Green Lake Economic Analyses

This report summarizes the contribution, impact and valuation analyses of Green Lake and its effect on the local economy.

Stantec

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Executive Summary

Green Lake provides local residents with amenities that contribute to the quality of life in Green Lake County and surrounding communities. A comprehensive economic study can help assign a dollar value to some of the Lake's amenities. Linking Green Lake's amenities to estimated economic values of those amenities provides residents, elected officials and resource managers with an understanding that an investment in protecting the water quality of the lake is also an investment in preserving those parts of the economy.

Given that Green Lake is central to so much of the recreation, businesses and properties that surround it, a variety of different economic studies were required to tell a complete story. Specifically, three different economic analyses were completed, each answering different questions.

- The first question relates to the contribution that Green Lake makes to local businesses and recreators at the current level of water quality. Locals and tourists enjoy recreating on and around Green Lake as indicated by park visitation, purchases of lake-related equipment, etc. In order to measure this baseline of activity, a **contribution analysis** was completed and measured business revenue and jobs related to the lake. A contribution analysis provides resource managers with a baseline understanding of how Green Lake currently contributes to the local economy. The contribution analysis measures economic activity like business sales and jobs supported, for example bait and tackle shops, boat rentals, sales of water-related recreational equipment, etc. Key findings of the contribution analysis include:
    - Green Lake supported **$88.1 million to $122.7 million** in annual economic activity and **973 to 1,400 jobs** in Green Lake County and City of Ripon. The Lake's estimated contribution to economic activity represents between 3-5% of all economic output in the study area, and between 6-8% of all employment in the study area.
    - US Census data (2022) suggests that, without Green Lake, only **47% to 65%** of the population currently living within 1.5 miles of the shoreline would reside in the area.
- Secondly, should Green Lake's water quality change, either improve or decline, decision makers would expect that this change might impact the local economy. An **impact analysis** was completed to help decision makers understand the magnitude of a gain or loss in economic activity that might be expected from a specific change in Green Lake's water quality. For example, how does decreasing water clarity due to increased algae growth due to excess phosphorus impact the economy? The impact analysis metrics are very similar to the contribution analysis metrics like business output, labor income and jobs, for example bait and tackle shops, boat rentals, sales of water-related recreational equipment, etc. Key findings include:
    - If water quality improves (indicated by a substantial decrease in filamentous algae), annual economic output in Green Lake County could increase by **$5.6 million to $7.9 million**, supporting 57 to 80 full- and part-time jobs.

  - Conversely, a decline in water quality (indicated by a decline in water clarity), could result in annual economic losses of **$8.1 million to $11.4 million and a loss of 82 to 115 full- and part-time jobs**.

  These estimates of economic output from both the contribution and the impact analysis are comparable to or higher than similar studies, after accounting for inflation and the relative size of the surrounding economy.

- Lastly, indicating its value to property owners, real estate values are higher on property on or near the lake than properties further from Green Lake. Leading to the question, would property values decline if water quality declined and by how much? Additionally, how would a decline in property values translate into a potential decline in property tax revenues that fund the municipalities, schools and special districts with the project area? To answer these types of questions, a **valuation analysis** was completed. The valuation analysis is measured in terms of the % change in property values and tax revenue. Key findings of the valuation analysis include:

  - Lakefront property values are estimated to **decline between 2% and 12%** if water clarity declines from a Secchi depth of 4.65 meters to 4.0 meters and 2.0 meters, respectively.

  - Total decline in property values for lakefront parcels in Green Lake County is estimated to be between **$33.5 million and $201.1 million**.

  - On average, lakefront properties values could decline between **$11,370 to $68,220** per home.

  - Total decline in property tax revenue in Green Lake County is estimated to be between **$469.6 thousand and $2.8 million per year.**

Together, **these three analyses, the contribution analysis, impact analysis and the valuation analysis, illustrate the strong connection between lake health and regional economic well-being**. The results support continued investment in nutrient management and water quality improvement efforts as a means of preserving economic value and suggest the magnitude of an investment to preserve the current economic activity enjoyed in the community.

1 Background and Purpose

Green Lake is a large, deep, natural inland lake in Green Lake County, Wisconsin with a surface area of 7,920 acres (32 km^2) and a maximum depth of 236 ft (72 m). The lake supports a broad range of economic activity in the area, particularly through recreation, tourism, real estate, and seasonal residency (Green Lake Area Chamber of Commerce, 2024).

The Green Lake Association (GLA) commissioned this analysis to better understand the lake's current economic contributions, the potential financial impacts of changes in water quality, and the economic benefits associated with maintaining or improving water quality—particularly in relation to residential property values.

This report presents:

- A regional economic **contribution analysis** to quantify current lake-driven economic activity,
- An economic **impact analysis** to estimate the potential effects of improved or degraded water quality, and
- A **valuation analysis** to assess how water quality influences lakefront residential property values.

1.1 Local Economic Conditions

Green Lake County's economy is comprised of a variety of industries spread across several communities, including Berlin, Markesan, Green Lake, and Princeton. In 2023:

- Total business sales volume in the county was estimated at $1.07 billion,
- Approximately 9,000 people were employed in the county (ESRI Business Analyst, 2024), and
- Real gross domestic product (GDP) totaled $640.39 million in 2023 (FRED, 2024).

Green Lake County encompasses approximately 380 square miles, with a total housing density of about 28 housing units per square mile (ACS, 2022). In contrast, within 1.5 miles of Green Lake's shoreline, housing density more than doubles to 59 housing units per square mile—an indication that the lake has attracted residential development. The current estimated market value of lakefront residential properties is approximately $1.735 billion, with an assessed value of $736 million.

Outside of its population centers, Green Lake County remains largely rural, consisting of farmland, natural areas, waterways, and wetlands. Many local residents and visitors travel to nearby Ripon—located just over the county line in Fond du Lac County—for goods and service needs. Because of this close relationship, Green Lake's influence extends beyond the county boundary.

In 2023, Ripon's total business sales were estimated at $1.47 billion, with approximately 7,700 people employed (ESRI Business Analyst, 2024).

1.2 Purpose and Scope of Analysis

Green Lake provides local residents with amenities that contribute to the quality of life in Green Lake County and surrounding communities. A comprehensive economic study can help assign a dollar value to some of the Lake's amenities. Linking Green Lake's amenities to estimated economic values of those amenities provides residents, elected officials and resource managers with an understanding that an investment in protecting the water quality of the lake is also an investment in preserving those parts of the economy.

Given that Green Lake is central to so much of the recreation, businesses and properties that surround it, a variety of different economic studies were required to tell a complete story. Specifically, three different economic analyses were completed, each answering different questions.

- The first question relates to the contribution that Green Lake makes to local businesses and recreators at the current level of water quality. Locals and tourists enjoy recreating on and around Green Lake as indicated by park visitation, purchases of lake-related equipment, etc. In order to measure this baseline of activity a **contribution analysis** was completed and measured business revenue and jobs related to the lake and the amenities it offers. A contribution analysis provides decision makers with a baseline understanding of how Green Lake currently contributes to the local economy. The contribution analysis measures economic activity like business sales and jobs supported in the recreation, restaurant and vacation rental industries, among others.

- Secondly, should Green Lake water quality change, either improve or decline, decisions makers would expect that this change might impact the local economy. An **impact analysis** was completed to help decision makers understand the magnitude of a gain or loss in economic activity that might be expected from a specific change in Green Lake's water quality. For example, how does increasing levels of filamentous algae impact the local economy? The impact analysis metrics are very similar to the contribution analysis metrics like business output, labor income and jobs supported in the recreation, restaurant and vacation rental industries, among others.

- Lastly, Green Lake is a valuable amenity to lakefront property owners, as lakefront homes have higher property values than non-lake front homes. Would property values decline if water quality declined and by how much? Additionally, how would a decline in property values translate into a potential decline in property taxes that fund the municipalities, schools and special districts with the project area? To answer these types of questions a **valuation analysis** was completed. The valuation analysis is measured in terms of the % change in property values and tax revenue.

The GLA and Lake Management Planning Team aim to remove Green Lake from the impaired waters list designated by the Wisconsin Department of Natural Resources (WDNR)—an ambitious and costly undertaking that requires a strong justification for public and private investment. Quantifying the lake's economic importance, as well as the potential financial consequences of inaction, provides a compelling rationale for advancing restoration efforts.

Together, the three analyses provide a comprehensive picture of the lake's role in the regional economy.

2 Contribution and Impact Analyses

This section evaluates the role of Green Lake in the regional economy through two complementary approaches:

- Contribution analysis estimates the level of current economic activity—such as sales volume and jobs—that exist in Green Lake County and the City of Ripon because of the lake's presence and existing condition.
- Impact analysis estimates how changes in water quality could increase or decrease that economic activity in the future.

The contribution analysis focuses on identifying the current level of economic value supported by the lake in Green Lake County and the City of Ripon. This analysis accounts for both:

- *Lake-driven activity*, such as recreation and tourism, and
- *Population effects*, where the lake's presence influences where people choose to live and spend money.

The contribution analysis relies on data from the ESRI Business Analyst, the Census Bureau's American Community Survey (ACS), and primary survey data pursued and collected by GLA. Its geographic scope is limited to Green Lake County and the City of Ripon.

The impact analysis estimates how economic activity might shift in response to changes in Green Lake's water quality. The economic indicators used to measure estimated impacts are jobs, income, and output. Two scenarios were simulated using the IMPLAN input-output (I-O) model, which captures how spending circulates through a regional economy:

- A positive scenario, in which a substantial reduction in filamentous algae leads to improved water quality and increased tourism and lake use.
- A negative scenario, in which a substantial decline in water clarity leads to reduced tourism and lake use.

Using the IMPLAN I-O model, the analysis estimates how these scenarios would affect jobs, income, and overall economic output in Green Lake County.

Detailed methods, assumptions, and results for both analyses are provided in the sections that follow.

2.1 Literature Review

To guide the contribution and impact analyses, Stantec conducted a literature review of existing economic studies focused on Wisconsin lakes (Table 2-1). The goal was to identify comparable methodologies, relevant benchmarks, and contextual insights.

This literature review is distinct from the one supporting the valuation analysis (which is presented in Section 3).

Among the studies reviewed, three were identified as most relevant based on geographic scope, analytical approach, and data quality. These studies—on Delavan Lake, Dane County, and the Madison area lakes—differ in their methods from one another but share common elements that inform the approach used for Green Lake.

Of particular note is the Delavan Lake study, which includes both contribution and impact components, making it the most comprehensive point of comparison for the analyses presented here.

Table 2-1: Previous Studies in Wisconsin.

	Delavan (2005)	**Dane County (2007)**	**Madison Area Lakes (2024)**
People of interest	Visitors and residents	Boaters/anglers only	Outside visitors only
Area of interest	Delavan Lake area	Dane County, WI	Five Yahara Lakes in Dane County, WI
Analyses undertaken	Contribution, Impact, Hedonic Property Value,	Contribution	Contribution, Benefits Survey, Hedonic Property Value,
Population in county (at approx. time of study)	94,000 (35,000 households)	472,000 (197,00 households)	562,000 (241,000 households)
County GDP (at approx. time of study (2024$)	$5.0B	$43B	$58B
Economic contribution (2024$)	$124M/yr	$86M/yr	$220M/yr
Economic contribution expressed as a proportion of GDP[1]	2.5%	0.2%	0.4%
Economic impact from a (+) change in water quality (2024$)	$10M/yr	N/A	N/A
Economic impact from a (-) change in water quality (2024$)	-$9M/yr	N/A	N/A

[1] For illustrative purposes only, we express the economic contribution as a proportion of GDP. Whereas total economic contribution includes the value of intermediate inputs, GDP excludes the value of intermediate inputs. We include it here as a relative metric to compare the level of contribution found across studies within the regional economic context of each study, despite its limitations.

2.2 Contribution Analysis Methodology and Data

Green Lake supports regional economic activity through two primary mechanisms:

1) Lake amenity effects – economic activity generated by recreation, tourism and lake-related activities.

2) Population effects – higher residential density near the lake, relative to the rest of Green Lake County, that leads to increased local spending.

Lake recreation and tourism are significant economic drivers in the area. Additionally, population density within 1.5 miles of Green Lake is between 1.5 and 2.1 times higher than the county average, suggesting the lake attracts both permanent and seasonal residents. The contribution analysis estimates the magnitude of lake and population effects using data from the ESRI Business Analyst tool and 2022 American Community Survey (ACS) 5-year estimates.

To avoid double counting, this report separates population effects from lake effects and applies them sequentially when constructing the “no-lake” counterfactual. Population effects capture the higher residential density observed within the 1.5-mile buffer relative to the rest of Green Lake County and are used to adjust population-dependent sub-industries downward to reflect the baseline level of local spending and employment that would be expected absent the lake-driven concentration of households/housing units. This density-adjusted estimate is the counterfactual baseline (using both ACS households and housing units to reflect primary residences and seasonal/short-term occupancy). Lake amenity effects are then applied only to this adjusted baseline by attributing 0/50/100 percent of sales and employment for buffer-area NAICS sub-industries based on their subjective dependency on lake recreation, tourism, and lake-related activity, as determined by professional judgement.

2.2.1 Lake Effects Analysis

The ESRI Business Analyst tool provides economic data organized by six-digit North American Industry Classification (NAICS) sub-industry codes. This 6-digit classification delineates all business activities into approximately 1,000 different sub-industries, 98 of which are found in the Green Lake buffer area and 164 of which are found in the Ripon area. This analysis uses 2023 data within Green Lake County and applies a 1.5-mile buffer from Green Lake to isolate lake-specific effects, since other lakes exist in the county (Figure 2-1).

