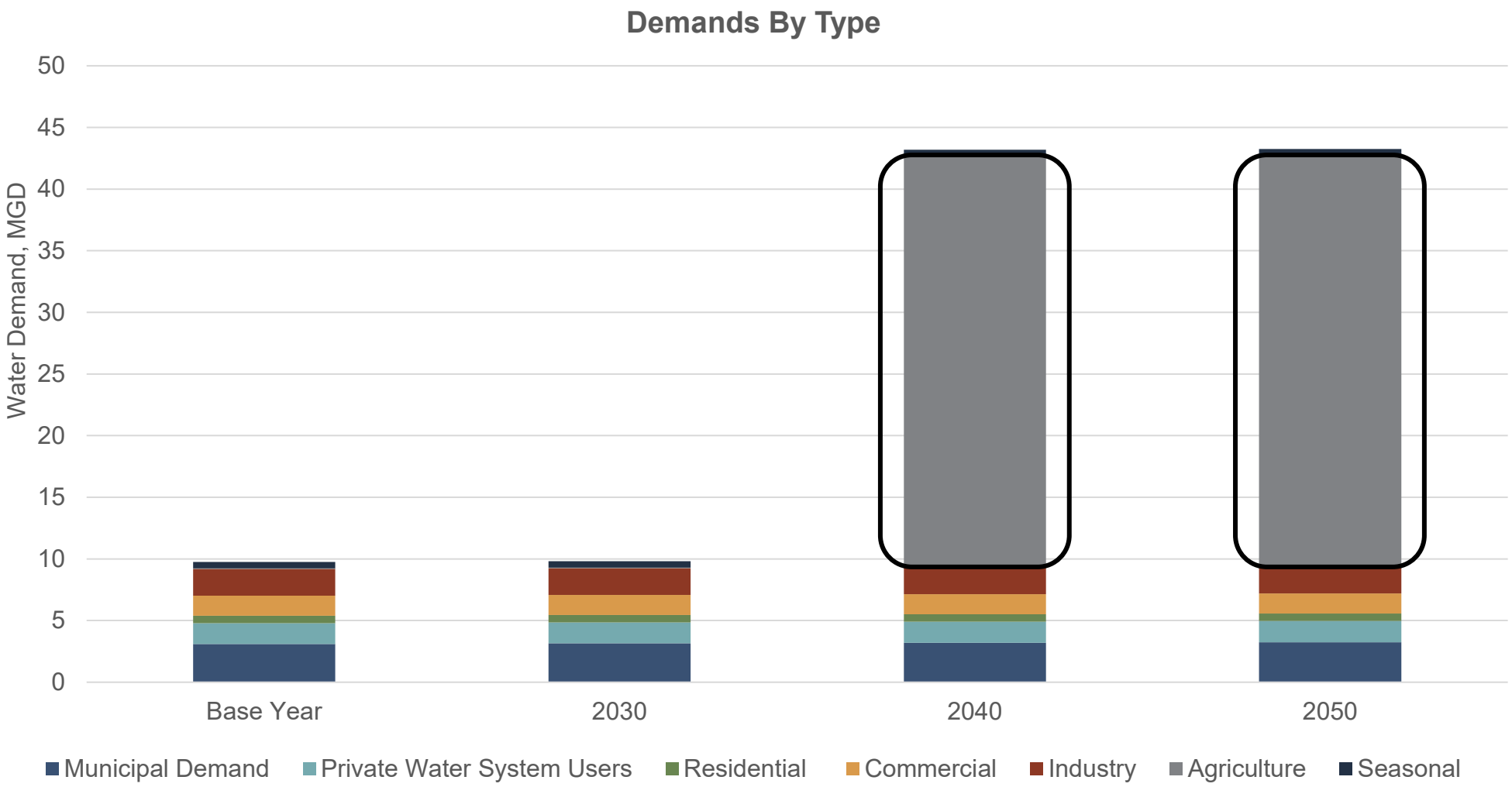
Ohio's Country Journal

Irrigation in Ohio?

The 23-tower pivot on Imboden's farm is the largest in the Midwest. Like his other irrigation pivots, it is accompanied by big benefits and big challenges.

Future Conditions: Agriculture Water Demands

Municipal and private water system growth shown in the graph are based on the expected growth trend



Future Conditions: Infrastructure

WTP Capacity
7.5 MGD

No Assumed Projects by 2030

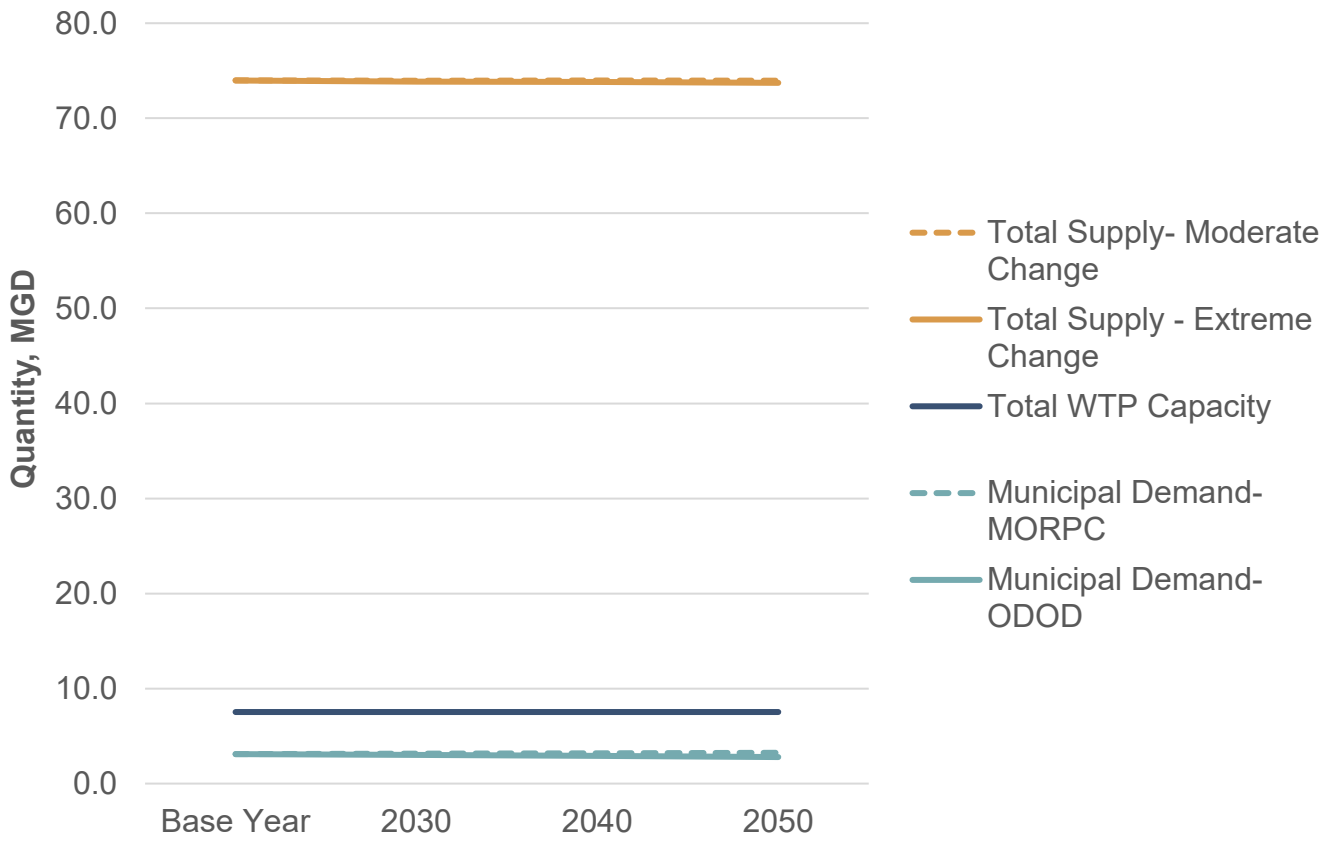
WWTP Capacity
10.2 MGD

No Assumed Projects by 2030

Needs Analysis

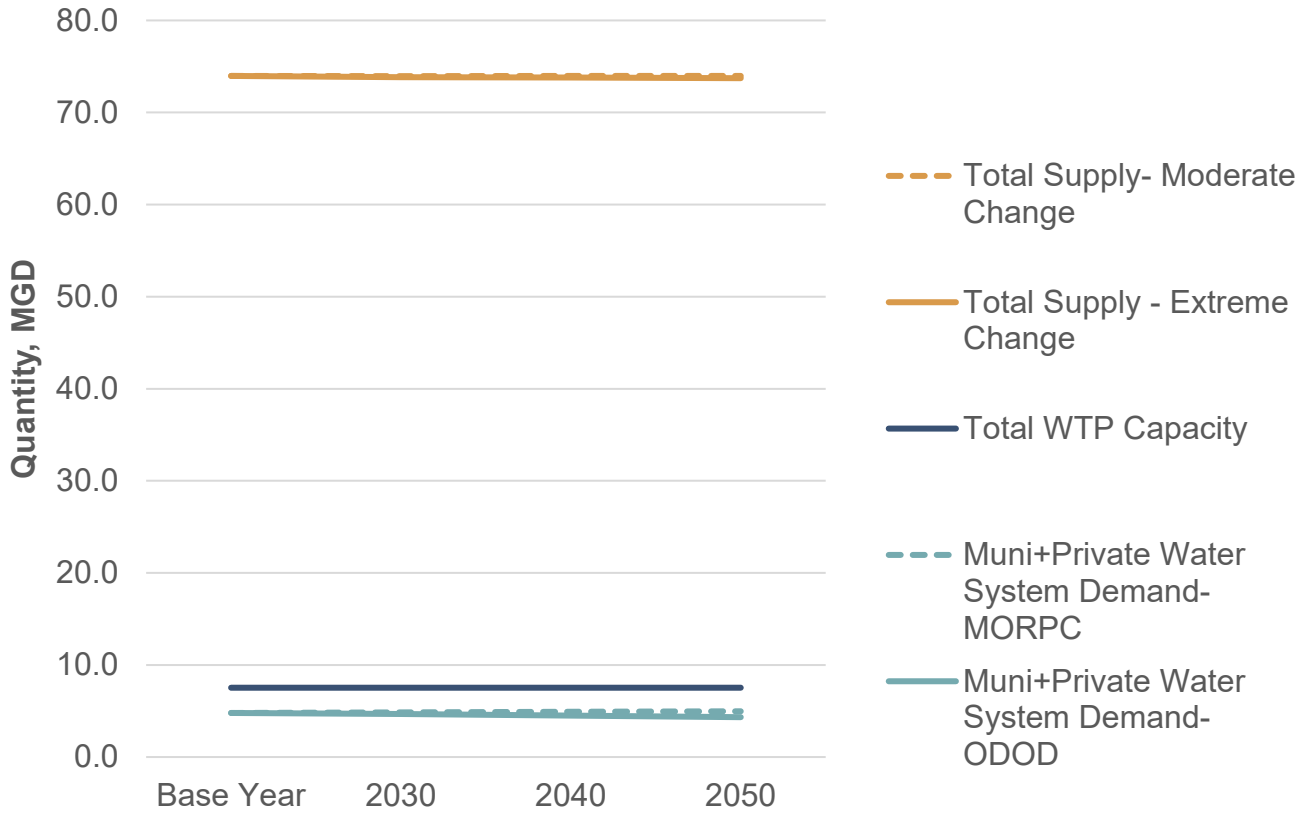
Needs Analysis: Municipal Water Demands

- Existing raw water supplies and water treatment capacity are sufficient to meet future municipal demands ***at the county-level***



