An Assessment of Lakefront Property Values Based on a Decline in Water Levels:

It’s Impact on Value and Taxes

by

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Abstract. This study uses the hedonic price model to estimate the effect a change in water level has on the value of real estate on Lake Koshkonong in Wisconsin. Hedonic techniques are employed to show that a 2 inch reduction in the lake’s water level has had a significant effect on Lake Koshkonong’s shoreline property values. The body of existing research demonstrates that changes in both the subjective and objective indicators of value are important for estimating the implicit value of water quality in hedonic analysis. This paper provides new evidence on the economic harm created by the reduction of water levels.
Introduction

This paper addresses the property value impact created by a 1991 Wisconsin Department of Natural Resources (DNR) order to lower the water level in Lake Koshkonong. This lake, located between Madison, Milwaukee, and Chicago is a shallow lake at only seven feet deep, but encompasses 10,000 acres of area. In addition, Koshkonong is home to over 400 homes with lakefront property. As the prior literature on water level economics has found, a reduction in the potential high water mark of a lake can result in a lower level of relative property value appreciation for housing stock with water frontage.

Although Koshkonong is a natural lake, its size and level were impacted by the creation of the Indianford Dam. The water level of Lake Koshkonong has been a longstanding source of contention since DNR issued a revised water level order in 1991 requiring the dam owner to lower the lake’s water level. During the summer boating season, the level of the lake was generally higher than the level set in the 1991 order for several decades because one of the two gates that pass water through the dam was frozen shut. The defective gate was made operable as part of an extensive renovation project in 2002. However, when DNR issued an amended water level order in 2005, it did not modify the summer water level set in the 1991 order. This effectively resulted in lake levels falling approximately 0.5 feet for half of the summer season, rising above normal for 10% of the summer season and remaining at the historical norm of the last 18 years for the remaining 40% of the summer season. The order resulted in uncertainty to both actual and potential homeowners regarding the shoreline and lake level, ultimately decreasing property value appreciation in comparison to other similar regional lakes.

The economic challenges created by the 1991 and 2005 DNR orders, together with the repairs to the dam’s discharge capacity, include: (a) Potential loss of pier functionality and the ability to use piers for boating, swimming and other water activities for all or portions of the period between May and October (the summer season); (b) Loss or diminishment of the ability to access the shoreline by watercraft; (c) Degradation of the appearance of the shoreline and exposure of “mud flats” under low water level conditions; (d) Reduction of areas of navigability by larger motorized craft; (e) Exposure of rocks and other obstacles that can damage watercraft.

This study focuses on the impact of low water levels and uncertainty on 413 waterfront residences located on Lake Koshkonong. As described in the report, we conclude that the value of each of these homes increased in value by approximately $20,000 less than similarly situated homes on a comparable lake as a result of the water level problem. In the aggregate, the lost value on those homes totals nearly $8.3 million, roughly 10% of the aggregate value of the waterfront homes on Lake Koshkonong. This loss in value is based on the change in value to Lake Sinsinippi rather than Big Muskego Lake. The loss in value based on Big Muskego Lake would be over $39 million.

Additional unmeasured, albeit substantial, impacts to the other parcels located in the lake district as well as reductions in business activity near the lake (related to the recreational boating and hospitality sectors) have also occurred as a result of the low water levels and water level uncertainty (see Appendix A and B). The additional parcels in the Lake District contribute another $32.6 million in lost potential wealth. The foregone property value to residents and the lost business earnings have led to significant reductions in the tax base of the five townships surrounding the lake. This study employs a hedonic regression model to estimate the economic impacts of lowered lake levels on property values and the corresponding reductions in the region’s tax base.
Literature Review

**The Value of a Lake Lot to the Homeowner**

Hedonic techniques estimate the implicit prices of attributes which characterize a product through examination of observed prices of the product across different levels and combinations of the attributes. Econometrically, implicit prices are estimated through a first-step regression analysis (Rosen, 1974). In the context of this study, the product of interest is housing. In terms of housing, hedonic values are the result of a model of equilibrium housing price differentials. This model hypothesizes that homeowners maximize their utility by trading-off between differences in home prices and the associated attributes which make up different housing units.

A given housing unit is best characterized as a bundle of attributes which describe the structure itself (e.g. bedrooms, bathrooms), the land upon which it is built (e.g. acres, proximity to lake), and relevant locational characteristics (e.g. schools, crime). Claims of valuation comparisons which ignore the differences between these units ignore the uniqueness of each bundle of attributes. Thus, proximity to water, water depth, and length of shoreline are three of the housing bundle’s land and locational attributes. At any given time, there exists a given distribution over space of the supplies of these attributes, since the housing stock alters only slowly over time and the attributes are inelastic in supply (Brown and Pollakowski, 1977), albeit natural disasters or governmental actions can alter that supply.

When forming policy, hedonic analysis provides decision makers with the ability to explore the supply and demand aspects of environmental goods. While the physical environment helps shape supply issues, obtaining the demand curve requires knowledge of the prices that consumers are willing-to-pay. With marketed goods, such prices are observable, but it is often difficult to isolate the value of environmental amenities because they are bundled into the price of the entire property along with all of the other hedonic attributes. In this study, examining the value of a certain amount of shoreline footage constitutes just such an environmental amenity. Since it is almost impossible to purchase a single foot of shoreline (not associated with lot acreage), hedonic analysis extracts the contribution of the environmental good, which is an attribute embedded in the hedonic characteristics comprising a housing unit, to the overall price of the housing unit.