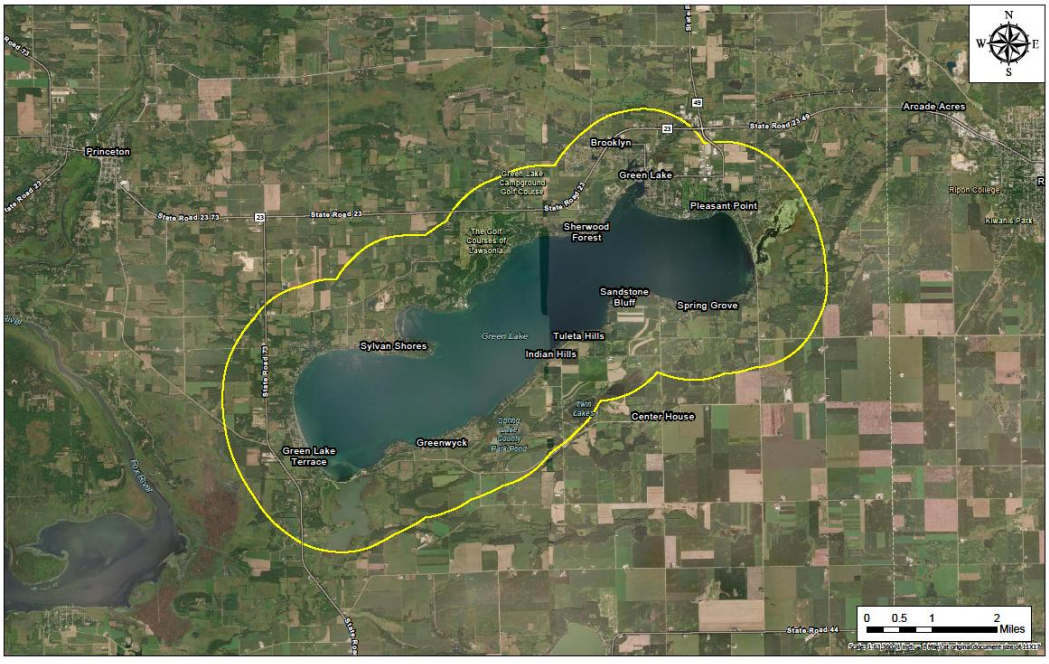


Figure 2-1. Contribution Analysis Study Area, 1.5 Mile Buffer Surrounding Green Lake

Each sub-industry located within this buffer zone is categorized based on its dependency to the lake:

- Fully lake-dependent: An estimated 100% of sales volume and employment is attributed to Green Lake. Examples of sub-industries in this category include Sporting Good Retailers, Boat Dealers and Marinas.
- Partially lake-dependent: An estimated 50% of sales volume and employment is attributed to Green Lake. Examples of sub-industries in this category include Hotels and Motels, Golf Courses and Country Clubs, and Bicycle Retailers.
- Non-lake-dependent: An estimated 0% of economic activity is attributed to the lake. Examples of sub-industries in this category include General Merchandise Retailers, Miscellaneous Health Care Services, and Crop Farming.

These assumptions allow the analysis to estimate which economic activities in the buffer zone are directly supported by the lake outside of any population effects.

2.2.2 Population Effects Analysis

To estimate population effects, the analysis uses GIS data provided by the ESRI Business Analyst tool and ACS housing statistics. According to the ESRI Business Analyst tool, Green Lake County covers approximately 380 square miles, while the lake and the 1.5-mile-from-shoreline buffer zone covers approximately 47 square miles (Figure 2-2). Using ACS data for the incorporated City of Green Lake (north side) and the Town of Green Lake (south side), housing density is calculated for both the buffer zone and the county overall.

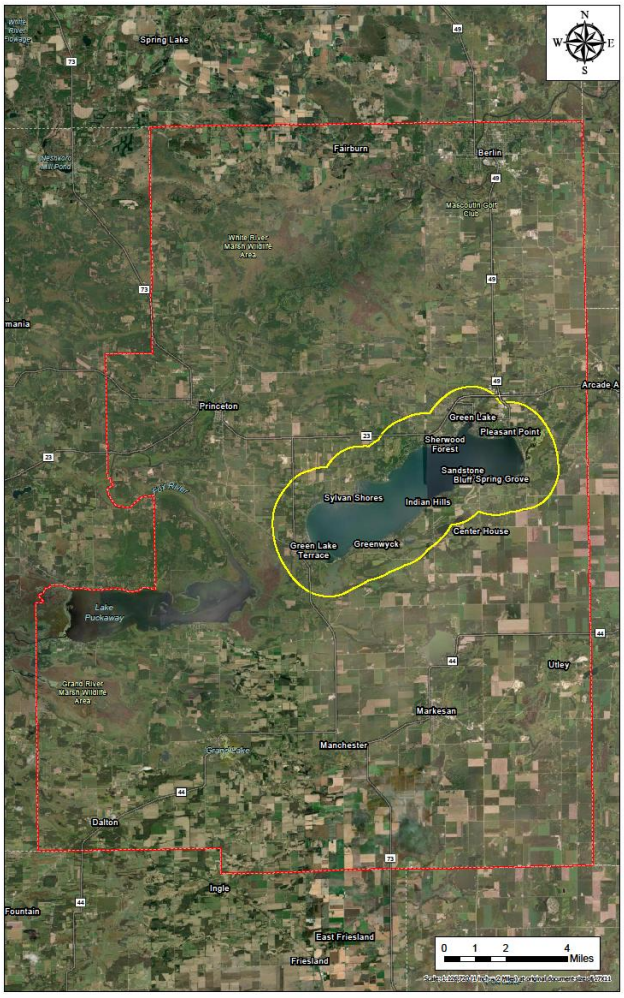


Figure 2-2. Green Lake County Outlined in Red Compared to the Green Lake Buffer Zone Outlined in Yellow.

The ratio of housing density in the buffer zone to that of the broader county serves as a proxy for the lake's effect on population-driven economic activity. If a sub-industry is considered population-dependent, the ratio is used to adjust its sales volume and employment. The difference between actual and adjusted values is interpreted as the portion attributable to Green Lake.

To account for the presence of vacation homes and short-term rentals, population effects are estimated using two different ACS metrics:

- Households, which reflect primary residences only.
- Housing units, which also include vacation homes, short-term rental properties, and vacant homes, as well as primary households.

Table 2-2 and Table 2-3 below show the resulting population effects. Counterintuitively, a lower percentage implies a larger population effect, as it indicates a greater portion of economic activity would not exist without the lake.

For example:

- A population effect of 65% means that 65% of activity would remain if the lake did not exist. In this case, 35% of activity is attributable to the presence of Green Lake (Table 2-2).
- A population effect of 47% means that only 47% of current sales and employment in population-dependent sub-industries would remain without the lake—therefore, 53% of the current activity is attributable to the presence of the lake (Table 2-3).

Table 2-2 : Population Effect Using ACS Household Counts

	Number of Households	Area (Square Miles)	Density (HH/sq mi)	Population Effect
Green Lake County	8,025	380.12	21.1	**65%**
Buffer Zone	1,532	47.15	32.5	

Table 2-3 : Population Effect Using ACS Housing Unit Counts

	Number of Housing Units	Area (Square Miles)	Density (HH/sq mi)	Population Effect
Green Lake County	10,525	380.12	27.7	**47%**
Buffer Zone	2,799	47.15	59.4	

This methodology relies on several simplifying assumptions to allow for estimation of population effects. The following key assumptions for the population-effect methodology are relevant:

- Proportionality: Population-driven sales and employment scale linearly with housing density (i.e., a X% lower density over a fixed area implies ~X% lower population-driven economic activity).
- Household homogeneity: Within a given sub-industry, per-household/per-capita consumption does not differ systematically between lake-adjacent and non-lake households.
- Exogeneity: Higher housing density near the lake is primarily driven by the lake's amenity value rather than unrelated historical development patterns, zoning, infrastructure, or other non-lake factors.
- No spatial spillovers: Lake-adjacent spending and employment do not materially displace or redistribute activity from elsewhere in the county.

If these assumptions are violated, the estimated population effect could be moderately overestimated or underestimated.

2.2.3 Extension to Ripon

Green Lake's economic contribution likely extends beyond the buffer zone described above. For example, the nearby areas Markesan, Princeton and Ripon, among others, may also enjoy economic

support from the existence of Green Lake. This analysis identifies the City of Ripon, located just 7.5 miles to the east of the lake, as a large economic beneficiary from Green Lake beyond the 1.5-mile buffer. The City of Ripon offers a variety of goods and services that are not available within the buffer zone. More specifically, the City of Ripon provides the closest and most convenient opportunity for full-service grocery stores, a range of dining experiences, certain health and personal care opportunities, and other goods and services. It is reasonable to assume that some Green Lake residents and tourists spend money in Ripon, even though they reside or vacation elsewhere.

However, because other lakes also exist in the area, isolating Green Lake's specific economic impact on Ripon using the same buffer methodology is not feasible. Instead, the analysis relies on a population effect approach informed by primary data.

The GLA distributed surveys to Ripon business owners asking them to estimate:

- The proportion of their sales that come from Green Lake residents or tourists, and
- Whether seasonal patterns influence their business activity.

Once collected by the GLA and provided to Stantec for the analysis, the survey responses were categorized by NAICS sub-industry codes and used to adjust Ripon's economic data. The average share of Green Lake-related sales per sub-industry was then applied to Ripon's full economic dataset to estimate the lake's contribution to the city.

For example, the results from the analysis of Ripon survey data suggest that approximately 5% of sales in the basic retail and basic services industries are supported by Green Lake. In addition, approximately 12% of sales in the premium retail and premium service industries and approximately 25% of sales in the new build construction industries are also supported by Green Lake.

These data provide an anecdotal, business-informed estimate of Green Lake's economic footprint in Ripon rather than a statistically significant representation. In our professional judgement, these data provide useful and meaningful results for economic contribution accounting.

2.3 Contribution Analysis Results

The results of the contribution analysis are summarized in

Table 2-4. These estimates reflect the difference between existing business sales volumes and employment and the levels of sales and employment that could be expected if Green Lake did not exist. This difference represents the lake's economic contribution to the region.

Green Lake's annual contribution to Green Lake County is estimated at $59.2 million to $78.6 million in business sales per year, and 819 to 1,165 jobs supported. This represents between 45% to 60% of all yearly business sales and 37% to 53% of total employment in the buffer zone. Alternatively, this represents between 5% to 7% of all yearly business sales and 9% to 13% of total employment in the county.

The lake's annual contribution to the City of Ripon is estimated at $29.0 million to $44.1 million in business sales and 154 to 235 jobs supported. This represents an estimated 2% to 3% of Ripon's business sales and 2% to 3% of total employment.

Combined, Green Lake supports an estimated $88.1 to $122.7 million in economic activity each year across both Green Lake County and Ripon, and 973 to 1,400 jobs. This represents a contribution between 3-5% of all economic output and 6-8% of all employment in Green Lake County and Ripon.

Table 2-4 : Green Lake Annual Economic Contribution

Results Summary[1]	**Low Estimate (Using Households)**	**Moderate Estimate (Using Housing Units)**
Existing Sales Volume in 1.5 Mile Buffer Zone	$131.7 Million	
Estimated Sales Volume in 1.5 Mile Buffer Zone Without Green Lake	$72.5 Million	$53.1 Million
Lake Contribution to Green Lake County	**$59.2 Million**	**$78.6 million**
Existing Employment in 1.5 Mile Buffer Zone	2,216 jobs	
Estimated Employment in 1.5 Mile Buffer Zone Without Green Lake	1,397 jobs	1,051 jobs
Lake Contribution to Green Lake County	**819 jobs**	**1,165 jobs**
Existing Sales Volume in Ripon	$1,468.2 Million	
Estimated Sales Volume in Ripon Without Green Lake	$1,439.2 Million	$1,424.1 Million
Lake Contribution to Ripon	**$29.0 Million**	**$44.1 Million**
Existing Employment in Ripon	7,678 jobs	

[1] The economic contribution estimates for Green Lake County combine population and lake effects. Approximately 60% of the estimated contributions to Green Lake County result from population effects. The Ripon results rely on business' responses to a survey and do not rely on population/lake effects as modeled for Green Lake County estimates.

Estimated Employment in Ripon Without Green Lake	7,524 jobs	7,443 jobs
Lake Contribution to Ripon	**154 jobs**	**235 jobs**
Total Sales Volume Attributable to Green Lake	**$88.1 Million**	**$122.7 Million**
Total Employment Attributable to Green Lake	**973 jobs**	**1,400 jobs**

2.4 Impact Analysis Methodology and Data

The impact analysis estimates the extent to which specific changes in the water quality of Green Lake could affect economic activity in Green Lake County. Specifically, it models how shifts in visitor behavior—resulting from either improved or degraded water conditions—could impact jobs, income, and overall economic output.

Two scenarios were simulated using the IMPLAN input-output (I-O) model, a widely used tool for regional economic analysis:

1. A positive scenario, in which a significant decrease in filamentous algae mats observed in Green Lake increases tourism and lake use.
2. A negative scenario, in which a substantial decline in water clarity reduces tourism and lake use.

Both scenarios reflect conditions identified in Green Lake.

2.4.1 IMPLAN Input-Output Model

To estimate regional economic impacts, the analysis used the IMPLAN I-O model, an industry standard and proprietary tool that draws on data from multiple sources to create a Social Accounting Matrix (SAM) for each region and industry. This framework also tracks how spending flows through a local economy, capturing:

- Direct effects – immediate economic activity generated by changes in visitor spending (e.g., visitor spending at hotels, restaurants, marinas, and boat rental businesses).
- Indirect effects – business-to-business activity in the supply chain that supports direct spending (e.g., a marina purchasing fuel, equipment, and repair services from local suppliers).
- Induced effects – household spending resulting from the wages earned in directly and indirectly affected businesses (e.g., employees of marinas, restaurants, or suppliers spending their income locally on groceries, healthcare, childcare, or housing).

This structure models the multiplier effect, where a single dollar spent circulates through the local economy, generating additional economic activity.

2.4.2 Estimating Direct Impacts

To simulate the two scenarios, the analysis first estimated the direct effects of water quality change, which is the change in visitor spending directly attributable to the lake.

Baseline data included:

- 2023 visitor spending in Green Lake County, estimated at $44.2 million (Wisconsin Department of Tourism, 2024)
- Assumptions from the contribution analysis and discussions with the GLA, which estimate that 50% to 70% of visitor spending in Green Lake County is related to Green Lake, and
- Results from the Delavan Lake Study (Eiswerth et al., 2005), which examined how visitors respond to changes in lake conditions.

From the GLA assumption that 50-70% of visitor spending is related to the Lake, the analysis assumes that $22.1 to $31.0 million in visitor spending in 2023 (totaling $44.2 million) was attributed to Green Lake-specific tourism. This range serves as the baseline for modeling the effects of water quality changes.

2.4.3 Applying the Delavan Lake Study

The Delavan Lake Study (Eiswerth et al., 2005) surveyed visitors and residents about their willingness to visit under different water quality conditions. Though conducted in 2005, Delavan Lake is located about 100 miles south of Green Lake, in Walworth County Wisconsin, and was considered a reasonable proxy due to geographic and recreational similarities.

The Delavan Lake survey (Eiswerth et al., 2005) found that:

- Visitation would increase by 23.5% with a significant reduction in Eurasian watermilfoil (used here as a proxy for filamentous algae), and
- Visitation would decrease by 33.8% with a substantial decline in water clarity. This is a direct comparison to Green Lake given the opportunity for water clarity issues to arise if no action is taken.

The survey results showed that visitors are likely to react more strongly to negative changes in water quality than to positive changes.

2.4.4 Modeled Visitor Spending Scenarios

These values were used to model behavioral response in Green Lake under the two scenarios:

- Positive scenario: Applying a 23.5% increase to the 2023 Green Lake visitor spending baseline results in an additional $5.2 million to $7.3 million in direct spending.

- Negative scenario: Applying a 33.8% decrease results in a reduction of $7.5 million to $10.5 million in direct spending.

