



Assessing Drivers of Municipal Water Use Trends in the Great Lakes Region

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Outline

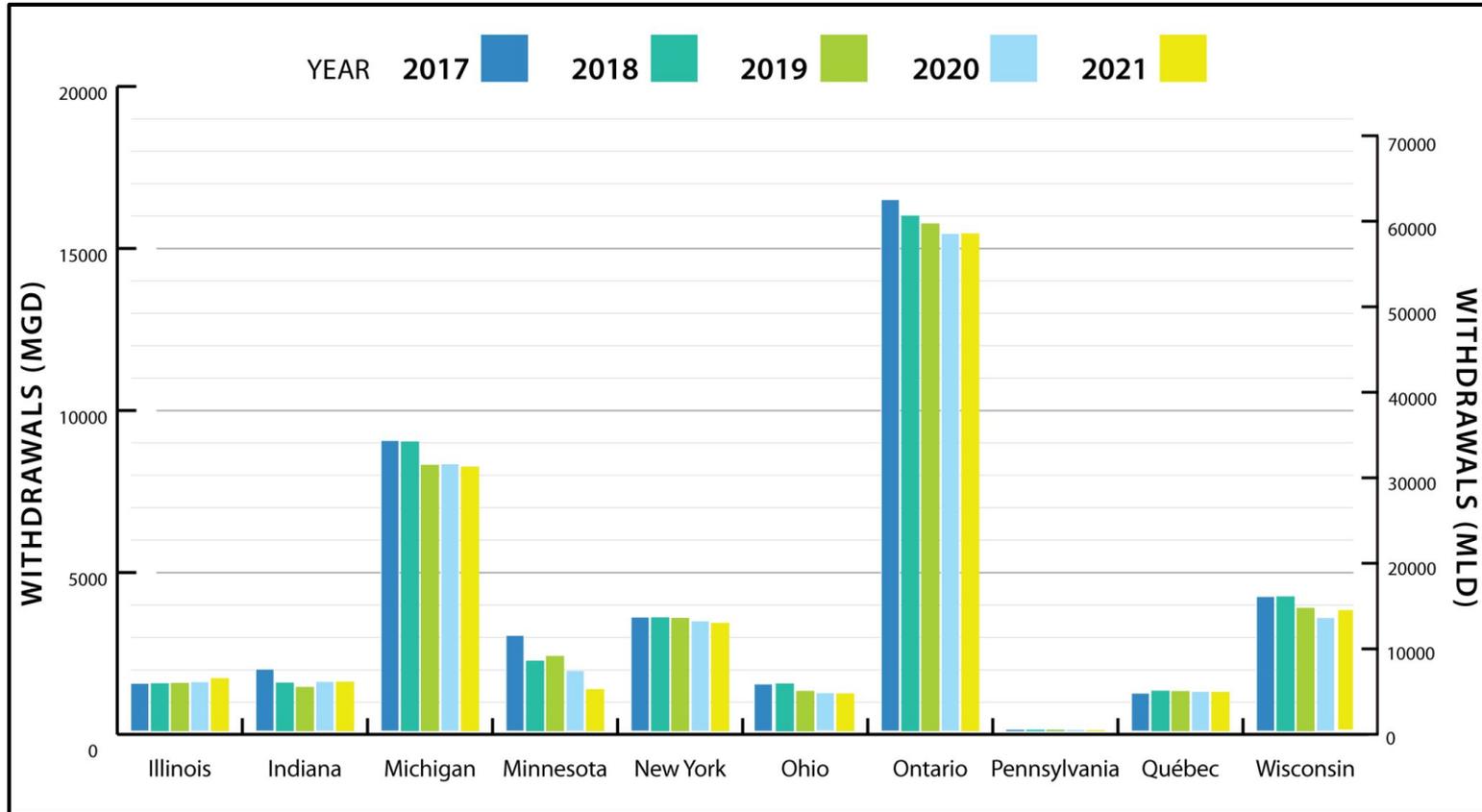
- I. Basin-wide water use trends (2012-2021)
 - A. Basin-wide water use decline
 - B. Jurisdictional trends
- II. Basin-wide public water supply withdrawal trends (1998-2018)
 - A. Basin-wide PWS decline
 - B. Jurisdictional trends/reporting procedures
- III. Municipal water use trends (1998-2018)
 - A. Background
 - B. Methods
 - C. Results
 - D. Discussion