While economists generally assume that people know their preferences with certainty and their purchasing choices are based on observable, well-understood measures of the goods and services they consume (as well as the component characteristics which comprise those goods and services), this may not be the case when considering complex, heterogeneous commodities where some component characteristics are not observed. For instance, in the case of housing markets, characteristics such as the number of bedrooms are easily observed and quantified. On the other hand, some characteristics, such as the property’s environmental quality, may not be readily observable. These characteristics, however, may be inferred by the purchaser with background research on a property. In the case of this study, changes in lake levels over time can be found and appear to impact purchasing decisions of home buyers.

**Water Quality**

Economic psychologists recognize that objective data may not represent valid measures when used as proxies for analyzing consumer decision making behavior (Singh 1988). Puto (1987) suggests that consumer decisions over public goods that are purchased as part of a heterogeneous
marketed good tend to be based on their expectations or internal assessment of the public good. Likewise, Payne (1982) suggests that buying decisions are dependent upon perceptual factors. As such, consumers’ subjective assessments are included in Payne’s modeling framework. Factors such as these are important to consider in the case of environmental amenities associated with housing units, as the quality of the associated amenity may be difficult to objectively characterize in the description of the home and therefore lead to subjective interpretations by potential purchasers.

David (1968) used the hedonic technique when observing how water quality affects lakeshore properties on artificial lakes in Wisconsin. She found that property prices were significantly correlated with a measure of water quality that represented levels of lake pollution, with water quality measurements provided by an expert. This early work was instrumental in the creation of subjective measurements of the economic value of an environmental amenity.

Epp and Al-Ani (1979) estimated two different equations based on lake water quality and its impact on lake property values. Both were quantitative analyses, using Secchi depth measurements, as well as qualitative analysis from individual perceptions, which yielded significant and positive relationships between water quality and property value. Young and Teti (1984) studied the effect of perceived water quality in the vicinity of St. Albans Bay on Lake Champlain in Vermont. The inclusion of water quality perceptions resulted in a significant and negative relationship between perceived degraded water quality and lake home sale prices.

Colwell and Dehring (2005) used hedonic analysis to compare the frontage and depth pricing of lake properties, controlling for price differentials across three different towns included in the analysis. They found that whether or not a lot is directly located on a lake is critical to the price of the house and that quality of the lake also affected the price of the house.

Michael et al. (2000) rated lakes for both subjective and objective water clarity. The results revealed that implicit price estimates proved significant; both the objective and subjective variables produced significant coefficients. The authors concluded that the significance of the subjective variable creates a concern that these coefficients are dependent on policy recommendations that may ignore the public perception of environmental quality. As a result, public perception and public policy may be in conflict.

Poor et al. (2001) used an objective measure of an environmental amenity, water clarity for lake front property owners, in a hedonic model and compared it to the use of a directly comparable subjective measure of the same amenity. The coefficients on both water clarity variables were significant. However, while the subjective measure was positive and significant (the greater the perceived water clarity, the higher the price), it was not as accurate in predicting sales prices as the objective variable.

Krysel et al. (2003) used hedonic pricing to examine lakeshore property on thirty-seven different lakes in Minnesota that were then separated into six market groups. Once the data was collected for all the lakes, Krysel et al. analyzed it using a regression which related property price to housing characteristics, as well as water quality. Their study found that the water quality variable significantly affected prices paid for lakeshore property, showing that individuals pay more for houses that have those amenities.

**Distance from Waterfront and Shoreline Length**
In addition to water quality measures, a variety of location issues impact the value of real estate. Parsons and Wu (1991), using 2002 dollars, found that the value of a home falls by $4,175 for every mile it is farther away from water. In this study, the mean sales price was $181,341.

Michael et al. (2003) found that for each 100 meters of distance from shore, Maryland property values decreased by about 3-4% in Shady Side and Piney Point, and by 18% on the Hooper Islands located in the State of Maryland. In the case of unimproved real estate, the decrease was lower, at between 2% and 4%.

Besides distance to water, another economic concern regarding the lowering of a lake’s water level is its impact on quantity of shoreline. The reduction of water inside the lake ultimately results in less area covered by the lake, and thus a reduced total length of shoreline. Given there is an implicit value in a foot of shoreline, the elimination of shoreline eliminates wealth. This claim is well-documented. Boyle and Taylor (2001) used hedonic models to estimate implicit prices on freshwater lakes and ponds in Maine, including the sales of properties with frontage on 34 lakes between 1990 and 1995. The lakes were segmented into four market groups whose shoreline was worth between $72 and $456 a foot. The Mississippi Headwaters Board (2003) considered residential sales from 1996 to 2001 on thirty seven lakes of various size and geography. Assigning the 1205 residential sales to one of six lake groups created realistic market areas. This study found that the value of a foot of lake frontage ranged from $80 per foot to $421 per foot.

Conner, Gibbs and Reynolds (1973) looked at the value of lake or canal land frontage. A sample of vacant residential lots in Florida produced a value of $40 per frontage foot. Poor et al. (2001) found that an additional ten feet of shoreline increased property values by between $83 and $170 on lakes and ponds located in Maine.