These estimates are limited to Green Lake County and do not include economic effects in surrounding areas.

2.4.5 Industry Allocation

Once the ranges of direct impacts were estimated, they were allocated across relevant industries in Green Lake County. This enabled the IMPLAN I-O model to calculate indirect and induced effects specific to each scenario. Table 2-5 below displays the industry descriptions, IMPLAN codes, and percentage allocation of the ranges of impacts to spending described in section 2.4.4 resulting from changes in water quality in Green Lake. This analysis assumes the same allocation of impacts across industries for both the positive and negative impact scenarios.

Table 2-5: Industry Allocations for IMPLAN Modeling

Impacted Industry Description	IMPLAN Industry Code	Percent of Direct Impact
Full-Service Restaurant	491	16.4%
Marinas and Recreation	486	14.5%
Limited-Service Restaurant	492	13.3%
Household Income Tiers	10006-10009	13.2%
Gas Station/Convenience Store	391	11.3%
Lake Rentals	433	8.4%
Retail – Food & Beverage	389	8.2%
Hotels and Motels	489	7.5%
Retail – Sporting Goods	393	2.9%
Campgrounds and Camping	490	2.2%

Scenic and Sightseeing	402	2.1%
Total	**N/A**	**100%**

The final results of the impact analysis, as generated by IMPLAN, are presented in Section 2.5.

2.5 Impact Analysis Results

2.5.1 Positive Change in Water Quality

To simulate the economic impact of improved water quality, the input-output (I-O) model was run using a range of direct spending increases between $5.2 million and $7.3 million, based on a substantial reduction in filamentous algae mats. While the spatial distribution of filamentous algae in Green Lake is not widespread, localized presence and density has anecdotally detoured some tourism and recreation in those areas. The results are presented in Table 2-6.

Notably, direct output impacts to Green Lake County are slightly lower than the input values due to leakages—dollars that leave the local economy. These occur when a portion of spending (e.g., on retail goods or services) flows to businesses or supply chains located outside Green Lake County. Retail margins, in particular, are a common source of leakage, reducing the extent to which local dollars are recirculated and retained.

Table 2-6: Economic Impact Results from a Positive Change in Water Quality

Impact	Employment (jobs)	Labor Income ($M)	Output ($M)
1 - Direct	46 to 65	$1.3 to $1.8	$3.9 to $5.4
2 - Indirect	6 to 9	$0.2 to $0.3	$1.0 to $1.4
3 - Induced	5 to 7	$0.2 to $0.3	$0.8 to $1.1
Total	**57 to 80**	**$1.7 to $2.5**	**$5.7 to $7.9**
Multiplier	1.23	1.34	1.46

The model estimates that a significant improvement in water quality could support 57 to 80 full- and part-time jobs, generate $1.7 million and $2.5 million annually, and produce $5.7 million to $7.9 million in total economic annually in Green Lake County.

2.5.2 Negative Change in Water Quality

Results from simulating a decline in water quality—indicated by declining water clarity—are shown in *Table 2-7*. In this scenario, direct economic losses range from -$7.5 million to -$10.5 million.

As with the positive scenario, leakages reduce the size of the local impacts, especially in retail sectors where supply chains often extend beyond county lines.

Table 2-7: Economic Impact Results from a Negative Change in Water Quality

Impact	**Employment**	**Labor Income ($M)**	**Output ($M)**
1 - Direct	-66 to -93	-$1.9 to -$2.6	-$5.6 to -$7.9
2 - Indirect	-9 to -12	-$0.4 to -$0.5	-$1.4 to -$2.0
3 - Induced	-7 to -9	-$0.3 to -$0.4	-$1.1 to -$1.6
Total	**-82 to -115**	**-$2.6 to -$3.5**	**-$8.1 to -$11.4**
Multiplier	-1.23	-1.34	-1.46

The analysis suggests that a significant decline in water quality could result in the loss of 82 to 115 full- and part-time jobs, a reduction in labor income between -$2.6 million and -$3.5 million, and a decrease in total economic output between -$8.1 million and -$11.4 million annually.

3 Valuation Analysis

In contrast to the contribution and impact studies, the valuation analysis estimates the value of clean, clear water as measured by property values on and near the Lake. The property-based valuation analysis helps answer the question, would property values decline if water quality declined and by how much? Additionally, how would a decline in property values translate into a potential decline in property tax revenues that fund the municipalities, schools and special districts within the project area? To answer these types of questions, the **valuation analysis** employs a benefits transfer approach to measure the percent change in property values and tax revenue should water quality decline below current levels.

A benefits transfer approach applies resource valuation estimates from existing peer-reviewed economic studies in reference areas to the subject area—in this case, Green Lake. Benefits transfer is widely accepted, including by federal funders, as a cost-effective and practical alternative to conducting primary valuation research, which can be time- and resource-intensive. When applied carefully, the benefits transfer methodology provides credible, policy-relevant estimates, based on rigorous research. The reliability of this approach depends on the quality, rigor, and contextual similarity of the studies used.

In this case, the analysis drew on a substantial body of existing literature that assesses how changes in water quality—particularly due to nutrient loading—affect lakefront property values. This section outlines the methods used, summarizes relevant studies, and discusses the implications for nutrient reduction and water quality investment for Green Lake.

3.1 Methods

The valuation analysis followed a standard four-step benefits transfer process:

1) Literature review – identify previously published studies that estimate the economic value of changes in lake water quality.

2) Transferability assessment – evaluate how similar the selected studies are to Green Lake, including ecological conditions, lake type, and community characteristics.

3) Study quality evaluation – Assess the methodological rigor and reliability of the candidate studies.

4) Assessment of values – Calibrate study findings to reflect Green Lake's specific economic and ecological conditions.

3.1.1 Step 1: Literature Review

The literature review focused on identifying economic studies that link water quality to changes in property value and ultimately to changes in property tax revenue.

3.1.1.1 Selection Considerations

Three considerations help determine the applicability of existing research to Green Lake, namely:

1) The **economic model** used to estimate water quality value, prioritizing studies that use a **hedonic model,** an accepted valuation technique. Hedonic models estimate the impact environmental attributes—such as water quality—have on property values, while controlling for other factors (e.g., home size, year built, lot, size, and location) that also affect property values.

2) The **ecological data** chosen to represent water quality. The two most common ecological indicators for nutrient-related degradation are: water clarity, measured by **Secchi depth**, and **harmful algal blooms** (HABs). Secchi depth measures the depth at which a disk is no longer visible when submerged. This measure of water clarity is relatively observable to lakefront property owners and visitors year round. HABs occur periodically and may not be present, or disclosed, during a sale, and could have less of an impact on property prices. Therefore, studies using Secchi depth as the water quality variable were prioritized in the selection process.

3) **Similarities of geography, lake type, demographics** (e.g. income, housing market, etc.). The ensure transferability, the valuation analysis prioritized studies conducted on mid-sized inland lakes with similar characteristics and location to Green Lake.

Appendix A provides the full list of reviewed studies. The literature search selected the studies that best matched the ecological, physical, and economic characteristics of Green Lake.

All of the studies found a decline in property values as water clarity (measured by Secchi depth) declined. The changes in property values ranged from 19.7% for a 0.3-meter change in Secchi depth for properties adjacent to a lake (Liu) to a 1.39% reduction in property value for a 4-meter reduction in Secchi depth for properties that are within 0.3 miles from the lake (Wolf).

In general, all the studies also found a smaller magnitude of property values changes the further the property is from the lake. Several studies tested the range beyond which a change in property value was not seen. Two of the studies (Lui and Wolf) found that at a distance of 0.3 miles from the lake water quality did not explain changes in property values.

The Weng paper studied Lake Mendota, which is in located in Madison WI, approximately 70 miles from Green Lake. Weng tested the change in property values for a range of Secchi depth values. An interesting finding of Weng's research suggests that the value of water quality, as measured by property value, is greater the higher the starting Secchi depth value (e.g. when lake water is relatively clearer). And beyond a Secchi depth, approximately 2 meters for Lake Mendota, further declines in Secchi depth do not change property values significantly. This result suggests that there may be greater value in protecting a relatively clean lake than restoring a lake with relatively low water clarity

Table 3-1: Pertinent Literature for Use in Benefits Transfer Valuation Study

Title & Lead Author	**Coupling Natural and Human Models in the Context of a Lake Ecosystem: Lake Mendota, Wisconsin, USA, Weng, Weizhe** (1)	**Beyond Marginal: Estimating the Demand for Water Quality. Wolf, David** (2)	**Hedonic Price Estimates of Lake Water Quality: Valued Attribute, Instrumental Variables, and Ecological-Economic Benefits Moore, Michael** (3)	**Valuing water quality change using a coupled economic-hydrological model Liu, Hongxing** (4)
Study Location	Lake Mendota, Wisconsin	State of Wisconsin	United States	Hoover Reservoir, Ohio
Summary of Findings	For properties adjacent to the lake, the magnitude of the change in property value is dependent on the starting Secchi depth value. A 3-meter change in Secchi depth from 7.2 meters to 4 meters results in an 8.2% change in property value. A continued 3-meter decline in Secchi depth results in a 4% change in property values.	2.4% change in property value from 4-meter change Secchi depth for properties within 0.15 miles from the lake. A 1.39% change in property value from 4-meter change if Secchi depth for properties within 0.3 miles of the lake.	9.9% change in property value per one meter Secchi depth for properties within 0.1 miles of a lake.	0.3-meter reduction in Secchi depth resulted in a 19.7% reduction in property values for properties adjacent to the lake, decreasing to a 7.7% decrease for properties within 0.3 miles

Notes: 1) Weng, Weizhe; Kevin J. Boyle, Kaitlin J. Farrell, Cayelan C. Carey, Kelly M. Cobourn, Hilary A. Dugan, Paul C. Hanson, Nicole K. Ward, Kathleen C. Weathers (2020). 2) Wolf, David & Klaiber, H. & Gopalakrishnan, Sathya. (2022). 3) Moore, Michael R.;Jonathan P. Doubek, Hui Xu, Bradley J. Cardinale. (2020). 4) Liu, Hongsing, S. Gopalakrishnan, D. Browning, G. Sivandran

3.1.2 Step 2: Transferability Evaluation of Primary Study

Values from two different studies were chosen for the benefits transfer, one for the estimates of property values that are adjacent to the lake (Weng et al.) and one for the detailed information about how the change in property values declines the further the property is from lake (Liu et al.). Each paper was published in a referred journal and the authors are widely respected in their fields.

The papers and their respective suitability factors are listed below.

Coupling Natural and Human Models in the Context of a Lake Ecosystem: Lake Mendota, Wisconsin, USA (Weng et al. 2020)

- The geographic proximity of Lake Mendota to Green Lake (Weng)
- Recency of the study's publication
- The relevance of its data, methods, and modeling approach.
- The relative similarity of demographics of the communities.

Valuing water quality change using a coupled economic-hydrological model (Liu et al. 2019)

- The detailed study of the % decline in the change in property values as the distance from the lake increase
- The relatively appropriate geography (inland lake in Ohio).

Notably, Weng et al. (2020) employed the General Lake Model (GLM) to simulate lake water quality responses to varying nutrient loading scenarios—this is the same foundational model used in Green Lake's recent study by USGS on the lake's response to phosphorus loading (Robertson et al. 2022). This shared modeling framework enhances the study's relevance and applicability to the Green Lake context.

The primary difference between Green Lake and Lake Mendota lies in the baseline water quality. Green Lake currently has relatively good water quality and lower nutrient concentrations compared to Lake Mendota. However, this contrast offers a valuable opportunity to ask: What is the avoided loss in property values if Green Lake's current water quality is protected?

By reversing the framework of Weng et al. (2020), which modeled the benefits of restoring Lake Mendota's water quality to a high level, the valuation analysis for Green Lake assesses the value of protecting existing conditions rather than recovering from degradation.

The Lui paper, and additionally the Wolf paper, also provide useful estimates of the decline in the impact that water clarity has on property values. Both researchers found that the values of properties more than 0.3 miles from the lake were likely not impacted by a change in water quality. Wolf estimated the average change in property values from a one-meter change in Secchi depth for all properties within 0.3 miles of the lakes in the study, and additionally tested the difference between property value changes within 0.1 miles and 0.3 miles of the lakes.

Lui included one other area in his study. Lui estimated the property value changes of properties that were adjacent to the lake, at 0.1 miles and at 0.3 miles distance from the lake. This additional detail

provides information that allows the Green Lake study to also estimate the 0.1 mile and 0.3 mile bounds, in addition to relying on the Weng paper for the estimate of the change in property values for lake-adjacent properties.

Since the estimated change in property values is most impacted by the 2 percent to 12 percent decline in property values from the Weng paper, and the study location of the Wend paper is Lake Mendota, what follows is a brief comparison of the demographics and ecological characteristics of Lake Mendota compared to Green Lake. This comparison helps determine the compatibility of the study area (Lake Mendota) to the reference area (Green Lake).

3.1.2.1 Demographic and Financial Comparison

The analysis compared demographic and property ownership characteristics in the Green Lake area with those in the Lake Mendota region studied by Weng et al. (2020). As shown in Table 3-2, the two communities are broadly similar in terms of the total number of lakefront residential properties, median lakefront property values, and percentage of owner-occupied lakefront residences.

These parallels support the use of Weng et al.(2020) findings in the Green Lake valuation analysis.

Table 3-2: Comparing Key Demographic Factors of Green Lake and Lake Mendota

Demographic Trend	Green Lake (b)	Lake Mendota (a)
Total Lakefront Residential Properties	964	772
Median Lakefront Property Value	$1,129,300	$1,324,605
Percent Owner Occupied; Lakefront Residential	28%	51%

Source: (a) Wisconsin Department of Administration (2024), (b) Green Lake County (n.d.) (2025).

3.1.2.2 Ecological and Physical Comparison

Green Lake and Lake Mendota share several important ecological and physical characteristics, though key differences—especially in nutrient loading and water clarity— are important considerations when evaluating the applicability of benefit transfer.

- Green Lake is a long, deep lake with a total surface area of 7,920 acres and a maximum depth of 236 feet. It has relatively low nutrient concentrations and has high baseline water clarity.
- Lake Mendota, in contrast, is larger in surface area at 9,781 acres but shallower, with a maximum depth of 83 feet. It experiences significantly higher total phosphorus (TP) loading, resulting in poorer water clarity.

The two lakes are most notably differentiated by current nutrient loading, which directly influences water clarity. Elevated nutrient loading increases algal productivity, which decreases water clarity. Green Lake currently receives 8,980 kg (19,800 lbs) of TP per year, while Lake Mendota currently receives approximately 34,000 kg (75,000 lbs) annually (Weng et al., 2020; Robertson et al. 2022).

Despite these differences, the lakes are comparable in several other key ecological factors. For example, the percentage of agricultural land in each watershed is nearly identical, indicating similar

external loading pressures from surrounding land use. Table 3-3 below summarizes key physical and ecological variables for both lakes.