Basin-wide Water Use Trends

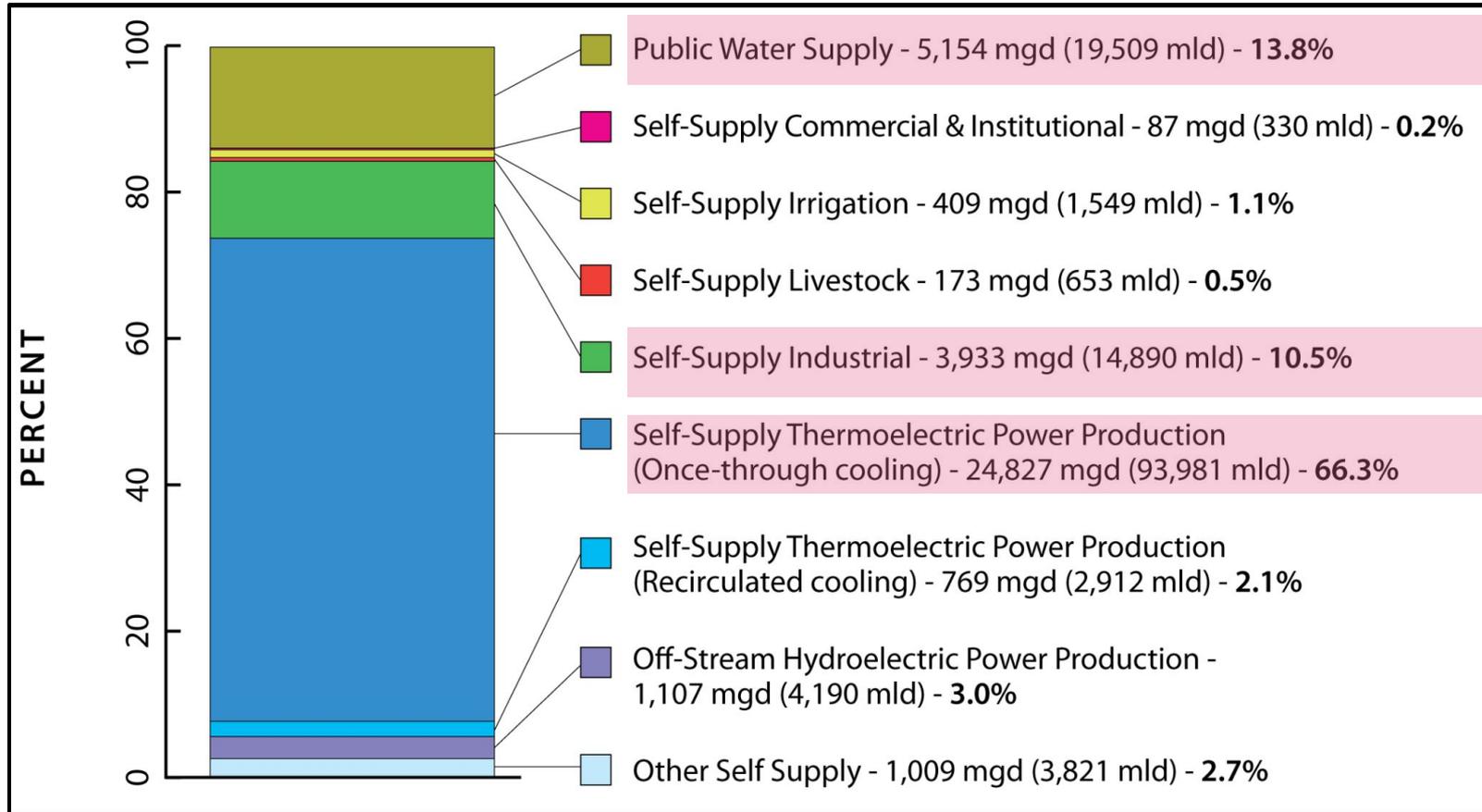
- Great Lakes Commission (GLC) chosen to serve as water use database repository after Great Lakes Charter signed in 1985
- GLC produces an annual report of water use in the basin
 - Water users report monthly Withdrawals, Consumptive Uses, and Diversions to relevant State/Provincial program
 - Users withdrawing over 100,000 gallons per day averaged over a 30-day period required to report
 - Sorts water use by jurisdiction, sector, and sub-basin
 - Reports for years 1987-1993 and 1998-2020