**Reduction in Water Level**

In a pattern similar to the earlier research, the following studies provide insight into the general direction housing values take as the result of lower water levels. Because a lake’s water level is implicitly an attribute associated with lakefront property, any changes to the water level have the potential to impact the value of housing. The results are each consistent with the hypothesis that the drawing down of a lake’s level results in reduced property values for real estate on the lake.

Early work by Khatari-Chhetri and Hite (1989) looked at the impact of lower water levels on the sales price of vacant lots in South Carolina. They estimated that each vertical foot of water reduction reduces sale price by $8,454 per acre.

More recently, Lansford and Jones (1995a, 1995b) estimated shoreline value around two Texas lakes, finding that water level at time of sale is worth about $914 per foot of elevation. The average impact of a six foot water level decrease is approximately $9,492. Their study found three statistically significant hedonic characteristics that affect sale prices: distance from lake, scenic view, and water front location. After analyzing these characteristics, they discovered that distance to a lake was the most important for recreational and aesthetic value. Additionally, the study determined that the farther a house is from a lake, the lower the implied value of recreation and aesthetic value. They also found that lakefront property impacts the value of all homes in a town containing a lake, increasing values by 20 percent.
In an exhaustive study on the “Economic Effects of TVA Lake Management Policy in East Tennessee”, researchers at the University of Tennessee looked at the economic impact of a winter water level decrease (Murray 2003). The winter water level decrease results in a decrease in the value of lake properties of between 1% and 5%. In addition, the benefits of delaying the winter water level decrease until September 1st range from $35 to $4,950 per parcel on Douglas Lake. Furthermore, the more valuable the property associated with the lot, the larger the effect. Finally Hanson and Hatch (2001), drawing on a contingent valuation model, determined that a permanent one foot reduction in the summer water level results in a 4% to 15% decrease in property value.

Quality of Lakeshore Properties

Scenic beauty, peace, quiet, and being removed from urban living give some people higher utility than from living in the suburbs or the city, making lake properties appealing to such people. “The water quality standards of the Clean Water Act (1977) and related state standards require lakes to support uses for fishing, swimming, aquatic life support, and human fish consumption” (Michael et al. 1996). These improvements make the lake more useful, which in turn causes an increase in the demand for lakefront property. Residents living on lakes value these features to such an extent that their presence can often be a positive externality, improving water quality and conservation. “The benefits from tourism, water supply, lakeside property, and environmental quality also play important factors in the value of reservoir management” (Yates 2009). The government has spent thousands of dollars on the Clean Water Act (1977) to keep water clean. “Over the last decade, $80,000 to $250,000 a year has been allocated by the state for lake protection and restoration” (Michael et al. 1996). Local government also spends money to keep the lake looking nice to enhance tourism. The beauty of a lake is one of the biggest factors influencing lakefront property values. “Lake-front property owners are potentially the recipients of the greatest economic gains from improved lake-water quality because the benefits of water quality can be capitalized in the price of lake-front properties” when they are sold (Michael et al. 1996).

Lakefront Properties on a local tax base

The gains in property value do not solely accrue to the homeowners though. Lake front properties have a large impact on counties’ tax bases. Williams (1994) looked at waterfront properties in Lake Blackshear and documented the positive impact it had on the tax base for that county. He found that lakefront properties accounted for 12.4 percent of residential parcels, but those properties contributed 27.9 percent of the counties total residential tax base, or $646,680 in taxes.

Since Lakefront properties can raise tax revenues, Gibbs et al. (2002) analyzed the impact of water clarity declines on the tax base. Their results showed that a decline in lake water clarity causes a decrease in local property tax revenues. A large number of lakefront properties lost value and, because of this loss in value, the government experienced declines in tax revenue.

Model

In order to examine the impact of the dam repairs and the 1991 and 2005 orders issued by the Wisconsin DNR, a hedonic analysis examining the order’s impact on lakefront property values across several similar Wisconsin lakes was undertaken. Data for the study were drawn from the County Assessor and Treasury Database, which provides information regarding single family home sales from 1997 to 2013 at Lake Koshkonong and three comparable large shallow lakes in
Wisconsin. In addition to housing sales for lake front property on Lake Koshkonong, the data collected also include homes sold on three other lakes of similar size and depth as Lake Koshkonong from 1997 to 2013, including Lake Sinissippi, Lake Beaver Dam, and Big Muskego Lake. The nominal property values on Lake Beaver Dam did not appreciate over this time frame and serve as a baseline for comparison.

The formal model recognizes the internal and locational attributes of lakefront real estate. Internal attributes (table 2) include such characteristics as bathrooms, bedrooms, square feet, etc. Being on a lake gives the properties unique characteristics that other houses would not have, one of which is distance from the lake in feet. The distance in feet is recorded in our table as Near_Distance FT. If any one of these characteristics were to change it could affect the demand for the property. Sometimes characteristics are more in demand than others, so having multiple characteristics could mask some of these effects. For example, if the demand for more lake frontage on Lake Koshkonong were to decrease but all other characteristics of the house were to improve, the total increase in demand from all the other characteristics could outweigh the single attribute. This does not mean that lake frontage is insignificant in determining the demand of the house as a whole; it simply indicates that if people demanded lake frontage on Lake Koshkonong slightly more than for houses on Lake Koshkonong, there would have been a larger increase in value.