Needs Analysis: Municipal + Private Water System Water Demands

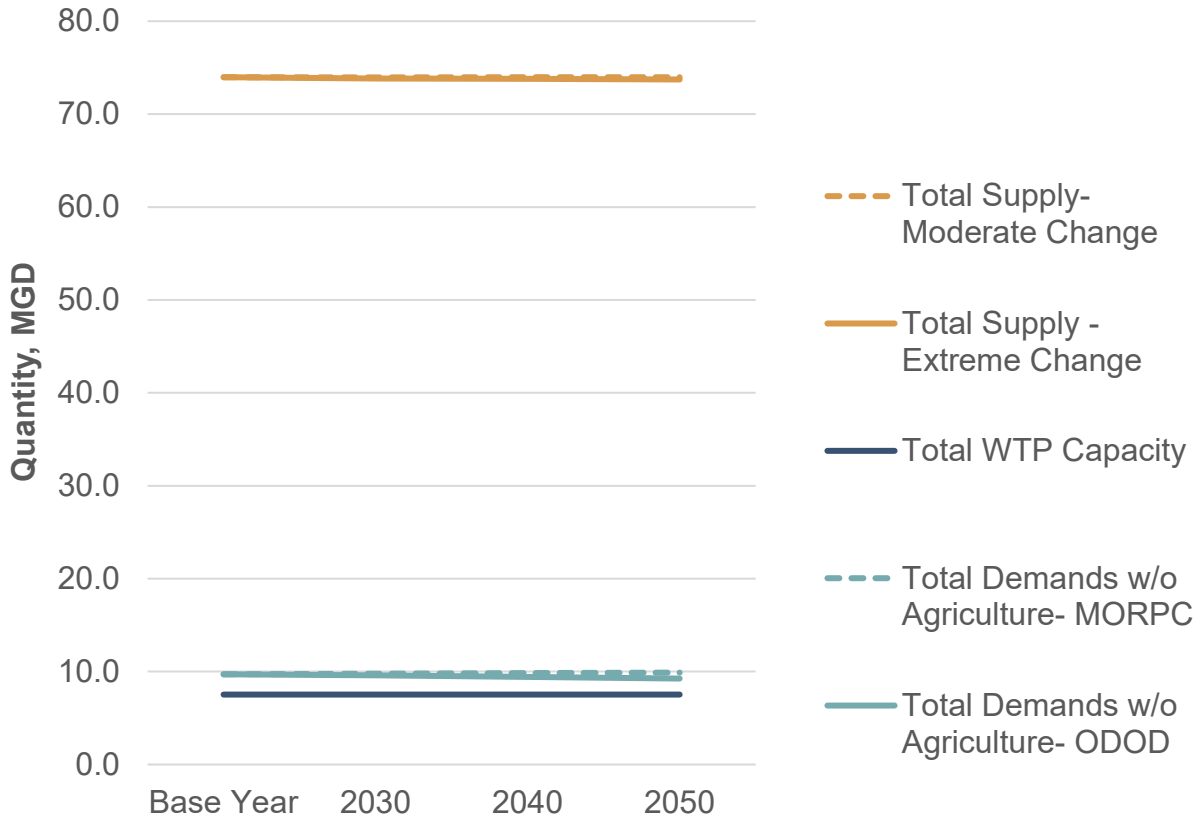
- Existing raw water supplies and water treatment capacity are sufficient to meet future municipal demands and private water system demands ***at the county-level***



Needs Analysis: Municipal + Private + Non-Municipal Water Demands

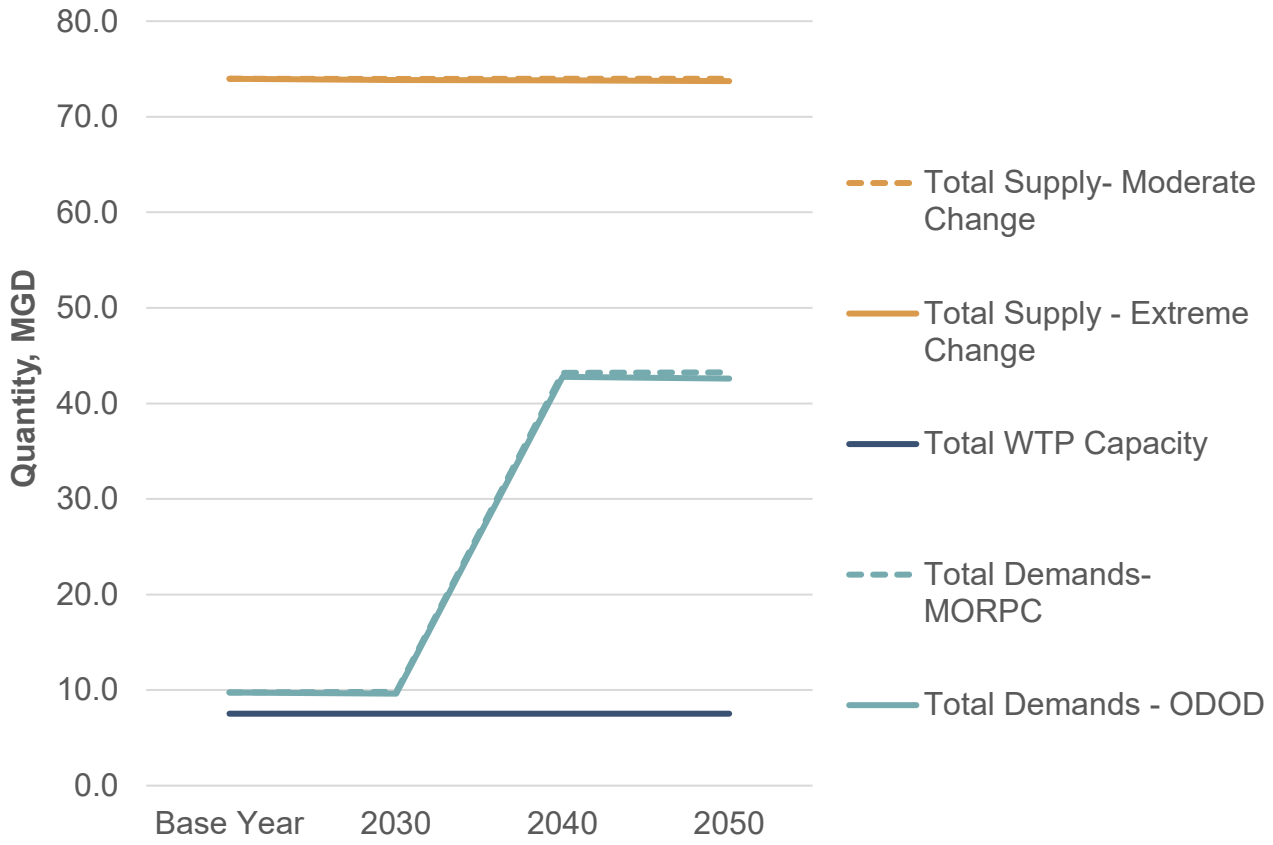
Excludes Agriculture Demands

- Existing raw water supplies are sufficient to meet future municipal demands, private water system demands, and non-agriculture non-municipal demands ***at the county-level***
- Existing water treatment capacity is surpassed if private water system and/or non-industry non-municipal demands are served by municipal WTPs ***at the county-level***



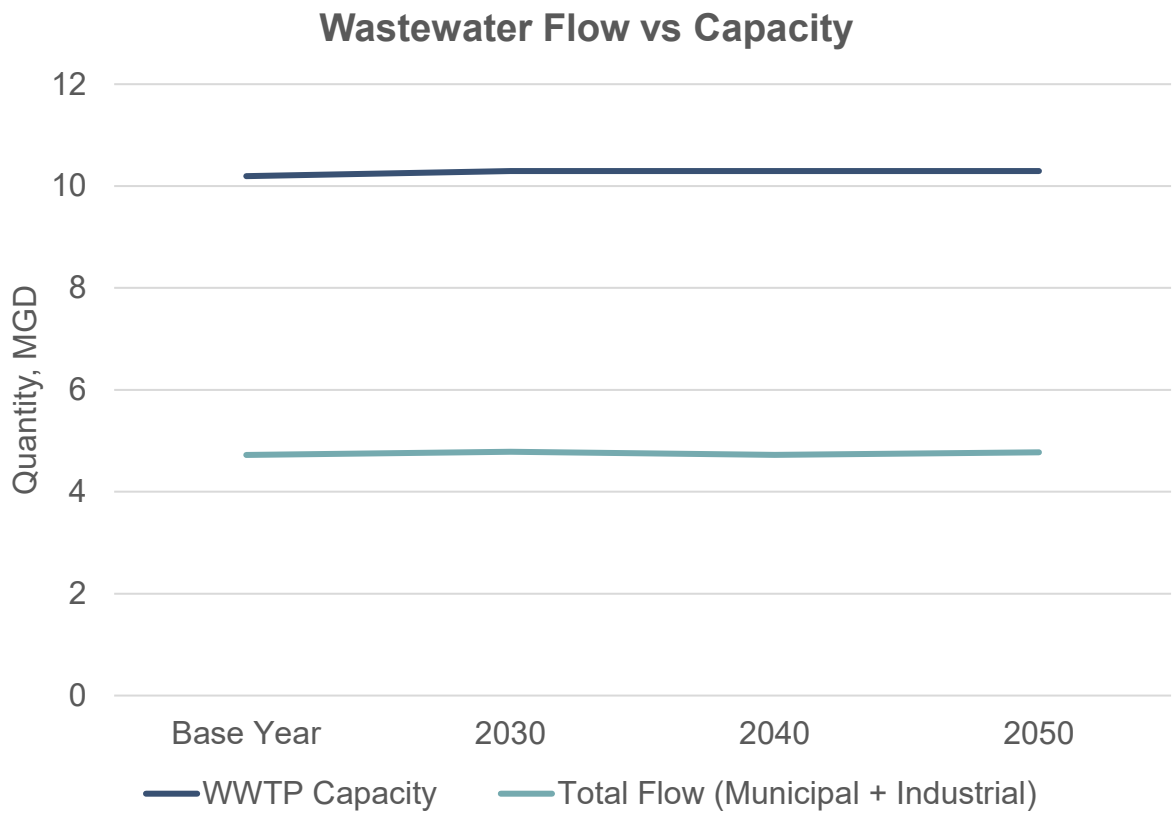
Needs Analysis: Total Water Demands

- Existing raw water supplies are sufficient to meet municipal, private water system, and non-municipal demands through 2050 ***at the county-level***
- Agriculture water demands increase the deficit of existing water treatment capacity ***at the county-level***
- Assumed agriculture demands beyond 2040 are not expected to be served by municipal WTPs ***at the county-level***



Needs Analysis: Municipal Wastewater Demands (Max Annual Average)

- Existing wastewater treatment capacity are sufficient to meet future municipal and industrial demands ***at the county-level***
- Industrial wastewater is not expected to be served by municipal WWTPs ***at the county-level.***



Resource Gaps and Abundances

County Level Overview

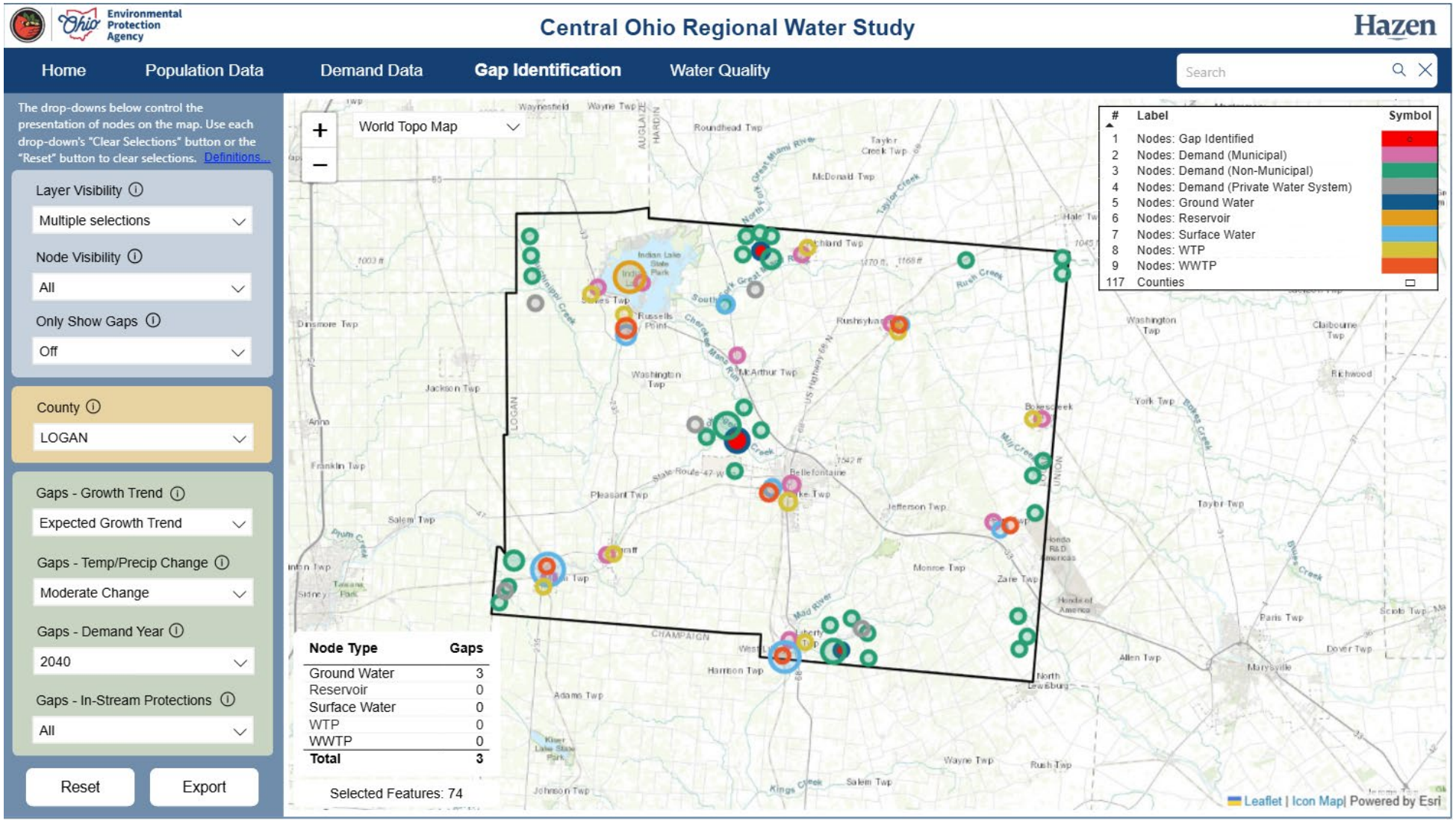
Findings – Resource Gaps

Planning Tool Visualization – Logan County 2040, Moderate Precipitation / Temperature Change

Red nodes represent "gaps":

- SW: Is any shortage observed?
- Reservoir: Does the usable storage ever reach 20%?
- GW: Does the remaining ground water amount ever reach zero?
- WTP: Is the max month average flow > 80% of the permitted capacity?
- WWTP: Is the max annual average flow > 100% of the permitted capacity?