Table 3-3: Ecological and Physical Comparison of Green Lake and Lake Mendota.

Variable of Interest	Green Lake	Lake Mendota	Unit
Total Surface Area	7,920	9,781	Acres
	32	40	Sq Kilometers
Maximum Depth	236	83	Feet
	72	25	Meters
Hydraulic Residence Time	9.3 - 23.8	4.3	Years
Agriculture Land Percent of Total Watershed	65	67	Percent
Average Annual TP Load	8,980	34,000	Kg / Year

Sources: Robertson et al. (2022) and Weng et al. (2020)

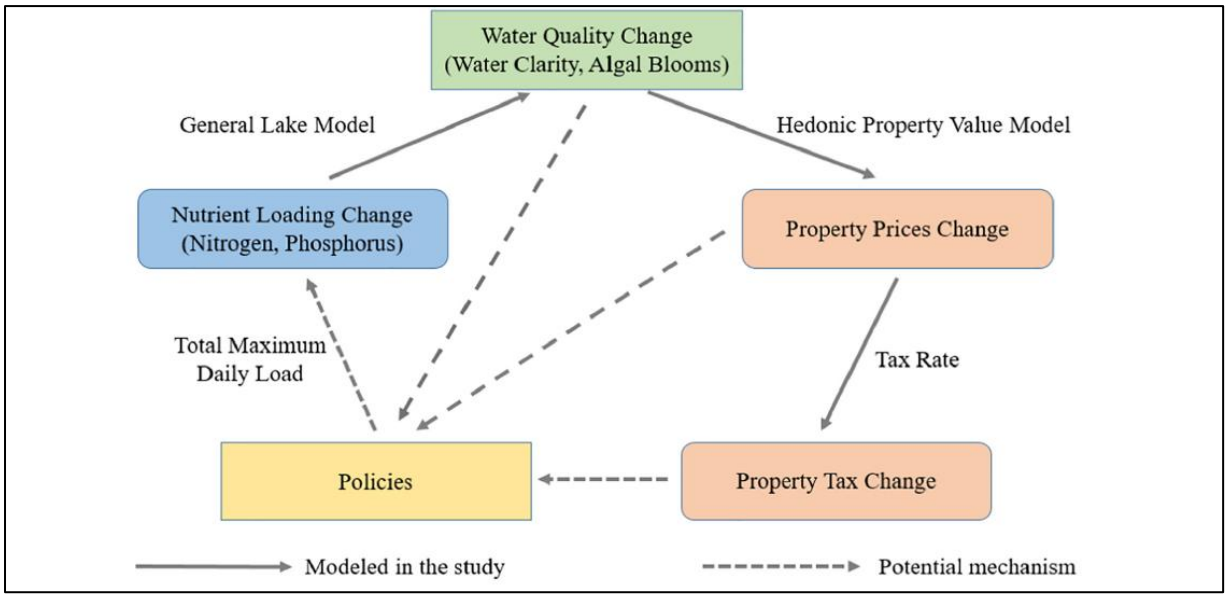
Overall, While Green Lake and Lake Mendota differ in depth and current nutrient loading, their shared comparable economic and physical characteristics and input factors from the surrounding region support use of Weng et al. (2020) as a credible and transferable source for benefit estimation.

3.1.2.3 Transferability Summary

The conceptual framework outlined in Weng et al. replicates the core question explored in this valuation study: How does a change in nutrient loading affect water quality, property values, and ultimately, local tax revenues?

In their study, Weng et al. links changes in nutrient loading to water quality outcomes, measured as water clarity, using a General Lake Model (GLM). These simulated water quality outcomes are then applied in a hedonic pricing model to estimate the resulting change in sales prices of lakefront properties. Finally, changes in property values are used to project shifts in property tax revenue, which supports critical local services, such as public schools.

This stepwise logic is depicted in Figure 3-1, and serves as the foundation for adapting the Lake Mendota results to the Green Lake context.



Source: Weng et al. (2020)

Figure 3-1. Conceptual Framework of the Selected Benefits Transfer Study.

3.1.3 Step 3: Evaluating the Quality of Primary Study

The third step of the benefits transfer process evaluates the reliability and rigor of the primary study used in the transfer.

Weng et al. (2020) was published in *Ecological Economics*, a monthly, peer reviewed, academic journal. The study's lead author, Dr. Weizhe Weng, is a specialist in human-freshwater interactions and has published extensively on the economic impacts from ecological changes (University of Florida, n.d.).

The second author, Dr. Kevin J. Boyle, is internationally recognized for his development and advancement of non-market valuation methods, bringing both theoretical and empirical rigor to the development of stated- and revealed preference methods. For the Lake Mendota study, Dr. Boyle developed a hedonic pricing model based on a robust longitudinal dataset that included 13,169 property-sale records spanning 2009 to 2015.

On both economic and ecological fronts, the Weng et al. (2020) study uses well-established, repeatable methods and provides a strong foundation for application in the Green Lake analysis.

3.1.4 Step 4: Adapting Results of Primary Studies to Green Lake

The final step in the benefits transfer process involved adapting the Weng et al. (2020) and Liu et al. (2019) results to Green Lake's unique ecological and economic context. While Lake Mendota is a heavily eutrophic system with high nutrient loads and low Secchi depths values, Green Lake—despite its relatively lower nutrients loads and high Secchi depths—is still classified as an impaired water body due to elevated phosphorus concentrations.

3.1.4.1 Estimating Property Value Changes to Lake-Adjacent Properties

The key contribution of Weng et al. (2020) is its quantification of how changes in Secchi depth—a visible indicator of water clarity—correlated with changes in property values. This relationship forms the basis of Green Lake's valuation analysis, which estimates potential losses in both property values and tax revenues under a scenario of declining water clarity (measured by Secchi depth).

Whereas the contribution and impact analyses (Sections 2.2 and 2.4) focused on Green Lake's current role in the local economy and the behavioral changes that might accompany shifting water quality, this valuation analysis evaluates the economic value of *avoiding future degradation*. It estimates the avoided loss property value and tax revenue that could result from proactively protecting Green Lake's future water quality.

To apply the Weng et al. (2020) model to Green Lake:

1) The analysis first identified lakefront, residential properties, as Weng et al. (2020) only identify changes for lakefront properties.

2) Next, it estimated the potential change in water clarity for Green Lake measured through Secchi depth under various water quality scenarios.

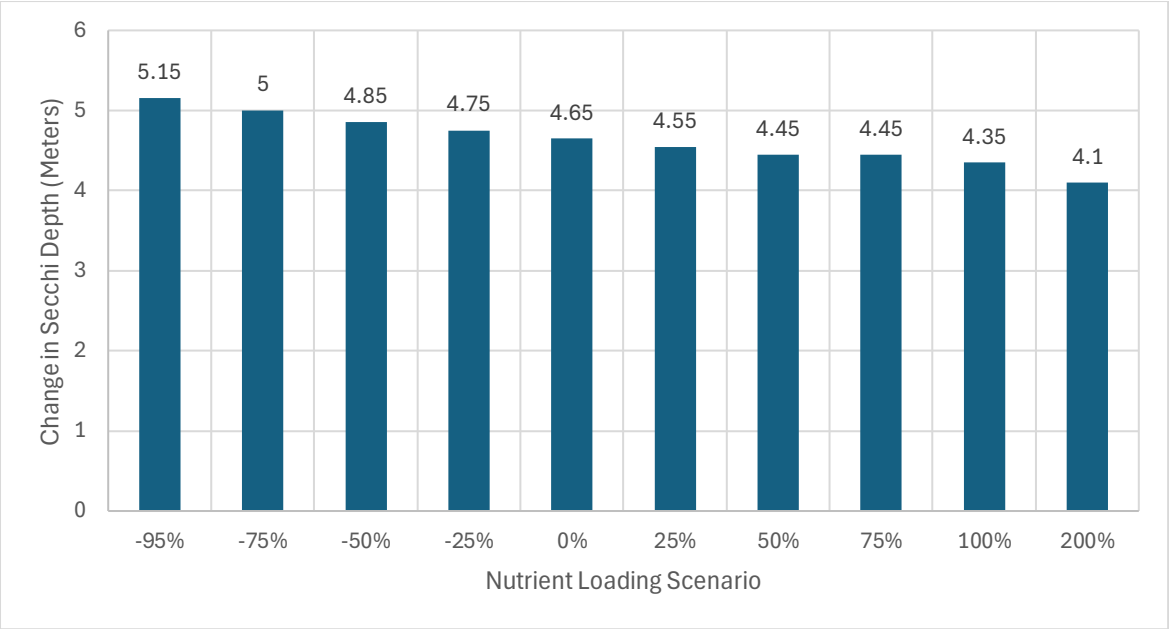
3) Finally, it applied the Weng et al. (2020) model to calculate the percent change in property values expected from the change in Secchi depth.

3.1.4.2 Predicted Nutrient Loading for Green Lake

The valuation analysis considered two scenarios in which water quality in Green Lake declines due to increased nutrient loading and estimated the corresponding effect on lakefront property values.

1) Baseline comparison scenario – In this scenario, water clarity in Green Lake is assumed to deteriorate to the baseline Secchi depth of 2 meters observed in Lake Mendota, as used in Weng et al. (2020).

2) Marginal comparison scenario – This second scenario uses projections from Robertson et al. (2022) which simulated changes in Green Lake's water clarity under various nutrient loading conditions. At present, Green Lake has an average Secchi depth value of 4.65 meters. Robertson et al. (2022) found that a 200% increase in nutrient loading would reduce clarity to 4.1 meters, representing a 0.55-meter loss in Secchi depth (Figure 3-2).



Source: Robertson et al. (2022)

Figure 3-2. Nutrient Loading and Mean Secchi Depth Values, Green Lake.

3.1.4.3 Adapting Estimates in Change in Lake Mendota Property Values to Green Lake Property Values

Weng et al. (2020) estimated the relationship between nutrient loading and Secchi depth using the General Loading Model, and between water clarity and property values using a hedonic pricing model. Figure 3-3 illustrates the strong nonlinear relationship between nutrient loading and Secchi depth improvement. Notably, modest reductions in nutrient loading yield little improvements in water clarity, but more aggressive reductions (e.g., the last 25%) result in substantial gains in Lake Mendota.

This non-linear relationship underscores a key insight: It is more effective, and likely less expensive, to prevent water quality degradation in a relatively clean lake than to restore clarity once it has already degraded from heavy nutrient loading.

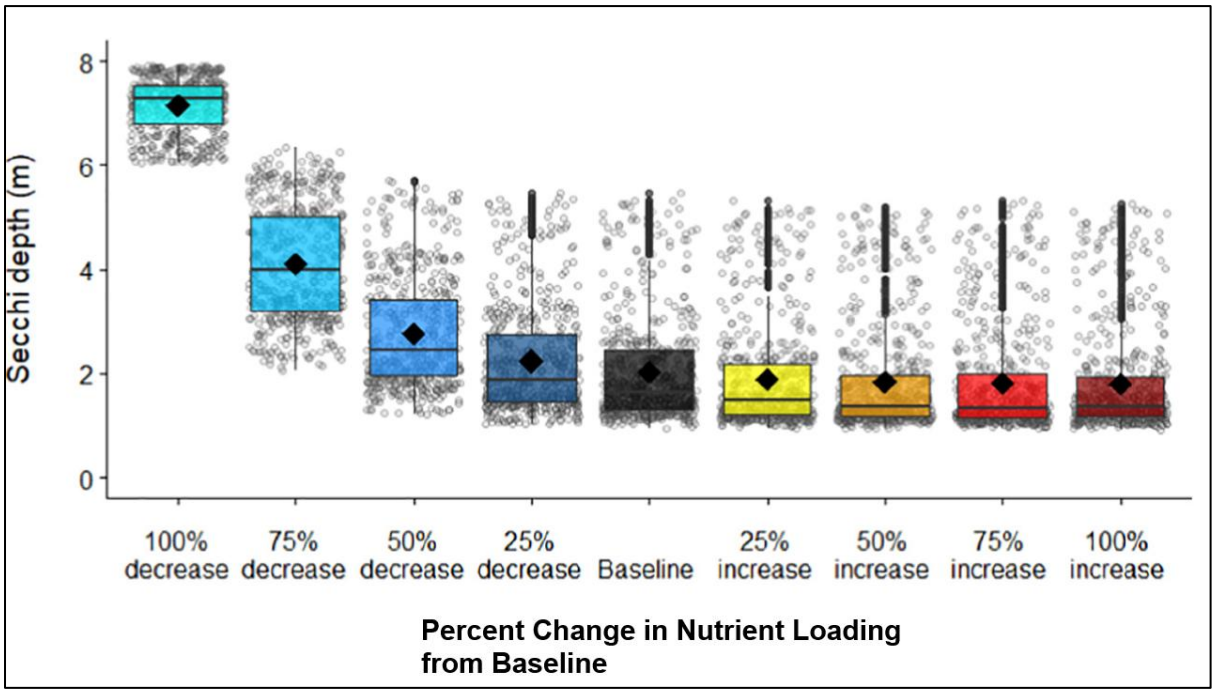


Figure 3-3. Results of General Lake Model Analysis from Weng et al. 2020 (Figure 6A).

Weng et al. (2020) also estimated the change in property value based on nutrient-driven changes in Secchi depth (Figure 3-4).

Changes in the mean value for lakefront properties.

Nutrient load change scenarios	Change in property values	
	Secchi depth changes	Chl-a concentration changes
25% increase	−$5756 (−1.0%)	−$2883 (−0.5%)
50% increase	−$7808 (−1.4%)	−$4162 (−0.7%)
75% increase	−$8587 (−1.5%)	−$5007 (−0.9%)
100% increase	−$9146 (−1.6%)	−$4995 (−0.9%)
25% decrease	+$6897 (1.2%)	+$3994 (0.7%)
50% decrease	+$23,135 (4.1%)	+$13,531 (2.3%)
75% decrease	+$53,659 (9.4%)	+$31,854 (5.6%)
100% decrease	+$100,190 (17.6%)	+$108,161 (19.0%)

Notes: Values in parentheses represent corresponding percentage changes in property values for each scenario based on the average selling price of lakefront properties during the study period of $569,921.

Source: Weng et al. (2020). Note (1) the Weng hedonic model estimated the change in property value from both a change in Secchi depth as well as the Chl-a concentration. In this valuation study only the change in property values related to Secchi depth is used.

Figure 3-4. Estimated Change in Property Value from Nutrient Loading Scenarios, Lake Mendota.

The valuation analysis links changes in nutrient loading to changes in property values by combining two relationships from Weng et al. (2020):

1) Nutrient loading as measured by the change in Secchi depth (Figure 3-3)
2) Secchi depth, with the estimate of a change in nutrient loading, to a change in property values (Figure 3-4).

Together, these relationships allow the analysis to estimate how a change in Secchi depth affects property values in Green Lake (see Figure 3-5).