Total Water Withdrawals by Jurisdiction (2017-2021)



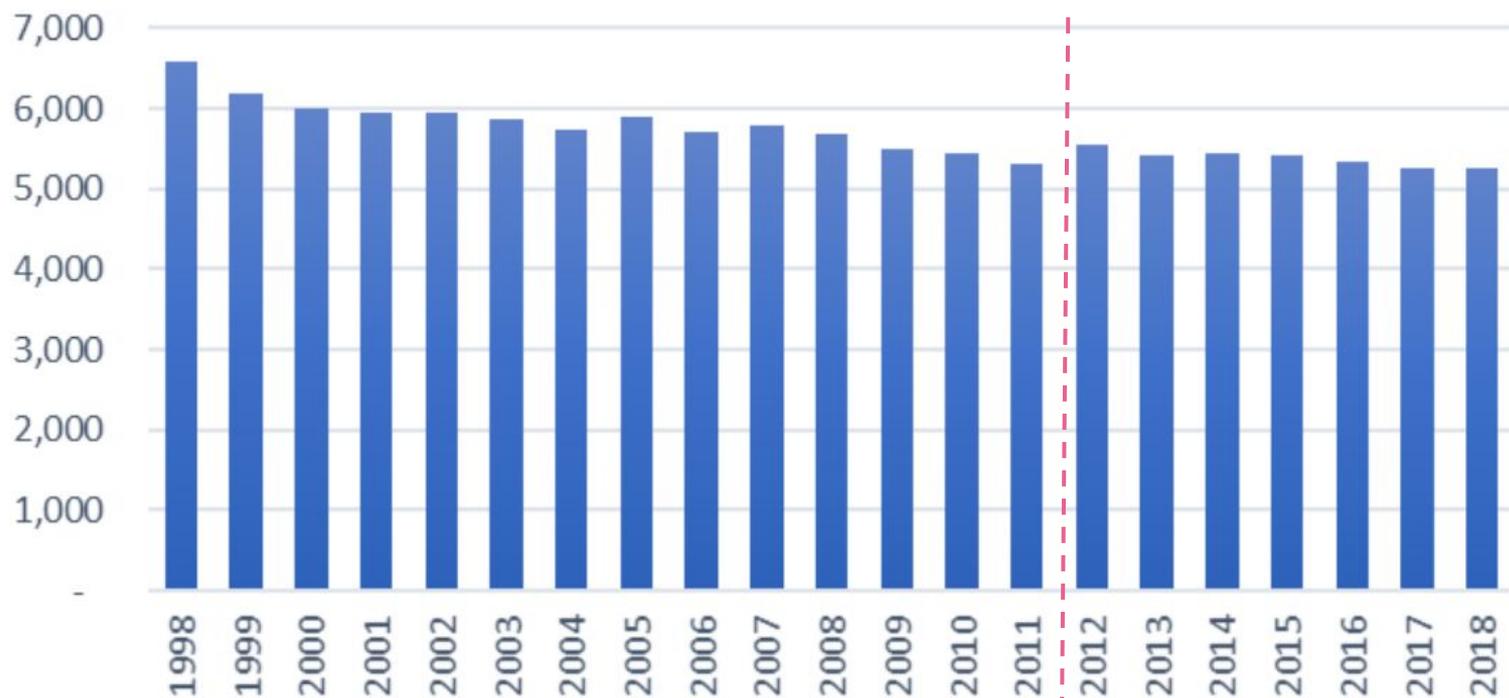
2021 Water Withdrawals by Sector



Basin-wide Public Water Supply

- Report by Jim Nicholas and Emily Posthumus in May 2020
 - Summarizes changes in withdrawals for PWS in the Basin from 1998-2018
 - Pulled data from GLC annual reports and the Great Lakes Water Use Database
- Reasoning for writing report
 - GSGP regularly evaluates the cumulative impact of withdrawals, consumptive uses, and diversions on the basin
 - PWS is a significant sector of water use
 - Fairly reliable long-term PWS data for most jurisdictions

Water Withdrawals - Public Supply All Jurisdictions (mgd)



Municipal Water Use Trends

- Report by Dr. Drew Gronewold and James Polidori in August 2018
 - Assess trends in public water supply use in key municipalities within the Great Lakes basin between 1998 and 2018
 - Accompanied basin-wide PWS report
- Reasoning for writing report
 - Understand correlations/relationships with social/economic data and changes in municipal water use
 - Assess drivers behind observed water use trends over the 1998 to 2018 period

