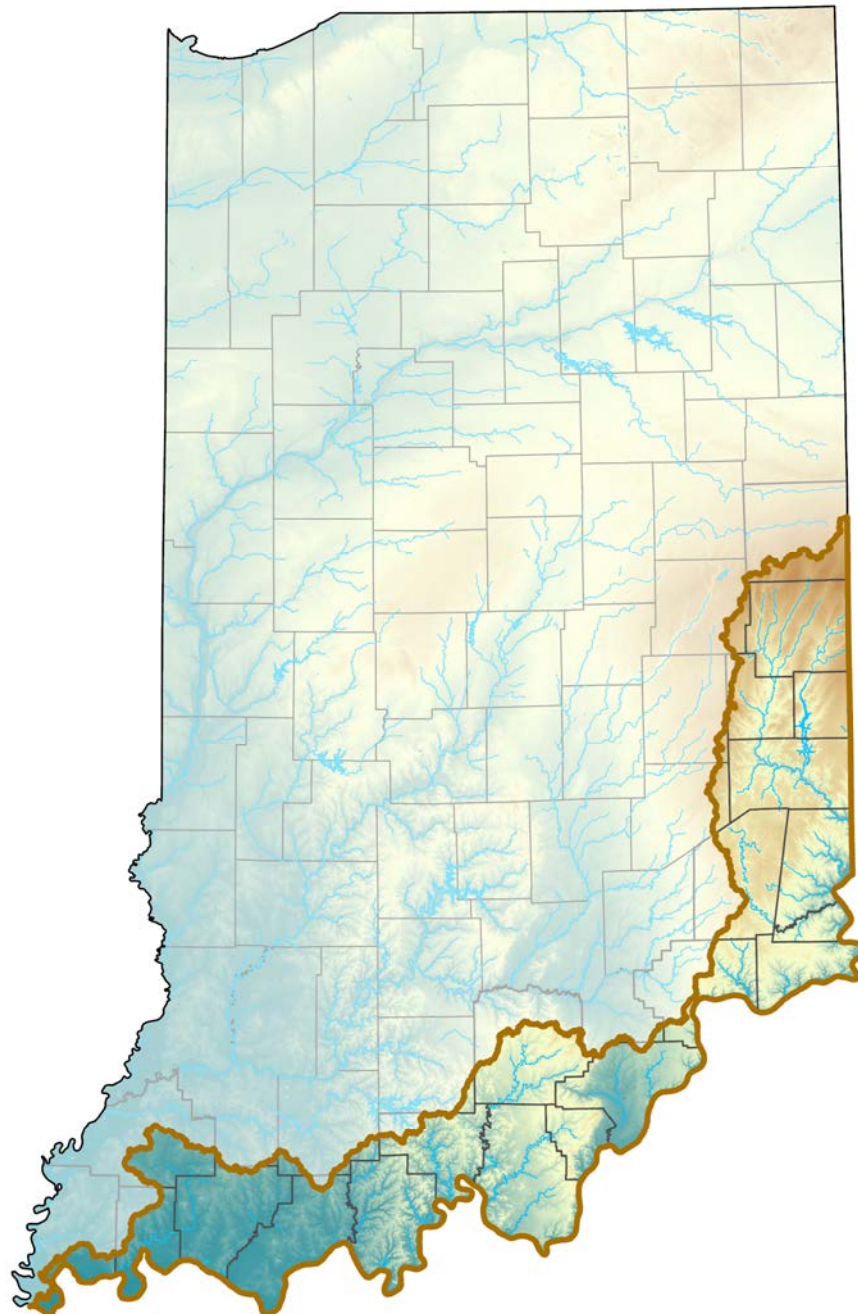


# Regional Water Study

## Water Demand and Availability in the Ohio River and Southeast Indiana Region



September 2026

FINAL REPORT

# Regional Water Study

Water Demand and Availability in the Ohio River and Southeast Indiana Region

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SEPTEMBER 2026

## Acknowledgements

This research was funded by the Indiana Finance Authority as requested by the Indiana Department of Natural Resources pursuant to Executive Order 25-63.

We thank the following for their participation in the advisory committee for this project.

- Indiana Department of Natural Resources, Division of Water
- Indiana Department of Environmental Management
- Indiana University
- United States Geological Survey
- The Indiana Farm Bureau

## Citation

INTERA, 2026. Regional water study: Water demand and availability in the Ohio River and Southeast Indiana Region; Report to the Indiana Finance Authority, 162 p.

## Executive Summary

The Ohio River and Southeast Indiana Region (Region) includes portions of 21 Indiana counties across southeastern Indiana, extending from the Whitewater River basin near the Ohio border to the lower Ohio River counties near Evansville (**Figure ES-1**). This study evaluates water demand and availability across the Region from 2020 through 2070 to determine whether the Region's water resources are sufficient to meet the needs of its communities, industries, and farms and to identify where targeted planning and investment are most needed.

This study was prepared for the Indiana Finance Authority (IFA), at the request of the Indiana Department of Natural Resources (IDNR), pursuant to Executive Order 25-63, to evaluate whether sufficient water resources exist within the Region to meet projected public water supply needs through the year 2070. The results of this study are intended to support state and local decision-makers, public water utilities, and regional stakeholders in planning for reliable and sustainable water supplies across the Region.

Specific objectives of the study are to:

- Quantify current water withdrawals and use across major water-use sectors within the study area.
- Develop projections of future water demand for public water supply and other significant sectors through 2070.
- Evaluate current water availability within the study region.
- Estimate how water availability may change over time under future climate conditions.
- Compare projected water demand with available water supplies to identify potential deficits or areas of limited availability.
- Identify risks, constraints, and potential strategies to improve long-term water supply resilience.

### Key Findings

- Land cover in the Ohio River and Southeast Indiana Region is over 46% agriculture and 38% forested.
- Public water suppliers predominantly utilize groundwater as their source of supply.
- Current and Future water demand is dominated by power generation and public water supply withdrawals.
- Regional annual average withdrawals are expected to decrease from 2,013 MGD in 2020 to 761 MGD in 2070, mostly due to decreases in power generation withdrawals.
- In the Whitewater River watershed, annual water availability will decrease slightly by 2070. However, larger seasonal decreases are expected.
- Outside the Whitewater Basin, future water availability is expected to be stable, with continued low availability.

## Approach

The study is structured around three major analytical components: (1) development of a 50-year forecast of regional water demand, (2) evaluation and forecasting of regional water availability, and (3) comparison of demand and availability to identify potential future water-supply gaps and opportunities for improved water management.

Water demand estimates were developed from nearly four decades of reported water withdrawals (1985-2023), combined with population, economic, and climate projections, to forecast future demand for public water supply, irrigation, industry, power generation, and other sectors through 2070. Water

withdrawals are used as a proxy for demand, and both groundwater and surface-water resources are evaluated to determine the capacity of regional resources to meet projected needs.

Water availability was evaluated using historical USGS streamflow records, reported water withdrawals, return flows, and future climate projections to estimate how much water is likely to remain available under future conditions while maintaining the minimum streamflow needed to support rivers and aquatic ecosystems.

## Setting

The Region includes portions of 21 Indiana counties within the Ohio River Basin, encompassing eight HUC-8 watersheds that range from the Whitewater River Basin in the northeast, to the Ohio River and its outwash deposits along the Region's southern boundary. The largest population centers are Evansville, Jeffersonville, New Albany, and Richmond, and major interstate corridors, including I-64, I-65, I-69, I-70, and I-74, connect communities across the Region. This study combines two planning regions in Indiana: the Southeast Region and the Ohio River Region. The Ohio River Region consists of two HUC-8 watersheds in the southwest corner of the Region, and the Southeast Region contains all the remaining six HUC-8 watersheds illustrated on **Figure ES-1**.

Public water supply is provided by over 100 municipal and community utilities drawing from a mix of groundwater, surface water, and purchased-water sources. Evansville Water Utility, the Region's largest system, serves approximately 182,000 people with surface water from the Ohio River. The Utility is currently planning a transition to groundwater sources. Groundwater remains the predominant source across much of the interior and northern portions of the Region, while surface-water and purchased-water systems are more common along the Ohio River corridor. Outside the urban corridors, land use is predominantly agricultural, with the largest irrigation withdrawals concentrated in Spencer, Posey, Vanderburgh, and Wayne counties.

### Ohio River and Southeast Indiana Water Region Fun Facts

- Covers parts of 21 Indiana counties
- 8 HUC-8 watersheds
- 102 public water utilities serve over 870,000 people
- Power generation is the largest water withdrawal, but it will decrease in the future
- Over 80% of the land cover in the Region is forested or agriculture.

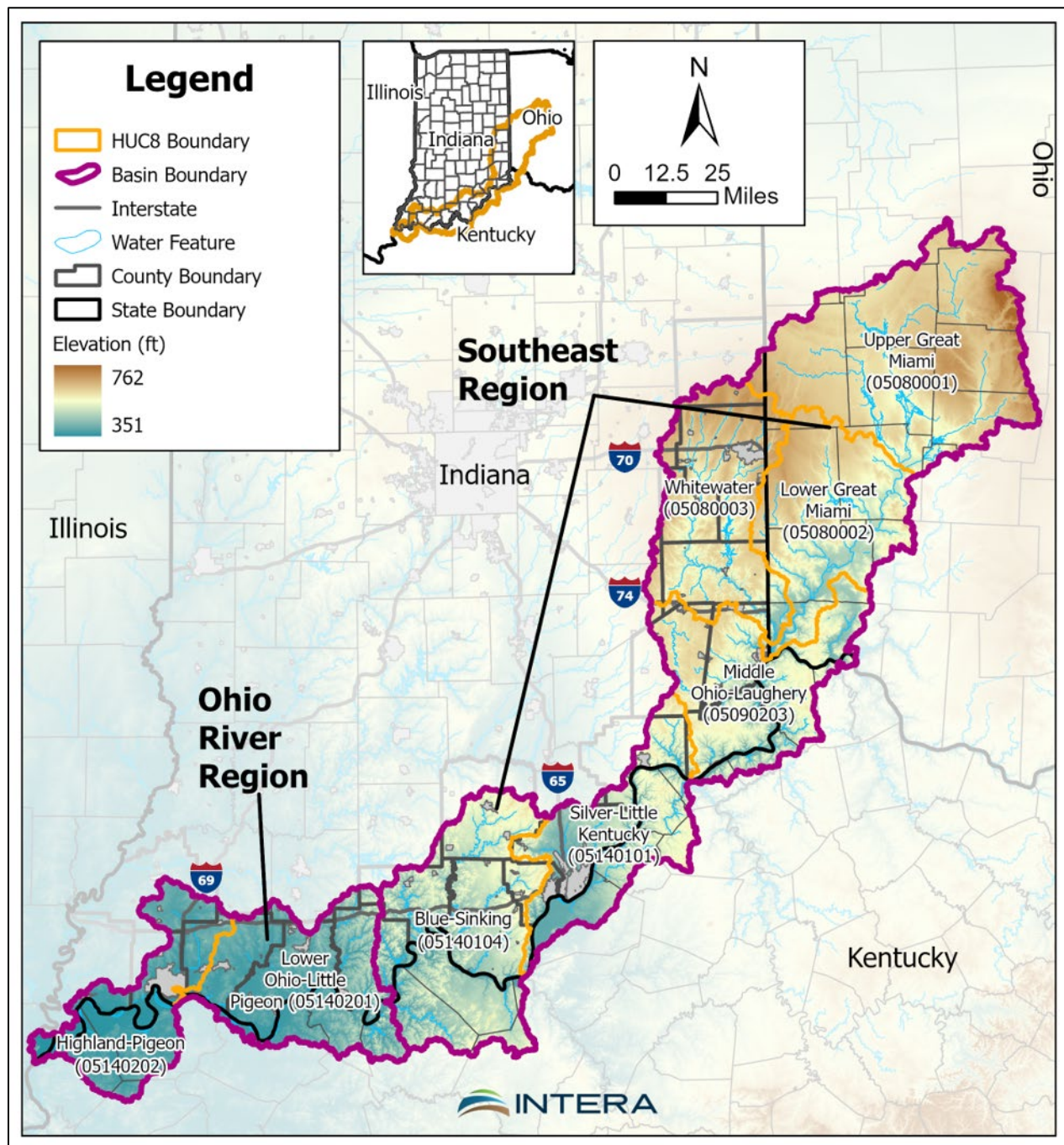


Figure ES-1. Extent of the Ohio River and Southeast Indiana Water Regions. The combined Region includes eight HUC-8 watersheds, two in the Ohio River Region and six in the Southeast Region.

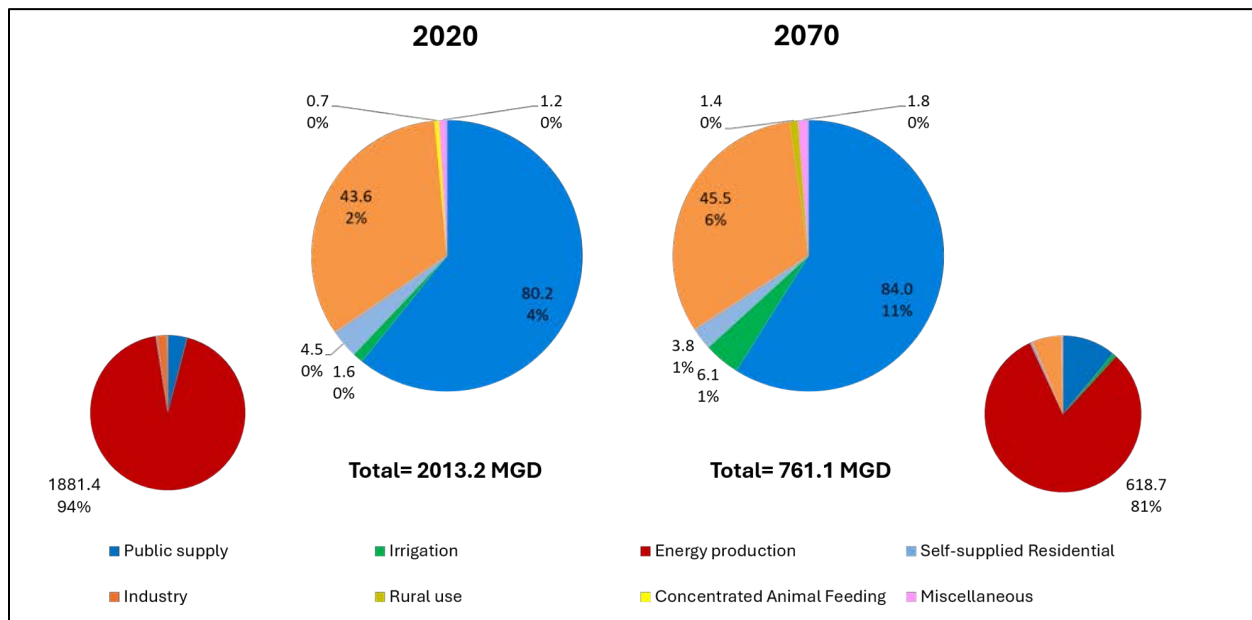


**Figure ES-2.** Annual average regional water demand in 2020 (left) and 2070 (right) by water-use sector. Note: The small pie charts include power generation, which is the largest water use sector. The large pie charts have power generation removed to make the relative water demand for the smaller sectors visible.

## Water Demand

Total regional water demand across all use sectors is projected to fall sharply, from 2,013 million gallons per day (MGD) in 2020 to 761 MGD in 2070, a decline of roughly 62 percent (**Figure ES-2**). This decline is driven almost entirely by the retirement of the Region's once-through coal-fired power plants. Power generation withdrawals, which dominate the regional total, are projected to fall from 1,881 MGD in 2020 to 619 MGD in 2070, with nearly all the decline occurring in Jefferson County.

Among the remaining sectors, industrial withdrawals are projected to grow modestly, from about 44 MGD to about 46 MGD; public water supply demand is projected to rise modestly through the mid-2020s before easing to about 84 MGD by 2070; and irrigation, while a small share of total withdrawals, is projected to grow the fastest in percentage terms, from about 1.6 MGD to more than 6.1 MGD, concentrated in Spencer, Posey, and Vanderburgh counties.

## Water Availability

Water availability is assessed on a sub-basin scale, with the Region divided into 11 sub-basins (**Figure ES-3**). Historical water availability, assessed for the period 2007-2023, is positive across nearly all the Region's sub-basins on a seasonal basis; only one sub-basin, Sub-Basin 6, outside the Whitewater

### Instream Flow

Instream flow is a minimum streamflow target that protects the water quality, ecological health, and recreational uses of a stream. If the flow in a stream drops below the instream flow target for an extended period time, the health of the stream may be impacted. The Indiana Regional Water Studies have adopted two statistical measures of streamflow to define instream flow: the 7Q10 and the annual Q90.

River watershed, experienced a single historical season (Fall) with streamflow below its minimum instream flow target. The Ohio River and its outwash deposits (Major Sub-Basin 11) have cumulative excess water availability one to two orders of magnitude greater than the Region's other sub-basins, reflecting the much larger flow volumes of the Ohio River itself.

Looking forward, the Whitewater River watershed and the rest of the Region diverge sharply. In the Whitewater watershed (Sub-Basins 1 through 5), projected cumulative excess water availability declines in every sub-basin, and the number of sub-basins experiencing at least one seasonal occurrence of negative cumulative excess water availability grows from none historically to all five sub-basins in the future, with occurrences concentrated in Fall.

Outside the Whitewater watershed, future conditions are more stable. The only sub-basin (Sub-Basin 6) that experienced a historical occurrence of negative cumulative excess water availability is projected to have no such occurrences in the future, and Sub-Basins 7 through 11, including the Ohio River mainstem, remain fully positive throughout the planning horizon, though the Ohio River itself is expected to see reduced Fall streamflow by 2070 (**Figure ES-3**).

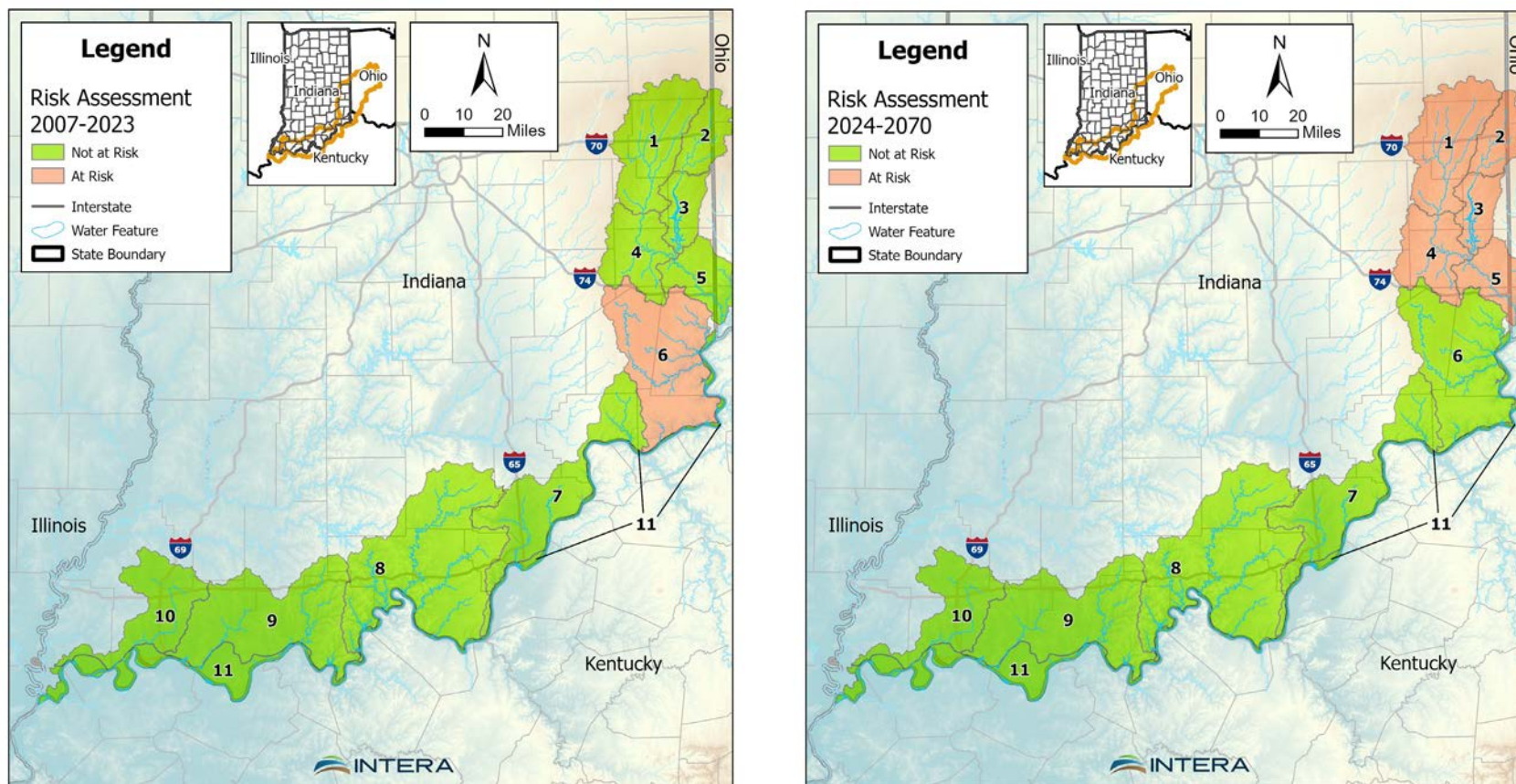


Figure ES-3. At-risk major sub-basins in the historical (left) and projected future (right) period. Green represents basins that have not and are not expected to exceed their seasonal cumulative excess water availability. Orange shows sub-basins that have dropped below the minimum instream flow target at least once (left) or are predicted to in the future (right).

## Findings and Recommendations

The water demand and availability analysis indicates that the Ohio River and Southeast Indiana Region is not approaching a region-wide water deficit, but the Whitewater River watershed faces a growing and increasingly frequent **seasonal** risk to streamflow availability, particularly in Fall, even as total regional demand declines overall due to power plant retirements.

Layered onto this seasonal availability risk are ongoing risks from climate, water quality, and aging infrastructure. The Region faces the largest projected increase in extreme heat of any part of the state, present-day drought has already reduced Ohio River flows to historical lows, and the Region's water and wastewater infrastructure—illustrated by Evansville's 90-year-old cast iron water mains and multi-hundred-million-dollar combined sewer overflow obligations—is in many places well past its designed service life. Nitrate risk in the Whitewater Valley aquifer and per- and polyfluoroalkyl substances (PFAS) detections in the Ohio River add further water-quality pressure, while emerging data center development along the Clark County corridor introduces a new source of water and power demand for which the Region has not previously had to plan.

As regional planning progresses in the Ohio River and Southeast Indiana Region, the following recommendations will benefit the Region's water resources:

1. **Conservation review of new withdrawals** - Ensure that any future proposal for new or increased withdrawals in the Region documents sound and economically feasible conservation and efficiency measures, consistent with the Indiana's Water Shortage Plan's drought-response framework and IDNR's authority under IC 14-25-7-14.
2. **Ohio River low-flow resilience** - Incorporate the projected decline in minimum Fall water availability and recent flash-drought experience into intake, raw-water, and drought-contingency planning for utilities along the Ohio River Corridor. Explore water treatment technologies related to PFAS removal.
3. **Hydrologic monitoring** - Increase the number of active USGS stream and groundwater monitoring stations in the Region to better assess water availability. The Ohio River and Southeast Indiana Region has far less active monitoring than other regions in the state.
4. **Brookville Reservoir** - Explore water supply development in the Whitewater River watershed using storage in the Brookville Reservoir owned by the State of Indiana. The State has access to a nominal yield of 80.6 million gallons of water per day from the reservoir under contract with the federal government. Little of that storage has been accessed for water supply in the past.
5. **Irrigation efficiency** - Target irrigation efficiency incentives and drought-contingency programs toward Spencer, Posey, and Vanderburgh counties, where irrigation withdrawals show the strongest increasing seasonal peaks.
6. **Industrial and energy production sectors** - Continue to support industrial water recycling and process efficiency improvements to offset the Region's modest long-term growth in industrial withdrawals and coordinate with power generation operators along the Ohio River corridor to sustain the ongoing decline in thermoelectric withdrawals.
7. **Public water supply infrastructure** - Encourage full participation in, and expansion upon, the existing Indiana water loss audit requirements among the Region's nearly 100 public water

utilities. Continue the Region-wide capital needs and condition-rating inventory prioritizing state revolving fund/Indiana Finance Authority funding toward smaller systems with high per-connection project costs.

8. **Peak-day demand management** - Adopt local ordinances or incentive programs addressing discretionary summer outdoor water use, consistent with the pronounced seasonal peak observed in public supply demand across the Region.
9. **Water quality protection** - Expand nitrate monitoring in the Whitewater Valley and Ohio River Outwash aquifer systems and in the karst counties; continue PFAS compliance support for utilities ahead of federal deadlines; support continued combined sewer overflow separation planning at Evansville, Jeffersonville, and New Albany; continue acid mine drainage remediation in the southwestern coal counties.
10. **Data centers and emerging demand** - Establish a coordinated review of cumulative water withdrawals, associated power-generation cooling water and wastewater discharges from data center development.
11. **Regional monitoring and data** - Continue and expand SWWF reporting compliance and biennial water loss audits; track peaking factors and demand data across utilities to refine future planning updates to this Study.

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## Acronyms and Abbreviations

|        |                                                                                     |
|--------|-------------------------------------------------------------------------------------|
| °F     | Degrees Fahrenheit                                                                  |
| 7Q10   | Lowest 7-day average flow that occurs every 10 years (on average)                   |
| CAFO   | Concentrated Animal Feeding Operation                                               |
| CFO    | Confined Feeding Operation                                                          |
| CFS    | Cubic feet per second (stream discharge)                                            |
| CSO    | Combined Sewer Overflow                                                             |
| CXS WA | Cumulative excess water availability (regionally aggregated upstream-to-downstream) |
| DOE    | U.S. Department of Energy                                                           |
| EPA    | U.S. Environmental Protection Agency                                                |
| GPCD   | Gallons per capita per day                                                          |
| GW     | Groundwater                                                                         |
| HAB    | Harmful algal bloom                                                                 |
| HUC    | Hydrologic Unit Code                                                                |
| IDEM   | Indiana Department of Environmental Management                                      |
| IDNR   | Indiana Department of Natural Resources                                             |
| IFA    | Indiana Finance Authority                                                           |
| IGWS   | Indiana Geological and Water Survey                                                 |
| MGD    | Million gallons per day                                                             |
| MCL    | Maximum Contaminant Level                                                           |
| NCCV   | National Climate Change Viewer                                                      |
| NID    | National Inventory of Dams                                                          |
| NLCD   | National Land Cover Database                                                        |
| NOAA   | National Oceanic and Atmospheric Administration                                     |
| NPDES  | National Pollutant Discharge Elimination System (EPA)                               |
| PFAS   | Per- and poly- fluoroalkyl substances                                               |
| PFOA   | Perfluorooctanoic acid                                                              |
| PFOS   | Perfluorooctanesulfonic acid                                                        |
| Q80    | Minimum flow that is present 80% of the time                                        |
| Q90    | Minimum flow that is present 90% of the time                                        |
| SIC    | Standard industrial classification                                                  |
| SMCL   | Secondary Maximum Contaminant Level                                                 |
| SW     | Surface water                                                                       |
| SWWF   | Significant Water Withdrawal Facility (high-capacity water pumping)                 |
| USDA   | U.S. Department of Agriculture                                                      |
| USGS   | U.S. Geological Survey                                                              |
| WA     | Water availability                                                                  |
| WBM    | Water balance model                                                                 |
| XS WA  | Excess water availability (locally generated)                                       |

## 1.0 Introduction

Ensuring the continued reliability of Indiana's water resources requires sustained, long-term planning that accounts for changes in both demand and supply. This Study evaluates current and future water demand and water availability in the Ohio River and Southeast Indiana Region, referred to herein as the Region.

The technical analyses conducted in this Study are performed at the watershed and sub-basin scale. Hydrologic unit boundaries (HUC-8 watersheds) are used to represent natural drainage systems that govern surface-water flow, groundwater recharge, and water availability throughout the Region. The study area encompasses eight 8-digit Hydrologic Unit Code (HUC-8) watersheds (**Figure 1**):

- Upper Great Miami, Indiana, Ohio (HUC-8 05080001)
- Lower Great Miami, Indiana, Ohio (HUC-8 05080002)
- Whitewater (HUC-8 05080003)
- Middle Ohio-Laughery (HUC-8 05090203)
- Silver-Little Kentucky (HUC-8 05140101)
- Blue-Sinking (HUC-8 05140104)
- Lower Ohio-Little Pigeon (HUC-8 05140201)
- Highland-Pigeon (HUC-8 05140202)

The Southeast Region is combined with the Ohio River Region in this report. The Ohio River Region consists of the Lower Ohio-Little Pigeon and Highland-Pigeon HUC-8 watersheds listed above. The Southeast Region consists of the remaining six HUC-8 watersheds.

The analysis focuses on public water supply needs over a 50-year planning horizon and includes the other significant water-use sectors. Water withdrawals are used as a proxy for demand, and both groundwater and surface-water resources are evaluated to determine the capacity of regional water resources to meet projected needs. The Study integrates historical water-use data, demographic and economic projections, and hydrologic analyses to quantify water demand and water availability within the study area.

The work is structured around three major analytical components:

1. Development of a 50-year forecast of regional water demand.
2. Evaluation and forecasting of regional water availability.
3. Comparison of demand and availability to identify potential future water-supply gaps and opportunities for improved water management.

The results of this Study are intended to support state and local decision-makers, public water utilities, and regional stakeholders in planning for reliable and sustainable water supplies across the region. The following subsections present the study objectives, describe the study area, provide a regional overview, and define the sub-basin scale of analysis.

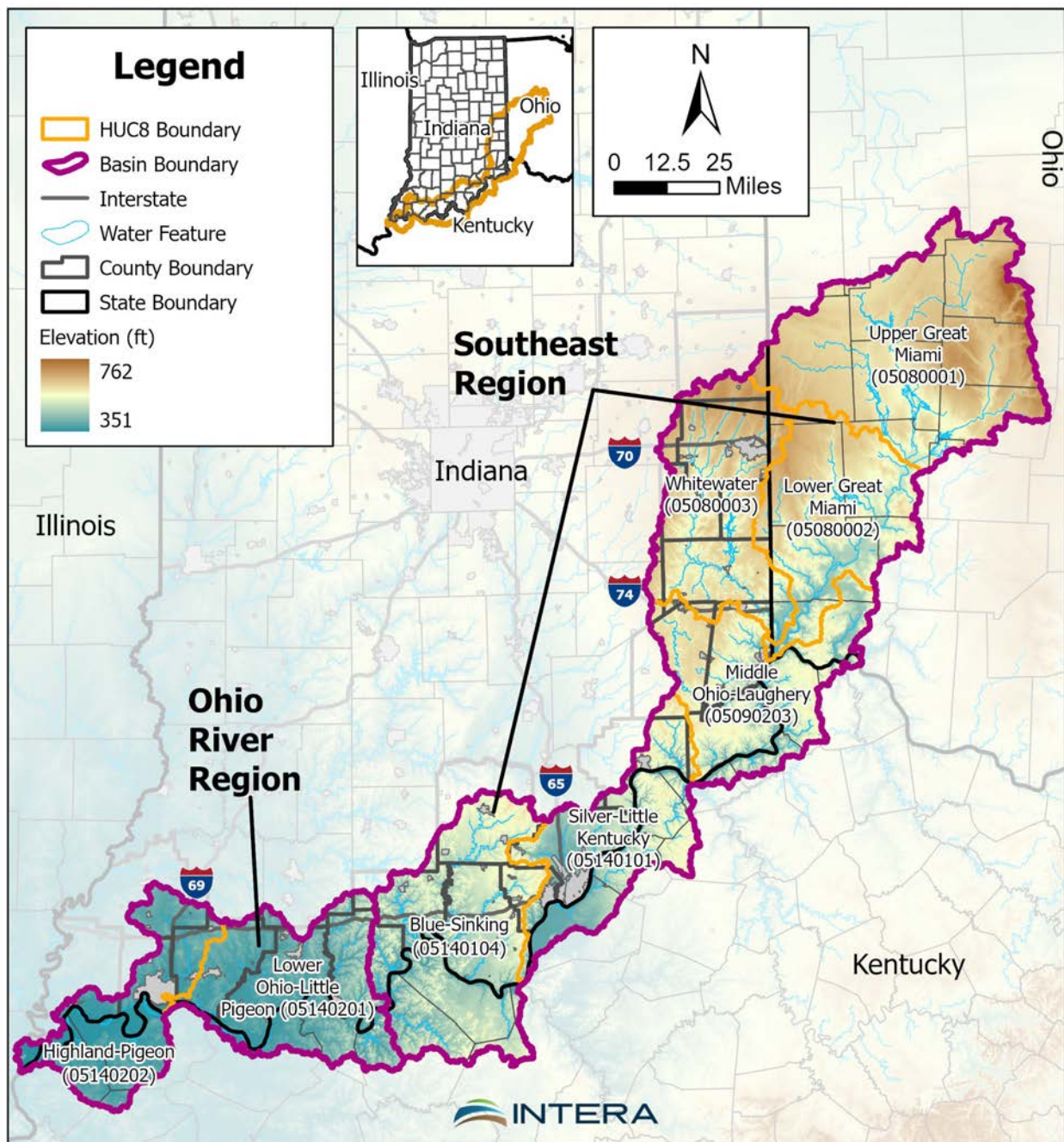


Figure 1. Extent of the Ohio River and Southeast Indiana Region. The study area includes eight HUC-8 watersheds and consists of two Water Planning Regions.

## 1.1 Study Objectives

The objective of this Study is to evaluate whether sufficient water resources exist within the Ohio River and Southeast Indiana Region to meet projected public water supply needs through the year 2070. The analysis focuses on understanding both current conditions and how water demand and water availability may evolve over time in response to demographic, economic, and climate factors. This study provides a regional planning assessment and is not intended to replace detailed local or site-specific evaluations, which may be needed for specific infrastructure or water development projects. The results of this Study are intended to support state and local decision-makers, public water utilities, and regional stakeholders in planning for reliable and sustainable water supplies across the Region.

Specific objectives of the study include:

- Quantify current water withdrawals and use across major water-use sectors within the Region.
- Develop projections of future water demand for public water supply and other significant sectors through 2070.
- Evaluate current water availability within the Region.
- Estimate how water availability may change over time under future climate conditions.
- Compare projected water demand with available water supplies to identify potential deficits or areas of limited availability.
- Identify risks, constraints, and potential strategies to improve long-term water supply resilience.

## 1.2 Ohio River and Southeast Indiana Region

The Region includes portions of 21 Indiana counties located within the Ohio River Basin (**Figure 2**). The Region extends across much of southeastern Indiana and includes areas that ultimately drain to the Ohio River through a network of tributary watersheds. Seven additional counties with only minor areas inside the Ohio River Basin are not part of this Study.

Counties included wholly or partially within the study area include:

- |                      |                       |                         |
|----------------------|-----------------------|-------------------------|
| ▪ Clark (partial)    | ▪ Harrison (whole)    | ▪ Spencer (partial)     |
| ▪ Crawford (partial) | ▪ Jefferson (partial) | ▪ Switzerland (whole)   |
| ▪ Dearborn (whole)   | ▪ Ohio (whole)        | ▪ Union (whole)         |
| ▪ Fayette (partial)  | ▪ Perry (whole)       | ▪ Vanderburgh (partial) |
| ▪ Floyd (whole)      | ▪ Posey (partial)     | ▪ Warrick (partial)     |
| ▪ Franklin (whole)   | ▪ Randolph (partial)  | ▪ Washington (partial)  |
| ▪ Gibson (partial)   | ▪ Ripley (partial)    | ▪ Wayne (whole)         |

These counties form a corridor across southeastern Indiana extending from the Ohio-Indiana border in the east to the lower Ohio River counties in southwestern Indiana. The largest population centers include Evansville, Jeffersonville, and Richmond (**Figure 3**). Major interstate transportation corridors,

including I-64, I-65, I-69, I-70, and I-74, cross portions of the region and connect many of the communities located within the study counties.

The Ohio River Basin forms the primary hydrologic framework for the study. Tributary watersheds within the basin convey surface water and groundwater discharges from southeastern Indiana to the Ohio River, which serves as the ultimate receiving water body for the region's drainage system. The Whitewater HUC-8 (**Figure 1**) is the largest drainage system in the Region connected to the Ohio River; the Whitewater River leaves Indiana and joins the Great Miami River in Ohio which then joins the Ohio River. The Upper Great Miami and Lower Great Miami HUC-8 watersheds (**Figure 1**) lie primarily in Ohio, with only small portions in Indiana. Those watersheds were excluded from the current study.

The watershed framework supports evaluation of regional demand and availability and reporting of results at a scale useful for local planning. Staying within the watershed framework, when county data is reported in this report, it is not the whole county, but the portion of each county that is within the Region.

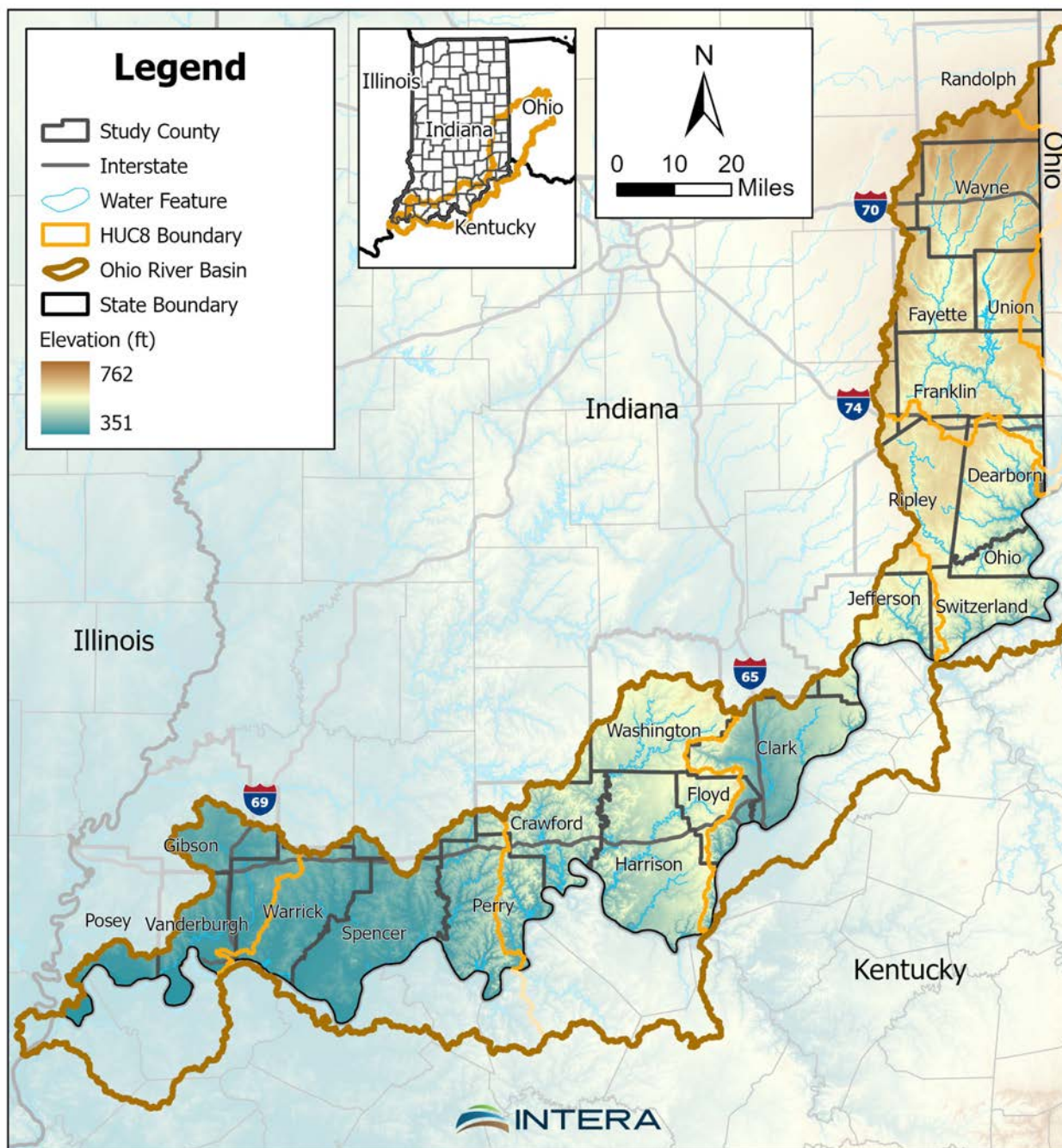


Figure 2. Counties within the Ohio River and Southeast Indiana Region.

## 1.3 Regional Overview

Understanding the characteristics of the Region, including population distribution, public water utilities, land use, climate, geologic setting, and water sources, is important for interpreting patterns of water demand and evaluating the availability of water resources. The following sections provide a brief overview of these regional characteristics.

### 1.3.1 Population Centers

Population within the study area is distributed across rural areas, small towns, and several mid-sized cities located along the Ohio River. Several communities serve as regional population and economic centers (**Figure 3**). A complete list of incorporated areas with a population greater than 1,000 is provided in **Table 1**. Evansville is the largest city within the region with a 2020 population of 117,298, followed by Jeffersonville (49,447), New Albany (37,841), and Richmond (35,720). Additional mid-sized communities include Clarksville (22,333), Connersville (13,324), and Madison (12,357). Smaller incorporated communities include Tell City, Batesville, Charlestown, Sellersburg, Boonville, and Salem, among others.

Population growth within the region varies among communities, with areas near metropolitan centers and major interstate corridors, particularly along the I-65 and I-70 corridors near Jeffersonville and Richmond, experiencing more recent growth than many rural interior counties (Indiana Business Research Center, 2023).

Changes in population distribution influence both the magnitude and spatial distribution of water demand within the Region. Growth and urban expansion in communities along the Ohio River can increase municipal and industrial water demands, while more rural areas of the region may continue to rely on smaller community water systems or private wells.

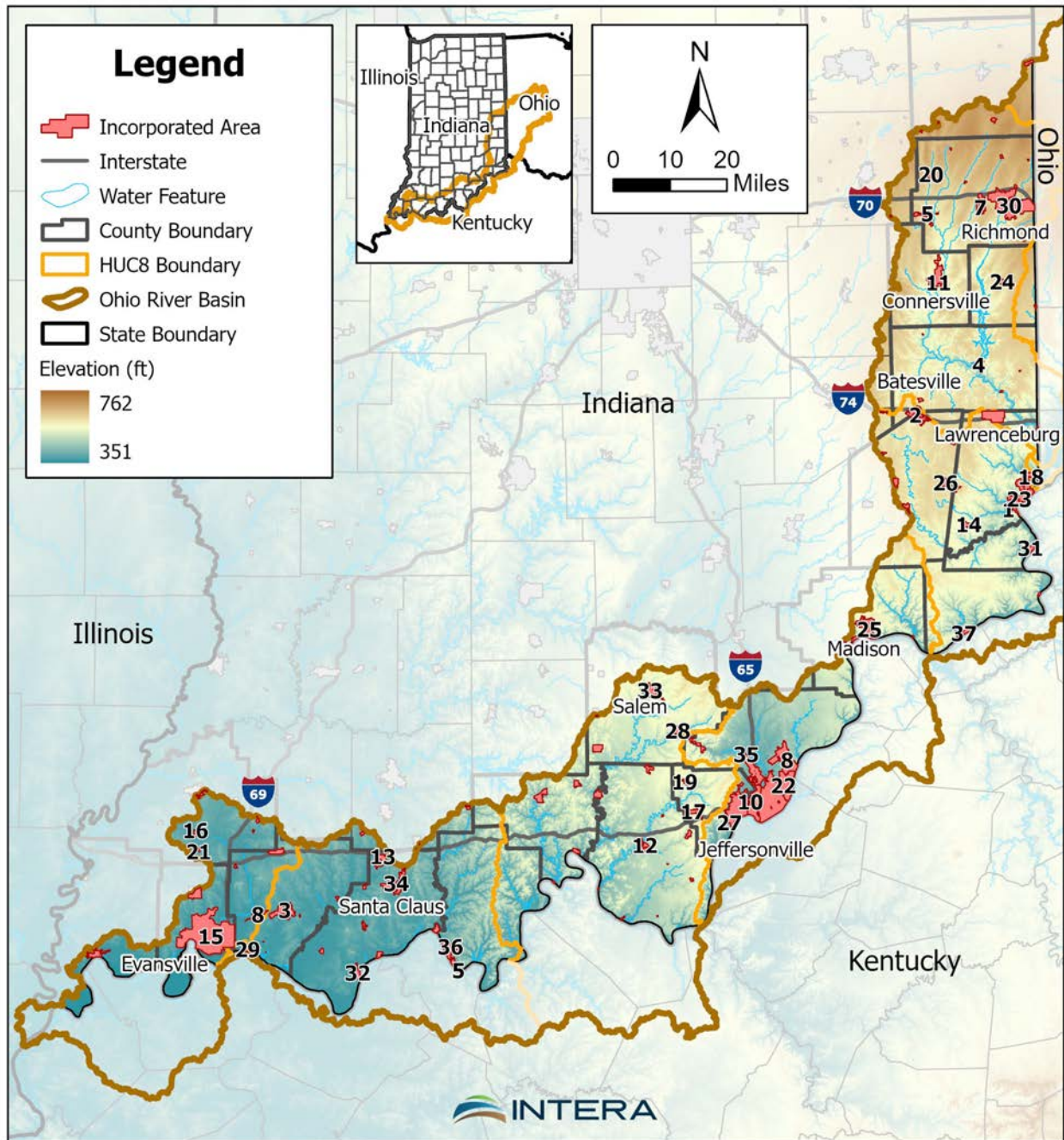


Figure 3. Population centers within the Ohio River and Southeast Indiana Region. Number labels correspond to Table 1 which provides identifying information.

**Table 1.** Population centers in the Ohio River and Southeast Indiana Region with 2020 population greater than 1,000.

| Map ID | Name of Incorporated Area | 2020 Population | Area (Square Miles) | Population Density (People/Square Mile) |
|--------|---------------------------|-----------------|---------------------|-----------------------------------------|
| 1      | Aurora                    | 3,479           | 3.52                | 988                                     |
| 2      | Batesville                | 7,202           | 5.89                | 1,224                                   |
| 3      | Boonville                 | 6,712           | 5.93                | 1,132                                   |
| 4      | Brookville                | 2,622           | 1.45                | 1,805                                   |
| 5      | Cambridge City            | 1,751           | 1.01                | 1,727                                   |
| 6      | Cannelton                 | 1,524           | 1.92                | 793                                     |
| 7      | Centerville               | 2,748           | 3.54                | 776                                     |
| 8      | Chandler                  | 3,693           | 2.97                | 1,243                                   |
| 9      | Charlestown               | 7,775           | 12.15               | 640                                     |
| 10     | Clarksville               | 22,333          | 10.11               | 2,210                                   |
| 11     | Connersville              | 13,324          | 7.18                | 1,856                                   |
| 12     | Corydon                   | 3,153           | 1.57                | 2,009                                   |
| 13     | Dale                      | 1,544           | 2.42                | 637                                     |
| 14     | Dillsboro                 | 1,360           | 1.35                | 1,007                                   |
| 15     | Evansville                | 117,298         | 47.80               | 2,454                                   |
| 16     | Fort Branch               | 2,965           | 1.09                | 2,721                                   |
| 17     | Georgetown                | 3,805           | 2.18                | 1,742                                   |
| 18     | Greendale                 | 4,602           | 5.73                | 803                                     |
| 19     | Greenville                | 1,365           | 0.90                | 1,516                                   |
| 20     | Hagerstown                | 1,681           | 1.32                | 1,272                                   |
| 21     | Haubstadt                 | 1,638           | 0.72                | 2,276                                   |
| 22     | Jeffersonville            | 49,447          | 33.89               | 1,459                                   |
| 23     | Lawrenceburg              | 5,129           | 5.54                | 925                                     |
| 24     | Liberty                   | 2,000           | 0.79                | 2,532                                   |
| 25     | Madison                   | 12,357          | 8.89                | 1,390                                   |
| 26     | Milan                     | 1,823           | 2.05                | 887                                     |
| 27     | New Albany                | 37,841          | 15.52               | 2,439                                   |
| 28     | New Pekin                 | 1,323           | 2.40                | 550                                     |
| 29     | Newburgh                  | 3,344           | 1.43                | 2,338                                   |
| 30     | Richmond                  | 35,720          | 24.42               | 1,463                                   |
| 31     | Rising Sun                | 2,248           | 1.52                | 1,477                                   |
| 32     | Rockport                  | 1,984           | 1.69                | 1,176                                   |
| 33     | Salem                     | 6,371           | 4.15                | 1,535                                   |
| 34     | Santa Claus               | 2,586           | 6.90                | 375                                     |
| 35     | Sellersburg               | 9,310           | 7.47                | 1,247                                   |

| Map ID | Name of Incorporated Area | 2020 Population | Area (Square Miles) | Population Density (People/Square Mile) |
|--------|---------------------------|-----------------|---------------------|-----------------------------------------|
| 36     | Tell City                 | 7,506           | 4.46                | 1,682                                   |
| 37     | Vevay                     | 1,741           | 1.62                | 1,075                                   |

### 1.3.1 Climate

The Region is characterized by a humid continental to humid subtropical climate with warm, humid summers, moderately cold winters, and precipitation distributed throughout the year with a modest Spring maximum. The region spans a pronounced north-to-south climatic gradient, with the northern portions near Richmond experiencing conditions typical of the broader Midwest interior, while the southwestern portions near Evansville and the Ohio River corridor are among the warmest and wettest areas of the state. Climate data referenced in this Study are based on the 1991–2020 climate normals (National Oceanic and Atmospheric Administration [NOAA], 2021). Seasonal variability in temperature and precipitation controls evapotranspiration, groundwater recharge, streamflow variability, and surface-water storage (Winter et al., 1998).

#### 1.3.1.1 Temperature

Average annual temperatures across the region range from approximately 53 to 59 degrees Fahrenheit (°F), based on 1991–2020 climate normals (NOAA, 2021), with the warmest conditions recorded near Evansville in the southwest and cooler conditions in the northeastern portions of the region near Richmond and Brookville. January average temperatures are approximately 34°F near Evansville, whereas July average temperatures reach approximately 79°F (NOAA, 2021). Interior counties within the Norman Upland and Mitchell Plateau areas (see **Section 1.3.5**) may experience slightly cooler temperatures than Ohio River valley communities.

Temperature patterns influence both surface-water and groundwater systems. During Winter months, reduced soil frost compared to northern Indiana generally supports more consistent year-round infiltration, though cold snaps can temporarily restrict recharge. Higher temperatures during the growing season increase evapotranspiration rates, which can reduce effective recharge despite relatively high precipitation totals (Winter et al., 1998). Urban areas such as Evansville and Jeffersonville may experience slightly elevated temperatures relative to surrounding rural areas due to urban heat island effects (NOAA, 2022).

#### 1.3.1.2 Precipitation

Average annual precipitation across the region ranges from approximately 43 to 51 inches per year (NOAA, 2021), generally increasing from the northeast toward the southwest, with Evansville averaging approximately 48 inches and Tell City, in the Ohio River valley, averaging over 51 inches. Precipitation is distributed throughout the year with a Spring maximum; April is the wettest month across much of the region, with Spring also representing the wettest season overall (National Weather Service [NWS], 2021). Late Summer and early Fall tend to be the driest periods of the year.

Spring and Winter precipitation contributes most directly to groundwater recharge and elevated streamflow conditions. The primary recharge period is late Winter through Spring, roughly February through May, when evapotranspiration demand remains low and soil moisture deficits are being

replenished. By early Summer, rising evapotranspiration associated with crop growth and vegetation significantly reduces net recharge despite continued precipitation (Winter et al., 1998).

### 1.3.1.3 Flooding

Flooding within the Region is driven by a combination of factors including heavy rainfall events, seasonal high flows along the Ohio River and its tributaries, and the region's varied topography. Much of the southeastern region is characterized by unglaciated (i.e., driftless) or partially glaciated uplands with steeper slopes and thinner soils, which can produce rapid runoff responses to intense precipitation (NOAA, 2022). Riverine flooding is most prominent along the Ohio River corridor and along major tributaries including the Whitewater River and Blue River systems.

The Ohio River itself represents a distinct flooding influence that is not present in other Indiana regions. High-water events on the Ohio River, which drains a large multi-state watershed, can cause backwater flooding along lower reaches of Indiana tributaries even when local precipitation is limited. Communities along the Ohio River corridor, including Evansville, Jeffersonville, Madison, and Rising Sun, are subject to both local tributary flooding and Ohio River backwater conditions (NOAA, 2022).

Flooding contributes to floodplain recharge and riparian aquifer replenishment, but it also damages infrastructure and degrades water quality. Understanding flood dynamics is critical for water resource management, infrastructure planning, and hazard mitigation within the Region.

## 1.3.2 High-Capacity Water Users

High-capacity water users (also called “significant water withdrawal facilities” [SWWFs]) within the Region are shown in **Figure 4**. SWWFs are facilities that have the capacity to withdraw 100,000 gallons or more per day from either groundwater or surface-water sources and are required to report their withdrawals to the Indiana Department of Natural Resources (IDNR). A single facility registered in the SWWF database may have multiple withdrawal sites and may include both groundwater wells and surface water intakes. A total of 367 water withdrawal sites were active in the Region in 2023 and are comprised of 86 surface-water intakes and 281 groundwater wells (**Figure 4**). These sites represent water withdrawals within the State of Indiana across six water-use sectors: public supply, industry, energy production, irrigation, rural use, and miscellaneous.

Public supply wells and intakes are the most numerous withdrawal sites and are distributed broadly across the Region, consistent with the utility service areas described in **Section 1.3.3**. Public supply facilities are present throughout the region but are particularly concentrated along the Ohio River corridor near Evansville and Jeffersonville, where large municipal intakes serve major population centers.

Industrial facilities are distributed across the Region with notable concentrations near Evansville, along the Ohio River corridor, and in the Richmond area. Energy production facilities, surface-water intakes, and wells used for thermoelectric or other power generation purposes are also concentrated along the Ohio River, where surface water is available in sufficient quantity to support cooling water demands. Industrial and energy production facilities cluster along the Ohio River corridor, where surface-water flows are large enough to supply cooling demand.

Irrigation withdrawals are represented by both wells and surface-water intakes and are distributed primarily across the southern and western portions of the region, with notable concentrations near

Evansville and along the lower Ohio River tributaries. Rural use withdrawal sites are clustered in the eastern portion of the Region, at lower densities than other categories.

The Ohio River corridor supports the highest density of large-volume withdrawals, while interior portions of the Region are served predominantly by groundwater wells associated with public supply and rural use.

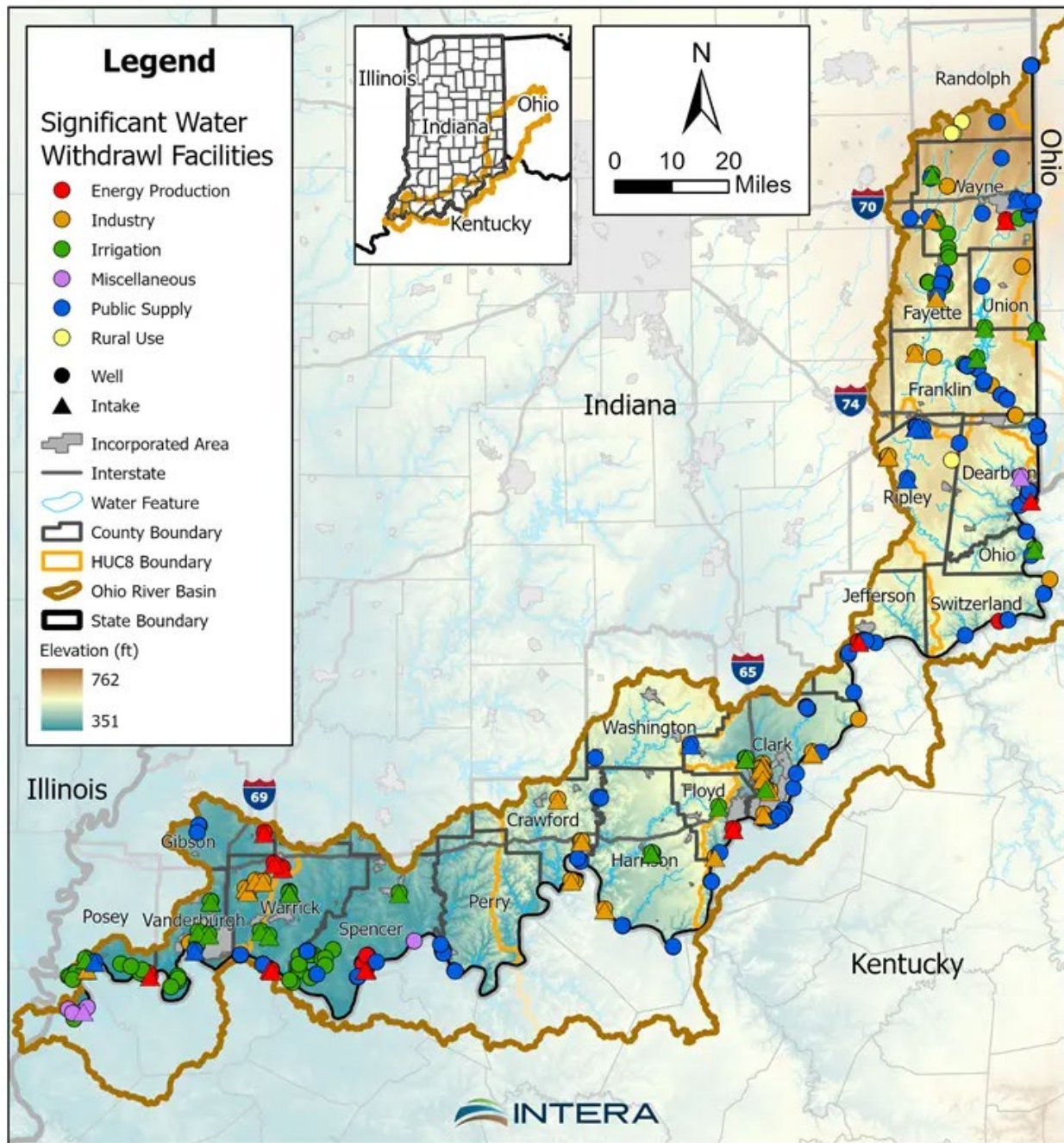


Figure 4. Locations of high-capacity water withdrawals within the Ohio River and Southeast Indiana Region. Figure shows groundwater wells and surface water intakes active in 2023.

### 1.3.3 Public Water Utilities

Public water utilities are the primary providers of drinking water and municipal water supply within the Region. The utility service areas are extensive across the region, with most of the Region's population served by public systems. As shown in **Figure 5**, the central and northern parts of the state have smaller service areas that often correspond with incorporated areas. The larger service areas in southern Indiana reflect limited groundwater availability in the upland areas, where even rural residents commonly rely on public water supply. In other parts of the state, rural residents are typically served by private domestic wells.

Utilities range from large municipal systems serving urban populations to smaller systems supplying rural communities and unincorporated areas. A list of the top 25 public water utilities by their service areas, population served, and water source, is provided in **Table 2**. A complete list of public water utilities is included in the Appendices. Note that some of these utilities lie outside the Region, but export supplies to customers inside the Region.

Water supplies for utilities in the Region are derived from both groundwater and surface-water sources. Many utilities rely on groundwater withdrawn from alluvial aquifers associated with river valleys or from bedrock aquifers where unconsolidated deposits are thin or absent. Surface-water supplies are obtained primarily from the Ohio River and other regional rivers and reservoirs and are used by several of the Region's larger systems. Several utilities supplement or augment their own supply through purchased water arrangements with neighboring systems, reflecting the interconnected nature of water infrastructure across the region (IFA, 2024).

