



Integrated Planning: Characterizing the Value of Water to Inform Decision-Making



Office of Wastewater
Management

August 2017
EPA 830-R-17-001



ACKNOWLEDGMENTS

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This report was developed under EPA Contracts EP-C-11-009 and EP-C-16-003.

Cover photo: City of Springfield, Department of Environmental Services (top right)

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Many communities face complex challenges in operating their wastewater and stormwater infrastructure, including meeting Clean Water Act (CWA) obligations under financial constraints. Communities with multiple CWA obligations for their wastewater treatment plants, sewer systems and stormwater infrastructure must prioritize their investments. They must also evaluate different approaches and options for improving their systems, including gray, green and data infrastructure investments. Integrated planning is the process of systematically identifying and prioritizing actions and projects to meet CWA obligations.¹

Establishing a value for water resources in a particular community—taking into account ecological, economic, social and quality-of-life considerations—can help inform integrated planning decisions and support communication with stakeholders. This document displays some of the ways to characterize and quantify the value of water, and to apply that value to inform integrated wastewater and stormwater planning.

This document uses examples from Springfield, Missouri: efforts by the city of Springfield, Greene County, and City Utilities of Springfield to develop a comprehensive integrated plan to address the region's CWA, air quality and land resource quality obligations. Through the integrated plan, the city of Springfield and Greene County seek to prioritize investments in water, land and air resource improvements that address the most pressing problems first and provide the greatest value to the area's citizens. Springfield and Greene County are interested in characterizing the value of their water resources to provide a tool for communicating local priorities with stakeholders.

This document presents:

- Approaches for quantifying water resource users (Section 2).
- Approaches to estimating the value of water resources (Section 3).

Two separate documents, available at <https://www.epa.gov/npdes/npdes-integrated-planning-documents>, offer more details on the work in Springfield–Green County:

- Estimating the Value of Water: A Literature Review (EPA 830-R-17-004)
- Estimating Users of Water Resources: Springfield–Greene County Data Collection Plan (EPA 830-R-17-005)

Also available are two complementary integrated planning documents that focus on soliciting stakeholder input through communication and outreach, and using that input to inform decision-making:

- Prioritizing Wastewater and Stormwater Projects Using Stakeholder Input (EPA 830-R-17-002)
- Public Outreach for Integrated Wastewater and Stormwater Planning (EPA 830-R-17-003)

¹ EPA released the Integrated Municipal Stormwater and Wastewater Planning Approach Framework to provide guidance on developing integrated plans. The framework identifies the operating principles and essential elements of an integrated plan. For more information, visit <http://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater>

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QUANTIFYING WATER RESOURCE USERS

Identifying water uses and users is an important part of the water resource valuation process. A quantitative assessment of water users can help communicate the importance of water resource protection and improvement as well as provide data for prioritizing infrastructure improvement projects. Data on water users can come from a variety of sources, with in-depth investigation needed in some cases.

Springfield and Greene County, with assistance from EPA, developed a data collection plan to characterize the number of water resource users in the region. (The report *Estimating Users of Water Resources: Springfield-Greene County Data Collection Plan* offers a comprehensive overview of this plan and the results of its execution.) The project team investigated data on water resource users within and downstream of the city of Springfield and Greene County. After compiling existing data, the team identified data gaps and recommended ways to fill them. Springfield-Greene County's data collection plan provides the next steps for the project partners, as well as ideas for other communities on gathering water resource user data to support an integrated planning process. The data collection plan considered major water users (e.g., municipal water supply, industrial facilities and agriculture), recreational water users (e.g., boating and fishing) and those who value the aesthetic appeal of water resources.

2.1 Major Water Users

Government agencies, industries and the public can all be major water users, and depend on quality and quantity of the water supply. For example, the Missouri Department of Natural Resources (MDNR) defines a major water user as a public or private entity that is capable of

withdrawing 100,000 gallons/day from a source of either surface or groundwater. Many major users are documented or permitted, making data on them easy to come by. To determine the number of major water users within their jurisdiction, the city and county used MDNR records from 2013 showing total surface and groundwater withdrawals by major users in the watershed area. The data revealed 33 major users, accounting for the withdrawal of over 45 billion gallons of water in 2013. The most significant major user was a local power plant; municipal water supply, industrial facilities and agriculture (mostly beef cattle) also contributed to the total.