Introduction

- Compact and Agreement protect the Great Lakes freshwater resources from being diverted outside the basin, with few exceptions
 - To better understand how the demands on this supply may change, we ***investigate publicly owned municipal water utility data in relation to various socioeconomic and demographic factors.***
- Decline of water use since the 1970s
 - Increase of water service rates and fees, more shutoffs
 - Impacting those who use less water overall
 - Relationship suggested between water affordability and socioeconomic factors
 - AWWA report
 - Necessity for PWSs to understand demographics of service area as potential factor in explaining water use trends

Why is Residential Water Use Decreasing?

Reduced Demand?

- Duration and time of day of water use
- Clusters of socioeconomic groups use water differently
- Impacts of climate change

More Efficient Practices?

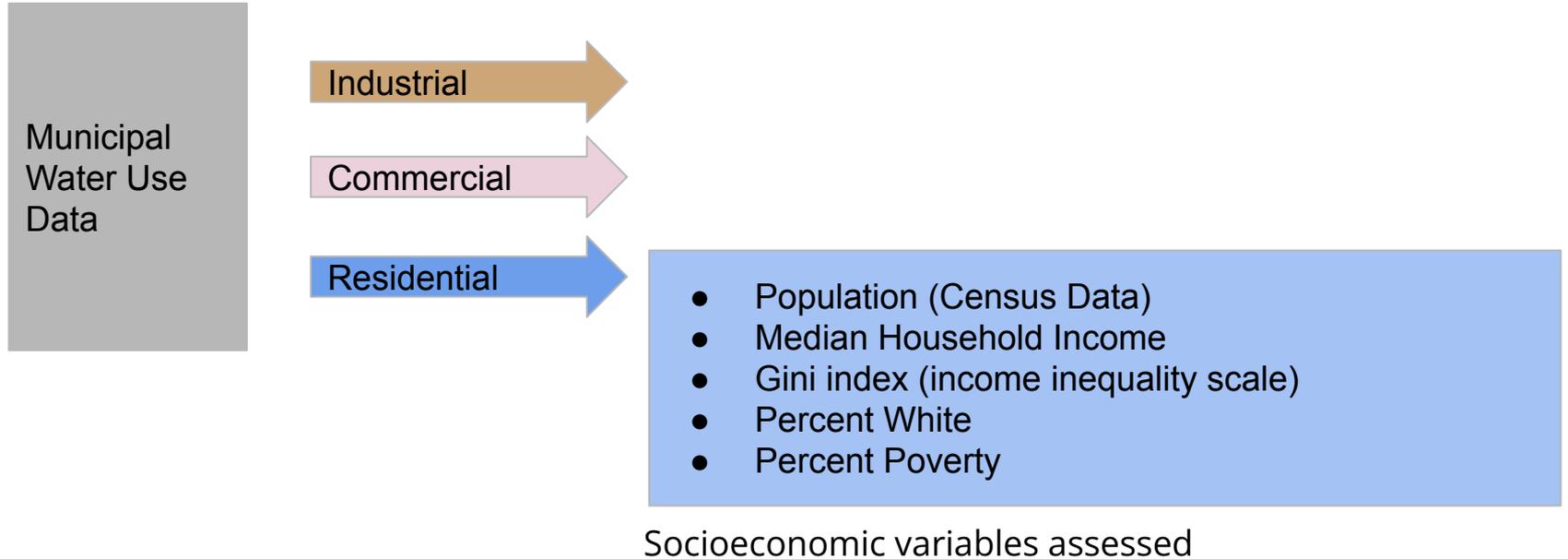
- Federal water efficiency standards
- Power to choose water efficient fixtures and appliances
- Trust in neighbors and utility

Socioeconomic Drivers?