Node sizing reflects magnitude of gap or surplus



Findings – Resource Gaps

Full Summary of Gaps – Logan County

Scenario		GW	Reservoir	SW	WTP	WWTP	Total
Base Year		0	0	0	0	0	0
Intense Pressure *(expected growth + high temperature/precipitation stress)*	2030	0	0	0	0	0	0
	2040	3	0	0	0	0	3
	2050	3	0	0	0	0	3
Full Speed Ahead *(expected growth + moderate temperature/precipitation stress)*	2030	0	0	0	0	0	0
	2040	3	0	0	0	0	3
	2050	3	0	0	0	0	3
Easy Does It *(historical growth + high temperature/precipitation stress)*	2030	0	0	0	0	0	0
	2040	3	0	0	0	0	3
	2050	3	0	0	0	0	3
Resource Abundance *(historical growth + moderate temperature/precipitation stress)*	2030	0	0	0	0	0	0
	2040	3	0	0	0	0	3
	2050	3	0	0	0	0	3

Resource Gaps and Potential Project Options

World of Project Options to fill Gaps…. Solution Strategies

- Gaps exist across supply, treatment, and water quality. Gaps can be filled by developing a set of solutions that could consist of several projects to develop an overall strategy
- Supply: Ground Water Wells, Reservoirs, Intakes, Dams, Other Storage, Emergency connections
- Treatment: Expand Capacity, Optimize treatment, Modify for water quality
- Policy: Restrictions, Adjust location of demand, Funding, Regionalization
- Discharge/Reuse: Receiving stream water quality, non-potable water reuse, potable reuse

Scenario Scorecard Criteria

Recall the scenarios: Base, Intense Pressure, Full Speed Ahead, Easy Does It, Resource Abundance

Scenario applicability

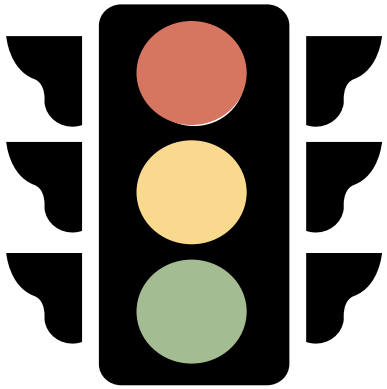
- Project that addresses more gaps across scenarios

Favorability across gaps

- Project that addresses more gaps within the same scenario ranks higher

Life cycle cost

- Projects with the lowest combined capital and O&M costs ranks higher. Capital costs are provided. Relative O&M considered.
- Green: <$75 million
- Yellow: $75 - $125 million
- Red: >$125 million



Red – Low Favorability

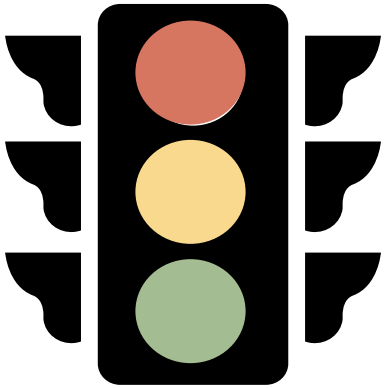
Yellow – Medium Favorability

Green – High Favorability

Scenario Scorecard Criteria

Water Quality Impact

- Projects that provide higher water quality ranks higher
- Green: Minimal water quality concerns, minimal industrial influence anticipated
- Yellow: Water quality conditions that need to be evaluated, increased permitting requirements, withdrawal from or discharge into a Superior high quality water
- Red: Elevated water quality concerns, high permitting requirements, withdrawal from or discharge into an Outstanding state water



Red – Low Favorability

Yellow – Medium Favorability

Green – High Favorability

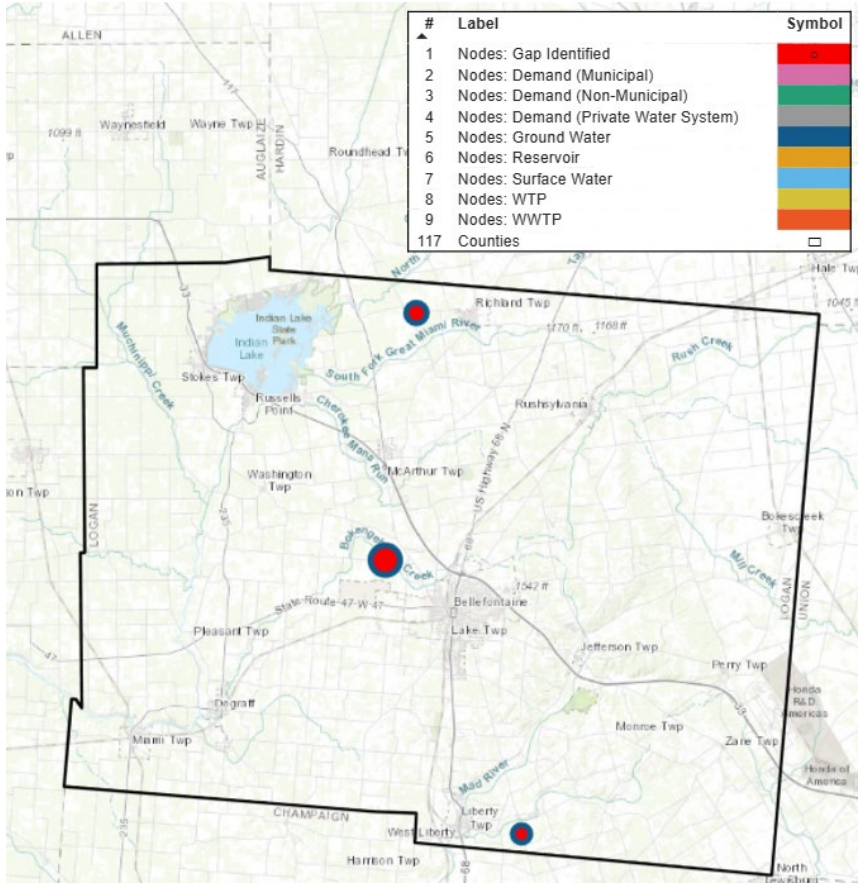
Implementation Timeline

- Projects with shorter timelines ranks higher
- Includes project planning, funding, design, construction, and start-up
- Larger infrastructure projects have longer durations
- Green: < 3 years
- Yellow: 3 – 5 years
- Red: 5 – 10 years

Approach to Resource Gaps

2040 Full Speed Ahead Scenario

- Solution strategies developed for the 2040 Full Speed Ahead Scenario *(expected growth + moderate temperature/precipitation stress)* to provide guidance on what planning might be considered in the near term.
- The 2040 Full Speed Ahead Scenario was selected as the target planning scenario to allow stakeholders to assess current and future project needs without extending too far into the future while using reasonable temperature/precipitation projections.
- Pre-planning level projects developed to fill gaps that provide conceptual solutions
- Project next steps include:
  - Project development
  - Alternatives development with economic and non-economic evaluation
  - Regulatory evaluation and approval
- Cost models for comparative purposes and are in 2024 costs



- Projects to fill gaps categorized by type:
  - Local – Utility largely uses its own assets to fill gap or industrial provides its own onsite solutions
  - Regional – Utility collaborates with other utilities
  - Reuse – Utility leverages reuse water to provide non-potable water to an industrial user to reduce potable water demand

Resource Gaps

2040 Full Speed Ahead Scenario

- Logan County Gaps are summarized in the table below:

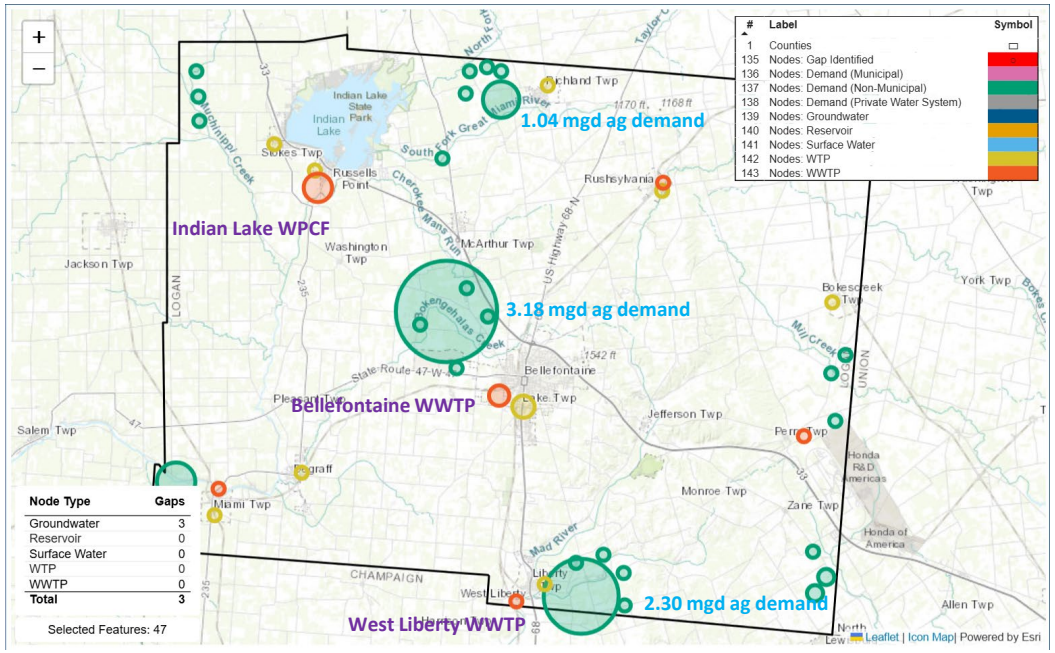
Recommendations on next slide based on 2040 gap

Name	2030 Max Shortage (MGD)	2040 Max Shortage (MGD)	2050 Max Shortage (MGD)	2040/2050 Agricultural Demand (MGD)
Headwaters Great Miami River (GW)	0.00	2.22	2.22	4.12
Bokengehalas Creek - Great Miami River (GW)	0.00	9.33	9.36	12.61
Headwaters Mad River (GW)	0.00	0.59	0.59	9.14

- WTP and WWTP capacity generally sufficient within the County based on projected demands
- Low ground water supplies predicted in the Headwaters Great Miami River, Bokengehalas Creek - Great Miami River, and Headwaters Mad River based on the projected agricultural demands. Should this demand be realized, the supply shortage has the potential to impact local groundwater supplies, including agricultural, municipal, and private systems.
- Ongoing coordination with the local agricultural community is recommended to monitor potential changes in irrigation usage and groundwater availability.