2.2 Recreational Water Users

Many water-related recreational opportunities are available to the public. These opportunities can vary greatly depending on a municipality's proximity to water resources, as well as what those resources are. Some recreational activities generate revenue (e.g., boat rentals and park entry fees), and all rely on access to healthy bodies of water. Data on recreational users can be hard to gather, requiring some investigation and/or outreach.

Ways to collect recreational user data include automatic trail counters, visitor center door counters, boat rental sales and direct surveys. Surveys can be especially valuable to local organizations, municipalities and state agencies, especially as they plan and consider future capital development projects. These methods can be expanded to collect information beyond user counts. Potentially useful questions include where users are from, what they use the recreational area for, and what they would like to have included in a recreational area (e.g., playgrounds, benches, additional trails).



Scenic views from roadways. *City of Springfield, Department of Environmental Services*

In the Springfield-Greene County case, the project team investigated available recreational user data for parks managed within Springfield and Greene County, as well as information from canoe and kayak vendors. Examples of data collected:

- More than 21,000 watercraft rentals from private vendors annually in the study area.
- About 53,327 visitors to Lake Springfield annually, 3,000 of them renting watercraft on the lake.

(For more data on recreational use, see *Estimating Users of Water Resources: Springfield-Greene County Data Collection Plan*.)

2.3 Other Users

Water resources are valued for other, less tangible uses as well. For example, scenic views of streams and lakes offer an aesthetic value to drivers and sightseers. While pinpointing the number of users enjoying the aesthetic value of water resources

may be difficult, there are ways to quantify the approximate number of people who at least have the opportunity to partake. Traffic counts are one such method. Traffic count data or vehicle volume can often be obtained from a state's department of transportation, and some local governments may also collect additional traffic data.

In the Springfield-Greene County case, vehicle volume data came from the Missouri Department of Transportation's (MDOT's) website. MDOT determines annual average daily traffic by deploying pneumatic road tube sensors perpendicular to the roadway. These tubes count the number of vehicles that travel particular segments of roadway as the vehicles drive over them. Every three years, MDOT produces maps detailing the amount of traffic using Missouri's state highways. The project team used these data to determine the number of vehicles exposed to each of 10 different scenic crossings. The data showed that more than 53,500 vehicles per day passed by the selected areas.

Data on Magnitude of Water Use in Springfield and Greene County

- Within the study area watersheds (Greene County and downstream of Springfield–Greene County), about 45 billion gallons of water are withdrawn from surface and groundwater sources each year (based on 2013 data).
- Among livestock populations downstream of urban areas, over 10,000 cattle depend on streams as a direct water supply.
- Recreational trails, including many that follow or cross over streams, draw thousands of visitors each week, resulting in over 200,000 individual visits each year.
- While data on boat use are limited, watercraft rental in the region reflects at least 20,000 individual uses annually.



Kayaks on the James River. *City of Springfield, Department of Environmental Services*

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ESTIMATING THE VALUE OF WATER RESOURCES

Every community is unique in its circumstances, its relationship with water and its perspective on why its water is valuable. For this reason, water resource values are determined and categorized in a variety of ways.

Springfield's unique circumstances include its location on a plateau. Many streams start within its boundaries and flow through, providing greenway corridors for recreational trails and wildlife while conveying stormwater from urban development. At several locations inside and outside the city, streams and rivers are impounded for water supply purposes and recreational use.

In Springfield, as in most communities nationwide, water quality is important not only for drinking water, industrial uses and recreation (boating, fishing, hiking, wading), but also for economic stability, growth and overall quality of life. The water quality of lakes draws in thousands of tourists who desire clear, clean, safe lakes for recreation. In addition to the economic revenue the lakes bring, there is intrinsic value for residents and tourists in knowing that the water is safe to use and enjoy.