The purpose of this study is to determine if a particular environmental amenity can change the demand for a house. In this case, the environmental amenity is the amount of lake frontage. By isolating the demand for lake frontage at housing units along Lake Koshkonong from the other characteristics (such as interior attributes), we can determine whether changes in Lake Koshkonong’s water level have altered the demand for houses and, if so, by how much.

The data available consists of information on houses sold between 1997 and 2013 at Lake Koshkonong and the three other lakes, which serve as controls. There were 308 houses that were sold on all four lakes in this 16 year span. There were 39 houses sold on Big Muskego Lake, 47 on Lake Koshkonong, 91 on Lake Sinissippi, and 131 on Lake Beaver Dam. The frontage of the lakes was calculated from GIS maps from the Dane, Dodge, Jefferson, Rock, and Waukesha county websites.

Lake Beaver Dam, Lake Sinissippi, and Big Muskego Lake were each chosen because of their similar size and depth to Lake Koshkonong. Lake Beaver Dam covers 6,542 acres and has a maximum depth of seven feet, Sinissippi covers 2,800 acres and has a maximum depth of eight feet, and Big Muskego covers 2,260 acres and has a maximum depth of eight feet. Similarly, Lake Koshkonong covers 10,460 acres and has a maximum depth of seven feet. The physical features of each of these lakes make them similar in terms of recreational activities. Beaver Dam and Sinissippi are both located in Dodge County, Koshkonong is located in Jefferson, Dane, and Rock County and Big Muskego is located in Waukesha County. All four lakes are located in relatively similar geographic areas. However, it should be noted that Beaver Dam Lake is the most remote. Its ultimate lack of relative appreciation is not surprising due to this market constraint. However, all four lakes are within driving distance of Madison, Milwaukee, and Chicago.

Lake Koshkonong is the second closest lake to Chicago out of the four lakes, next to Big Muskego Lake. Its close proximity should raise prices relative to Lake Beaver Dam and Lake Sinissippi, but this study hypothesizes that the lowering of water levels will give Lake Sinissippi, Lake Beaver Dam, and Big Muskego Lake higher appreciation values, with Big Muskego Lake
having the highest appreciation out of the four because of its close proximity to large metropolitan populations in Chicago and Milwaukee.

A hedonic pricing equation is used to determine the appreciation of lake frontage real estate on the four lakes over the past 16 years. The hedonic equation tests the relationship between the independent variables (lake frontage, lake, bedrooms, bathrooms, total rooms, and square feet of the house) and the dependent variables (sales price) to determine whether or not lower lake levels affected property values. With the hedonic regression, a number of explanatory variables are included which may influence residential property prices. To control for unobserved lake characteristics for any given time period, interaction dummies were created that indicated the lake, time epoch, and lake frontage for each observation. The three time epochs include: pre-dam repair (1997-2002) post-dam repair (2003-2007) and post-dam repair during and after the recession (2008-2013). The isolated lake and epoch dummies are also included in the model (see table 2).

The literature cited earlier is replete with studies that have used these types of housing characteristics. The variables used in this study are similar to those used by Brown and Pollakowski (1977) and Palmquist (1984). They include variables such as number of bedrooms, number of bathrooms, square feet of living space, the existence of an attached garage, the existence of a basement, the existence of central air conditioning, and other variables. Boyle and Taylor (2001) use shoreline feet to estimate value. The specific hedonic models estimated in this manuscript are outlined in the following section. Table 1 provides the descriptive statistics.

The functional form of the hedonic model is:

\[
V_{it} = \alpha + \beta_1(EPOCH1_x \text{LakeDummy1_x Shoreline1}) + \beta_2(EPOCH2_x \text{LakeDummy1_x Shoreline1}) + \beta_3(EPOCH3_x \text{LakeDummy1_x Shoreline1}) + \beta_4(EPOCH1_x \text{LakeDummy2_x Shoreline2}) + \beta_5(EPOCH2_x \text{LakeDummy2_x Shoreline2}) + \beta_6(EPOCH3_x \text{LakeDummy2_x Shoreline2}) + \beta_7(EPOCH1_x \text{LakeDummy3_x Shoreline3}) + \beta_8(EPOCH2_x \text{LakeDummy3_x Shoreline3}) + \beta_9(EPOCH3_x \text{LakeDummy3_x Shoreline3}) + \beta_{10}(EPOCH1_x \text{LakeDummy4_x Shoreline4}) + \beta_{11}(EPOCH2_x \text{LakeDummy4_x Shoreline4}) + \beta_{12}(EPOCH3_x \text{LakeDummy4_x Shoreline4}) + \delta(X_{it}) + \zeta(Near\text{Dist FT}) + \phi(Lake) + \epsilon_{it}
\]

\(EPOCHx\text{LakeDummy}_x\text{Shoreline}\) is a series of interaction terms between the frontage of the property, the time indicator variables and either the shoreline linear feet variable for Lake Koshkonong, Lake Sinissippi, Big Muskego Lake or Lake Beaver Dam; \(X_{it}\) is a vector that includes the housing characteristics mentioned above; \(Lake\) represents the lake variable multiplied by the year sold indicator; the distance in feet each house is from the water (both squared and unsquared) is represented as \(Near\text{Dist Ft}\).