The largest utility by population is Evansville Water Utility, which supplies water to approximately 182,444 people across a 156-square-mile service area using the Ohio River as its surface-water source. Other major systems include the Indiana American Water Southern System (104,445), Madison Water Department (15,323 people), and Watson Rural Water Company (15,750 people). Large regional systems lying outside of the Ohio River and Southeast Indiana Region, such as Stucker Fork Water Utilities, Patoka Lake Regional Water, German Township Water District, and Pike Gibson Water serve broad rural territories, in some cases exceeding 250 square miles, primarily through purchased surface-water or regional reservoir supplies. Along the Ohio River corridor, utilities serving Jeffersonville, Charlestown, Sellersburg, and surrounding Clark and Floyd counties form a dense cluster of interconnected systems that collectively supply one of the most populous portions of the region.

Groundwater remains the predominant supply source across much of the interior and northern portions of the Region with 68 utilities supplying groundwater, while surface-water and purchased-water systems are more common along the Ohio River corridor and in areas underlain by less productive aquifers.

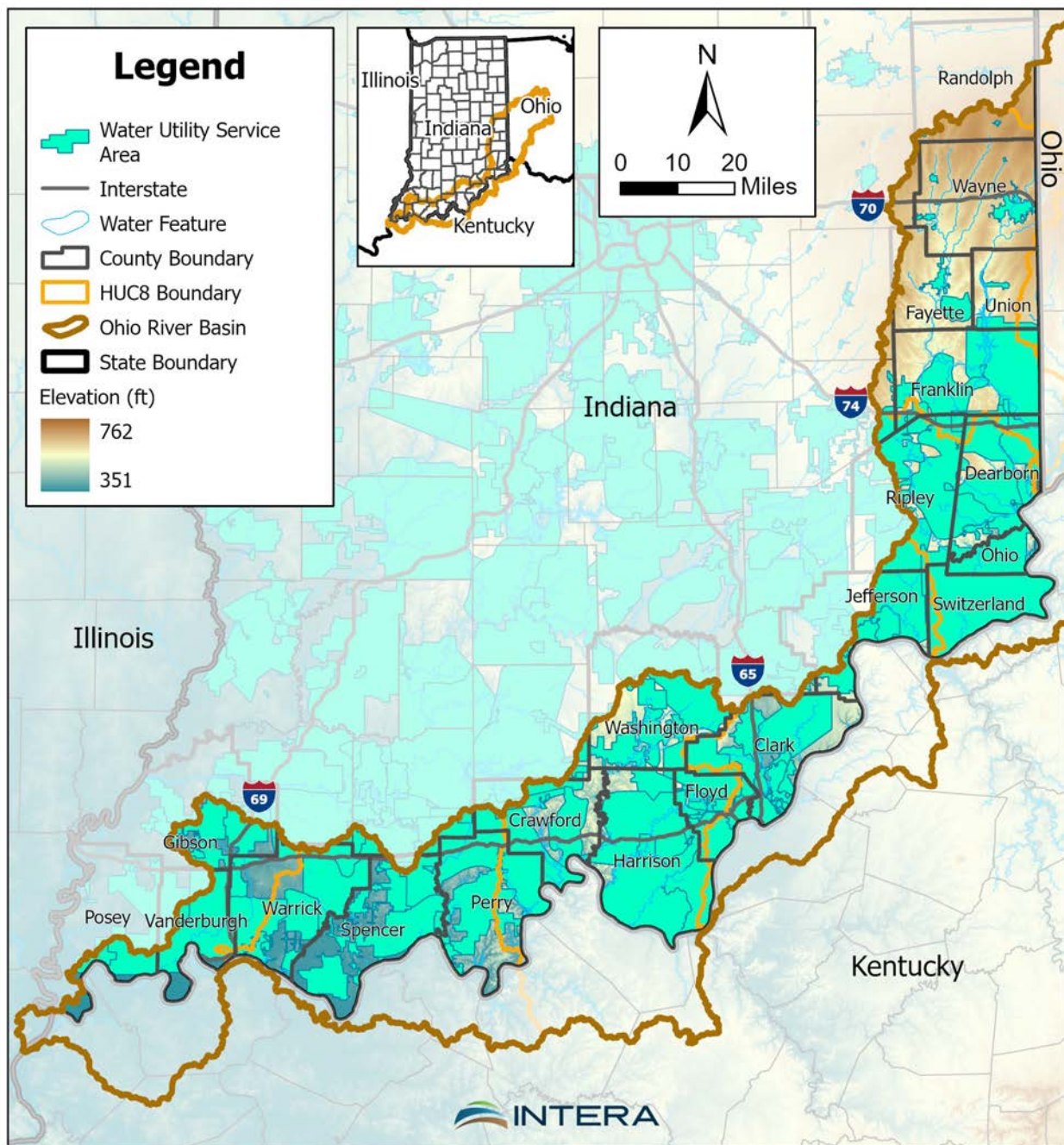


Figure 5. Water utility service areas in the Ohio River and Southeast Indiana Region.

**Table 2.** The largest 25 public water utilities serving the Ohio River and Southeast Indiana Region. A complete list is provided in the Appendices.

| Utility Name                              | Area<br>(sq. mile) | Population<br>Served | Density<br>(people/sq.<br>mile) | Towns/Places<br>Served | Source/<br>*Purchased |
|-------------------------------------------|--------------------|----------------------|---------------------------------|------------------------|-----------------------|
| Borden Tri-County Regional Water District | 102.84             | 11,637               | 113                             | Borden                 | SW                    |
| Chandler Water Works                      | 58.70              | 20,120               | 343                             | Newburgh               | GW                    |
| Charlestown Water Department              | 6.66               | 8,658                | 1,300                           | Charlestown            | GW                    |
| City of Boonville Utility                 | 40.69              | 10,260               | 252                             | Boonville              | GW                    |
| Connersville Utilities                    | 10.28              | 13,282               | 1,292                           | Connersville           | GW                    |
| Edwardsville Water Corporation            | 56.73              | 10,442               | 184                             | Georgetown             | GW                    |
| Evansville Water Utility                  | 156.15             | 182,444              | 1,168                           | Evansville             | SW                    |
| German Township Water District Inc.       | 144.12             | 12,890               | 89                              | Evansville             | SW*                   |
| Hoosier Hills Regional Water District     | 199.16             | 8,660                | 43                              | Milan                  | GW                    |
| Indiana American - Newburg                | 13.59              | 22,215               | 1,634                           | Newburgh               | GW                    |
| Indiana American - Richmond               | 24.60              | 41,485               | 1,686                           | Richmond               | SW                    |
| Indiana American - Southern Indiana       | 73.24              | 104,445              | 1,426                           | Jeffersonville         | GW                    |
| Madison Water Department                  | 16.78              | 15,323               | 913                             | Madison                | GW                    |
| Patoka Lake Regional Water                | 573.61             | 13,503               | 24                              | Dubois;<br>Loogootee   | SW                    |
| Patriot Water Department                  | 229.60             | 11,937               | 52                              | Patriot                | GW                    |
| Pike Gibson Water, Inc.                   | 268.00             | 10,000               | 37                              | Oakland City           | SW*                   |
| Ramsey Water Company, Inc.                | 141.61             | 16,475               | 116                             | Ramsey                 | GW                    |
| River Ridge Development Authority         | 16.83              | 10,500               | 624                             | Charlestown            | GW                    |
| Sellersburg Water                         | 10.75              | 15,655               | 1,456                           | Jeffersonville         | GW                    |
| Silver Creek Water Corporation            | 37.00              | 20,028               | 541                             | Sellersburg            | GW*                   |
| South Harrison Water Corporation          | 172.45             | 9,057                | 53                              | Corydon                | GW                    |
| Stucker Fork Water Utility                | 288.08             | 19,120               | 66                              | Austin                 | SW                    |
| Tell City Water Department                | 7.39               | 9,315                | 1,261                           | Tell City              | GW                    |
| Tri-Township Water Corporation            | 49.37              | 10,435               | 211                             | Lawrenceburg           | GW                    |
| Watson Rural Water Company                | 21.62              | 15,750               | 729                             | Jeffersonville         | GW                    |

### 1.3.4 Industry and Agriculture

Industrial and agricultural activities represent important components of the regional economy and contribute to water demand across the study area. The Region supports a diverse range of industrial sectors including manufacturing, mineral extraction, energy production, and agricultural processing of both grains and livestock. Many industrial facilities are located along the Ohio River corridor due to access to transportation infrastructure, water supply, and regional labor markets. Agricultural activities remain widespread throughout the interior counties of the region and include row-crop production and livestock operations that contribute to seasonal water demand (USDA, 2024).

#### 1.3.4.1 Quarries

Limestone and other carbonate aggregate resources are widely mined in southern Indiana, supported by the extensive Silurian and Devonian limestone and dolostone formations that underlie much of the region. Quarry operations extract limestone, dolomite, and crushed stone for use in road construction, building materials, cement manufacturing, and industrial processes. Indiana is a major producer of construction sand and gravel, crushed stone, dimension stone, and portland cement, and consistently ranks among the 10 leading crushed stone-producing states in the nation (USGS, 2022). Large limestone deposits in southern Indiana have supported quarry operations for more than a century, with active operations present in several counties within and adjacent to the Region.

Quarry activities may involve water use for dust suppression, material processing, and washing operations. Although water withdrawals associated with quarry operations are typically smaller than those of municipal or large industrial users, quarrying can influence local groundwater conditions and surface drainage patterns, particularly where operations intersect shallow groundwater systems or extend below the water table (Dieter et al., 2018).

#### 1.3.4.2 Coal Mining

Coal mining has historically been (and remains) an important economic activity in the southwestern portion of the state, including counties located near the Ohio River within the study area. Surface-minable coal reserves represent a substantial resource for Indiana, and their extraction beginning in 1915 has reshaped both the physical landscape and the economy of the state's southwestern counties (Harper, 1985). The state's coalfields lie on the eastern edge of the Illinois Basin: a broad, gently down-warped bedrock structure extending across parts of Indiana, Illinois, and Kentucky (Indiana Department of Environmental Management [IDNR], 2026a; 2026b). Coal-bearing rocks are restricted to Pennsylvanian-age sedimentary formations in southwestern Indiana, where recoverable bituminous coal reserves underlie an area of approximately 6,500 square miles across 25 counties (IDNR, 2023a). Surface mining has been the primary method of coal removal in Indiana since the mid-twentieth century, with most current production coming from surface mines (Harper, 1985; IDNR, 2026c).

Coal mining operations may require water for dust control, coal processing, and site reclamation activities. Mining activities can also influence regional hydrology through changes to surface drainage patterns, groundwater levels, and the creation of reclaimed mine lands that alter infiltration and runoff characteristics.

#### 1.3.4.3 Cultivated Crops and Animal Agriculture

Agriculture is the dominant land-use across much of southeastern Indiana. Cultivated crops primarily include corn and soybeans, which represent the largest share of crop production in the region.

Additional crops include wheat, hay, and specialty crops grown on smaller acreages. Livestock operations include hog (finishers), poultry (chickens, turkeys) and dairy production, and are common throughout the region (United States Department of Agriculture [USDA], 2024).

Agricultural water use occurs through irrigation withdrawals, livestock watering, and water associated with agricultural processing activities. Although irrigation demand in Indiana is generally lower than in more arid regions of the United States, irrigation use can increase during periods of drought or prolonged dry conditions (Dieter et al., 2018). The relatively higher precipitation totals across southeastern Indiana compared to the state's northern and central regions generally reduce irrigation demand, though variability in summer precipitation can necessitate supplemental irrigation during dry years.

#### 1.3.4.4 Power Generation

Electric power generation facilities located along the Ohio River represent an important water-use sector in the region. Thermoelectric power plants require substantial volumes of water for cooling processes associated with electricity generation. Surface water from large rivers, particularly the Ohio River, is commonly used for this purpose due to the large and reliable flows available in these systems (Dieter et al., 2018). Plant-level estimates developed by the USGS indicate that once-through and recirculating cooling systems account for most industrial water withdrawals in river corridor settings (Harris and Diehl, 2019).

##### Consumptive Water Use

Consumptive use is the portion of water withdrawn from a source that is not returned and is effectively removed from the immediate water system.

Although large quantities of water are withdrawn for cooling, much of the water used by thermoelectric power plants is returned to the source after use, meaning thermoelectric generation typically represents a large withdrawal but a comparatively smaller consumptive use of water (Harris and Diehl, 2019). The distinction between withdrawal and consumption is important for evaluating net water availability within the region, particularly along the Ohio River corridor where multiple facility types compete for water access.

### 1.3.5 Physiographic Regions

Physiographic regions are areas grouped by shared landforms, topography, and underlying geology. Indiana's physiographic divisions (Malott, 1922; Gray, 2000) provide a useful framework for the Ohio River and Southeast Indiana Region; the same geologic factors that shape the land surface also control groundwater recharge, aquifer productivity, and the baseflow that sustains streams during dry periods. The physiographic regions within the Ohio River and Southeast Indiana Region are shown in **Figure 6**.

The northeastern portion of the Region includes the New Castle Till Plains and Drainageways, where glacial till is cut by buried valleys and outwash-filled river valleys. The remainder of the Region largely escaped the most recent glaciation, so its landscape more directly reflects the underlying bedrock.

In the eastern portion of the Region the Dearborn Upland consists of steep, deeply dissected valleys carved into interbedded limestone and shale, some of the oldest bedrock exposed in Indiana. The Muscatatuck Plateau is a gently sloping limestone and dolomite plain. Farther west, the Norman Upland is a landscape of narrow ridges and steep valleys cut into siltstone and shale. The small Charlestown Hills stand in sharp relief along the Ohio River in Clark County.

In the central part of the Region, the Mitchell Plateau is a limestone karst landscape of sinkholes, caves, springs, and sinking streams. The Crawford Upland is capped by sandstone, and the Boonville Hills to the west are a rolling landscape of sandstone and shale. The Wabash Lowland contains wide valleys filled with outwash sand and gravel. Across the Region, the Ohio River and other major valleys are filled with thick outwash and alluvial deposits.

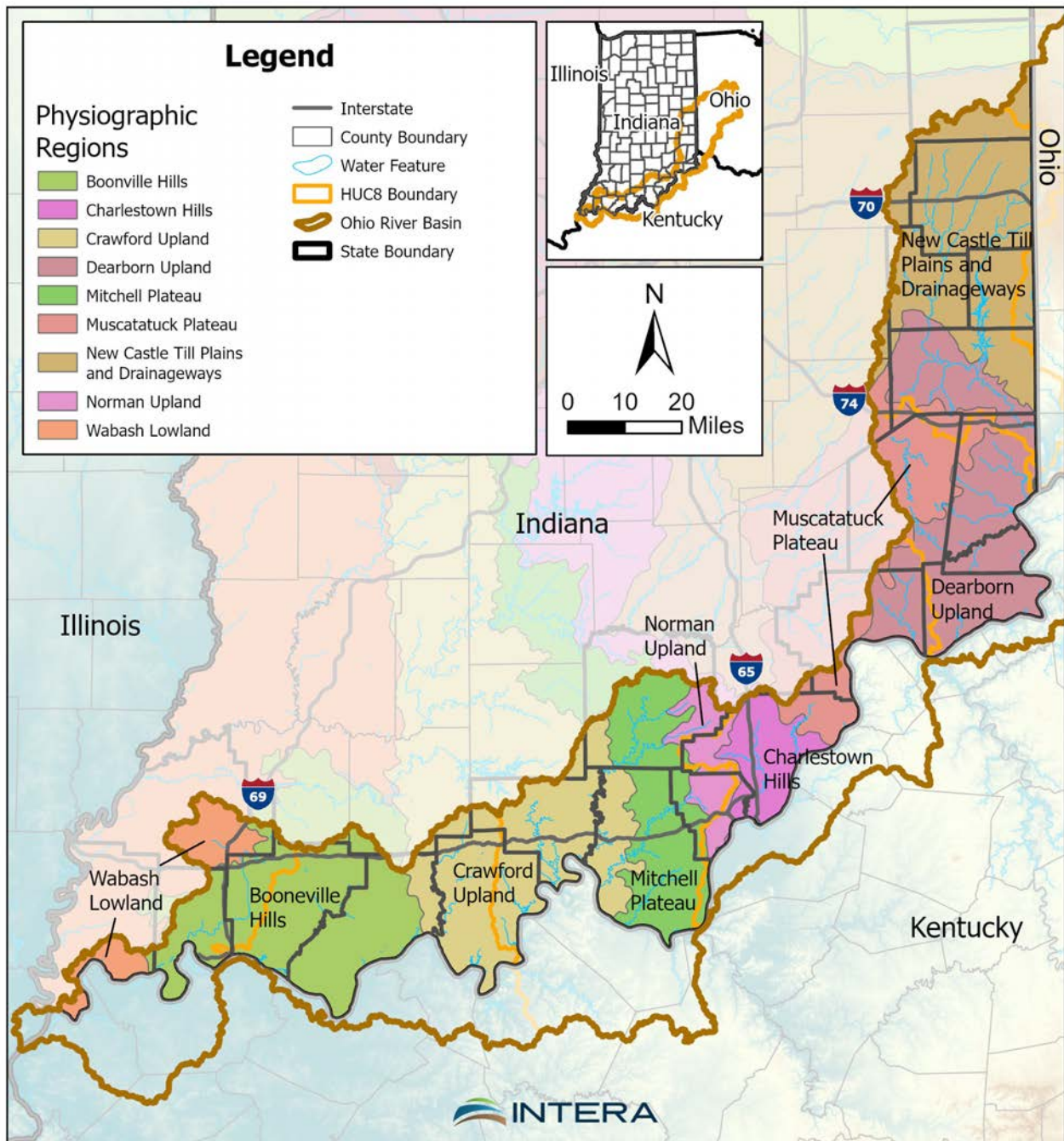


Figure 6. The physiographic regions within the Ohio River and Southeast Indiana Region (Gray, 2000).

### 1.3.6 Land Cover

Land cover composition has direct implications for water demand within the study area. The substantial agricultural footprint introduces seasonal water demand through irrigation and livestock operations, particularly during Summer months. Urban and suburban development drives municipal and commercial water demand concentrated near the region's cities and highway corridors. Forested land cover, which dominates the Ohio River-adjacent portions of the study area, generally contributes to higher infiltration rates and baseflow support compared to developed or agricultural surfaces (Dewitz, 2023).

Land cover across the study area is dominated by a mix of forested landscapes, agricultural uses, and scattered urban development, a transition from the intensively farmed central part of Indiana to the more rugged, forested terrain approaching the Ohio River (**Figure 7**).

According to 2021 National Land Cover Database (NLCD) data, deciduous forest is the single largest land cover class, comprising approximately 34% of the study area. As visible in the map, forested cover is concentrated in the southern portions of the study area along and near the Ohio River corridor, as well as in upland areas throughout the region. Mixed and evergreen forest classes contribute an additional 4.2% combined, bringing total forest cover to roughly 38% of the study area. The Hoosier National Forest extends across much of Crawford and Perry counties within the Region.

Agricultural land is the second largest land cover category. Cultivated crops account for nearly 30% of the study area, while pasture and hay lands cover an additional 16%, together comprising approximately 46% of total land cover. Agricultural land is most prevalent in the northern and central portions of the study area, where flatter terrain supports row crop production.

Developed land is concentrated near larger population centers and major transportation corridors, including Interstates I-64, I-65, I-69, I-70, and I-74. Developed open space (6.8%), developed low intensity (3.8%), developed medium intensity (1.5%), and developed high intensity (0.5%) together account for approximately 12.6% of the study area.

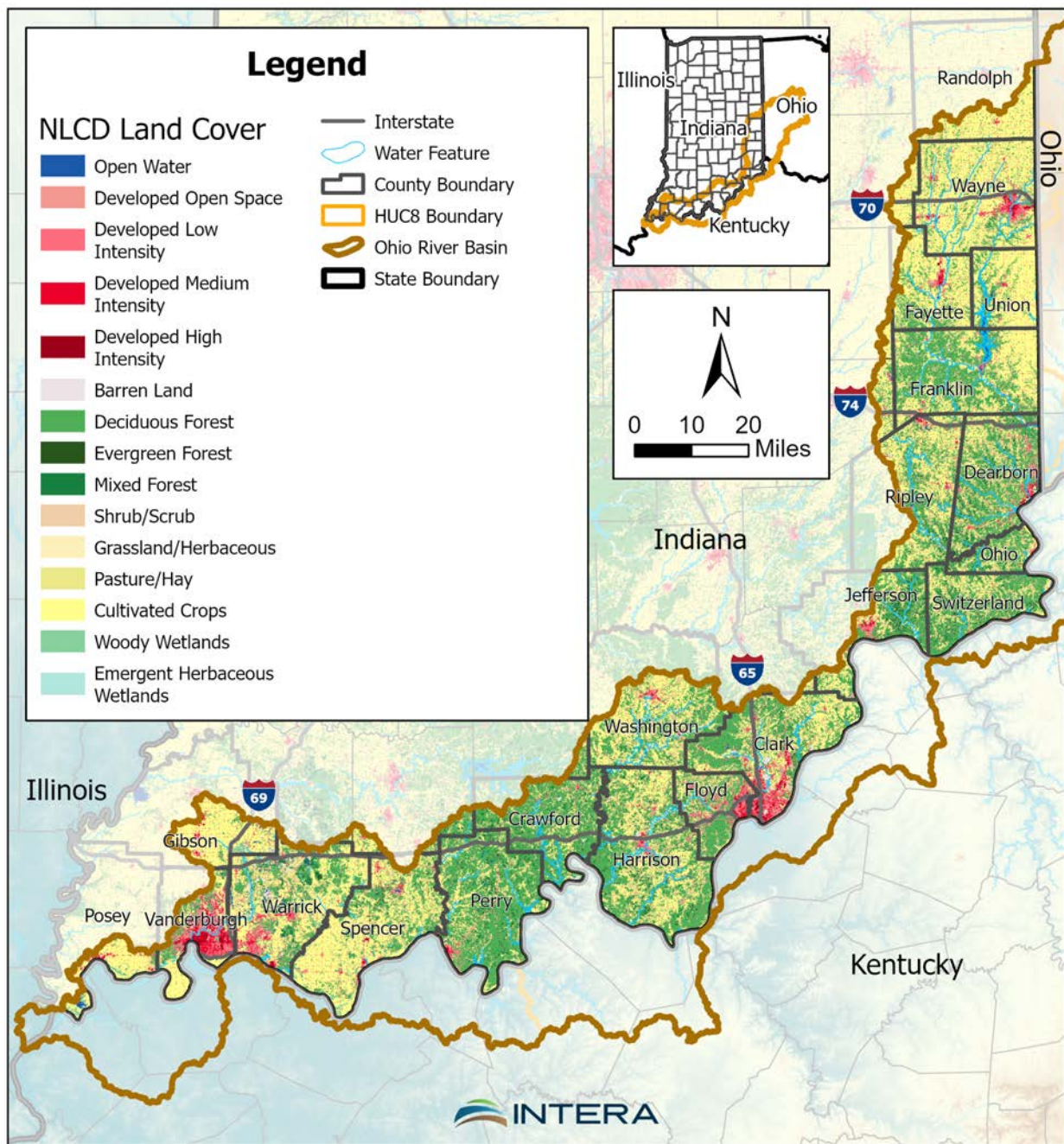


Figure 7. Land cover within the Ohio River and Southeast Indiana Region based on the 2021 National Land Cover Database (Dewitz, 2023).

### 1.3.7 Tile Drains

Subsurface tile drainage is an agricultural water management practice used in small portions of the Region. Tiles are installed to remove excess soil water from poorly drained agricultural fields and improve conditions for crop production. Tile drainage systems consist of perforated pipes or conduits buried below the root zone that intercept shallow groundwater and route it to surface ditches or streams. Indiana has the highest percentage of tile-drained cropland of any state in the nation, with approximately 35% of cropland having subsurface drainage improvements; most of the more than 8 million acres with drainage improvements would not be productive without the ditches or tiles that remove excess water from the field (Frankenberger and Klavivko, n.d.).

As shown in **Figure 8**, tile drainage within the study area is concentrated predominantly in the northern and eastern portions of the Region (Newcastle Till Plains), particularly in the glaciated and formerly glaciated agricultural counties near Richmond and within the upper Whitewater and Great Miami watersheds, where flat to gently rolling topography and poorly drained soils favor installation (Valayamkunnath et al., 2020). Tile drainage density decreases markedly toward the south and southwest, reflecting the unglaciated, more steeply dissected terrain of the Mitchell Plateau, Crawford Upland (**Figure 6**), and Ohio River corridor, where natural drainage gradients reduce the need for artificial drainage and installation is less practical. Within the southern HUC-8 watersheds, including the Highland-Pigeon, Lower Ohio-Little Pigeon, and Blue-Sinking watersheds, tile drainage is sparse relative to the northern portions of the region, consistent with the transition from glaciated to unglaciated terrain.

Tile drainage tends to increase watershed baseflow, decrease groundwater travel times, increase annual runoff volume, and increase instream nitrate concentrations (Valayamkunnath et al., 2020). By intercepting shallow groundwater that would otherwise contribute to aquifer recharge, tile drainage can reduce groundwater storage in shallow unconsolidated aquifers while simultaneously increasing the volume and responsiveness of streamflow (Adelsperger et al., 2023). Regional water balance analyses indicate that tile drainage significantly reduces surface runoff, groundwater recharge, and evapotranspiration, while increasing infiltration and soil water storage potential (Valayamkunnath et al., 2022). By increasing the hydrologic connectivity of a catchment, subsurface agricultural drainage may increase non-event flow or the streamflow between storm events, typically dependent on lateral flow through the subsurface and groundwater (Podzorski and Ryberg, 2025).

Tile drainage also creates efficient pathways for agricultural nutrients, particularly nitrate, to move from fields into streams and other water-bodies. This has implications for surface-water quality and source-water protection for utilities relying on surface-water supplies in tile-drained portions of the region (Valayamkunnath et al., 2020). Nitrate loading is therefore most likely to affect surface-water supplies in the northern and eastern portions of the region, where tile drainage is most extensive.

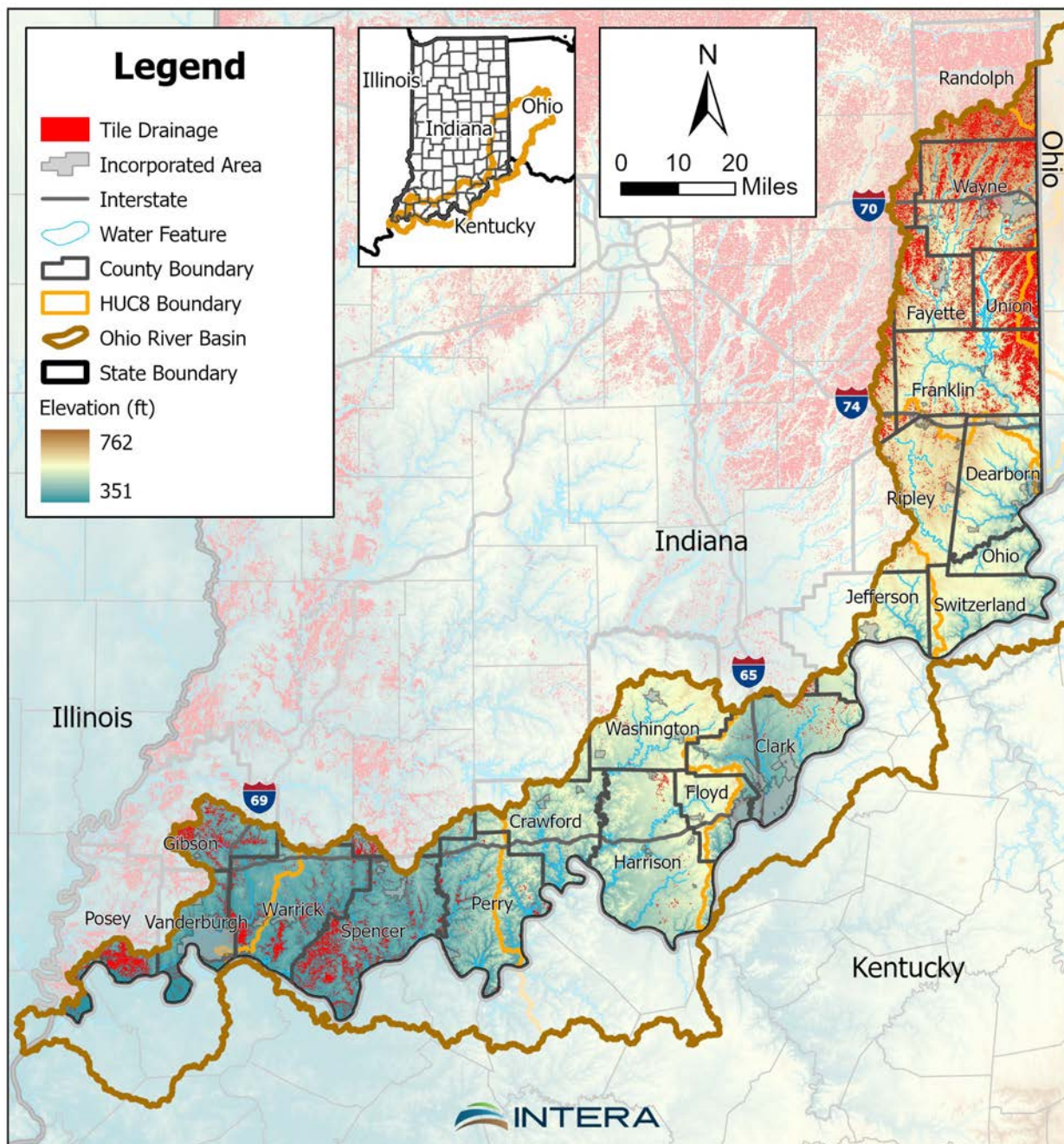


Figure 8. Extent of tile drainage in the Ohio River and Southeast Indiana Region (Valayamkunnath et al., 2020).

### 1.3.8 Karst Landscapes

Where soluble carbonate bedrock is present at or near the land surface, dissolution has produced karst landscapes characterized by sinkholes, sinking streams, springs, and underground drainage systems. Two physiographic divisions in southeastern Indiana, the Mitchell Plateau and the Crawford Upland (Gray, 2000), exhibit well-developed karst features developed on carbonate strata of Mississippian age (Gray, 2000). As shown in **Figure 9**, karst sinkhole areas within the study region are concentrated in the south-central portion of the region, extending across parts of the Blue-Sinking and adjacent HUC-8 watersheds, reflecting the surface and near-surface expression of these carbonate formations (Powell, 1997). There are some karst features to the east on the Muscatatuck Plateau (**Figure 6**), but they are less extensively developed than those of the Mitchell Plateau to the west, owing to the fewer deeply incised streams in this region (Indiana Karst Conservancy, 2026).

Karst landscapes are sensitive to contamination because most surface water that flows directly into solution features is not filtered by soil and bedrock (IGWS, 2026). Groundwater flow in karst settings is often dominated by conduit and fracture flow rather than intergranular flow, resulting in rapid recharge, limited natural filtration, and strong hydraulic connectivity between surface water and groundwater. These conditions support the development of springs, sinking streams, and other karst features that influence local hydrology and water-supply behavior and represent increased vulnerability to contamination from surface activities, an important consideration for groundwater development and source-water protection planning within the region (IGWS, 2026).

The interaction between bedrock geology and overlying unconsolidated sediments controls groundwater flow patterns and recharge throughout the region. As a result, the availability and productivity of groundwater resources vary significantly across southeastern Indiana depending on local hydrogeologic conditions, the degree of karst development, and the thickness of unconsolidated deposits overlying carbonate bedrock (Woodfield and Fenelon, 1994).

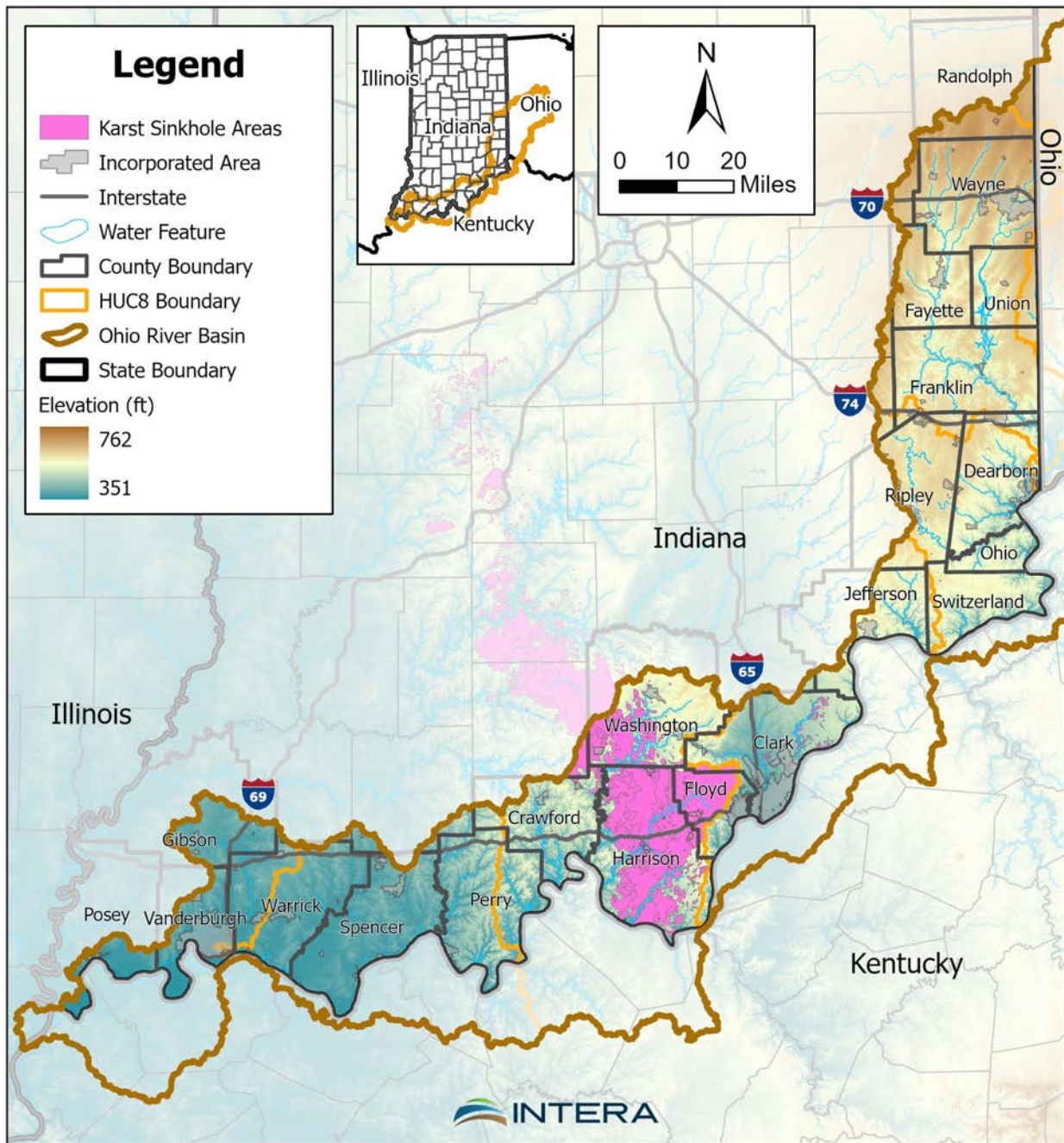


Figure 9. Karst sinkhole areas within the Ohio River and Southeast Indiana Region (Powell, 1997).

### 1.3.9 Geology

The geologic framework strongly influences groundwater occurrence, recharge, and aquifer productivity within the study region. The distribution of aquifers and groundwater resources is largely controlled by the interaction between underlying sedimentary bedrock formations and overlying unconsolidated sediments deposited during glacial and post-glacial periods. Together, these materials form the principal hydrogeologic units that supply groundwater to municipal, industrial, and domestic wells throughout the region (Woodfield and Fenelon, 1994).

#### 1.3.9.1 Unconsolidated Deposits

Unconsolidated sediments overlying the bedrock surface were deposited primarily during the Pleistocene glaciations and subsequent fluvial processes. These deposits consist of mixtures of sand, gravel, silt, and clay, and vary widely in thickness across Indiana depending on the extent of glaciation and the presence of buried bedrock valleys. In many parts of the state, glacial deposits form important aquifers that provide groundwater for municipal and industrial water supply (Woodfield and Fenelon, 1994).

Within southern Indiana, unconsolidated deposits tend to be thinner than in northern parts of the state because glacial ice advanced less extensively into this region. However, locally thick deposits of sand and gravel occur along major river valleys where glacial outwash and alluvial sediments accumulated. These coarse-grained sediments often form highly productive aquifers capable of supporting high-capacity wells used by municipal utilities and industries.

Alluvial aquifers associated with major river systems, including the Ohio River and its tributaries, are particularly important sources of groundwater. These aquifers commonly consist of permeable sand and gravel deposits that allow groundwater to move easily through the subsurface and can yield substantial quantities of water to wells. Because of their hydraulic connection to nearby rivers, these aquifers may also receive recharge from surface-water systems during periods of high streamflow.

#### 1.3.9.2 Bedrock

The bedrock underlying southeastern Indiana (**Figure 10**) consists primarily of sedimentary rock formations deposited during the Paleozoic Era, including limestone, dolomite, sandstone, and shale units that form part of the regional structural geology associated with the Illinois Basin. This large sedimentary basin underlies most of Illinois, southwestern Indiana, and western Kentucky, and bedrock units within the basin generally dip gently toward the southwest (Woodfield and Fenelon, 1994). Bedrock geology exerts fundamental control on groundwater occurrence, aquifer productivity, and the distribution of karst features throughout the region.

Groundwater in bedrock aquifers occurs primarily within fractures, bedding-plane openings, and solution-enhanced pathways within carbonate formations. In limestone and dolomite units, dissolution processes enlarge fractures and create secondary porosity that can significantly increase the capacity of carbonate bedrock to store and transmit groundwater. Although bedrock aquifers generally yield smaller quantities of water than unconsolidated sand and gravel aquifers, they represent an important source of groundwater in areas where unconsolidated deposits are thin or absent, and many domestic wells and smaller community water systems within the region rely on bedrock aquifers for water supply (Woodfield and Fenelon, 1994).

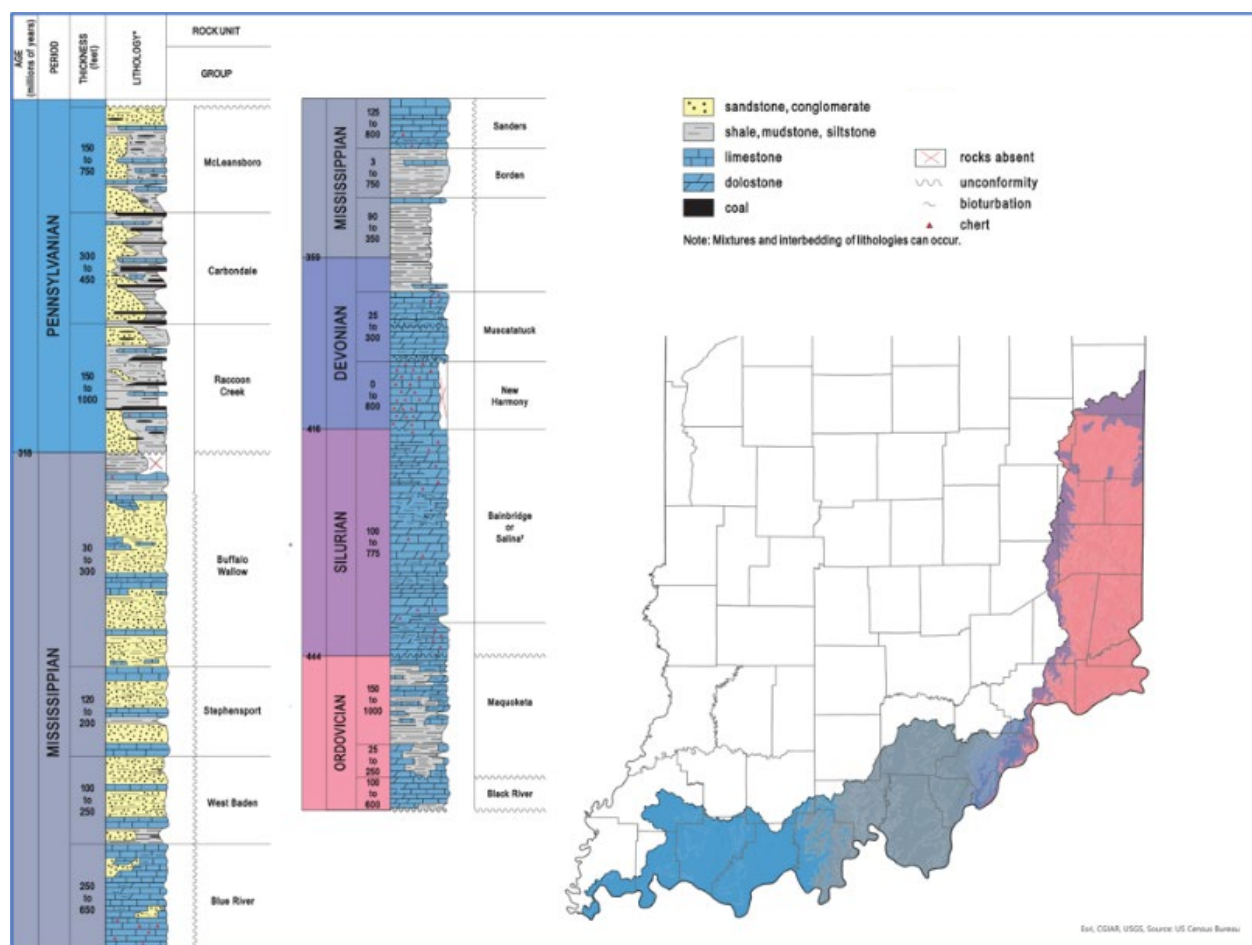


Figure 10. Generalized stratigraphic column of bedrock (modified from Thompson et al., 2016).

### 1.3.10 Water Resources and Trends

Water resources in the Ohio River and Southeast Indiana Region include both surface-water systems and groundwater aquifers that supply municipal, industrial, and agricultural users. Water resource distribution follows the geology and physiography described previously and determines the location of public water utility service areas and significant water withdrawal facilities.

#### 1.3.10.1 Rivers

Surface-water resources in the region are dominated by the Ohio River and several major tributary systems that drain portions of southeastern Indiana before ultimately discharging to the Ohio River. The Ohio River forms the southern boundary of Indiana and represents the most significant surface-water resources available for municipal and industrial water supply in the Region. Its large, reliable flows support major withdrawal facilities including the Evansville Water Utility, which serves the largest population center in the Region, as well as numerous energy production and industrial intakes along the Ohio River.

The Whitewater River watershed drains portions of eastern Indiana and ultimately joins the Great Miami River before entering the Ohio River. The basin includes portions of several southeastern Indiana counties. Surface-water systems within the basin provide water for municipal supply, industry, and recreation and play an important role in regional hydrology and water management (IDNR, 1988).

Other significant river systems within the Region include the Blue River, and numerous smaller Ohio River tributaries that drain the unglaciated interior counties. These systems support both surface-water withdrawals and groundwater recharge to adjacent alluvial aquifers, and their flows influence baseflow conditions in river valley wellfields operated by utilities throughout the Region. River systems also influence groundwater conditions through surface-water and groundwater interactions that can affect aquifer recharge and sustain baseflow during dry periods (Winter et al., 1998).

Annual and seasonal trends in streamflow were assessed using Mann-Kendall trend statistics for select USGS gages in the region, using the most recent 30-year period of record. **Figure 11** illustrates results of the annual trend test. Streamflow in the Whitewater watershed in the northeast portion of the Region is generally increasing, while flows in the Blue River watershed in the central portion of the Region show no trends. Annual flows in the Ohio River are mixed with some gages showing no trend and others increasing trends. Details of the Mann-Kendall statistics from the annual and seasonal tests are presented in **Appendix A**.

### 1.3.10.2 Aquifers

Groundwater resources in the Region occur within both unconsolidated sediment deposits and consolidated bedrock formations. Sand and gravel deposits associated with glacial outwash and river valleys often form highly productive aquifers capable of supporting municipal wellfields (**Figure 12**). In major river valleys, including the Ohio River valley, thick deposits of sand and gravel derived from glacial outwash commonly form highly productive aquifers capable of supplying large quantities of groundwater to wells. These coarse alluvial deposits often exhibit high permeability and may yield several hundred gallons per minute to properly constructed wells, particularly where hydraulic connection with the river allows induced infiltration from surface-water sources (Gallaher and Price, 1966).

In addition to unconsolidated aquifers, groundwater is also obtained from bedrock aquifers composed of limestone, dolomite, sandstone, and shale formations. These bedrock units transmit groundwater through fractures, bedding planes, and solution openings. The distribution and productivity of these aquifers vary across Indiana depending on geologic conditions and glacial history (Woodfield and Fenelon, 1994). Although bedrock aquifers generally yield smaller quantities of water than unconsolidated sand and gravel aquifers, they are an important source of groundwater in areas where unconsolidated deposits are thin or absent. Many domestic wells and smaller community water systems rely on bedrock aquifers for water supply. The productivity of these aquifers can vary widely depending on local geologic conditions, fracture development, and the presence of solution features within carbonate formations.

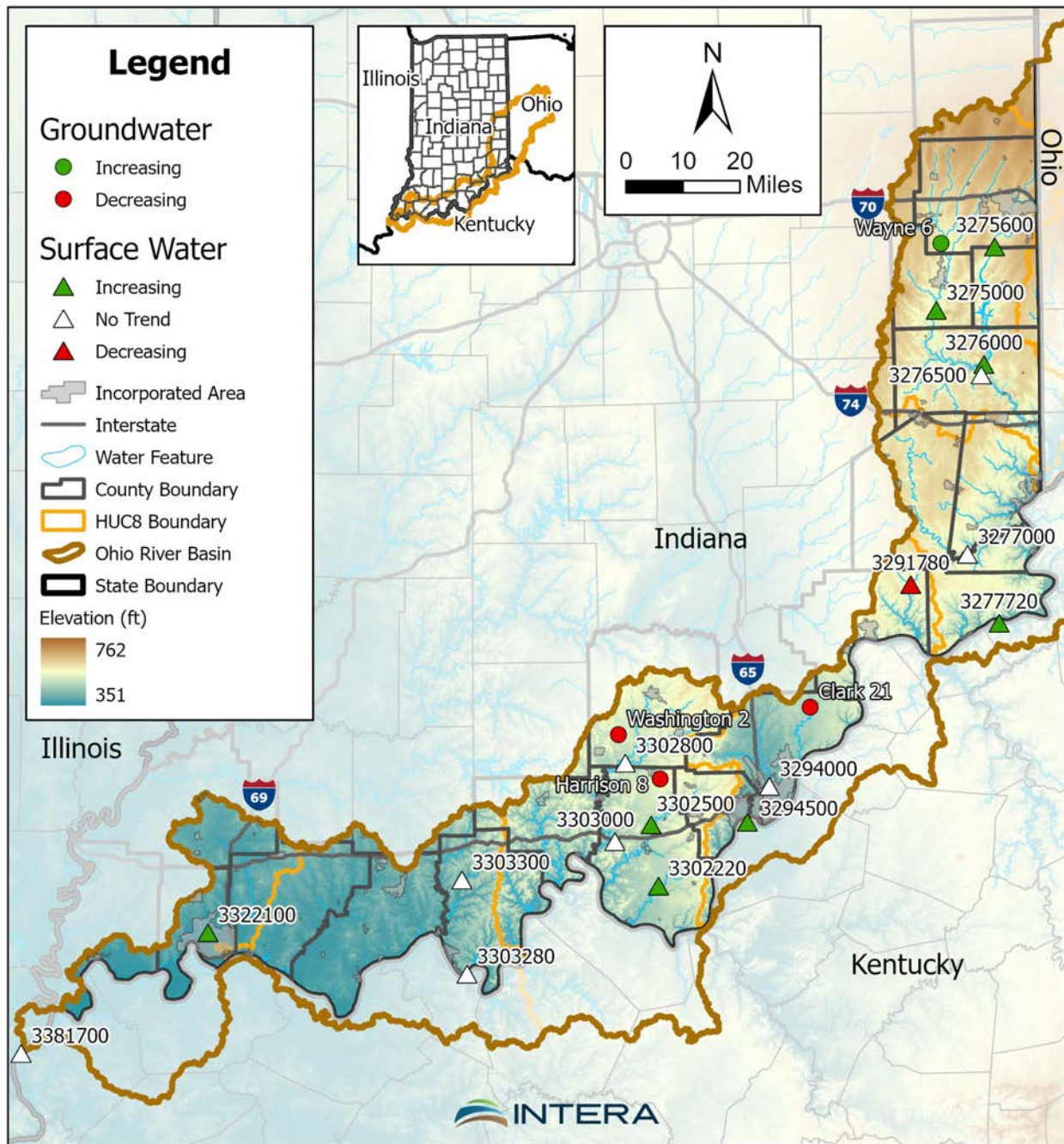


Figure 11. Annual trends in streamflow and groundwater levels at USGS monitoring stations in the Region.

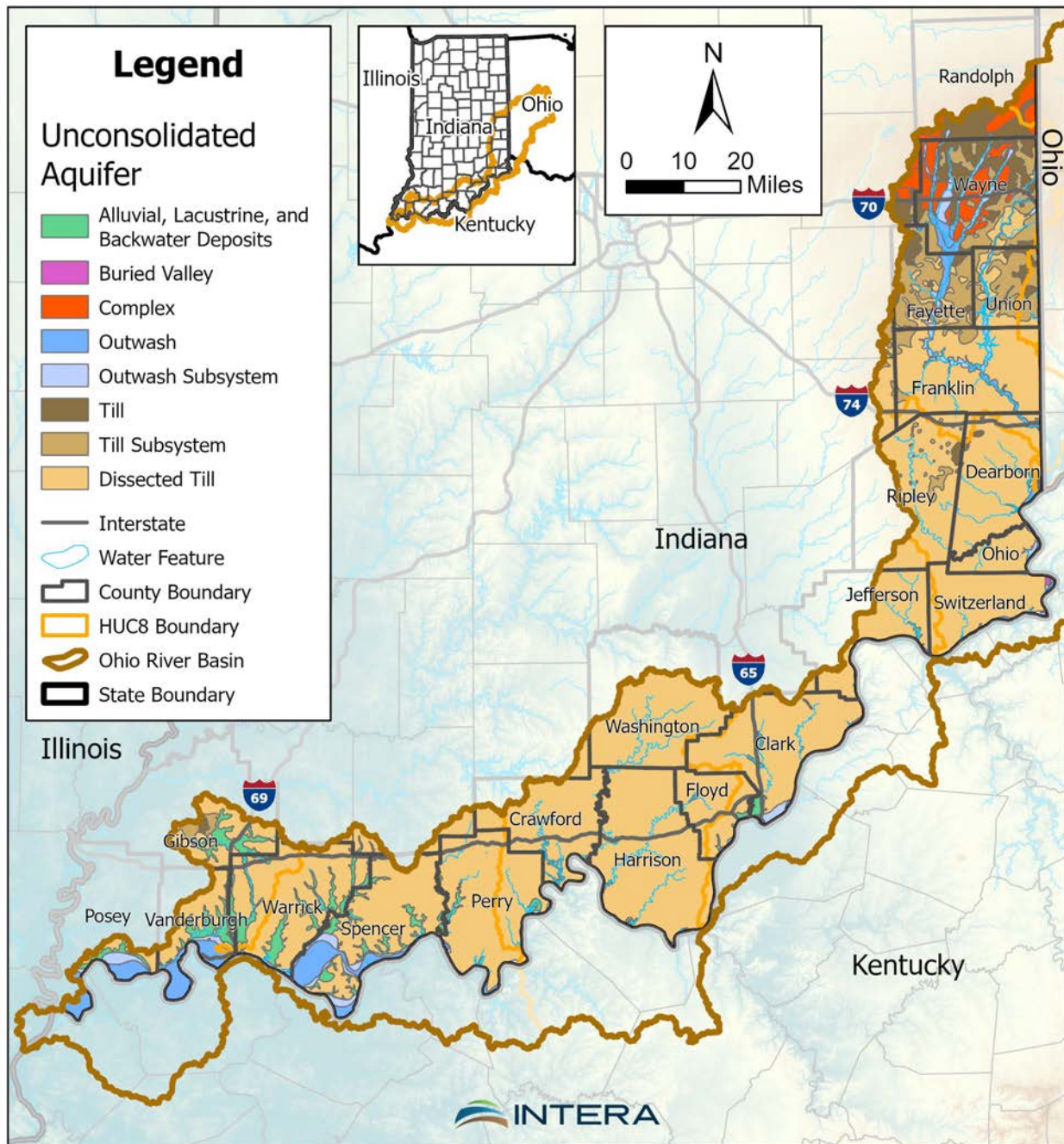


Figure 12. Unconsolidated aquifer systems within the Ohio River and Southeast Indiana Region (modified from IDNR, 2024).

### 1.3.11 Dams and Reservoirs

Information on dams and reservoirs in the Ohio River and Southeast Indiana Region was obtained from the National Inventory of Dams (NID, 2026). A total of 180 dams listed in the NID within the Region are shown in **Figure 13**. In the figure, dams are classified by their Primary Purpose and by their normal storage volume, defined in the NID as the total storage space in a reservoir below the normal retention level, including dead and inactive storage and excluding any flood control or surcharge storage.

**Table 3** breaks down the dams by Primary Purpose as reported in the NID and the Normal Storage of the reservoir. These reservoirs are used primarily for recreational purposes and have small storage volumes. Several small reservoirs throughout the region are used as a water supply source. Most of the dams whose primary purpose is flood risk reduction have small reservoirs with less than 10,000 acre-feet of storage.

Only one dam in the region, the Brookville Dam on the East Fork of the Whitewater River, has a significant storage volume and is actively operated by the U.S. Army Corps of Engineers for flood control. The Brookville Reservoir has a normal storage of 47 billion gallons. A large portion of that storage volume (29 billion gallons) is allocated to the State of Indiana for water supply.

Table 3. Number of dams in the study area sorted by Primary Purpose and Normal Storage Capacity.

| Primary Purpose      | NS = Normal Storage (acre-feet) |                    |            |            |
|----------------------|---------------------------------|--------------------|------------|------------|
|                      | NS < 1,000                      | 1,000 ≤ NS < 7,000 | 7,000 ≤ NS | Total      |
| Recreation           | 105                             | 5                  | 0          | 110        |
| Water Supply         | 16                              | 3                  | 0          | 19         |
| Flood Risk Reduction | 18                              | 3                  | 1          | 22         |
| Debris Control       | 1                               | 0                  | 0          | 1          |
| Other                | 19                              | 2                  | 0          | 21         |
| Not Reported         | 5                               | 2                  | 0          | 7          |
| <b>Total</b>         | <b>164</b>                      | <b>15</b>          | <b>1</b>   | <b>180</b> |

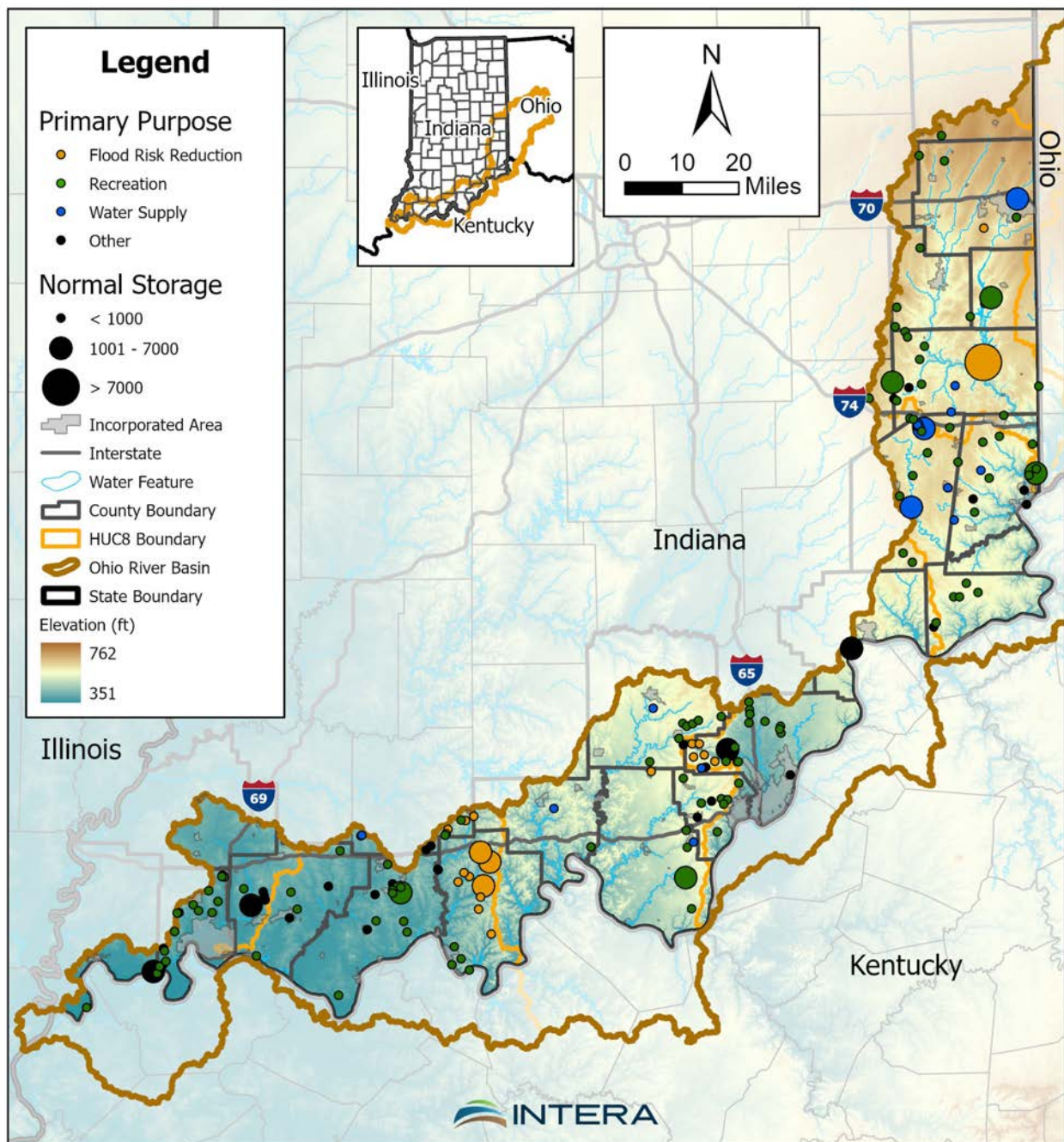


Figure 13. Dams and reservoirs in the Ohio River and Southeast Indiana Region, classified by purpose and normal storage volume in acre-feet.

### 1.3.12 Oil and Gas Wells

Oil and gas wells are present throughout the Region, with most active well locations concentrated along the Ohio River corridor in the southwestern portion of the Region (**Figure 14**). There are 1,478 active oil and gas wells in the Region (IDNR, 2026c). Well density is highest within the Highland-Pigeon, Lower Ohio-Little Pigeon, and Blue-Sinking HUC-8 watersheds, reflecting the occurrence of Pennsylvanian and Mississippian-age petroleum-bearing formations associated with the eastern flank of the Illinois Basin in this portion of the state. A secondary cluster of wells is present in the eastern portion of the Region near the Whitewater and Middle Ohio-Laughery watersheds. The distribution of oil and gas wells is relevant to groundwater resource management, as improperly abandoned or deteriorated well casings can provide conduits for vertical migration of fluids between subsurface formations, with potential implications for groundwater quality in overlying aquifers.