Springfield and Greene County wish to estimate and illustrate the value of their water resources.² The estimates are intended to focus on the value of existing water quality and additional value associated with restoring water quality. EPA supported the city of Springfield's integrated plan by conducting a literature review of relevant studies and recommended methods for communicating water resources value to the public. The review identified studies relating water resource value to recreational opportunities and the value of scenic views of lakes from single-family homes. Information from the review will help inform the integrated plan and show the

benefits of sustaining existing water resource value and achieving additional value through further restoration of water quality.

3.1 Estimating a Dollar Value for Recreational Use

Several techniques can be used to estimate the value of recreational opportunities for a particular waterbody (Figure 1). Two of the most common are "stated preference" studies and "revealed preference" studies. Generally considered the most comprehensive, stated preference studies use surveys to estimate the public's willingness-to-pay for recreational opportunities and often measure values based on different lake conditions, including fishable, boatable or swimmable water quality (U.S. EPA 2010a). Revealed preference studies collect data on consumer spending during recreational trips and derive the economic benefit of recreational opportunities from these data; this is sometimes called the travel cost method.



Lake clarity enhances recreational value. *Photo: shore of Lewis Smith Lake, Alabama—Quintaped*

² Proposed projects are being evaluated using a Sustainable Return on Investment (SROI) analysis, which measures the return on investment in terms of environmental, social and economic effects of the proposed projects in the long term (described further in the Springfield literature review).

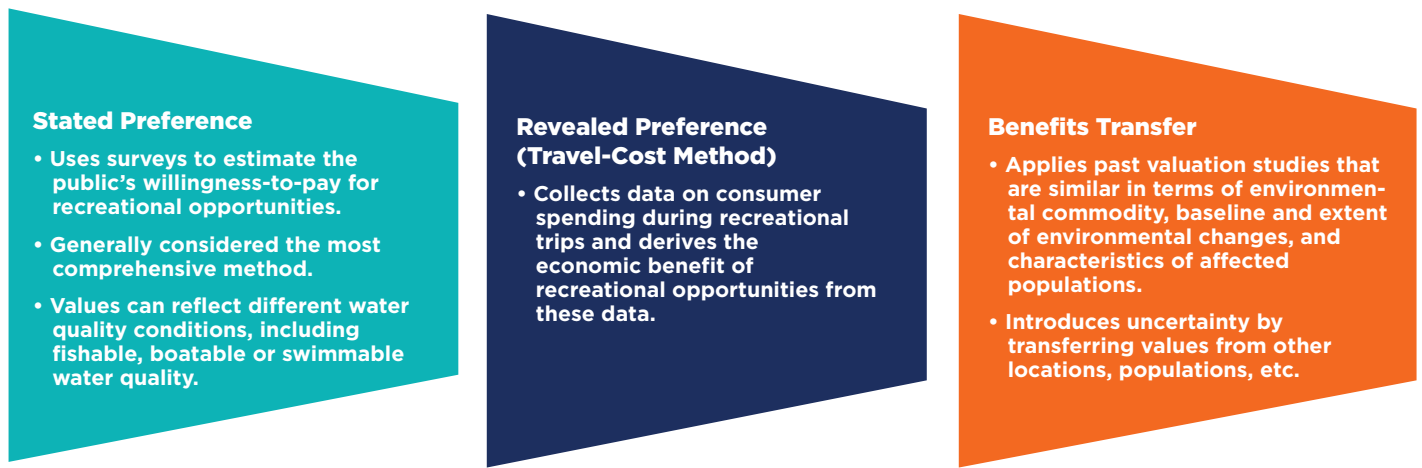


Figure 1. Approaches to estimate value of recreational opportunities.

No one has directly used stated preference or revealed preference methods to estimate the value of recreational opportunities in Springfield–Greene County. But studies in other Missouri counties and other states using a “benefits transfer” approach can inform an estimate of this value. This approach involves identifying valuation studies of resources similar to the resource in question in terms of environmental commodity, baseline and extent of environmental changes, and characteristics of affected populations (U.S. EPA 2010a).