Logan County Agriculture Reuse Opportunity

- Ground water supply availability gaps projected; Coordination and monitoring of irrigation usage is recommended
- Potential Solutions include: alternative supply, reuse, policy
- Several non-municipal demands including agriculture demands (max monthly average)
  - **4.12 mgd ag demand near Indian Lake WPCF**
  - **12.61 mgd ag demand near Bellefontaine WWTP**
  - **9.14 mgd ag demand near West Liberty WWTP**
- Agriculture Reuse Considerations
  - **No current Ohio regulation**
  - **Requirements vary by state (monitoring vs. treatment)**
  - **Plant type is significant consideration**
    - *Salt tolerance*
    - *Metal uptake*
    - *Alkalinity, pH*
    - *Chlorine residual*
  - **Human exposure**
    - *Spray irrigation*
  - **Public perception**

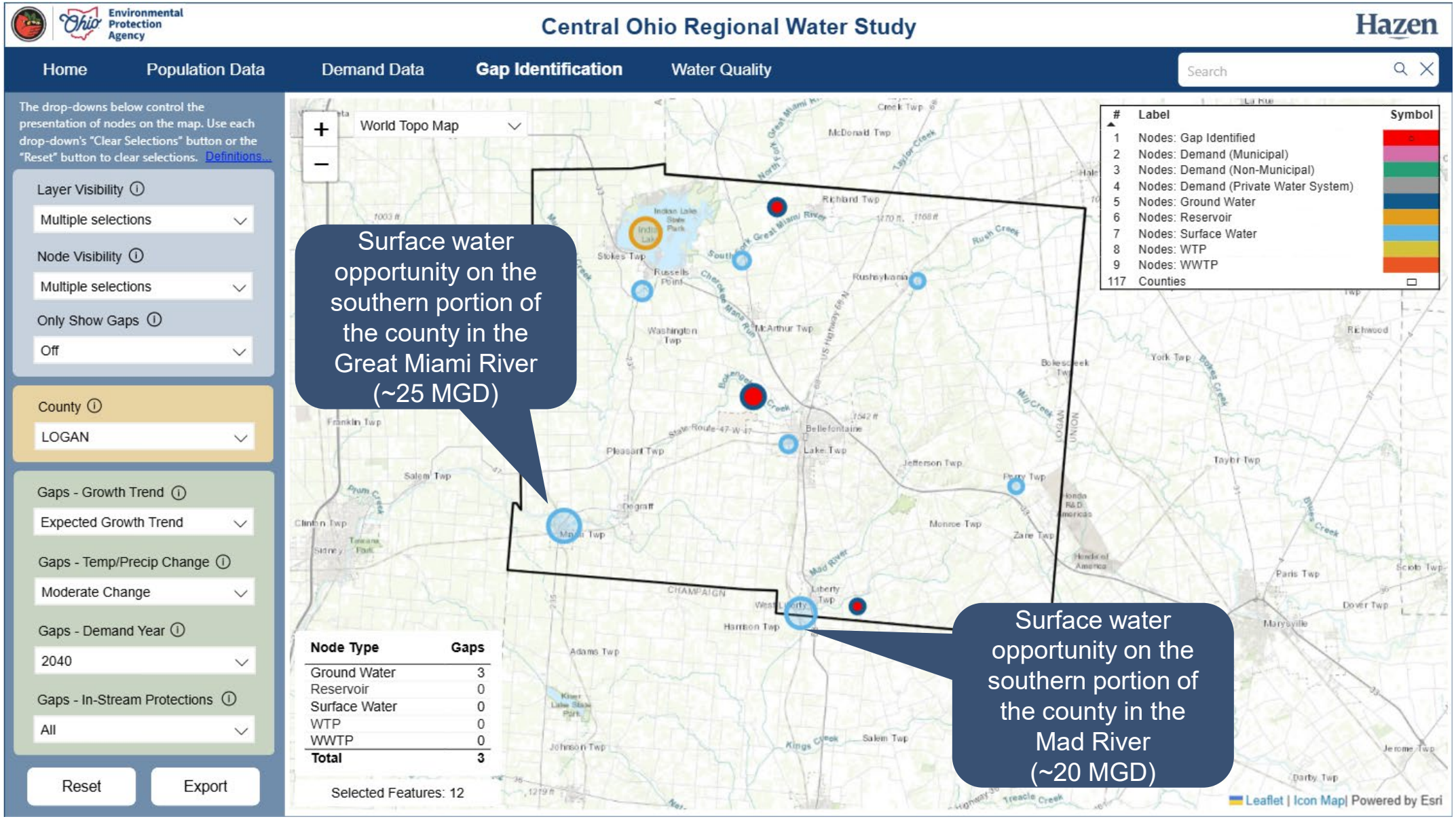


Plant	Flow (mgd)	Reuse Treatment Cost	Purple Pipe Distance (miles)	Purple Pipe Cost
Indian Lake WPCF	2.0	$10,000,000	5	$5,500,000
Bellefontaine WWTP	4.0	$13,800,000	6	$8,600,000
West Liberty WWTP	3.0	$11,900,000	3	$3,300,000

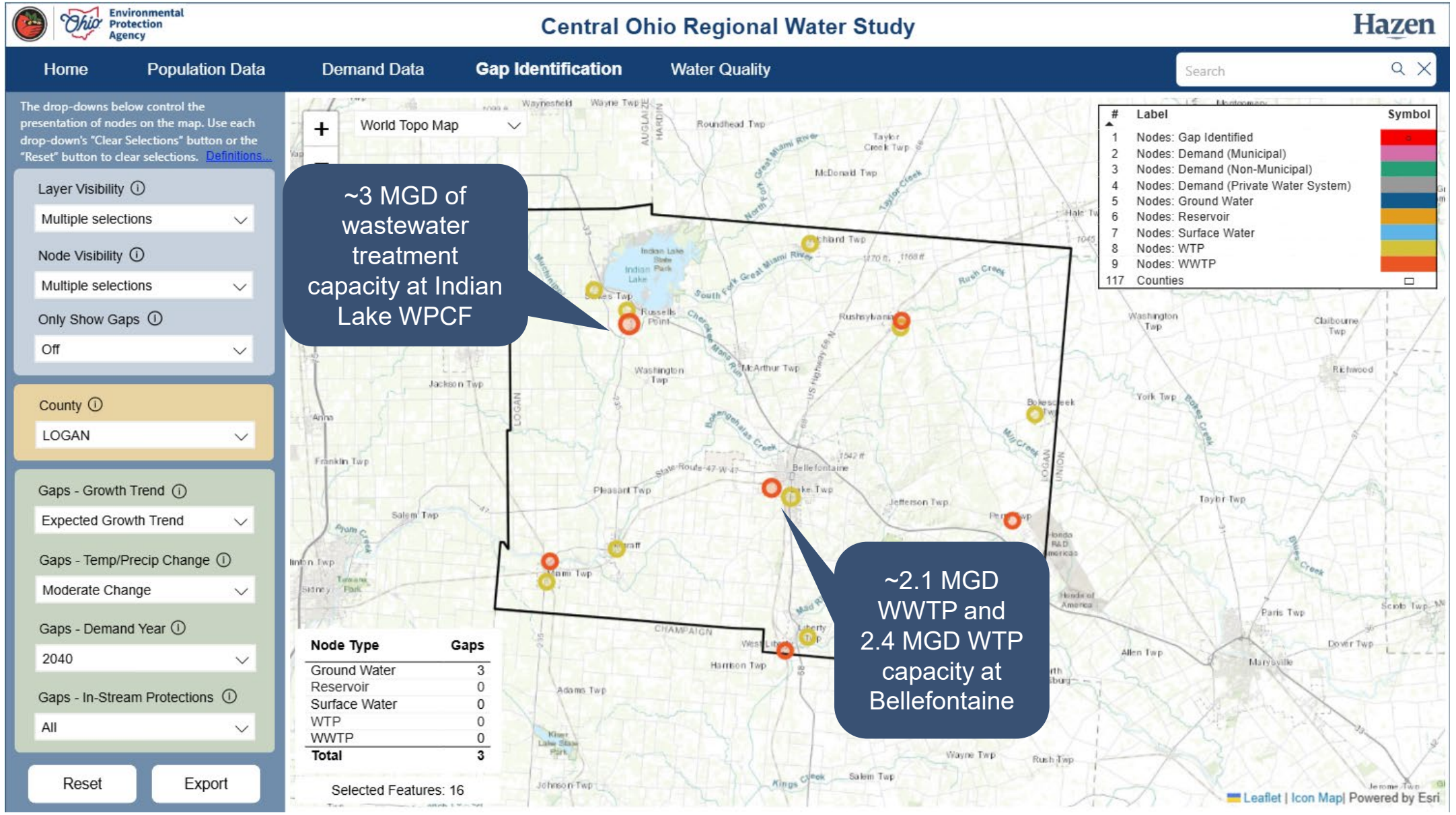
Note: Sizing of facility based on annual average demand. Sizing should be evaluated further.