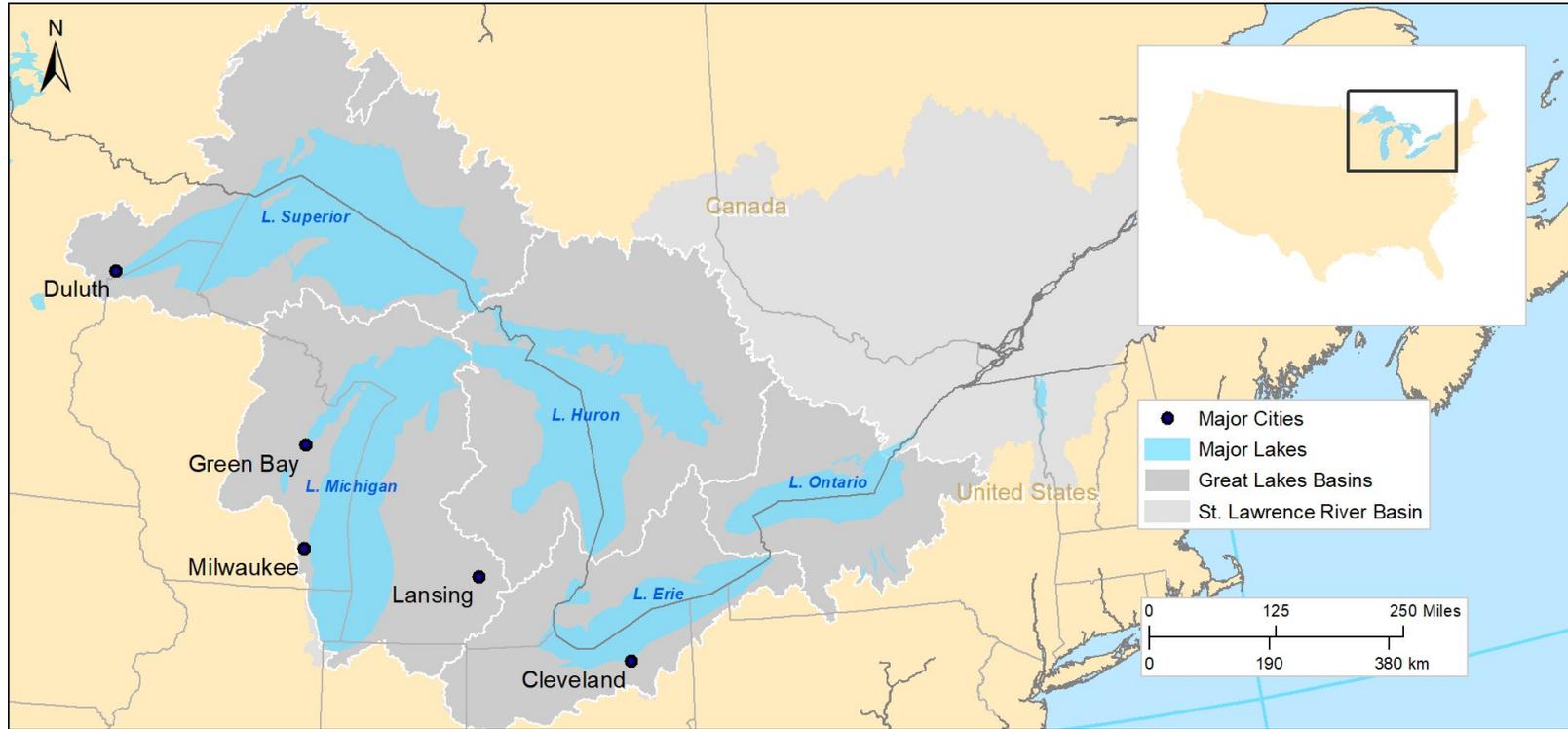
Very few studies have looked at the relationship between demographics and water use:

- Focus in water-scarce Western U.S.
- No existing literature on these trends in the Great Lakes region