**Results**

Estimating appreciation over time for a foot of lake frontage on Lake Koshkonong relative to Lake Beaver Dam, Lake Sinissippi, and Big Muskego Lake is the main objective of the model. In other words, we attempt to determine the contribution of the shoreline to any change in the value of properties, *ceteris paribus*. Since the LM heteroskedasticity test indicates heteroskedastic variance of the error term, we apply a procedure proposed by White (1980) to generate heteroskedasticity-consistent estimates.
For the reasons set forth in the literature review, and assuming that the dam repairs resulted in a corresponding decline in water levels at Lake Koshkonong, the results of this model are expected to indicate that there was a slowdown in the appreciation of a foot of shoreline at Lake Koshkonong relative to Lake Beaver Dam. As seen in Table 2, the results of the hedonic model support the hypothesis. The significance and coefficient sign of such variables as square feet, bathrooms, and air conditioning are consistent with expectations as well as values found in the earlier literature. One notable variable, shoreline squared, follows the expectation that while shoreline frontage has value, the marginal value of additional shoreline is diminishing in value. Finally, the relative slowdown in appreciation of the value of a foot of shoreline at Lake Koshkonong, as compared to Lake Beaver Dam, is supported.

**Property Value**

On average, home values on Lake Koshkonong increased by $54,000.12 through this timeframe, with Lake Sinissippi home values increased by $74,226.41 and a Big Muskego Lake home value increase of $149,177.83. This statistically significant difference in value improvements between Lake Koshkonong and the other lakes suggests that the change is peculiar to Lake Koshkonong as opposed to a change that altered lake frontage generally. Since the value increase for Lake Koshkonong is so much lower than for the other lakes, the demand for this lake’s frontage should have been reduced as well. Therefore, there is reason to believe that this change in demand for lake frontage on Lake Koshkonong is related to the lowering of the water levels from the Indianford Dam modifications.

We next sought to identify the average change in value for each lake, and with that derive the total lost tax revenue for Lake Koshkonong. To calculate the average increase in value for Lake Koshkonong, we took our first and third Epoch figures and multiplied these by the total square footage of the Lake. Following this multiplication, we subtracted the third Epoch figure from the first and divided it by the total houses on Lake Koshkonong. We were able to make this calculation for all the lakes and determine the average increase in value for every lake. Between 1997 and 2013, the average increase in value for Lake Koshkonong’s lake front property was $54,000.12 per epoch which is lower than Lake Sinissippi’s increase of $74,226.41 per epoch and much lower than for Big Muskego Lake of $149,177.83 per epoch.

The aggregate difference in property value appreciation between waterfront residences on Lake Koshkonong versus Lake Sinnissippi (the most conservative estimate) is $8,353,457.77. This is found by taking $74,226.41 – 54,000.12 = $20,226.29 (the difference in property value appreciation between Sinnissippi and Koshkonong lake front residences) and multiplying it by 413 (the number of Koshkonong waterfront residences). If the rate of appreciation had been closer to that seen on Big Muskego Lake, the aggregate difference in property value appreciation on Lake Koshkonong would be closer to $39,308,394.23 (149,177.83 – 54,000.12 = 95,177.71 multiplied by 413). These numbers do not include the slower appreciation of the other Rock Koshkonong Lake District properties that are not directly adjacent to the lake. This could be substantial, but was beyond the scope of this study. As a result, the non-lake impact is estimated. However, this negative impact on these properties near the lake is consistent with the academic literature and is reviewed in the conclusion.
**Tax Base**

To identify total lost tax revenue for Lake Koshkonong, the estimated total aggregate property loss from decreased appreciation on the waterfront properties is multiplied by the average general property tax rate for the townships with territory within the Rock Koshkonong Lake District, (i.e. the mil rate which is equal to $14 per 1000 square feet or 0.014). We performed the same exercise for Lake Sinnissippi and Big Muskego Lake, yielding total lost tax revenue for Lake Koshkonong from the water level reduction. We determined that Lake Koshkonong lost $116,948.40 in yearly tax revenues compared to Lake Sinnissippi and $550,317.52 in yearly tax revenues compared to Big Muskego Lake because of the water level reduction in Lake Koshkonong (see table 3).

Since Lake Koshkonong did not appreciate in value as much as Lake Sinnissippi, or Big Muskego Lake, it could generate an adverse economic impact on the entire region. If Lake Koshkonong had kept pace in appreciation with Lake Sinnissippi, the town of Koshkonong would have received an extra $116,948.40 in yearly tax revenue, and the lake as a whole would have conservatively generated an extra $20,226.29 in average lake front property value per house. The lost tax revenue could range as high as $550,317.52 annually if property appreciation had occurred at the rate seen on Big Muskego Lake, which would have raised property values by $95,177.71 on average per house. We were unable to find significant data for Lake Beaver Dam.

**Business Activity**

While this study focused specifically on the reduction in property appreciation and tax base collection associated with homes directly adjacent to Lake Koshkonong, the lower water levels and uncertainty surrounding the water levels may have also resulted in substantial reductions to other Rock Koshkonong Lake District homes. In addition, reductions in business activity, particularly for businesses related to recreational use of the lake would also have resulted in negative economic impacts. A separate examination and analysis of these impacts can be found in Appendices A and B.