Areas of Opportunity

Water Supply Areas of Opportunity



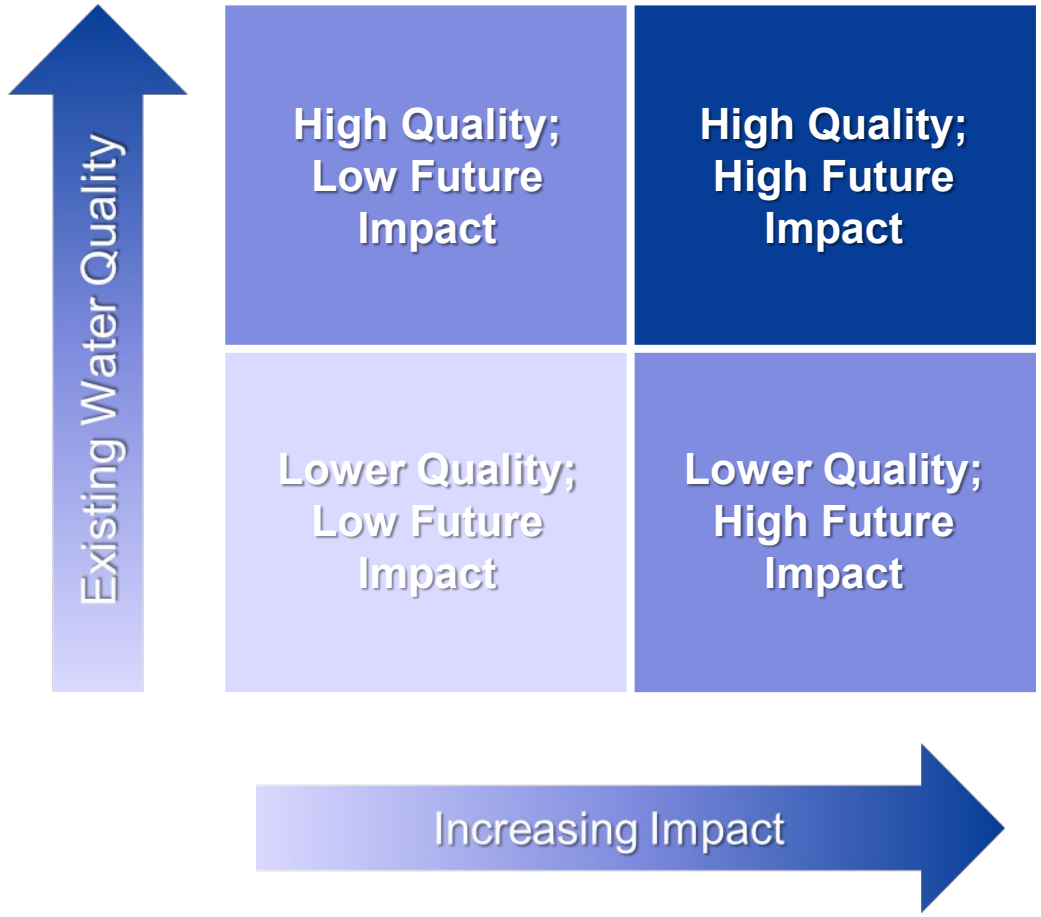
Infrastructure Areas of Opportunity



Water Quality

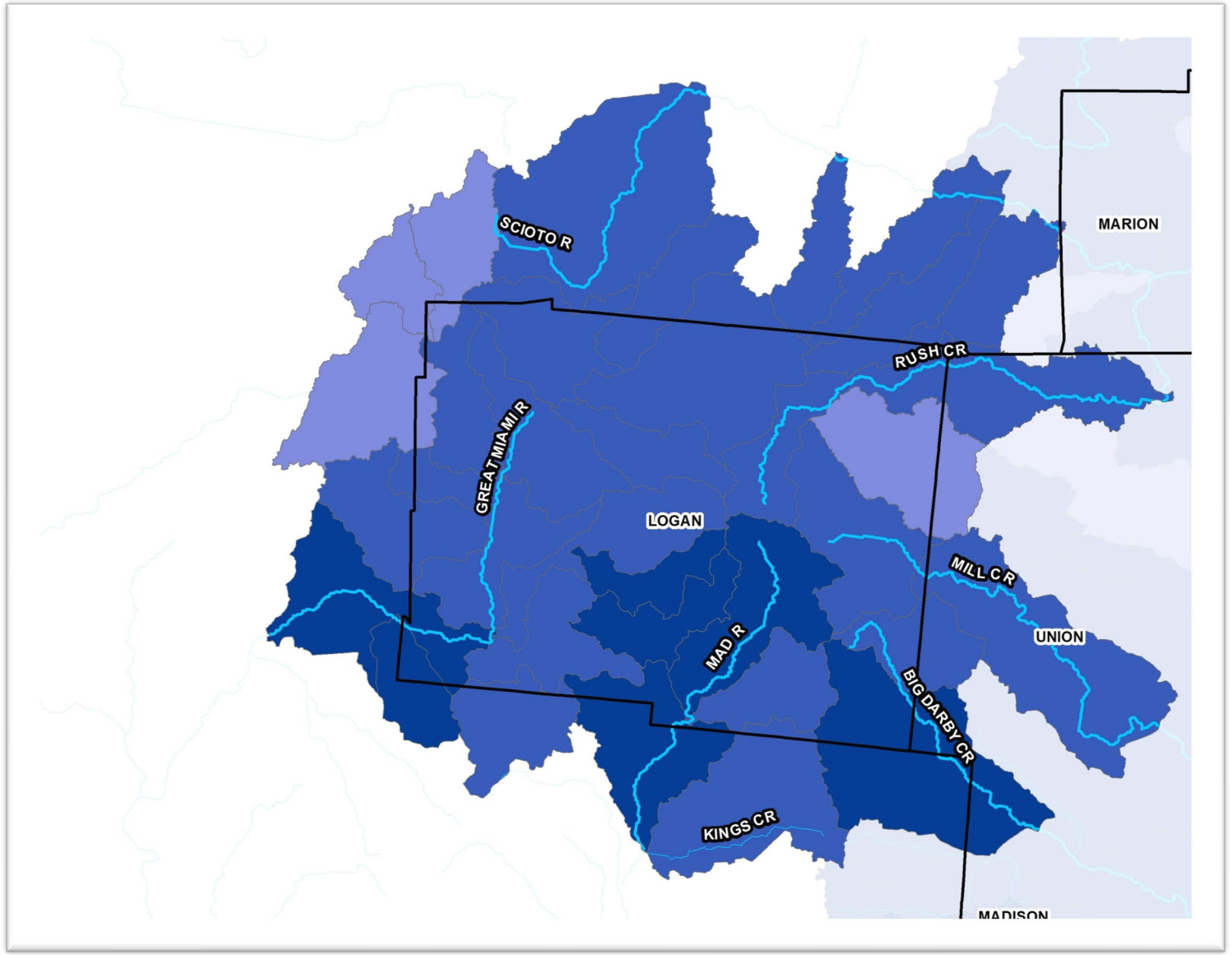
Water Quality

- Goals:
  - Characterize current water quality at the local watershed level (HUC-12)
  - Determine potential challenges based on a suite of possible future scenarios
  - Characterize watersheds and identify potential for future water quality impacts
  - Identify activities that may support the protection and improvement of streams and water quality



Existing Water Quality

- Watersheds are characterized by:
  - **Quality of aquatic habitat (QHEI)**
  - **Targeted water quality standards**
  - **Stream biological health**
- Majority of Logan County watersheds have good to excellent water quality



Future Water Quality Scenarios

- Future scenarios were examined for ***potential impacts*** to water quality due to:
  - **Land use**
    - *Increased impervious area may lead to degraded streams due to loss of riparian corridor, increased flows, and reduced ground water recharge*
  - **Hydromodification**
    - *Higher flows in frequently occurring events may contribute to increased erosion and reduced water quality*
  - **Increased occurrence of low flows**
    - *Lower and longer base flows during dry periods may disrupt aquatic habitats and lead to more restrictive permitting requirements*
  - **Temperature and Precipitation Impacts**
    - *Hotter/drier conditions may result in more frequent and lower base flows*

Land Use

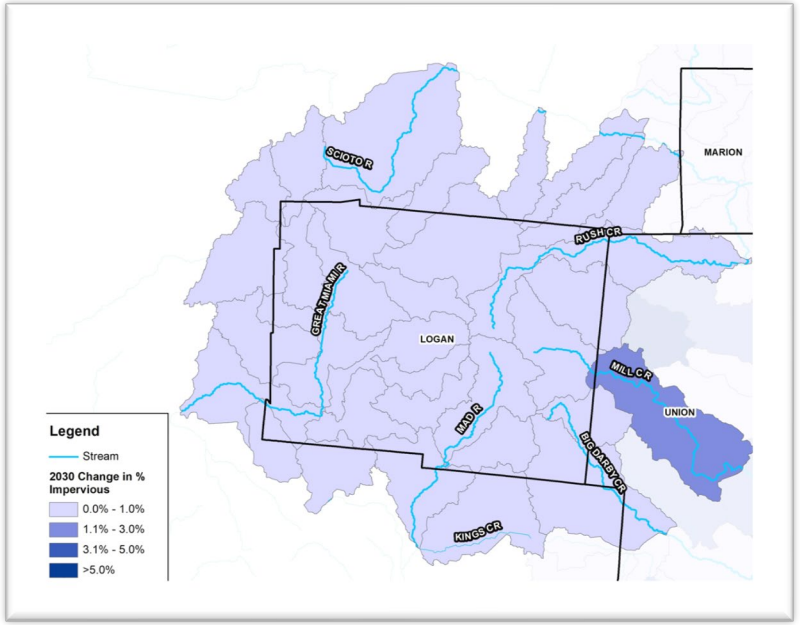
Hydromodification

Low Flows

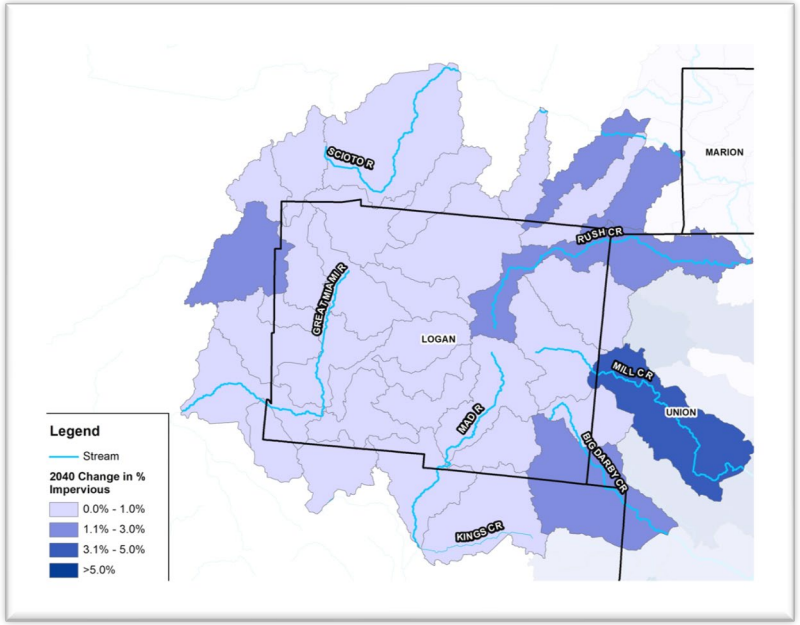
Temperature & Precipitation

Potential Land Use Impacts

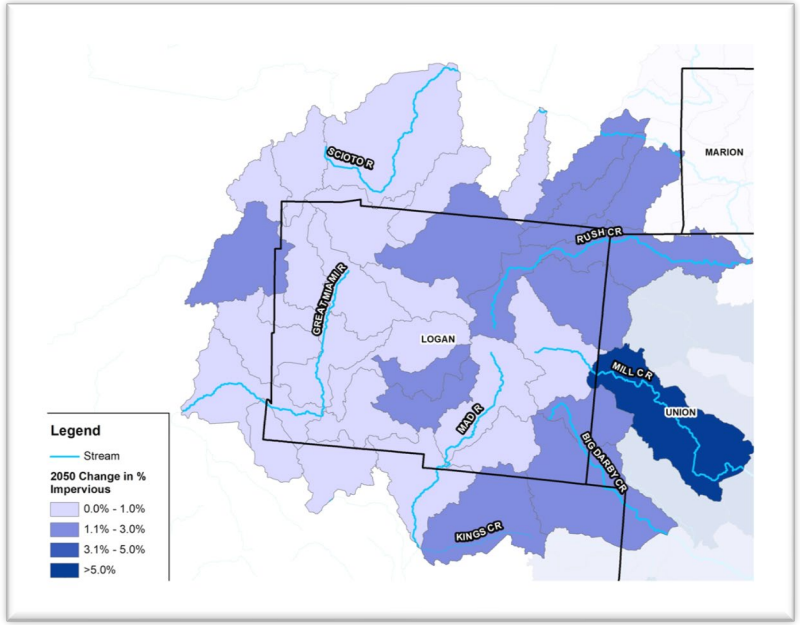
- *Land Use: Increased impervious area without appropriate setbacks, mitigation, or stormwater controls may lead to degraded streams due to loss of riparian corridor, increased flows, and reduced ground water recharge*