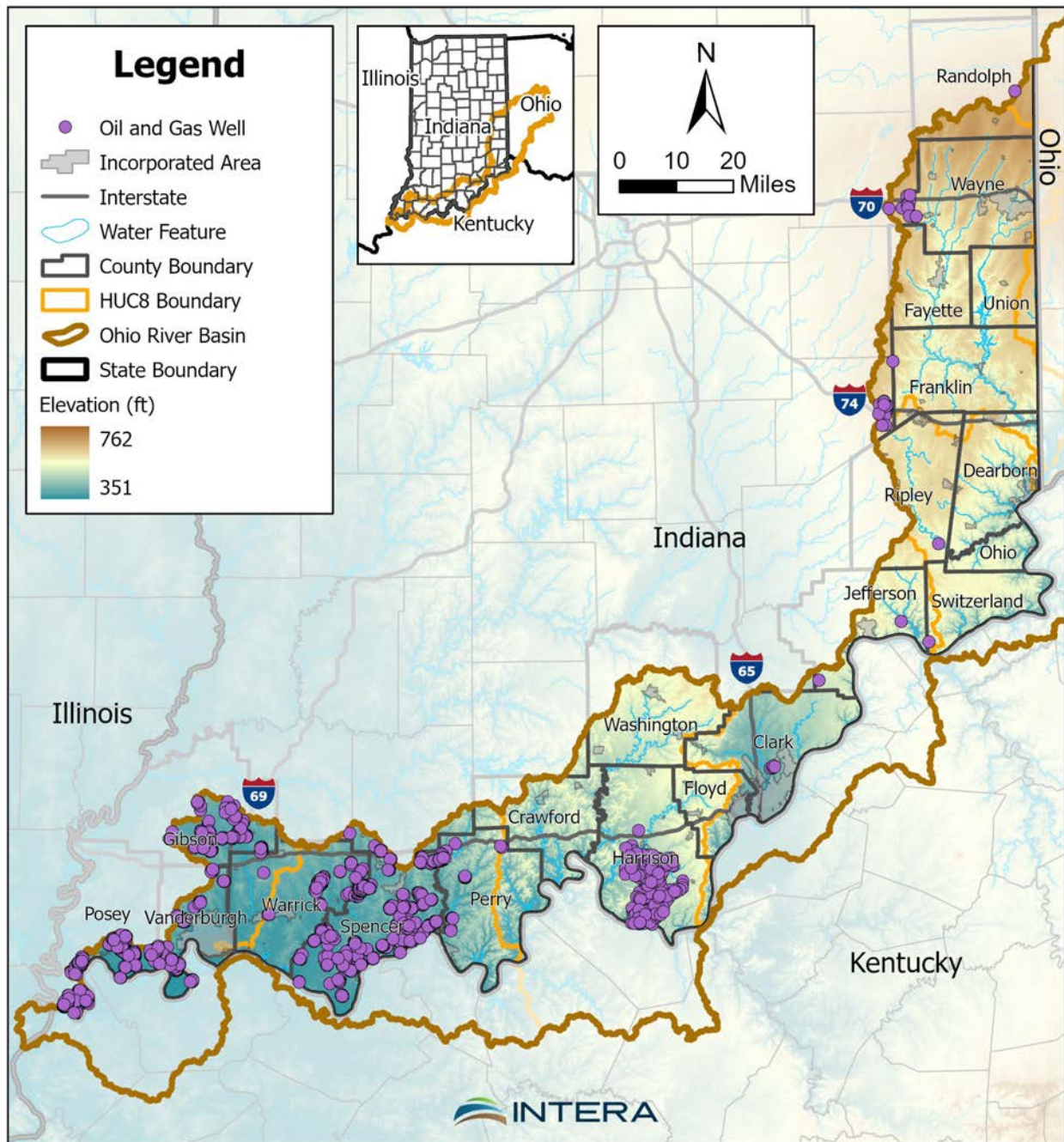


Figure 14. Oil and gas wells in the Ohio River and Southeast Indiana Region (IDNR, 2026d).

## 1.4 Spatial Scale of Demand and Availability Analyses

As water availability and demand vary spatially across the Region, analyses are conducted at the sub-basin scale to better represent local hydrologic conditions and water-use patterns. Other regional studies in Indiana have defined sub-basins by hydrologic boundaries and the presence of active USGS stream gages in each region. The Ohio River and Southeast Indiana Region is unique in that there is a lack of active stream gages to provide complete spatial coverage for the Region. Here, two levels of sub-basins are defined:

- Minor sub-basins are defined by the presence of an active USGS gage at the downstream end of a watershed and are used for detailed hydrologic analysis following IFA (2021). The hydrologic characteristics of the minor sub-basins are scaled up to represent regional conditions before assessing water availability (**Section 3.0**). **Figure 15** shows the minor sub-basins in the region. There are few minor sub-basins with which to characterize the entire Region.
- Major sub-basins are defined by the intersection of HUC-8 boundaries with the Ohio River outwash and outwash subsystem (**Figure 12**) and are used for reporting aggregated water demand and availability results. **Figure 16** shows the major sub-basins in the region.

Of the major sub-basins, The Whitewater River watershed is the exception, as the Whitewater HUC-8 has near-complete coverage by active USGS gages. The Whitewater HUC-8 is divided into five major sub-basins (1-5), and each is analyzed by hydrologic methods presented in IFA (2021). **Figure 17** shows a flow schematic for the Whitewater River sub-basins, indicating the connection between Major Sub-Basins 1-5. Major sub-basins outside the Whitewater watershed (6-10) drain through one or more streams directly to the Ohio River; these sub-basins are not interconnected and are characterized by the hydrology of the minor sub-basins in, or near, each major sub-basin. Finally, Major Sub-Basin 11 consists of the Ohio River and adjacent outwash and outwash subsystems.

**Table 4** identifies the major sub-basins in the Whitewater River watershed by number, including the USGS gaging station at the downstream end of each sub-basin, the sub-basin contributing area, the total watershed area contributing to the gage, and the period of record for each USGS station. **Table 5** identifies the remaining major sub-basins by number and name along with their contributing area. **Table 6** identifies the minor sub-basins by number, the USGS gaging station at the downstream end of each, the sub-basin contributing area, the total watershed area contributing to the gage, and the period of record for each USGS station.

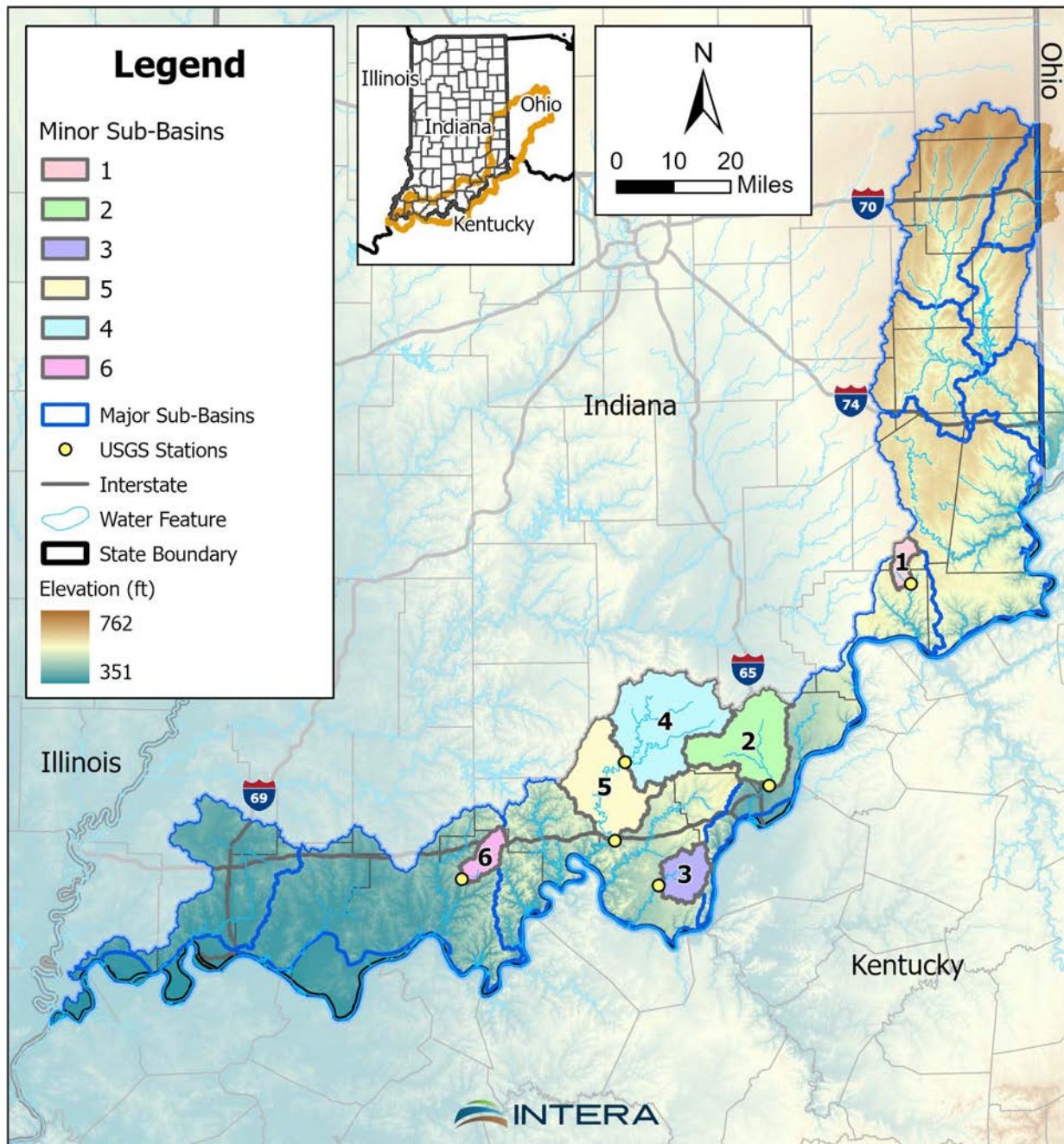


Figure 15. Minor sub-basins in the Region. The minor sub-basins are used to characterize the hydrology of the larger major sub-basins in which they occur. The major sub-basins boundaries are shown with the blue lines.

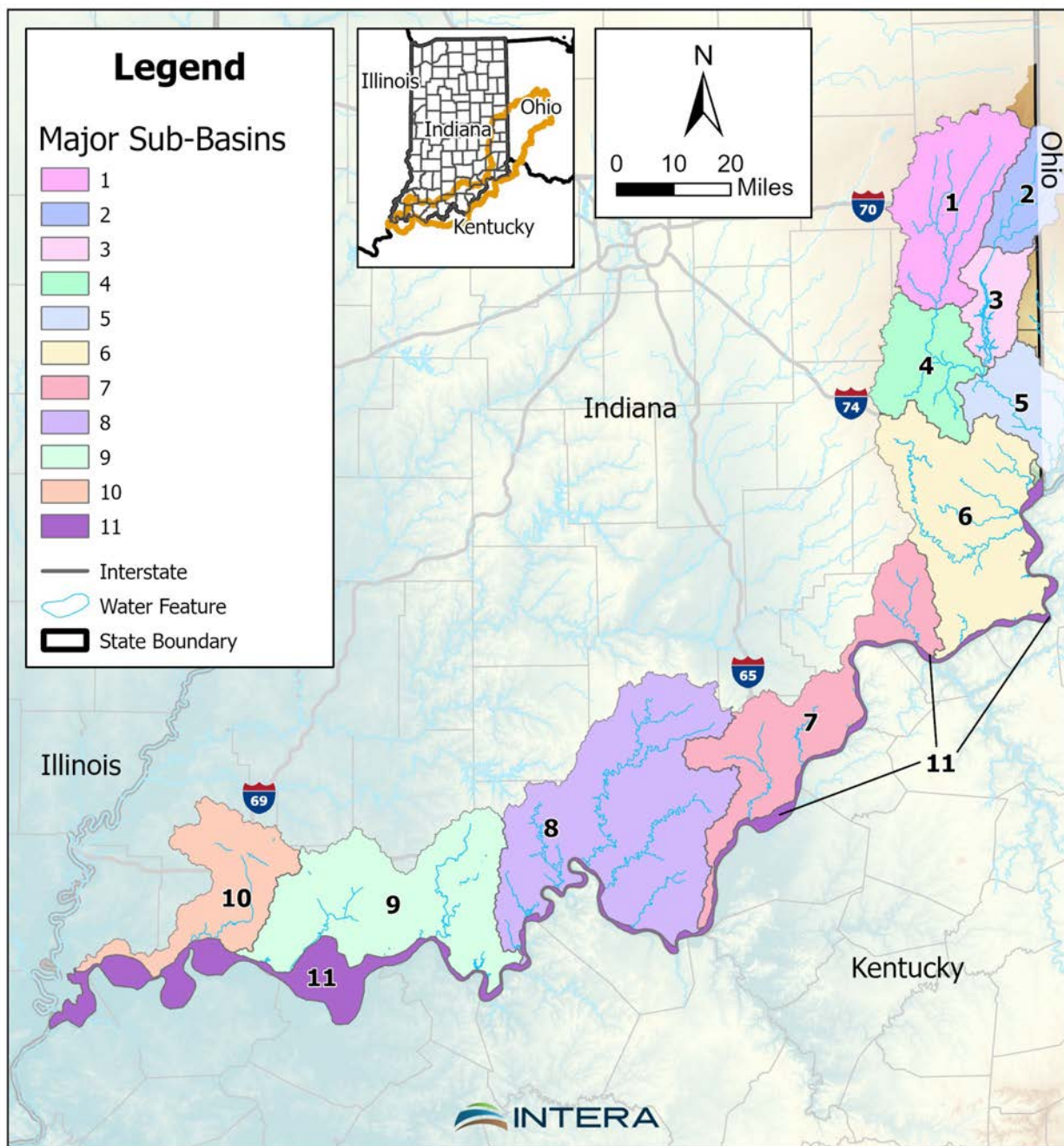


Figure 16. Major sub-basins defined for the Region. Water availability is assessed for each major sub-basin.

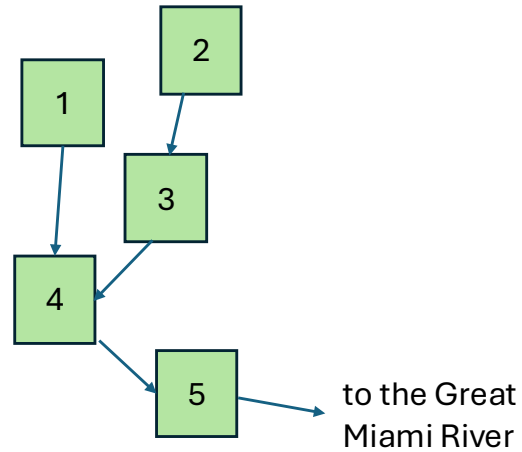


Figure 17. Flow schematic for major sub-basins in the Whitewater River watershed.

Table 4. Major sub-basins in the Whitewater River watershed.

| Major Sub-Basin ID | Downstream USGS Station | Description                                  | Major Sub-Basin Area (mi <sup>2</sup> ) | Watershed Area (mi <sup>2</sup> ) | Period of Record |
|--------------------|-------------------------|----------------------------------------------|-----------------------------------------|-----------------------------------|------------------|
| 1                  | 03275000                | Whitewater River near Alpine, IN             | 529                                     | 529                               | 1928-2025        |
| 2                  | 03275600                | East Fork Whitewater River at Abington, IN   | 200                                     | 200                               | 1965-2025        |
| 3                  | 03276000                | East Fork Whitewater River at Brookville, IN | 180                                     | 380                               | 1954-2018        |
| 4                  | 03276500                | Whitewater River at Brookville, IN           | 315                                     | 1224                              | 1987-2025        |
| 5                  | No gage                 | Whitewater - Downstream Reach                | 178                                     | 1402                              | --               |

**Table 5.** Major sub-basins outside of the Whitewater watershed. The Ohio River Region includes Major Sub-Basins 9 and 10, and the adjacent portion of 11.

| Major Sub-Basin ID | Name                   | Major Sub-Basin Area (mi <sup>2</sup> ) | Related HUC-8                   |
|--------------------|------------------------|-----------------------------------------|---------------------------------|
| 6                  | Middle Ohio            | 778                                     | 05090203 Middle Ohio            |
| 7                  | Silver                 | 643                                     | 05140101 Silver-Little Kentucky |
| 8                  | Blue-Sinking           | 1234                                    | 05140104 Blue-Sinking           |
| 9                  | Lower Ohio             | 837                                     | 05140201 Lower Ohio             |
| 10                 | Pigeon                 | 415                                     | 05140202 Highland-Pigeon        |
| 11                 | Ohio River and Outwash | 493                                     | None                            |

**Table 6.** Minor sub-basins used for detailed hydrologic analysis.

| Minor Sub-Basin ID | Downstream USGS Station | Description                               | Minor Sub-Basin Area (mi <sup>2</sup> ) | Watershed Area (mi <sup>2</sup> ) | Period of Record |
|--------------------|-------------------------|-------------------------------------------|-----------------------------------------|-----------------------------------|------------------|
| 1                  | 03291780                | Indian-Kentuck Creek near Canaan, IN      | 27.5                                    | 27.5                              | 1977-2025        |
| 2                  | 03294000                | Silver Creek near Sellersburg, IN         | 189                                     | 189                               | 1954-2025        |
| 3                  | 03302220                | Buck Creek near New Middletown, IN        | 65.2                                    | 65.2                              | 1987-2025        |
| 4                  | 03302800                | Blue River near Fredericksburg, IN        | 283                                     | 283                               | 1987-2025        |
| 5                  | 03303000                | Blue River near White Cloud, IN           | 144                                     | 427                               | 1931-2025        |
| 6                  | 03303300                | Middle Fork Anderson River at Bristow, IN | 39.8                                    | 39.8                              | 1987-2025        |

## 2.0 Water Demand

This section characterizes water demand within the Region, both historically and projected over the study horizon. Historical demand is established from withdrawals reported to the IDNR through the SWWF registration program from 1985 through 2023, for the six use sectors that frame the analysis: public supply, irrigation, industry, energy production, rural use, and miscellaneous withdrawals. Demand forecasts are then developed for each of those sectors through 2070. The forecasts, together with the methodology, driver assumptions, and limitations on which those forecasts rest are described in **Section 2.2** and detailed in the Appendices. Demand is reported at the county (portion within basin) and major sub-basin scales described in **Section 1.4** so that projected withdrawals can be compared directly against the water availability estimates presented in **Section 3.0**.

### 2.1 Historical Water Use

Historical water withdrawal records for the Region span the period from 1985 to 2023, providing a nearly four-decade record of water demand across six use sectors: public supply, irrigation, industry, energy production, rural use, and miscellaneous. These data, compiled from SWWF registrations maintained by the IDNR, document substantial changes in both the magnitude and composition of regional water demand over the study period and establish the baseline conditions against which future demand projections are evaluated. The following subsections describe historical withdrawal patterns by sector.

**Figure 18** presents total historical water withdrawals for the Ohio River and Southeast Indiana Region by water-use sector from 1985 through 2023. A broken vertical axis is used to accommodate the disparity in magnitude between energy production and all other use categories. Energy production withdrawals dominate total regional water use throughout the period of record, generally representing more than 90% of the combined total in any given year; as a result, the total withdrawal curve (dashed black line) closely tracks the energy production curve (red line) rather than the combined trend of the other five sectors. Total withdrawals ranged between approximately 2,600 and 3,400 million gallons per day (MGD) from 1985 through 2010, followed by a pronounced decline beginning around 2012 to a range of approximately 1,800 to 2,100 MGD from 2016 through 2023. This decline was driven almost entirely by the reduction in energy production withdrawals discussed further in **Section 2.1.4**.

By comparison, all other use sectors combined account for well under 150 MGD in any year of the period of record. Public supply is the second-largest sector, ranging from approximately 75 to 108 MGD and increasing gradually over time with a peak in the mid-2000s, consistent with the trends discussed in **Section 2.1.1**. Industrial withdrawals, the third-largest sector, increased from approximately 22 MGD in 1985 to a range of roughly 30 to 47 MGD in later years, including a temporary jump to more than 45 MGD during the mid-1990s. Irrigation, miscellaneous, and rural use withdrawals are each less than approximately 5 MGD throughout the period of record and are not readily distinguishable at this scale, underscoring the extent to which total regional water demand is driven by a small number of large-volume energy production facilities rather than distributed across sectors.

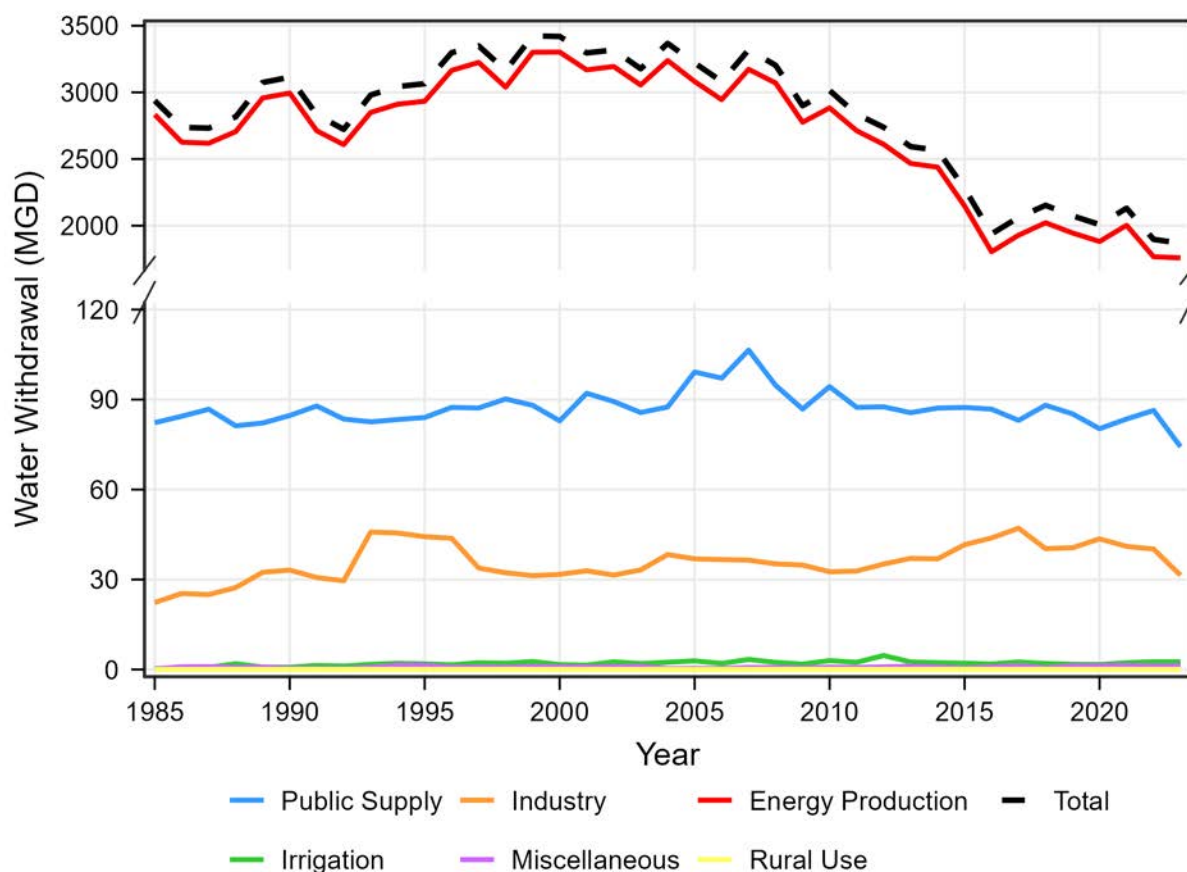


Figure 18. Total historical water demands for the Ohio River and Southeast Indiana Water Region by water-use sector, 1985–2023. Note the break in the y-axis at 120 MGD.

### 2.1.1 Public Water Supply

Public water supply is the second largest water use sector within the Region, encompassing 175 registered groundwater wells and 15 surface-water intakes active withdrawals in 2023 (**Figure 19**). Public supply withdrawal sites occur throughout the Region but are most densely clustered along the Ohio River corridor near Evansville and Jeffersonville and within the Whitewater River watershed near Richmond, consistent with the distribution of the Region’s largest population centers and public water utilities described in **Sections 1.3.1** and **1.3.3**, respectively.

Because public water utilities serve customers who often live in a different county (or even watershed) from the facilities that supply them, **demand** for public water supply within the Region must be distinguished from **withdrawals** for public water supply. Withdrawals are reported in the SWWF database, while demand must be estimated for each county where the water is used rather than where it is withdrawn, with each utility’s demand placed with the population it serves. The process for distinguishing between demand and withdrawals in the Region are described further in **Section 2.2.3**.

Annual average public supply **demand** in the Region from 1985 through 2023 are shown in **Figure 20**. Combined groundwater and surface-water demand remained relatively stable at approximately 80 to 90 MGD from the mid-1980s through 2000, with no sustained decline evident during this period. Beginning in 2001, withdrawals increased notably and continued rising through the mid- to late-2000s to a peak of approximately 104 MGD in 2007.

Withdrawals then gradually declined and stabilized in the range of roughly 82 to 87 MGD through most of the 2010s, before falling further to approximately 80 MGD in 2020 and declining more sharply to approximately 73 MGD by 2023, the lowest combined total in the 39-year record.

Groundwater has been the source of most of the Region's public-supply withdrawals since 2001, increasing from approximately 37 MGD in 1985 to a range of roughly 47 to 62 MGD in most recent decades, before declining to approximately 39 MGD in 2023. Surface-water withdrawals have varied throughout the record, generally ranging from 27 to 43 MGD.

Annual average public supply **demand** by county is presented in **Figure 21** and **Figure 22**. The figures illustrate substantial variability in both magnitude and trend across the 21-county region. Note the y-axis differences between counties in the figures. Vanderburgh County, home to Evansville, is the largest, ranging between 18 and 27 MGD during the period of record and easing gradually from an average of 25 MGD in the 1990s and 2000s to about 18 to 23 MGD over the past decade. Currently Evansville's public supply source is surface water from the Ohio River; plans to switch sources to groundwater are currently being made. Clark County, in the growing Jeffersonville-Clarksville area, is the second largest: demand rose from roughly 9 to 11 MGD in the 1980s and 1990s to a peak of about 18 MGD in 2007, stayed in the mid-teens through the 2010s, and then fell sharply to about 7 MGD in 2023. Floyd County, adjoining Clark in the New Albany area, follows the same metropolitan pattern, rising to about 13 MGD in 2007, holding near 10 MGD, and falling to about 5 MGD in 2023. Floyd is the clearest illustration of the served-population basis: its utility purchases most of its supply from another system rather than operating large local sources, so the county's residents represent substantial public-supply demand even though little water is produced within the county.

Trends in the remaining counties are comparatively muted. Washington County shows why local **withdrawals** are not a reliable guide to a county's public-supply **demand**: the County operates with almost no large local sources of their own, yet its residents are served roughly 1.7 to 2.9 MGD in every year by systems that purchase their supply from elsewhere. Fayette County shows a genuine decline, from about 4.2 to 4.6 MGD in the mid- to late-1980s to roughly 2.3 to 2.5 MGD in recent years. Wayne County held comparatively steady at approximately 7.5 to 8.5 MGD through the 1980s and 1990s, fell sharply to about 4.2 MGD in 2009, and has since recovered and stabilized in a range of roughly 5 to 6.5 MGD over the past decade. Ripley County increased from about 1.6 MGD in the mid-1980s to roughly 2.0 to 2.6 MGD in the 2000s and has held near 2.0 to 2.2 MGD since. Gibson County demand is small and essentially flat throughout, near 1.3 to 1.8 MGD; its utilities shifted to purchased supply around 1999 to 2000, but the demand served to Gibson residents was unaffected.

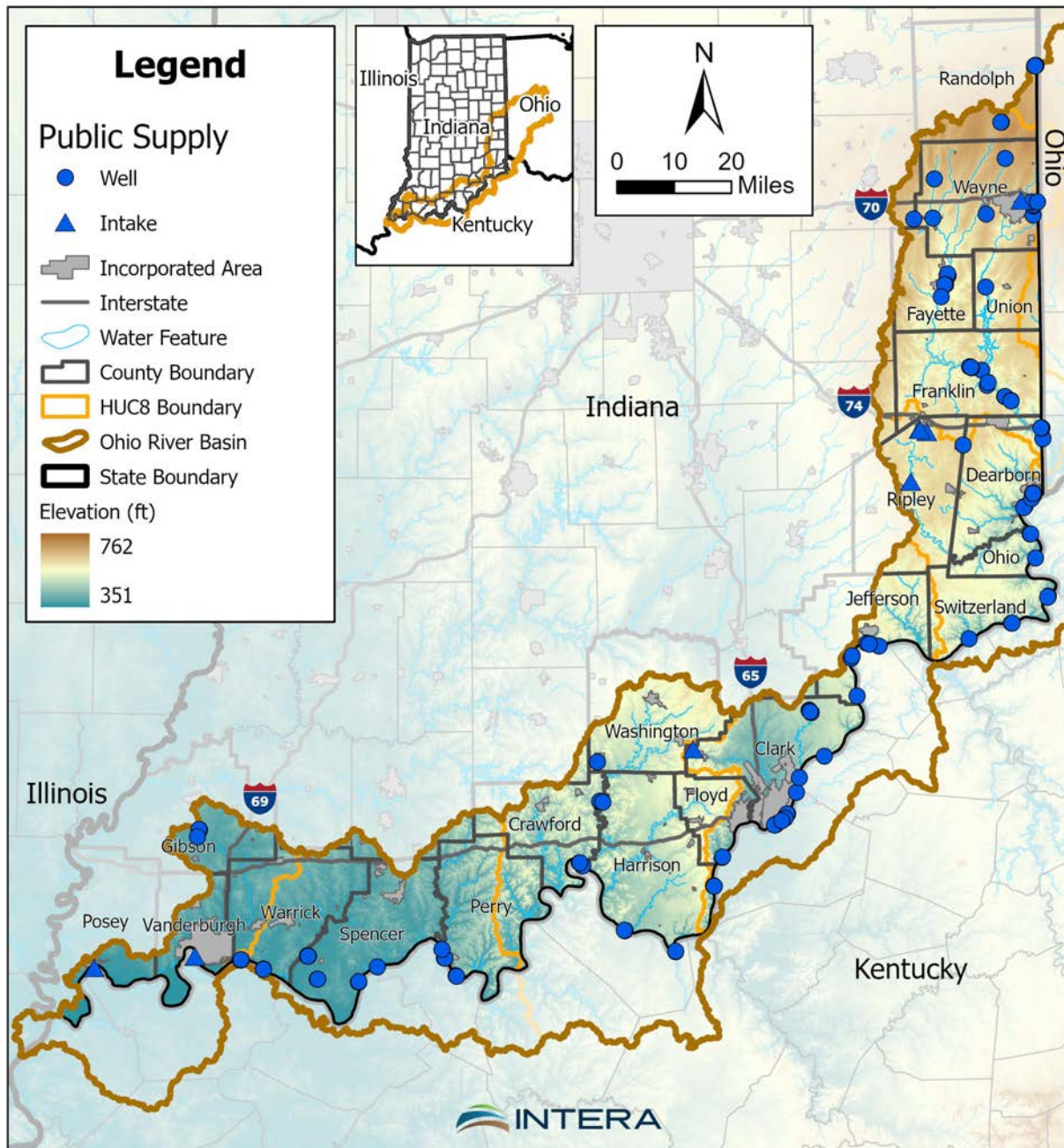


Figure 19. Public water supply withdrawal sites from the SWWF database. Figure shows groundwater wells and surface water intakes that were active in 2023.

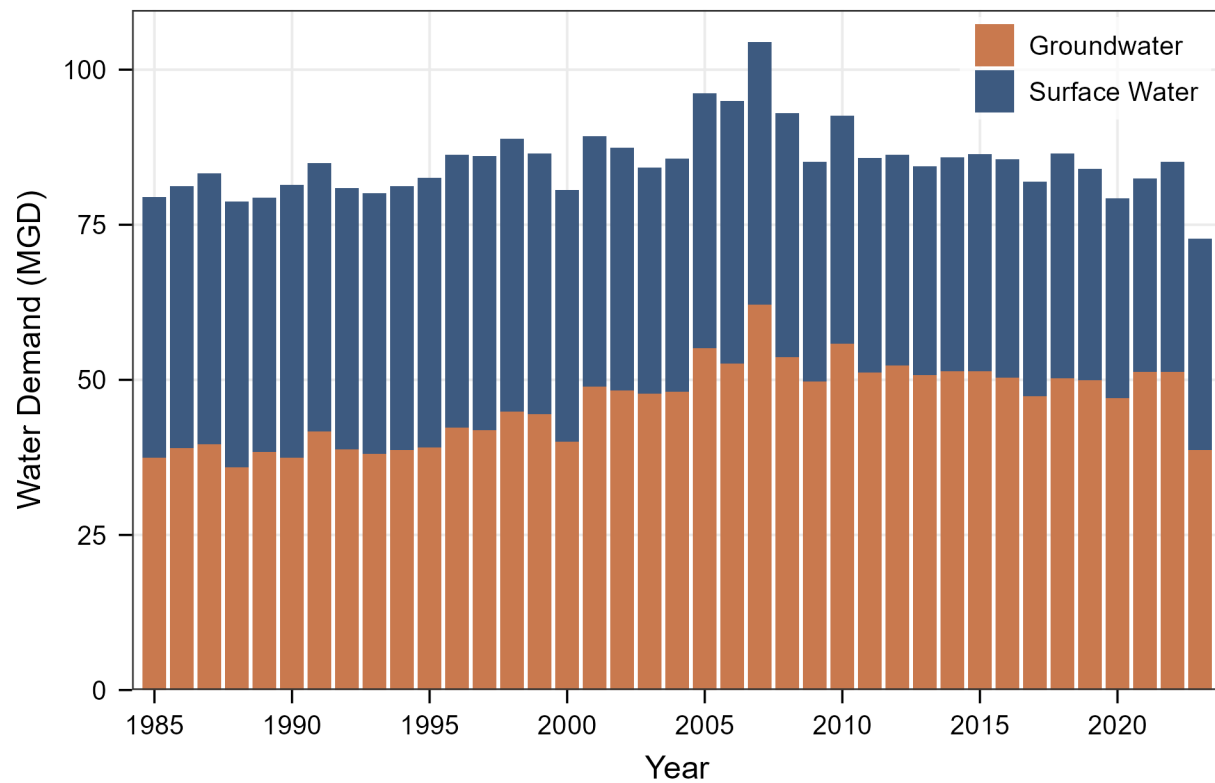


Figure 20. Annual average public supply demand for the Region by source, SWWF database from 1985-2023.

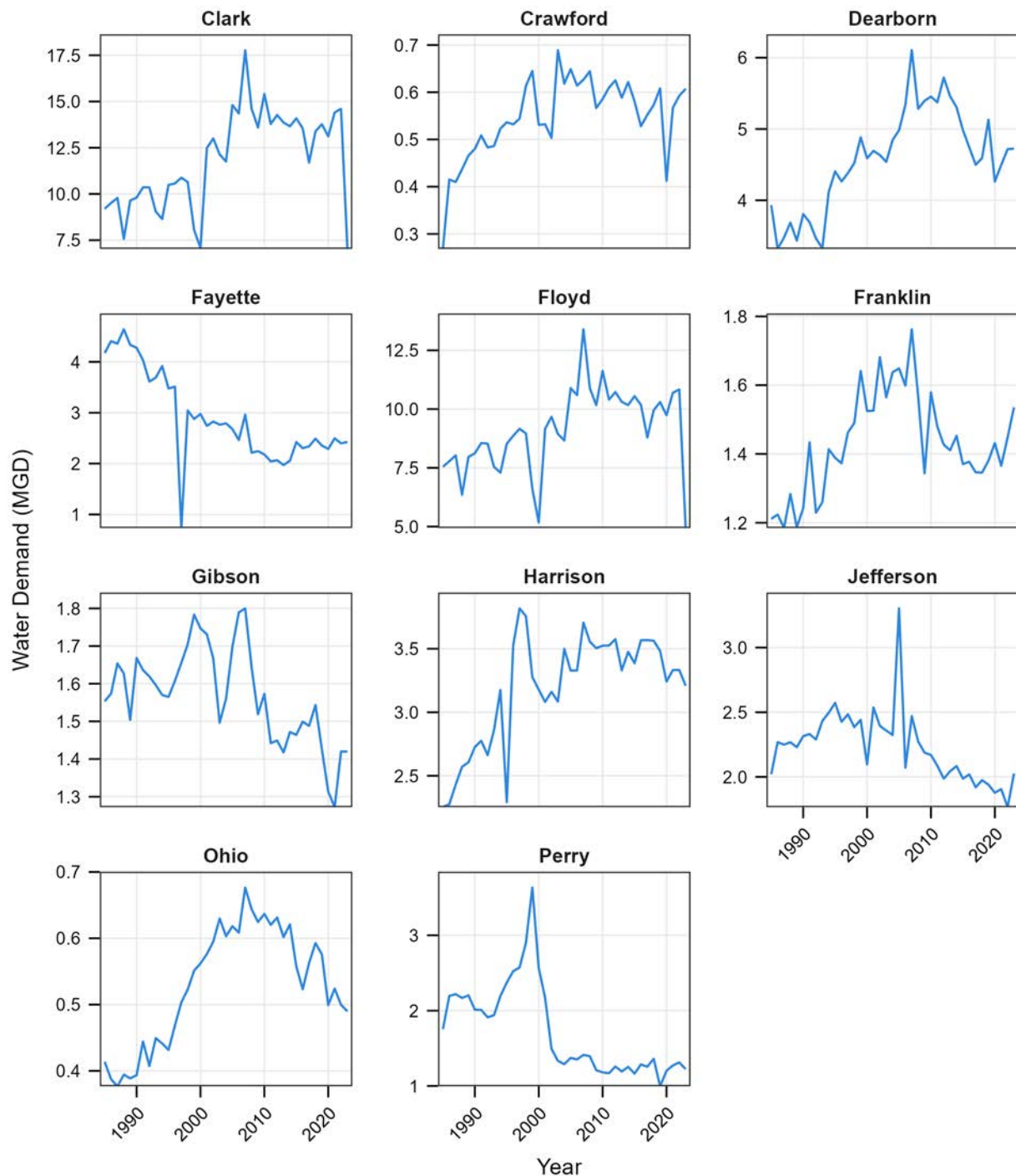


Figure 21. Annual public supply demand by county, 1985-2023 (page 1 of 2). Only demands from within the Region are presented in the graphs. Counties that lie partially within the Region include Clark, Crawford, Fayette, Gibson, and Jefferson.

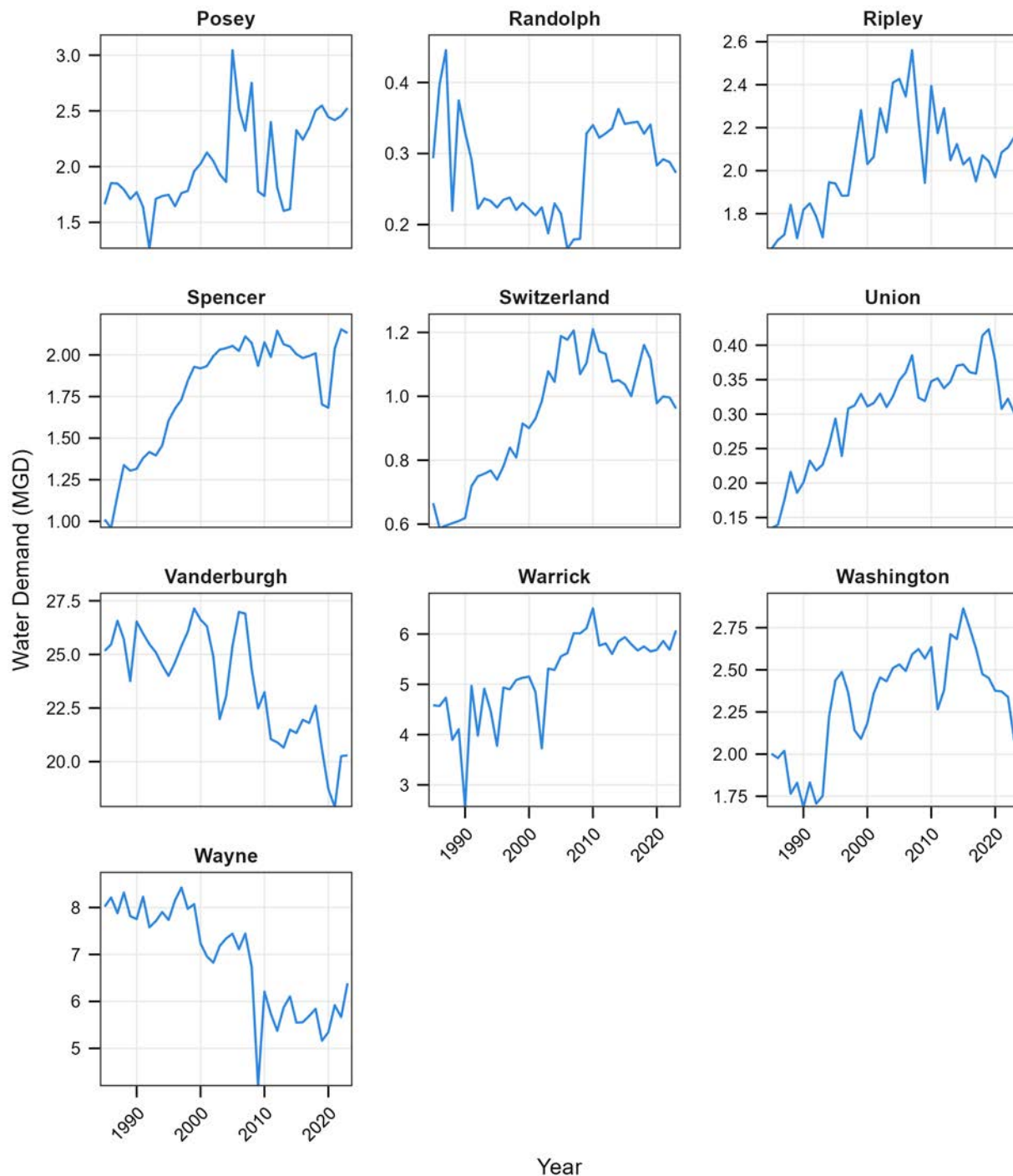


Figure 22. Annual public supply demand by county, 1985-2023 (page 2 of 2). Only data from within the Region are presented in the graphs. Counties that lie partially within the Region include Posey, Randolph, Ripley, Spencer, Vanderburgh, Warrick, and Washington.

### 2.1.1.1 Peak Day Water Demand

Public water withdrawals across all the Region's counties exhibit a pronounced and consistent annual seasonal cycle, with peak demand occurring in the Summer months (typically June through August) and minimum demand in Winter. This pattern is normal for public water suppliers and is driven primarily by outdoor water use, lawn and landscape irrigation, car washing, and pool filling, which adds substantial non-essential demand on top of the relatively stable year-round domestic base demand. Elevated Summer temperatures and reduced rainfall further compound this effect by increasing evapotranspiration and irrigation requirements, while cooling-water demand from commercial and institutional users adds an additional increment during peak heat. Because this discretionary outdoor demand scales with the size of the customer base and irrigated landscape area, the seasonal swing tends to grow or shrink in proportion to overall system withdrawals over time, rather than remaining a fixed volume.

Public water utility water demand and water production are often discussed as average annual use, like the data presented in this report. However, water utilities cannot properly design and size treatment plants, wells, pumps, storage tanks, or distribution mains around the average annual water use. Instead, systems must be sized to reliably meet the maximum day demand and, for distribution piping and storage, the even higher instantaneous peak hour demand. The ratio between a system's peak day use and its average day use is expressed as a peaking factor; it is this factor, not the average day figure alone, that governs how much capacity a utility must build and maintain.

**Table 7** summarizes the peaking factors (peak day ÷ average day) calculated for public water supply systems where both values were available in Preliminary Engineering Reports provided by the Indiana Finance Authority (IFA, 2025). As with most Indiana water systems, peaks in this Region are driven primarily by outdoor irrigation during hot, dry Summer months; by predictable daily surges in the morning and early evening tied to household routines; and by the specific mix of residential, commercial, and industrial customers each utility serves. A utility with a peaking factor of 2.0 must build and maintain treatment and supply capacity roughly twice what its average day demand alone would suggest. This is capacity that goes underutilized for much of the year but is essential during the highest-demand periods of the Summer.

Table 7. Peaking factors (peak day ÷ average day) calculated for public water supply systems within the Ohio River and Southeast Indiana Region (IFA, 2025).

| County      | Peaking Factors |
|-------------|-----------------|
| Clark       | 1.53            |
| Crawford    | --              |
| Dearborn    | 1.49            |
| Fayette     | 1.85            |
| Floyd       | 1.75            |
| Franklin    | 1.88            |
| Gibson      | 1.30            |
| Harrison    | 1.65            |
| Jefferson   | 2.11            |
| Ohio        | --              |
| Perry       | 1.64            |
| Posey       | 4.00*           |
| Randolph    | --              |
| Ripley      | 1.35            |
| Spencer     | 2.32            |
| Switzerland | --              |
| Union       | --              |
| Vanderburgh | 1.50            |
| Warrick     | 1.63            |
| Washington  | 1.37            |
| Wayne       | 2.16            |

'—' indicates data not available.

\* Value reported by Town of Poseyville; no data was available for Mount Vernon.

### 2.1.2 Self-Supplied Residential Water Supply

Self-supplied residential demand represents households on private wells that are not served by a public utility and therefore are not included in the SWWF database. Demand was estimated directly as the share of each county's population located outside mapped utility service areas, but within project limits of each county and multiplying that population by an assumed per-capita use rate. Because historical utility service area boundaries are unavailable, a meaningful historical record of self-supplied residential demand could not be developed. Consequently, estimates were prepared only for current conditions and were not projected backward in time.

The assumed per-capita water use rate is 80 gallons per capita per day (GPCD), consistent with conventional self-supplied domestic water use estimates reported by Dieter et al. (2018). County-level estimates of current self-supplied residential demand are summarized in **Table 8**. Current (2023) self-supplied residential demand is estimated at approximately 4.5 MGD across the Region.

**Table 8.** Self-supplied water withdrawals by county, estimated for 2023. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County       | MGD        |
|--------------|------------|
| Clark*       | 0.41       |
| Crawford*    | 0.12       |
| Dearborn     | 0.25       |
| Fayette*     | 0.56       |
| Floyd        | 0.25       |
| Franklin     | 0.51       |
| Gibson*      | 0.00       |
| Harrison     | 0.00       |
| Jefferson*   | 0.00       |
| Ohio         | 0.01       |
| Perry        | 0.03       |
| Posey*       | 0.16       |
| Randolph*    | 0.20       |
| Ripley*      | 0.23       |
| Spencer*     | 0.01       |
| Switzerland  | 0.00       |
| Union        | 0.35       |
| Vanderburgh* | 0.00       |
| Warrick*     | 0.02       |
| Washington*  | 0.14       |
| Wayne        | 1.28       |
| <b>TOTAL</b> | <b>4.5</b> |

### 2.1.3 Irrigation, Rural Water Supply, and Livestock Operations

Agricultural water use within the Region is captured across two distinct registration categories in the SWWF database (irrigation and rural use), plus livestock operations (animal feeding operations) which are not included in the SWWF database.

The Irrigation sector encompasses withdrawals associated with crop irrigation, including both field irrigation and horticultural operations, as well as turf or landscape irrigation (such as golf courses), and represents by far the larger of the two categories by facility count and withdrawal volume. The Rural Use sector is more narrowly defined and refers specifically to water withdrawal activities associated with non-irrigation agricultural and rural production, including livestock watering, fisheries and aquaculture, and similar agricultural support uses. Rural use withdrawals are typically smaller in volume, more uniformly distributed across the Region, and less responsive to seasonal precipitation variability than irrigation withdrawals, because livestock and aquaculture demand occurs year-around. Together, these three categories represent the primary components of agricultural water use within the Region and are discussed in the following subsections.

#### 2.1.3.1 Irrigation

Registered irrigation facilities within the Ohio River and Southeast Indiana Region include 44 groundwater wells and 26 surface-water intakes with active withdrawals in 2023 (**Figure 23**). Irrigation withdrawal points are concentrated in the southwestern portion of the region near Evansville and in the northeastern portion of the region near Richmond and along the upper Whitewater River, with a secondary cluster along the Ohio River corridor near Jeffersonville. Annual average irrigation withdrawals are presented here, with monthly withdrawals presented in **Appendix B**. As irrigation occurs primarily in the Summer, monthly average withdrawals during the Summer are significantly higher than annual averages.

Annual average irrigation withdrawals (**Figure 24**) have increased over the period of record, though with pronounced year-to-year variability tied to precipitation and drought conditions. Withdrawals were generally less than 1 MGD prior to 1991 and increased gradually thereafter, punctuated by a pronounced peak of approximately 4.6 MGD in 2012, coincident with the severe regional drought of that year. Withdrawals in recent years have generally ranged between 1.6 and 2.6 MGD, roughly double to triple the levels observed in the late 1980s and early 1990s. Groundwater and surface water contribute roughly comparable shares of total irrigation withdrawal in most years, although groundwater represented a substantially larger share of withdrawals during the 2012 peak, accounting for roughly two-thirds of that year's total.

Annual average irrigation withdrawals by county (**Figure 25** and **Figure 26**) show county-to-county variability in both magnitude and long-term trends, consistent with differences in local agricultural water use and reporting practices. Posey, Spencer, and Warrick Counties show sustained increases in withdrawals across the period of record: irrigation in Warrick County rose from approximately 0.02 MGD in the mid-1980s to a peak of roughly 0.27 MGD in 2017; in Posey County, irrigation increased from near-zero withdrawals prior to 2000 to a peak of approximately 1.3 MGD around 2011–2012; and, irrigation in Spencer County rose from approximately 0.1 to 0.4 MGD in the 1980s and 1990s to a range of roughly 0.5 to 1.2 MGD over the past decade.

Clark, Dearborn, Franklin, and Ohio Counties show a rise followed by a sustained decline: withdrawals in these counties increased through the 1990s and into the early to mid-2000s before declining over

approximately the past 10 to 20 years, with Clark County declining from a peak of roughly 0.65 MGD around 1997–1999 to approximately 0.15 to 0.4 MGD in recent years, and Dearborn, Franklin, and Ohio Counties showing comparable rise-then-decline patterns from peaks in the range of roughly 0.15 to 0.26 MGD. Wayne and Vanderburgh Counties are more accurately characterized as noisy and without a consistent long-term directional trend; Wayne County in particular shows a sharp decline of more than half around 2008 followed by a partial, temporary recovery around 2011–2012. Several other counties, including Crawford, Fayette, Floyd, Harrison, Jefferson, Perry, Ripley, and Union, show comparatively small, short, or discontinuous periods of record, with several exhibiting a brief, isolated pulse of withdrawal activity concentrated within a single decade (e.g., Floyd and Harrison in the late 1990s; Perry and Ripley in the 1990s and 2000s) rather than a sustained or gradual trend.

Overall, withdrawals for irrigation in the Region are small in comparison to the other sectors but increasing. Though withdrawals are small, the consumptive use for irrigation is the highest of all sectors, and withdrawals are concentrated in the Summer when water availability is low.

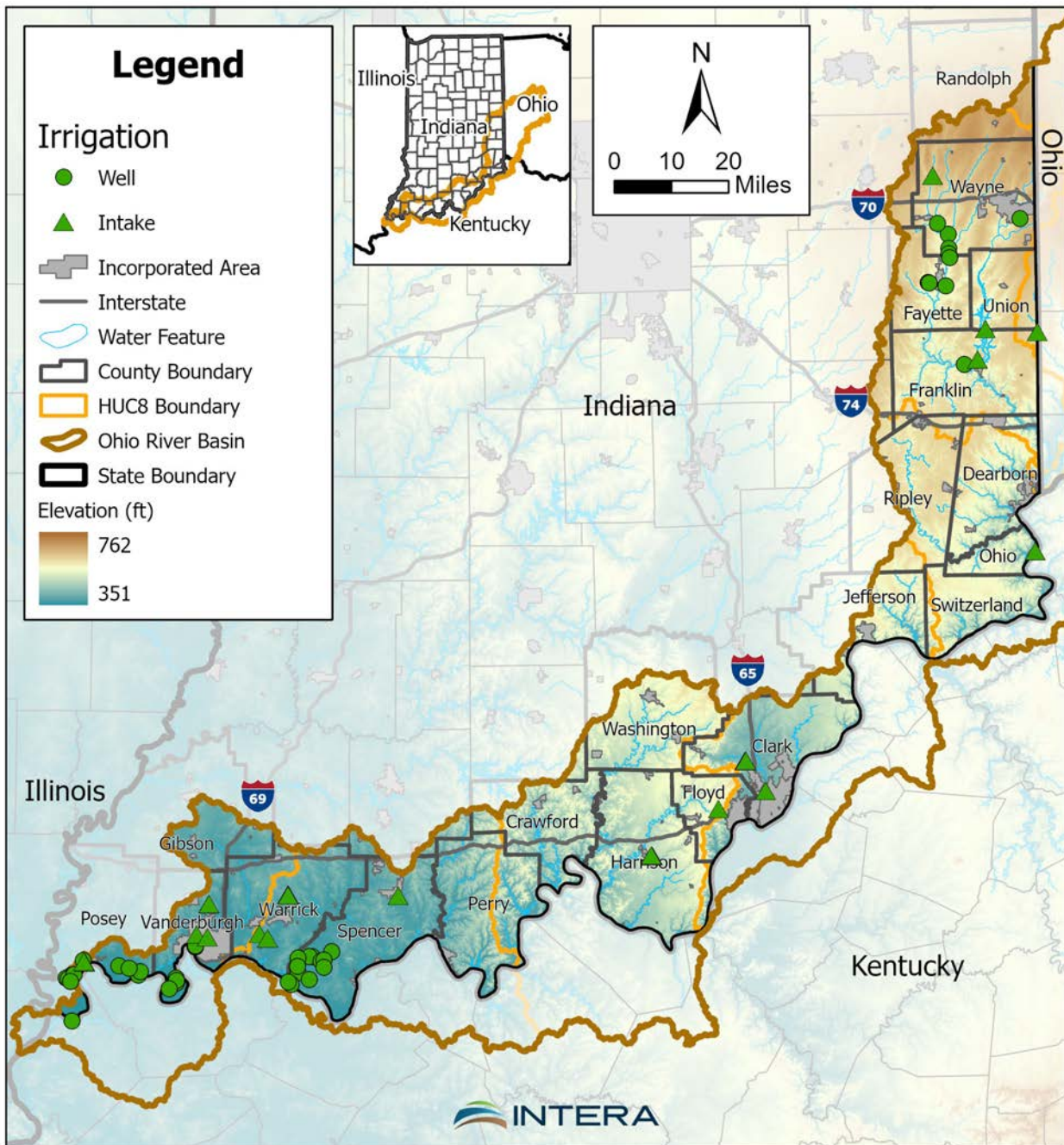


Figure 23. Irrigation withdrawal sites from the SWWF database. Figure shows groundwater wells and surface water intakes that were active in 2023.

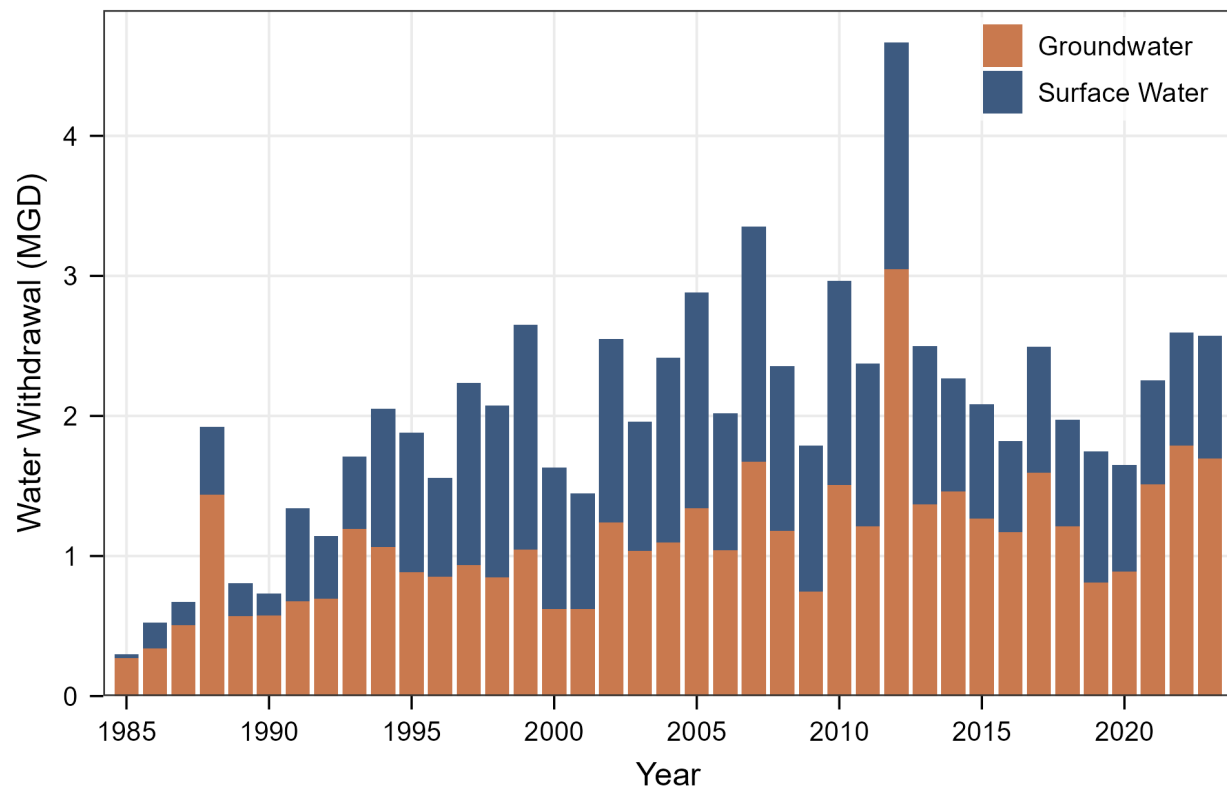


Figure 24. Annual average irrigation withdrawal for the Region by source, 1985-2023.

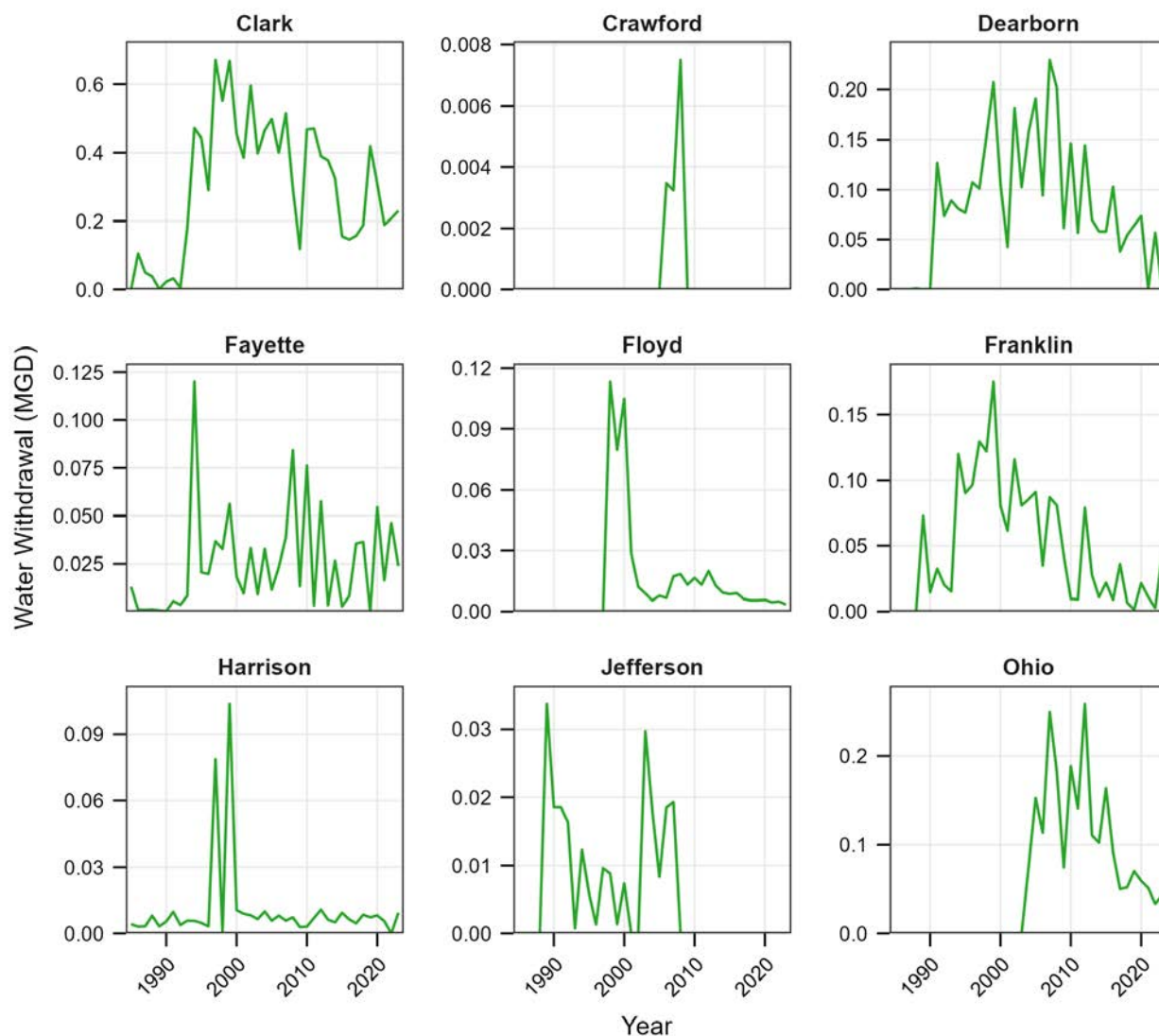


Figure 25. Average annual irrigation withdrawals by county, 1985-2023 (page 1 of 2). Only demands from within the Region are presented in the graphs. Counties that lie partially within the Region include Clark, Crawford, Fayette, and Jefferson.