**Conclusion**

This study explores how the Wisconsin DNR’s 1991 and 2005 orders, as well as Indianhead dam repair, resulted in lowering the level of Lake Koshkonong and the resultant impacts to lake front property values and tax revenue loss, using a hedonic regression. The analysis showed that the decision resulted in financial harm to the homeowners and to the community around the lake. The link between property value appreciation and the change in water level was quantified and found to be statistically significant. On average, homeowners lost between $20,226.29 and $95,177.77 in property value appreciation. This results in an aggregate loss in property value appreciation for waterfront residences on Lake Koshkonong of $8,353,457. If this study uses the appreciation based on Big Muskego Lake, this lost wealth would rise to over $39 million.

In a final consideration of wealth, the appreciation of real estate surrounding Lake Koshkonong lagged behind the other large shallow lakes. It is consistent with the literature to recognize that, although the off-lake homes do not have the equivalent positive externality of properties directly on the lake, there would be some diminution of value brought about by the same forces that restricted the value directly on Lake Koshkonong and that the relationship between on
Lake and off-lake property values are correlated (Lansford, 1995a). Given that there are approximately 3,500 additional homes in the Lake District, valued at approximately $186,270 (SNL, 2015), this diminution of potential appreciation can be considerable. Even a 5% restriction would result in a loss of wealth of $9,313 times 3,500 or $32,597,250.

Furthermore, Lake Koshkonong lost between $116,948.40 and $550,317.52 in yearly property tax revenues because of the water level reduction in the lake. These numbers do not, however, include any employment, non-lake front property value or other economic losses of reduced business activity attributable to lowered lake levels and increased water level uncertainty, all of which could be substantial as well. When non–lake property values are added, this loss rises to between $573,310 and $1,006,679.

This analysis showed that if Lake Koshkonong’s water level had not been reduced, it would have enjoyed a higher appreciation in property value. By and large, the coefficients of the hedonic regression have the expected signs and magnitudes. The coefficients on the housing characteristic variables all have the anticipated sign: the variables that were included concerned bedrooms, bathrooms, total rooms, and square feet of the house. The conclusion is robust in that it continues to hold after controlling for unmeasured, underlying factors that vary, such as unique market conditions.

There is a well-established link between property values and changing environmental amenities generally, and to lake levels in particular. Together, the theory and empirical evidence support the hypothesis that changing lake water levels influenced shoreline values on Lake Koshkonong. In this study, the repairs to the Indianford Dam, the corresponding decline in water levels at Lake Koshkonong, and the public’s knowledge of these issues caused a substantial change in demand that contributed to a significant decrease in shoreline property values and local tax revenues.

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References


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* Signifies that the coefficient is significantly different from zero between a 5% and 10% probability of a type 1 error for OLS (robust) estimate
** Signifies that the coefficient is significantly different from zero between a 1% and 5% probability of a type 1 error for OLS (robust) estimate
*** Signifies that the coefficient is significantly different from zero with a 1% or less probability of a type 1 error for OLS (robust) estimate
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Appendix A: SBDC Lake Koshkonong Business Survey (Full Report Below)
Interviews with Business Representatives on the Economic Impact of Lake Koshkonong Water Levels

Research and report provided by the Wisconsin Innovation Service Center, a specialty center of the Wisconsin SBDC Network.

Working to support your success.
Executive Summary

The Wisconsin Innovation Service Center market research manager conducted interviews with participants recruited by Rock Koshkonong Lake District Board President Brian Christianson. Participants are owners (and one manager) of businesses affected by boating traffic on Lake Koshkonong. The interviews elicited opinions on the potential economic impact of raising the target water level of Lake Koshkonong seven inches during the summer season. Interviews were conducted November 20, 2014.

Participants were asked what percentage of their business revenue came from boaters. The chart below shows percentage of revenue from boaters as reported by representatives from seven participating companies. One additional respondent, JAD Realty, did not provide a percentage, but said that boating customers make up a large portion of business revenue.

![Percentage of Business from Boaters](chart)

Participant responses produced consistent findings regarding the impact of lake water level on sales revenue. The majority of business representatives anticipated increased revenue from raising the target lake water level by seven inches during the summer season. Only one participant expressed concern over the higher target water level, and that concern applied only if the increase would result in more days when high water levels caused no wake zone status to take effect. In general, participants expressed opinions that higher average water levels in the summer would increase business revenues by increasing the number and types of boats using the lake.

Participants report that, in a typical season, low water levels significantly reduce boating activity on the lake. When water levels are lower, lake users are more likely to encounter the following problems:
• Prop damage to their boat or the rental boat (costly)
• Injury to people recreating in the water due to collisions with hidden obstacles
• Unpleasant water conditions causing people to not want to enter the water for skiing, swimming, tubing
• Difficulty taking off when water skiing
• Inability to launch boats
• Boats stuck on lifts requiring costly removal

When people see Lake Koshkonong’s water levels as unpredictable and likely to be too low, they decide to go to a different lake for their outings and vacations. They also tell their friends and family about their negative experience and that eliminates potential customers as well. Participants welcomed a change that would help alleviate the low water level problems that limit Lake Koshkonong usage.