As detailed in *Estimating the Value of Water Resources: A Literature Review*, EPA reviewed the literature for relevant values on recreational benefits of lakes and streams in the city and county. Many of the studies initially included in EPA’s review were conducted in distant states or for waterbodies different in size and morphology from the Springfield–Greene County lakes and streams. From this larger list, EPA was able to identify a subset of studies whose value data were more relevant due to similar demographics, geography, morphology or other factors.

The EPA team also evaluated studies on how lake clarity affects the public’s willingness to travel for recreation. The Keeler et al. (2015) study (conducted on lakes in Minnesota and Iowa) found that better water clarity increases the number of visits to lakes and that lake users were willing to incur greater costs to visit clearer lakes. This information can be used to estimate perceived user

values based on differing lake clarity measurements. When using the benefits transfer approach in a case like this—applying the Keeler subject lakes to Springfield–Greene County—the sources of bias must be considered in the estimates and the potential for double counting “and any related caveats must be noted when reporting the value estimates.”³

3.2 Estimating the Impacts of Water Resources on Property Values

Property values can be affected both positively and negatively by ecological and environmental factors related to water resources. For example, waterfront property is affected by proximity and views, water quality, and recreational value. Using models to estimate the impact of environmental factors on property values, economists have established that public water bodies provide external benefits that are reflected in the value of nearby residential real estate.

The EPA team for this project conducted a literature review to identify studies providing relevant property value data to Springfield–Greene County. One study examined values of views of artificial lakes from single-family homes near Omaha, Nebraska. Models estimated that lake views, including those associated with lakes

³ U.S. EPA (2010a) provides additional guidance for the benefit transfer process in general, and Rosenberger and Stanley (2007) discuss bias specifically related to recreation value estimates.



Lakefront property. *Photo: Lake of the Ozarks homes, Missouri—Ben Jacobson*

designed primarily for flood control and stormwater management, increased home values by between 7.5 and 8.3 percent (Shultz and Schmitz 2008). The literature values from this study can be used in conjunction with GIS and real estate market analysis to estimate a value for scenic views. Other literature in nearby states can be used to support the concept that scenic views, water quality and water clarity are valuable.

3.3 Additional Benefits from Improving Water Resources

Benefits beyond water quality/quantity improvement are sometimes considered in efforts to value water resources. These additional benefits often take the form of landscape and infrastructure improvements. A common example is the promotion of green infrastructure practices to achieve the desired water resource quality/quantity improvements. Further, the proliferation of green infrastructure can promote the establishment of “green jobs” in a community.

Although the value of these additional benefits (sometimes called “co-benefits”) was not specifically calculated for Springfield–Greene County, the literature review provides detailed discussion on how value is typically calculated, as well as examples from other communities.

3.3.1 The Value of Green Infrastructure

Green infrastructure can come with a variety of environmental benefits, including reduced energy use and heat island effects, better air quality and more carbon sequestration. It can also promote infrastructure cost savings and increase property value.

Green infrastructure often provides an opportunity to reduce the costs associated with traditional gray infrastructure. As green infrastructure provides infiltration, evapotranspiration and storage of stormwater, it reduces the stress put on gray infrastructure to control runoff. This can mean less need for gray infrastructure maintenance, as well as less capital needed to manage gray infrastructure capacity concerns. Several cities have implemented green infrastructure on a large scale and have seen significant cost savings.

Green infrastructure and similar practices have also been shown to raise surrounding property values. Green infrastructure can improve aesthetics, drainage and recreational opportunities. (Figure 2 shows an approach to estimating property value changes based on proximity to green infrastructure.) Increases in property value not only benefit individual property owners, but also can lead to higher tax revenue and general economic improvement.

3.3.2 Green Jobs

Green infrastructure projects can stimulate local economies by creating jobs for local residents, which can provide direct, indirect and induced economic benefits (see Figure 3). While the design of green infrastructure requires professional disciplines, such as landscape architecture, its implementation yields “green collar” jobs in construction, operation, maintenance and installation.

Green infrastructure’s maintenance needs create an opportunity for local employment and offer low barriers to workforce entry, since the majority of work involves landscaping and other activities that require minimal training. Jobs created through green infrastructure give local communities an economic value added beyond the jobs themselves. Economic modeling can be used to estimate the number and type of jobs as well as the associated economic benefits expected from future green infrastructure expenditures. IMPLAN (IMpacts for PLANning) is one commonly used economic model.