Weng et al. (2020) determined that Lake Mendota's baseline Secchi depth is 2 meters. According to their model:

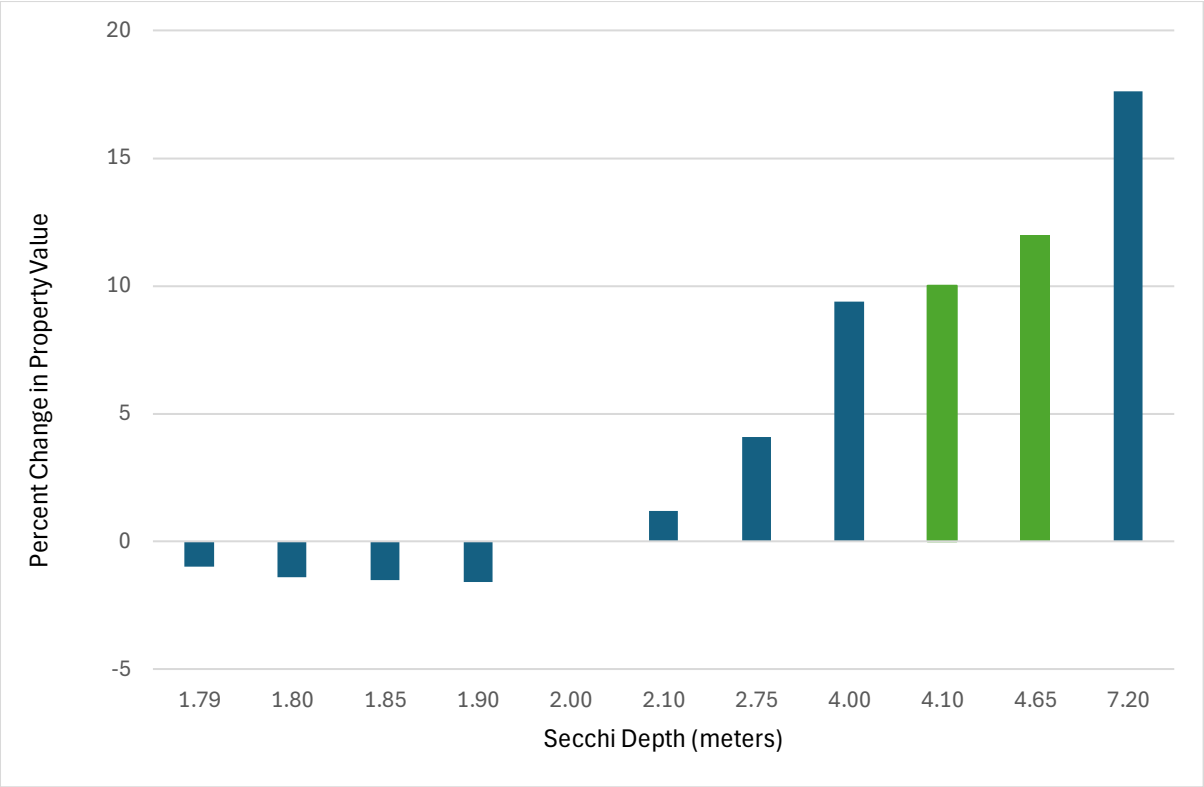
- An increase in water quality (e.g. increasing Secchi depth to 4 meters from the baseline of 2 meters) results in an approximate 9.5% increase in property values.
- An increase in water quality (e.g., increasing Secchi depth to 7.2-meters) results in a 17.6% increase in property values.

By interpolating between these two points, the valuation study estimates that a Secchi depth of 4.65 meters, from a 2.0-meter baseline would increase property values in Lake Mendota by 12%. And a 4.10-meter Secchi depth would increase property values in Lake Mendota by 10.0%. These interpolated points are the basis for adapting the results of Weng et al. (2020) to Green Lake.

Using this relationship and an avoided damage approach—which estimates the economic benefit of preventing future losses—the valuation study quantifies the economic benefit of preventing future water quality losses in Green Lake (as described in Section 3.1.4.2 and 3.1.4.3).

To quantify this, the analysis considers an alternative future in which Green Lake's water clarity declines to a Secchi depth of 2 meters—the baseline level modeled in the Weng et al. (2020) Lake Mendota study (see Section 3.1.4.3 for more details). While this represents a more severe decline than the 200% nutrient loading increase modeled by Robertson et al. (2020), it serves as a useful worst-case alternative to evaluate the potential scale of future economic loss (See Section 3.1.4.2 for more details on 200% nutrient loading increase).

The Weng et al. (2020) model estimated a change in property values at Secchi depths of approximately 2 meters. Improving water clarity in Lake Mendota from 2 meters to 4.65 meters would increase lakefront property values by approximately 12%. Applied to Green Lake, this suggests that maintaining current water quality protects property values equivalent to 12% of total lakefront market value. Put differently, investing up to 12% of lakefront property value in water quality protection could be economically justified by the property value it preserves.



Note: Values in blue are taken directly from the Weng et al. (2020) paper. Values in green were interpolated from Weng et al. (2020) findings in order to estimate the change in property values at Secchi depths of 4.00 meters and 4.65 meters.

Figure 3-5. Percent Change in Property Values per Meter Secchi Depth: Green Lake Results over Weng Results.

3.1.4.4 Adapting Estimates in a Change in Property Value Based on Proximity to the Lake

The Lui paper estimates the bounds of the impact of water quality on property values based on the distance the property is from the lake. Liu estimates the percent change in property value of lake-adjacent properties for a one-meter change in Secchi depth is 19.7% (Table 3-4). That estimated percent change declines to 15.9% for properties located 0.1 miles from the lake (excluding lake-adjacent properties), or only 79% of the estimated 19.7% change in property value of lake-adjacent properties. Similarly, the estimated change in property values for properties located between 0.1 miles and 0.3 miles of the lake declines to 7.7%, or only 39% of the lake-adjacent counties.

In order to estimate the impact of a change in Secchi depth at Green Lake for more than just the lake-adjacent properties, as Weng did the percent of the previous threshold was applied to the 12% estimated property value change obtained from Weng et al. (2020).

Table 3-4 shows the percent change in non-lakefront properties (using the threshold values from Lui). A 9.5 percent change in property values at the 0.1 mile distance threshold and a 4.7% change for the 0.1 mile to 0.3 miles distance threshold.

Table 3-4. Estimated Change Property Values Based on Distance from the Lake

Metric	Distance Thresholds from the Lake		
	Adjacent	**0.1 miles**	**0.3 miles**
Percent change in property value for a 1-meter change in Secchi depth	19.7%	15.7%	7.7%
Percent of previous thresholds estimated change in property value	NA	79%	39%
Estimated percent change in property values in Green Lake	12.0%	9.5%	4.7%

Source: Liu et al. (2019).

3.1.4.5 Estimating Property Values

To identify lakefront parcels in Green Lake County, a GIS analysis was conducted to identify all parcels located within each of the distance thresholds (Figure 3-6). For the lakefront parcels a distance of 130 feet from the shoreline was selected and found to be effective for capturing properties adjacent to the lake.

Out of a total of 19,319 parcels in the Green Lake County assessor's database with a non-zero value, 2,918, or 15% are located within the study area. 1,190 parcels were identified as lakefront, representing approximately 6% of all parcels in Green Lake County. Another 780 and 948 parcels are located in the 0.1 mile and 0.3 mile distance threshold, respectively.

The total assessed value of these study area parcels is $1.86 billion, 47% of the County's total assessed value.[2] Note, although the study area parcels only represent 15% of the total parcels in the County, they represent a much greater share of the assessed value. Lakefront parcels are estimated to have a total assessed value of $1.4 billion, or 36% of the county's total assessed property value of $3.9 billion (Table 3-6). Another $224.8 million and $224.2 million of assessed value is attributed to parcels located in the 0.1 mile and 0.3 mile distance threshold, respectively. To see the difference in the assessed value of properties based on the proximity to the lake, see Figure 3-7. Note that the majority of the assessed value in the study area accrues to the lakefront properties, $1.4 billion, or 76% of the study area assessed value.

Weng et al. (2020) used the *sales* price of homes in their hedonic pricing model, rather than the assessed values. The Town of Green Lake recently conducted a revaluation of property taxes for the 2025 tax year to establish assessment values at 100% of market value (Town of Green Lake, 2025). As such, the analysis could confidently use 2025 assessed parcel valuations as a basis for the change in property values due to a change in lake clarity.

[A] Assessed values were downloaded from the Green Lake County Tax Parcel Viewer and represent the total 2025 assessed valuation for each parcel. (Green Lake County. (n.d.).

The 2025 assessed value for all parcels in Green Lake County is $3.9 billion, where the parcels located within the study area account for $1.9 billion (47.0%) of the total current market value (Table 3-5).

Table 3-5. Parcel Count, Assessed Value and Estimated Market Price All Green Lake County Parcels by Distance Threshold

Metric	All Parcels	Within Project Area				Outside Project Area (Greater than 0.3 Miles)
		Lakefront Parcels	0.1 Miles from Lake (exc. Lakefront)	Between 0.1 miles and 0.3 miles	Total Study Area Parcels (within 0.3 miles of Lake)	
Total Assessed Value (millions of 2025 dollars)	$3,940	$1,411	$225	$224	$1,860	$2,080
Percent of total Assessed Value	*100%*	*36%*	*5.71%*	*5.69%*	*47.21%*	*53%*
Count of Parcels	19,460	1,195	789	964	2,948	16,512
Percent of total Parcels		*6%*	*4.10%*	*4.90%*	*15.00%*	*85%*

Source: Green Lake County Tax Assessor database and Shadick and Dolan

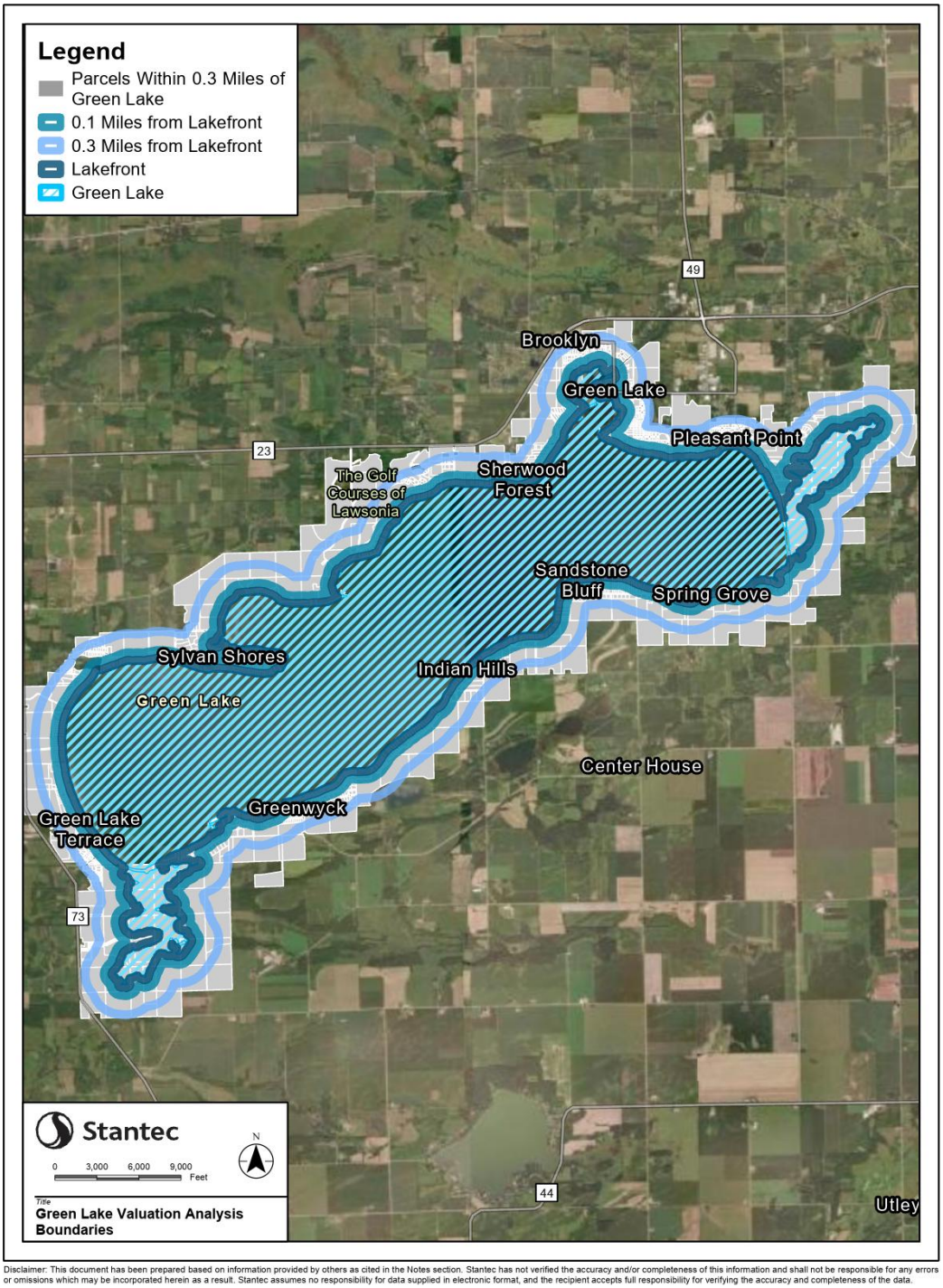


Figure 3-6. Valuation Analysis Study Area, Distance Thresholds.