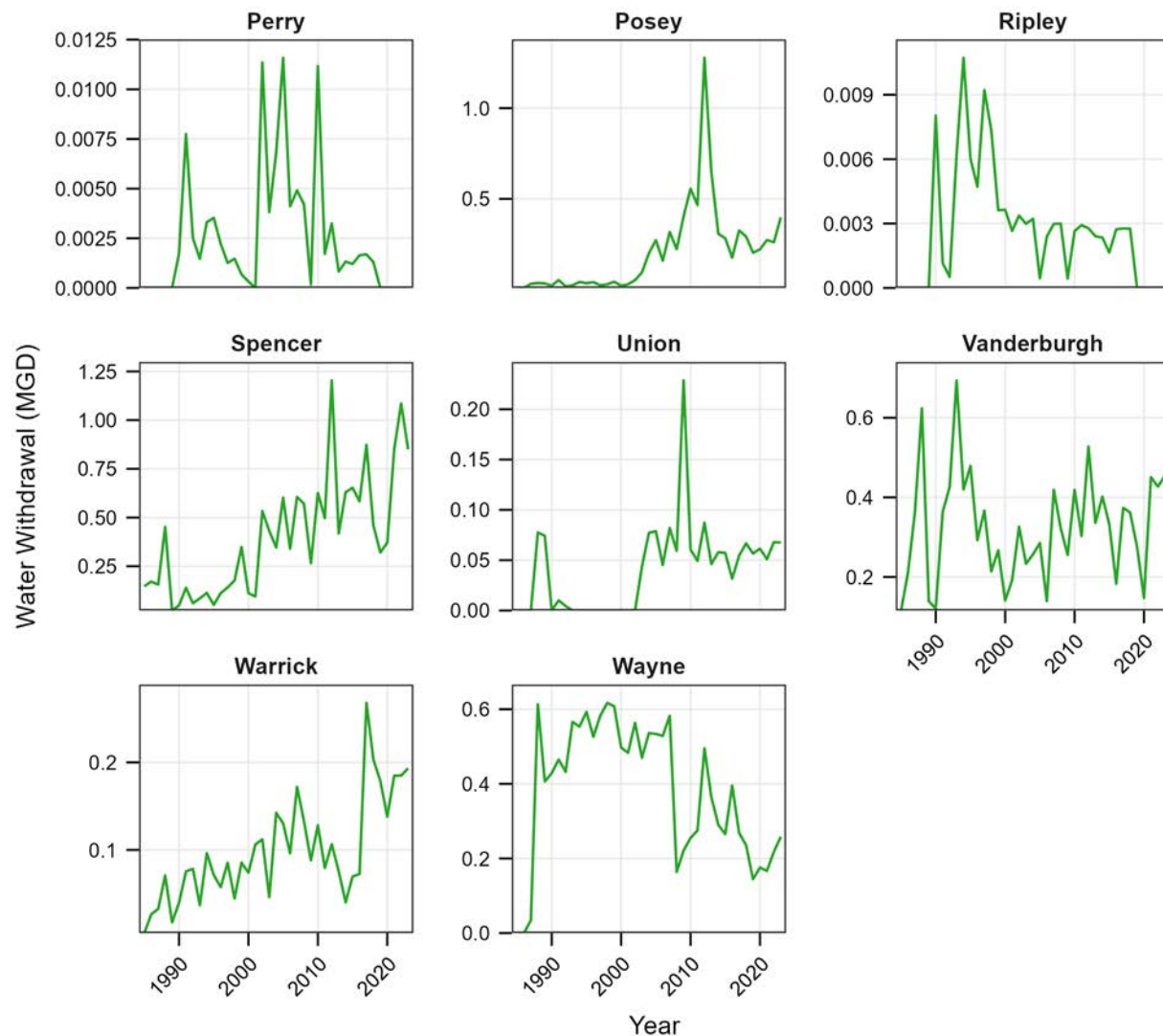


Figure 26. Average annual irrigation withdrawals by county 1985-2023 (page 2 of 2). Only data from within the Region are presented in the graphs. Counties that lie partially within the Region include Posey, Ripley, Spencer, Vanderburgh, and Warrick.

### 2.1.3.2 Rural Water Supply

Rural use withdrawals represent a minor component of overall agricultural water demand within the region, with only five registered groundwater wells and no registered surface-water intakes that had active withdrawals in 2023 (**Figure 27**). These facilities are concentrated in the northeastern portion of the region near Richmond and Wayne County. The registered facilities report withdrawals in 2023 exclusively for livestock watering

Annual average rural use withdrawals (**Figure 28**) are correspondingly small, generally ranging between approximately 0.003 and 0.008 MGD from 1985 through the late 1990s. Withdrawals dropped to near zero in 2000 and remained low, generally less than 0.003 MGD, through the mid-2000s, before increasing again beginning in 2008. Withdrawals then rose sharply in 2009 to a peak of approximately 0.019 MGD, followed by a brief dip and a secondary peak of approximately 0.016 MGD in 2014–2015, before stabilizing at approximately 0.0135 MGD from 2016 through 2023. All reported rural use withdrawals are sourced from groundwater.

Average annual rural use withdrawals by county (**Figure 29**) are reported for only three counties: Dearborn, Fayette, and Randolph. Fayette County withdrawals are minimal (approximately 0.001 MGD) and were reported only for a brief period from 1993 through 1996. Randolph County withdrawals begin around 2009 at approximately 0.0155 MGD, dip briefly to roughly 0.0125 MGD, rise again to approximately 0.0155 MGD around 2015, and have since remained essentially flat at approximately 0.0125 to 0.013 MGD through 2023. Dearborn County has the longest and most complete period of record among the three counties, with withdrawals fluctuating between approximately 0.003 and 0.008 MGD from the mid-1980s through 2000, before declining, with a brief rebound around 2008, to a stable level of approximately 0.0011 to 0.0012 MGD from the mid-2010s through 2023.

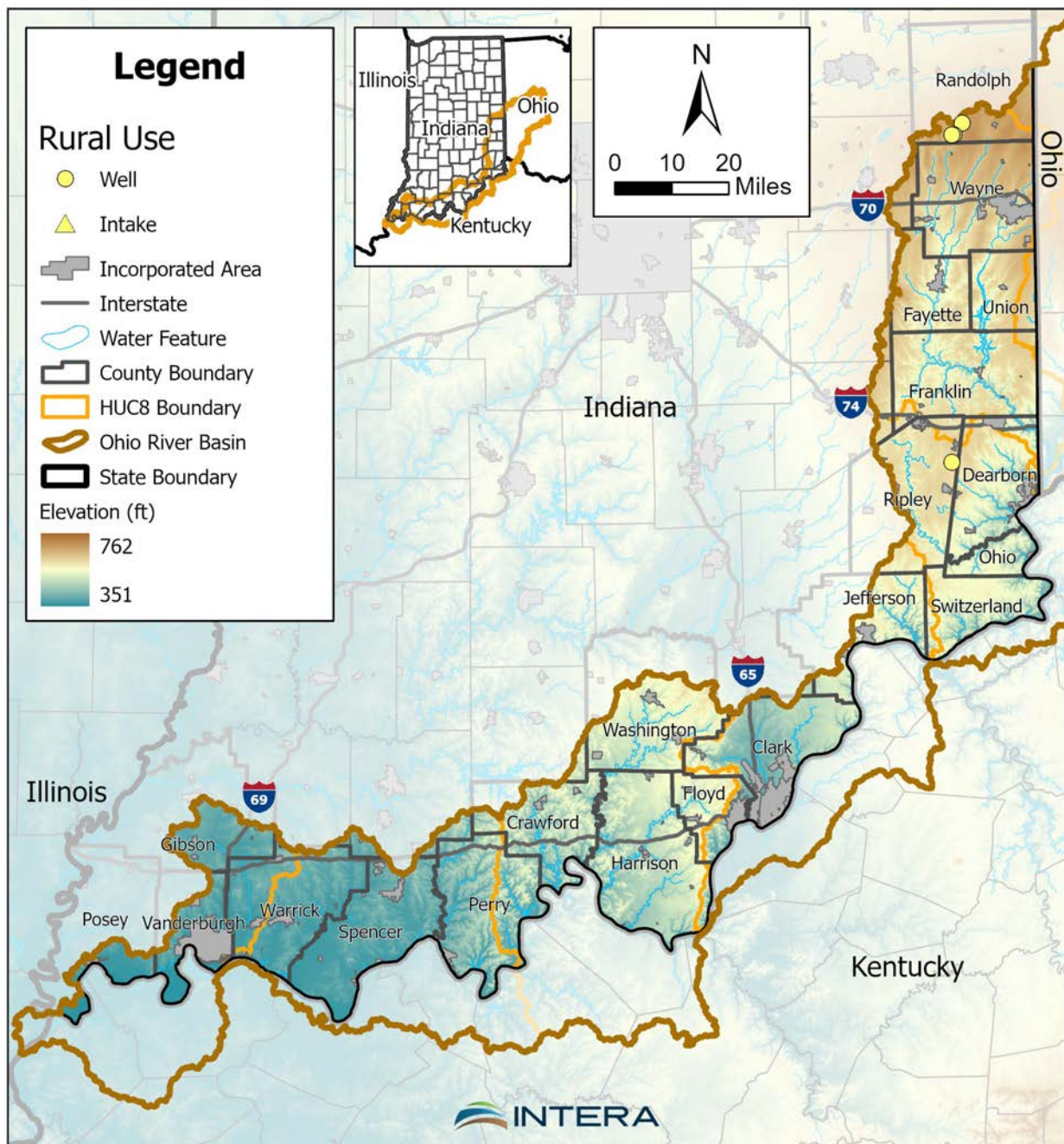


Figure 27. Rural-use withdrawal sites from the SWWF database. Figure shows groundwater wells that were active in 2023.

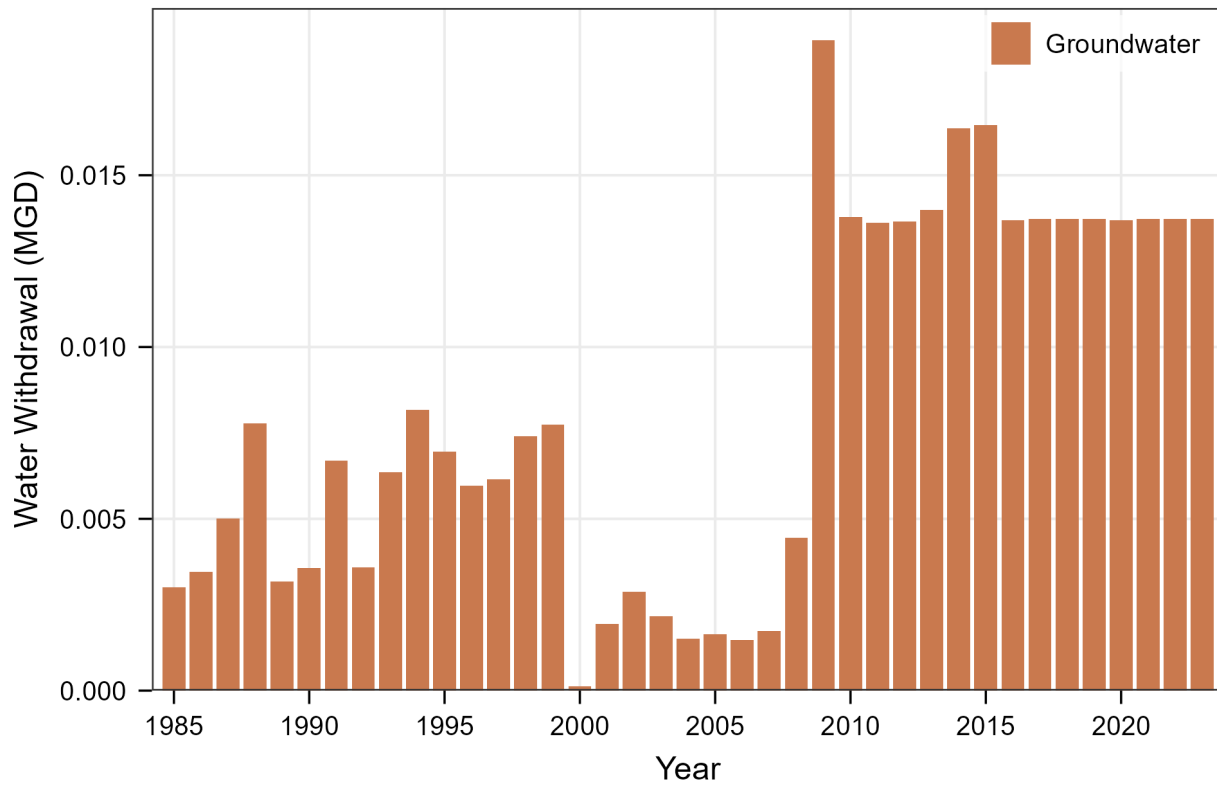


Figure 28. Annual average rural use withdrawals for the Region by source, 1985-2023.

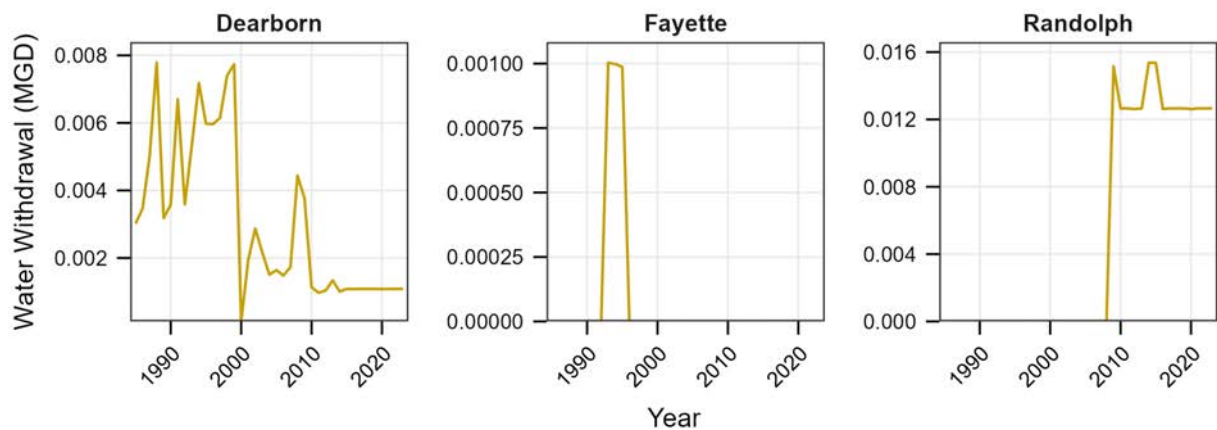


Figure 29. Annual average rural use withdrawals by county, 1985-2023. Only data from within the Region are presented in the graphs. Counties that lie partially within the Region include Fayette and Randolph.

### 2.1.3.3 Animal Feeding Operations

In Indiana, animal feeding operations over a certain size are regulated by Indiana Department of Environmental Management (IDEM), Office of Land Quality, under IC 13-18-10 of the Indiana Code. Confined feeding operations (CFOs) and the larger concentrated animal feeding operations (CAFOs) are subject to a permitting process and inspections of associated building and manure storage structures. CFOs are farms that have more than 300 cattle, 600 pigs or sheep, 30,000 poultry, or 500 horses. CAFOs are farms with more than 700 dairy cows, 1,000 beef cattle, 2,500 adult pigs, 10,000 adolescent swine, 500 horses, 10,000 sheep, 55,000 turkeys, or between 30,000 and 125,000 chickens (depending on type and manure handling system). Both types of operations are referred to as CAFOs in this report.

The IDEM Office of Land Quality reports on the current location, type, and the permitted number of animals (**Figure 30**) for all CAFOs in Indiana. These reported data from 2021 were used to estimate CAFO water withdrawals within the basin by multiplying the number of animals with a per-animal water-use coefficient (**Table 9** and **Appendix B**).

To understand how CAFOs have changed over time, the USDA's reported historical survey of animals (all animals, not just CAFOs) in each county was used as a surrogate. These data provided a historical trend to use in the predictive analysis (**Section 2.2.5.3**).

**Table 9.** Calculated CAFO water withdrawal (MGD) for the county areas within the Ohio River and Southeast Indiana Water Region (IDEM, 2021). Only data from within the Region are presented in the graphs. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | CAFO Water Withdrawals (MGD) |
|---------------------|------------------------------|
| Clark*              | 0.01                         |
| Crawford*           | 0.01                         |
| Dearborn            | 0.00                         |
| Fayette*            | 0.02                         |
| Floyd               | 0.00                         |
| Franklin            | 0.04                         |
| Gibson*             | 0.03                         |
| Harrison            | 0.05                         |
| Jefferson*          | 0.00                         |
| Ohio                | 0.00                         |
| Perry               | 0.03                         |
| Posey*              | 0.00                         |
| Randolph*           | 0.07                         |
| Ripley*             | 0.05                         |
| Spencer*            | 0.07                         |
| Switzerland         | 0.00                         |
| Union               | 0.05                         |
| Vanderburgh*        | 0.00                         |
| Warrick*            | 0.00                         |
| Washington*         | 0.21                         |
| Wayne               | 0.04                         |
| <b>Total Demand</b> | <b>0.7</b>                   |

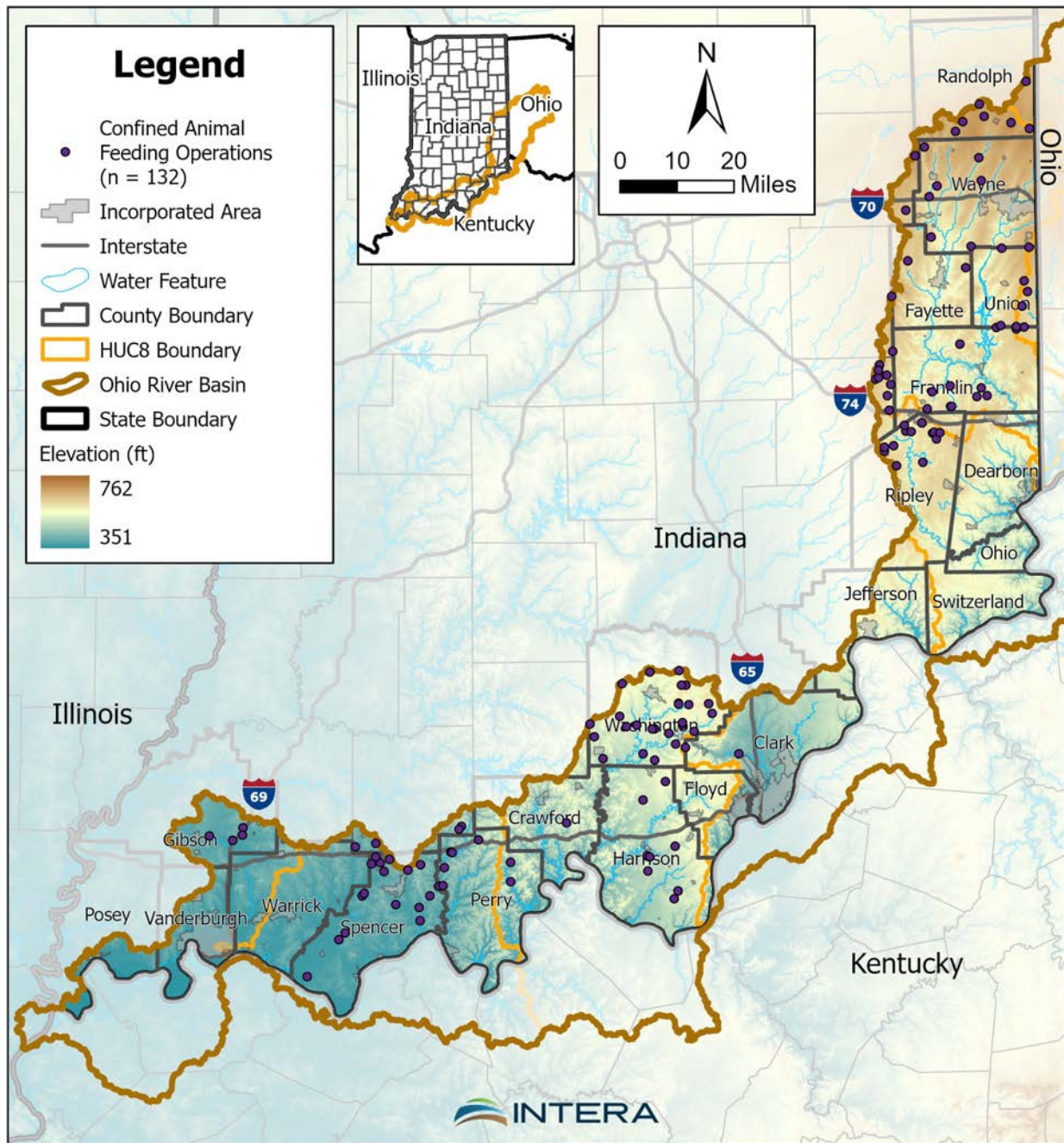


Figure 30. Concentrated animal feeding operations in the Ohio River and Southeast Indiana Region (IDEM, 2021).

## 2.1.4 Power Generation

Power generation is the largest water use sector within the Region, including 22 registered groundwater wells and 15 surface-water intakes within the Region with active withdrawals in 2023 (**Figure 31**). Energy production facilities are concentrated along the Ohio River corridor near Evansville, where multiple wells and intakes are clustered to support thermoelectric generation, with additional facilities distributed near Richmond. All the registrations in Gibson and Warrick Counties outside of the Ohio River corridor are coal mines rather than power plants. Mine dewatering and coal preparation withdrawals peaked near 19 MGD in 1992, have fallen to about 1 MGD, and have always been under 1 percent of the sector total, most recently in Gibson and Warrick Counties.

Annual average energy production withdrawals (**Figure 32**) are drawn almost entirely from surface water and represent by far the largest category of water withdrawal in the region, substantially exceeding public supply, industrial, and agricultural withdrawals combined. Withdrawals were relatively stable at approximately 2,200 to 2,800 MGD from 1985 through the mid-2000s, followed by a pronounced and sustained decline beginning around 2010. By the early 2020s, energy production withdrawals had fallen to approximately 1,300 to 1,500 MGD, roughly half of peak historical levels, consistent with the broader national trend of retiring or reducing reliance on older thermoelectric generating capacity in favor of more efficient generation technologies. While water demands for energy production are very high in the Region, the consumptive use of this water is very low, with most of the water returned to the Ohio River.

Annual average energy production withdrawals by county (**Figure 33**) show this decline concentrated in a subset of counties. Dearborn County, which historically supported withdrawals in the range of approximately 450 to 850 MGD, held relatively stable at the upper end of that range through the mid-2000s, dipped and partially recovered to roughly 500 to 600 MGD from 2010 to 2015, and then declined sharply to near zero by the early 2020s. The Dearborn County drop-off aligns with the closure of the Tanners Creek Generating Station, a coal-fired plant in Lawrenceburg operated by Indiana Michigan Power and ultimately owned by American Electric Power (AEP). Opened in 1951, it ceased operations on May 31, 2015, as part of a coal plant settlement wave stemming from a 2013 federal court decision in which AEP agreed to retire or switch to natural gas from coal-burning units in Ohio and Indiana by the end of 2015.

Floyd and Wayne Counties show more gradual declines over a similar period, from a peak of approximately 330 MGD to generally less than 100 MGD by the early 2020s in Floyd, and from a peak of approximately 2.2 MGD in the mid-1990s to less than 0.1 MGD in Wayne. Floyd County's decline reflects the staged retirement of the R. Gallagher Generating Station (New Albany), which retired two of its four units in 2012 and the remaining two in 2021. Wayne County's more gradual decline corresponds to a shift in how the Whitewater Valley Generating Station (Richmond) is used: ownership transferred from Richmond Power & Light to the Indiana Municipal Power Agency in 2014, after which the plant moved from continuous operation to intermittent use during peak summer and winter demand periods.

Jefferson County, the largest energy producer in the region at approximately 1,075 to 1,340 MGD, shows a gradual downward drift over the period of record, punctuated by considerable year-to-year variability and several pronounced low-flow years in the 2010s, without the abrupt step-change declines seen in Dearborn and Floyd. Jefferson County's relative persistence as the region's largest energy producer, without the outright retirement or conversion trends seen elsewhere in the region, reflects the Clifty Creek Generating Station's distinct ownership structure. Unlike the merchant coal plants that

have closed or converted across the region, Clifty Creek is owned by the Ohio Valley Electric Corporation (OVEC), a consortium of utilities across Indiana, Kentucky, Ohio, and West Virginia formed originally to supply a federal uranium enrichment facility. OVEC's member utilities remain contractually obligated to purchase the plant's output regardless of market competition, insulating it from the economic pressures that have driven the closure of similarly aged, single-owner coal plants such as Tanners Creek and R. Gallagher.

In contrast to the counties discussed previously, Posey County withdrawals show an increasing trend, rising from approximately 4.5 to 5 MGD in the late 1980s to peaks of roughly 8 to 9 MGD in recent years, while Warrick and Spencer Counties have maintained comparatively stable, though variable, withdrawals of approximately 550 to 820 MGD and 10 to 48 MGD, respectively, with Spencer showing some decline toward the low end of that range over the past several years. Vanderburgh County supported modest energy production withdrawals only through approximately 2000, after which no further withdrawals were reported. Switzerland County shows no reported activity before approximately 1990, after which withdrawals rose sharply and have remained comparatively stable at approximately 2.5 to 4 MGD. Gibson County withdrawals fluctuate between approximately 0 and 6.3 MGD without a clear directional trend.

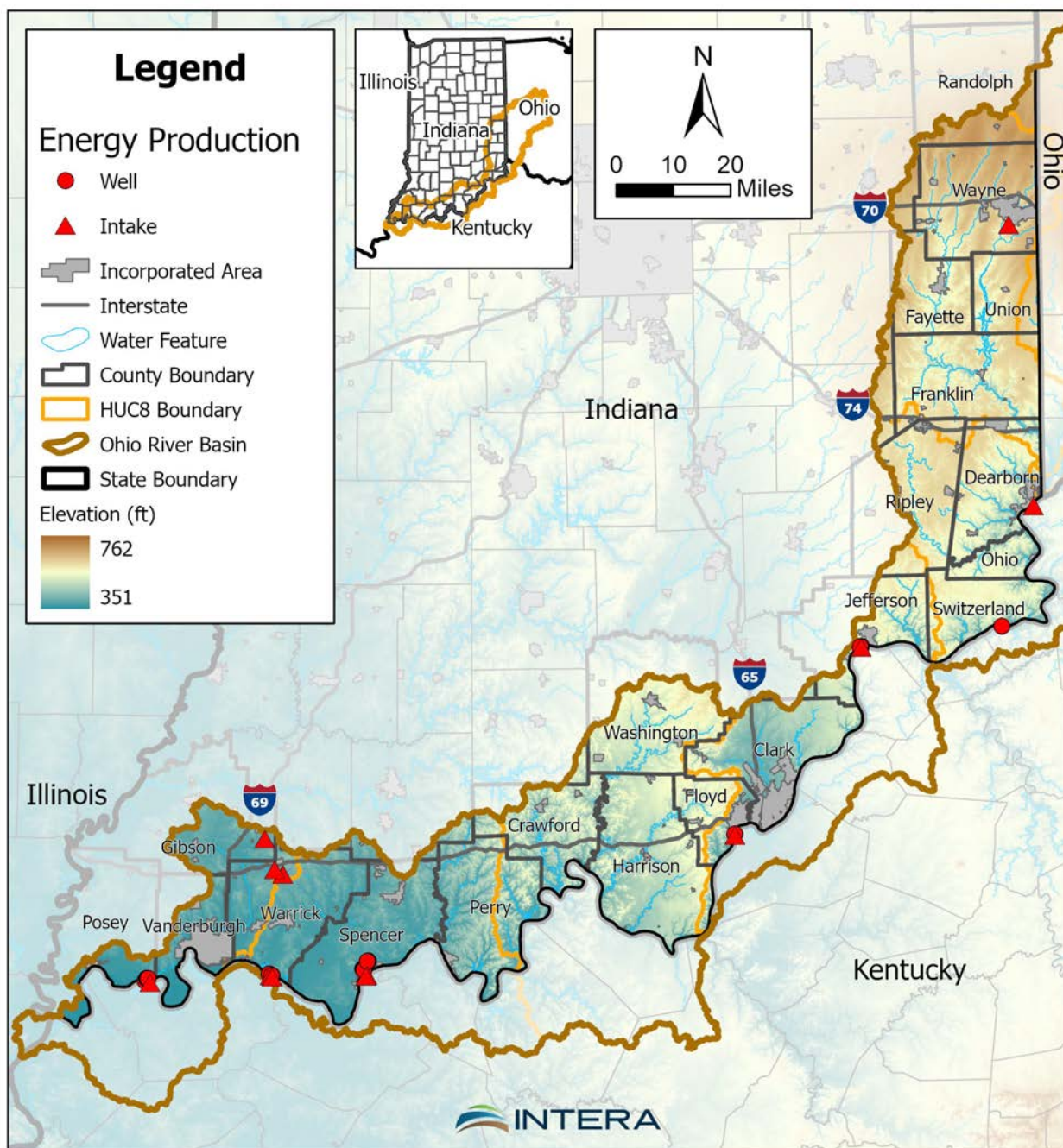


Figure 31. Energy production withdrawal sites from the SWWF database. Figure shows groundwater wells and surface water intakes that were active in 2023.

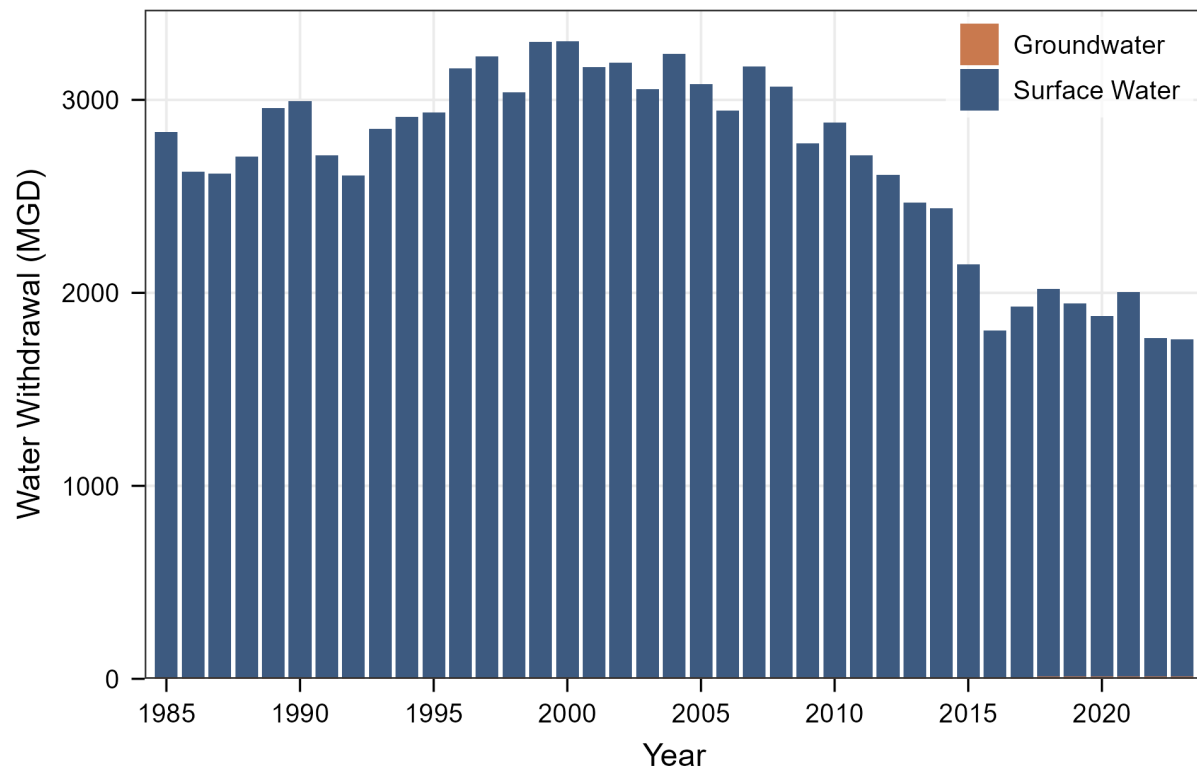


**Figure 32.** Annual average energy production withdrawals for the Region by source, 1985-2023. Groundwater withdrawals do occur but are small relative to surface-water withdrawals and cannot be seen on the graph.

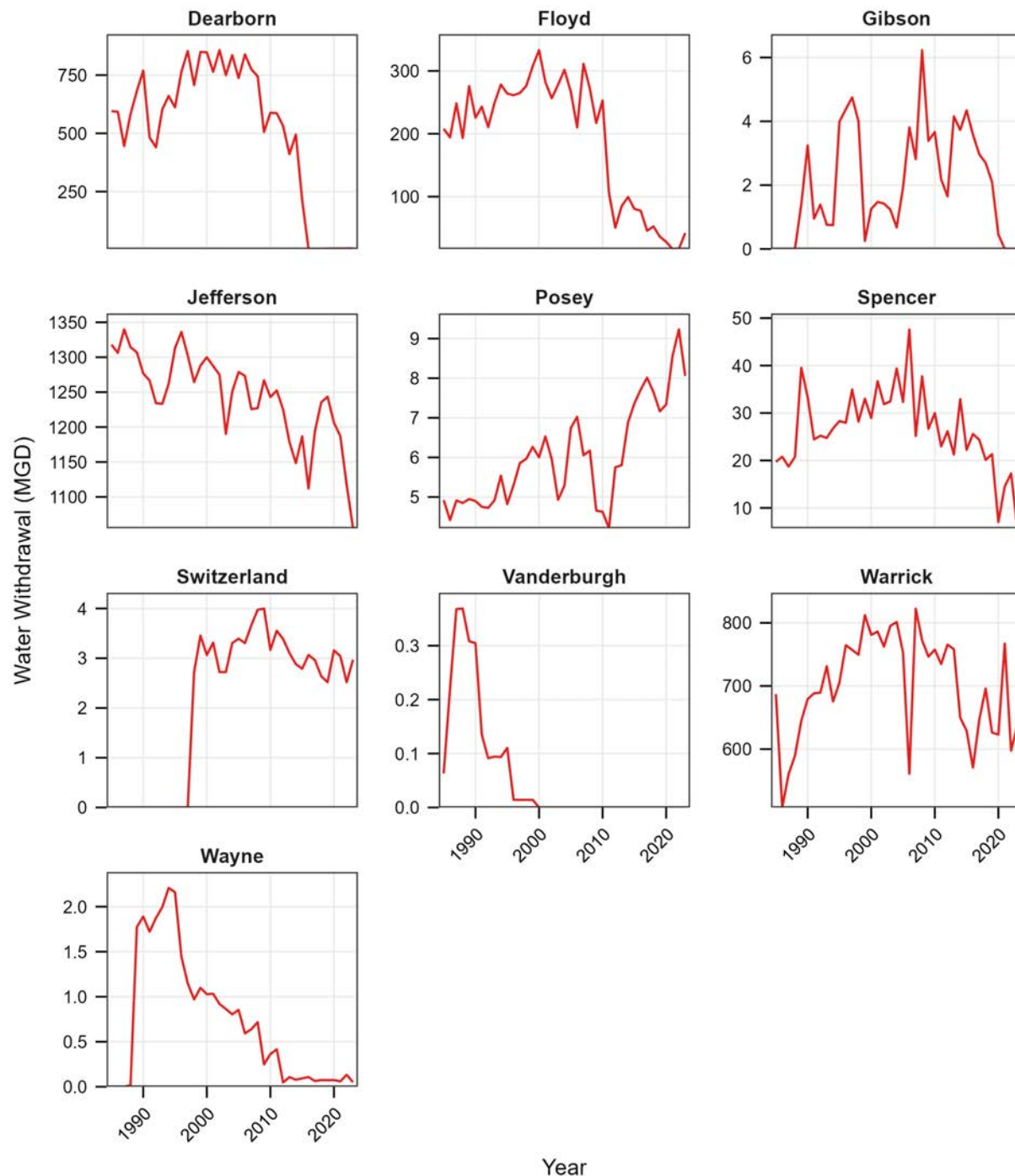


Figure 33. Average annual energy production withdrawals by county, 1985-2023. Only demands from within the Region are presented in the graphs. Counties that lie partially within the Region include Gibson, Jefferson, Posey, Spencer, and Vanderburgh.

### 2.1.5 Industrial Water Supply

Industrial water withdrawals within the Region are supported by 30 registered groundwater wells and 32 surface-water intakes with active withdrawals in 2023 (**Figure 34**). Industrial facilities are broadly distributed across the Region but are most densely concentrated along the Ohio River corridor near Evansville and Jeffersonville and within the Whitewater watershed near Richmond, mirroring the pattern of industrial development described in **Section 1.3.4**.

Annual average industrial withdrawals (**Figure 35**) are supplied predominantly by surface water, with groundwater contributing a smaller but more variable share, generally ranging from approximately 10 to 17 MGD over the period of record rather than remaining flat. Total industrial withdrawals increased from approximately 22 MGD in 1985 to a range generally between 30 and 40 MGD through most of the record, punctuated by a pronounced peak of approximately 45 MGD in the early- to mid-1990s. Withdrawals have trended upward over the past decade, reaching approximately 41 MGD in the mid- to late-2010s, before declining in recent years to approximately 31 MGD in 2023.

Annual average industrial withdrawals by county (**Figure 36** and **Figure 37**) reveal considerable variability in both magnitude and trend across the Region. Posey and Dearborn Counties show the highest sustained industrial withdrawals among the counties in the Region. Posey County has remained comparatively high and relatively stable throughout the period of record, generally ranging between approximately 7.3 and 10.9 MGD. Dearborn County shows a gradual increase over time, from roughly 5 to 8 MGD in the 1980s and 1990s to a recent range of approximately 9 to 11.5 MGD.

Perry, Ripley, and Harrison Counties show abrupt step-changes rather than gradual trends, shifting from a low, near-zero baseline to a sustained higher level of withdrawal at different points in the record. Perry County industrial use shifted beginning around 2000–2001, rising to a peak of approximately 2.15 MGD before settling into a range of roughly 1 to 1.7 MGD in recent years. Ripley County withdrawals remained low and flat (approximately 0.1 to 0.25 MGD) through roughly 2018, before rising sharply to approximately 0.5 to 0.85 MGD by 2020–2023. Harrison County followed a similar pattern, holding near zero through approximately 2015 before a noisy step-up to a range of roughly 0.2 to 0.7 MGD, including a pronounced single-year spike around 2020.

Clark County withdrawals follow a more complex, multi-phase pattern rather than a simple decline: a low baseline through the early 1990s (approximately 4 to 5 MGD), a sharp increase to approximately 15 to 17.5 MGD in the mid-1990s, a decline back to roughly 4 to 5 MGD by the early 2000s, a partial recovery to approximately 5 to 8.7 MGD through the 2000s and 2010s, and a return to approximately 4 to 5 MGD by the end of the record.

Vanderburgh and Wayne Counties both show a rise followed by a decline. Vanderburgh County increased from near zero to approximately 1 to 2 MGD by the mid-2010s, peaking around 1.95 MGD, before falling back to near zero after approximately 2019. Wayne County rose from a relatively stable baseline of approximately 1.5 to 4 MGD through the 2000s to a peak of roughly 8.7 to 8.8 MGD around 2018–2020, before partially retreating to approximately 4 to 4.5 MGD by 2023.

Washington County withdrawals, despite considerable volatility through roughly 2010 (ranging from approximately 0.2 to 1.25 MGD), have declined to near zero since approximately 2015. Fayette, Gibson, Spencer, Union, and Randolph Counties show only brief, discontinuous windows of registered industrial withdrawals rather than a sustained record. Fayette County registered negligible withdrawals from the mid-1980s through the early 1990s, followed by a gap and a later pulse rising to approximately 1.6 MGD

around 2018–2020 before declining to roughly 0.4 to 0.8 MGD. Gibson, Spencer, Union, and Randolph Counties each show a single brief pulse of withdrawal activity, generally lasting only a few years and not exceeding approximately 0.05 to 0.76 MGD, with no reported withdrawals outside those windows. Crawford and Franklin Counties remain noisy throughout the record, though Crawford shows a modest overall upward drift, from approximately 1 to 2 MGD in the late 1980s to a range of roughly 3 to 7 MGD in recent years, while Franklin shows no clear directional trend.

Warrick County shows essentially no reported withdrawal for nearly the entire record, with activity appearing only in the final several years, rising from near zero to approximately 0.56 MGD by 2023. Floyd County shows a declining trend, from a peak of approximately 1.6 MGD around 1990 to generally less than 0.5 MGD in recent years. Switzerland County held relatively stable at approximately 3 to 4.3 MGD from the late 1980s through around 2018, before declining sharply to roughly 0.6 to 1 MGD by 2023.

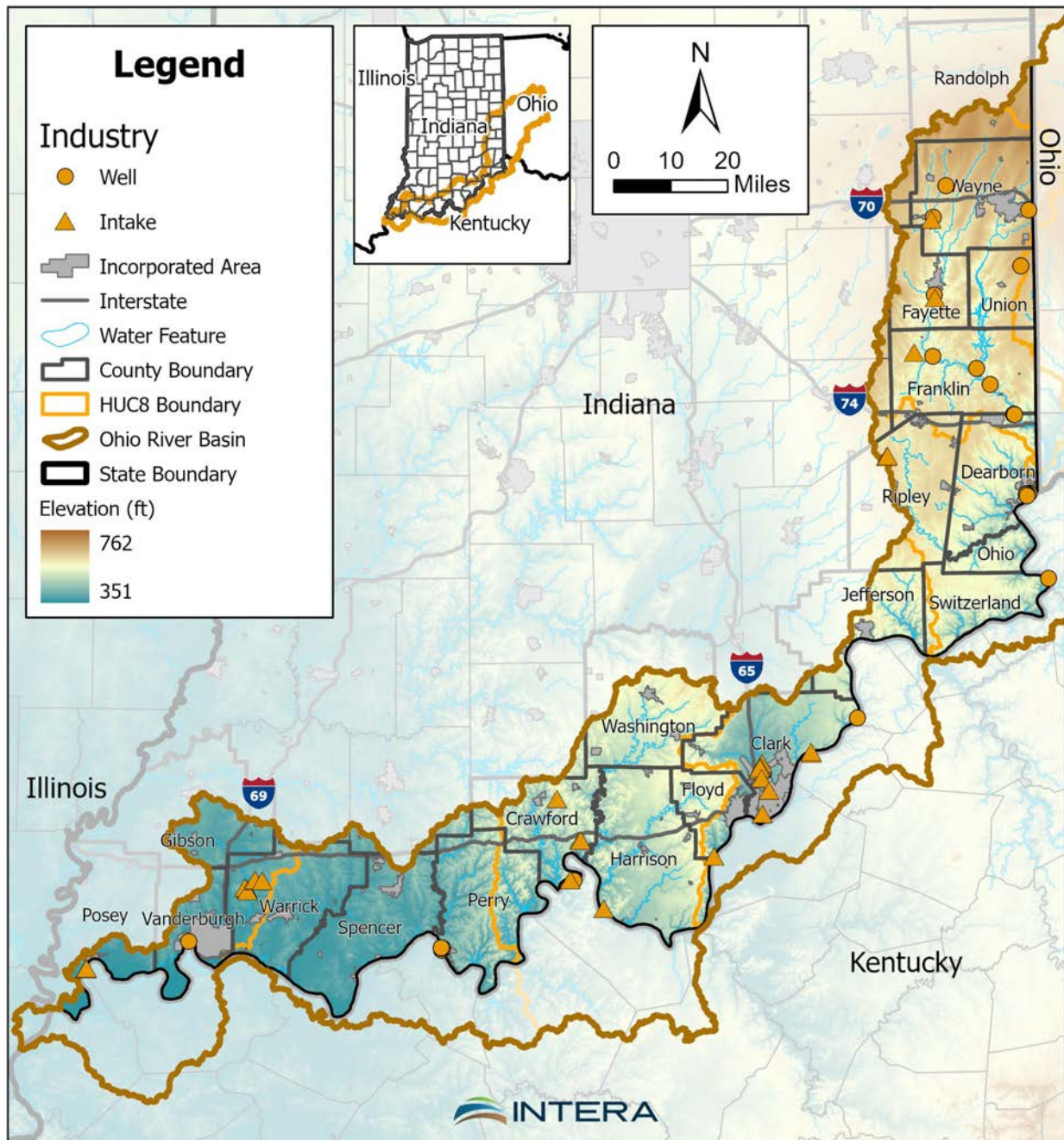


Figure 34. Industrial supply withdrawal sites from the SWWF database. Figure shows groundwater wells and surface water intakes that were active in 2023.

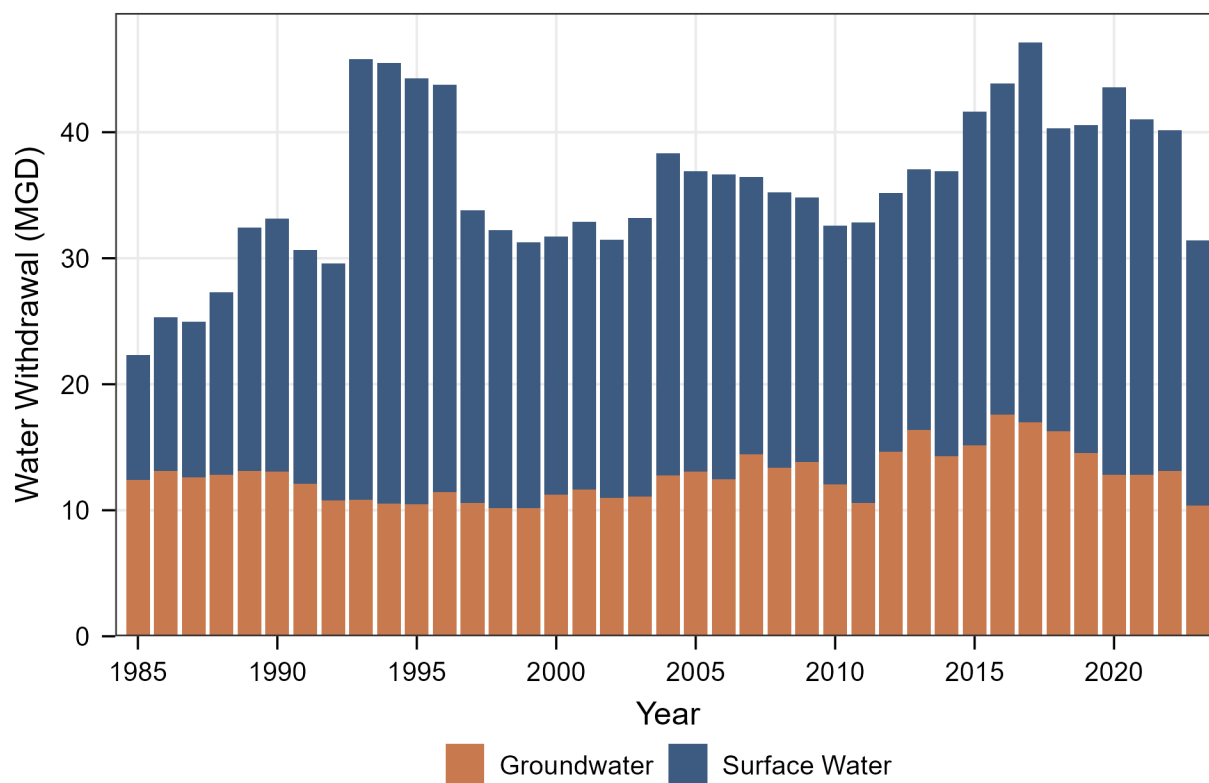


Figure 35. Annual average industrial withdrawals for the Region by source, 1985-2023.

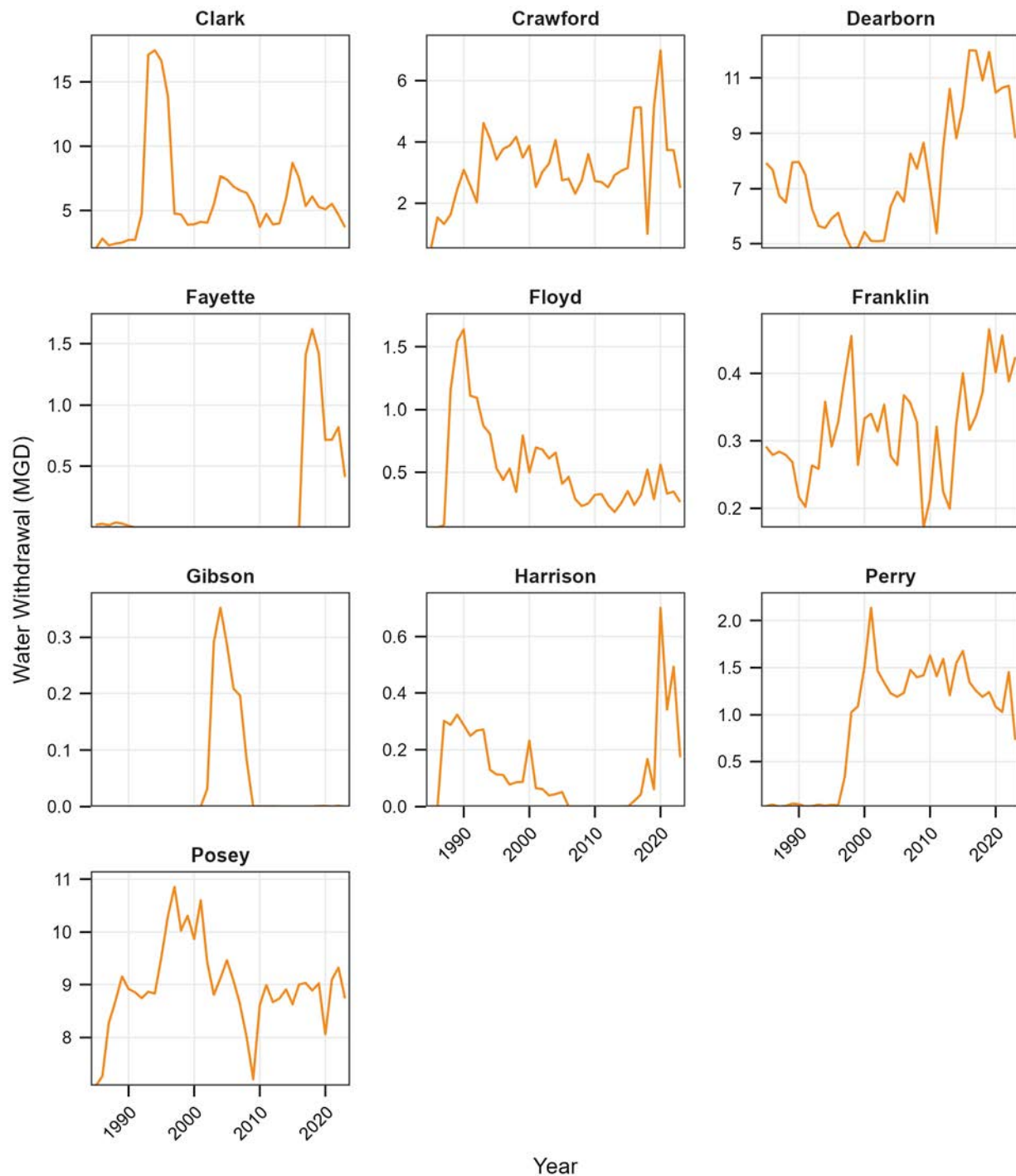


Figure 36. Annual average industrial withdrawals by county, 1985-2023 (page 1 of 2). Only demands from within the Region are presented in the graphs. Counties that lie partially within the Region include Clark, Crawford, Fayette, Gibson, and Posey.

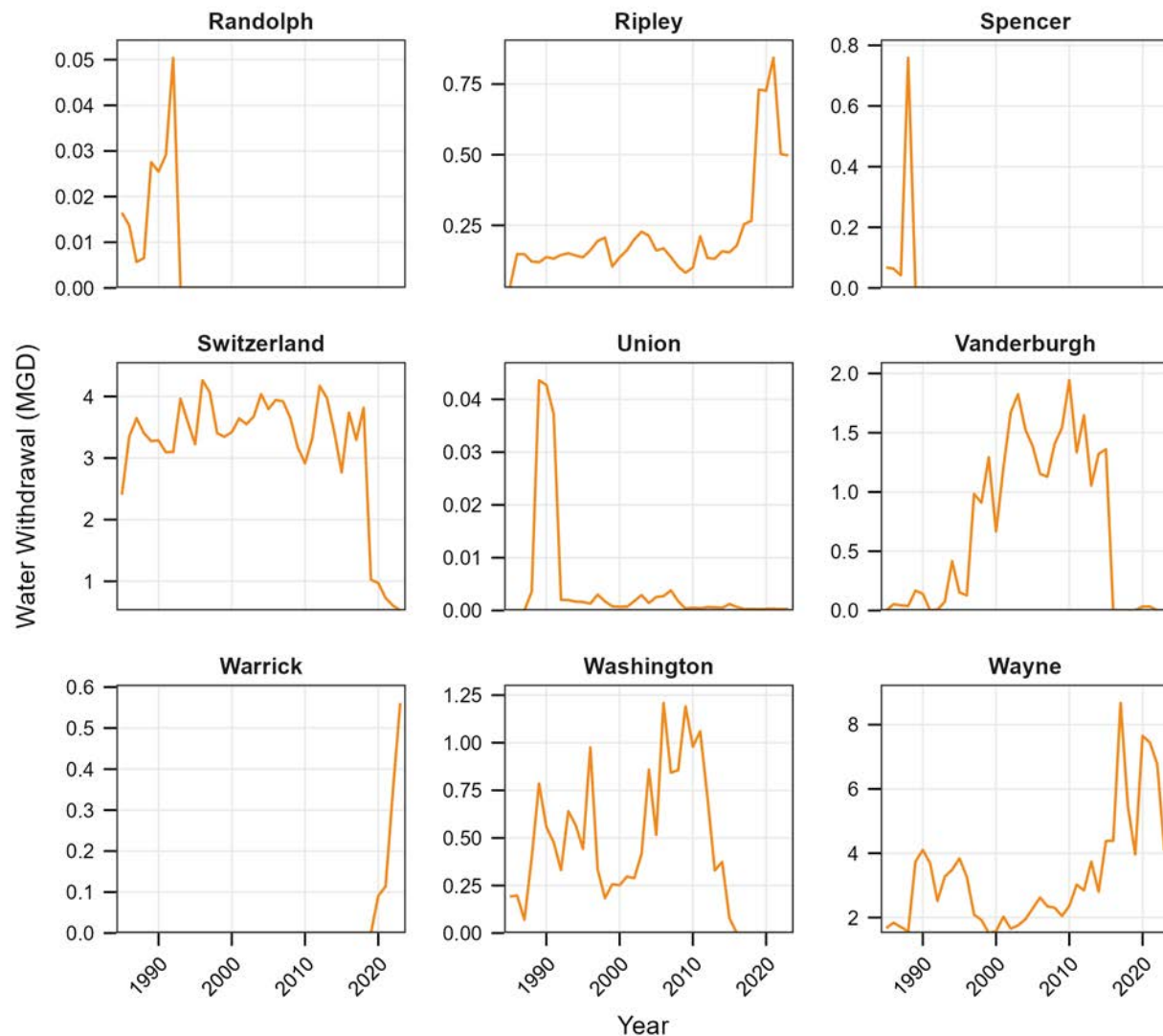


Figure 37. Annual average industrial withdrawals by county, 1985-2023 (page 2 of 2). Only data from within the Region are presented in the graphs. Counties that lie partially within the Region include Randolph, Ripley, Spencer, Vanderburgh, Warrick, and Washington.

### 2.1.6 Miscellaneous Use

The miscellaneous sector in the Region includes water withdrawals for fire suppression and protection, construction and foundation dewatering, dust control, and hydrostatic testing of pipelines. As shown in **Figure 38**, five groundwater wells and two surface-water intakes registered under the miscellaneous use category reported a withdrawal in 2023. Miscellaneous withdrawals within the Region come predominantly from surface water (**Figure 39**) which supplied 86 percent of the sector over the period 2019 through 2023. Regional miscellaneous withdrawals averaged 0.78 MGD across the record, peaked at 1.39 MGD in 1994, and stood at 1.22 MGD in 2023. The withdrawals by county (**Figure 40**) are highly variable from year to year and show no apparent trend, with Posey and Dearborn Counties accounting for nearly all the regional total. This reflects the transient nature of the water use sector, where continuous withdrawals over many years are unlikely. Rather, facilities register withdrawals as needed and then become inactive.

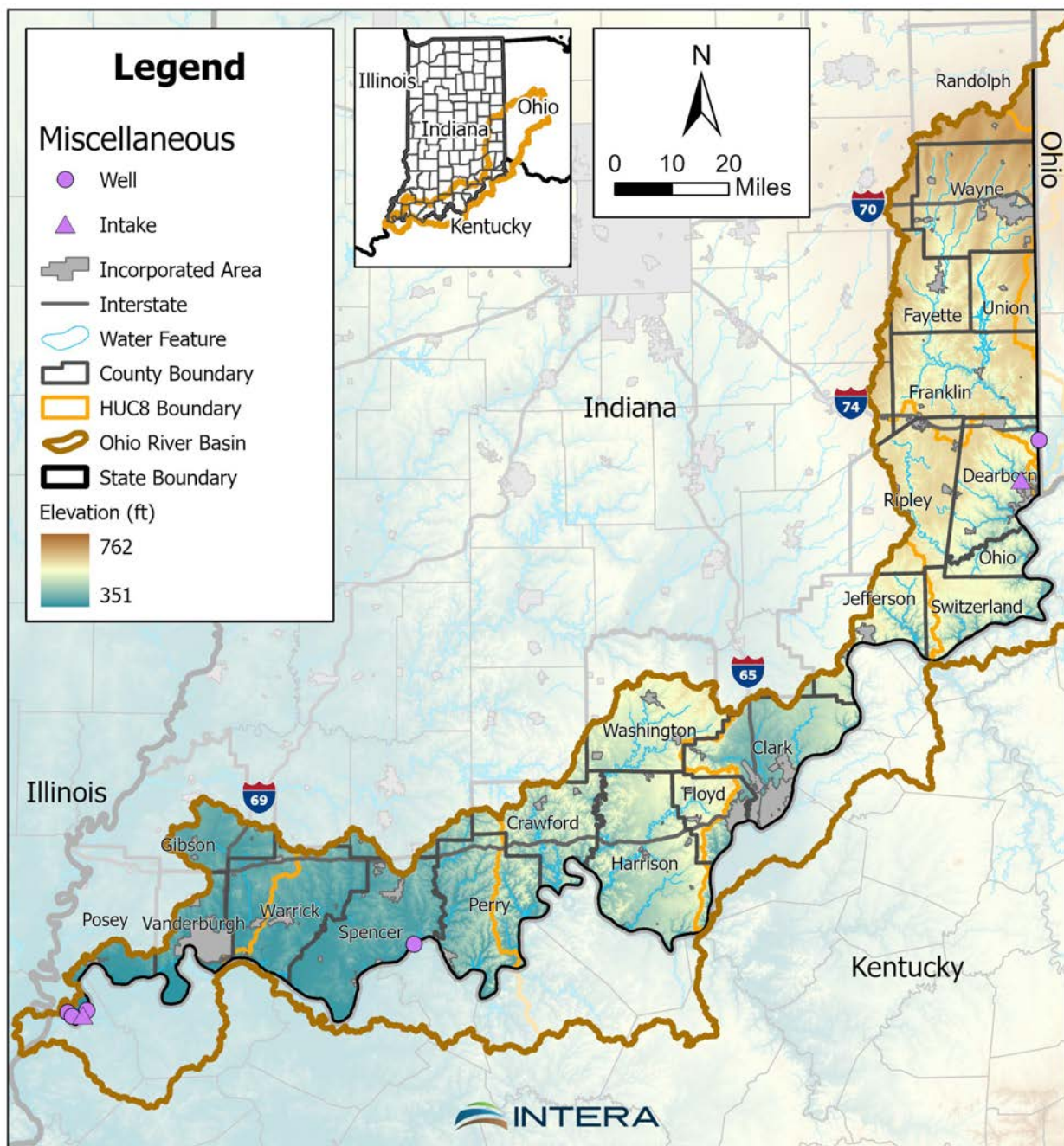


Figure 38. Miscellaneous withdrawal sites from the SWWF database. Figure shows groundwater wells and surface water intakes that were active in 2023.