2030



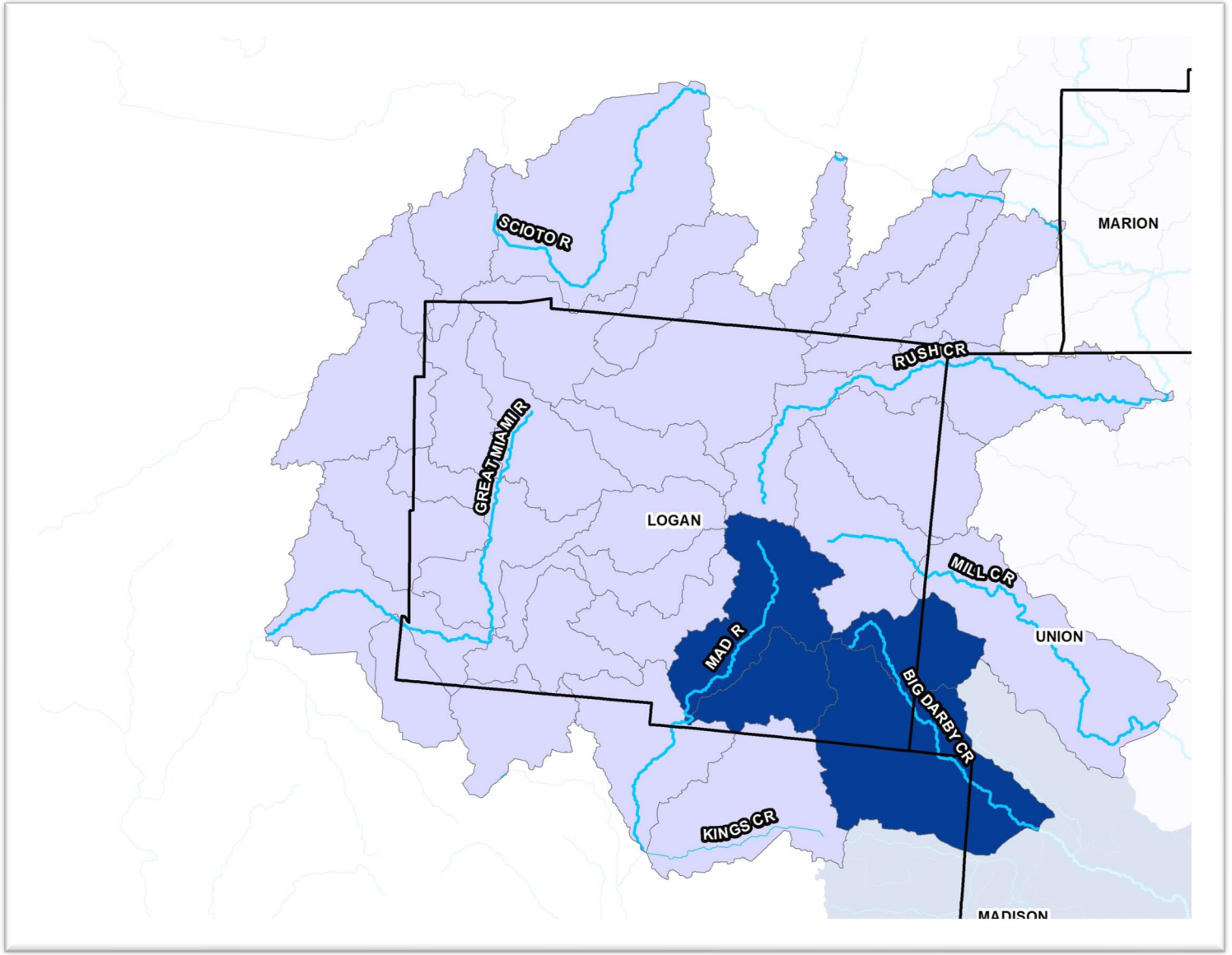
2040



2050

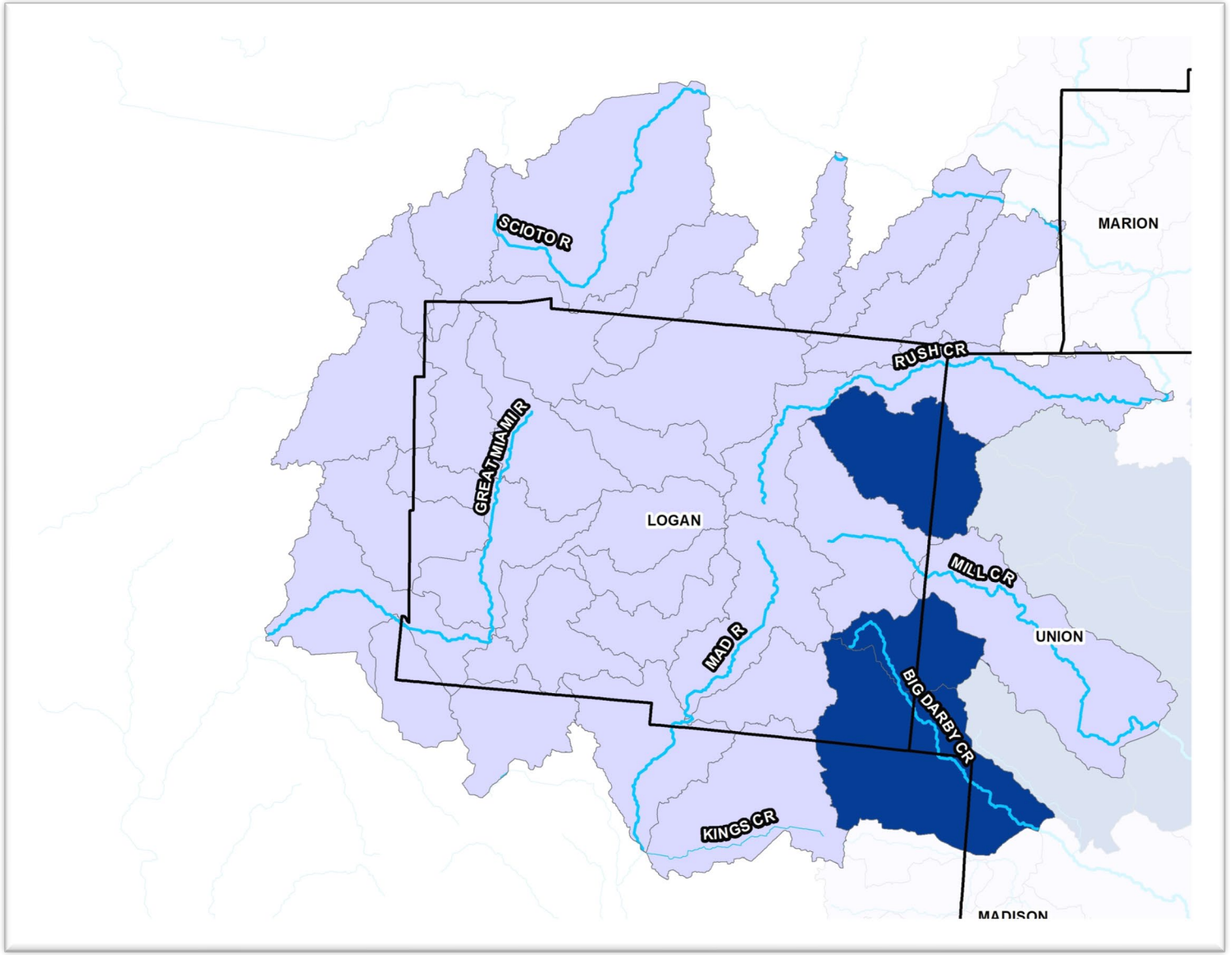
Hydromodification Impacts

- *Hydromodification: Higher in-stream flows in frequently occurring events resulting from increased development may result in streambank erosion and channelization, contributing to increased sediment load and reduced water quality*
- Watersheds in dark blue have higher potential for future hydromodification impacts
- Watersheds in light purple have lower potential for future hydromodification impacts



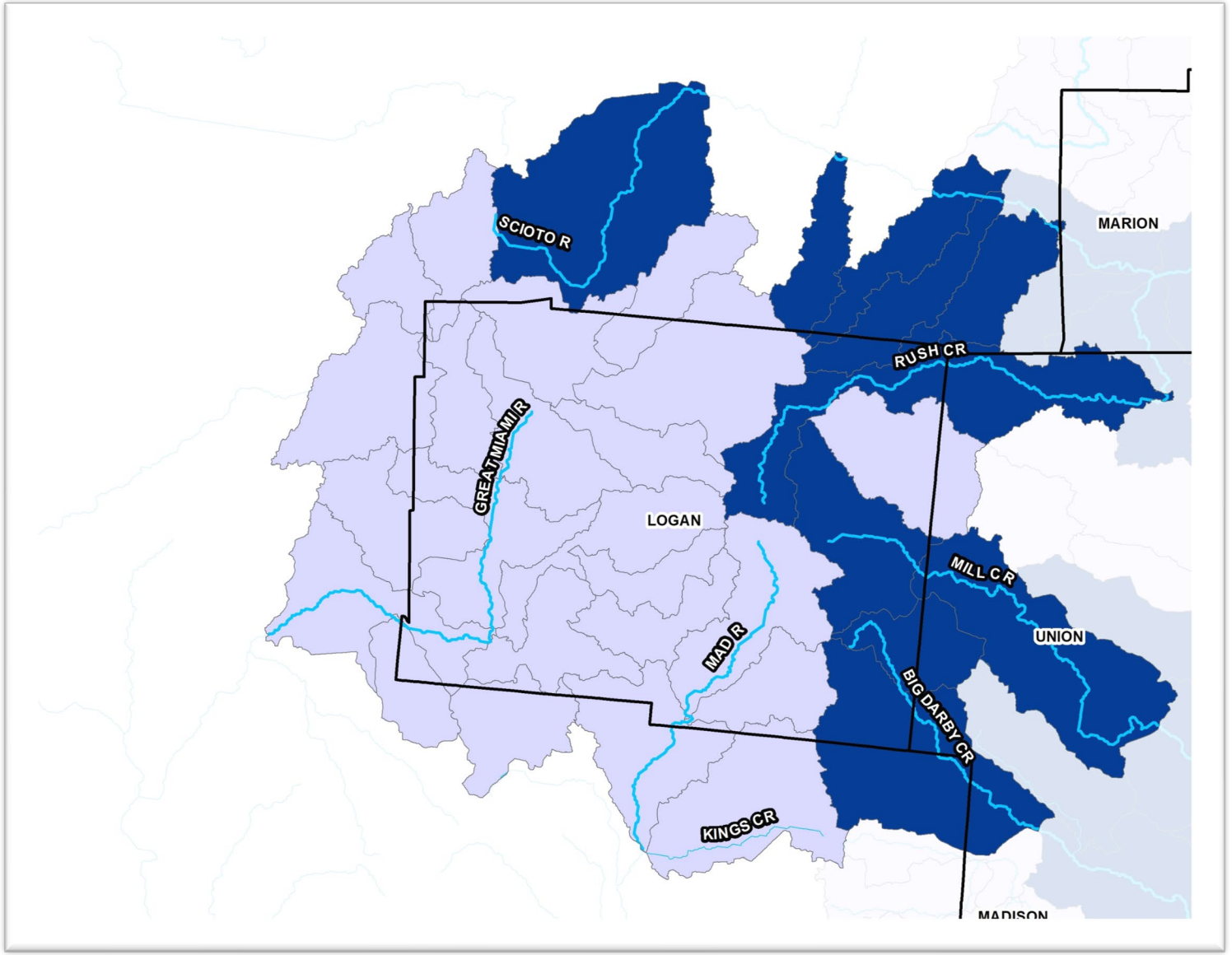
Low Flows Impacts

- *Low Flows: Lower base flows during dry periods resulting from reduced ground water levels or a decrease in pervious areas may disrupt aquatic habitats and lead to more restrictive permitting requirements*
- Watersheds in dark blue have higher potential for future water quality impacts and more restrictive permitting requirements due to low flows
- Watersheds in light purple have lower potential for future water quality impacts and more restrictive permitting requirements due to low flows
- *Note: Low flows areas are not indicative of potential water supply/availability issues but rather where changes could impact local aquatic habitat and permitting requirements*