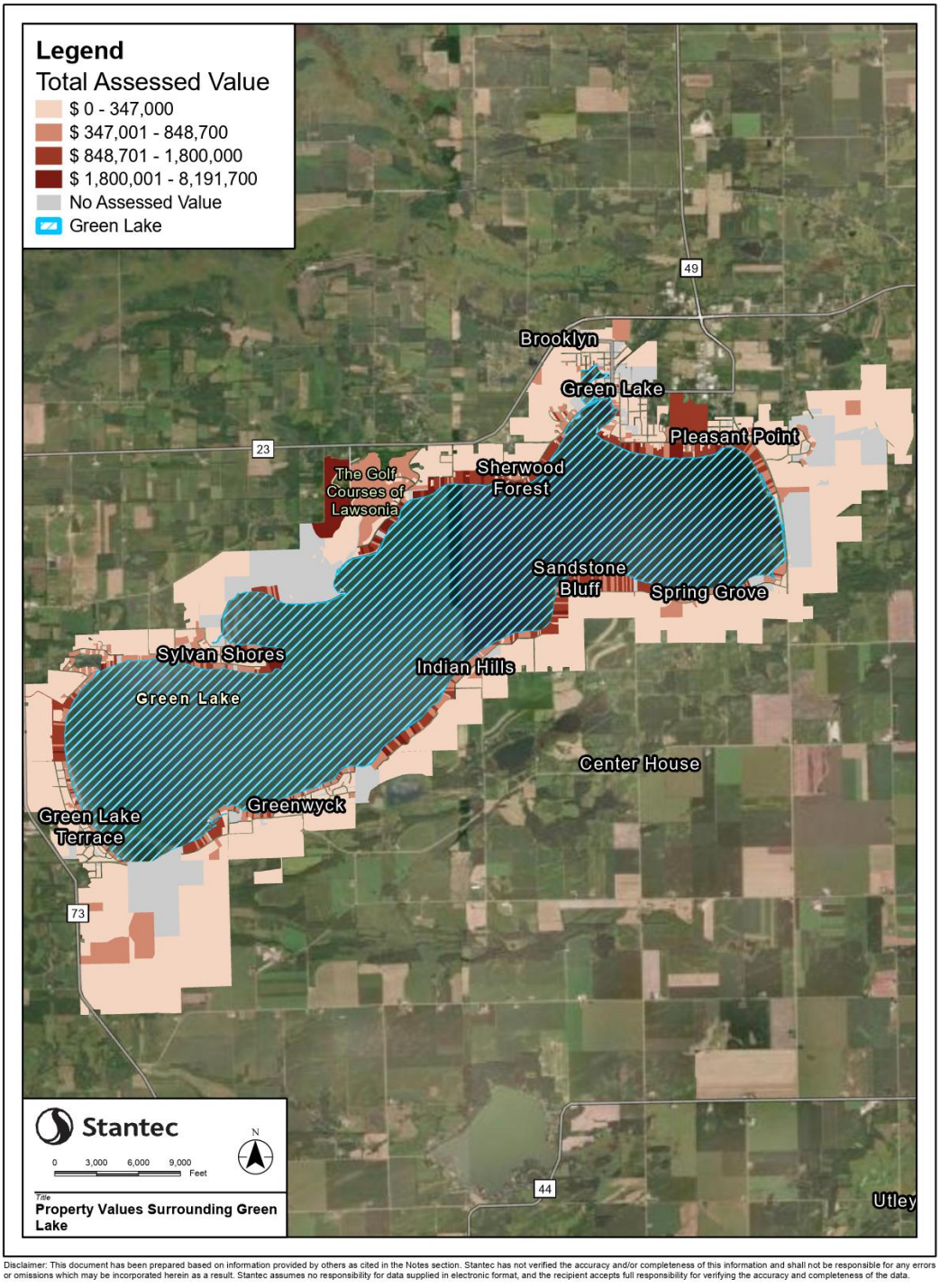


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Figure 3-7. 2023-2024 Assessed Values, Lakefront vs. Non-Lakefront Parcels.

3.2 Results

Applying the findings of the Weng et al. (2020) and Lui et al. (2019) studies to the value of current lakefront properties in Green Lake provides both:

- An estimate of how property values might change given a change in lake water quality (as measured by Secchi depth).
- An estimate of how declining property values could reduce property tax revenue to multiple municipalities, school districts and special districts in the study area.

3.2.1 Potential Loss in Property Value

Applying the estimated reduction in assessed property values (from Weng et al. (2020)) to Green Lake properties suggests that lakefront property values in Green Lake could decline between 2% to 12% if Secchi depth were to worsen from the current average of 4.65 meters to a future scenario of 4.1 meters or 2.0 meters, respectively.[3] For the non-lakefront properties and the findings of Liu et al, (2019) properties within 0.1 miles of the lakefront, depth could result in a 1.6% and 9% loss in property values, respectively. Properties within 0.3 miles of the lakefront could experience a 0.8% and 5% loss in property values, respectively.

Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65 meters to 4.1 meters, the estimated loss in property value is $33.5 million (Table 3-6). Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65-meters to 2.0 meters, the estimated loss in property value for project area properties is estimated to be $201.1 million. As expected, the decrease is greatest for lakefront properties, as both the underlying property values are relatively greater and also the percent decrease in property values is higher than for properties within 0.1 miles and 0.3 miles of the lake.

At the individual property level, this translates to an average loss in assessed value of $11,370 per property for a decline in Secchi depth from 4.65 meters to 2.0 meters (Table 3-7). For Secchi depth declines from 4.65 to 4.1 meters, the decline in value for individual properties is $68,220.

[3] Throughout the text references to property value refer to assessed property values.

Table 3-6. Estimated Decrease in Total Assessed and Estimated Market Value of Properties, by Distance Threshold (2025 dollars in millions).

Water Quality Assumption	Distance Thresholds						Study Area	
	Lakefront Parcels		0.1 Miles from Lake (exc. Lakefront)		Between 0.1 miles and 0.3 miles			
	Accessed	Est. Market	Accessed	Est. Market	Accessed	Est. Market	Accessed	Est. Market
Secchi depth declines from 4.65 meters to 2.0 meters (e.g. Lake Mendota baseline)	$28.2	$28.2	$3.6	$3.6	$1.8	$1.8	$33.5	$33.5
Secchi depth declines from 4.65 meters to 4.1 meters (e.g. 200% nutrient loading increase in Green Lake as modeled by Robertson et al. 2022)	$169.3	$169.3	$21.3	$21.3	$10.5	$10.5	$201.1	$201.1

Table 3-7. Estimated Decrease in Average Per Household Assessed and Estimated Market Value of Properties by Distance Threshold. (2025 dollars in millions).

Water Quality Assumption	Distance Thresholds						Study Area	
	Lakefront Parcels		0.1 Miles from Lake (exc. Lakefront)		Between 0.1 miles and 0.3 miles			
	Accessed	Est. Market	Accessed	Est. Market	Accessed	Est. Market	Accessed	Est. Market
Secchi depth declines from 4.65 meters to 2.0 meters (e.g. Lake Mendota baseline)	$23,613	$23,613	$4,502	$4,502	$1,814	$1,814	$11,370	$11,370
Secchi depth declines from 4.65 meters to 4.1 meters (e.g. 200% nutrient loading increase in Green Lake as modeled by Robertson et al. 2022)	$141,680	$141,680	$27,011	$27,011	$10,883	$10,883	$68,220	$68,220

3.2.2 Potential Loss in Property Tax Revenue

If property values decline because of worsening water quality, local property tax revenues could be affected—assuming mill rates remain unchanged. Conversely, if property values decline many taxing jurisdictions may be forced to increase their mill rates. However, for this study mill rates are assumed to remain constant.

To calculate the potential change in property tax revenue, the current mill rates for the multiple municipalities, school districts and special districts were used (Table 3-8).[4] The study area encompasses five municipalities; City of Green Lake, Town of Brooklyn, Town of Green Lake, Town of Marquette and Town of Princeton, four school districts, Green Lake School District, Markesan School District and Princeton School District, and Ripon School District. Additionally, some of the properties also pay property tax to the Green Lake Sanitary District. Finally, all properties pay tax to Green Lake County and Moraine Park.[5] Figure 3-8 and Figure 3-9 illustrate the spatial extent of municipal, school, and special tax districts relevant to the analysis. See Appendix B for more details about mill rates.

All municipalities in the study area have one mill rate. However, the school districts', County and special districts mill rates change depending on which municipality that portion of the entity serves.

Matching all mill rates in Table 3-8 to their corresponding properties, an estimate of the reduction in property tax revenue by municipality, school district and special district was completed. The property tax analysis uses a property's assessed value as the basis for change in property tax from a decline in property values.

Table 3-8. Municipality, School, and Special District Mill Rates in Green Lake County.

Town	School	School District Mill Rates	Town Mill Rate	Green Lake County Mill Rate	Green Lake Sanitary District	Moraine Park
City Of Green Lake	Green Lake School District	0.004010	0.005508	0.004232	0.000000	0.000561
Town Of Brooklyn	Green Lake School District	0.004424	0.001227	0.004557	0.000955	0.000612
Town Of Brooklyn	Ripon Area School District	0.007729				
Town Of Brooklyn	Berlin Area School District	0.006232				
Town Of Green Lake	Green Lake School District	0.004025	0.000824	0.004278	0.000873	0.000575
Town Of Green Lake	Markesan School District	0.010231				

[4] In this report mill rate is the amount of tax payable per dollar of assessed property value. For example, the City of Green Lake's stated mill rate of 0.004009808 means for every $1 of property value $0.004009808 of property tax is collected. Mill rates are sometimes also reported as the amount of tax payable for each $1,000 of property value. Using the City of Green Lake example the mill rate would be stated as 4.009808. Either formation of the mill rate returns the same estimated property tax revenue.

[5] The Town of Marquette has a mill rate for the Lake Puckaway Protection & Rehabilitation District (District). However, the District is not located within the study area therefore not reported here.

Town	School	School District Mill Rates	Town Mill Rate	Green Lake County Mill Rate	Green Lake Sanitary District	Moraine Park
Town Of Green Lake	Ripon Area School District	0.008521				
Town Of Marquette	Markesan School District	0.014718	0.002249	0.006277	0.001315	0.000844
Town Of Marquette	Princeton School District	0.008452				
Town Of Marquette	Montello School District	0.007964				
Town Of Princeton	Green Lake School District	0.007876	0.001267	0.008114	0.001700	0.001090

Source: Prellwitz (2026).

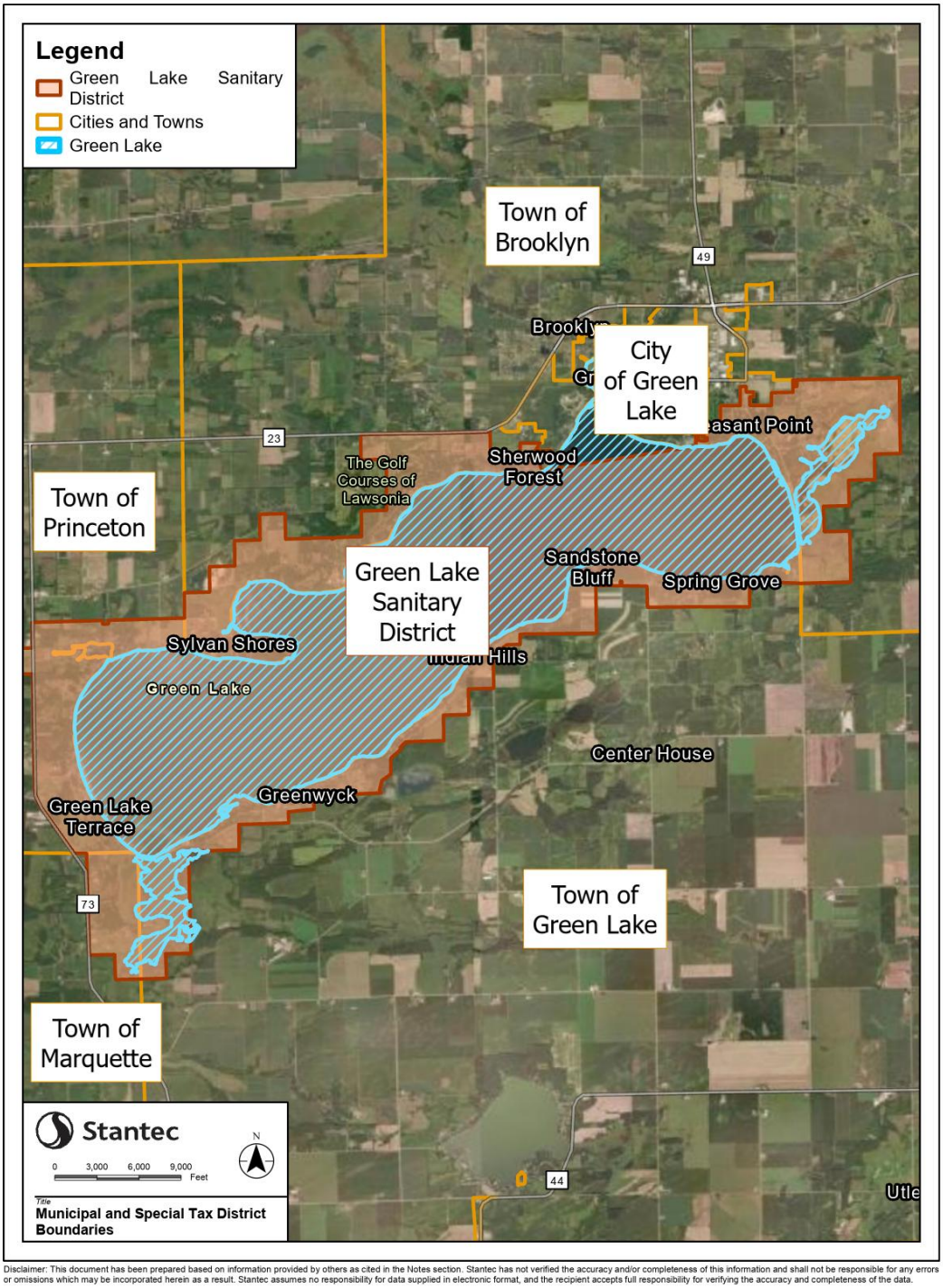

Figure 3-8. Municipal Boundaries Surrounding Green Lake.