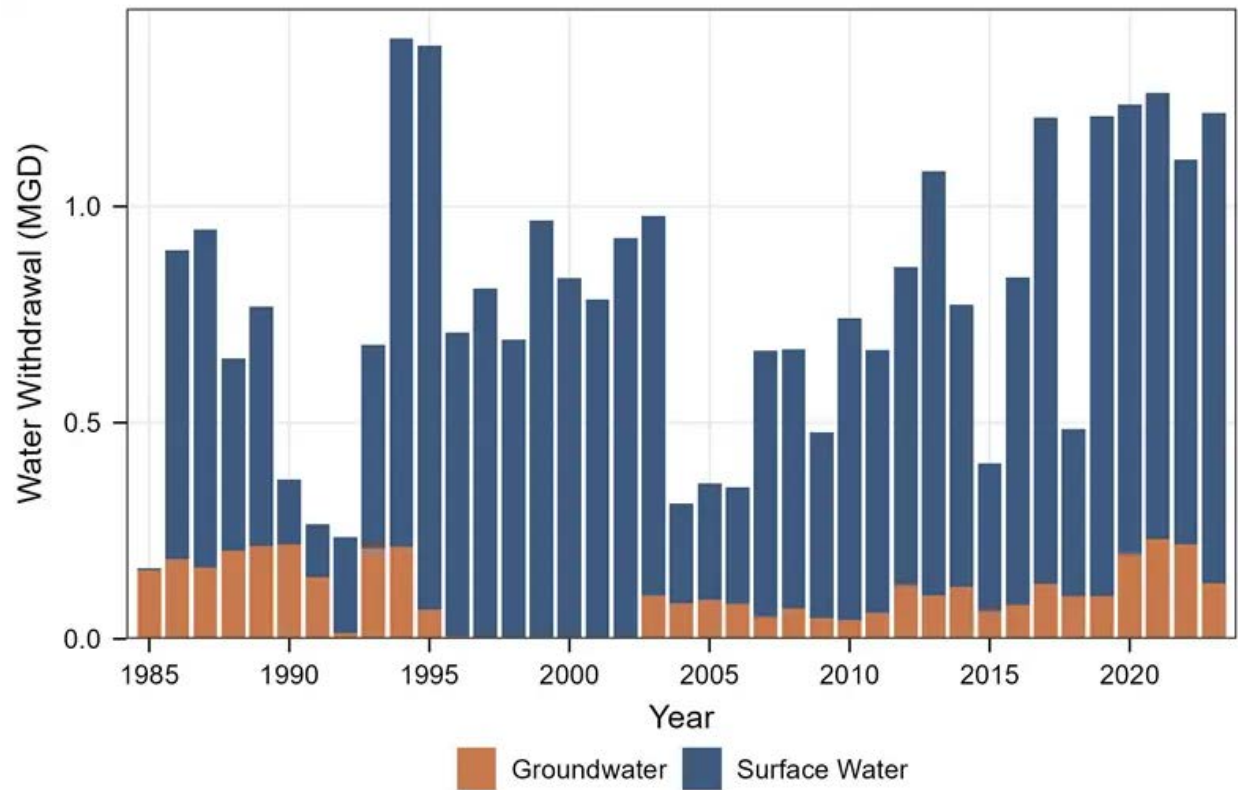


Figure 39. Annual average miscellaneous withdrawals for the Region by source, 1985-2023.

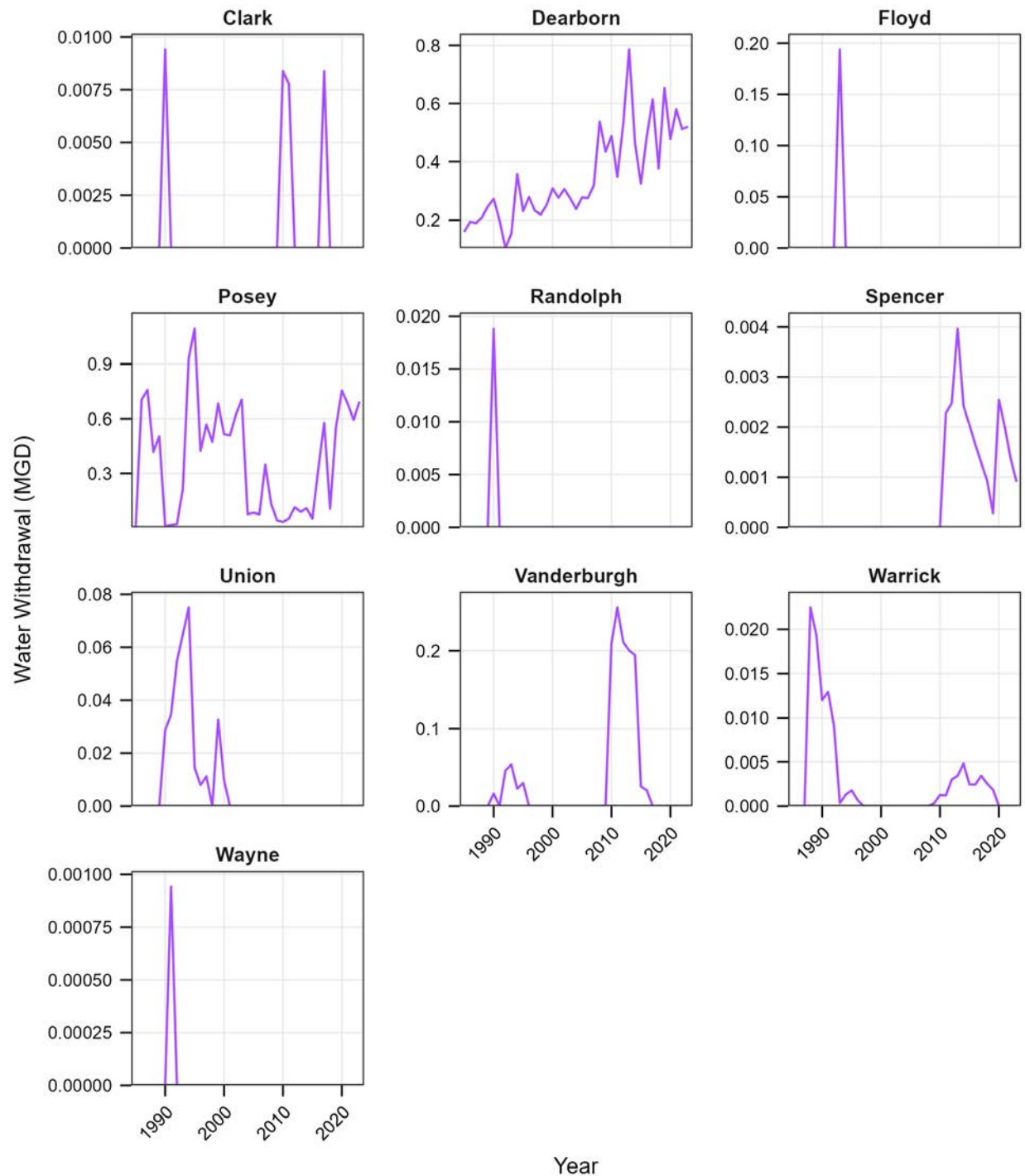


**Figure 40.** Annual average miscellaneous withdrawals by county, 1985-2023. Only data from within the Region are presented in the graphs. Counties that lie partially within the Region include Clark, Posey, Randolph, Spencer, and Vanderburgh.

## 2.2 Water Demand Forecasts

Water withdrawals reported to the SWWF database are the foundation of the demand analysis. Every facility that has the capacity to withdraw 100,000 gallons or more per day is required to report its monthly withdrawals to the IDNR, and that reported volume is what the analysis treats as water demand. Withdrawal is the quantity a user removes from a groundwater or surface-water source to meet a need, and for planning purposes the volume withdrawn is the volume the region must be able to supply. For most use sectors, the terms “withdrawal” and “demand” are therefore used interchangeably throughout this section, except for public water supply, which is treated specially.

The SWWF program records withdrawals by use-category, and those categories define the use sectors carried through the forecast: public water supply, irrigation and agriculture, industry and commerce, power generation, and a small set of miscellaneous and rural-use withdrawals. Two additional sectors fall outside the SWWF program because their individual users each withdraw less than the 100,000 gallon-per-day threshold that triggers registration. These are self-supplied residential water use, which covers households on private wells or springs not connected to a public system, and animal agriculture (confined feeding operations and livestock watering). Both are estimated separately and added to the SWWF-based sectors to give a complete picture of regional demand.

All demand quantities are reported in MGD, and both groundwater and surface-water withdrawals are included. The demand models are calibrated to the 1985–2023 historical record.

### 2.2.1 Methodology

Demand forecasts are produced by fitting statistical models to the historical record of monthly withdrawals and then extending those relationships forward to project demand over the planning horizon to 2070. The models relate demand to a set of explanatory drivers (population, income, and climate, together with sector-specific factors), so that the forecast responds to expected future changes in those drivers rather than simply continuing a past trend. The methodology is further explained in **Appendix B**.

### 2.2.2 Total Demand Forecast

Combining the modeled use from all use sectors gives the regional demand forecast (**Table 10** and **Figure 41**). The picture is dominated by power generation, and the total is projected to fall sharply over the horizon. Total demand is projected to decline from about 2,013 MGD in 2020 to about 761 MGD in 2070, a drop of roughly 62%. The decline is almost entirely due to the retirement of the basin’s once-through coal plants, whose cooling-water withdrawals dominate the regional total: power generation alone falls from about 1,881 MGD in 2020 to about 619 MGD in 2070. Among the remaining sectors, public supply, the largest non-power sector, and industry are projected to grow modestly; irrigation is small but rising in percentage terms; and self-supplied residential, miscellaneous, and rural use are minor.

Because power generation is so much larger than every other sector, when displayed graphically, it compresses the rest of the demand picture in a combined view (**Figure 42**); on the figure, some non-power sectors appear to have zero demand. Instead, the data is plotted with a logarithmic scale on the vertical axis, to clearly display each sector’s demand with a range of five orders of (**Figure 43**). For clarity, the demand value for each sector is presented in the figure. In addition, the values are summarized in **Table 10**.

Total demand is also highly concentrated geographically (**Figure 44** and **Table 11**). Most of the Region's 21 counties show comparatively modest, stable demand across the forecast horizon, whereas a small number of counties account for the bulk of the regional total and drive nearly all its projected change. Warrick County holds the region's largest sustained withdrawal, remaining near 607 MGD throughout 2030–2070. Jefferson County withdrawals, by contrast, are projected to decline from about 1,212 MGD in 2020 to about 6 MGD by 2070, with nearly all the decline occurring between 2035 and 2050. This single county's decline accounts for most of the region-wide power-generation retirement discussed previously.

The forecasts are monthly and carry the seasonal cycle and year-to-year variability of the projected climate, so demand in the weather-sensitive sectors (chiefly irrigation) swings both within and between years. These swings reflect the general variability of the modeled climate projection and should not be read as predictions of demand in any specific calendar year.

**Table 10.** Forecast total regional water demand by use sector (MGD), 2020–2070, selected years. Reported values are annual averages.

| Use sector                       | 2020         | 2025         | 2045       | 2070       |
|----------------------------------|--------------|--------------|------------|------------|
| <b>Power generation</b>          | 1,881.4      | 1,856.0      | 676.8      | 618.7      |
| <b>Public water supply</b>       | 80.2         | 92.6         | 86.2       | 84.0       |
| <b>Industry</b>                  | 43.6         | 42.1         | 45.5       | 45.5       |
| <b>Irrigation</b>                | 1.6          | 4.0          | 3.7        | 6.1        |
| <b>Self-supplied residential</b> | 4.5          | 4.5          | 4.3        | 3.8        |
| <b>Miscellaneous</b>             | 1.2          | 1.2          | 1.5        | 1.8        |
| <b>Rural use and CAFO</b>        | 0.7          | 0.8          | 1.1        | 1.4        |
| <b>Total</b>                     | <b>2,013</b> | <b>2,001</b> | <b>819</b> | <b>761</b> |

Table 11. Water demand forecasts for all water-use sectors by county, in MGD. Reported values are annual averages. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020         | 2025         | 2030         | 2035         | 2040         | 2045       | 2050       | 2055       | 2060       | 2065       | 2070       |
|---------------------|--------------|--------------|--------------|--------------|--------------|------------|------------|------------|------------|------------|------------|
| Clark*              | 25.7         | 28.3         | 28.1         | 27.7         | 28.9         | 28.1       | 28.8       | 29.8       | 29.5       | 30.2       | 29.5       |
| Crawford*           | 8.7          | 6.3          | 6.9          | 6.8          | 6.6          | 6.5        | 6.5        | 6.5        | 6.5        | 6.5        | 6.4        |
| Dearborn            | 20.8         | 24.7         | 26.9         | 26.9         | 27.1         | 26.7       | 26.7       | 26.9       | 26.7       | 26.7       | 26.6       |
| Fayette*            | 3.6          | 3.3          | 3.3          | 3.1          | 3.1          | 2.9        | 2.9        | 2.9        | 2.8        | 2.7        | 2.6        |
| Floyd               | 30.3         | 22.6         | 2.5          | 2.5          | 2.6          | 2.6        | 2.6        | 2.7        | 2.7        | 2.7        | 2.7        |
| Franklin            | 4.0          | 4.7          | 5.0          | 4.8          | 4.9          | 4.5        | 4.5        | 4.6        | 4.4        | 4.4        | 4.2        |
| Gibson*             | 0.7          | 0.3          | 0.3          | 0.3          | 0.3          | 0.3        | 0.3        | 0.3        | 0.3        | 0.3        | 0.3        |
| Harrison            | 3.2          | 3.3          | 3.4          | 3.2          | 3.3          | 3.1        | 3.1        | 3.1        | 3.0        | 3.0        | 2.9        |
| Jefferson*          | 1,212.4      | 1,168.7      | 1,168.8      | 1,168.5      | 471.6        | 64.6       | 6.5        | 6.7        | 6.5        | 6.6        | 6.3        |
| Ohio                | 0.7          | 0.7          | 0.7          | 0.7          | 0.7          | 0.6        | 0.6        | 0.6        | 0.6        | 0.6        | 0.5        |
| Perry               | 1.5          | 3.2          | 3.4          | 3.3          | 3.2          | 3.2        | 3.1        | 3.1        | 3.1        | 3.1        | 3.0        |
| Posey*              | 19.1         | 14.2         | 14.4         | 14.1         | 14.7         | 13.7       | 13.9       | 14.7       | 14.1       | 14.9       | 13.9       |
| Randolph*           | 1.0          | 1.2          | 1.2          | 1.2          | 1.2          | 1.1        | 1.1        | 1.1        | 1.1        | 1.1        | 1.1        |
| Ripley*             | 2.2          | 1.8          | 1.9          | 1.9          | 1.9          | 1.8        | 1.8        | 1.8        | 1.8        | 1.8        | 1.7        |
| Spencer*            | 8.8          | 16.4         | 9.9          | 9.5          | 10.1         | 9.2        | 9.7        | 10.4       | 10.0       | 11.3       | 10.2       |
| Switzerland         | 5.1          | 4.8          | 4.2          | 4.1          | 4.1          | 4.0        | 4.0        | 4.0        | 3.9        | 3.9        | 3.9        |
| Union               | 0.8          | 0.8          | 0.8          | 0.7          | 0.7          | 0.7        | 0.6        | 0.6        | 0.6        | 0.6        | 0.5        |
| Vanderburgh*        | 22.7         | 25.2         | 24.0         | 22.5         | 23.6         | 21.4       | 21.8       | 22.9       | 22.0       | 22.3       | 20.5       |
| Warrick*            | 627.0        | 655.0        | 606.7        | 606.6        | 606.9        | 606.7      | 606.9      | 607.1      | 607.1      | 607.3      | 607.1      |
| Washington*         | 0.4          | 0.4          | 0.5          | 0.5          | 0.5          | 0.6        | 0.6        | 0.6        | 0.7        | 0.7        | 0.7        |
| Wayne               | 14.6         | 15.3         | 17.6         | 17.2         | 17.3         | 16.7       | 16.7       | 17.2       | 16.7       | 16.8       | 16.5       |
| <b>Total Demand</b> | <b>2,013</b> | <b>2,001</b> | <b>1,931</b> | <b>1,926</b> | <b>1,233</b> | <b>819</b> | <b>763</b> | <b>768</b> | <b>764</b> | <b>768</b> | <b>761</b> |

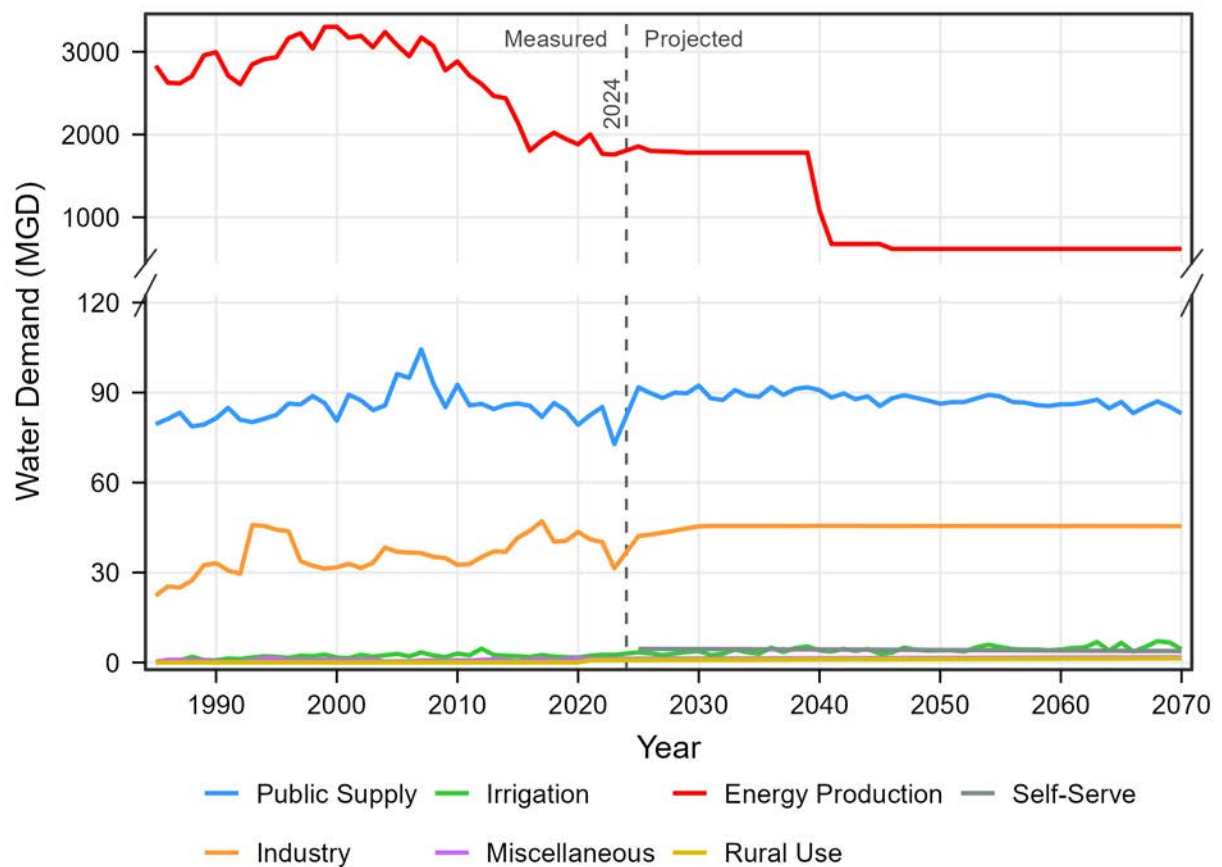


Figure 41. Historical and future water demand by water-use sector for the Region (1985-2070). Note the broken vertical axis.

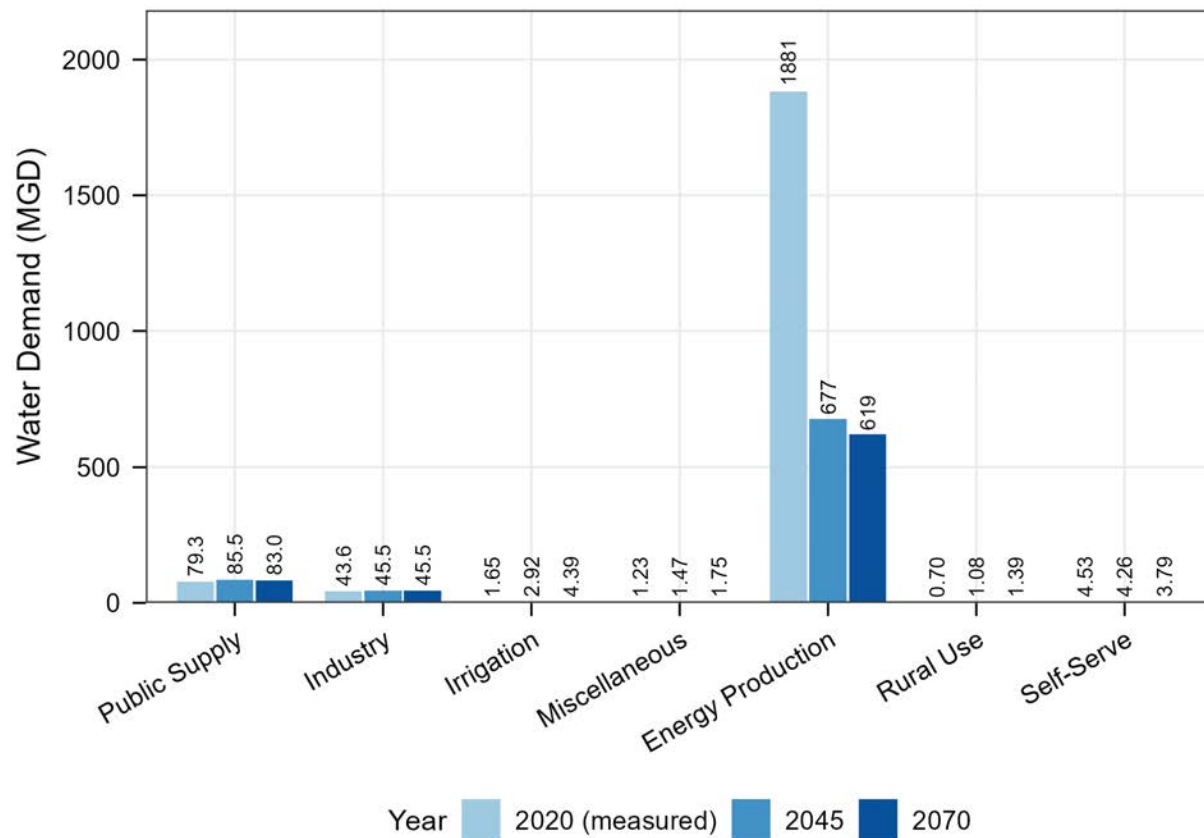


Figure 42. Demand by use sector (MGD) in 2020, 2045, and 2070, shown with linear vertical axis. Note that the linear scale incorrectly makes several sectors appear to have no demand. This graph is reproduced in Figure 43 with a logarithmic scale on the vertical axis. Values are noted at the top of each column for clarity. Results are also summarized in Table 10.

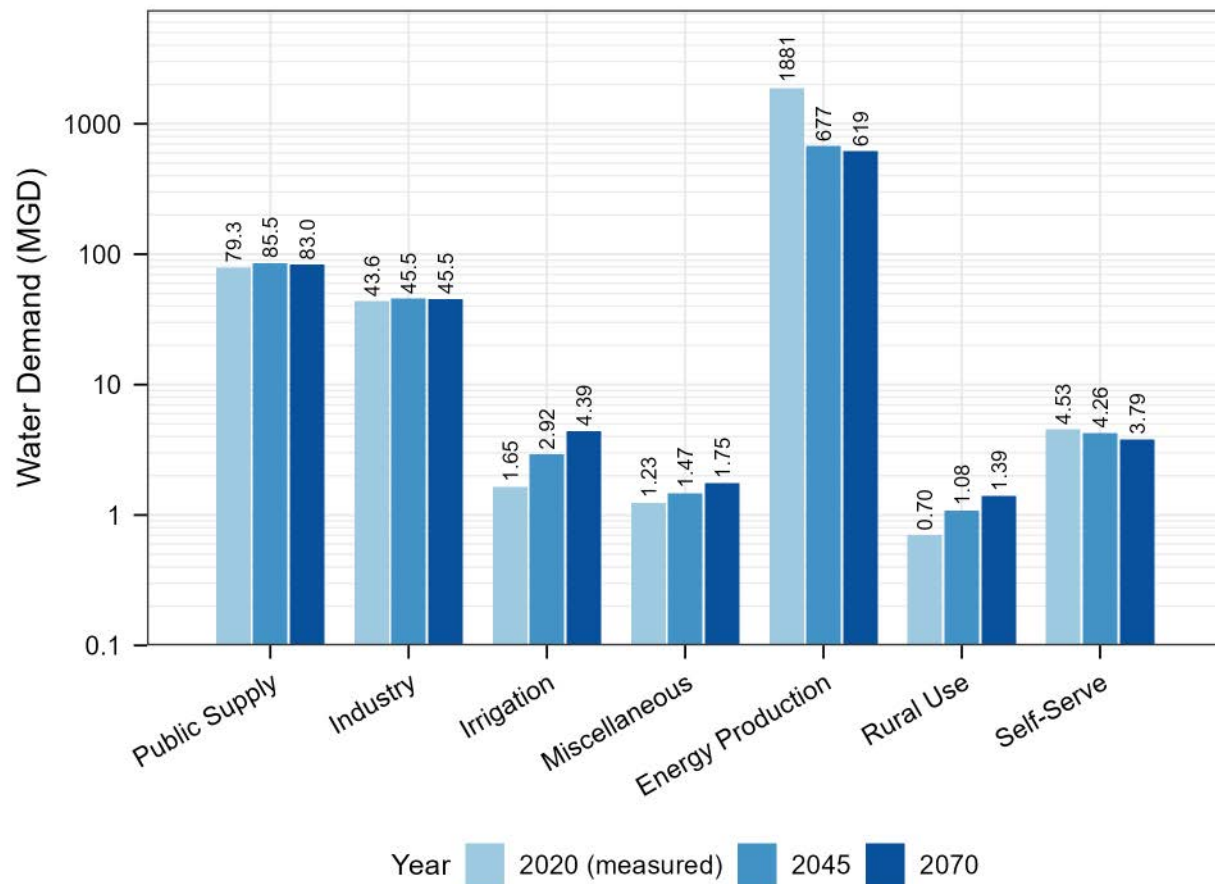


Figure 43. Demand by use sector (MGD) in 2020, 2045, and 2070, shown with logarithmic vertical axis. Values are noted at the top of each column for clarity. Results are also summarized in Table 10.

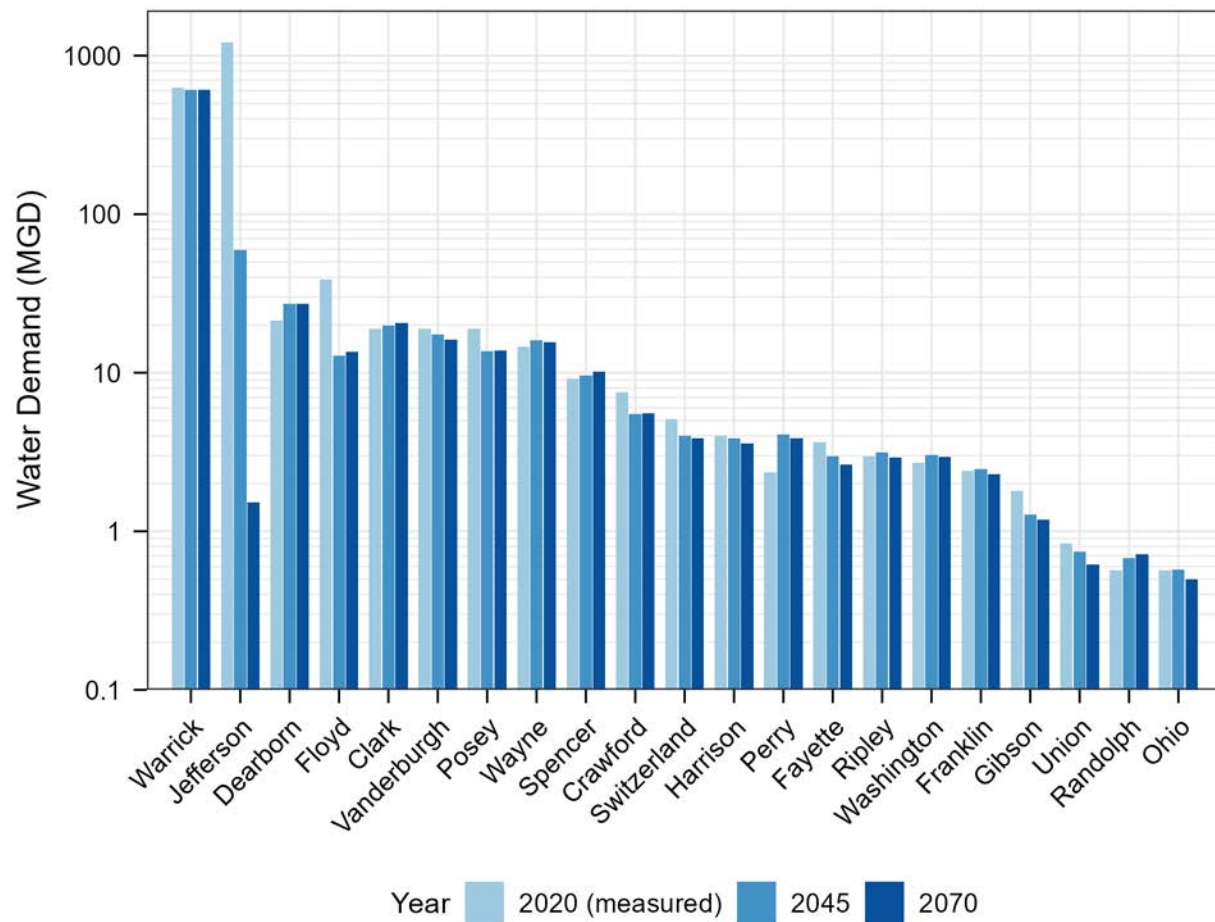


Figure 44. Demand by county (MGD) in 2020, 2045, and 2070, shown with logarithmic vertical axis. Results are also summarized in Table 11.

### 2.2.3 Public Water Supply

Public supply is the largest non-power demand sector and the one where withdrawal and demand are kept distinct. For every other sector, demand is assumed to occur at the point of withdrawal, so the withdrawal location is the demand location, and the two are used interchangeably. For public supply, a utility withdraws water at its wells or intakes, but the population it serves—and therefore the demand it meets—does not always coincide with where the water is withdrawn. Some utilities serve customers outside the basin, and some sell water to neighboring systems. To account for this, single-supplier groups of merged service areas were created. Where utilities buy and sell water from one another, they are combined into a single supplier group so that the demand is counted once, at the system that produces it. The Region is divided into 39 such utility groups, whose merged service areas are shown relative to the project HUC-8 boundary in **Figure 45**. The utility groupings are detailed in **Appendix B**.

The utility group's whole served population is the modeling unit, so demand and withdrawal are modeled for the full group regardless of where its customers, intakes, or wells are located relative to the project boundary. The two quantities then diverge in how results are reported. County-level demand reports only the portion of a group's demand that falls within the project boundary (**Table 12**), so each county counts only the in-basin part of the demand served to it (partial counties are indicated in the table with an asterisk). Sub-basin-level results, which provide inputs to the water-availability analysis, report withdrawals rather than demand, allocated by the location of each withdrawal point.

Public-supply demand is projected to increase from about 79 MGD in 2020 to about 83 MGD in 2070, an increase of about 5%, as a continuing decline in per-capita use is slightly outpaced by modest population growth. This per-capita decline is a long-term trend attributed to steadily improving water efficiency in fixtures, appliances, and outdoor use. Because such efficiency gains cannot continue indefinitely, public supply is the clearest case for the 2030 trend cap (see methodology in **Section 3.1**), which keeps the forecast from projecting implausibly low per-capita use by 2070. Per-capita demand projections still respond to income and climate after 2030. Out of several reliable forecasting models, we selected a standard per-capita model because its results sit safely in the middle of the expected range. Because public water utilities serve industrial and commercial businesses alongside residents, water use patterns carry signals that housing-focused factors like population, income, and climate cannot fully explain. So, we deliberately exclude water-use patterns interpreted as one-off business cycles in the demand models. As a result, some unexplained variation in the data is normal. This gap is most noticeable in smaller water systems, where a single large factory can dominate local water use. **Figure 46** through **Figure 48** present the historical and forecast demand series for each utility group, where the fit quality and the scale of these residuals can be compared group by group.

Table 12. Public Supply water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020      | 2025      | 2030      | 2035      | 2040      | 2045      | 2050      | 2055      | 2060      | 2065      | 2070      |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Clark*              | 13.12     | 15.97     | 16.62     | 16.38     | 17.02     | 16.53     | 16.99     | 17.66     | 17.46     | 17.93     | 17.51     |
| Crawford*           | 0.41      | 0.63      | 0.64      | 0.59      | 0.59      | 0.55      | 0.54      | 0.54      | 0.51      | 0.51      | 0.47      |
| Dearborn            | 4.26      | 5.69      | 6.03      | 5.80      | 5.91      | 5.40      | 5.43      | 5.56      | 5.32      | 5.32      | 5.08      |
| Fayette*            | 2.29      | 1.85      | 1.66      | 1.52      | 1.52      | 1.39      | 1.37      | 1.38      | 1.28      | 1.25      | 1.15      |
| Floyd               | 9.74      | 11.82     | 12.25     | 12.04     | 12.51     | 12.12     | 12.45     | 12.94     | 12.78     | 13.13     | 12.80     |
| Franklin            | 1.43      | 1.56      | 1.59      | 1.51      | 1.53      | 1.39      | 1.39      | 1.42      | 1.35      | 1.34      | 1.26      |
| Gibson*             | 1.31      | 1.44      | 1.39      | 1.31      | 1.35      | 1.25      | 1.25      | 1.28      | 1.23      | 1.23      | 1.15      |
| Harrison            | 3.24      | 3.65      | 3.67      | 3.50      | 3.55      | 3.34      | 3.34      | 3.37      | 3.24      | 3.26      | 3.07      |
| Jefferson*          | 1.88      | 2.01      | 1.91      | 1.78      | 1.81      | 1.63      | 1.63      | 1.69      | 1.61      | 1.62      | 1.53      |
| Ohio                | 0.50      | 0.60      | 0.61      | 0.57      | 0.58      | 0.52      | 0.52      | 0.52      | 0.49      | 0.48      | 0.45      |
| Perry               | 1.20      | 2.63      | 2.66      | 2.55      | 2.54      | 2.39      | 2.35      | 2.35      | 2.26      | 2.25      | 2.14      |
| Posey*              | 2.44      | 2.39      | 2.45      | 2.37      | 2.32      | 2.20      | 2.16      | 2.12      | 2.03      | 1.97      | 1.87      |
| Randolph*           | 0.28      | 0.30      | 0.31      | 0.29      | 0.28      | 0.26      | 0.25      | 0.25      | 0.24      | 0.23      | 0.22      |
| Ripley*             | 1.97      | 2.25      | 2.30      | 2.19      | 2.22      | 2.03      | 2.03      | 2.07      | 1.97      | 1.95      | 1.83      |
| Spencer*            | 1.68      | 2.31      | 2.40      | 2.30      | 2.30      | 2.15      | 2.13      | 2.13      | 2.04      | 2.03      | 1.91      |
| Switzerland         | 0.98      | 1.16      | 1.20      | 1.13      | 1.13      | 1.01      | 0.99      | 1.00      | 0.95      | 0.94      | 0.88      |
| Union               | 0.38      | 0.40      | 0.41      | 0.39      | 0.38      | 0.34      | 0.32      | 0.31      | 0.30      | 0.29      | 0.27      |
| Vanderburgh*        | 18.73     | 20.18     | 19.13     | 17.99     | 18.55     | 17.11     | 17.19     | 17.72     | 17.05     | 17.04     | 15.88     |
| Warrick*            | 5.68      | 6.51      | 6.69      | 6.51      | 6.84      | 6.54      | 6.75      | 7.03      | 6.96      | 7.17      | 6.93      |
| Washington*         | 2.38      | 2.65      | 2.71      | 2.62      | 2.63      | 2.48      | 2.46      | 2.46      | 2.36      | 2.35      | 2.22      |
| Wayne               | 5.34      | 5.75      | 5.68      | 5.29      | 5.25      | 4.86      | 4.75      | 4.87      | 4.65      | 4.60      | 4.37      |
| <b>Total Demand</b> | <b>79</b> | <b>92</b> | <b>92</b> | <b>89</b> | <b>91</b> | <b>86</b> | <b>86</b> | <b>89</b> | <b>86</b> | <b>87</b> | <b>83</b> |

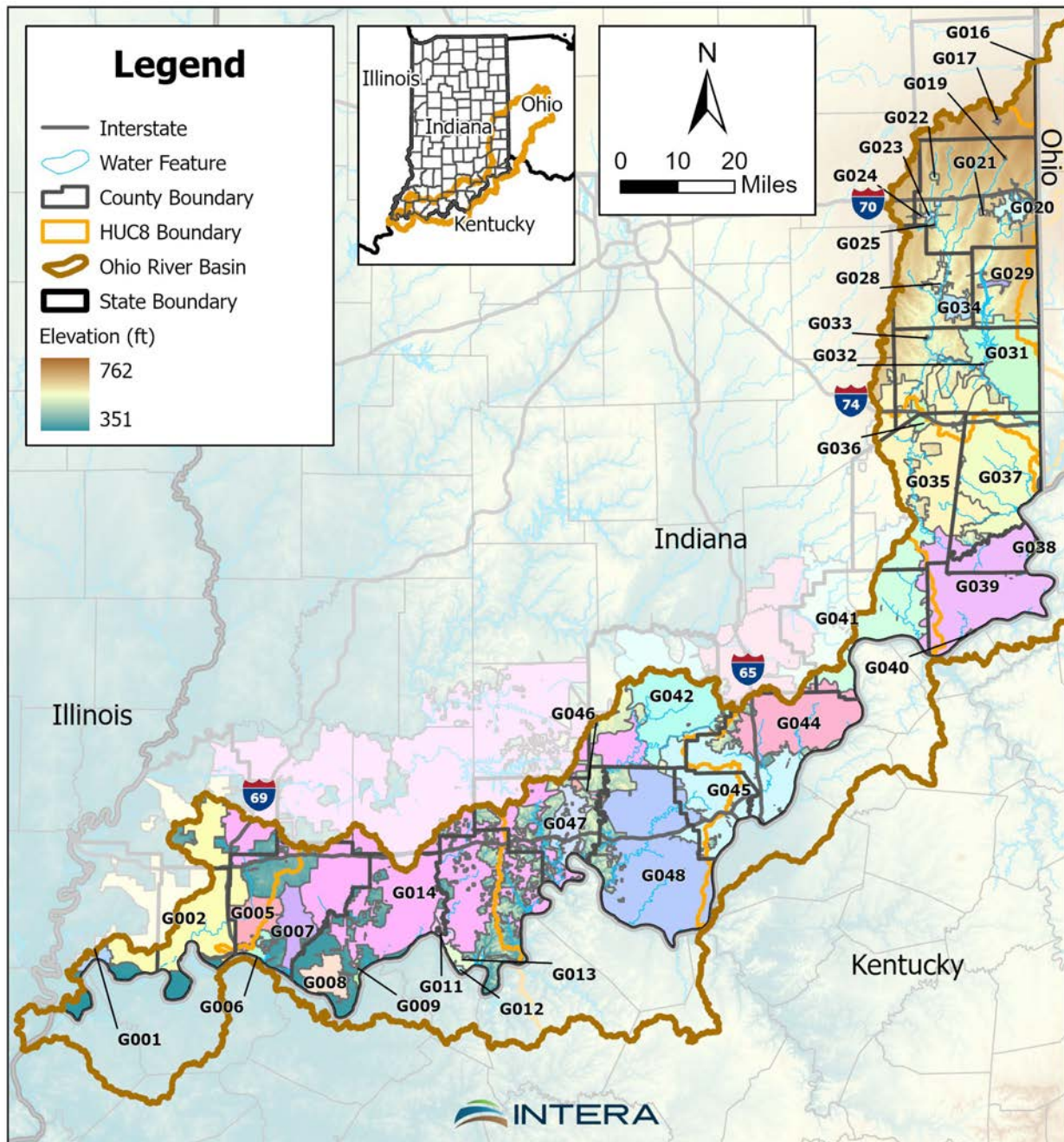


Figure 45. Modeled public-supply utility groups (G001-G048): merged buy/sell service areas labeled by group ID, with the project HUC-8 boundary. This map is the key for the per-group demand figures that follow (Figure 46 through Figure 48). See Appendix B, Table B-2 for a complete list of the public water systems in each group.

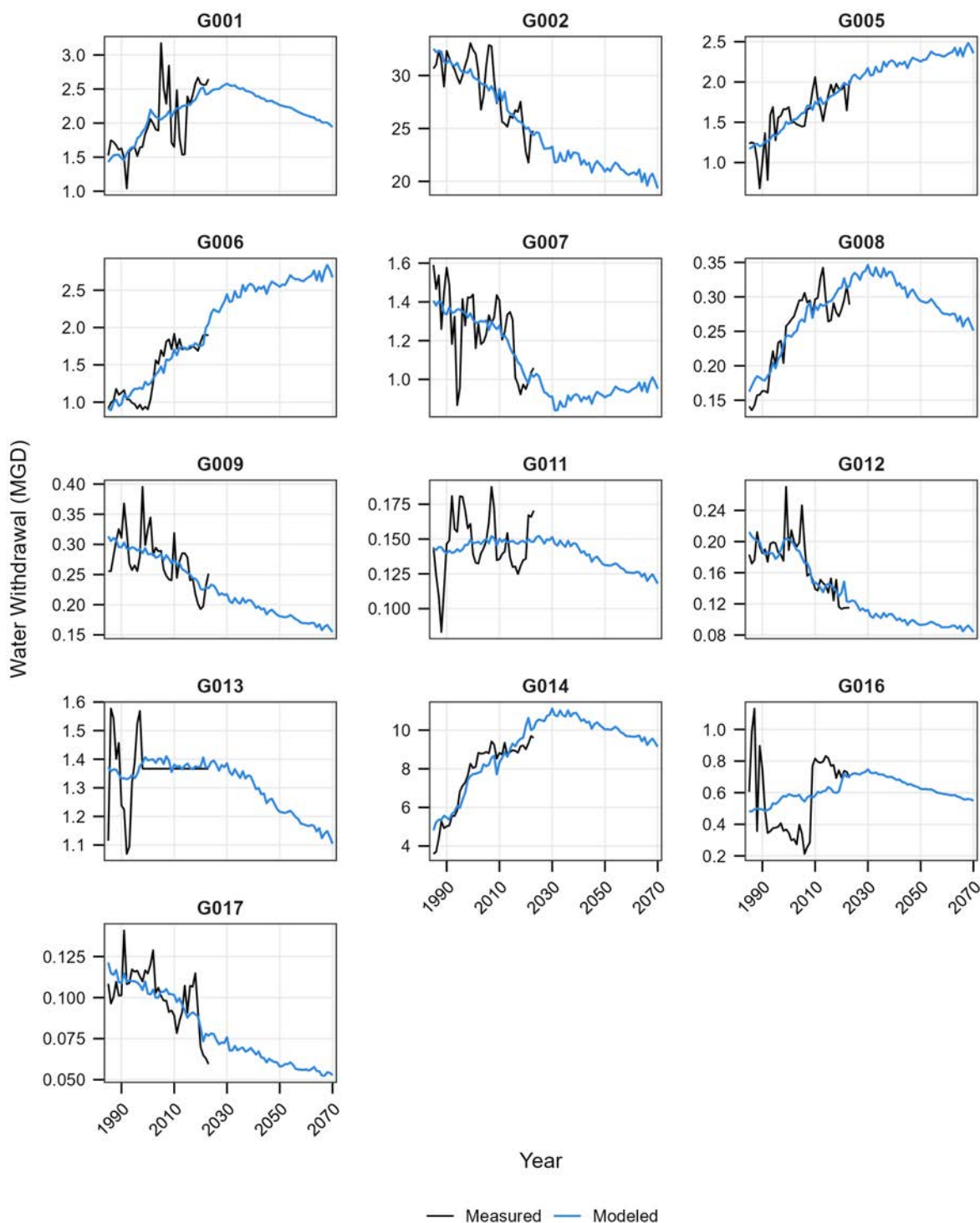


Figure 46.

Historical and forecast public-supply demand (MGD) by utility group, 1985-2070 (page 1 of 3). See Figure 45 for the location of each utility group. See Appendix B, Table B-2 for a complete list of the public water systems in each group.

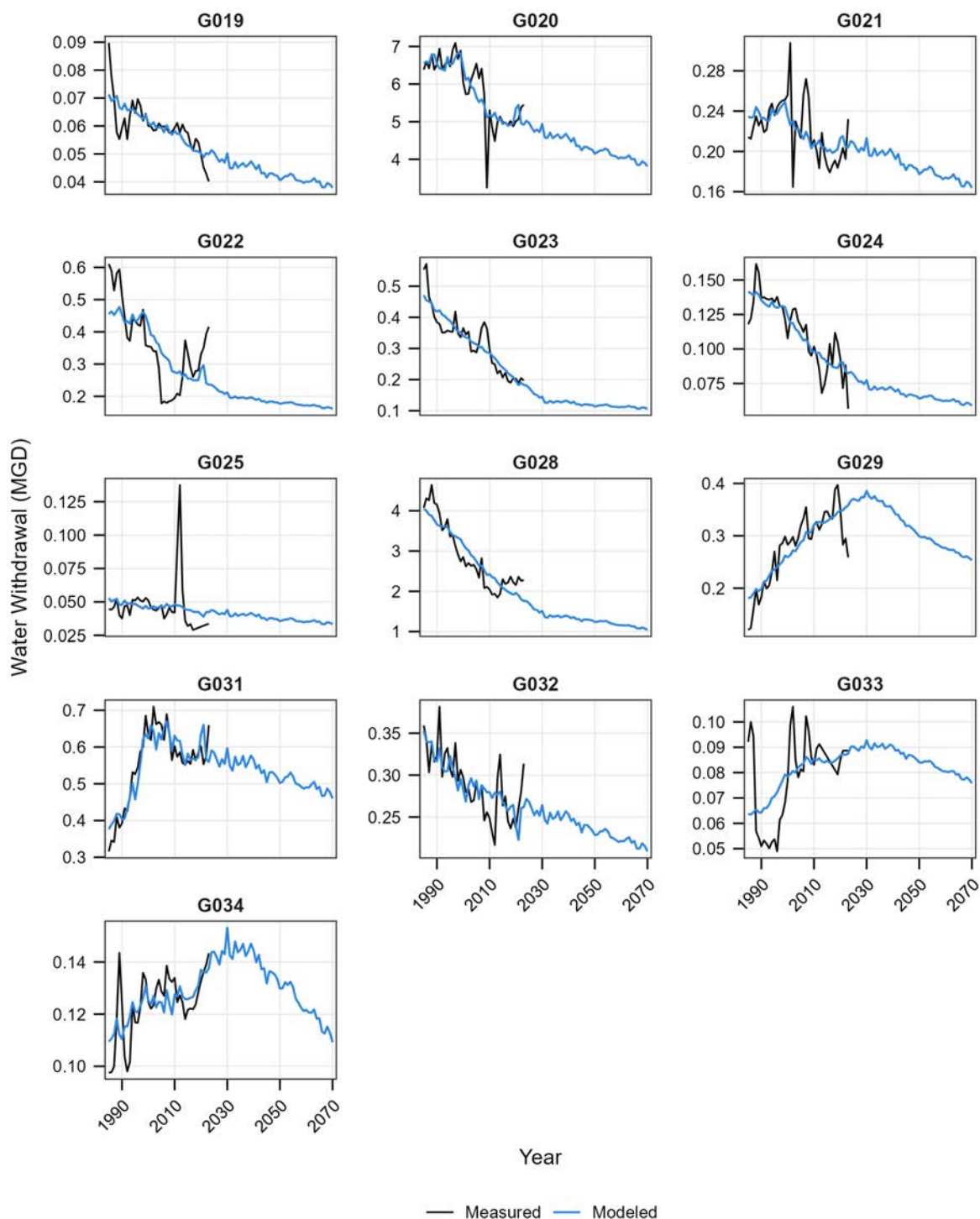


Figure 47. Historical and forecast public-supply demand (MGD) by utility group, 1985-2070 (page 2 of 3) . See Figure 44 for the location of each utility group. See Appendix B, Table B-2 for a complete list of the public water systems in each group.

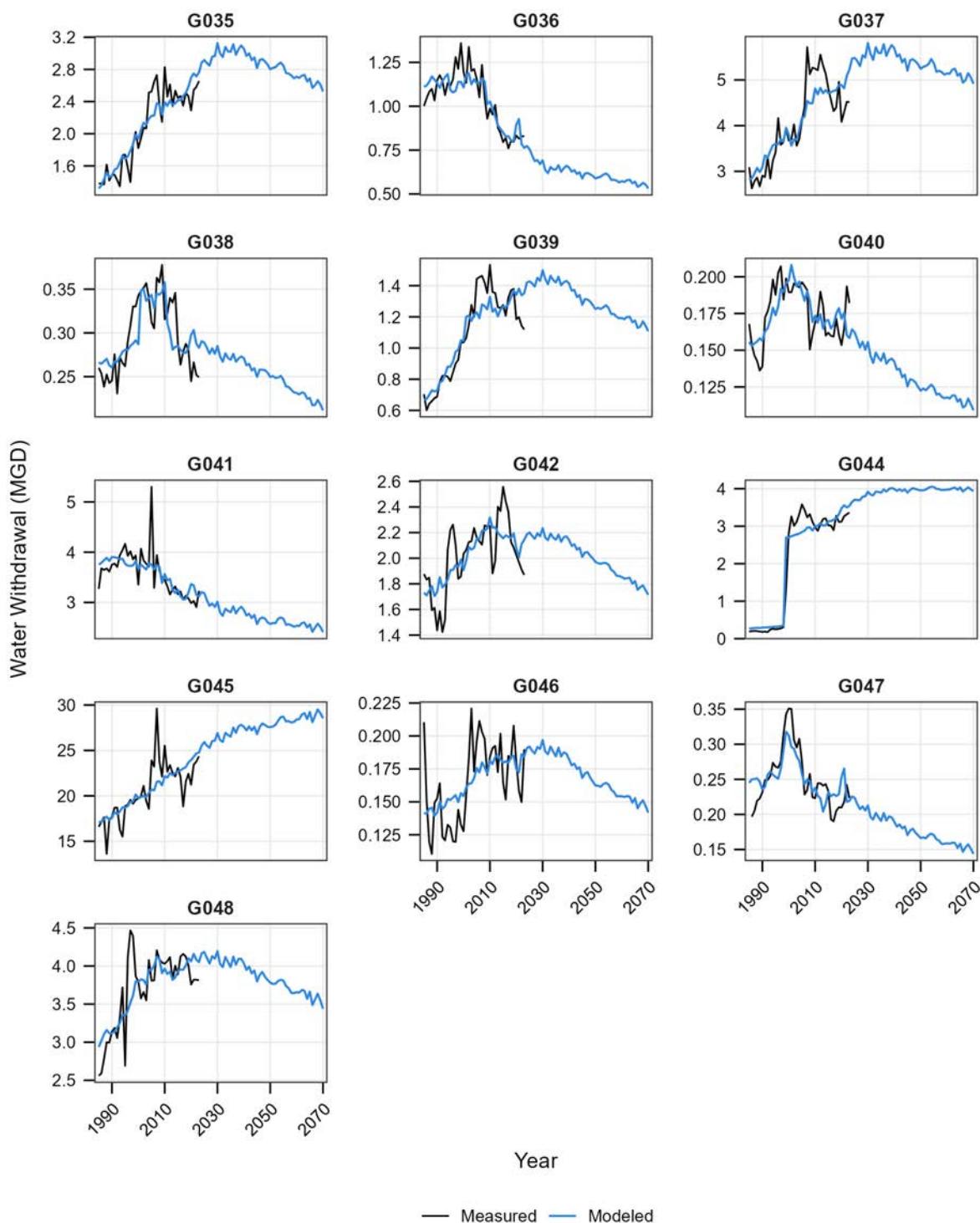


Figure 48. Historical and forecast public-supply demand (MGD) by utility group, 1985-2070 (page 3 of 3). See Figure 45 for the location of each utility group. See Appendix B, Table B-2 for a complete list of the public water systems in each group.

## 2.2.4 Self-Supplied Residential Water Supply

Self-supplied residential demand covers households with private wells that are not served by a public utility and so does not appear in the SWWF record. Self-supplied demand is not fit with a demand model; instead, it is computed directly, as the share of each county's population that falls outside mapped utility service areas multiplied by an assumed per-capita use rate. The served and unserved populations are derived spatially: census block-group population is apportioned by area to each county and to the mapped utility service-area geometry, and the population outside that geometry is the unserved, private-well population. There are some limitations to this approach, as rural utilities may not provide services to all households within their service areas.

The per-capita rate used in the projection is 80 gallons per person per day (a conventional self-supplied domestic rate, after Dieter et al., 2018), and the same rate is applied to every county. Both the served/unserved split and the per-capita rate are held constant over time, so the forecast tracks projected county population alone. Self-supplied residential demand is projected to ease from about 4.5 MGD in 2020 to about 3.8 MGD in 2070 as the population slowly decreases (**Table 13**). The sector projections do not include seasonality, so they do not respond to climate.

Table 13. Self-supplied residential water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020       | 2025       | 2030       | 2035       | 2040       | 2045       | 2050       | 2055       | 2060       | 2065       | 2070       |
|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Clark*              | 0.41       | 0.41       | 0.42       | 0.43       | 0.44       | 0.45       | 0.46       | 0.47       | 0.48       | 0.49       | 0.50       |
| Crawford*           | 0.12       | 0.12       | 0.12       | 0.12       | 0.11       | 0.11       | 0.10       | 0.10       | 0.10       | 0.09       | 0.09       |
| Dearborn            | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.24       | 0.24       | 0.24       | 0.23       | 0.23       | 0.22       |
| Fayette*            | 0.56       | 0.56       | 0.55       | 0.54       | 0.53       | 0.52       | 0.51       | 0.48       | 0.46       | 0.44       | 0.42       |
| Floyd               | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       | 0.25       |
| Franklin            | 0.51       | 0.51       | 0.51       | 0.50       | 0.50       | 0.49       | 0.48       | 0.46       | 0.45       | 0.44       | 0.43       |
| Gibson*             | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Harrison            | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Jefferson*          | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Ohio                | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       |
| Perry               | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       |
| Posey*              | 0.16       | 0.16       | 0.16       | 0.16       | 0.15       | 0.15       | 0.14       | 0.14       | 0.13       | 0.13       | 0.12       |
| Randolph*           | 0.20       | 0.20       | 0.19       | 0.19       | 0.18       | 0.17       | 0.17       | 0.16       | 0.15       | 0.15       | 0.14       |
| Ripley*             | 0.23       | 0.23       | 0.23       | 0.23       | 0.22       | 0.22       | 0.22       | 0.21       | 0.21       | 0.20       | 0.19       |
| Spencer*            | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       |
| Switzerland         | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Union               | 0.35       | 0.35       | 0.34       | 0.32       | 0.31       | 0.29       | 0.27       | 0.25       | 0.24       | 0.23       | 0.22       |
| Vanderburgh*        | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Warrick*            | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       |
| Washington*         | 0.14       | 0.14       | 0.14       | 0.13       | 0.13       | 0.13       | 0.12       | 0.12       | 0.12       | 0.11       | 0.11       |
| Wayne               | 1.29       | 1.29       | 1.27       | 1.24       | 1.21       | 1.18       | 1.15       | 1.12       | 1.10       | 1.07       | 1.04       |
| <b>Total Demand</b> | <b>4.5</b> | <b>4.5</b> | <b>4.5</b> | <b>4.4</b> | <b>4.4</b> | <b>4.3</b> | <b>4.2</b> | <b>4.1</b> | <b>4.0</b> | <b>3.9</b> | <b>3.8</b> |

## 2.2.5 Irrigation and Rural Water Supply

Irrigation is the most weather-sensitive water-use sector, though it is small in absolute terms in the Region. Demand is driven by the area of irrigated land and by the growing-season moisture deficit, so the forecast responds both to expected changes in irrigated acreage and to a warmer, drier projected climate.

### 2.2.5.1 Irrigation

Irrigation demand is projected to rise from about 1.6 MGD in 2020 to about 4.4 MGD in 2070, roughly a 166% increase (**Table 14**). Irrigation is forecast in two parts. Agricultural irrigation, concentrated in four counties, is modeled as a function of irrigated acreage and growing-season climate and carries all of the projected growth; golf course irrigation, about 1 MGD and the only irrigation withdrawal in several counties, is a small, fixed set of courses and is held at each county's recent observed level, without modeling its climate response. Because the agricultural response to the moisture deficit is significant, irrigation is the forecast most dependent on the choice of future climate scenario. However, the starting point is small and the projected increase contributes little to the regional total. More details about the relationship between the irrigation projections and climate scenarios are provided in **Appendix B**.

The irrigation forecast should be read with a data limitation firmly in mind. The reported withdrawals are markedly inconsistent with mapped agriculture. Several counties with substantial irrigated farmland report little or no irrigation withdrawal at all: Clark County (about 1,900 irrigated acres, almost entirely within the basin) and Harrison County (about 1,200 acres, wholly within the basin) each record no agricultural irrigation withdrawal in recent years, and Perry, Ripley, and Washington counties are similar. Even the two largest-acreage counties, Posey (about 26,000 irrigated acres) and Gibson (about 8,000), report only on the order of one inch of water applied per acre per year, against a published Indiana statewide average of roughly five to six inches and comparable rates across the surrounding Ohio River basin. Across the project area, reported irrigation amounts to only about a fifth to a quarter of what the irrigated acreage would imply at those application rates.