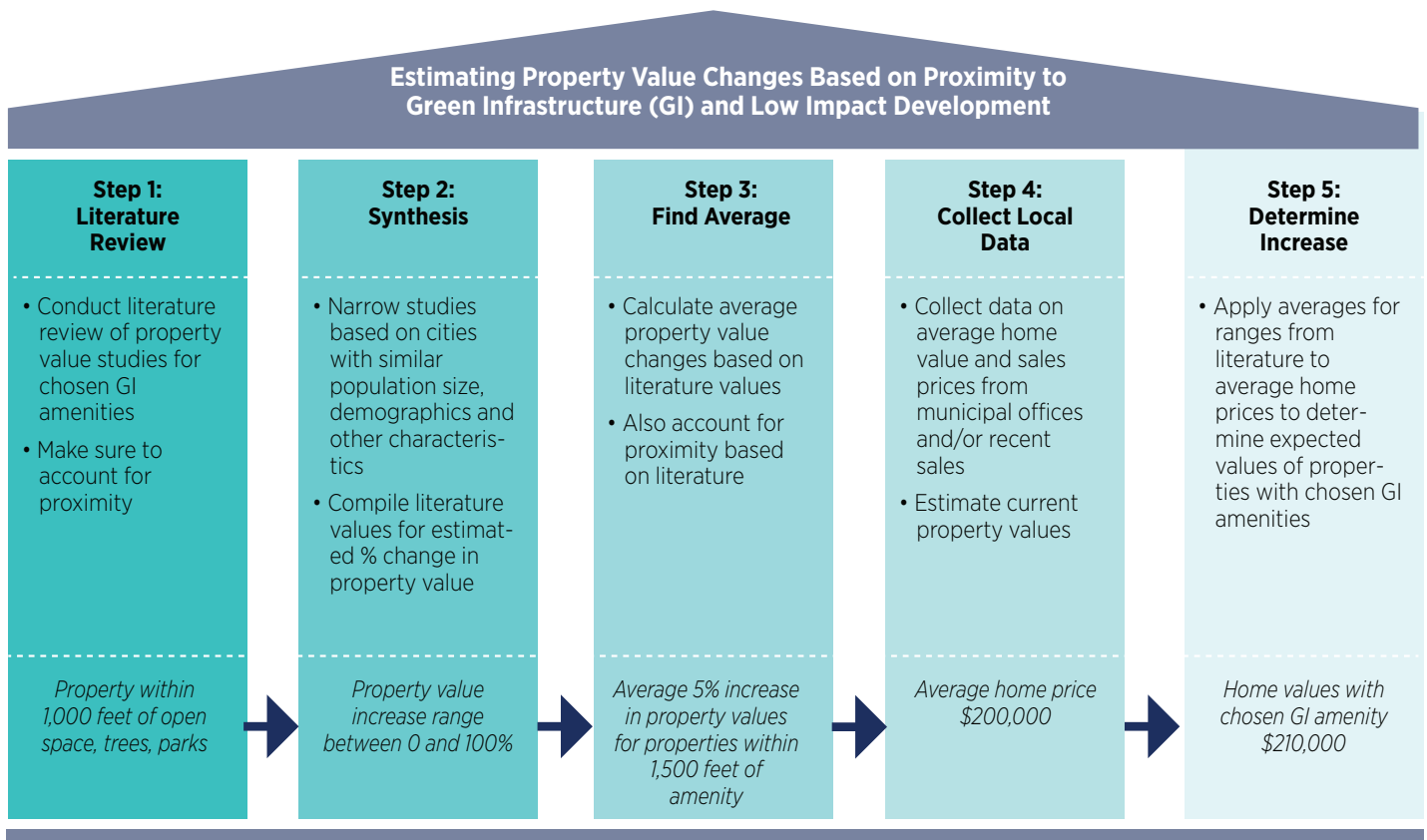


Figure 2. Example of estimating property value changes based on proximity to green infrastructure.



In Northeast Ohio, **31,000 direct jobs** could be created between 2012-2016 from a **\$3 billion investment in stormwater infrastructure** (Green for All 2011).