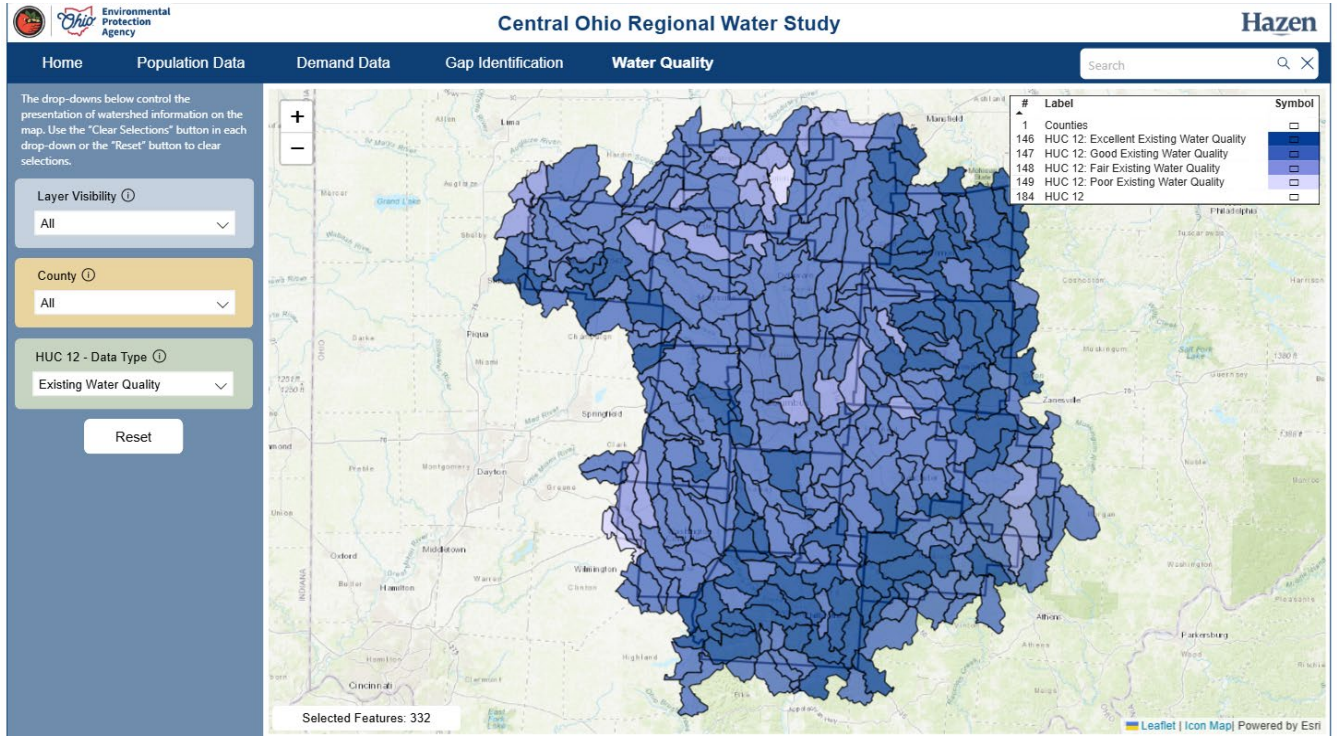
Temperature and Precipitation Impacts

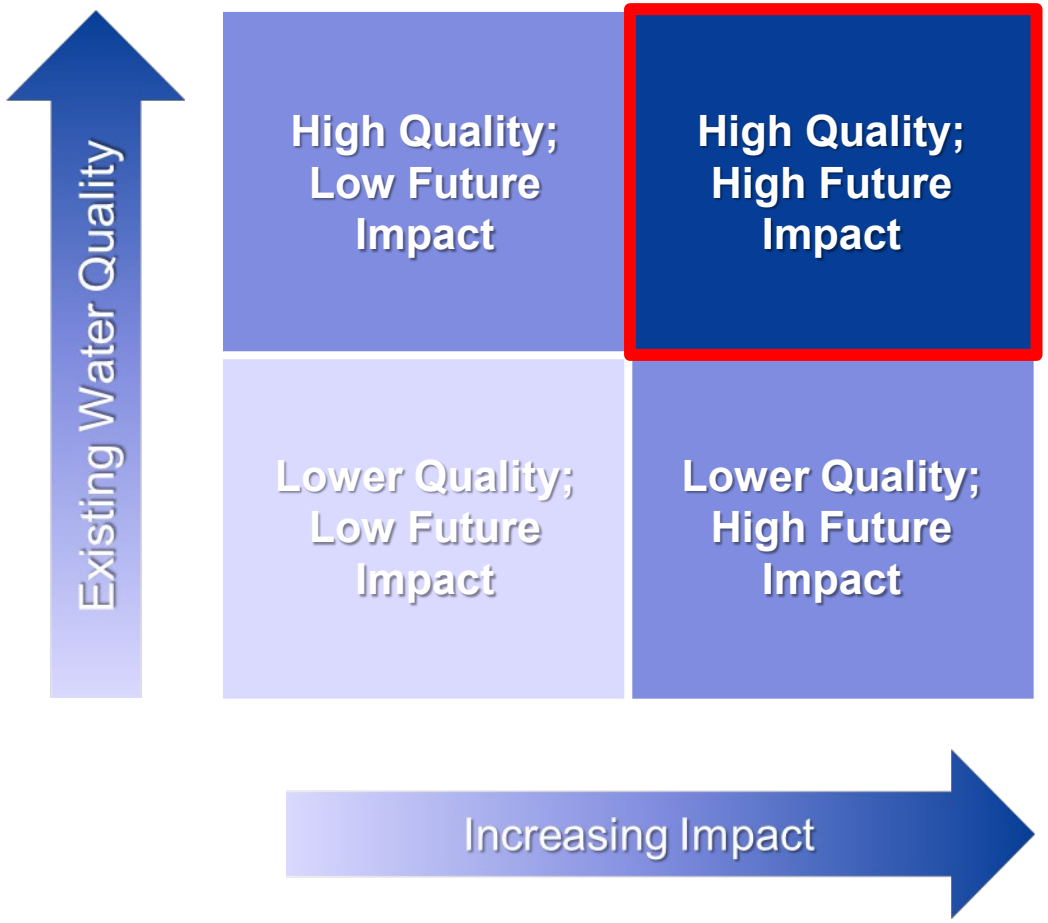
- *Temperature and precipitation: Hotter/drier conditions may result in more frequent and lower base flows*
- Watersheds in dark blue have higher potential for future low flow impacts due to temperature and precipitation conditions
- Watersheds in light purple have lower potential for future low flow impacts due to temperature and precipitation conditions



Watershed Impacts

- Water quality dashboard can be utilized to examine individual watershed characteristics and identify watersheds with excellent existing water quality and high potential for future impacts
- Protection, conservation, and restoration activities can be identified and prioritized in those watersheds





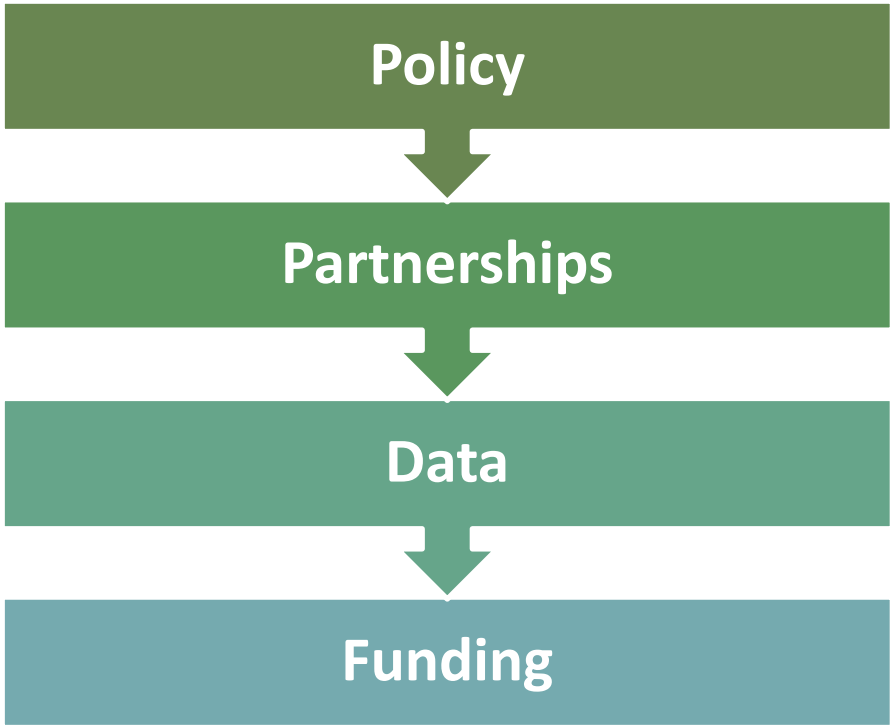
Water Quality Protection

All watersheds are living systems and are constantly changing.

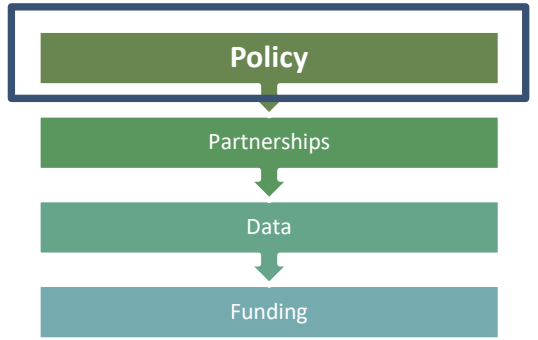
The **magnitude** of change will vary across the region based on several variables.

- Due to the enhanced benefits they provide, watersheds with high quality features should be prioritized for protection.
- Best management practices should be implemented across all watersheds to protect existing water quality.
- Opportunities for conservation should be explored along stream corridors in all watersheds to preserve riparian areas.

When properly implemented and aligned, these mechanisms may adequately protect ecosystems alongside land use changes:



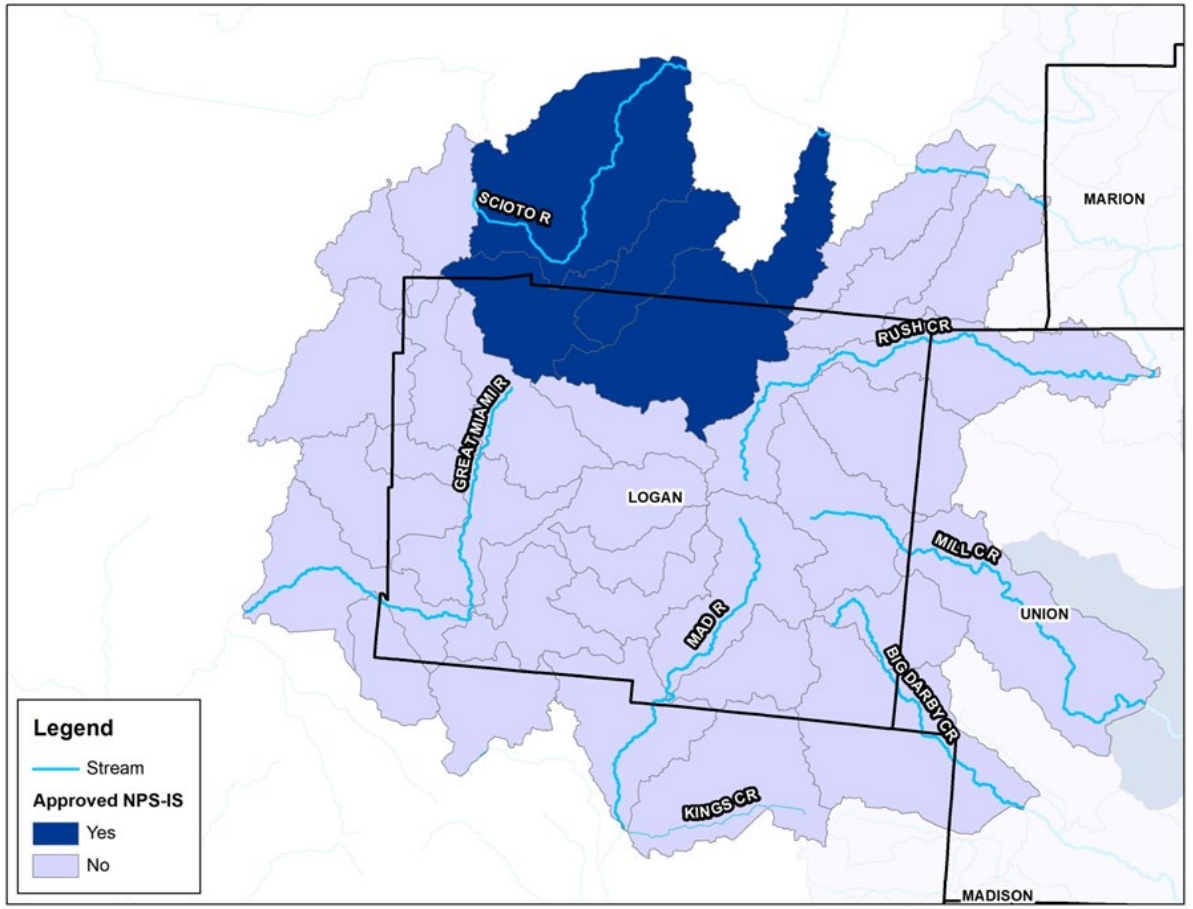
Water Quality Protection Mechanisms



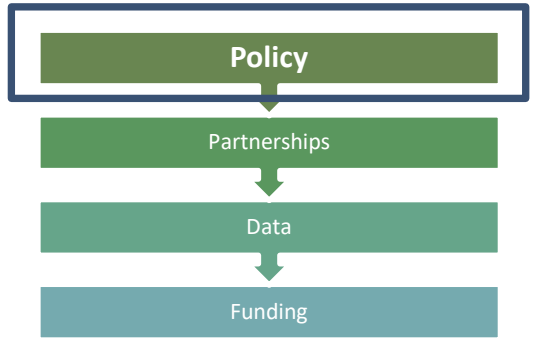
- **Review Local Ordinances**
  - Riparian Setbacks
  - Floodplain Requirements
  - Stormwater Management Plans
  - Tree Codes
  - Zoning and Planning
  - Application and review fee rates

- **Develop 9 Element Nonpoint Source Implementation Strategies (NPS-IS)**
  - Logan County includes all or part of **33 HUC-12 watersheds**
  - Currently, **5 HUC-12 watersheds have an Ohio EPA approved NPS IS**

- **MS4 Compliance**
  - Ensure communities approaching Urban Area designation are prepared for the regulatory responsibilities under the CWA
  - MS4 communities can leverage an approved NPS-IS plan to meet permit requirements

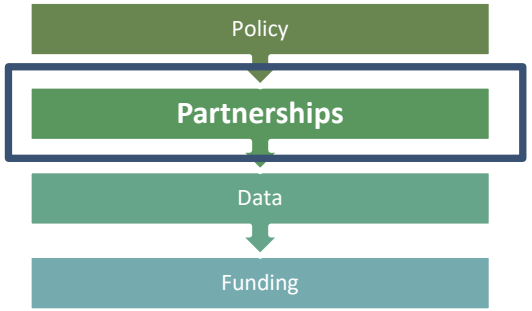


Water Quality Protection Mechanisms



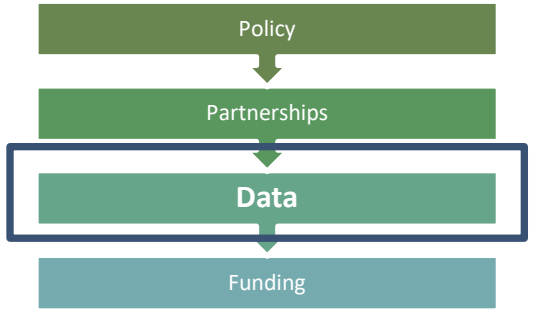
MS4 Requirement	How a NPS-IS Plan Can Help
NPDES Permit	Guide permit applications and support permit reviews
Planning and Development	Encourage Low Impact Development and watershed friendly land use
Stormwater BMP Implementation	Identify green infrastructure and restoration projects
Public Education and Outreach	Offer resources, partners, and initiatives
TMDL Compliance	Provide baseline data and pollutant load estimates.
IDDE	Identify high risk areas for inspection and monitoring
Funding Opportunities	Support Section 319 grant applications