Three factors plausibly contribute to this underreporting, in proportions the record cannot separate: the SWWF program records only facilities with the capacity to withdraw 100,000 gallons or more per day, so the many small farms below that threshold fall outside it entirely; registered irrigators may under-report; and the region is genuinely less irrigated than Indiana's heavily irrigated sand-plain areas. Whatever the mix, the modest forecast here should be taken as a lower bound rather than a precise estimate. Because the model is fit to reported withdrawals, it reproduces the reported level and cannot recover use that was never registered; the climate sensitivity it captures is informative, but the absolute magnitude is constrained by the coverage and completeness of the underlying data.

Table 14. Irrigation water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020       | 2025       | 2030       | 2035       | 2040       | 2045       | 2050       | 2055       | 2060       | 2065       | 2070       |
|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Clark*              | 0.31       | 0.28       | 0.28       | 0.28       | 0.28       | 0.28       | 0.28       | 0.28       | 0.28       | 0.28       | 0.28       |
| Crawford*           | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Dearborn            | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       |
| Fayette*            | 0.05       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       |
| Floyd               | 0.01       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Franklin            | 0.02       | 0.03       | 0.03       | 0.03       | 0.03       | 0.02       | 0.02       | 0.03       | 0.03       | 0.03       | 0.03       |
| Gibson*             | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Harrison            | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       |
| Jefferson*          | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Ohio                | 0.06       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       |
| Perry               | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Posey*              | 0.22       | 0.82       | 0.94       | 0.59       | 1.16       | 0.65       | 1.01       | 1.55       | 1.15       | 1.94       | 1.13       |
| Randolph*           | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Ripley*             | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Spencer*            | 0.37       | 1.12       | 1.24       | 0.84       | 1.23       | 0.81       | 1.56       | 1.86       | 1.57       | 2.86       | 1.59       |
| Switzerland         | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Union               | 0.06       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       |
| Vanderburgh*        | 0.15       | 0.35       | 0.35       | 0.35       | 0.35       | 0.35       | 0.35       | 0.35       | 0.35       | 0.35       | 0.35       |
| Warrick*            | 0.14       | 0.19       | 0.19       | 0.19       | 0.19       | 0.19       | 0.19       | 0.19       | 0.19       | 0.19       | 0.19       |
| Washington*         | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Wayne               | 0.18       | 0.38       | 0.59       | 0.44       | 0.57       | 0.41       | 0.45       | 0.67       | 0.56       | 0.70       | 0.61       |
| <b>Total Demand</b> | <b>1.6</b> | <b>3.4</b> | <b>3.8</b> | <b>2.9</b> | <b>4.0</b> | <b>2.9</b> | <b>4.1</b> | <b>5.1</b> | <b>4.3</b> | <b>6.6</b> | <b>4.4</b> |

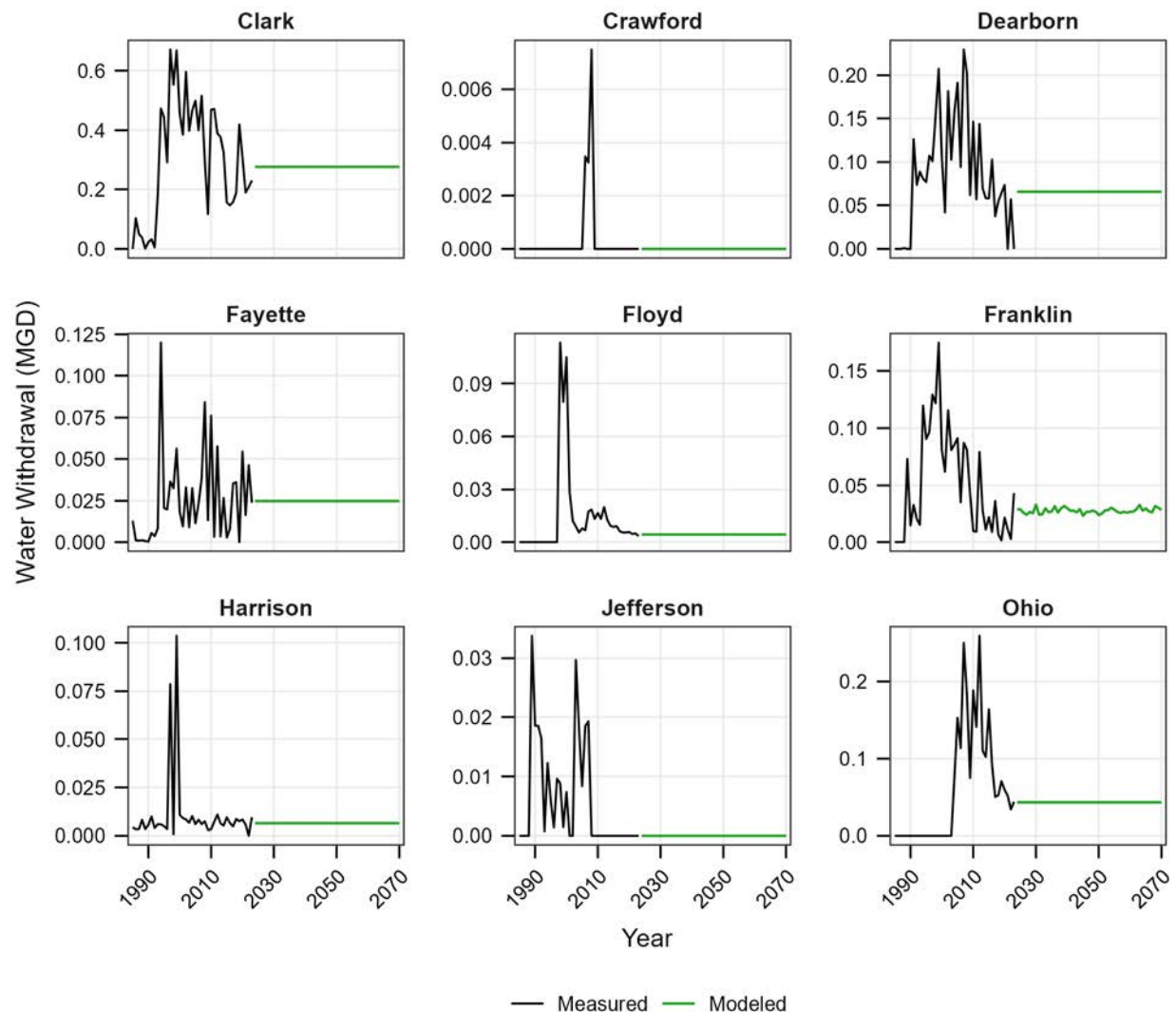


Figure 49. Historical and forecast irrigation withdrawal (MGD) by county, 1985–2070 (page 1 of 2). Only data from within the Region are presented. Counties that lie partially within the Region include Clark, Crawford, Fayette, and Jefferson.

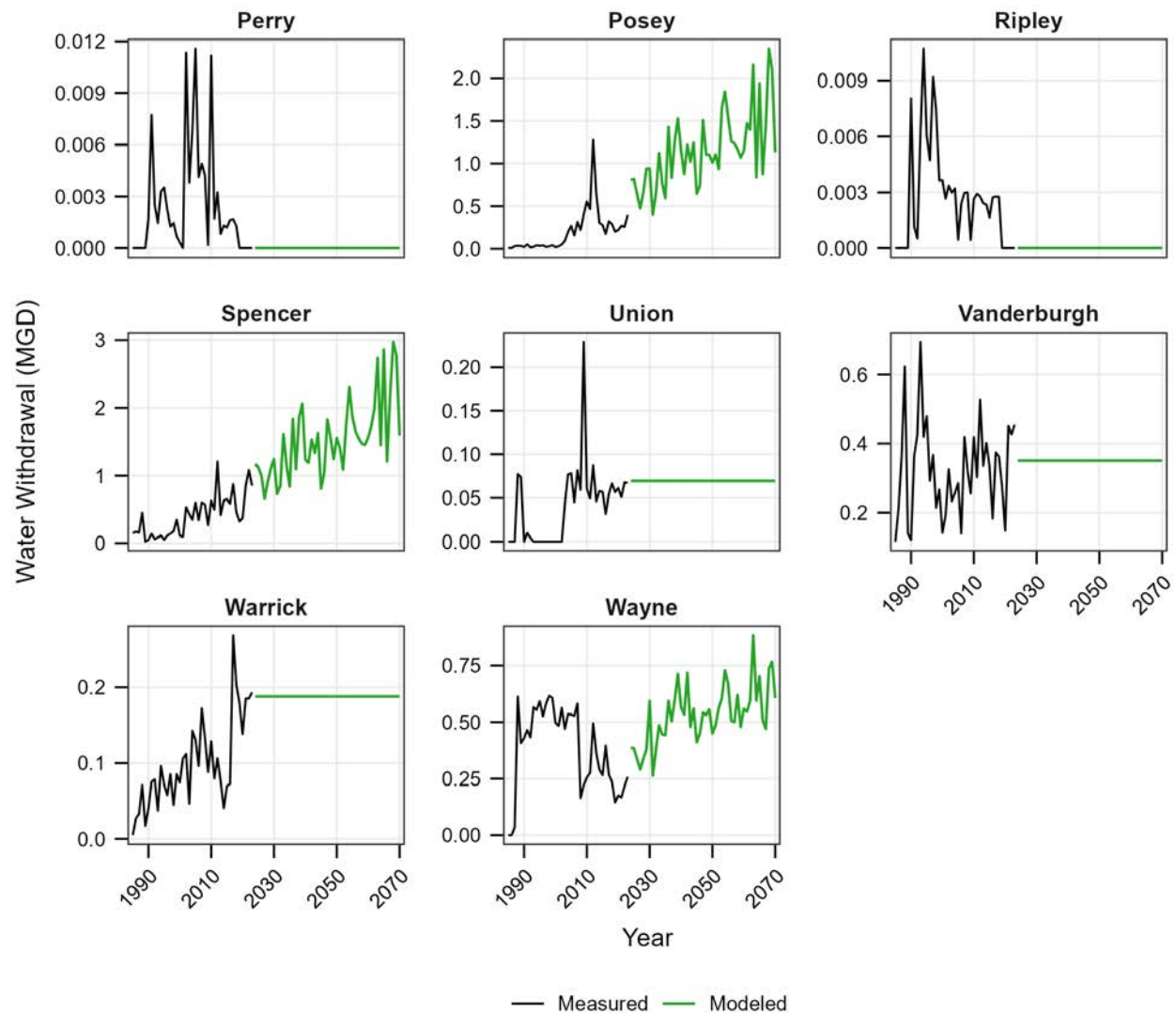


Figure 50. Historical and forecast irrigation withdrawal (MGD) by county, 1985–2070 (page 2 of 2). Only data from within the Region are presented. Counties that lie partially within the Region include Posey, Ripley, Spencer, Vanderburgh, and Warrick.

### 2.2.5.2 Rural Use

Rural use (fish hatcheries and SWWF-registered animal agriculture) is negligible in the Region, about 0.01 MGD across the planning horizon, confined to a few sparse counties and held flat at its recent level (Table 15 and Figure 51).

Table 15. Rural use water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020        | 2025        | 2030        | 2035        | 2040        | 2045        | 2050        | 2055        | 2060        | 2065        | 2070        |
|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Dearborn            | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       | 0.001       |
| Randolph*           | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        |
| <b>Total Demand</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> | <b>0.01</b> |

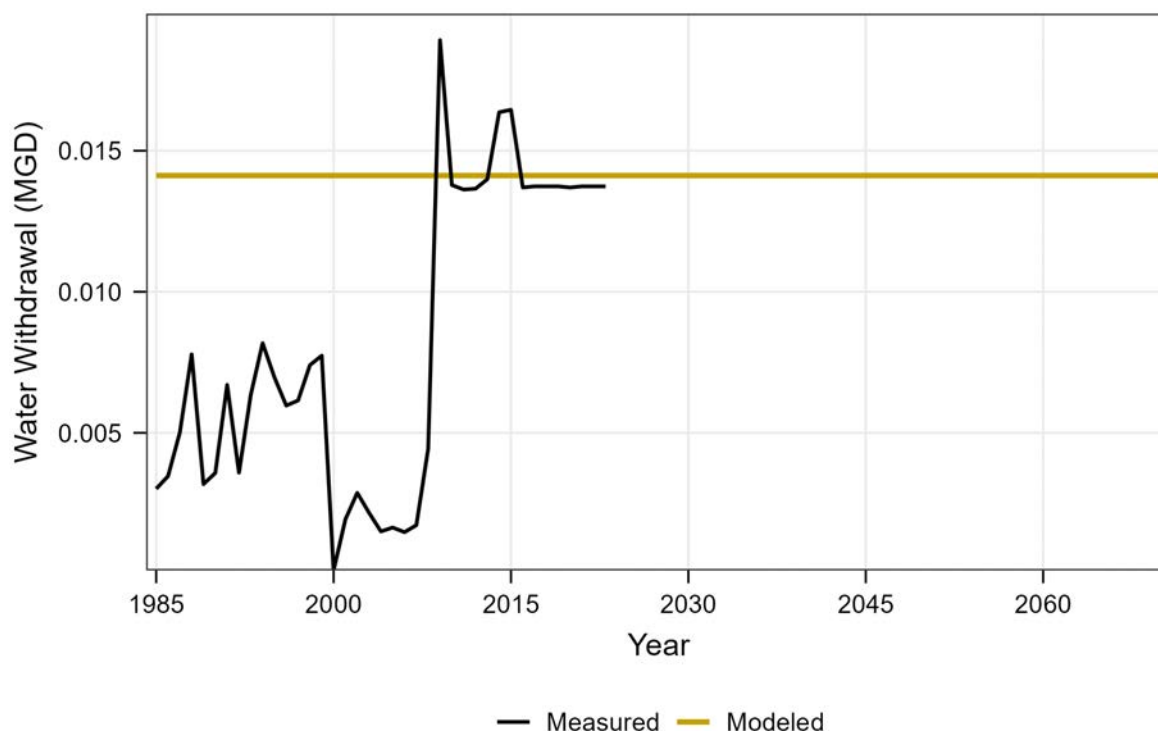


Figure 51. Historical and forecast rural-use withdrawal (MGD), regional total, 1985–2070.

### 2.2.5.3 Concentrated Animal Feeding Operations (CAFOs)

The historical water use calculation was described in **Section 2.1.3.3**. To make projections for future water use for CAFOs, the linear trend for each county was calculated from the historical dataset (**Table 16**).

Table 16. CAFO water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020       | 2025       | 2030       | 2035       | 2040       | 2045       | 2050       | 2055       | 2060       | 2065       | 2070       |
|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Clark*              | 0.01       | 0.00       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       | 0.01       |
| Crawford*           | 0.01       | 0.01       | 0.01       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.03       | 0.03       | 0.03       |
| Dearborn            | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Fayette*            | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       | 0.02       |
| Floyd               | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Franklin            | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       |
| Gibson*             | 0.03       | 0.02       | 0.02       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       |
| Harrison            | 0.05       | 0.05       | 0.05       | 0.05       | 0.06       | 0.06       | 0.06       | 0.06       | 0.07       | 0.07       | 0.07       |
| Jefferson*          | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Ohio                | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Perry               | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       | 0.03       |
| Posey*              | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Randolph*           | 0.07       | 0.14       | 0.16       | 0.18       | 0.21       | 0.23       | 0.25       | 0.27       | 0.29       | 0.31       | 0.33       |
| Ripley*             | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       |
| Spencer*            | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       | 0.07       |
| Switzerland         | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Union               | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       | 0.05       |
| Vanderburgh*        | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Warrick*            | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Washington*         | 0.21       | 0.28       | 0.32       | 0.35       | 0.39       | 0.43       | 0.46       | 0.50       | 0.53       | 0.57       | 0.61       |
| Wayne               | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       | 0.04       |
| <b>Total Demand</b> | <b>0.7</b> | <b>0.8</b> | <b>0.9</b> | <b>0.9</b> | <b>1.0</b> | <b>1.1</b> | <b>1.1</b> | <b>1.2</b> | <b>1.2</b> | <b>1.3</b> | <b>1.4</b> |

### 2.2.6 Power Generation

Power generation is the defining sector of the Region's forecast. It is by far the largest component of regional demand, about 1,856 MGD in 2025 (many times the other sectors combined), and it is projected to decline to about 619 MGD by 2070, a decline of roughly 67% that drives the entire regional total down (**Table 17** and **Figure 52**).

Both the magnitude and the decline come from cooling-water technology. Once-through plants withdraw 10 to 100 times more water than recirculating (cooling-tower or cooling-pond) plants of the same capacity, because the entire condenser flow is drawn from the river and then returned (tracked by reported NPDES discharges); their county-level withdrawals run into the hundreds of MGD and decline to near zero when the plant retires. Although the consumed water rates are not projected to change dramatically, the raw water withdrawal rates are. The basin contains several of Indiana's large once-through coal stations and have announced retirement or conversion schedules. Power generation is therefore not fit with the statistical model; it is projected plant by plant, as facility-specific levels plus announced retirement and conversion schedules, each anchored on the plant's recent observed withdrawal (**Appendix B** and **Table 18**).

A few facilities dominate the schedule (**Table 18**). The largest single element is Clifty Creek in Jefferson County, a once-through coal station withdrawing on the order of 1,100 MGD that operates under a power agreement to about 2040 and then will be decommissioned. The once-through reductions at Warrick (beginning with a unit retirement in 2026) and the coal cessation at Rockport in Spencer County (2028) account for most of the remainder. The sharp fall in the regional total is the loss of these large once-through intakes as the plants retire.

Table 17. Energy production water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020         | 2025         | 2030         | 2035         | 2040         | 2045       | 2050       | 2055       | 2060       | 2065       | 2070       |
|---------------------|--------------|--------------|--------------|--------------|--------------|------------|------------|------------|------------|------------|------------|
| Clark*              | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Crawford*           | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Dearborn            | 5.9          | 5.9          | 5.9          | 5.9          | 5.9          | 5.9        | 5.9        | 5.9        | 5.9        | 5.9        | 5.9        |
| Fayette*            | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Floyd               | 28.1         | 20.3         | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Franklin            | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Gibson*             | 0.5          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Harrison            | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Jefferson*          | 1,206.2      | 1,161.8      | 1,161.8      | 1,161.8      | 464.7        | 58.1       | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Ohio                | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Perry               | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Posey*              | 7.3          | 1.5          | 1.5          | 1.5          | 1.5          | 1.5        | 1.5        | 1.5        | 1.5        | 1.5        | 1.5        |
| Randolph*           | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Ripley*             | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Spencer*            | 7.0          | 13.2         | 6.6          | 6.6          | 6.6          | 6.6        | 6.6        | 6.6        | 6.6        | 6.6        | 6.6        |
| Switzerland         | 3.2          | 2.8          | 2.8          | 2.8          | 2.8          | 2.8        | 2.8        | 2.8        | 2.8        | 2.8        | 2.8        |
| Union               | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Vanderburgh*        | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Warrick*            | 623.0        | 650.4        | 601.8        | 601.8        | 601.8        | 601.8      | 601.8      | 601.8      | 601.8      | 601.8      | 601.8      |
| Washington*         | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| Wayne               | 0.1          | 0.0          | 0.0          | 0.0          | 0.0          | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        | 0.0        |
| <b>Total Demand</b> | <b>1,881</b> | <b>1,856</b> | <b>1,780</b> | <b>1,780</b> | <b>1,083</b> | <b>677</b> | <b>619</b> | <b>619</b> | <b>619</b> | <b>619</b> | <b>619</b> |

**Table 18.** Southeast power-generation facilities by county: recent level, projected change, and basis. Once-through coal plants drive both the level and the decline.

| County                           | Plant                                           | Recent level (MGD) | Projected change                                               | Basis                                                         |
|----------------------------------|-------------------------------------------------|--------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| Jefferson                        | Clifty Creek (once-through coal)                | ~1,162             | Step down 2040, residual to 2045, closed 2046                  | Operates under power agreement to ~2040                       |
| Warrick                          | Alcoa Warrick + Culley (once-through coal)      | ~650               | -49 MGD step 2026 (Culley 2 retired)                           | Department of Energy (DOE) order through 3/2026               |
| Spencer                          | Rockport (recirculating, 2,600 megawatts)       | ~13                | Step to ~6.6 MGD in 2029 (coal ceases, partial gas conversion) | Coal units cease 12/2028                                      |
| Floyd                            | R. Gallagher (once-through, retired)            | ~25                | Ramp to 0 by 2028 (ash-basin closure dewatering)               | Retired 6/2021                                                |
| Dearborn                         | Lawrenceburg Energy Center (gas combined cycle) | ~6                 | Flat                                                           | Operating, contracted 2028–2034                               |
| Switzerland                      | Markland Hydro                                  | ~3                 | Flat                                                           | No retirement planned                                         |
| Posey                            | A.B. Brown (coal retired, gas turbines)         | ~1.5               | Flat                                                           | Coal retired 10/2023; turbines negligible cooling             |
| Gibson, Pike, Vanderburgh, Wayne | (no in-basin utility-scale plant)               | 0                  | —                                                              | Mines ended / plant outside basin / removed from utility plan |

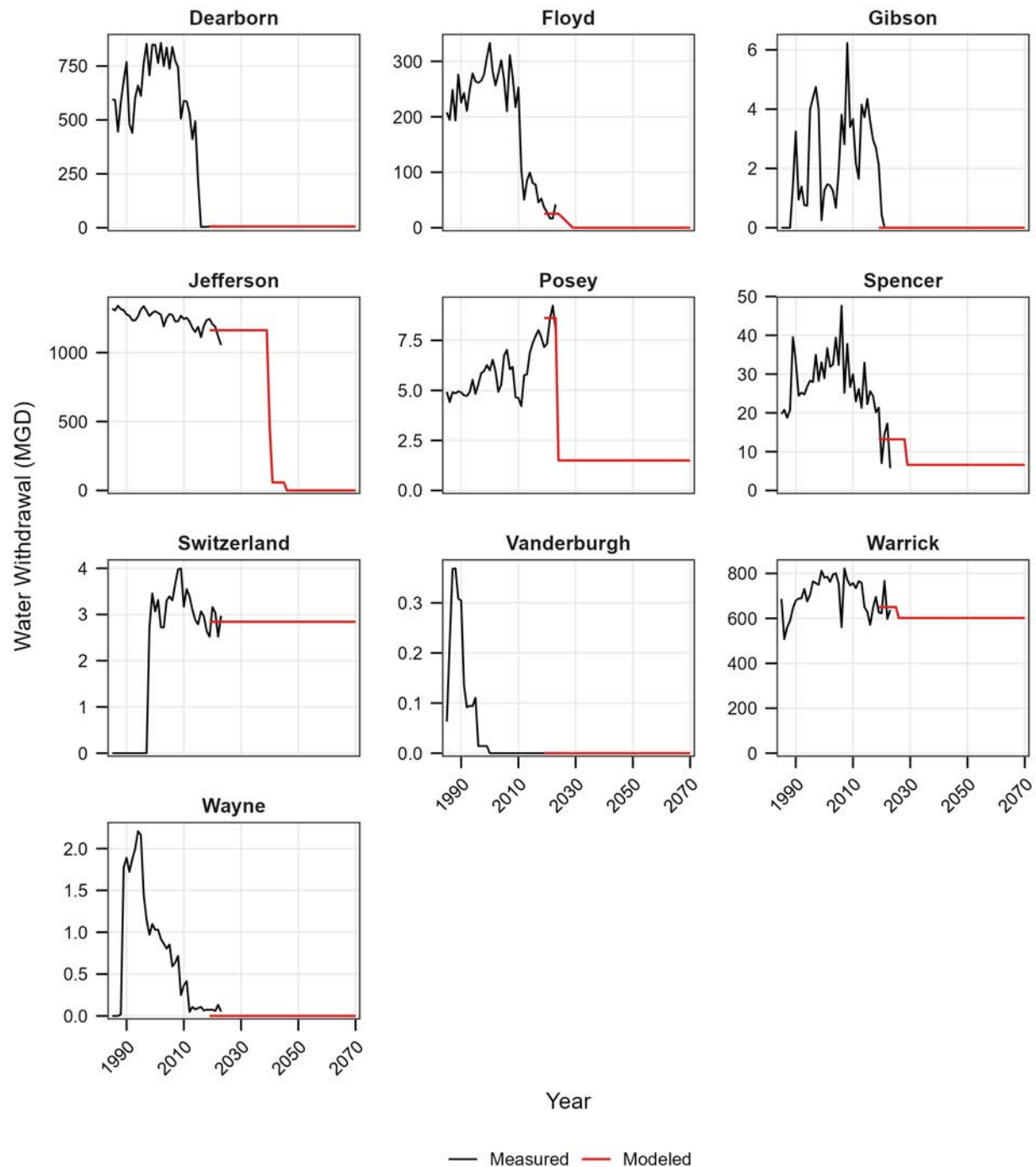


Figure 52. Historical and forecast power-generation withdrawal (MGD) by county, 1985-2070. Only data from within the Region are presented. Counties that lie partially within the Region include Gibson, Jefferson, Posey, Spencer, Vanderburgh, and Warrick.

### 2.2.7 Industrial Water Supply

Self-supplied industrial and commercial demand is the manufacturing and processing water that facilities meet from their own water withdrawals. It is the second largest non-power sector in the Region and the principal source of projected demand growth, rising from about 44 MGD in 2020 to about 46 MGD in 2070, an increase of about 4% (**Figure 53** and **Figure 54**). As noted under public supply, this sector captures only the water that facilities withdraw themselves; industrial water purchased from a public utility is embedded in the public-supply record and is not projected as an industrial trend.

The forecast considers the largest industrial counties individually. For the remaining areas, we break down collective regional data based on each county's actual water use over the last five years. This ensures every county gets its own tailored industrial forecast rather than a generic regional average.

This model was chosen specifically because it remains stable over the long term. Instead of showing unrealistic spikes, it levels off after 2030. It also adjusts for communities experiencing sharp industrial declines. For example, in Vanderburgh County, the model projects water-use downward to reflect the 2016 closure of its largest manufacturing facility. Because the model handles these shifts on its own, separate adjustments for factory closures were not needed. More details about the county lumping methodology are provided in **Appendix B**.

Table 19. Industry water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020      | 2025      | 2030      | 2035      | 2040      | 2045      | 2050      | 2055      | 2060      | 2065      | 2070      |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Clark*              | 5.10      | 3.62      | 2.47      | 2.42      | 2.57      | 2.52      | 2.47      | 2.42      | 2.37      | 2.32      | 2.27      |
| Crawford*           | 7.00      | 4.43      | 5.04      | 5.04      | 4.82      | 4.84      | 4.86      | 4.88      | 4.90      | 4.92      | 4.94      |
| Dearborn            | 10.46     | 12.88     | 14.71     | 14.76     | 14.85     | 14.84     | 14.82     | 14.80     | 14.79     | 14.77     | 14.75     |
| Fayette*            | 0.71      | 0.83      | 1.02      | 1.03      | 1.02      | 1.02      | 1.02      | 1.02      | 1.03      | 1.03      | 1.03      |
| Floyd               | 0.56      | 0.37      | 0.48      | 0.49      | 0.50      | 0.50      | 0.50      | 0.49      | 0.49      | 0.49      | 0.49      |
| Franklin            | 0.40      | 0.43      | 0.53      | 0.54      | 0.53      | 0.53      | 0.53      | 0.54      | 0.54      | 0.54      | 0.54      |
| Gibson*             | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Harrison            | 0.70      | 0.36      | 0.44      | 0.45      | 0.44      | 0.44      | 0.44      | 0.44      | 0.45      | 0.45      | 0.45      |
| Jefferson*          | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Ohio                | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Perry               | 1.09      | 1.51      | 1.64      | 1.65      | 1.62      | 1.62      | 1.63      | 1.64      | 1.65      | 1.66      | 1.67      |
| Posey*              | 8.06      | 8.45      | 8.39      | 8.41      | 8.47      | 8.48      | 8.49      | 8.50      | 8.51      | 8.51      | 8.52      |
| Randolph*           | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Ripley*             | 0.73      | 0.67      | 0.83      | 0.83      | 0.82      | 0.82      | 0.83      | 0.83      | 0.83      | 0.83      | 0.83      |
| Spencer*            | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Switzerland         | 0.97      | 0.81      | 0.09      | 0.10      | 0.16      | 0.15      | 0.15      | 0.14      | 0.14      | 0.13      | 0.13      |
| Union               | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Vanderburgh*        | 0.03      | 0.09      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Warrick*            | 0.09      | 0.23      | 0.28      | 0.28      | 0.28      | 0.28      | 0.28      | 0.28      | 0.28      | 0.28      | 0.28      |
| Washington*         | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      | 0.00      |
| Wayne               | 7.65      | 7.46      | 9.47      | 9.53      | 9.48      | 9.50      | 9.51      | 9.52      | 9.54      | 9.55      | 9.57      |
| <b>Total Demand</b> | <b>44</b> | <b>42</b> | <b>45</b> | <b>46</b> | <b>46</b> | <b>46</b> | <b>46</b> | <b>46</b> | <b>46</b> | <b>45</b> | <b>45</b> |

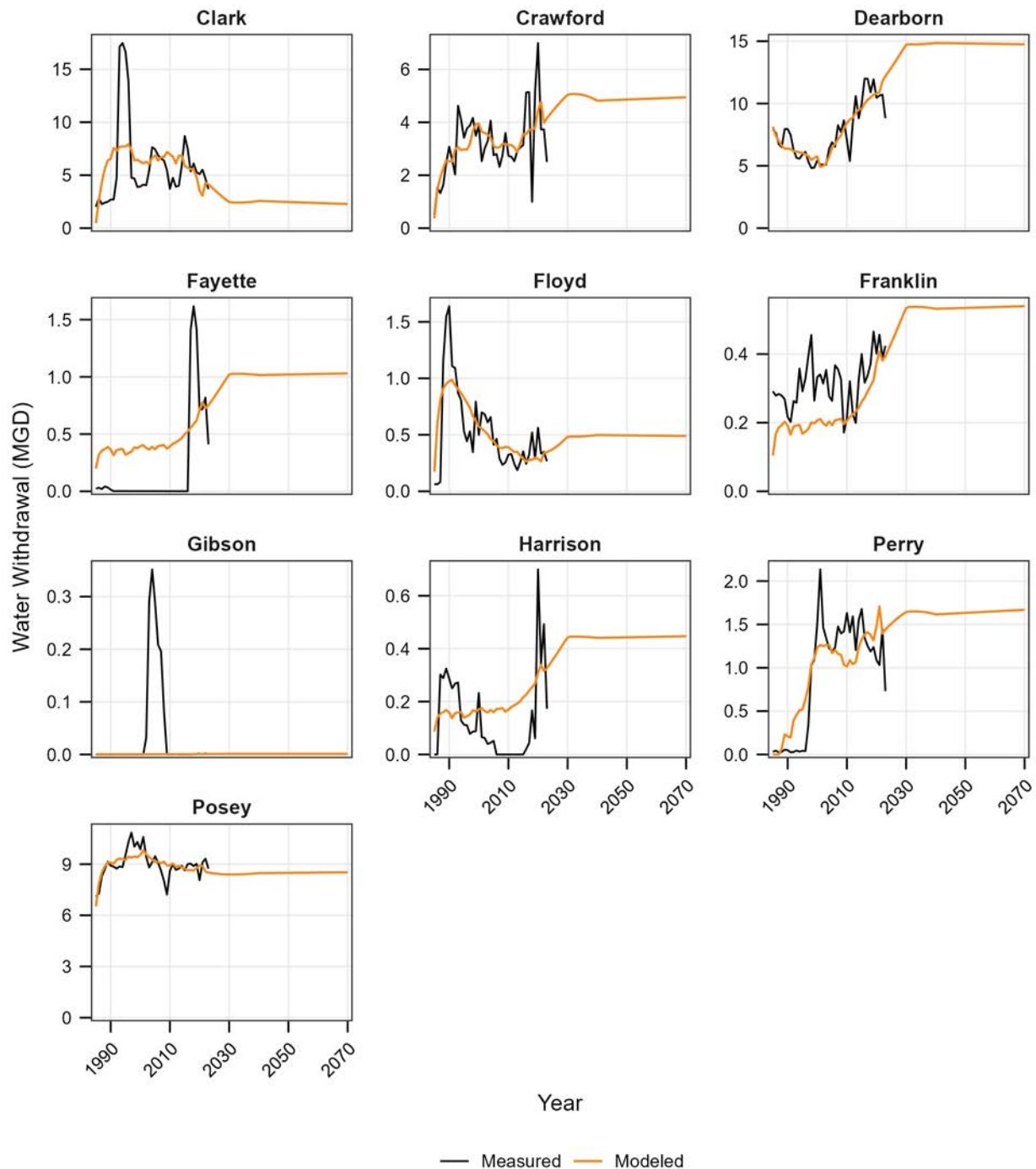


Figure 53. Historical and forecast industry withdrawals (MGD) by county, 1985–2070 (page 1 of 2). Only data from within the Region are presented. Counties that lie partially within the Region include Clark, Crawford, Fayette, Gibson and Posey.

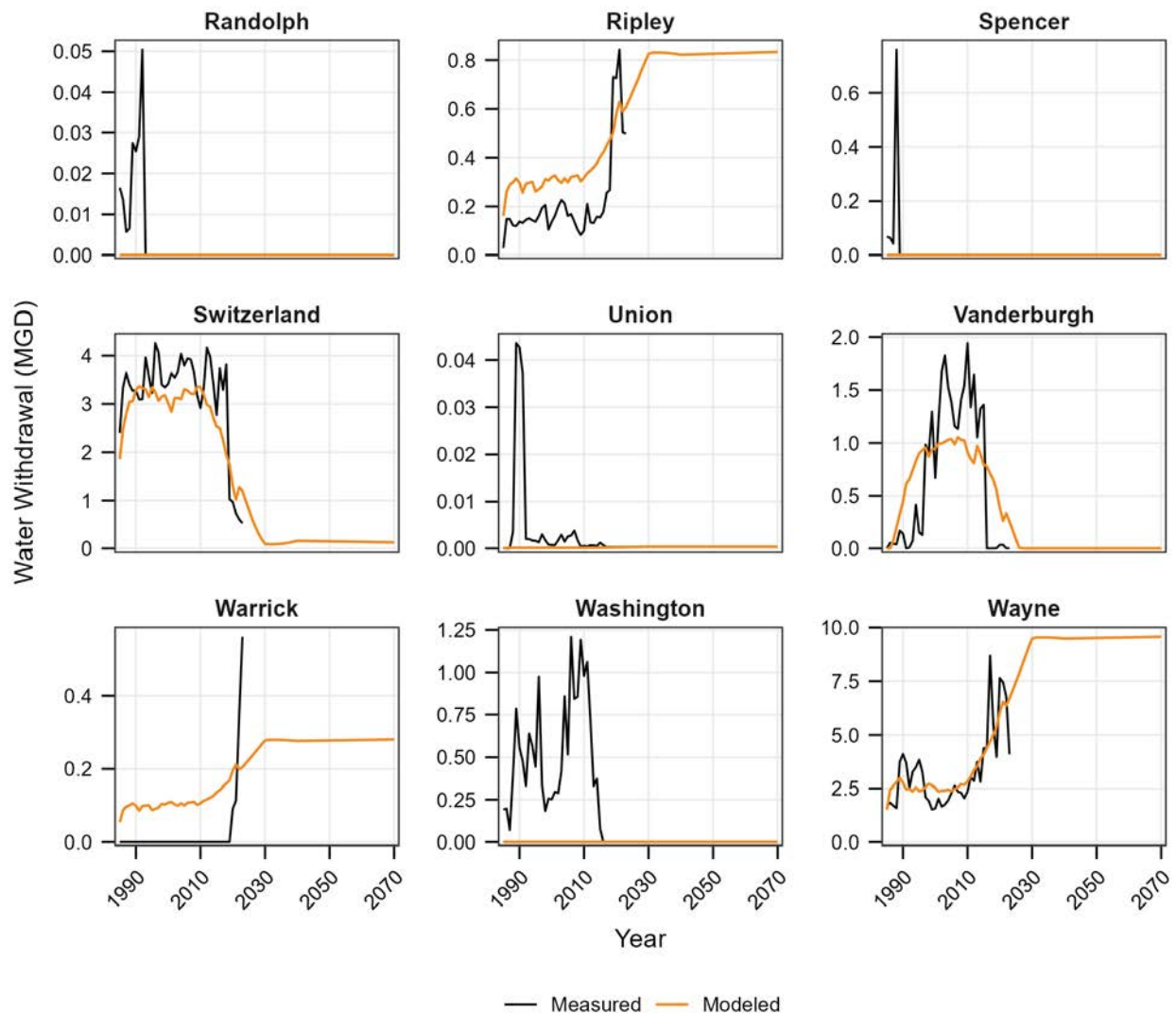


Figure 54. Historical and forecast industry withdrawals (MGD) by county, 1985–2070 (page 2 of 2). Only data from within the Region are presented. Counties that lie partially within the Region include Randolph, Ripley, Spencer, Vanderburgh, Warrick, and Washington.

## 2.2.8 Miscellaneous Use

Miscellaneous use (a heterogeneous catch-all of remediation, construction dewatering, recreational-lake upkeep, and fire protection) rises from about 1.2 MGD in 2025 to about 1.8 MGD in 2070, carrying a modest upward trend concentrated in Dearborn County that no single driver explains; it is projected with that trend rather than held flat (Table 20).

Table 20. Miscellaneous water demand forecast by county, in MGD. Only data from within the Region are presented. Counties that lie partially within the Region are indicated by an asterisk (\*) in the table.

| County              | 2020       | 2025       | 2030       | 2035       | 2040       | 2045       | 2050       | 2055       | 2060       | 2065       | 2070       |
|---------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Dearborn            | 0.48       | 0.59       | 0.64       | 0.70       | 0.76       | 0.81       | 0.87       | 0.92       | 0.98       | 1.04       | 1.09       |
| Posey*              | 0.75       | 0.66       | 0.66       | 0.66       | 0.66       | 0.66       | 0.66       | 0.66       | 0.66       | 0.66       | 0.66       |
| Spencer*            | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| Warrick*            | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       | 0.00       |
| <b>Total Demand</b> | <b>1.2</b> | <b>1.2</b> | <b>1.3</b> | <b>1.4</b> | <b>1.4</b> | <b>1.5</b> | <b>1.5</b> | <b>1.6</b> | <b>1.6</b> | <b>1.7</b> | <b>1.8</b> |

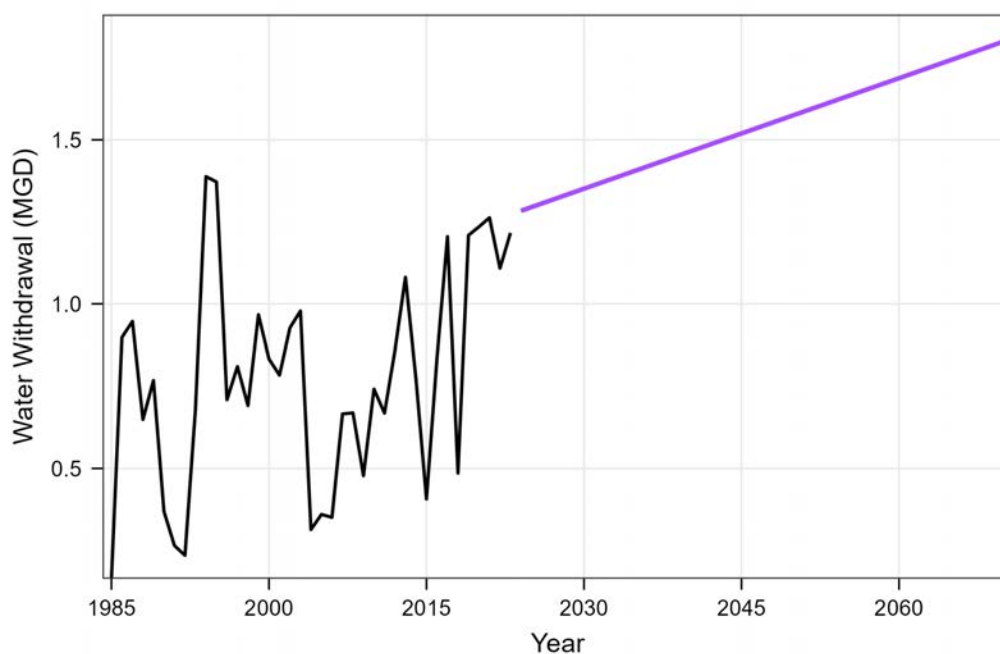


Figure 55. Historical and forecast miscellaneous withdrawal (MGD), regional total, 1985–2070.

## 3.0 Water Availability

The hydrologic methods used to evaluate water availability are completely described in the Central Indiana Water Availability report (IFA, 2021, Chapter 2 and Appendix A). Water availability is assessed on a major sub-basin scale (see **Section 1.4**) and reported as annual and seasonal averages. Water availability is evaluated using three related metrics:

- **Water Availability (WA):** the portion of natural baseflow generated within a sub-basin and remaining in the stream at the sub-basin outlet after instream flow requirements in the sub-basin are accounted for. Natural baseflow is an estimate of the natural groundwater discharge to the stream that would occur in the watershed in the absence of groundwater withdrawals and return flows. Instream flows are minimum stream flows required to support the ecological health of the stream, recreational use, and water quality. Water availability within a sub-basin may be supplemented by flows released from reservoir storage. While the net baseflow generated in a sub-basin may be negative, the water availability in a sub-basin cannot be less than zero.
- **Excess Water Availability (XS WA):** the portion of water availability within a sub-basin that could be used to support additional surface water or groundwater withdrawals without impacting instream flows or existing water withdrawals. Excess water availability is calculated as the water available in the sub-basin under natural baseflow conditions reduced by existing water use (i.e., existing withdrawals minus returns). A positive value indicates that there is unused water in the sub-basin, while a negative value indicates that more water is being used than is generated naturally within the sub-basin.
- **Cumulative Excess Water Availability (CXS WA):** the excess water availability summed over all upstream sub-basins. Sub-basins with negative excess water availability are using the positive excess from upstream sub-basins to supply demand. Most values of cumulative excess water availability are positive; a negative value means that the seasonal average streamflow falls below the minimum instream flow target. The streamflow itself is always positive.

Components of the water budget analysis described in the Central Indiana Regional Study (IFA, 2021, Chapter 2) include:

- **Measured Streamflow:** historical USGS daily streamflow records for all gages at sub-basin outlets.
- **Instream Flow:** in the Indiana Regional Water Availability studies, instream flow is defined as the Q90 flow metric in the Winter and Spring seasons and as the 7Q10 during the Summer and Fall seasons. The Q90 is the minimum daily streamflow that is exceeded 90% of the time; the 7Q10 is the lowest average seven-consecutive-day flow that occurs on average once every ten years. These flow statistics are computed from the measured streamflow using standard statistical analysis.
- **Water Withdrawals and Returns:** Historical water withdrawals by major water use sector are available from the IDNR SWWF database. Historical wastewater return flows in the region are obtained from the U.S. Environmental Protection Agency (EPA) ECHO database, which includes a summary of discharge monitoring reports required by National Pollutant

Discharge Elimination System (NPDES) permitting. The ECHO data is filtered into sectors like the SWWF data using the Standard Industrial Classification (SIC) Code for each facility.

- **Reservoir Storage:** Reservoir storage was not included in the analysis of water availability in the Ohio River and Southeast Indiana Region: the many dams and reservoirs on rivers in the Region are too small to significantly influence the analysis (see **Section 1.3.11**). The only exception to this is the Brookville Reservoir in the Whitewater River watershed, which is operated by the Army Corps of Engineers. Operations of Brookville Dam were evaluated using data from the Army Corps of Engineers and the USGS and incorporated into the analysis of historical data.

## 3.1 Methodology

The analysis of water availability in the Ohio River and Southeast Indiana Region required modification of the methods reported in IFA (2021, Chapter 2), which is the process followed by all regional studies in Indiana. Three different approaches were taken, depending on the data types available in each region described in the following subsections.

### 3.1.1 Whitewater River (Major Sub-Basins 1-5)

The analysis of the Whitewater River watershed follows the methods described in IFA (2021, Chapter 2). The watershed has adequate coverage of active USGS stream gaging stations throughout the watershed (see **Figure 16** and **Table 4**. Major Sub-Basin 5—the downstream end of the watershed to the Indiana State line—does not have a stream gage at the downstream end. Hydrologic results from Major Sub-Basin 4 are scaled by drainage area to cover Major Sub-Basin 5.

### 3.1.2 Major Sub-Basins 6-10

The remaining major sub-basins have incomplete coverage by active USGS stream gages (see **Figure 16** and **Table 5**). The minor sub-basins (**Figure 15**) in or adjacent to each major sub-basin are analyzed to develop time series of local natural streamflow and natural baseflow for the historical period 2007-2023. These series are then scaled to provide values representative of the entire major sub-basin. In a similar manner, the instream flow requirements for the minor sub-basins are scaled to represent requirements in each major sub-basin. The scaling by drainage area is approximate but necessary. An analysis of water availability is then conducted for each major sub-basin.

### 3.1.3 Ohio River and Outwash (Major Sub-Basin 11)

All major sub-basins in the region represent a small portion of the drainage basin contributing to the Ohio River Basin. The Ohio River and adjacent high-permeability outwash deposits are the source for most water withdrawals in the Region. Evaluating the water availability in the Ohio River is important for the Region, but using the methods in IFA (2021, Chapter 2) would require the entire Ohio River Basin up to its headwaters in Pennsylvania to be assessed: this is not feasible. A modified method of evaluating cumulative excess water availability (CXS WA) at USGS stream gaging stations on the Ohio River is described in **Appendix C**. However, is not possible to use the method to evaluate water availability (WA).

## 3.2 Historical Water Availability

Historical water availability is assessed using USGS daily streamflow records, records of water withdrawals from the SWWF database, withdrawal data obtained from the state of Ohio, and return flows obtained from the EPA ECHO database. The EPA data are only available beginning in 2007, and the SWWF data, when this study was initiated, were available until the end of 2023. Therefore, the historical period analyzed for water availability extends from January 2007 through December 2023.

Water availability metrics are computed on an annual average and seasonal average basis and are provided in units of MGD. The Winter season corresponds to the months of December, January, and February; the Spring season corresponds to the months of March, April, and May; the Summer season corresponds to the months of June, July, and August; and the Fall season corresponds to months of September, October, and November. Details of the Historical Water Availability analysis are provided in **Appendix C**.

### 3.2.1 Instream Flows

Instream flows are defined as the minimum amount of natural baseflow that should be left in a stream to support the ecological health of the stream, recreational use, and water quality. The Indiana Natural Resources Commission is authorized to determine and establish minimum instream flows based on Indiana Code 14-25-7-14. The statute does not explicitly define minimum instream flows for river systems but suggests that when values are established, they should be based on the varying low flow characteristics of streams, and the importance of instream and withdrawal uses. Instream uses means any use of water that uses surface water in place, including commercial and recreational navigation, hydroelectric power generation, waste assimilation, fish and wildlife habitat, general recreation, and maintenance of environmental and aesthetic values.

Indiana's Water Shortage Plan (IDNR, 2015) provides some background on minimum instream flow values in Indiana. Historically, the streamflow equivalent to the 7Q10 (lowest seven-day average flow having a 10-year recurrence interval) is considered the minimum allowable instream flow. This metric is critical to protect water quality and is used as a factor in determining the level of wastewater treatment required for discharges into the State's rivers and streams. Recognizing that it is desirable to protect the 7Q10 flow to maintain water quality in addition to other instream uses, the Water Shortage Plan recommends initiating reductions to water withdrawals during drought conditions before flow declines to the 7Q10, typically when the Q80 (the daily average flow that is exceeded 80% of the time) is met. For the months of May through October, the Q80 is a trigger to initiate a local action process to protect aquatic and riparian habitat, which could include monitoring of water withdrawals, voluntary reduction of water withdrawals, or development of local or regional policies that reflect public preferences regarding water use priorities.

Consistent with recent regional water studies in Indiana, this Study uses both the 7Q10 and the Q90 (the daily average flow that is exceeded 90% of the time) to define minimum instream flows within each sub-basin (IFA, 2021, Chapter 2). The 7Q10 is used to define minimum instream flow values, consistent with the Water Shortage Plan, during the typically drier months of June through November (Summer through Fall). The Q90 is used to define minimum instream flow values during the wetter months of December through May (Winter through Spring). There is no guidance in the Water Shortage Plan for defining minimum instream flows outside of shortage conditions and outside of the drier Summer months—the

Q90 metric is often used as a presumptive standard for environmental flow protection when instream flow values are not defined (Gleeson and Richter, 2018).

To calculate 7Q10 and Q90 for each sub-basin, the measured USGS daily flow data were collected from the recent 30-year period from 1995 to 2024 (or shorter if the full record was not available), a period that reflects recent climate and streamflow trends (Blum et al., 2019) and is consistent with other regional water studies' (Letsinger and Gustin, 2024) assessment periods used to calculate the values. The USGS stream gages used in the analysis are listed in **Table 21**, along with the assessment period used for the analysis. **Table 22** summarizes the instream flows defined for each major sub-basin together with its reference gage.

**Table 21. Instream flow values used in the water availability analysis.**

| Gage            | Name                                     | Period    | 7Q10<br>(cfs) | 7Q10<br>(MGD) | Q90<br>(cfs) | Q90<br>(MGD) |
|-----------------|------------------------------------------|-----------|---------------|---------------|--------------|--------------|
| <b>03381700</b> | Ohio River at Old Shawneetown            | 2002-2024 | 15,539        | 10,043        | 38,200       | 24,689       |
| <b>03303280</b> | Ohio River at Cannelton Dam at Cannelton | 1995-2024 | 10,705        | 6,919         | 24,800       | 16,029       |
| <b>03294500</b> | Ohio River at Louisville                 | 1995-2024 | 10,072        | 6,510         | 21,900       | 14,154       |
| <b>03277200</b> | Ohio River at Markland Dam near Warsaw   | 1995-2024 | 9,268         | 5,990         | 19,600       | 12,668       |
| <b>03275000</b> | Whitewater River near Alpine             | 1995-2024 | 69            | 45            | 120          | 78           |
| <b>03275600</b> | East Fork Whitewater River at Abington   | 1995-2024 | 15            | 10            | 33           | 21           |
| <b>03276000</b> | East Fork Whitewater River at Brookville | 1988-2017 | 27            | 18            | 44           | 28           |
| <b>03277000</b> | Laughery Creek near Farmers Retreat      | 1940-1973 | 0.0           | 0.0           | 1.0          | 0.6          |
| <b>03276500</b> | Whitewater River at Brookville           | 1995-2024 | 120           | 77            | 220          | 142          |
| <b>03291780</b> | Indian-Kentuck Creek near Canaan         | 1995-2024 | 0.0           | 0.0           | 0.1          | 0.06         |
| <b>03294000</b> | Silver Creek near Sellersburg            | 1995-2024 | 0.2           | 0.1           | 4            | 2.6          |
| <b>03302220</b> | Buck Creek near New Middletown           | 1995-2024 | 0.7           | 0.5           | 3            | 1.9          |
| <b>03302800</b> | Blue River near Fredericksburg           | 1995-2024 | 3.6           | 2.3           | 13           | 8.4          |
| <b>03303000</b> | Blue River near White Cloud              | 1995-2024 | 17.1          | 11.0          | 50           | 32           |
| <b>03303300</b> | Middle Fork Anderson River at Bristow    | 1995-2024 | 0.0           | 0.0           | 0.4          | 0.3          |
| <b>03322100</b> | Pigeon Creek at Evansville               | 1960-1985 | 0.0           | 0.0           | 8.0          | 5.2          |

cfs = cubic feet per second. MGD = million gallons per day.

**Table 22.** Instream flows in millions of gallons per day (MGD) defined for the major sub-basins including reference gages.

| Major Sub-basin | Name                                     | 7Q10 (MGD) | Q90 (MGD) | Reference Gage(s) |
|-----------------|------------------------------------------|------------|-----------|-------------------|
| 1               | Whitewater River near Alpine             | 45.0       | 78.0      | 03275000          |
| 2               | East Fork Whitewater River at Abington   | 10.0       | 21.0      | 03275600          |
| 3               | East Fork Whitewater River at Brookville | 18.0       | 28.0      | 03276000          |
| 4               | Whitewater River at Brookville           | 77.0       | 142.0     | 03276500          |
| 5               | Whitewater River-downstream reach        |            |           | 03276500          |
| 6               | Middle Ohio                              | 0.0        | 2.0       | 03277000          |
| 7               | Silver                                   | 0.3        | 8.8       | 03294000          |
| 8               | Blue-Sinking                             | 22.0       | 55.0      | 03302220          |
|                 |                                          |            |           | 03302800          |
|                 |                                          |            |           | 03303000          |
| 9               | Lower Ohio                               | 0.0        | 6.3       | 03303300          |
| 10              | Pigeon                                   | 0.0        | 6.6       | 03322100          |
| 11              | Ohio River and Outwash                   | 6,510      | 14,154    | 03294500          |

### 3.2.2 Brookville Reservoir Operations

Historical operation of the Brookville Reservoir (Franklin County, Indiana) is estimated from a combination of Army Corps of Engineer operation records, USGS daily flow and stage records downstream of the dam, USGS rating curves downstream of the dam, and USGS daily flow records upstream of the reservoir at Abington. Only the upstream flow records are complete for the historical period of interest. A continuous record of outflow from the dam was assembled from the available data. Details and results of the analysis are presented in **Appendix C**.

### 3.2.3 Cumulative Excess Water Availability

While each of the water availability metrics (water availability, excess water availability, and cumulative excess water availability) provides information about the spatial distribution of water use and hydrologic conditions, the cumulative excess water availability is perhaps the most useful metric for water supply planning; it represents the total available excess water upstream of any point in a watershed, independent of what any individual sub-basin contributes to the total. Water withdrawals are not typically limited to the portion of excess available water generated within a single sub-basin.

The annual and seasonal cumulative excess water availability for the Ohio River and Southeast Indiana Region is summarized in the following subsections. The lowest values of the metrics that occurred in the 17-year period of record are presented, along with box and whisker plots showing the range of values that occur throughout the period of record. Results for the other metrics of water availability are summarized in **Appendix D**.

### 3.2.3.1 Minimum Annual and Seasonal Cumulative Excess Water Availability

The historical record consists of 17 years of data. The minimum annual cumulative excess water availability is the lowest average annual value of the metric to occur out of 17 total values. Similarly, the minimum seasonal value is the lowest value for each seasonal metric out of 17 total values. These minimum values roughly correspond to an 18-year recurrence interval. Therefore, the minimum value of each metric during the period of record represents seasonal drought conditions that can be expected to occur, on average, every 18 years (approximately a 6% chance of occurrence in any year). This allows a level of risk to be assigned to the drought conditions, which is an important aspect of water supply planning.

The minimum annual average and seasonal average cumulative excess water availability in the 17-years of record are summarized in **Table 23**, and are presented graphically in **Figure 56** through **Figure 60**. The minimum summer and fall cumulative excess water availability in Major Sub-Basins 1 through 10 are small relative to the area of each basin. The minimum seasonal cumulative excess water availability of Major Sub-Basin 11 is very large—one to two orders of magnitude greater than the other basins—due to the presence of the Ohio River.

**Table 23.** Minimum annual and seasonal cumulative excess water availability in the major sub-basins of the Ohio River and Southeast Indiana Region.

| Major Sub-Basin | Annual (MGD) | Winter (MGD) | Spring (MGD) | Summer (MGD) | Fall (MGD) |
|-----------------|--------------|--------------|--------------|--------------|------------|
| 1               | 81.7         | 38.1         | 172.6        | 20.9         | 5.3        |
| 2               | 29.5         | 17.1         | 61.8         | 6.3          | 3.2        |
| 3               | 109.0        | 45.5         | 11.6         | 0.8          | 108.8      |
| 4               | 213.1        | 103.6        | 335.1        | 32.6         | 161.3      |
| 5               | 233.4        | 111.6        | 397.1        | 37.1         | 161.0      |
| 6               | 147.1        | 222.8        | 200.9        | 4.0          | -1.6       |
| 7               | 150.8        | 211.2        | 306.4        | 30.3         | 19.5       |
| 8               | 504.3        | 551.9        | 913.8        | 93.6         | 27.5       |
| 9               | 310.7        | 321.0        | 338.9        | 6.6          | 11.0       |
| 10              | 154.3        | 158.5        | 166.5        | 4.4          | 6.4        |
| 11              | 36,700       | 33,800       | 54,400       | 3,400        | 4,300      |

MGD = million gallons per day.

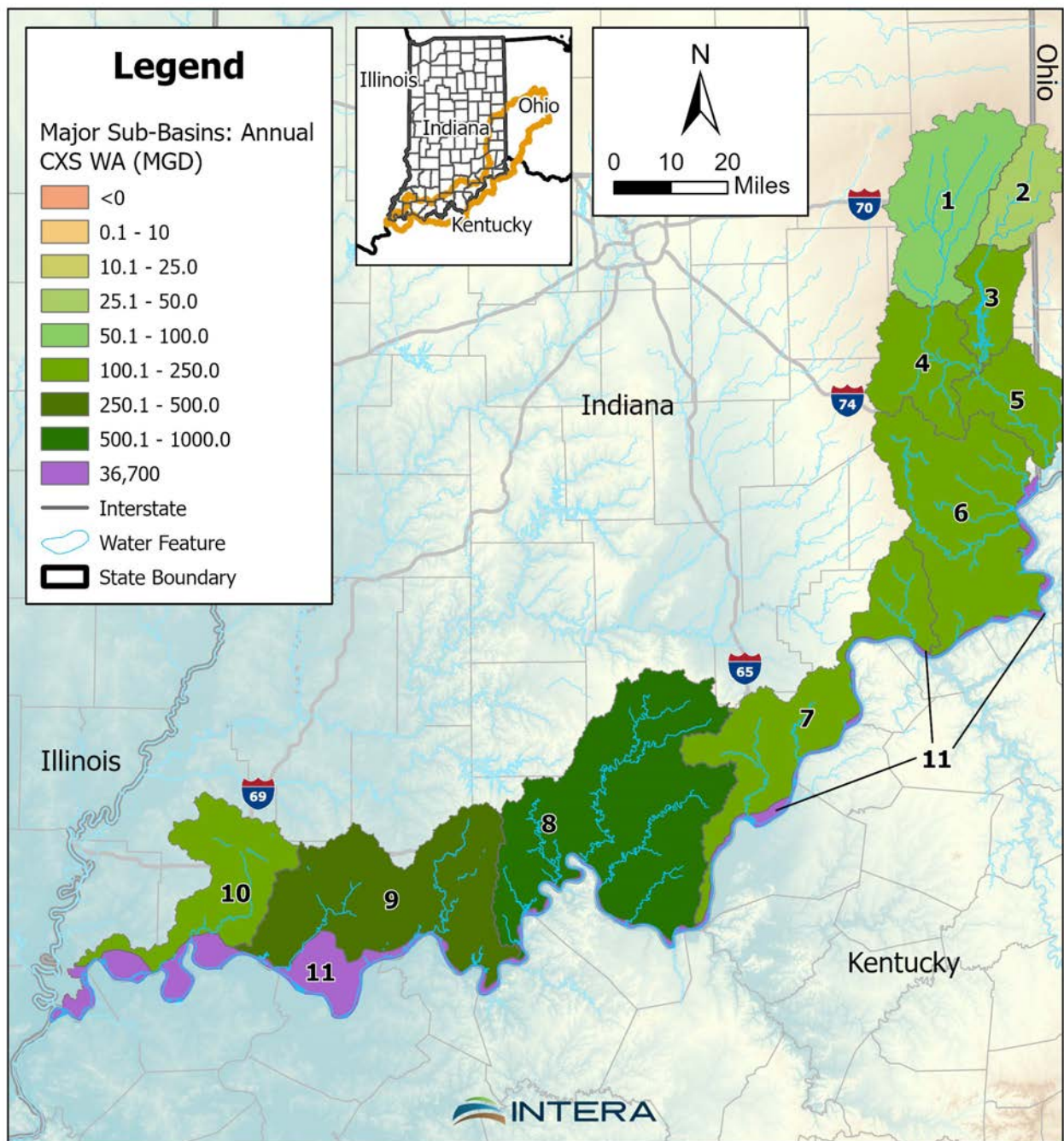


Figure 56. Minimum annual cumulative excess water availability, 2007-2023.