Poor usability of the lake due to low water levels also impact property values and real estate business. Best Realty owner, Paula Carrier, said, “When you cannot boat on it, then the shoreline is unattractive with cracks, dirt, muck, smells, people are pushing their piers out further and further. When you’re bringing a customer by to look at properties, they are alarmed. That is one of the biggest hinges for sales. They can go to an area where water is deeper so they do not experience those low water levels like those on Lake Koshkonong.” Restaurants and bars with piers find that larger and heavier boats are reluctant to use the pier, so they may lose business from people who would otherwise dock and come in for drinks and dining. During lower water times, the piers, which often extend 200-300 feet from shore, may not be usable by any boats.

Participants did not show as much interest in extending the boating season by two to three weeks as they did in having higher water levels during the summer months. Most representatives said that cooler weather and the start of the school year impact sales drop-off more than water levels in September and October. Several respondents talked about problems with lower water levels in August and showed interest in maintaining higher water levels during the two weeks leading up to Labor Day. A couple representatives expressed interest in extending the season, seeing it as an opportunity to gain additional business.

Everyone interviewed said that adding seven inches of water to the target summer lake level would result in increased boat traffic on the lake. They anticipated that increased boat traffic would likely increase revenues for the entire area. The reasoning was that more boaters would mean more potential customers. No one anticipated problems from greater lake usage. Most responded that the lake is so large (10,500 acres) that overcrowding would not become an issue unless boat traffic increased dramatically.

Higher water levels would also result in boats like runabouts that need a little more clearance being able to use the lake. Currently the lake draws pontoon boats more
than runabout boats. Those interviewed said that often these types of boats that need more water are more expensive boats. Their experience is that parties on more expensive boats tend to spend more at the businesses. Also, runabouts are far more likely to be trailered to the lake than pontoons. Most people keep their pontoons someplace for the season rather than trailer them to a lake for an outing or vacation stay. One example of the estimated impact of more expensive boats using the lake comes from Ken Zolper at Sunset Bar & Grill, “The boats that people are worried about bringing in here are $100,000 boats, so those people have more expendable income and are likely to spend more money. That results in more revenue per boat. So having bigger boats would be a positive impact for the business.”

Drawing more recreational boaters to the area interests the business representatives more than attracting hunters to the area. Participants described the boating customers consistently when asked to breakdown the group into those who primarily engage in fishing, hunting and recreational boating. All interviewed said that, by far, recreational boaters are the majority of their boating customers with those fishing comprising a moderate level and those hunting being negligible in number.

Participants projected that increased business during the summer season would necessitate payroll increases. However, predictions about whether extending the season by two to three weeks would delay drawdown of payroll differed. About half of those with employees on payroll indicated than extending the water levels for boating two to three weeks would not change when payroll reductions started. This is because their experience has been that cooler weather and school starting drive the decline in customers more than end-of-season water levels. For example, Anchor Inn owner John Kinnett said, “Higher sales would result in higher payroll, but, in part, payroll reduction occurs when school resumes. Local customers would probably use the lake more, but the vacation season ends on Labor Day.” On the other hand, Buckhorn Supper Club owner Chico Pope thought that his restaurant—which is open three days a week during the summer and only two days during the off-season—might delay drawdown of payroll with a longer boating season. He said, “It is a fair assumption that we might employ more people longer. Our hours of operation might be longer. We start scaling our hours back right at Labor Day. Anytime we can extend the season and have more business we would surely have more people working.”

Clarity of water also concerned those interviewed. All agreed that clearer water resulted in greater lake usage and a better experience for those using the lake. Pope said, “People often want to swim when they come to the lake. Reality is that in August people probably can’t swim, especially along the shore. So they go to a different lake.” Marina and marine sports companies said that clearer water makes customers more likely to invest in their property because they can enjoy the lake more.
Overall, representative businesses saw highly positive effects likely to result from a seven-inch increase in target water levels during July, August and September. Several expressed opinions that low water level issues are holding back economic development. Kinnett of Anchor Inn said, "It would have a profound effect having our customer base enjoying the water more. That would bring in more people, and they would bring their friends, and there is a ripple effect from there that will make the area grow." Estimates on how much sales would increase following raising target water levels ranged from 10 percent to 25 percent. Zolper, manager of the Sunset Bar & Grill said, "We would have sales increase due to bigger boats spending more money. If boaters are able to get around a lot better, that would be good for every business on this lake. The more boaters there are, the more customers. More water would increase sales."

Generally, those interviewed reflected the following opinions:

• Many businesses rely on tourists: those using the campgrounds and owning seasonal homes. More customers use the lake for recreational boating than fishing and hunting.
• More boats on the lake would result in higher sales revenues because 25 to 100 percent of representative businesses’ customers come from boaters.
• Extending the season is not as critical as better boating waters during the summer months because after Labor Day people are less likely to vacation.
• Current lake levels are often too low for boaters to enjoy their experience.
• More expensive boat types on the lake would likely result in higher sales revenues.
• Higher sales revenues would result in higher payroll during peak season for most of the businesses.
• There is concern that lower water levels drive off customers to other lakes and discourage new customers.
• Business owners seek repeat customers. To retain boating customers, they must enjoy their time on the lake and have a positive overall experience.
• Better water clarity would have a positive impact on business.
Interview Questions