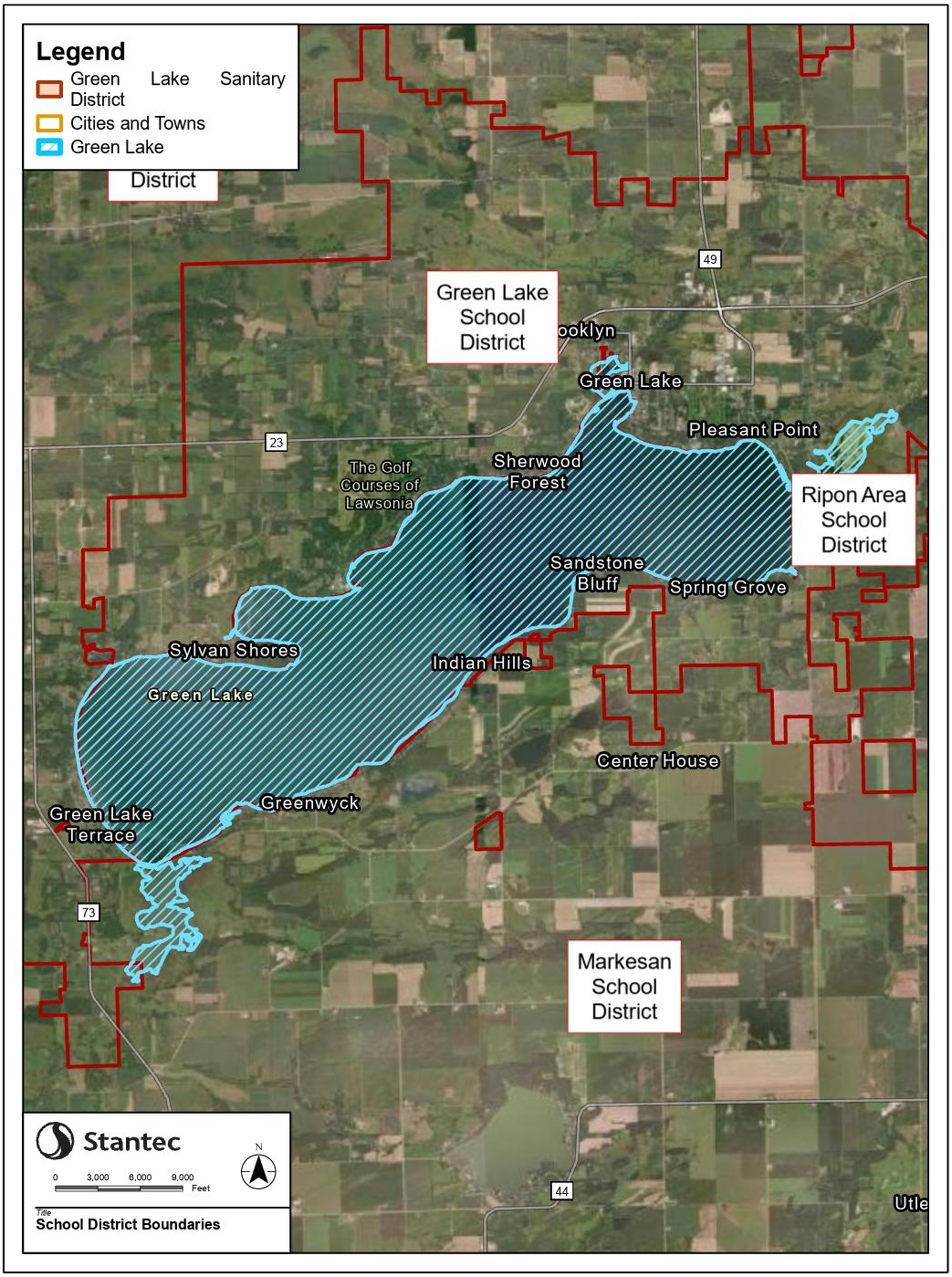

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Figure 3-9. School District Boundaries Surrounding Green Lake.

3.2.2.1 Total Project Area

Under the scenario in which water quality in Green Lake declines, as measured by Secchi depth, the estimated annual loss in tax revenue for all properties within the project area ranges between $470 thousand to $2.8 million (Table 3-9). The lower estimate of annual property tax loss ($470 thousand) assumes Secchi depth, declines from 4.65 meters to 4.1 meters. The higher estimate of annual property tax loss ($2.8 million) assumed Secchi depth, declines from 4.65 meters to 2.0 meters

Table 3-9. Annual Reduction in Property Tax Revenue by Taxing Entity, All Properties in Project Area (Municipality, School District and Special District), 2025 dollars in thousands.

District	Total Assessed ($ 000s)	Total property tax ($ 000s)	Decline in Property Tax ($ 000s)	
			Low (a)	High (b)
City Of Green Lake	$385,185	$2,122	$35	$212
Town Of Brooklyn	$595,172	$730	$13	$78
Town Of Green Lake	$690,668	$569	$11	$65
Town Of Marquette	$6,236	$14	$0	$1
Town Of Princeton	$185,872	$236	$4	$25
Total Municipalities	**$1,863,134**	**$3,671**	**$64**	**$381**
Green Lake School District	$1,380,467	$5,966	$107	$643
Markesan School District	$341,071	$3,517	$64	$386
Princeton School District	$139,335	$1,522	$27	$161
Ripon Area School District	$2,260	$17	$0	$1
Total School Districts	**$1,863,134**	**$11,023**	**$199**	**$1,191**
7020 GL Sanitary District	$1,863,134	$1,495	$27	$164
Moraine Park	$1,863,134	$1,186	$21	$128
Total Special Districts	**$3,726,267**	**$2,681**	**$49**	**$292**
Green Lake County	$1,863,134	$8,844	$159	$953
Total	NA	26,218.9	$470	$2,818

Notes: (a) Secchi depth, declines from 4.65-meters to 4.1 meters, (b) Secchi depth, declines from 4.65-meters to 2.0 meters

Based on the estimated reduction in lakefront residential property values, taxing entities may face a decision: absorb the resulting revenue loss or adjust mill rates. To recoup lost revenue, the taxing entity could increase property tax mill rates across the board or apply targeted increases specifically to lakefront parcels. The precise approach would depend on policy choices made by local taxing authorities.

3.2.2.2 Lakefront Properties Only

Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65 meters to 2.0 meters, the estimated annual loss in tax revenue from lakefront properties (Figure 3-6) is $2.3 million (Table 3-10).

Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65-meters to 4.1 meters, the estimated annual loss in tax revenue for lakefront properties could total $391 thousand (Table 3-10).

Table 3-10. Annual Reduction in Property Tax Revenue by Taxing Entity, Lakefront Properties (Municipality, School District and Special District), 2025 dollars in thousands.

District	Total Assessed ($ 000s)	Total property tax ($ 000s)	Decline in Property Tax ($ 000s)	
			Low (a)	High (b)
City Of Green Lake	$234,592	$1,292	25.8	155.1
Town Of Brooklyn	$433,521	$532	10.6	63.8
Town Of Green Lake	$612,940	$505	10.1	60.6
Town Of Marquette	$2,238	$5	0.1	0.6
Town Of Princeton	$128,161	$162	3.2	19.5
Total Municipalities	**$1,411,453**	**$2,497**	**49.9**	**299.6**
Green Lake School District	$1,040,562	$4,491	89.8	539.0
Markesan School District	$277,459	$2,849	57.0	341.8
Princeton School District	$93,379	$1,020	20.4	122.4
Ripon Area School District	$52	$0	0.0	0.0
Total School Districts	**$1,411,453**	**$8,361**	**167.2**	**1003.3**
7020 Green Lake Sanitary District	$1,176,860	$1,170	23.4	140.3
Moraine Park	$1,411,453	$891	17.8	106.9
Total Special Districts	**$2,588,313**	**$2,061**	**41.2**	**247.3**
Green Lake County	$1,411,453	$6,644	132.9	797.3
Total	**NA**	**$19,563**	**$391**	**$2,348**

Notes: (a) Secchi depth, declines from 4.65 meters to 4.1 meters, (b) Secchi depth, declines from 4.65 meters to 2.0 meters

3.2.2.3 Properties Within 0.1 Miles of Green Lake

Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65 meters to 2.0 meters, the estimated loss in tax revenue for properties within 0.1 miles of Green Lake (excluding lakefront) could total $314 thousand (Table 3-11). Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65 meters to 4.1 meters, the estimated loss in tax revenue for properties within 0.1 miles of Green Lake (excluding lakefront) could total $52 thousand (Table 3-11).

Table 3-11. Annual Reduction in Property Tax Revenue by Taxing Entity, within 0.1 Miles of Green Lake (Municipality, School District and Special District), 2025 dollars in thousands.

District	Total Assessed ($ 000s)	Total property tax ($ 000s)	Decline in Property Tax ($ 000s)	
			Low (a)	High (b)
City Of Green Lake	$69,857	$385	6.1	36.5
Town Of Brooklyn	$81,757	$100	1.6	9.5
Town Of Green Lake	$41,567	$34	0.5	3.2
Town Of Marquette	$90	$0	0.0	0.0
Town Of Princeton	$32,303	$41	0.6	3.9
Total Municipalities	**$225,574**	**$561**	**8.9**	**53.1**
Green Lake School District	$169,164	$727	11.5	68.9
Markesan School District	$26,863	$275	4.3	26.1
Princeton School District	$28,512	$311	4.9	29.5
Ripon Area School District	$1,035	$8	0.1	0.8
Total School Districts	**$225,574**	**$1,321**	**20.9**	**125.2**
7020 Green Lake Sanitary District	$155,717	$169	2.7	16.1
Moraine Park	$225,574	$148	2.3	14.1
Total Special Districts	**$381,292**	**$318**	**5.0**	**30.1**
Green Lake County	$225,574	$1,109	17.5	105.1
Total	**NA**	**$3,308**	**$52**	**$314**

Notes: (a) Secchi depth, declines from 4.65-meters to 4.1 meters, (b) Secchi depth, declines from 4.65-meters to 2.0 meters

3.2.2.4 Properties Within 0.3 Miles of Green Lake

Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65-meters to 2.0 meters, the estimated annual loss in tax revenue for properties within 0.3 miles of Green Lake (excluding lakefront, 0.1 miles) could total $157 thousand (Table 3-12). Under the scenario in which water quality in Green Lake, as measured by Secchi depth, declines from 4.65-meters to 4.1 meters, the estimated loss in tax revenue for properties within 0.1 miles of Green Lake (excluding lakefront, 0.1 miles) could total $26 thousand (Table 3-12).

Table 3-12. Annual Reduction in Property Tax Revenue by Taxing Entity, Within 0.3 Miles of Green Lake (Municipality, School District and Special District), 2025 dollars in thousands.

District	Total Assessed ($ 000s)	Total property tax ($ 000s)	Decline in Property Tax ($ 000s)	
			Low (a)	High (b)
City Of Green Lake	$80,736	$445	3.5	20.8
Town Of Brooklyn	$79,894	$98	0.8	4.6
Town Of Green Lake	$36,161	$30	0.2	1.4
Town Of Marquette	$3,907	$9	0.1	0.4
Town Of Princeton	$25,409	$32	0.3	1.5
Total Municipalities	**$226,107**	**$614**	**4.8**	**28.7**
Green Lake School District	$170,742	$748	5.8	35.0
Markesan School District	$36,749	$393	3.1	18.4
Princeton School District	$17,443	$191	1.5	8.9
Ripon Area School District	$1,173	$9	0.1	0.4
Total School Districts	**$226,107**	**$1,341**	**10.5**	**62.8**
7020 Green Lake Sanitary District	$145,371	$156	1.2	7.3
Moraine Park	$226,107	$146	1.1	6.8
Total Special Districts	**$371,477**	**$302**	**2.4**	**14.1**
Green Lake County	$226,107	$1,091	8.5	51.1
Total	**NA**	**$3,348**	**$26**	**$157**

Notes: (a) Secchi depth, declines from 4.65-meters to 4.1 meters, (b) Secchi depth, declines from 4.65 meters to 2.0 meters

4 Discussion

Three distinct types of economic analyses presented above provide support for GLA to inform the comprehensive watershed and lake management plan. Thes analyses described in this report included: (1) an economic contribution analysis of the lake's current role in supporting local economic activity in Green Lake County and the City of Ripon, (2) an economic impact analysis modeling potential gains or losses associated with changes in water quality, and (3) a valuation analysis estimating the effect of water quality on lakefront property values.

The contribution and impact analyses offer insights into how the lake and changes to its water quality may influence local economic activity in terms of jobs, income, and output. In contrast, the valuation analysis estimates the economic value of prevention—quantifying the potential property value and tax revenue losses that could result from declining water quality in the future.

4.1 Current Contribution and Impacts of Water Quality Changes on Local Economy

To contextualize the findings, Table 4-1 compares results from this study to a similar analysis conducted for Delavan Lake (Eisworth et al. 2005). Delavan was selected as a peer comparison due to the similarity of methods used and its location in an ex-urban setting—closer in character to Green Lake than the urban Yahara Lakes system in Madison.

Despite Green Lake County's smaller population and economic base compared to Walworth County (home to Delavan Lake), the findings are of similar or even greater magnitude. This is best illustrated by the lake's contribution to the local economy as a percentage of GDP:

- Delavan Lake accounted for 2.5% of Walworth County's GDP.
- Green Lake accounts for an estimated 12.3% of Green Lake County's GDP, underscoring its outsized importance to the regional economy.

While expressing economic contribution as a share of GDP is helpful for comparison, it is not a perfect match due to differences in how GDP and total economic activity are calculated (notably, the inclusion of intermediate inputs in contribution analyses). A more precise metric—contribution to total sales volume—is also included:

- Green Lake contributes approximately 7.3% of Green Lake County's total sales volume (excluding Ripon), and
- 4.8% when Ripon is included.

Comparable metrics for Delavan are not available.

Table 4-1. Findings from Delavan Compared to Green Lake with and without Ripon

	Delavan (2005)	Green Lake w/o Ripon (2024)	Green Lake (2024) With Ripon
People of interest	Visitors and residents	Visitors and residents	Visitors and residents
Area of Interest	Immediate Delavan Lake area	Immediate Green Lake area	Immediate Green Lake area plus Ripon, WI
Analyses undertaken	Contribution, Impact, Hedonic Property Value,	Contribution, Impact*	Contribution, Impact*
Population in county (approx. time of study)	94,000 (35,000 households)	19,344 (8,025 households)	27,110 (11,466) households)
County GDP (at approx. time of study (2024$)	$5.0B	$640M	N/A
Economic contribution (2024$)	$124M/yr	$78.6M/yr	$122.7M/yr
Economic contribution[1]expressed as a proportion of GDP	2.5%	12.3%	N/A
Contribution to employment	812	1,165	1,400
Economic impact from a (+) change in water quality	$10M	$5.7M to $7.9M	N/A
Economic impact from a (-) change in water quality	-$9M	-$8.1M to -$11.4M	N/A

[1] For illustrative purposes only, we express the economic contribution as a proportion of GDP. Whereas total economic contribution includes the value of intermediate inputs, GDP excludes the value of intermediate inputs. We include it here as a meaningful metric to compare the level of contribution found across studies within the regional economic context of each study, despite its limitations.

4.2 Property Value and Water Quality Changes

Green Lake currently enjoys relatively high-water clarity and low nutrient loading (Robertson et al. 2022). However, future degradation, particularly through increased phosphorus loading, could trigger substantial economic consequences, including reduced property values and additional tax burdens.

The valuation analysis shows that a decline in Secchi depth from 4.65 meters to 2.0 meters could result in:

- A 2% to 12% drop in lakefront property values, totaling, between $33.5 million and $201.1 million.
- An average decline in property value between $11,370 and $68,220 per household.

Total decline in property tax revenue in Green Lake County is estimated to be between **$470 thousand and $2.8 million per year.**

The valuation analysis determined that a potential future scenario—where increased nutrient loading reduces water clarity to a Secchi depth of 2 meters—could lead to a 12% decrease in total property values for all lakefront property owners. This corresponds to a total reduction in the market value of property in the study area of between $33.5 million and $201.1 million. Per individual property the average loss ranges between $11,370 to $68,220 per property.

These findings demonstrate that protecting Green Lake's water quality is not only environmentally necessary but economically justified. By quantifying the potential property value losses associated with declining water clarity, the analysis establishes a defensible basis for evaluating the return on investment in nutrient reduction strategies. This framework enables a rigorous, cost-effective comparison of potential interventions against the measurable financial risks of inaction.

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Appendix A

Table A-1. Summary of Literature Reviewed for Benefits Transfer.