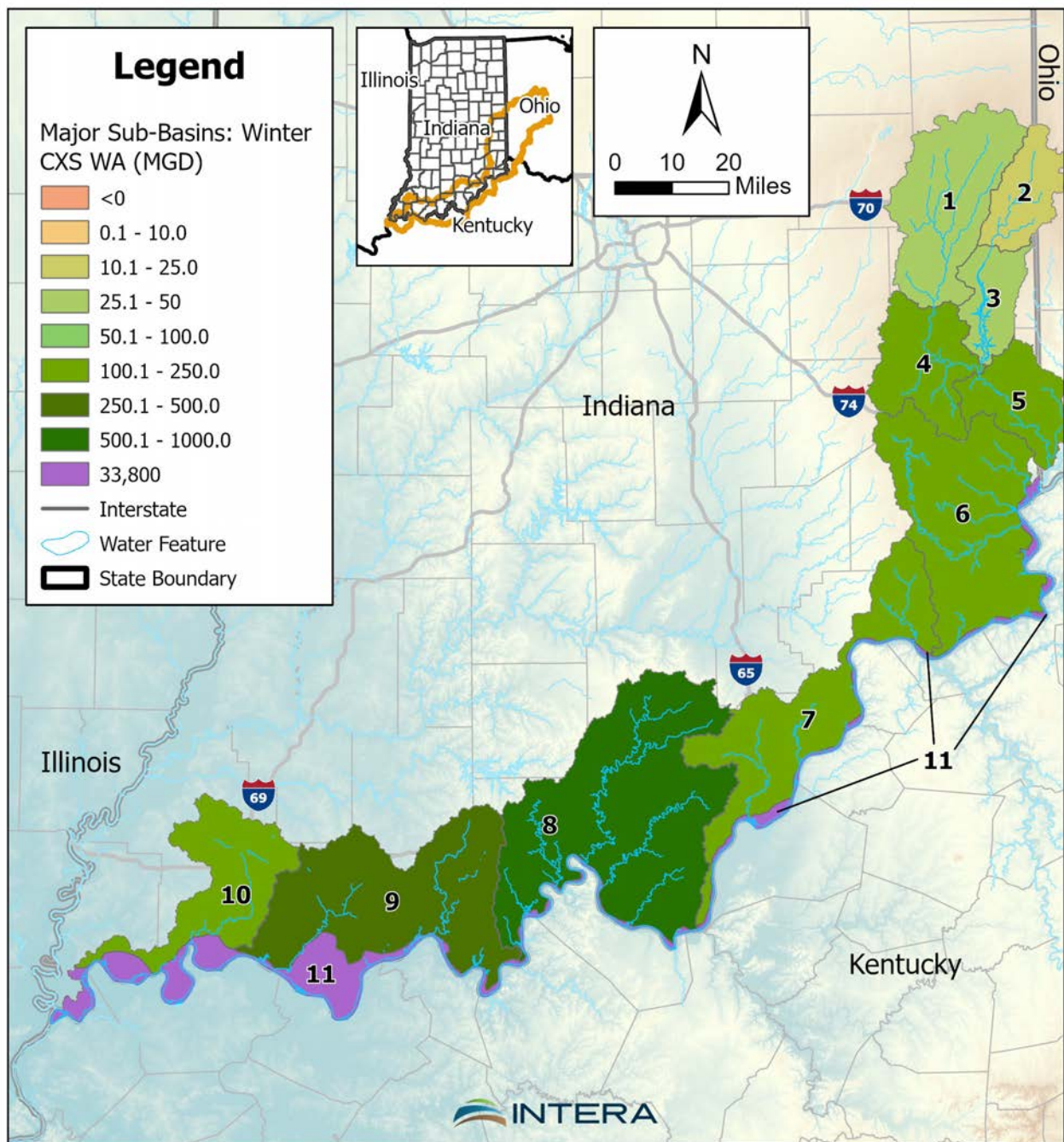


Figure 57. Minimum Winter cumulative excess water availability, 2007-2023.

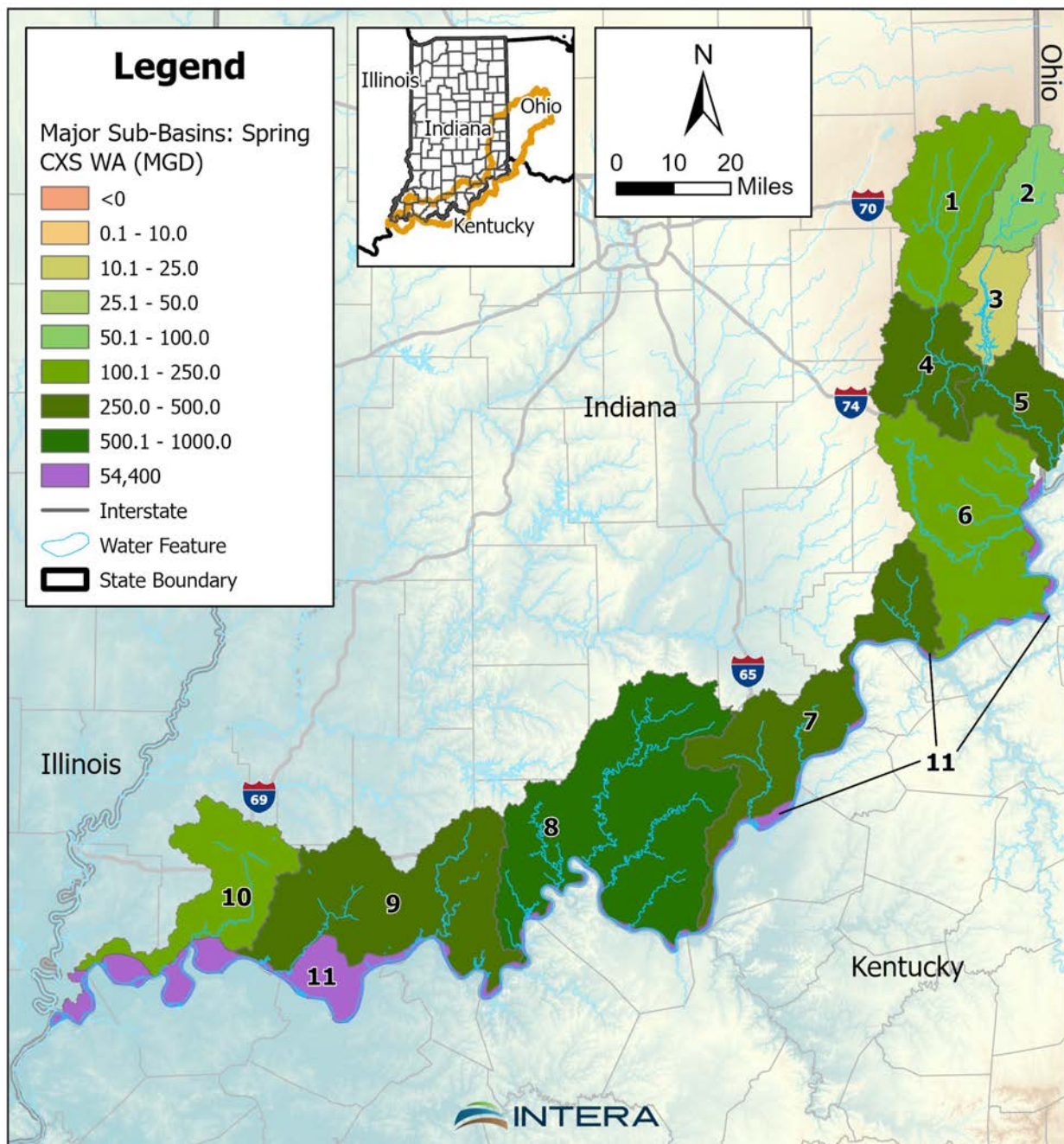


Figure 58. Minimum Spring cumulative excess water availability, 2007-2023.

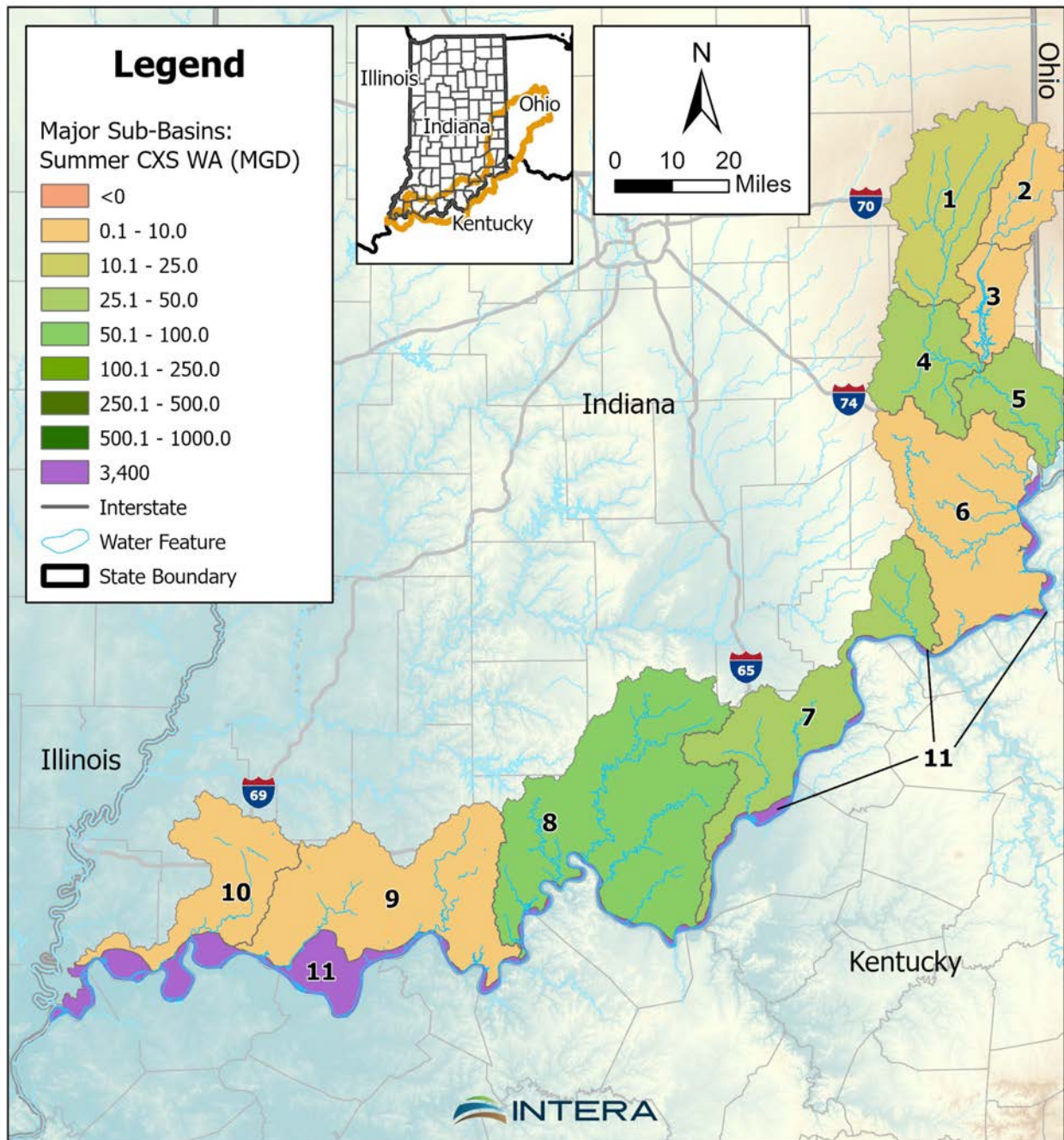


Figure 59. Minimum Summer cumulative excess water availability, 2007-2023.

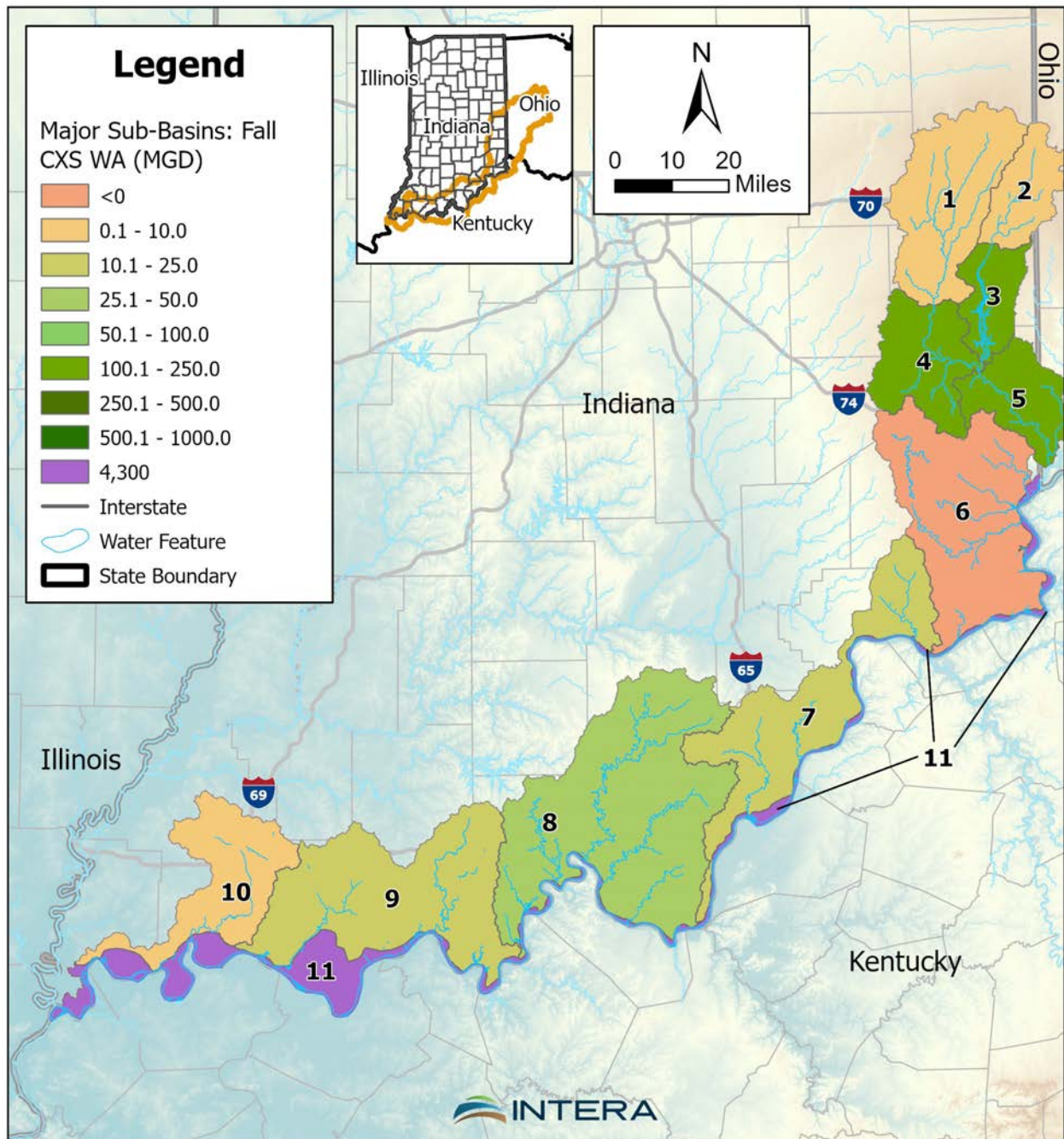


Figure 60. Minimum Fall cumulative excess water availability, 2007-2023.

### 3.2.3.2 Variations in Seasonal Cumulative Excess Water Availability

The variation of each water availability metric over the period of record is also important to assess. The variability can be shown compactly using box and whisker plots. **Figure 61** explains the box and whisker plot. An annual time series is shown on the left of the figure with a single value for each year in the period of record, 2007 to 2023; the time series shows the variation of the metric (cumulative excess water availability, for example) through time. The corresponding box and whisker plot is shown to the right of the figure. Each value from the time series is plotted, as a dot, on a single vertical line of the box and whisker plot. The box itself indicates the bounds of the mean ("x"), median (horizontal line), and the upper and lower quartile (top and bottom of the box) of the time series data. The whiskers, or vertical lines projecting from the box, indicate the range of values of the remaining 50% of the data. Any outliers are excluded from the whiskers, and the top and bottom of the whisker, denoted by the horizontal lines, represent the maximum and minimum values in the time series.

Box and whisker plots are provided for the seasonal cumulative excess water availability in each of the major sub-basins of the Region in **Figure 62** through **Figure 64**. In general, each metric may vary over one to two orders of magnitude from the minimum value to the maximum value. For example, the figure for Major Sub-basin 1 shows that Winter cumulative excess water availability has varied from a minimum of 38 MGD to a maximum of 422 MGD (with an outlier at 754 MGD) with a median value of 206 MGD. Note the different scales on the y-axes between sub-basins in each figure.

In the Whitewater watershed, **Figure 62** indicates that there is a larger variability in cumulative excess in the Winter and Spring with larger median values than in the Summer and Fall seasons: the boxes in Winter and Spring are larger and positioned higher than those representing the Summer and Fall. Major Sub-Basin 3 is an exception to these trends, with increased median flows in the Fall. This is due to the operation of the Brookville Reservoir within the sub-basin, which captures Spring streamflow and releases flow in the Fall. The effects of the Brookville Reservoir are also seen in Major Sub-Basins 4 and 5, which also have increased cumulative excess water availability in the Fall.

**Figure 63** shows the seasonal variation in the major sub-basins outside of the Whitewater River watershed. Summer and Fall water availability is much lower with minimum values approaching zero. **Figure 64** illustrates the results of the water availability analysis of the Ohio River and Outwash (Major Sub-Basin 11); the cumulative excess water availability is orders of magnitude greater than the other major sub-basins, with the Fall median availability being smaller than the other seasons.

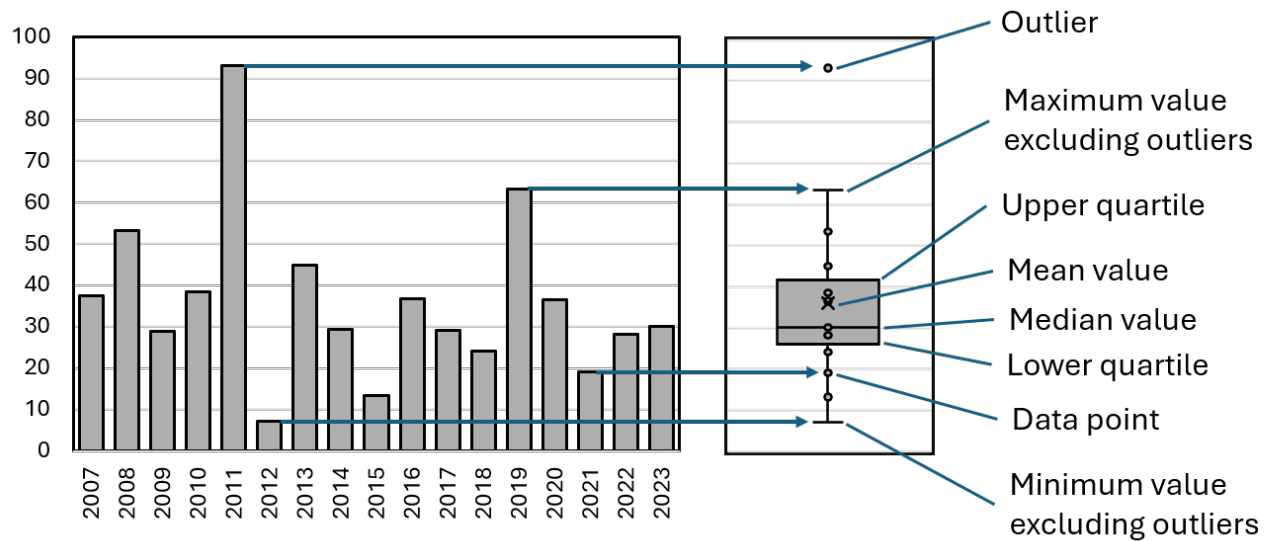


Figure 61. Explanation of the box and whisker plots used to show the variation in an annual time series.

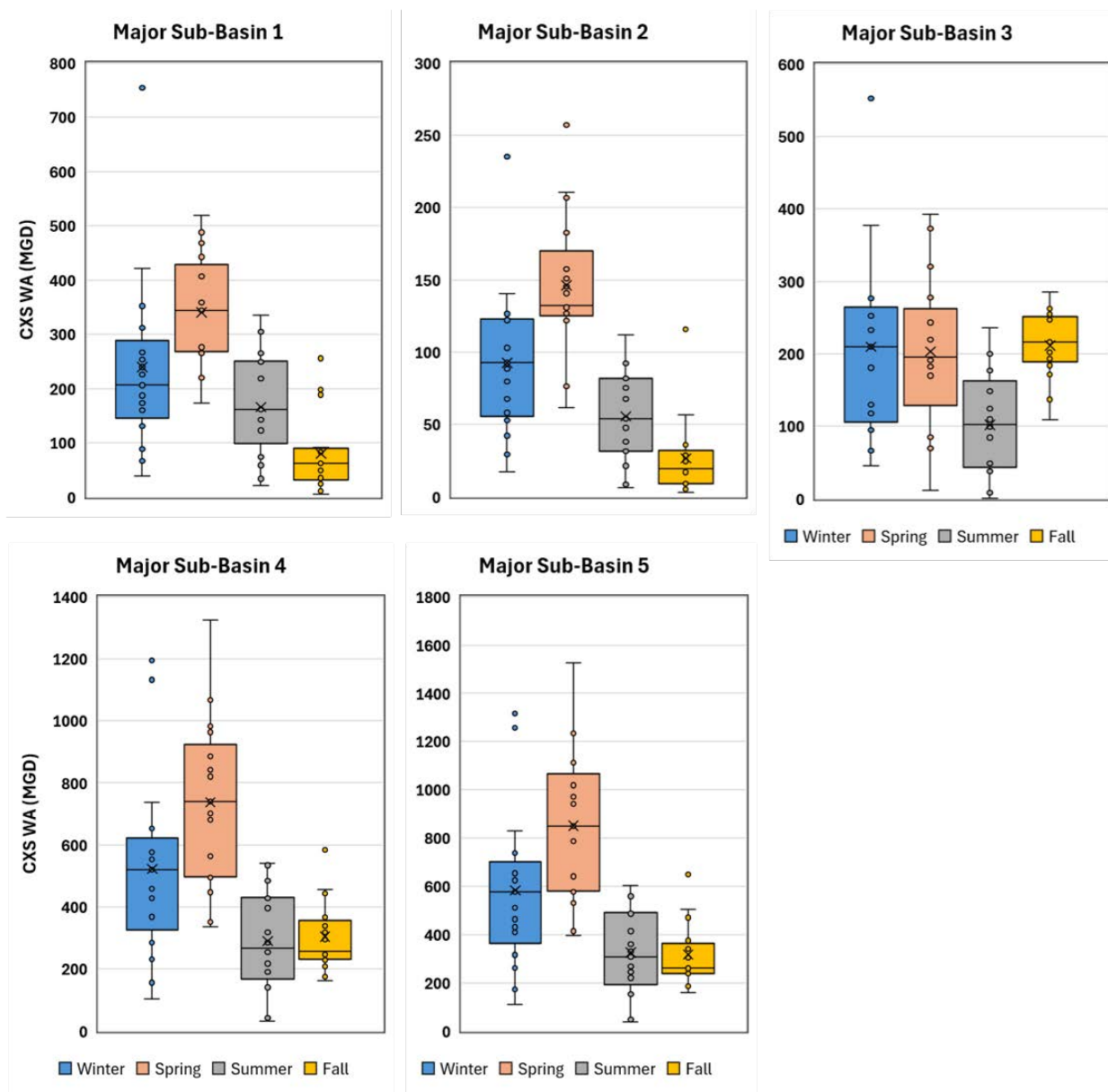


Figure 62. Seasonal cumulative excess water availability (CXS WA) in the major sub-basins of the Whitewater River, 2007-2023.

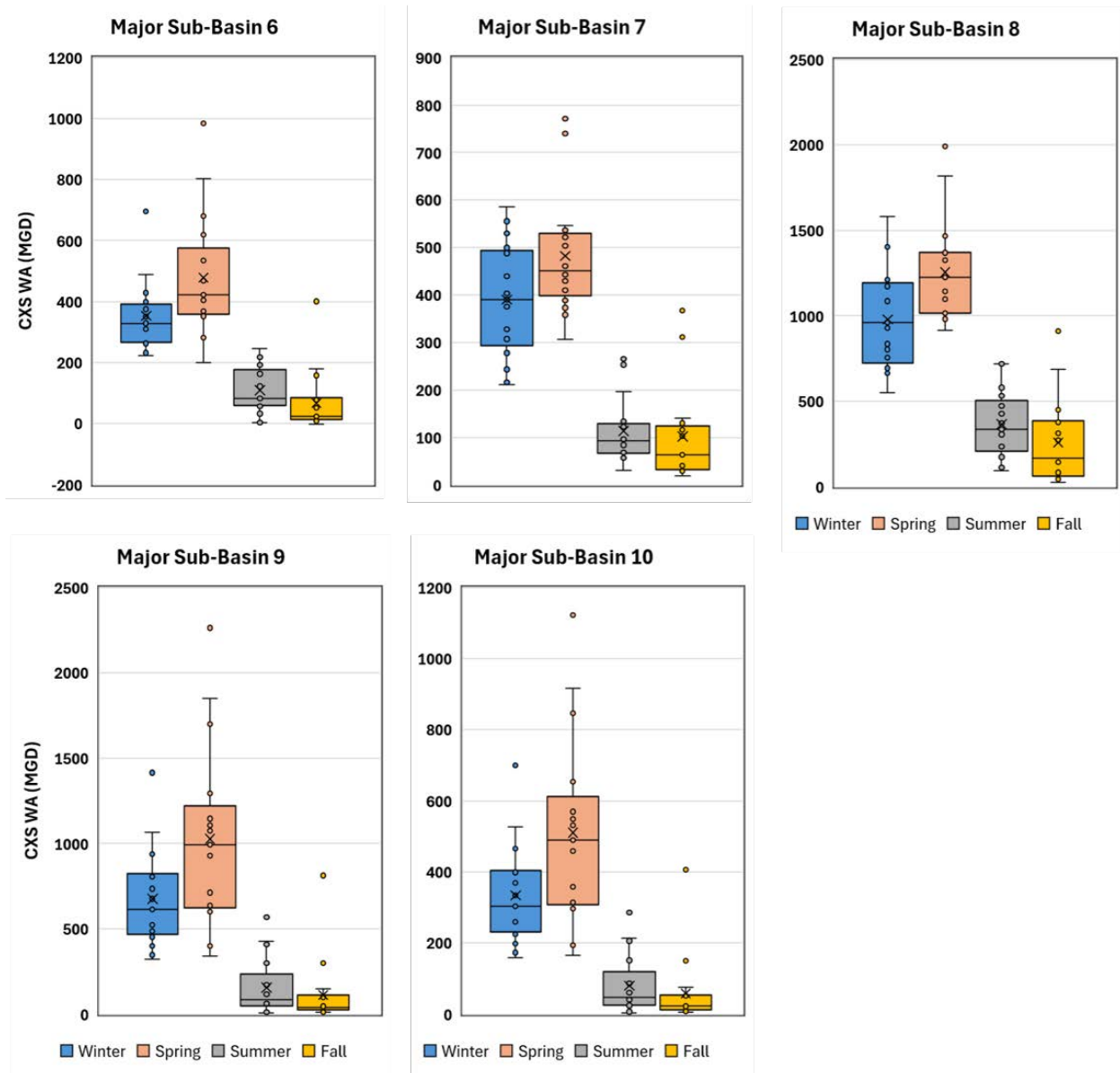


Figure 63. Seasonal cumulative excess water availability (CXS WA) in Major Sub-Basins 6 through 10, 2007-2023.

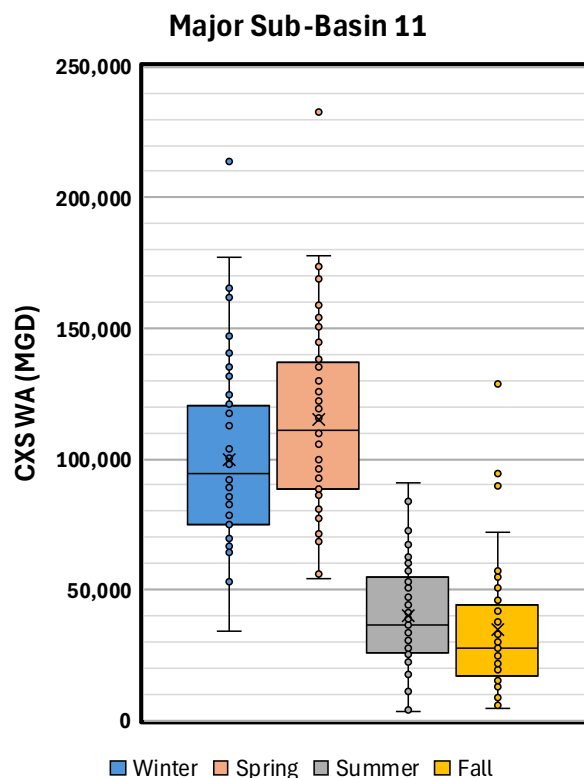


Figure 64. Seasonal cumulative excess water availability (CXS WA) in Major Sub-Basin 11 (Ohio River and Outwash), 1976-2024.

### 3.2.4 Summary of Historical Water Availability

Cumulative excess water availability in the Region varies seasonally, with Winter and Spring having relatively high values and Summer and Fall having relatively lower values. Fall is the critical season--the season with the lowest availability--for most of the major sub-basins, although low cumulative excess water availability has occurred infrequently in both the Winter and Spring seasons in some major sub-basins.

The Ohio River and Outwash (Major Sub-Basin 11) is the primary source of water supply for energy production, industry, and public supply in the Region, with total withdrawals ranging from 2,000 to 3,000 MGD in the historical period. For comparison to total withdrawals, Major Sub-Basin 11 has a minimum Summer cumulative excess water availability of 3,400 MGD; water withdrawals in the Basin could more than double without the flows of the Ohio River falling below the minimum instream flow target. In contrast, the minimum Summer cumulative excess water availability in the remaining major sub-basins range from 1 to less than 100 MGD. Any significant expansion of water supplies in Major Sub-Basins 6-11 in the Region will have to rely on the Ohio River.

Minimum cumulative excess water availability in the Whitewater River watershed (Major Sub-Basins 1-5) has been very low in the Summer and Fall seasons, with little capacity for expanding reliable water supplies. The Brookville Reservoir in Major Sub-Basin 3 is currently not being used as a significant source

for water supply. The dam is operated by the U.S. Army Corps of Engineers for flood control purposes. The reservoir has a normal storage capacity of over 47 billion gallons; a large portion of that storage volume (29 billion gallons) is allocated to the State of Indiana for water supply and could provide a significant source of supply for regional growth.

Cumulative excess water availability in the remaining major sub-basins (6-10) is small relative to the large size of the basins. Except for the Blue-Sinking Basin (Major Sub-Basin 8), the basins are characterized by low Summer and Fall streamflow with little baseflow component. Streamflow records show frequent periods when the streams go dry.

### 3.3 Water Availability Forecasts

Projections of future water demand are combined with projections of future natural streamflow to estimate future water availability. A summary of the methodology is provided below and supplemented by information contained in **Appendix D**. Complete tables of excess water availability and cumulative excess water availability are provided in **Appendix E** in 5-year intervals from 2010 to 2070.

#### 3.3.1 Methodology

The methodology for water availability projections follows the analysis of historical water availability with future hydrology, water withdrawals, and consumptive use developed from the demand models and hydrologic models informed by historical conditions in the sub-basins. The process is described briefly below, with additional information provided in **Appendix D**.

**Natural Streamflow Projections.** Estimates of future natural streamflow are based on the Water-Balance Model (WBM) (Wolock and McCabe, 1999). The WBM is incorporated into the National Climate Change Viewer (Alder and Hostetler, 2014; Hostetler and Alder, 2016) and produces estimates of natural streamflow from inputs of temperature, precipitation, and potential solar radiation. The inputs are provided by the suite of Global Climate Models included in the NCCV. Output from a single global climate model was used to drive the streamflow model: CNRM-CM6-1, Scenario SSP2-4.5. More details on the choice of this global climate model are provided in Appendix B. Output from the hydrologic model includes a monthly timeseries of natural streamflow, provided in inches per month on a HUC-8 spatial scale; the results were then scaled to each major sub-basin or watershed within the HUC-8.

**Validation of Model with Historical Results.** The resulting natural stream flows generated for each sub-basin were then compared with the historical natural stream flows (2007-2023) developed for Major Sub-Basins 1 through 4 and Minor Sub-basins 1 through 6. Flow duration curves were created for the observed data and data from the same period for the hydrologic model. A comparison of actual and model flow duration curves showed that the model predictions were acceptable for all sub-basins.

**Natural Baseflow.** As the projected natural streamflow from the Water-Balance Model (WBM) is at a monthly timescale, standard baseflow separation techniques, as described and used in previous regional studies (IFA, 2021, Chapter 2) cannot be used to estimate the natural baseflow. Instead, an analysis of the seasonal baseflow index was conducted using the historical record (2007-2023) at Major Sub-Basins

#### Flow Duration Curve

A flow duration curve graphically represents the relationship between streamflow magnitude and the frequency with which it is equaled or exceeded, providing key insights into hydrological behavior and water resource management.

1 through 4 and Minor Sub-Basins 1 through 6. Seasonal relationships for each watershed were developed between natural stream flow and natural baseflow and applied to the projected natural stream flows.

**Instream Flows.** Instream flow values used for forecasting water availability remain unchanged from the historical analysis (see **Section 3.2.1**).

#### Consumptive Water Use

Consumptive use is the portion of water withdrawn from a source that is not returned and is effectively removed from the immediate water system.

**Water Withdrawal Projections.** Withdrawal projections on the county scale were mapped to the sub-basins for all areas within the Indiana portion of the Region. No demand projections were made for areas in Ohio. The contributing portions of Ohio had minimal consumptive use. Sub-basin scale consumptive use estimates for Ohio for 2023, developed during the analysis of historical water availability, were projected forward to 2070.

**Consumptive Use Factors.** Sub-basin scale consumptive use factors were estimated during the analysis of historical water availability by relating water withdrawal sectors to wastewater return flows through the standard industrial classification (SIC) code present in the NPDES records. In this way, consumptive use factors were obtained for each withdrawal sector by sub-basin. The resulting factors are presented in **Appendix D**. A constant consumptive use coefficient of 0.13 was applied to all self-supplied residential withdrawals. A consumptive use factor of 1.0 was applied to all projected irrigation withdrawals. These consumptive use factors are like the coefficients used in the Great Lakes Basin (Schaefer and Runkle, 2007).

**Public Supply Withdrawals and Returns at Wastewater Treatment Plants.** Public supply withdrawals and the corresponding returns at wastewater treatment plants within a sub-basin are often directly related. This is not always the case in the Ohio River and Southeast Indiana Region. Many municipalities import most of their public supply from distant sources and return the treated wastewater locally. Therefore, public supply withdrawals and wastewater treatment plant returns must be projected separately rather than combining them into a single consumptive use factor. Projected returns at local wastewater treatment plants are based on **projected demands** within a major sub-basin, rather than **projected withdrawals** within that sub-basin.

Major sub-basins in which public supply withdrawals are strongly correlated with wastewater treatment plant returns often exhibit seasonal patterns. Combined Sewer Overflow (CSO) systems are present throughout the Ohio River and Southeast Indiana Water Region and therefore returns historically have exceeded withdrawals. Within these sub-basins, if returns historically exceed withdrawals throughout the year, a consumptive use factor of zero was applied to future public supply withdrawals. When returns and withdrawals exhibited seasonality with withdrawals exceeding returns during summer and fall, seasonal consumptive use coefficients were developed for those sub-basins.

### 3.3.2 Results: Whitewater River Watershed (Major Sub-Basins 1-5)

The major sub-basins of the Whitewater River watershed are illustrated in **Figure 16**, with details provided in **Table 4**. Annual cumulative excess water availability in the Whitewater watershed is projected to decrease through 2070 in each of the major sub-basins, with seasonal values showing either mild increasing or mild decreasing trends. Cumulative excess water availability in the Summer and Fall, the critical seasons, are expected to decrease by 2070.

Full annual and seasonal time series of historical and projected cumulative excess water availability are provided with trend lines in **Figure 65**, for Major Sub-Basin 5, the most downstream basin of the watershed. Note in the figure that the cumulative excess water availability in Sub-Basin 5 is negative in the Spring of 2036. A negative value indicates the seasonal average streamflow is below the minimum instream flow target (**Section 3.2.1**). This major sub-basin is chosen as a typical example to illustrate the projected annual variations in each metric. Although most graphs indicate a mild downward trend, the year-to-year variations are large.

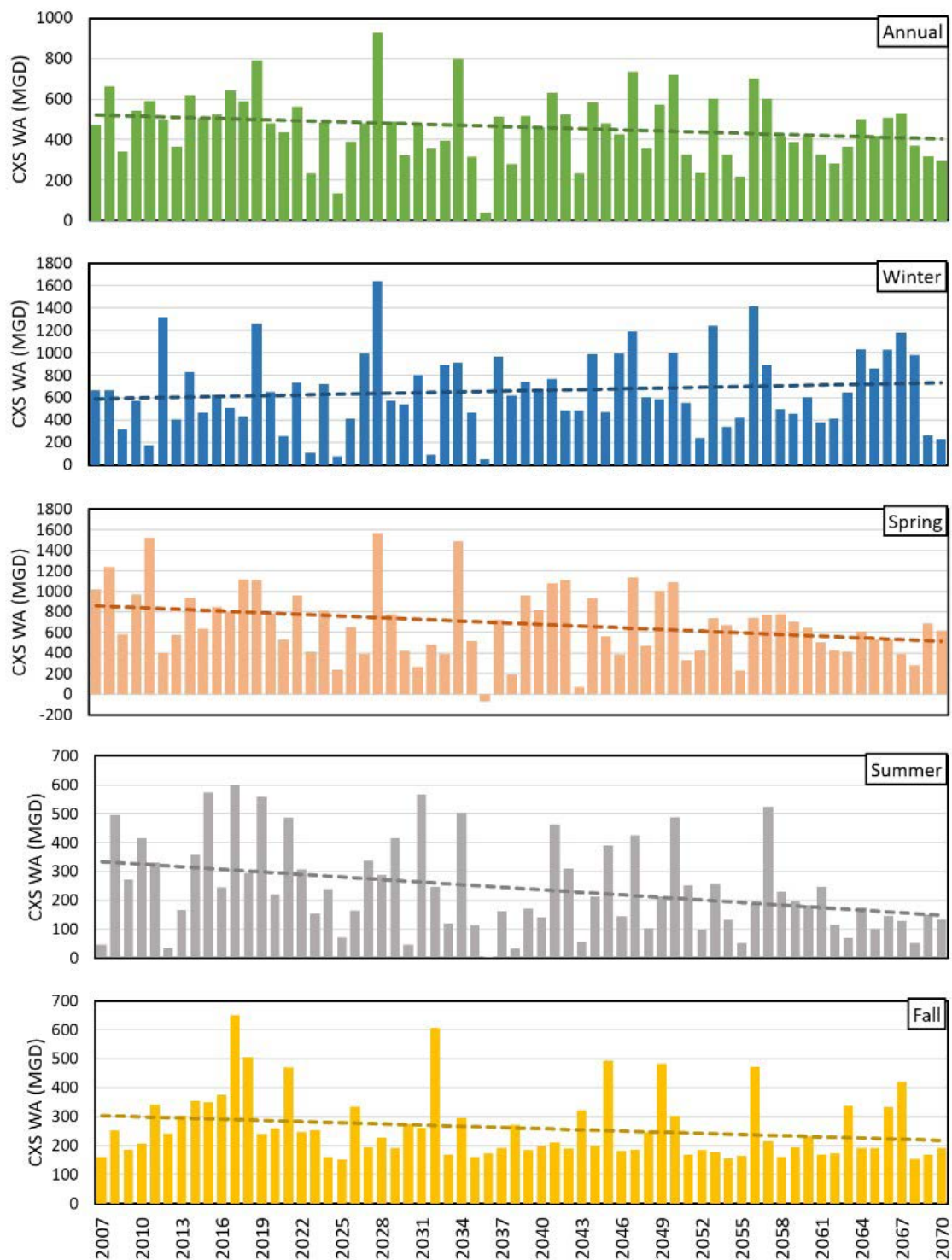


Figure 65. Annual and seasonal cumulative excess water availability (CXS WA) and trends for Major Sub-Basin 5 (Whitewater River Watershed).

### 3.3.3 Results: Major Sub-Basins 6-10

Major Sub-Basins 6-10 are illustrated in **Figure 16**, with details provided in **Table 5**. Annual cumulative excess water availability in Major Sub-basins 6 through 10 is projected to decrease by up to 40%, with large decreases in Winter and Spring seasonal values and more moderate decreases in Summer and Fall. Only Major Sub-Basin 6 has experienced a historical season with a negative cumulative excess water availability. Projected seasonal values in all Major Sub-Basins including 6 remain positive.

Annual and seasonal cumulative excess water availability are presented for Major Sub-Basin 8 (Blue-Sinking) in **Figure 66** and for Major Sub-Basin 10 (Pigeon) in **Figure 67**. These major sub-basins are chosen as typical examples to illustrate the projected annual variations in each metric. Although most of the graphs show a mild to moderate downward trend, the year-to-year variations are large.

### 3.3.4 Results: Ohio River and Outwash (Major Sub-Basin 11)

Major Sub-Basin 11 contains the Ohio River and adjacent outwash system and is illustrated on **Figure 16** with details in **Table 5**. Assessment of changes in streamflow and baseflow for the entire Ohio River Valley through Indiana due to climate change is not feasible for this project; no time series of water availability are generated for Major Sub-Basin 11. Instead, we rely on a modeling study conducted jointly by the Huntington District of the U.S. Army Corps of Engineers, the Ohio River Basin Alliance, the Institute for Water Resources, and the Great Lakes and Ohio River Division (USACE, 2017). The work was sponsored by the Institute for Water Resources through its Responses to Climate Change program. The scope of the project was more extensive than an evaluation of the impacts of climate change on water availability, including aquatic and terrestrial ecosystems, hydroelectric energy production, and infrastructure impacts including navigation and water supply.

Details of the study results and application to the current study are provided in **Appendix D**. The cumulative excess water availability in the Fall season is projected to rise from 4,300 MGD to 4,800 MGD by 2040 and then decrease to 2,700 MGD by 2070. In the study, the Fall season was assumed to be critical. Even though this projection represents a 15% decrease in streamflow by 2070, the cumulative excess water availability is still very large, far exceeding the other major sub-basins.

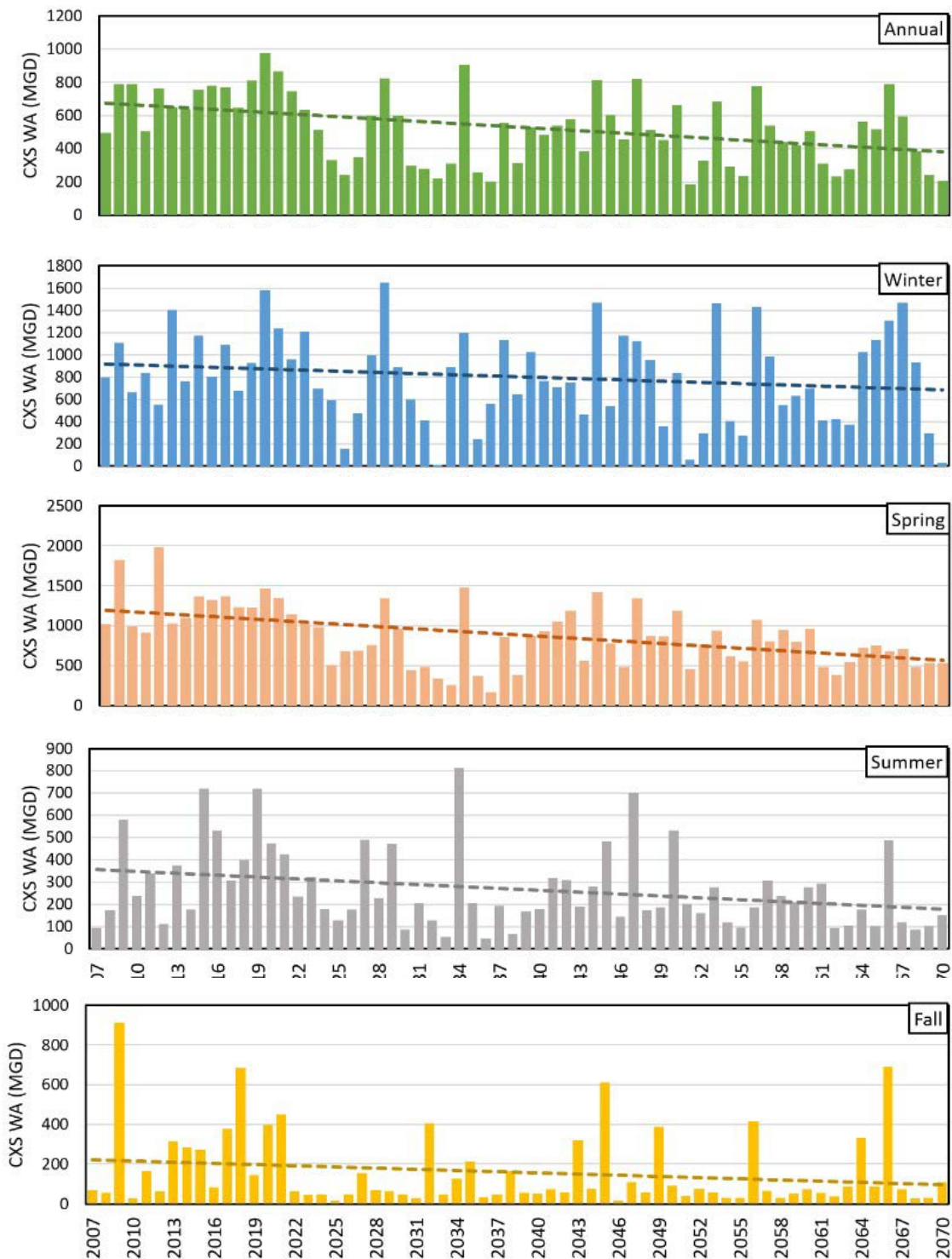


Figure 66. Annual and seasonal cumulative excess water availability (CXS WA) in Major Sub-Basin 8 (Blue-Sinking).

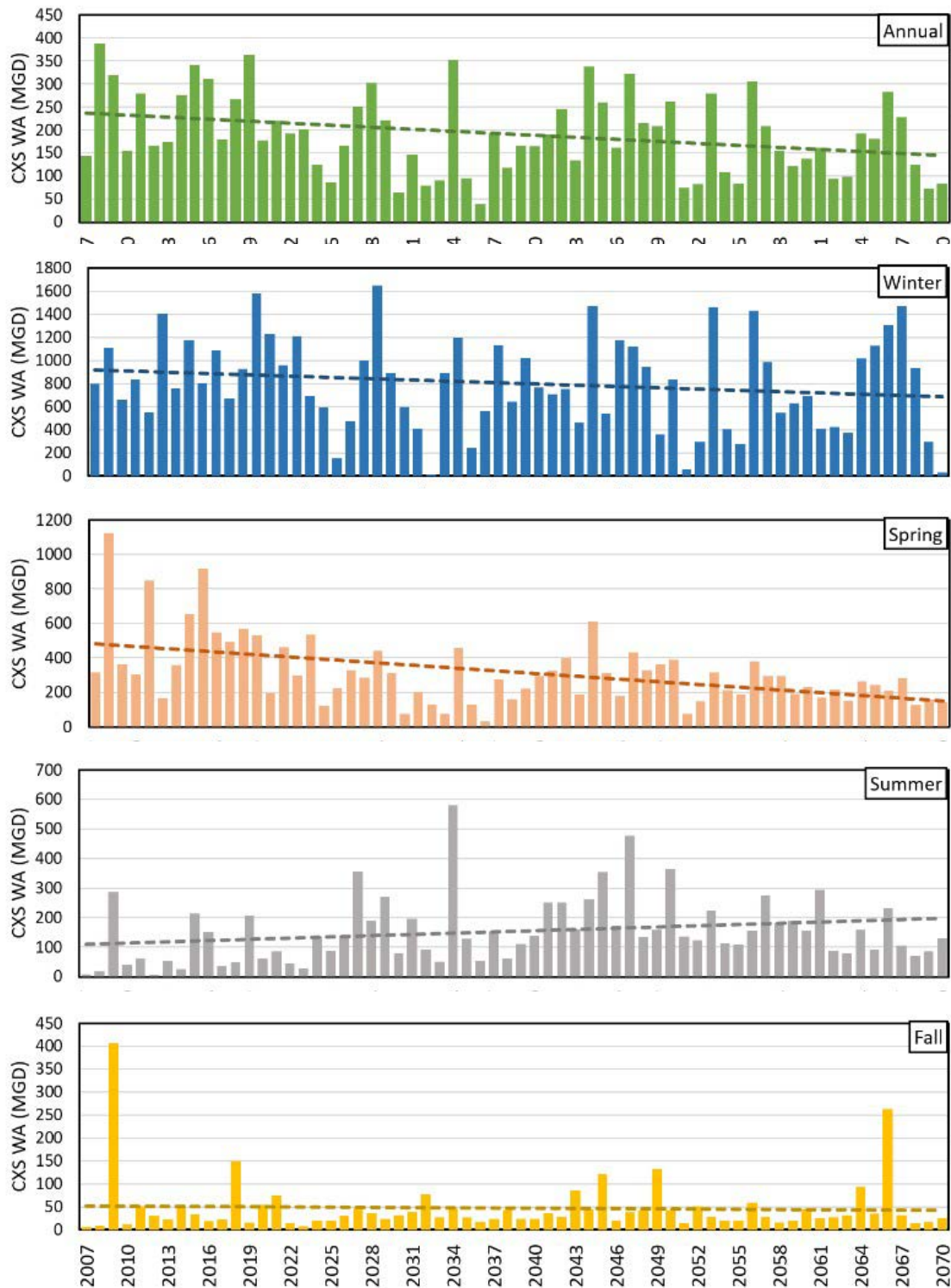


Figure 67. Annual and seasonal cumulative excess water availability (CXS WA) in Major Sub-Basin 10 (Pigeon).

## 4.0 Risks to Water Supply

This section addresses the factors that threaten long-term water supply reliability across the Region, including future climate conditions, water-quality concerns, industrial and data center pressures, and infrastructure conditions. These risks are assessed qualitatively, drawing on published monitoring records, regulatory actions, and climate projections rather than on the water-balance modeling presented earlier.

The Region's risk exposure is shaped by five interrelated pressures: a shift toward flash drought and sustained low-flow conditions on the Ohio River alongside more intense precipitation events; water-quality degradation driven by agricultural land use in the interior counties and by legacy industrial contamination along the river corridor; karst terrain in the southern counties that shortens the path from land surface to groundwater; aging treatment and conveyance infrastructure that in several communities is already past its design life; and emerging demand from data center development in Clark and Jefferson Counties. These pressures differ in character and severity between the Whitewater River watershed in the northeast, the interior and karst counties, and the Ohio River corridor. Those differences are essential context for the conservation and management recommendations provided in **Sections 5.0** and **6.0**.

### 4.1 Water Availability Risks

The future water availability analysis does not indicate a Region-wide annual water deficit through the 2070 planning horizon. However, the analysis identifies a shifting *seasonal* risk profile. In our risk analysis, a historically at-risk sub-basin is defined as a sub-basin that has had at least one seasonal occurrence of a negative cumulative excess water availability during the historical period, 2007-2023. This means that the average seasonal streamflow has dropped below the minimum instream flow target at least once historically. Similarly, a projected at-risk sub-basin has at least one predicted occurrence of negative cumulative excess water availability in the period from 2024-2070.

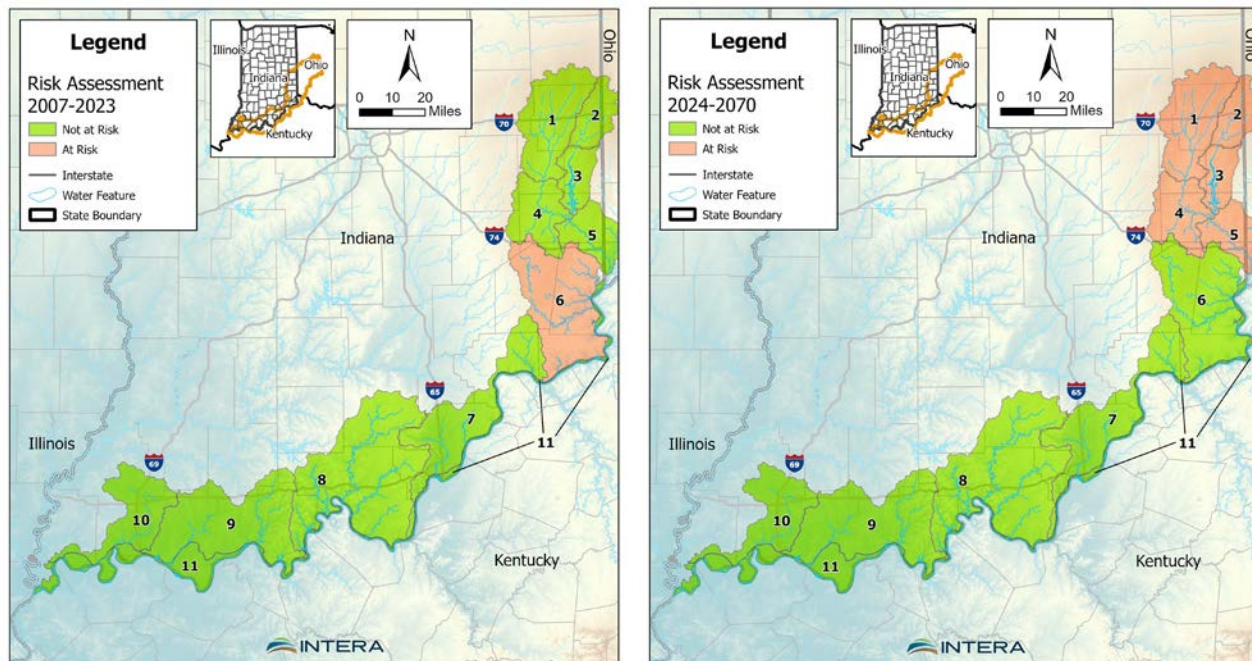
**Table 24** and **Figure 68** summarize the number of occurrences of negative seasonal cumulative excess water availability for the historical period and the projected period respectively. A negative, seasonal value of cumulative excess water availability indicates that average streamflow has decreased below the minimum instream flow threshold within a three-month period. This condition suggests a degradation of stream water quality, ecological health, and recreational use and is therefore defined as an at-risk condition.

The only historical occurrence of negative cumulative excess water availability in the Region is a single Fall season in Major Sub-Basin 6 (**Figure 16**). Future occurrences of negative values lie within the Whitewater River watershed, seven of them in Major Sub-Basin 2, and are concentrated in Fall. The Whitewater River watershed, where minimum instream flow targets are high relative to available flow, represents the Region's most acute water supply availability risk.

Major Sub-Basins 7 through 10 (**Figure 16**) show no occurrences of negative cumulative excess in either period. For Major Sub-Basin 11 (Ohio River and Outwash), no time series of water availability were generated; conditions there are assessed instead from the USACE (2017) Ohio River Basin climate study, as described in **Section 3.3.4**. The absence of occurrences (**Table 24**) for that sub-basin reflects the lack of future projections. However, our analysis shows that the cumulative excess water availability in the

Table 24. Number of occurrences of negative cumulative excess water availability by major sub-basin for the historical (2007-2023) and projected (2024-2070) periods.

| Major Sub-Basin | Historical Occurrences | Projected Occurrences |
|-----------------|------------------------|-----------------------|
| 1               | 0                      | 3                     |
| 2               | 0                      | 7                     |
| 3               | 0                      | 3                     |
| 4               | 0                      | 1                     |
| 5               | 0                      | 1                     |
| 6               | 1                      | 0                     |
| 7               | 0                      | 0                     |
| 8               | 0                      | 0                     |
| 9               | 0                      | 0                     |
| 10              | 0                      | 0                     |
| 11              | 0                      | 0                     |



## 4.2 Climate

Climate governs the timing and magnitude of groundwater recharge and streamflow, as well as the frequency of extreme events that stress water infrastructure. The historical record, present-day drought on the Ohio River, and mid- to late-century projections all indicate a widening range of both wet and dry conditions that the Region's water-supply and flood infrastructure must accommodate.

Flooding of the Ohio River dominates the Region's historical climate record. The January 1937 flood crested at nearly 80 feet at Cincinnati, caused an estimated 350 fatalities, and displaced approximately one million residents across the valley (NWS, 2026). Flood control, not water supply, remains the authorized purpose of Brookville Dam, the only reservoir in the Region with significant storage (**Section 1.3.11**).

Statewide, Indiana has warmed by about 1.2°F since 1895, and average annual precipitation has increased by approximately 5.6 inches, with a growing share arriving in heavy downpours rather than steady rainfall (Widhalm et al., 2018). The Region historically averages approximately seven days per year above 95°F and is projected to experience 38 to 51 such days per year by mid-century (Widhalm et al., 2018). Annual precipitation statewide is projected to increase 6 to 8% by mid-century and as much as 10% by late century, with Winter and Spring precipitation rising the most and snowfall becoming uncommon in southern Indiana (Hart et al., 2020).

Present-day climate risk in this Region is drought on the Ohio River. A rapid-onset flash drought affected the Ohio River Valley and upper Mississippi River Valley in 2022, reducing river stages to their lowest levels in more than a decade (National Integrated Drought Information System [NIDIS], 2025a). Conditions worsened further in 2023, when the lower Mississippi River hit record low water levels at Cairo, Illinois and Memphis, Tennessee (NIDIS, 2025a). As recently as September 2025, extremely dry conditions across the Ohio River Basin drove a rapid drought expansion that cut the Ohio River's contribution to the lower Mississippi River's flow to just 8% of total volume, compared with its typical 50% share (NIDIS, 2025b).

The Region's water-supply system is built around the assumption that the Ohio River and its tributaries, including the Whitewater, are reliably high-volume systems. Low flows reduce dilution capacity for the bacterial, nutrient, and industrial loading that contribute to the blue-green algae blooms documented at Brookville Reservoir (IDEM, 2025).

### Flooding

The Region's defining historical climate hazard is catastrophic flooding of the Ohio River. The January 1937 flood resulted from 19 consecutive days of rain falling on an already saturated basin. The river crested at nearly 80 feet at Cincinnati, disrupting public water supply and resulting in an estimated 350 fatalities and approximately one million displaced residents across the valley. The flood caused an estimated 13 million dollars in damage and inundated entire communities.

## 4.3 Water Quality

Water quality represents a distinct but interrelated risk to long-term water supply reliability in the Region, shaped by agricultural land use across the interior counties, a legacy of industrial development along the Ohio River corridor, and karst terrain in the southern counties. This section addresses the constituents of greatest concern in the Region, including nitrate, arsenic, sediment, fecal indicator bacteria, and risks to the Region's aquifer vulnerability.

### 4.3.1 Groundwater

Groundwater risk in the Region varies by aquifer type. Along the Ohio River corridor, groundwater is drawn primarily from the Ohio River Outwash Aquifer System, a thick sequence of sand and gravel deposits confined to the Ohio River valley and its major tributaries that forms the Region's most productive aquifer system (Maier, 2006; Schrader, 2004). This productivity comes with elevated susceptibility to upstream and local contamination (Ohio River Valley Sanitation Commission [ORSANCO], 2022).

In the Whitewater River watershed, coarse sand and gravel glacial outwash deposits are similarly susceptible to surface contamination (IDNR, 1988). Wayne County, at the heart of the Whitewater Basin, has been designated a priority groundwater protection area based on the susceptibility of the Whitewater Valley Aquifer System, the presence of a large number of public and private wells, and a documented inventory of contamination sources including hazardous waste facilities, landfills, and historical spill sites (IDNR, 1988).