Installing green roofs in 5% of Chicago's buildings would create **7,934 jobs from an investment of \$403 million** (American Rivers and Alliance for Water Efficiency 2008).



Montgomery County, Maryland expects to employ **3,300 workers** over the next 3 years building its new network of green stormwater controls (Chesapeake Bay Foundation 2011).



Investments of **\$166 million** in stormwater projects between 2009-2011 in Los Angeles produced an estimated **2,075 total jobs** (Burns and Flaming 2011).

Figure 3. Creating green jobs through green infrastructure projects.

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CONCLUSION

Figure 4 summarizes some results of the Springfield-Greene County effort to characterize the value of water resources to support decision-making and stakeholder communication and outreach, both key components of the integrated planning process.

Identifying major water uses is an important part of assessing the value of water in a community, which in turn can inform the prioritization and selection of capital projects as part of the integrated planning process. Further, knowing the economic impacts of keeping local water resources healthy can help communities identify key stakeholders, educate them on needs and priorities and ultimately foster more support for the integrated planning process. The data collection effort undertaken for this report

revealed that more local data may be available than expected. State and local officials, government agencies, and nonprofit organizations can be good resources. In addition, some organizations such as Ozark Greenways have developed customized methods for extrapolating user counts for limited data. The Springfield-Greene County case provides an example of how local data on water users and the value of water resources can be generated to inform integrated planning.

Although the Springfield-Greene County region has its own unique circumstances to consider in assessing the value of water resources, other communities can use the region's process and results as a learning tool.

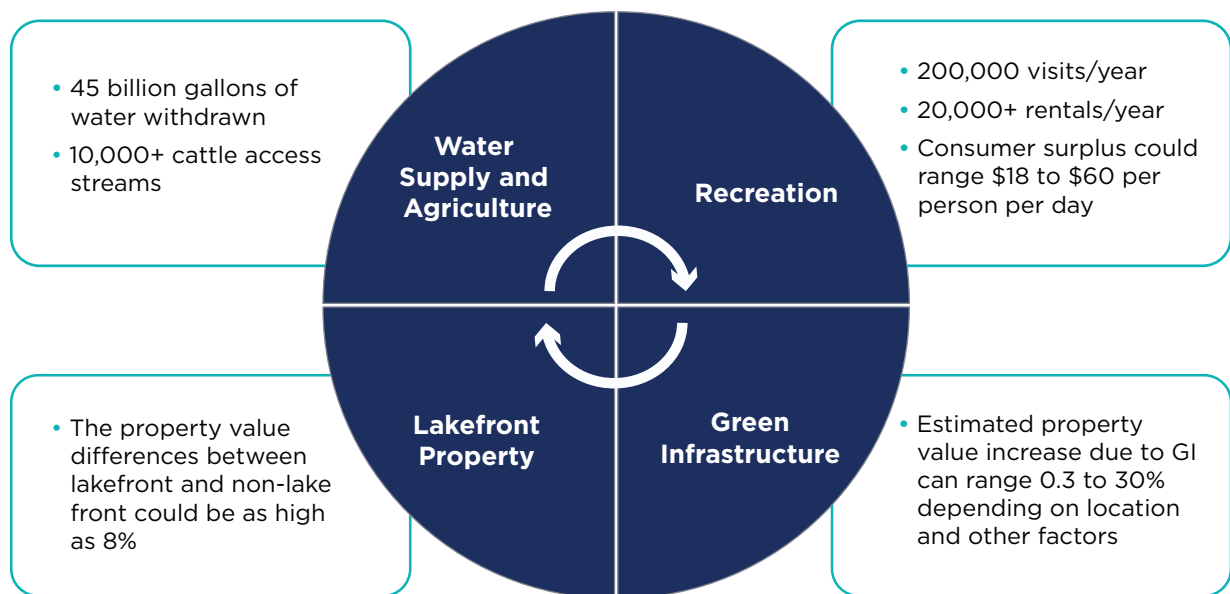


Figure 4. Some critical values associated with the value of the city of Springfield and Greene County's water resources.

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