Our Study



Study Area

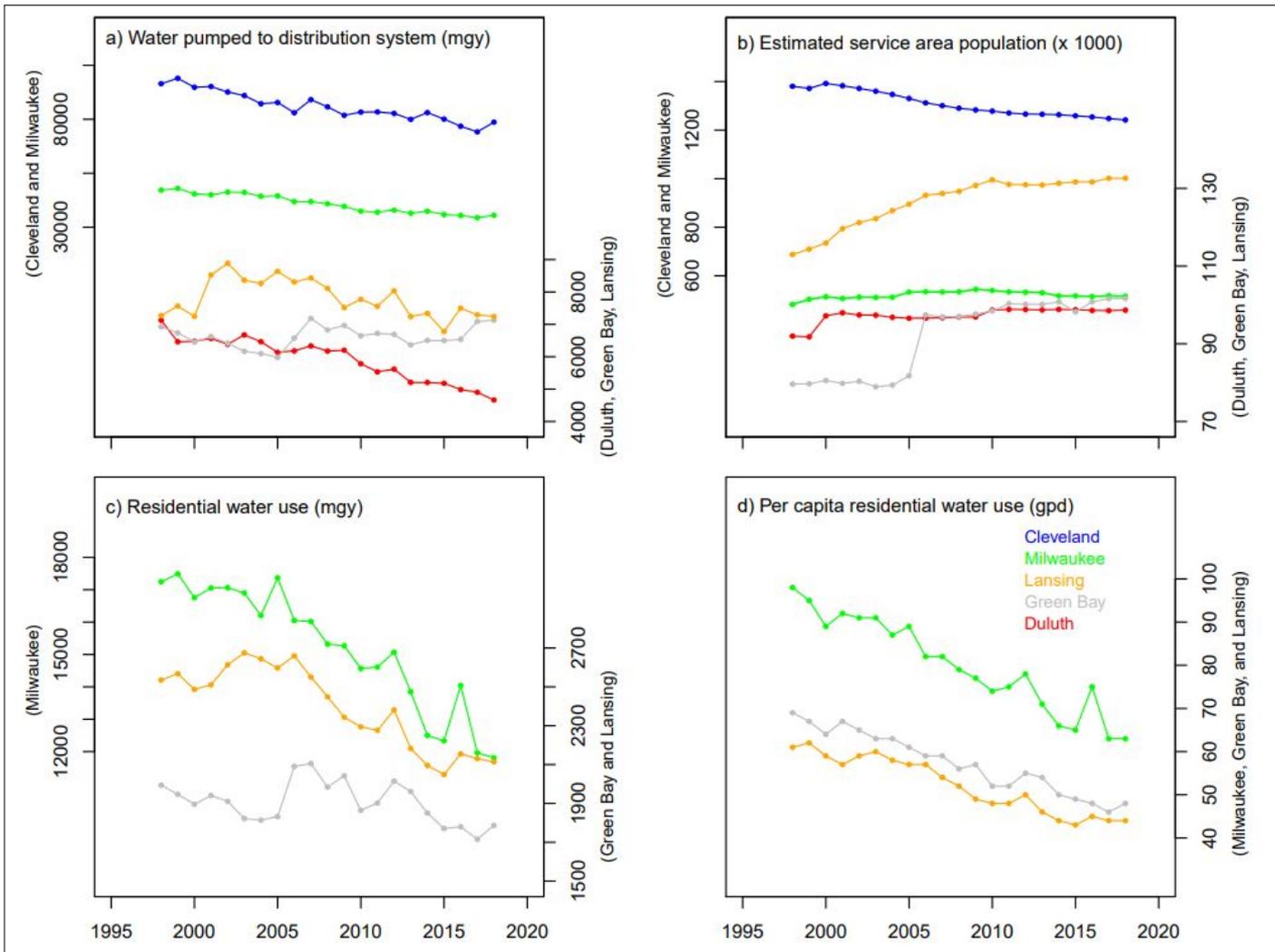


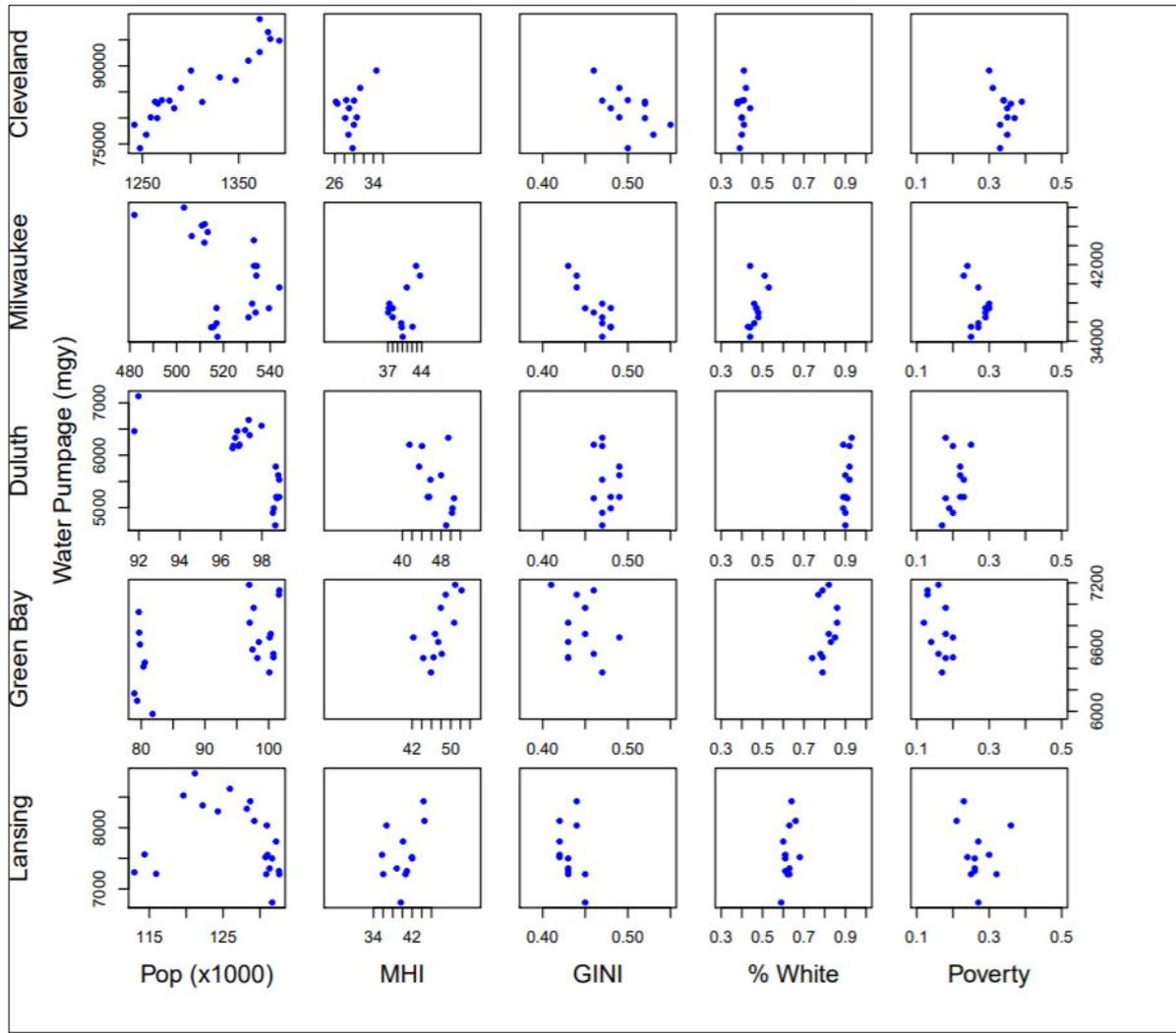
Methods

- Obtained total pumpage data from utility and water use managers
 - Disparities between pumped water and water reaching users due to leaking pipes and aging infrastructure
- Obtained public water supply usage from cities where this data was available
 - Separated PWS into RCI (Duluth started measuring residential use in 2017; Cleveland does not separate PWS use by class)
 - Did not want commercial and industrial use to skew data; direct comparison between individual users and demographic data

Results

- Total Pumpage Rates
 - Most cities saw a consistent decline over the study period
- Per Capita Water Use
 - Follows similar rates to total pumpage
 - Used this data to compare with socioeconomic variables
- Socioeconomic Variables
 - No single socioeconomic variable that explains per capita water use