Study Name	Author	Year Published	Economic Model
Measuring beachgoer preferences for avoiding harmful algal blooms and bacterial warnings	Boudreaux et al.	2023	Travel Cost
The economic impacts of harmful algal blooms and E.coli on recreational behavior in Lake Erie	Chen et al.	2018	Travel Cost
Valuing Water Quality as a Function of Water Quality Measures	Egan et al.	2009	Travel Cost
A Hedonic Analysis of the Effects of Lake Water Clarity on New Hampshire Lakefront Properties	Gibbs et al.	2002	Hedonic Price
Economic losses to inland recreational fisheries from harmful algal blooms	Jayasekera et al.	2024	Travel Cost
Exploring the hedonic value of ambient water quality: A local watershed-based study	Joan Poor et al.	2007	Hedonic Price
Lake Rehabilitation and the Value of Shoreline Real Estate: Evidence from Delavan, Wisconsin	Kashian, Russell & Eiswerth, Mark & Skidmore, Mark	2006	Hedonic Price
Valuing water quality change using a coupled economic-hydrological model	Liu et al.	2019	Hedonic Price
Valuing water quality in the United States using a national dataset on property values	Mamun et al.	2023	Hedonic Price
Hedonic Price Estimates of Lake Water Quality: Valued Attribute, Instrumental Variables, and Ecological-Economic Benefits	Moore et al.	2020	Hedonic Price
Hedonic valuation of harmful algal bloom pollution: Why econometrics matters?	Osseni et al.	2021	Hedonic Price
Measuring the Economic Benefits of Water Quality Improvements to Recreational Users in Six Northeastern States: An Application of the Random Utility Maximization Model	Parsons et al.	2003	Travel Cost
Collaborative valuation of ecosystem services to inform lake remediation	Spence et al.	2023	Travel Cost
A loon on every lake: A hedonic analysis of lake water quality in the Adirondacks	Tuttle & Heintzelman	2015	Hedonic Price
Modeling the Property Price Impact of Water Quality in 14 Chesapeake Bay Counties	Walsh et al.	2017	Hedonic Price
The effect of remediating PCB-contaminated sediments on home prices in Milwaukee, Wisconsin, USA	Wilkinson & Melstrom	2023	Hedonic Price
Bloom and bust: Toxic algae's impact on nearby property values, Ecological Economics	Wolf & Klaiber	2017	Hedonic Price
Reeling in the damages: Harmful algal blooms' impact on Lake Erie's recreational fishing industry	Wolf et al.	2017	Market Valuation (Recreation)
Beyond marginal: Estimating the demand for water quality	Wolf et al.	2022	Hedonic Price
Do U.S. Anglers Care about Harmful Algal Blooms? A Discrete Choice Experiment of Lake Erie Recreational Anglers	Zhang & Sohngen	2018	Travel Cost
Property values and cyanobacterial algal blooms: Evidence from satellite monitoring of Inland Lakes	Zhang et al.	2022	Hedonic Price

Appendix B

The 2025 mill rates used to estimate the impact on tax revenue by taxing entity are shown in Table A-1. Following Table A-1 in the individual City or Town Mill rate schedules from which the information in Table B-1 was taken.

Table B-1. Summary of 2025 Mill Rates by Taxing Entity Category, Taxing Entity Name and Sub-Region.

Entity Category	Taxing Entity Name	Sub-Region	Mill Rate	Note
City or Town	City Of Green Lake	NA	0.00550833	
	Town Of Brooklyn	NA	0.001227014	
	Town Of Green Lake	NA	0.000824225	
	Town Of Marquette	NA	0.002249445	
	Town Of Princeton	NA	0.001267324	
School District	Berlin Area School District	Town of Brooklyn	0.006231614	
	Green Lake School District	City Of Green Lake	0.004009809	Base & RF-5848
		Town Of Brooklyn	0.004423662	Base & RF-5848
		Town Of Green Lake	0.004024773	Base & RF-5848
		Town Of Princeton	0.007876391	Base & RF-5848
	Markesan School District	Town Of Green Lake	0.010231442	Base & RF-5245 & RF-6195
		Town Of Marquette	0.014717603	Base & RF-5245 & RF-6195
		Town Of Princeton	0.019024333	Base & RF-5245 & RF-6195
	Montello School District	Town Of Marquette	0.007964189	Base & RF-4750
	Princeton School District	Town Of Marquette	0.00845229	Base & RF-5258
		Town Of Princeton	0.010925615	Base & RF-5258
	Ripon Area School District	Town Of Brooklyn	0.00772897	Base & RF-5061 & RF-5360
		Town Of Green Lake	0.008520739	Base & RF-5061 & RF-5360
Green Lake County		City Of Green Lake	0.004232213	
		Town Of Brooklyn	0.004556901	
		Town Of Green Lake	0.004277964	
		Town Of Marquette	0.006276879	
		Town Of Princeton	0.008113629	
Green Lake Sanitation District		City Of Green Lake	0	

Entity Category	Taxing Entity Name	Sub-Region	Mill Rate	Note
		Town Of Brooklyn	0.000954666	
		Town Of Green Lake	0.000872641	
		Town Of Marquette	0.001315	
		Town Of Princeton	0.001699796	
	Moraine Park Technical College	City Of Green Lake	0.000560972	Base & 2022 $55M referendum
		Town Of Brooklyn	0.000612446	Base & 2022 $55M referendum
		Town Of Green Lake	0.000574958	Base & 2022 $55M referendum
		Town Of Marquette	0.000843612	Base & 2022 $55M referendum
		Town Of Princeton	0.001090471	Base & 2022 $55M referendum
	Lake Puckaway Protection & Rehabilitation District	Town Of Marquette	0.000495445	

Source: Prellwitz (2026).

2025 Tax Information - CITY OF GREEN LAKE

Published: No

Locked/Submit Rates: Yes

Average Assessment Ratio: 1.0493648730

School Levy Tax Credit: $273,958.12

** Include T.I.D's in Levy amount if applicable.*

Taxing Body Name	State Aid Amount	* Levy Amount	Total Assessed Value	Mill Rate
STATE OF WISCONSIN		$0.00	$463,231,400.00	0.0000000000
GREEN LAKE COUNTY	$153,766.00	$1,960,493.74	$463,231,400.00	0.0042322130
CITY OF GREEN LAKE	$212,793.00	$2,551,631.38	$463,231,400.00	0.0055083300
GREEN LAKE SCHOOL DISTRICT	$120,632.00	$1,425,512.09	$463,231,400.00	0.0030773220
MORAINE PARK	$259,840.00	$225,547.88	$463,231,400.00	0.0004869010
TOTAL	$747,031.00	$6,163,185.09		
SCHOOL LEVY TAX CREDIT		$273,958.12	$463,231,400.00	0.0005914070

District	Referendum	Amount	Mill Rate	Stop Year	Notes
GREEN LAKE SCHOOL DISTRICT	RF-5848	$431,957.04	0.0009324865	2028	
MORAINE PARK	2022 $55M Referendum	$34,311.92	0.0000740708	2045	

2025 Tax Information - TOWN OF BROOKLYN

Published: No

Locked/Submit Rates: Yes

Average Assessment Ratio: 0.9745957440

School Levy Tax Credit: $606,865.59

** Include T.I.D's in Levy amount if applicable.*

Taxing Body Name	State Aid Amount	* Levy Amount	Total Assessed Value	Mill Rate
STATE OF WISCONSIN		$0.00	$860,750,400.00	0.0000000000
GREEN LAKE COUNTY	$340,188.00	$3,922,354.54	$860,750,400.00	0.0045569010
TOWN OF BROOKLYN	$238,726.00	$1,056,153.00	$860,750,400.00	0.0012270140
BERLIN AREA SCHOOL DISTRICT	$148,554.00	$84,208.42	$13,513,100.00	0.0062316140
GREEN LAKE SCHOOL DISTRICT	$251,486.00	$2,687,476.14	$811,090,900.00	0.0033134090
RIPON AREA SCHOOL DISTRICT	$527,610.00	$235,783.44	$36,146,400.00	0.0065230130
MORAINE PARK	$574,863.00	$451,253.10	$860,750,400.00	0.0005242550
GL SANITARY DISTRICT	$0.00	$583,110.91	$610,801,100.00	0.0009546660
TOTAL	$2,081,427.00	$9,020,339.55		
SCHOOL LEVY TAX CREDIT		$606,865.59	$860,750,400.00	0.0007050420

District	Referendum	Amount	Mill Rate	Stop Year	Notes
RIPON AREA SCHOOL DISTRICT	RF-5061	$16,144.81	0.0004466506	2027	
RIPON AREA SCHOOL DISTRICT	RF-5360	$27,446.18	0.0007593060	2028	
GREEN LAKE SCHOOL DISTRICT	RF-5848	$900,515.90	0.0011102527	2028	
MORAINE PARK	2022 $55M referendum	$75,910.80	0.0000881914	2045	

2025 Tax Information - TOWN OF GREEN LAKE

Published: No

Locked/Submit Rates: Yes

Average Assessment Ratio: 1.0381423260

School Levy Tax Credit: $744,123.04

** Include T.I.D's in Levy amount if applicable.*

Taxing Body Name	State Aid Amount	* Levy Amount	Total Assessed Value	Mill Rate
STATE OF WISCONSIN		$0.00	$895,096,400.00	0.0000000000
GREEN LAKE COUNTY	$332,107.00	$3,829,190.60	$895,096,400.00	0.0042779640
TOWN OF GREEN LAKE	$242,351.00	$737,761.00	$895,096,400.00	0.0008242250
GREEN LAKE SCHOOL DISTRICT	$102,758.00	$1,098,111.38	$364,260,300.00	0.0030146340
MARKESAN SCHOOL DISTRICT	$2,007,714.00	$3,953,538.13	$526,868,100.00	0.0075038480
RIPON AREA SCHOOL DISTRICT	$63,852.00	$28,534.84	$3,968,000.00	0.0071912400
MORAINE PARK	$561,209.00	$440,534.92	$895,096,400.00	0.0004921650
GL SANITARY DISTRICT	$0.00	$601,874.71	$689,716,200.00	0.0008726410
LITTLE GREEN LAKE	$0.00	$0.00	$91,874,300.00	0.0000000000
TOTAL	$3,309,991.00	$10,689,545.58		

SCHOOL LEVY TAX CREDIT	$744,123.04	$895,096,400.00	0.0008313330

District	Referendum	Amount	Mill Rate	Stop Year	Notes
GREEN LAKE SCHOOL DISTRICT	RF-5848	$367,953.69	0.0010101394	2028	
MARKESAN SCHOOL DISTRICT	RF-5245	$420,305.73	0.0007977437	2026	
MARKESAN SCHOOL DISTRICT	RF-6195	$1,016,776.63	0.0019298504	2045	
RIPON AREA SCHOOL DISTRICT	RF-5061	$1,953.87	0.0004924068	2027	
RIPON AREA SCHOOL DISTRICT	RF-5360	$3,321.58	0.0008370917	2028	
MORAINE PARK	2022 $55M Referendum	$74,107.77	0.0000827931	2045	

2025 Tax Information - TOWN OF MARQUETTE

Published: No

Locked/Submit Rates: Yes

Average Assessment Ratio: 0.7075384510

School Levy Tax Credit: $153,746.42

** Include T.I.D's in Levy amount if applicable.*

Taxing Body Name	State Aid Amount	* Levy Amount	Total Assessed Value	Mill Rate
STATE OF WISCONSIN		$0.00	$100,590,600.00	0.0000000000
GREEN LAKE COUNTY	$54,761.00	$631,394.99	$100,590,600.00	0.0062768790
TOWN OF MARQUETTE	$120,151.00	$226,273.00	$100,590,600.00	0.0022494450
MARKESAN SCHOOL DISTRICT	$461,195.00	$908,174.31	$84,136,600.00	0.0107940460
MONTELLO SCHOOL DISTRICT	$40,395.00	$66,253.96	$9,014,400.00	0.0073497910
PRINCETON SCHOOL DISTRICT	$24,361.00	$54,028.95	$7,439,600.00	0.0072623460
MORAINE PARK	$92,537.00	$72,639.77	$100,590,600.00	0.0007221330
GL SANITARY DISTRICT	$0.00	$10,326.43	$7,852,800.00	0.0013150000
LAKE PUCKAWAY	$0.00	$24,585.70	$49,623,500.00	0.0004954450
TOTAL	$793,400.00	$1,993,677.11		
SCHOOL LEVY TAX CREDIT		$153,746.42	$100,590,600.00	0.0015284370

District	Referendum	Amount	Mill Rate	Stop Year	Notes
PRINCETON SCHOOL DISTRICT	RF-5258	$8,852.71	0.0011899444	2028	
MARKESAN SCHOOL DISTRICT	RF-5245	$96,549.18	0.0011475289	2026	
MARKESAN SCHOOL DISTRICT	RF-6195	$233,565.58	0.0027760283	2045	
MONTELLO SCHOOL DISTRICT	RF-4750	$5,538.43	0.0006143981	2029	
MORAINE PARK	2022 $55m Referendum	$12,219.62	0.0001214787	2045	

2025 Tax Information - TOWN OF PRINCETON

Published: No

Locked/Submit Rates: Yes

Average Assessment Ratio: 0.5472732100

School Levy Tax Credit: $611,423.29

** Include T.I.D's in Levy amount if applicable.*

Taxing Body Name	State Aid Amount	* Levy Amount	Total Assessed Value	Mill Rate
STATE OF WISCONSIN		$0.00	$336,198,100.00	0.0000000000
GREEN LAKE COUNTY	$236,582.00	$2,727,786.64	$336,198,100.00	0.0081136290
TOWN OF PRINCETON	$192,168.00	$426,072.00	$336,198,100.00	0.0012673240
GREEN LAKE SCHOOL DISTRICT	$27,171.00	$290,362.13	$49,217,500.00	0.0058995710
MARKESAN SCHOOL DISTRICT	$1,514.00	$2,981.68	$213,700.00	0.0139526440
PRINCETON SCHOOL DISTRICT	$1,213,799.00	$2,692,014.71	$286,766,900.00	0.0093874670
MORAINE PARK	$399,786.00	$313,822.27	$336,198,100.00	0.0009334450
GL SANITARY DISTRICT	$0.00	$331,730.95	$195,159,300.00	0.0016997960
TOTAL	$2,071,020.00	$6,784,770.38		
SCHOOL LEVY TAX CREDIT		$611,423.29	$336,198,100.00	0.0018186400

District	Referendum	Amount	Mill Rate	Stop Year	Notes
GREEN LAKE SCHOOL DISTRICT	RF-5848	$97,294.15	0.0019768202	2028	
MARKESAN SCHOOL DISTRICT	RF-5245	$316.99	0.0014833411	2026	
MARKESAN SCHOOL DISTRICT	RF-6195	$766.83	0.0035883482	2045	
PRINCETON SCHOOL DISTRICT	RF-5258	$441,089.90	0.0015381479	2028	
MORAINE PARK	2022 $55M Referendum	$52,791.88	0.0001570261	2045	

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