South of the outwash-dominated river valleys, karst terrain introduces a distinct contamination pathway: sinkholes and fractures can deliver surface contaminants directly into bedrock aquifers, bypassing the soil filtration that protects groundwater elsewhere in the region (Powell, 1997). Karst bacterial contamination is a recognized concern, and local groundwater users are advised to test for coliform bacteria and turbidity after heavy rainfall (IN Well Drillers, 2026).

In the following sections a summary of groundwater sampling and testing results conducted by IDEM (2026) between 2010 and 2016 are presented.

#### 4.3.1.1 Nitrates

IDEM's Statewide Ground Water Monitoring Network (GWMN) sampled private residential and small noncommunity public wells across the Region's 21 counties between 2008 and 2016 (IDEM, 2026). Testing results for "Nitrogen, Nitrate-Nitrite" and "Nitrogen, NO<sub>2</sub> plus NO<sub>3</sub>" are combined here across different sampling rounds. 241 nitrate results were reported region-wide, with a detection frequency of 62 percent and a mean concentration of 2.8 mg/L. Eleven samples exceeded the 10 mg/L nitrate-nitrite MCL (maximum contaminant level). Results are summarized by county and physiographic setting in **Table 25**.

Elevated nitrate levels are concentrated in a small number of repeatedly sampled wells. Posey and Gibson Counties in the Wabash Lowland, Dearborn and Switzerland Counties in the Dearborn Upland, and Ripley County in the Muscatatuck Plateau together account for all 11 of the Region's nitrate exceedances (IDEM, 2026).

The three counties in the karst terrain of the Mitchell Plateau and Crawford Upland — Crawford, Harrison, and Washington — had the lowest average nitrate results of any grouping examined here (mean 1.25 mg/L) and zero MCL exceedances, despite a relatively high detection frequency (80 percent, reflecting frequent trace-level results rather than high concentrations).

Sample sizes vary considerably by county and should temper how much weight any single county's average is given: several of the counties driving the higher averages have five to nine total samples (Dearborn, Switzerland, Washington), and in more than one case the "county average" is really a small number of repeat visits to a single well.

**Table 25.** Combined results for “Nitrogen, Nitrate-Nitrite” and “NO<sub>2</sub>+NO<sub>3</sub>”. Values above the Maximum Contaminant Level (MCL) are shown in red.

| County      | Setting                | Samples (n) | Detected (%) | Mean (mg/L) | Max (mg/L) | Samples > MCL (10 mg/L) |
|-------------|------------------------|-------------|--------------|-------------|------------|-------------------------|
| Clark       | Charlestown Hills      | 0           | --           | --          | --         | --                      |
| Crawford    | Crawford Upland        | 40          | 90%          | 0.49        | 2.8        | 0                       |
| Dearborn    | Dearborn Upland        | 5           | 100%         | 8.41        | 14.0       | 3                       |
| Fayette     | New Castle Till Plains | 17          | 82%          | 4.24        | 6.1        | 0                       |
| Floyd       | Norman Upland          | 0           | --           | --          | --         | --                      |
| Franklin    | Dearborn Upland        | 6           | 50%          | 1.85        | 4.1        | 0                       |
| Gibson      | Wabash Lowland         | 12          | 33%          | 2.77        | 15.0       | 1                       |
| Harrison    | Mitchell Plateau       | 13          | 38%          | 0.54        | 2.6        | 0                       |
| Jefferson   | Dearborn Upland        | 2           | 50%          | 0.01        | 0.01       | 0                       |
| Ohio        | Dearborn Upland        | 2           | 100%         | 0.64        | 0.98       | 0                       |
| Perry       | Crawford Upland        | 10          | 70%          | 0.12        | 0.27       | 0                       |
| Posey       | Wabash Lowland         | 33          | 67%          | 5.26        | 12.6       | 4                       |
| Randolph    | New Castle Till Plains | 3           | 33%          | 0.04        | 0.04       | 0                       |
| Ripley      | Muscatatuck Plateau    | 7           | 86%          | 5.08        | 11.3       | 1                       |
| Spencer     | Booneville Hills       | 5           | 0%           | ND          | ND         | 0                       |
| Switzerland | Dearborn Upland        | 9           | 100%         | 8.61        | 27.0       | 2                       |
| Union       | New Castle Till Plains | 19          | 47%          | 1.28        | 8.6        | 0                       |
| Vanderburg  | Booneville Hills       | 4           | 25%          | 0.02        | 0.02       | 0                       |
| Warrick     | Booneville Hills       | 4           | 25%          | 0.02        | 0.02       | 0                       |
| Washington  | Mitchell Plateau       | 7           | 100%         | 6.27        | 7.2        | 0                       |
| Wayne       | New Castle Till Plains | 34          | 32%          | 1.42        | 7.4        | 0                       |

#### 4.3.1.2 Arsenic

Arsenic was detected in 54 of 239 GWMN samples (23 percent) from the Region, with 12 samples (5 percent) exceeding the 10 µg/L MCL and a maximum reported concentration of 40 µg/L (**Table 26**). As in IDEM's statewide GWMN reporting, arsenic in glacial and alluvial deposits is generally attributed to natural mineral dissolution under reducing ground water conditions rather than a specific contaminant source (IDEM, 2016).

Posey County in the Wabash Lowland accounts for 6 of the Region's 12 exceedances, including four consecutive rounds (2008–2011) at a single well. Spencer County in the Booneville Hills had the Region's single highest result (40 µg/L) alongside a second nearby well at 12 µg/L sampled the same day. Wayne and Union Counties in the New Castle Till Plains each had two exceedances (11–14 µg/L). The counties in karst terrain (Crawford, Harrison, Washington) had no arsenic detections.

Table 26. Arsenic results by county. Values above the Maximum Contaminant Level (MCL) are shown in red.

| County      | Samples (n) | Detected (%) | Mean (µg/L) | Max (µg/L) | Samples > MCL (10 µ/L) |
|-------------|-------------|--------------|-------------|------------|------------------------|
| Clark       | 0           | --           | --          | --         | --                     |
| Crawford    | 39          | 0%           | ND          | ND         | 0                      |
| Dearborn    | 5           | 40%          | 2.15        | 2.2        | 0                      |
| Fayette     | 14          | 7%           | 3.30        | 3.3        | 0                      |
| Floyd       | 0           | --           | --          | --         | --                     |
| Franklin    | 6           | 50%          | 4.00        | 4.7        | 0                      |
| Gibson      | 12          | 0%           | ND          | ND         | 0                      |
| Harrison    | 13          | 0%           | ND          | ND         | 0                      |
| Jefferson   | 2           | 50%          | 2.30        | 2.3        | 0                      |
| Ohio        | 2           | 0%           | ND          | ND         | 0                      |
| Perry       | 9           | 0%           | ND          | ND         | 0                      |
| Posey       | 34          | 35%          | 9.15        | 28.0       | 6                      |
| Randolph    | 3           | 100%         | 4.90        | 5.6        | 0                      |
| Ripley      | 7           | 0%           | ND          | ND         | 0                      |
| Spencer     | 5           | 80%          | 15.82       | 40.0       | 2                      |
| Switzerland | 8           | 0%           | ND          | ND         | 0                      |
| Union       | 20          | 45%          | 6.19        | 11.0       | 2                      |
| Vanderburgh | 4           | 0%           | ND          | ND         | 0                      |
| Warrick     | 4           | 0%           | ND          | ND         | 0                      |
| Washington  | 7           | 0%           | ND          | ND         | 0                      |
| Wayne       | 35          | 43%          | 6.83        | 14.0       | 2                      |

#### 4.3.1.3 General Chemistry: Chloride, Sulfate, and Iron

Three general chemistry parameters exceeded the EPA Secondary Maximum Contaminant Levels (SMCLs) often enough to be worth noting, though none carry a health-based MCL — these are aesthetic standards addressing taste, odor, and staining, not drinking water safety thresholds (**Table 27**).

**Chloride** exceeded its 250 mg/L SMCL in 48 of 239 samples (20 percent), reaching as high as 2,000 mg/L in Gibson County. Unlike arsenic or nitrate, chloride exceedances were not concentrated in a few wells or counties — they appeared in 16 of the Region's 21 counties, generally as isolated high readings rather than persistent conditions at the same well. Elevated chloride in southern Indiana ground water is commonly attributed to natural saline formation water at depth and, in shallow wells, to road salt or other surface chloride sources.

**Sulfate** exceeded the 250 mg/L SMCL in 16 of 239 samples (7 percent), but almost all of this comes from just two wells: a Harrison County well at 1,500 mg/L and a Crawford County well that measured 1,000–1,300 mg/L consistently across all six of its sampling rounds between 2009 and 2013.

**Iron** exceeded the 0.3 mg/L SMCL in 81 of 240 samples (34 percent), spread across most of the Region with no strong county pattern. This is consistent with, though somewhat lower than, the 67 percent exceedance rate IDEM reported statewide in the 2016 GWMN report (IDEM, 2016).

Table 27. Secondary Maximum Contaminant Level (SMCL) exceedances for general chemistry parameters.

| Parameter       | SMCL (mg/L) | Samples (n) | Detected (%) | Max (mg/L) | Samples > SMCL                                          |
|-----------------|-------------|-------------|--------------|------------|---------------------------------------------------------|
| <b>Chloride</b> | 250         | 239         | 98%          | 2,000      | 48 (20%), spread across 16 of 21 counties               |
| <b>Sulfate</b>  | 250         | 239         | 93%          | 1,500      | 16 (7%), concentrated in 2 wells (Crawford, Harrison)   |
| <b>Iron</b>     | 0.3         | 240         | 51%          | 4.6        | 81 (34%), widespread, consistent with statewide pattern |

## 4.3.2 Surface Water

Surface-water quality risk in the Region follows two patterns. In the interior and Whitewater River counties, row-crop agriculture and subsurface drainage (**Section 1.3.7**) deliver nutrients, sediment, and bacteria to streams with limited attenuation. Along the Ohio River corridor, the dominant pressures are point sources: combined sewer overflows from older municipal systems in Clark, Floyd, and Vanderburgh counties, and discharges from the mining and quarrying activity described in **Section 4.3.4**. Both patterns impact supply where they coincide with a public intake or an alluvial wellfield in hydraulic connection with the river, or groundwater under the influence of surface water (**Section 4.3.1**).

### 4.3.2.1 Nitrate

Excess nitrogen from agricultural land use is Indiana's most documented water quality risk. In this Region, nitrogen fertilizer application, livestock biosolids, and septic system effluent are the primary sources of nitrate loading to both groundwater and surface water (USDA, 2024). Subsurface agricultural drains create efficient pathways that allow nitrate to bypass slower natural attenuation in soil and reach streams quickly, a mechanism documented specifically for Midwest agricultural watersheds (Adelsperger et al., 2023; Podzorski and Ryberg, 2025).

### 4.3.2.2 Sediment

Sediment functions both as a physical hazard to aquatic habitat and as a reservoir for legacy toxic substances that can be remobilized by high-flow events. In the Whitewater Basin, sediments have been documented to carry elevated concentrations of metals and organic contaminants tied to historical industrial and agricultural activity (IDNR, 1988). Increased runoff from more intense precipitation events poses a direct sediment and erosion risk across the Region's agricultural interior counties, where row-crop cultivation and tile drainage increase the volume and speed of surface runoff during storm events (Adelsperger et al., 2023).

In the Region's coal-bearing counties, sediment quality is further affected by mining-related inputs. A USGS assessment of the Cypress Creek watershed in Warrick County (**Section 4.3.4.1**) documented

elevated specific conductance, hardness, and major ion concentrations, and pH as low as 1.2, in tributaries draining mined and reclaimed lands, with concentrations of iron, manganese, sulfate, legacy pesticides and PCBs in streambed sediment exceeding EPA water-quality limits (Bobo and Peters, 1980).

#### 4.3.2.3 Eutrophication and Harmful Algal Blooms

The Brookville Reservoir has a normal storage capacity of 47 billion gallons and is the only reservoir in the Region with significant storage (**Section 1.3.11**). Brookville Reservoir has received repeated blue-green algae advisories in recent years, prompting caution notices for swimmers and boaters, and these bloom events recur at Brookville and other Indiana reservoirs on a near-annual basis. IDEM maintains a statewide blue-green algae monitoring and advisory program (IDEM, 2025).

Harmful algal blooms are not confined to the Region's reservoirs. The Ohio River mainstem has experienced blooms large enough to threaten drinking water intakes. In 2015, a harmful algal bloom (HAB) expanded to cover the Ohio River from Pike Island Lock and Dam to Cannelton Lock and Dam, a stretch of more than 630 river miles that includes the river's passage through Perry County (ORSANCO, 2021). The HAB prompted contact-recreation advisories issued jointly by Ohio, West Virginia, Kentucky, and Indiana that remained in place for two months, and water utilities along the river had to switch to alternate water sources as the bloom reached their intakes (ORSANCO, 2021). The Ohio River Valley Water Sanitation Commission (ORSANCO) now maintains a dedicated harmful algal bloom monitoring and response program (ORSANCO, 2021).

#### 4.3.2.4 CAFOs

Research has shown that contaminants from CAFOs come from (1) leaking manure lagoons, (2) overflow of lagoons when it rains, and (3) runoff from applications of waste to farm fields. These generally accepted livestock waste management practices do not adequately protect water resources from contamination from excessive nutrients, microbial pathogens, and pharmaceuticals present in the waste (Burkholder et al., 2007). Promotion of best management practices is needed to minimize inputs of nutrients and other chemicals from CAFOs (**Figure 69**). The presence of CAFOs in karst landscapes, like those that occur in the Region, can be particularly troublesome (Erb and Stieglitz, 2007).

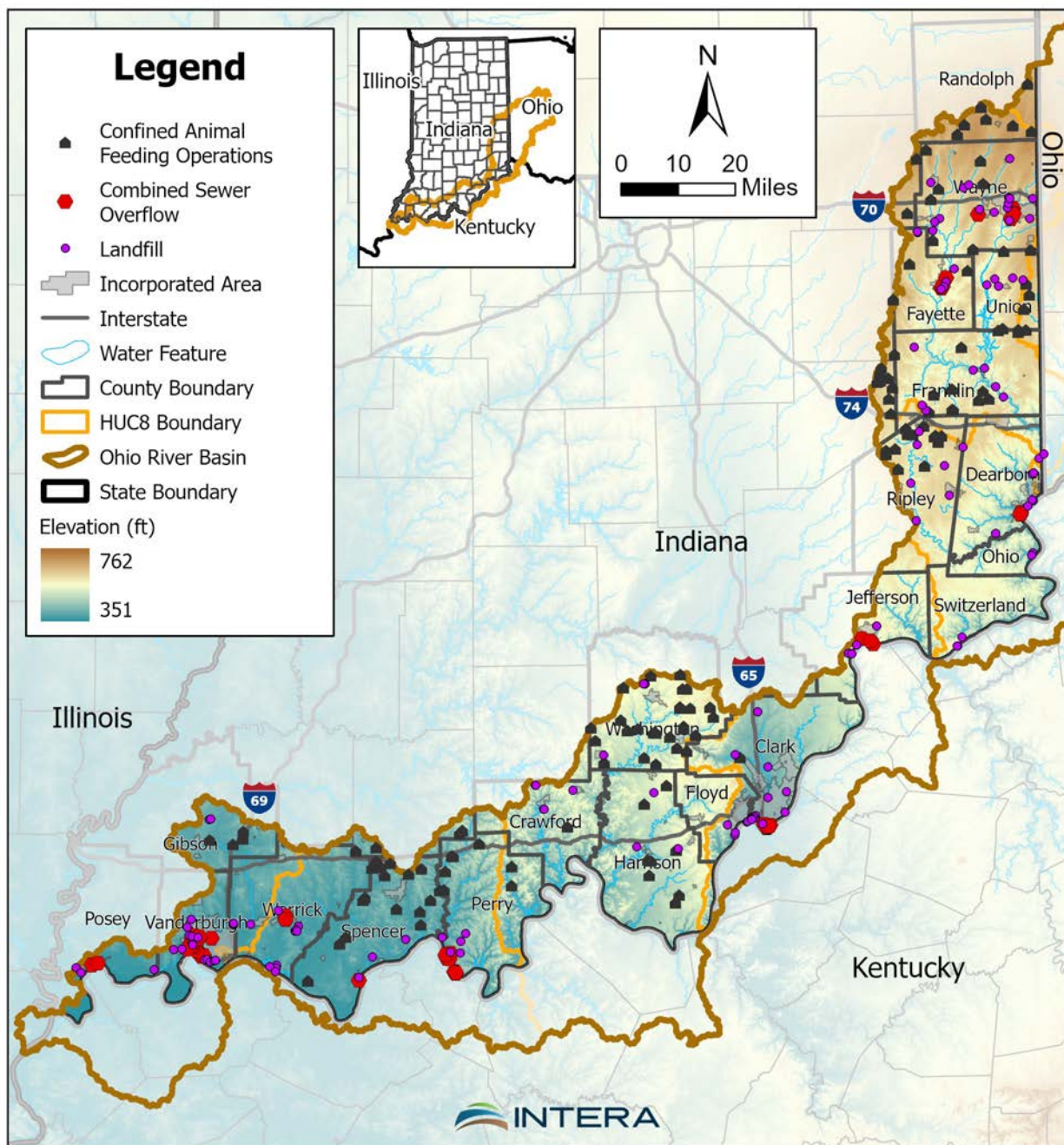


Figure 69. Potential sources of surface-water contamination in the Ohio River and Southeast Indiana Water Region.

#### 4.3.2.5 Fecal Coliform and *E. coli*

The Whitewater River watershed has a long-documented and still-active bacterial contamination problem. IDEM's East Fork Whitewater River total maximum daily load (TMDL), based on a comprehensive 2002 watershed survey covering Wayne, Union, Fayette, and Franklin counties, identified *E. coli* as the primary cause of impairment and established TMDLs addressing 11 separate impairment segments (IDEM, 2006). Indiana's 303(d) list is reissued every two years under Clean Water Act requirements, and *E. coli* remains one of the most common impairment listings statewide in each successive cycle, including the finalized 2024 list, indicating this is a persistent rather than historical problem for the watershed (IDEM, 2024). High fecal coliform and *E. coli* counts in the basin have been consistently linked to the same sources across multiple survey cycles: agricultural and pasture runoff, land application of manure, urban and rural stormwater runoff, straight-pipe discharges, failing home sewage disposal systems, and combined sewer overflows (IDEM, 2006).

Along the Ohio River mainstem, bacterial and combined sewer overflow (CSO) issues have historically affected the Region's largest cities on the Indiana side, Jeffersonville and New Albany, in Clark and Floyd Counties respectively (**Figure 69**). Jeffersonville in Clark County entered a Clean Water Act consent decree with EPA and the U.S. Department of Justice in 2009 requiring a comprehensive plan to reduce or eliminate combined sewer overflows into the Ohio River, at an estimated cost of 100 to 150 million dollars (U.S. Department of Justice, 2009). New Albany in Floyd County operated under a sewer connection ban for three decades before lifting it in 2021 following completion of wastewater treatment facility upgrades; prior to those improvements, the city reported nearly 200 overflow locations capable of discharging an estimated 15 million gallons of untreated sewage into yards, streams, and the river during large rain events. Evansville's utility is likewise under federal mandate to reduce combined sewer overflows into the Ohio River and Pigeon Creek; the Renew Evansville capital program is described in **Section 4.5** (EWSU, 2026).

#### 4.3.3 Per- and Polyfluoroalkyl Substances (PFAS)

Per- and poly- fluoroalkyl substances (PFAS) are a large family of manufactured chemicals used since the 1940s in industrial processes and in products such as firefighting foam, nonstick coatings, stain- and water-resistant materials, and food packaging. They are often called “forever chemicals” because many PFAS resist natural breakdown and can remain in the environment for decades.

Long-term exposure to certain PFAS, particularly well-studied compounds such as Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS), has been associated with increased cholesterol, reduced immune response, adverse developmental and reproductive effects, liver and thyroid impacts, and increased risk of certain cancers.

PFAS contamination is especially important for drinking-water supplies. Once PFAS enter a groundwater aquifer or surface-water source, affected utilities may need advanced treatment, such as granular activated carbon, ion exchange, or reverse osmosis, or may need to develop an alternative source. These treatment technologies come at a very high cost, particularly compared to typical groundwater treatment costs to which the utilities in the Region are accustomed.

The Ohio River and surrounding alluvial aquifer are known to have PFAS and other emerging contamination in both groundwater and surface water. Multiple studies by ORSANCO, the Ohio Environmental Protection Agency (OEPA), and IDEM indicate PFAS contamination of the Region (ORSANCO, 2022; OEPA, 2025; IDEM 2023, 2024). A summary of PFAS monitoring conducted by

ORSANCO at surface water sites along the Ohio River is provided in **Figure 70**. While this figure does not show groundwater sampling results, it does highlight the presence of PFAS in the most significant water source in the Region.

PFAS testing conducted by IDEM between March 2021 and December 2023 detected PFAS above EPA health advisory levels in public drinking water in several counties within the Region, including Clark, Crawford, Floyd, Gibson, Harrison, Jefferson, Perry, Posey, and Warrick (Indiana Office of the Attorney General, 2024). IDEM's untreated-water testing during the same period also detected PFAS at utilities in Dearborn County (Indiana Environmental Reporter, 2021). As of 2022, IDEM had analyzed more than 66,000 fish tissue samples statewide for PFAS and found PFOS, one of the most common and best-studied PFAS compounds, in 100% of samples analyzed, indicating that PFAS contamination is not confined to drinking water intakes but is actively cycling through the aquatic food chain (Indiana Office of the Attorney General, 2024). A complete summary of IDEM's PFAS activities and testing results in Indiana can be found at <https://www.in.gov/idem/resources/per-and-polyfluoroalkyl-substances-pfas>.

The Region is also home to the state's first PFAS treatment installation. Indiana American Water's Charlestown treatment plant in Clark County began operating a dedicated PFAS removal system in December 2025, a nearly six-million-dollar investment serving approximately 3,000 customers, following earlier IDEM sampling that had detected PFHxA and PFOA in that system's water (PR Newswire, 2026; Indiana Environmental Reporter, 2021).

The EPA National Primary Drinking Water Regulation for PFAS established the first enforceable maximum contaminant levels for six PFAS compounds, including a 4 parts-per-trillion limit (4 nanograms per liter) for PFOA and PFOS individually. The EPA has since proposed rescinding limits for four of the six regulated compounds while retaining the PFOA and PFOS standards, and in 2026 proposed extending the compliance deadline for those two compounds from 2029 to 2031 (EPA, 2024; EPA, 2026).

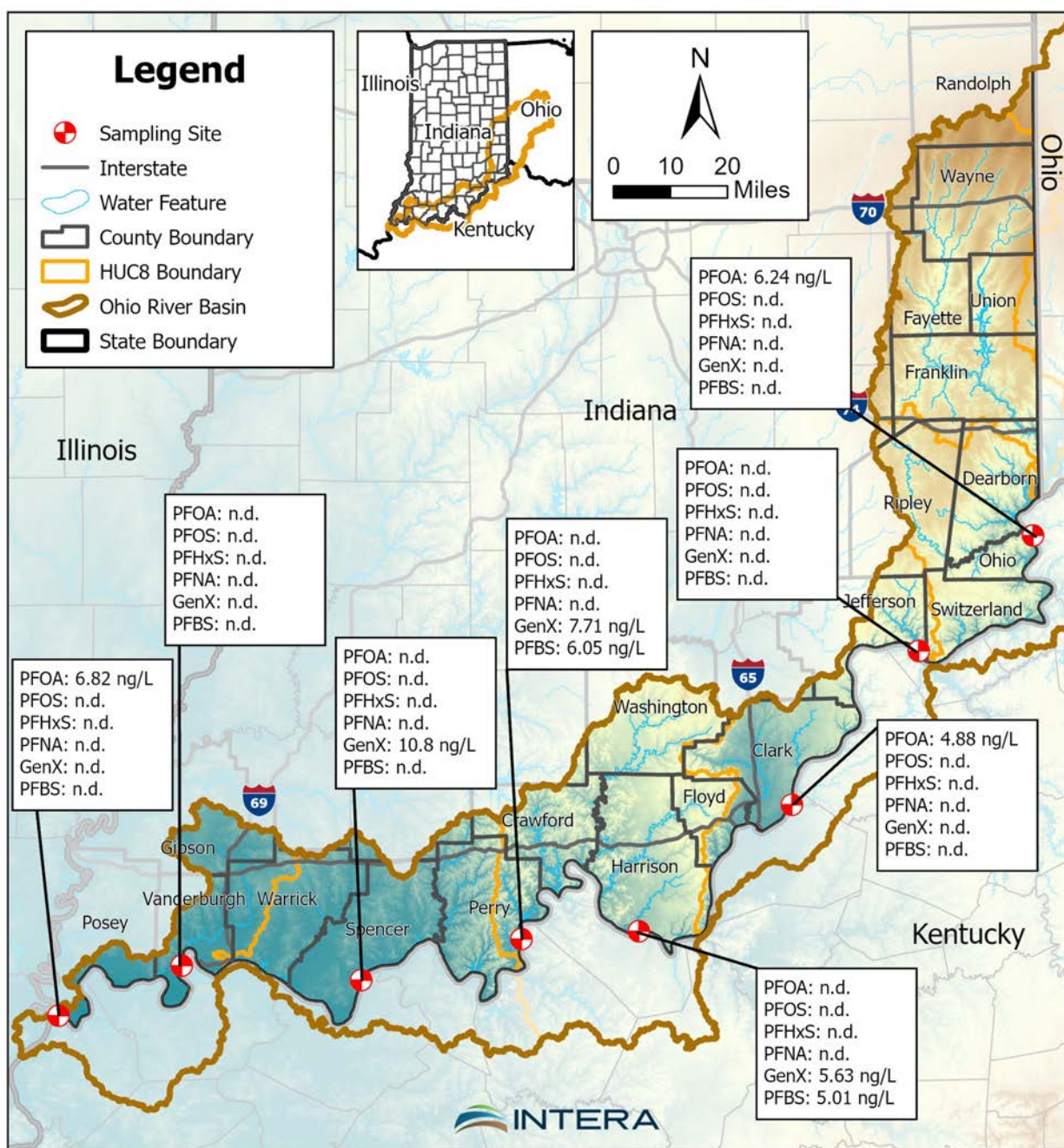


Figure 70. PFAS monitoring of the Ohio River; concentrations are provided in nanograms per liter; n.d. indicates no detection; ng/L = nanogram per liter (ORSANCO, 2022).

### 4.3.4 Industrial Risks

Industrial land use presents water-quality risks that are typically localized, chemically persistent, and capable of affecting water quality for decades after the activity has ceased. The activities that account for most of this risk in the Region are legacy and active coal mining in the southwestern counties along the eastern edge of the Illinois Basin coalfield and limestone quarrying and cement manufacturing in the karst terrain of Harrison and Crawford counties. In each case, the affected areas coincide with aquifers and surface-water intakes on which public water utilities in the Region rely.

#### 4.3.4.1 Quarrying, Mining, and Manufacturing

Coal mining is a legacy and ongoing activity in the Region's southwestern counties, including Warrick, Spencer, Gibson, and Pike, which lie along the eastern edge of the Illinois Basin coalfield (**Figure 71**). Acid mine drainage produces highly acidic, metal-laden water and sediment that can degrade the quality of both groundwater and surface water for decades after mining ends. The Tecumseh Abandoned Mine Land site in Warrick County required construction of a 40-acre passive treatment wetland and an anoxic limestone drain to treat a continuous acid seep from a 58-acre coal slurry impoundment, illustrating both the severity and the multi-decade remediation timeline associated with legacy coal mining sites in the Region (ITRC, 2010).

Limestone quarrying and cement manufacturing are among the Region's most significant non-agricultural industrial land uses, concentrated in the karst terrain of Harrison and Crawford counties. Quarrying and cement manufacturing can threaten water quality by introducing sediment into surface waters, altering the local groundwater system, and discharging alkaline wastewater into surface waters. In addition, heavy equipment can leak fuel and oil into surface waters and groundwater. Harrison County hosts multiple active and historical limestone operations, including quarries producing crushed stone, aggregate, and agricultural lime, and a former cement kiln operation, while a Mulzer Crushed Stone quarry operates directly on the Ohio River between New Amsterdam and Mauckport. The Indiana Geological Survey has identified southern Harrison County and central Clark County specifically as favorable areas for cement manufacturing, citing accessible Mississippian limestone and, in Harrison County's case, direct barge access on the Ohio River (Indiana Geological Survey, 1958). **Figure 71** shows the distribution of historical coal mines and abandoned quarries across the Region.

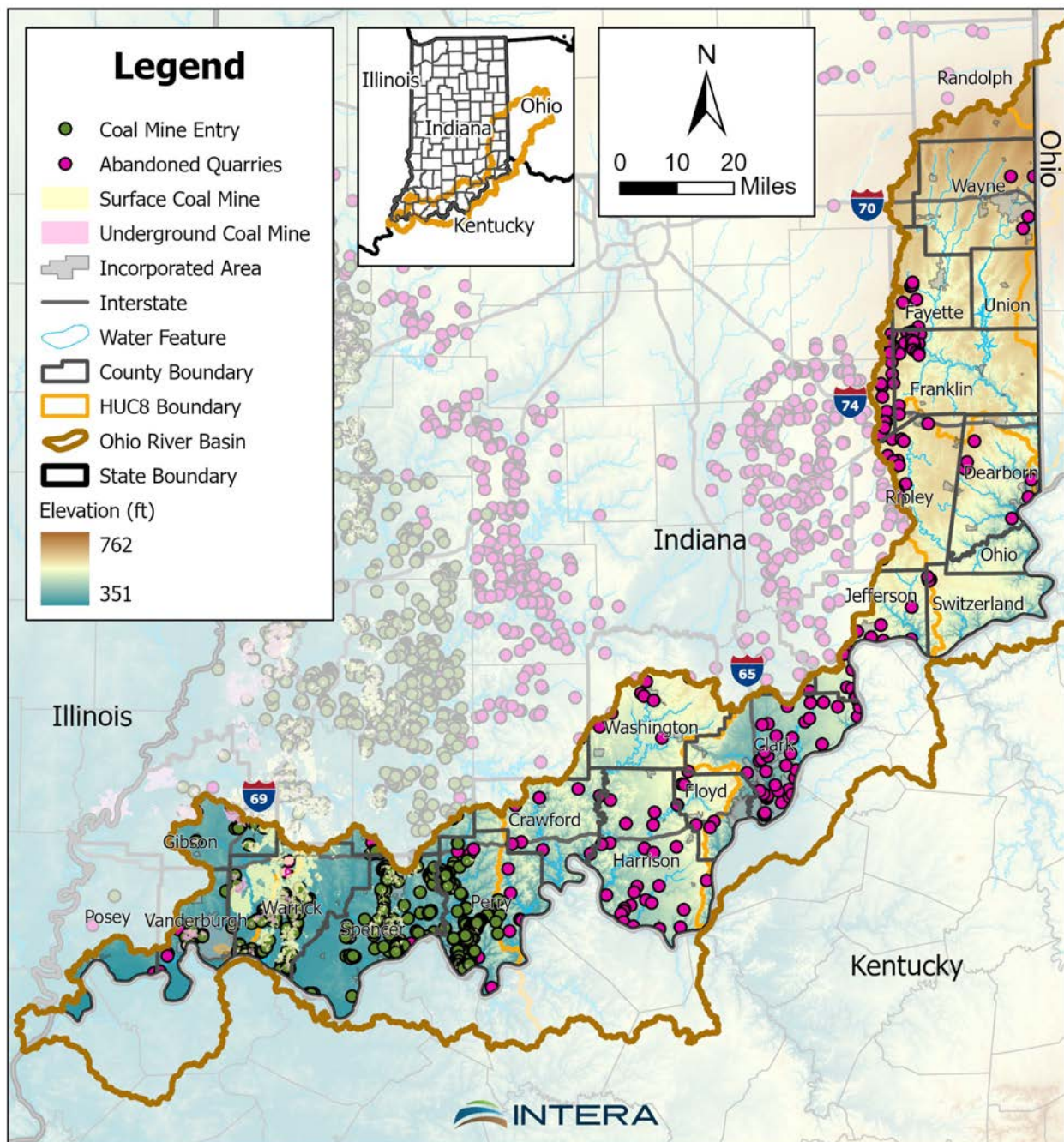


Figure 71. Coal mines and abandoned quarries in the Region (data from Hasenmueller and Ault, 2001; IGS, 2003; IDNR, 2017a, 2017b, 2017c).

## 4.4 Data Centers

Data center development is an emerging pressure in the Region. Concentrated in Clark County, Meta's roughly 700,000-square-foot data center campus at the River Ridge Commerce Center in Jeffersonville is nearing completion. A smaller data center proposal at the privately owned Shadow Lake Business Park in Charlestown was under plan commission review as of mid-2026 (LPM News, 2026). In response, Jeffersonville and New Albany have each adopted one-year moratoriums on new data center construction. Sellersburg is updating its zoning code to exclude data centers from mixed-use districts, and Clark County's commissioners separately considered a county-wide moratorium covering unincorporated areas (WDRB, 2026; News and Tribune, 2026). Two additional proposals within or near the Region include a 310-megawatt project near the former Marble Hill nuclear plant site in Hanover, Jefferson County, and a 600-megawatt project in the Gibson or Posey County area (AI Law Tracker, 2026).

As in other parts of the state, the primary local concern has been power and water demand. Duke Energy is shifting \$216 million in grid upgrade costs for the Jeffersonville Meta facility onto its broader Indiana customer base (Cause No. 45647, TDSIC-5) and separately negotiated an arrangement allowing Meta to purchase power from other providers rather than from Duke's own regulated generation (Citizens Action Coalition, 2026).

No single agency currently evaluates the combined effect of data center site withdrawals, associated power-plant cooling withdrawals, wastewater discharge composition, and land use impacts as one cumulative water budget.

## 4.5 Infrastructure

The Region's water and wastewater infrastructure is, in many places, well past its designed service life. Currently under renovations, the Evansville Water and Sewer Utility (EWSU) maintains more than 1,000 miles of water mains, 600 miles of which are cast iron pipe with an average age of 90 years, and its water treatment plant was built more than 125 years ago. EWSU has also identified as many as 3,000 homes that may be connected to lead service lines and is implementing a phased inventory, testing, and replacement program to meet a new federal requirement that all lead service lines be replaced within 10 years (WEHT-TV, 2024; EPA, 2025).

Combined sewer overflows remain the Region's most capital-intensive infrastructure liability. Evansville's Renew Evansville program represents a 729 million dollar, 25-year capital commitment under a federal Clean Water Act mandate, and Jeffersonville's 2009 consent decree required an estimated 100 to 150 million dollars in sewer system improvements (EWSU; U.S. Department of Justice, 2009). New Albany's sewer connection ban, in place for three decades before being lifted in 2021, illustrates how directly aging wastewater infrastructure can constrain a community's ability to grow until capital improvements are completed (Inside Indiana Business, 2021).

Indiana American Water, which serves several communities within the Region, reported more than 246 million dollars in statewide system upgrades in 2025, including 19 million dollars earmarked specifically for lead service line removal in 2026, and its Charlestown treatment plant now hosts the state's first operating PFAS removal system (PR Newswire, 2026). Larger utilities in the Region are therefore addressing emerging contaminants alongside conventional aging-pipe and CSO liabilities. The scale of

remaining need, particularly for smaller municipal utilities without access to comparable capital budgets, remains a material risk to long-term water supply reliability across the Region.

In addition to these statewide concerns, two Region-specific infrastructure issues exist. First, the extensive length of water mains that transport water sourced from the Ohio River corridor to the upland regions create continuing maintenance costs. Second, sinkholes in karst regions have been responsible for water main breaks, and continuing water losses.

## 5.0 Conservation

Water conservation and use efficiency are among the most cost-effective strategies available for extending the useful life of the water resources evaluated in this Study, typically requiring far less capital investment than developing new source capacity, storage, or conveyance infrastructure. Conservation is also directly relevant to Indiana's Water Shortage Plan (IDNR, 2015). The plan establishes the Q80 flow threshold, measured against the 7Q10 and Q90 minimum instream flow values calculated for each sub-basin in **Section 3.2.1**, as the trigger for initiating voluntary withdrawal reductions and local drought-response action during the May-through-October low-flow period. Because both public water supply and agricultural irrigation demand across the Region peak sharply during these same Summer months, reducing discretionary and seasonal demand directly reduces the likelihood that sub-basin flows will reach this drought-response trigger.

Enhanced water conservation and water use efficiency for the Region could include the following, organized by water use sector:

**Public water supply and non-revenue water:** Enhanced leak detection, meter testing, and more aggressive capital improvement planning for the over 100 public water utilities serving the Region, (**Appendix A** and **Table 2**) would reduce non-revenue water losses and extend the useful life of existing distribution infrastructure. Indiana water utilities are required under IC 8-1-30.8 to submit validated water loss audits to the IFA every even-numbered year; of the Region's utilities, 87 submitted a validated audit in the most recent reporting cycle. For these 87 utilities, the combined non-revenue water totaled approximately 4.7 billion gallons and an associated cost of roughly 10.5 million dollars in the 2023 audit year (IFA, 2024). Note that this is without all utilities in the Region reporting, therefore, this is underestimating the true costs. Continued and expanded participation in this program, supported by state funding and technical assistance where available, represents a low-cost opportunity to reduce real and apparent losses, particularly among the Region's smaller groundwater-dependent systems and the many purchased-water arrangements described in **Section 1.3.3**.

**Seasonal outdoor water use:** Public supply withdrawals exhibit a pronounced and consistent Summer peak (**Section 2.1.1**) driven by lawn and landscape irrigation, car washing, and pool filling. Local ordinances or incentive programs targeting this discretionary outdoor demand, such as watering schedules, turf reduction, and increasing block rate structures, could reduce peak-day demand and the associated infrastructure sizing burden without materially affecting essential domestic use.

**Agricultural irrigation:** Although irrigation remains a small fraction of total regional withdrawals, registered irrigation withdrawals have roughly doubled since the late 1980s and early 1990s, reaching a drought-driven peak of approximately 4.6 MGD in 2012 and recently ranging between 1.6 and 2.6 MGD (**Section 2.1.3.1**). Withdrawals are concentrated in Spencer County, which has the largest reported irrigation withdrawals in the Region (0.5 – 1.5 MGD), with generally increasing seasonal peaks also observed in Posey, and Vanderburgh counties. Because irrigation demand is sharply seasonal and concentrated in the June-through-August period, efficiency improvements among irrigators, such as soil moisture-based scheduling, conversion to low-pressure or drip systems, and drought-contingency planning, would directly target the Region's most demand-sensitive counties and critical season.

**Rural and self-supplied use:** Self-supplied residential and rural agricultural users, including livestock and aquaculture operations concentrated near Richmond and Wayne, Randolph, and Ripley Counties, are

not captured by utility-level conservation programs because they rely on private wells (**Section 2.1.3**). County-level outreach and education on fixture and livestock-watering system efficiency, delivered in coordination with county health departments and agricultural extension offices, would extend conservation benefits to this otherwise unreached share of regional demand.

**Energy and power generation:** Energy production is by far the largest water-use sector in the Region by withdrawal volume, though the great majority is drawn from surface water and returned to the source as non-consumptive once-through cooling flow rather than consumed outright. Regional withdrawals have declined by roughly half since the mid-2000s, from approximately 2,200 to 2,800 MGD to approximately 1,300 to 1,500 MGD, driven by the retirement of older thermoelectric generating capacity (**Section 2.1.4**). Continued coordination with plant operators in Jefferson, Dearborn, Warrick, and Spencer counties as this generating fleet modernizes represents an opportunity to sustain or extend this long-term downward trend.

**Industrial and commercial use:** Unlike the region's power generation sector, industrial withdrawals have grown over the period of record, from approximately 22 MGD in the mid-1980s to a range of 30 to 47 MGD over the past two decades, concentrated along the Ohio River corridor near Evansville and Jeffersonville and within the Whitewater watershed near Richmond (**Section 2.1.5**). Continued encouragement of water recycling, reuse, and process efficiency among the Region's industrial water users would help offset this growth and reduce pressure on the same river corridors that also supply public water utilities and power generation withdrawals.

Enhanced water conservation and use efficiency requires sustained public education and outreach and ongoing coordination among the Region's water providers, county agencies, and the IDNR and IFA at the state level.

## 6.0 Findings and Recommendations

This section synthesizes the demand, availability, and risk analyses presented in **Sections 2.0** through **4.0** into a set of overall findings for the Ohio River and Southeast Indiana Region, followed by a consolidated set of recommendations intended to guide state agencies, regional utilities, and local decision-makers in planning for reliable and sustainable water supplies through 2070. County level summaries of water demand are provided in **Appendix F**.

### 6.1 Water Demand

Total water demand across all use sectors in the Region is projected to decline from approximately 2,013 MGD in 2020 to approximately 761 MGD by 2070, a decrease of roughly 62%. This decline is driven almost entirely by the retirement of the Region's once-through coal-fired generating capacity: power generation withdrawals are projected to decline from about 1,881 MGD to about 619 MGD over the planning horizon. Because these withdrawals are predominantly non-consumptive cooling flows returned to the source, the projected decline represents a large reduction in gross withdrawal rather than an equivalent reduction in consumptive use. The change is also highly concentrated geographically. Water demands in Jefferson County are projected to decline from about 1,212 MGD in 2020 to less than 7 MGD by 2070, with nearly all of that decline occurring between 2035 and 2050, whereas Warrick County holds the Region's largest sustained withdrawal at approximately 607 MGD throughout the forecast period.

Among the remaining sectors, the picture is one of modest change rather than growth. Public water supply demand rises from about 80 MGD in 2020 to about 93 MGD in 2025 before easing to about 84 MGD by 2070, as per-capita efficiency gains offset modest population growth. Industrial and commercial demand is expected to grow slightly, from about 44 MGD to about 46 MGD. Agricultural irrigation is the fastest-growing sector in percentage terms, nearly tripling from about 1.6 MGD to about 6.1 MGD, but remains small in absolute volume. Self-supplied residential demand is expected to decline slightly, from about 4.5 MGD to about 3.8 MGD, while miscellaneous and rural withdrawals each grow by less than 1 MGD.

Two features of the forecast warrant emphasis for planning purposes. First, because power generation is an order of magnitude larger than every other sector, regional totals obscure the sectors that actually drive local infrastructure decisions; public supply, industry, and irrigation are best evaluated separately from the regional total. Second, irrigation remains the most climate-sensitive and least certain sector in the forecast, and it is concentrated in Spencer, Posey, and Vanderburgh Counties, where withdrawals peak sharply during the Summer season. Withdrawals from animal agriculture operations below the water-use reporting threshold are not included in these totals but are estimated in **Section 2.2.5.3**.

### 6.2 Water Availability

Historical cumulative excess water availability (2007–2023) is positive across nearly all the Region's major sub-basins on both an annual and a seasonal basis, indicating that current withdrawals are generally supported by naturally occurring streamflow after accounting for minimum instream flow targets. Availability is, however, distributed very unevenly. The Ohio River and Outwash Sub-Basin (Major Sub-Basin 11) has a minimum Summer cumulative excess water availability of approximately 3,400 MGD, whereas minimum Summer values in the remaining major sub-basins range from roughly 1

MGD to less than 100 MGD. Only Major Sub-Basin 6 (containing portions of Dearborn, Ripley, Ohio and Switzerland Counties) has experienced a historical season of negative cumulative excess water availability, and only once in the period of record.

Looking forward, the interior sub-basins and the Ohio River mainstem diverge. In the Whitewater River watershed (Major Sub-Basins 1 through 5), annual cumulative excess water availability is projected to decline in every sub-basin, with Summer and Fall, the critical seasons, decreasing slightly by 2070. All five Whitewater sub-basins are projected to experience at least one season of negative cumulative excess water availability during the projection period, with Major Sub-Basin 2 (containing the headwaters of the East Fork of the Whitewater River) having the most frequent occurrences, and with occurrences concentrated in Fall.

In Major Sub-Basins 6 through 10, annual availability is projected to decrease by as much as 40%, with the largest declines in Winter and Spring and more moderate declines in Summer and Fall. All projected seasonal values in these sub-basins nonetheless remain positive. Taken together, the Whitewater watershed, where minimum instream flow targets are high relative to available flow, is the part of the Region most at risk.

Along the Ohio River (Major Sub-Basin 11), projections drawn from the U.S. Army Corps of Engineers and Ohio River Forecast Center modeling indicate that mean annual streamflow near Louisville will increase 5 to 15% through 2070, while Fall minimum streamflow is projected to decline 5 to 15% over the 2041–2070 period. The seasonal signal is correspondingly split: minimum Spring cumulative excess water availability is projected to rise from approximately 54,400 MGD in the baseline period to approximately 64,700 MGD, while minimum Fall cumulative excess water availability decreases from approximately 4,300 MGD to approximately 2,700 MGD. The Ohio River therefore remains, by a wide margin, the Region's most abundant source, but its low-flow season is projected to tighten while the Region's supply system is becoming more dependent on it.

## 6.3 Risks to Water Supply

**Section 4.0** identified risks to the Region's water supply that operate independently of the demand and availability balance. The findings below summarize each, along with the asymmetry between the Ohio River corridor and the Region's interior and Whitewater watershed counties, in how those risks present.

**Climate:** The Region's defining historical hazard is catastrophic flooding, however, this hazard is now considered alongside an ever-growing concern, drought. A rapid-onset flash drought reduced Ohio River stages to their lowest levels in more than a decade in 2022, conditions worsened in 2023, and by September 2025 the Ohio River's contribution to lower Mississippi River flow had fallen to 8% of total volume against a typical share of 50%. Looking forward, the Region is projected to see the largest increase in extreme heat of any part of the state, moving from approximately seven days per year above 95°F historically to 38 to 51 such days per year by mid-century, while annual precipitation increases 6 to 8% by mid-century and as much as 10% by late century, concentrated in winter and spring. The result is a widening range of conditions at both the wet and dry extremes relative to what the Region's water-supply and flood infrastructure was designed to accommodate.

**Water quality:** Agricultural land use, legacy coal mining, and legacy industrial activity are the dominant drivers. Groundwater risk is inseparable from productivity: the coarse outwash deposits of the Whitewater Valley and Ohio River Outwash aquifer systems yield 400 to 2,000 gallons per minute but

are correspondingly efficient contaminant pathways, and Wayne County has been designated a priority groundwater protection area on that basis. Karst terrain in Harrison, Crawford, and Washington counties delivers surface contaminants directly into bedrock aquifers with minimal attenuation. PFAS has been detected above EPA health advisory levels in public drinking water in nine of the Region's counties, now subject to enforceable federal limits of 4 parts per trillion for PFOA and PFOS. Surface-water risks include persistent *E. coli* impairment in the East Fork Whitewater River; combined sewer overflows at Evansville, Jeffersonville, and New Albany; recurring blue-green algae advisories at Brookville Reservoir; a 2015 HAB extended more than 630 river miles along the Ohio River and forced utilities to switch to alternate sources; and acid mine drainage in the southwestern coal counties.

**Infrastructure:** Aging infrastructure is a present-day rather than theoretical risk across the Region's over 100 public water utilities. Evansville Water and Sewer Utility maintains more than 1,000 miles of water main, 600 miles of which is cast iron averaging 90 years of age and is replacing a water treatment plant built more than 125 years ago. Combined sewer overflow obligations are the Region's most capital-intensive liability, including a 729 million dollar, 25-year commitment in Evansville and an estimated 100 to 150 million dollars under Jeffersonville's 2009 consent decree; New Albany's three-decade sewer connection ban, lifted only in 2021, illustrates how directly these constraints can limit community growth. Of the Region's utilities, 87 submitted a validated water loss audit in the most recent reporting cycle, reporting approximately 4.7 billion gallons of non-revenue water at a cost of roughly 10.5 million dollars in the 2023 audit year. Smaller systems, which lack access to comparable capital budgets, face the greatest risk of reactive rather than planned replacement.

**Data centers and emerging demand:** Data center development is concentrated in Clark County, where a roughly 700,000-square-foot campus at the River Ridge Commerce Center in Jeffersonville is nearing completion and a second proposal in Charlestown was under plan commission review as of mid-2026. Additional projects sit within or adjacent to the Region, including a 310-megawatt project near the former Marble Hill site in Jefferson County and a 600-megawatt project reported in the Gibson or Posey County area. Local response has been rapid, with one-year moratoriums adopted in Jeffersonville and New Albany, zoning changes in Sellersburg, and a county-wide moratorium under consideration in Clark County; cost allocation is already contested, with 216 million dollars in grid upgrade costs for the Jeffersonville facility shifted onto the broader Indiana customer base. No single agency currently evaluates the cumulative water budget of site withdrawals, associated power-generation cooling demand, and wastewater discharge together, despite several of these projects sitting above the Ohio River Outwash aquifer system identified in Section 4.3 as highly susceptible to surface contamination.

## 6.4 Recommendations

The following recommendations (**Table 28**) are organized by focus area and are intended to be actionable by the state agencies, regional utilities, and counties best positioned to lead each effort.

Table 28. Summary of recommendations by focus area and lead entities.

| Focus Area                                                     | Recommended Action                                                                                                                                                                                                                                                                                                                                             | Lead / Partners                                                       |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>Conservation review of new withdrawals</b>                  | Ensure that any future proposal for new or increased withdrawals in the Region documents sound and economically feasible conservation and efficiency measures, consistent with the Water Shortage Plan's Q80 drought-response framework and IDNR's authority under IC 14-25-7-14.                                                                              | IDNR, IFA                                                             |
| <b>Ohio River low-flow and drought resilience</b>              | Incorporate the projected decline in minimum Fall cumulative excess water availability (approximately 4,300 to 2,700 MGD near Louisville) and recent flash-drought experience into intake, raw-water, and drought-contingency planning for Ohio River corridor utilities.                                                                                      | IDNR, ORSANCO, USACE, utilities                                       |
| <b>Add USGS streamflow gaging stations</b>                     | Add additional USGS streamflow gaging stations in the Region, particularly Pigeon Creek, to better measure water availability.                                                                                                                                                                                                                                 | USGS                                                                  |
| <b>Whitewater River Basin availability</b>                     | Explore water supply development in the Whitewater River Basin using storage in the Brookville Reservoir owned by the State of Indiana. The State has access to a nominal yield of 80.6 million gallons of water per day from the reservoir under contract with the federal government. Little of that storage has been accessed for water supply in the past. | IDNR, USACE Louisville District, basin utilities and counties         |
| <b>Irrigation efficiency</b>                                   | Target irrigation efficiency incentives, soil-moisture-based scheduling, conversion to low-pressure or drip systems, and drought-contingency planning in Spencer, Posey, and Vanderburgh counties, where irrigation withdrawals show the strongest increasing seasonal peaks.                                                                                  | IDNR, Indiana Farm Bureau, county Soil & Water Conservation Districts |
| <b>Industrial efficiency and power generation coordination</b> | Continue to support industrial water recycling and process efficiency improvements to offset the Region's modest long-term growth in industrial withdrawals and coordinate with power generation operators along the Ohio River corridor to sustain the ongoing decline in thermoelectric withdrawals.                                                         | IDEM, IDNR, industrial water users, power generation operators        |
| <b>Public water supply infrastructure</b>                      | Continue the Region-wide capital needs and condition-rating inventory for the over 100 public water utilities, prioritizing state revolving fund and IFA funding toward smaller systems with high per-connection project costs and toward lead service line inventory and replacement.                                                                         | IFA SRF program, IDEM, utilities                                      |

| Focus Area                             | Recommended Action                                                                                                                                                                                                                                                                                                                                                  | Lead / Partners            |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>Peak-day demand management</b>      | Adopt local ordinances or incentive programs addressing discretionary summer outdoor water use (watering schedules, turf reduction, increasing-block rates) to reduce peak-day demand and associated infrastructure sizing costs.                                                                                                                                   | Municipalities, utilities  |
| <b>Water quality protection</b>        | Expand nitrate monitoring in the Whitewater Valley and Ohio River Outwash aquifer systems and in the karst counties; continue PFAS compliance support for utilities ahead of federal deadlines; support continued CSO separation planning at Evansville, Jeffersonville, and New Albany; continue acid mine drainage remediation in the southwestern coal counties. | IDEM, IDNR, IFA, utilities |
| <b>Data center and emerging demand</b> | Establish a coordinated review of cumulative water withdrawals, associated power-generation cooling water, and wastewater discharge from data center development in Clark and Jefferson counties (and others as they arise), coordinated with local moratorium and zoning actions already underway.                                                                 | IDNR, IDEM, IFA, IURC      |
| <b>Regional monitoring and data</b>    | Continue and expand SWWF reporting compliance and biennial water loss audits; track peaking factors and demand data across utilities to refine future planning updates to this Study.                                                                                                                                                                               | IFA, IDNR, utilities       |

CSO = combined sewer overflow, IC = Indiana Code, IDEM = Indiana Department of Environmental Management, IDNR = Indiana Department of Natural Resources, IFA = Indiana Finance Authority, IURC = Indiana Utility Regulatory Commission, MGD = million gallons per day, ORSANCO = Ohio River Valley Water Sanitation Commission, PFAS = per- and polyfluoroalkyl substances, Q80 = the flow that is exceeded 80% of the time, SRF = State Revolving Fund, SWWF = Significant Water Withdrawal Facility, USACE = U.S. Army Corps of Engineers

## 7.0 Glossary

**7Q10:** The lowest 7-day average flow that occurs (on average) once every 10 years. In this study, the 7Q10 low flow was used as a minimum instream flow target in the Summer and Fall seasons.

### A

**alluvium:** A general term for clay, silt, sand, gravel or similar unconsolidated detrital material, deposited during comparatively recent geologic time by a stream or other body of running water, as a sorted or semi sorted sediment in the bed of the stream or on its floodplain or delta, as a cone or fan at the base of a mountain slope.

**anthropogenic:** Man-made, or influenced by man, such as water withdrawals from aquifers and streams, wastewater returns, land use, land-cover modifications, and sources of contamination.

**aquifer:** A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant or economic quantities of groundwater to wells and springs.

### B

**basin:** The contributing land area that drains water, such as rainfall or snowmelt, to a basin outlet, or pour point. Also called a drainage basin, watershed, or catchment.

**baseflow:** The portion of streamflow derived from groundwater discharged to the stream.

**bedrock:** Any lithified geologic material that remains intact and in place where it was deposited.

### C

**cumulative excess water availability:** A measure of the water remaining in a watershed or the collection of upstream sub-basins that could be used for expansion of public supplies, industry, or agriculture without jeopardizing instream flows.

### D

**dewatering:** The removal of surface waters or groundwater by pumping to facilitate excavations for construction or mining.

**discharge:** The volume of water that passes a given location within a given period of time.

**drawdown:** The vertical distance the water elevation is lowered or the reduction of the pressure head due to the removal of water.

## E

**evapotranspiration:** The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

**excess water availability:** A measure of the water remaining in a sub-basin that could be used for expansion of public supplies, industry, or agriculture without jeopardizing instream flows.

**extraction well:** An extraction well uses a pump to pull water from a vertical (or occasionally from a horizontal) interval screened in the saturated zone, moving the water to the surface for further disposition (e.g., treatment, beneficial use, etc.).

## F

**Fall:** Season defined in this report as the 3-month period September-October-November.

**flash drought:** A sudden and rapid intensification of drought conditions, usually developing over a period of just a few days to a few weeks, driven by a combination of below-average precipitation and high evaporative demand.

## G

**glacial till:** Unsorted sediment deposited directly by glacial ice and showing no stratification.

**groundwater:** Water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation in which it is situated. It excludes soil moisture, which refers to water held by capillary action in the upper unsaturated zones of soil or rock.

## H

**headwaters:** The most up-gradient, or first-order, tributary watersheds contributing water and sediment downstream to the stream network.

**hydrograph:** A graph showing stream discharge (y-axis) over time (x-axis), reflecting the total runoff from the area upstream of the measurement point.

## I

**Indiana Finance Authority:** Funding agency for this study.

**indirect water reuse:** The blending of treated or reclaimed water into a natural water source, such as a river or stream, and the subsequent use of that water as a potable supply.

**infiltration:** The flow of water downward from the land surface into and through the upper soil layers.

**instream flow:** A minimum flow that is retained in a stream to protect ecological health, recreational use, and water quality.

**intake:** A structure facilitating surface-water withdrawals.

**irrigation:** The controlled application of water for agricultural purposes through man-made systems to supply water requirements not satisfied by rainfall.

## L

**lithology:** The description of rocks, especially in-hand and in-outcrop specimens, based on such characteristics as color, mineralogic composition and grain size.

## M

**Mann-Kendall trend test:** A statistical test used to assess temporal datasets for increasing or decreasing trends as well as statistical significance of the trend.

**monitoring well:** A well designed for measuring water levels and/or testing ground-water quality.

## N

**natural baseflow:** The portion of natural streamflow derived from groundwater discharged to the stream.

**natural streamflow:** The streamflow that would be measured if anthropogenic effects of surface-water and groundwater withdrawals and return flows were eliminated.

## O

**outfall:** The place where a sewer, drain, or stream discharges; the outlet or structure through which reclaimed water or treated effluent is finally discharged to a receiving water body.

**outwash:** Deposit of sand and gravel carried by running water from the melting ice of a glacier and laid down in stratified layers.

## P

**parts per billion:** The number of "parts" by weight of a substance per billion parts of water.

Used to measure extremely small concentrations.

**parts per million:** The number of "parts" by weight of a substance per million parts of water. This unit is commonly used to represent pollutant concentrations.

**peaking factor:** Ratio of maximum water demand to the average demand, such as peak daily demand to average daily demand.

**Public Water System (PWS):** Water utilities that distribute water from either surface-water or groundwater sources. A PWS can be a community system that serves a large population, or a non-community non-transient (NCNT) system such as a school that has their own water well(s).

## Q

**Q90:** The average daily streamflow that is exceeded 90% of the time. In this report, the Q90 is used as the minimum instream flow target in the Winter and Spring seasons.

## R

**recharge:** Water added to an aquifer or the process of adding water to an aquifer. Ground water recharge occurs either naturally as the net gains from precipitation, or artificially as the result of human influence.

**return flow:** Discharges to surface waters from facilities permitted by the NPDES program, such as wastewater treatment plants.

## S

**Sen slope:** Theil–Sen estimator of slope used along with the Mann-Kendall trend test to calculate the magnitude of trends in the long-term temporal data.

**Spring** : Season defined in this study as the 3-month period March-April-May.

**stormflow:** The portion of streamflow derived from surface runoff, and excluding baseflow.

**stratigraphy:** The science of rocks: it is concerned with the original succession and age relations of rock strata and their form, distribution, lithologic composition, fossil content, geophysical and geochemical properties.

**stream gage:** A location where streamflow measurements of the streamflow is made.

**streamflow:** The flow of water in a stream or river, commonly measured at a USGS station, and reported in units of cubic feet per second, cubic meters per second, or millions of gallons per day.

**sub-basin:** A portion of a watershed defined by the drainage region between a downstream USGS station and one or more upstream USGS stations.

**Summer:** Season defined in this report as the 3-month period June-July-August.

**surface runoff:** Precipitation that is unable to infiltrate into a groundwater aquifer and instead flows along the earth's surface.

**surface water:** Water supply obtained from streams, lakes, and reservoirs.

## T

**till:** Unsorted sediment deposited directly by glacial ice and showing no stratification.

## U

**unconsolidated:** A sediment that is loosely arranged or unstratified, or whose particles are not cemented together.

**unconfined aquifer:** An aquifer that does not flow beneath an impermeable geologic layer and is free to flow in accordance with gravity. Sometimes called “water table aquifer.”

## W

**water availability:** The portion of the natural baseflow remaining in a stream after instream flow requirements and reservoir releases are accounted for.

**water budget:** An accounting of water moving into, out of, and accumulating within a given region.

**water demand:** The amount of water required for different purposes and in different water-use sectors, such as for residential, institutional, industrial, and public water supplies.

**watershed:** A land area that channels rainfall and snowmelt to creeks, streams and rivers, and eventually to an outlet point, such as a USGS station. Also called a drainage basin, or catchment.

**Winter:** Season defined in this study as the 3-month period December-January-February.

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