Water Quality Protection Mechanisms

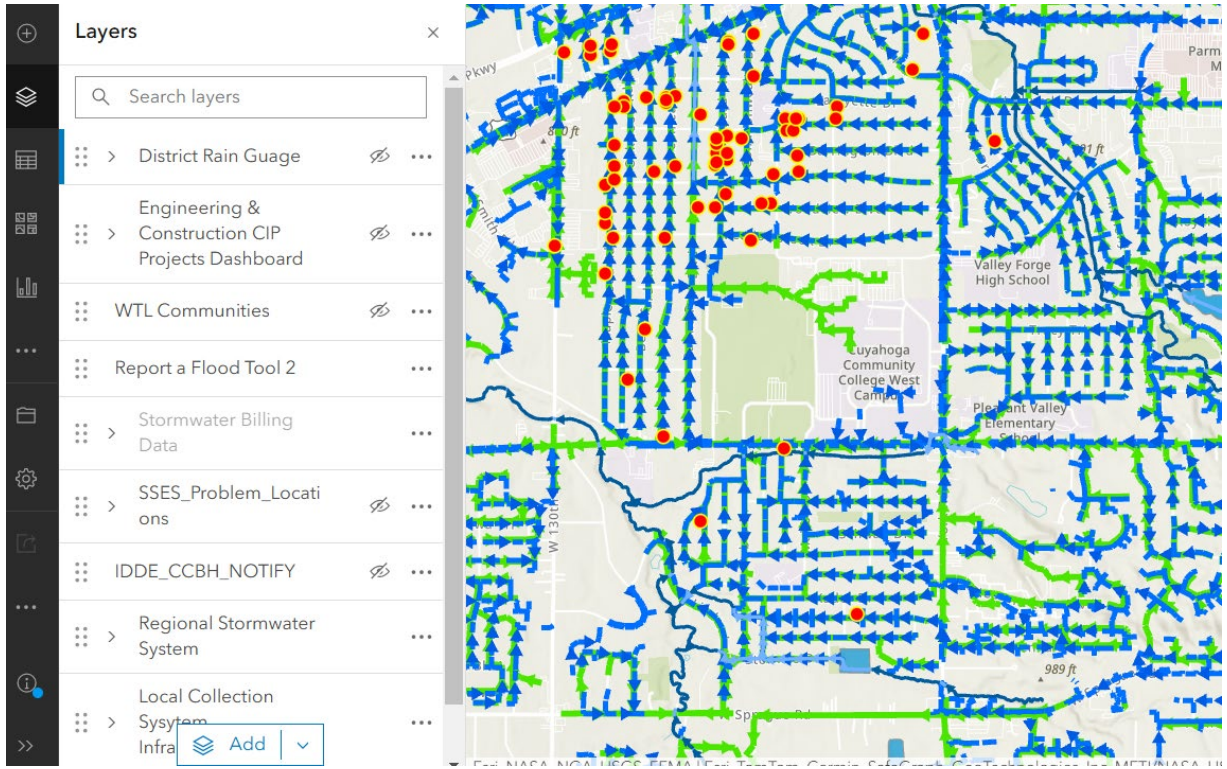


- **Pool Resources**
  - Meet routinely to discuss trends, projects, and upcoming plans
  - Invite guest speakers to learn about new opportunities
  - Delegate data collection and permit review responsibilities
  - Access technical expertise, resources, and cost sharing opportunities
- **Increase Community Engagement**
  - Organize public facing programs including clean up events, tree plantings, and citizen monitoring
  - Use NPS-IS fact sheets, reports, and maps in public education material

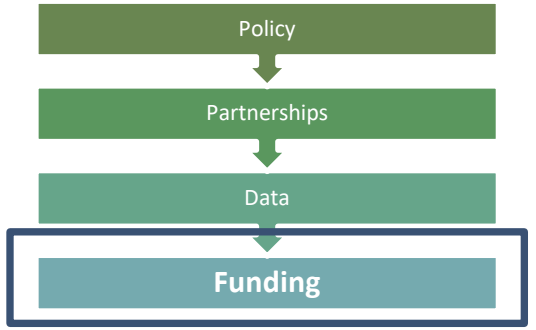
Water Quality Protection Mechanisms



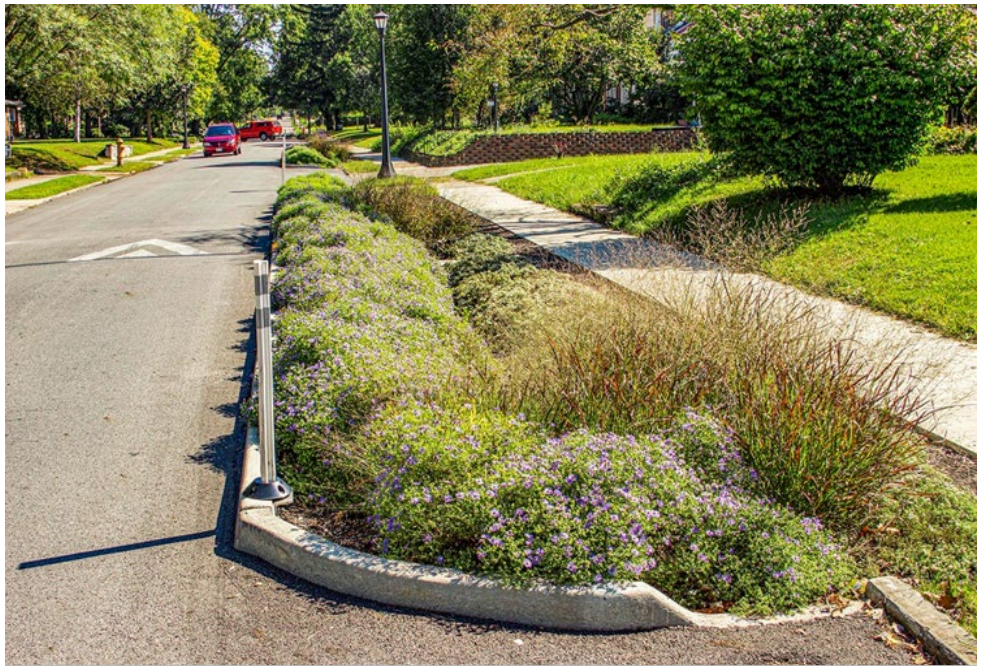
- **Monitor Water Quality**
  - Offer trainings to promote Citizen Science
  - Develop monitoring plans: identify locations to monitor or identify restoration and protection needs
  - Compare data to note new trends that may emerge
- **Digitize Records**
  - Georeference data to spatially analyze trends
  - Expand data collection efforts as needed
- **Public Reporting**
  - Collect observations from the public
  - Make findings and data accessible



Water Quality Protection Mechanisms

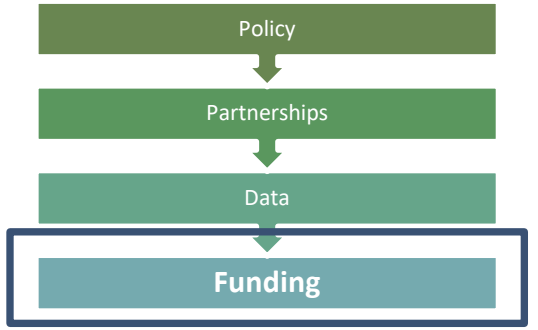


- **Prioritize Infrastructure Upgrades**
  - Focus on areas identified as current or near-term gaps
  - Consider future temperature and precipitation scenarios during planning
  - Assess regional optimization of services as early as possible
- **Incentivize Sustainable Practices**
  - Establish funding programs to encourage developers to adopt green infrastructure
    - *Encourage bioretention, pervious pavement, extended detention, and other BMPs*
  - Encourage redevelopment strategies
- **Leverage Grant Programs**
  - District 13 NRAC Clean Ohio Green Space funding
  - Ohio EPA Water Resource Restoration Sponsor Program
  - Section 319 Grant Funding
    - *Limited to HUC-12s with OEPA approved NPS-IS plan*



Curb extension bioretention in Columbus

Water Quality Protection Mechanisms



H2Ohio Program

- **H2Ohio Rivers Program**
  - Agricultural Incentive Program – Expanded to be statewide in 2024 (ODA)
  - Scioto River Watershed Conservation Reserve Enhancement Program (ODNR)
  - Chloride Reduction Grant Program (Ohio EPA)
  - Equipment Grants (Ohio EPA)
  - Healthy Rivers Livery Grant Program (ODNR)
  - Dam removals (ODNR/Ohio EPA)
  - Water Infrastructure Funding (Ohio EPA)
- **H2Ohio Statewide Wetland Grant Program (ODNR)**

Central Ohio Regional Water Study

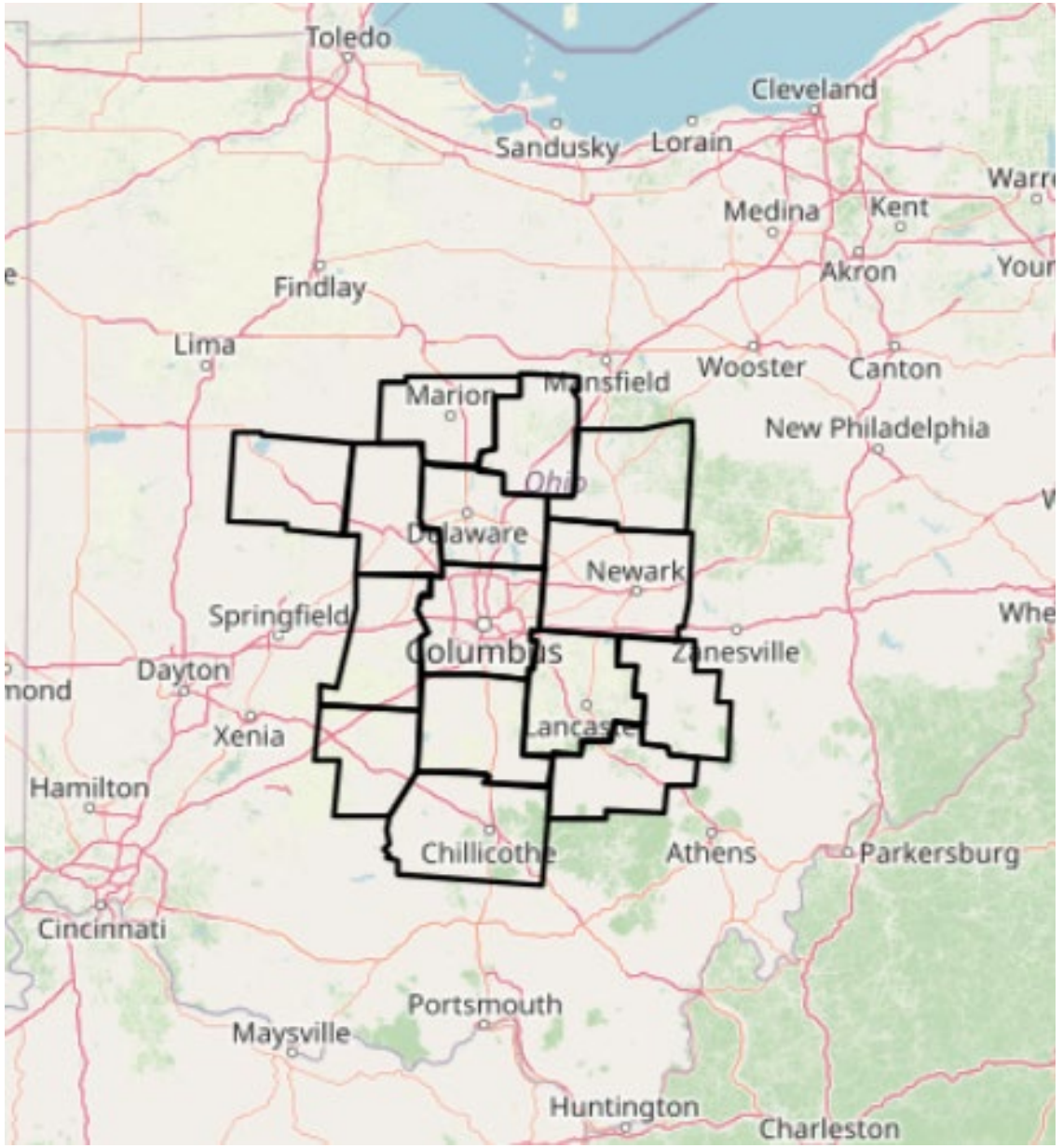
Overview

Residential & Industrial Growth

Water Resource & Infrastructure Adequacy

Future Projects and Opportunities

Planning for Water Quality Protection



Hazen

Ohio Environmental Protection Agency

Ohio Department of Natural Resources

Ohio Water Development Authority

Central Ohio Regional Water Study: Logan County

March 1, 2025