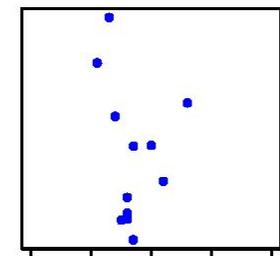
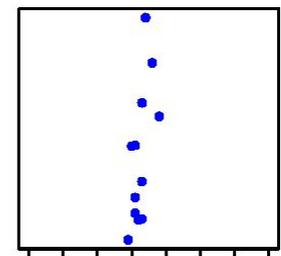
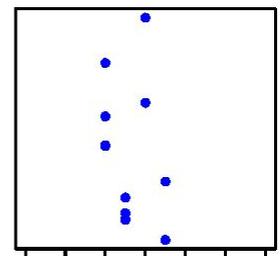
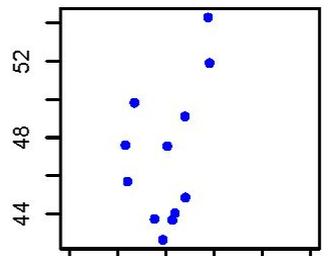
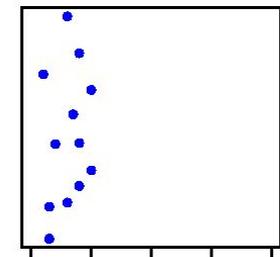
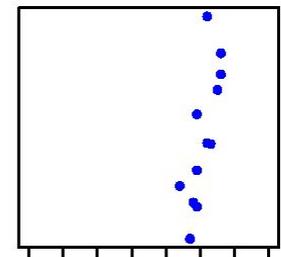
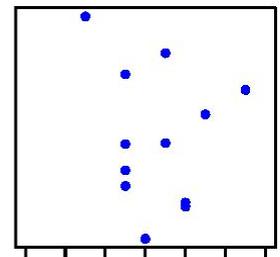
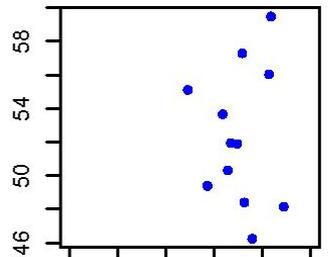
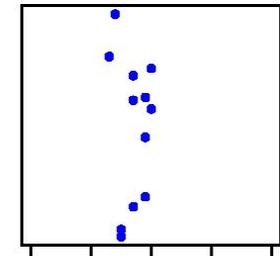
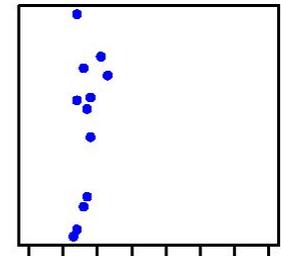
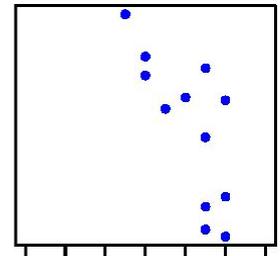
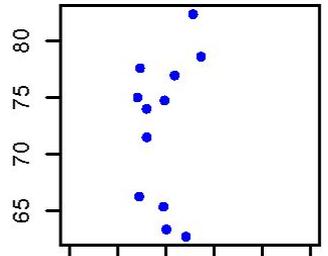


Milwaukee

Green Bay

Lansing

Per capita water use (gpd)



MHI (x\$1,000)

Gini

White

Poverty

Discussion

Water use is decreasing despite increasing populations

Why?

New Build Apartments vs. Multi-Family Homes vs. renters power of choice



FEDERAL WATER EFFICIENCY LEGISLATION

1972 Clean Water Act Amendments

The first formalized legislation that grants authority to the EPA to monitor and improve water quality by reducing pollutant loads into habitats and surface and groundwater sources. A focus on water quality laid the groundwork for water quantity conservation policies.

1992 Energy Policy Act

This comprehensive legislation set minimum efficiency standards for all toilets, showers, urinals and faucets manufactured in the United States by 1994. (e.g., low-volume residential toilets must now flush at 1.6 gpf compared to 3.5 gpf that was common previously.)

1996 Safe Drinking Water Amendments

Requires EPA to issue public guidelines to assist utilities develop water conservation plans. The use of these guidelines is not required by federal law or subject to regulation.

1998 EPA Water Conservation Plan

After August 6, 1999, states may require water systems (utilities) to submit a water conservation plan consistent with new water conservation guidelines as a condition of receiving a loan from a State Drinking Water Loan Fund.

2006 EPA WaterSense Label Program

This voluntary national program certifies fixtures, appliances and products that use 20 percent less water than the federal minimum with similar performance. The WaterSense program intends to provide consumers with federally recognized water-efficient options.

Better Water Efficiency Programming and Outreach?



TIPS ON WATER CONSERVATION

- Use a water efficient flush toilet.
- Find and repair leaks.
- Take a quick shower.
- Convert to water and energy saving faucets.
- Avoid wasting running water as possible.
- Use an energy efficient washing machine.
- Water plants during the coolest part of day.
- Clean driveways and sidewalks with a broom instead of hose.

The infographic features a blue background with white icons and text. It includes a logo for "NATRAN" in the top left corner. The tips are arranged in three rows, each with an icon and a short instruction.

Areas for Investigation

Are industry and commerce also following a decrease in water consumption?

- Hydropower
- Agriculture
- Manufacturing

Social Equity and Water Use

- Utility Shutoffs, power outages, rising cost of water per unit
- Consumptive use may not be meaningfully impacting water supply

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