1. Name and business name
2. What kind of business do you operate?
3. Please describe your customer base.
4. Are boaters a significant portion of your customers?
5. Thinking about your business and considering water levels, could you describe the difference between a typical week in peak boating season and a week when the lake is not as “boatable”?
6. How important would extending boating season by two to three weeks be for your business?
   a. What makes that important/not important?
7. How likely is it that adding seven inches of water in the summer season would increase the number of boats on the lake?
8. What impact would more boats using the lake have on your business?
9. What impact would larger/greater variety of boats using the lake have on your business?
   a. Do you see any negative impact from larger boats?
10. Do you draw down payrolls as the summer season ends?
11. What effect would the higher predictability of water levels have on payroll levels toward the end of the season?
12. Would the timing of the payroll drawdown change if the lake level was more predictable later in the season?
13. About what percentage of your business comes from the following types of lake users:
   - Waterfowl hunters?
   - Recreational boaters?
   - People interested in fishing?
14. Would clearer water benefit your business?
15. Could you describe the effects of the end of the season water level dropping on your business?
16. In conclusion, could you summarize what effect you think a seven-inch higher water level in July, August and September have on your business?
## List of Business Representatives Interviewed

### Anchor Inn
**John Kinnett, Owner**  
718 E. Hwy 59  
Edgerton, WI 53534  
(608) 884-7565  
anchorfun.com

### JAD Realty
**Jim Dovgin, Owner**  
W8569 White Crow Rd  
Fort Atkinson WI 53538  
(608) 695-8389  
jimdovgin@hotmail.com

### Best Realty
**Paula Carrier, Owner**  
5 West Rollin St  
Edgerton WI 53534  
(608) 884-8468

### Newville Marine
**Jim Bowers, owner**  
541 Lake Drive Rd  
Edgerton WI 53534  
(608) 220-7918  
newvillemarine.com

### Buckhorn Supper Club
**Chico Pope, Owner**  
11802 N Charley Bluff Rd  
Milton WI 53563  
(608) 868-2653  
thebuckhorn.net

### Rock River Marina and Motorsports
**Lorri Nastala, Owner**  
520 Richardson Springs Rd.  
Edgerton, WI 53534  
(608) 884-9415  
rockrivermarina.com

### Harbor Recreation
**Mark Richardson, Owner**  
807 Harbor Road  
Milton WI 53563  
(608) 884-6007  
harborrec.com

### Sunset Bar & Grill
**Ken Zolper, Manager**  
W7905 High Ridge Road  
Fort Atkinson WI 53538  
(920) 563-5702  
sunsetbaronthelake.com
INDIVIDUAL INTERVIEWS SUMMARIZED

John Kinnett, Owner
Anchor Inn
718 E. Hwy 59
Edgerton, WI 53534
(608) 884-7565
anchorfun.com

Business type: Bar, restaurant, boat launch and boat rentals

Customer base: campground users (people from out-of-town), recreational boaters (skiing, tubing, boating)

Percentage of business from boaters
Boaters are about 50 percent of business because they are next to the highway and get road traffic as well. Two-thirds of business revenue is between May and September.

Other details: In business for 18 years.

Typical boating week versus week when the lake is not as usable for boating
Water level affects the boat rentals. When the water level is low, then those renting boats are more likely to experience damage to the boat. That can cost them $150 for the damaged prop. That makes it less likely that they will return to Lake Koshkonong for their next boating experience.

Prior to the water level decreasing in August, no props were damaged. Once the water level dropped, that first weekend, there were about 20 rentals with 10 props damaged. That could result in those 10 people not coming back.

Low water is also a hazard for people swimming and playing in the water because, like the boats, they may impact with hidden obstacles. It is a recreational lake. When the water is too low, skiers cannot take off. They are too close to the bottom.

Sometimes people drive up from Chicago and they find that the water level is too low to take their boat out. They want a lake where the water is predictably deep enough to boat, so they switch to another lake.

Impact of extending the boating season two to three weeks
Kinnett thought that extending the season by two to three weeks would result in people utilizing the lake more.
Would adding seven inches to the target water level increase the number of boats on
the lake?
During target water levels, the ramp may see 150 launches in a day.
When water level drops, many boats cannot launch.

**Impact of more boats using the water**
Higher lake level would result in more usage, better property value, happier
residents and campers. He added that businesses that are doing better are more
likely to invest in their businesses and hire more employees.

**Impact of larger/more variety of boats using the lake**
Kinnett reports pontoon boats are common on this lake, but there are not as many
runabouts. That is because runabouts require a little deeper water. Larger boats are
not of as much interest to Kinnett as those runabouts that need to draw more water.
That is because families are more attractive customers than a couple on a cruise
boat.

**Payroll impact from higher predictability of water levels toward end of season**
Higher sales would result in higher payroll, but, in part, payroll reduction occurs
when school resumes. Local customers would probably use the lake more, but the
vacation season ends on Labor Day.

**Payroll impact from higher predictability of water levels toward end of season**
Anchor Inn increases payroll during the busy season.

**Percentage of customers primarily using the lake for each of the following: fishing,
hunting and recreational boating**
Majority is recreational boaters.
Seasonally, in the spring, fishing is a big draw.
Hunters are negligible.

**Effects of water clarity**
Clearer water would benefit business.

**Estimated overall effect of a seven-inch increase in target water levels**
Having our customer base enjoy the water more would have a profound effect
overall, and that would bring in more people who would bring in their friends, and
there is a ripple effect from there that will make the area grow. Expressed opinion
that water level issues are holding back economic development.
Paula Carrier, Owner
Best Realty
5 West Rollin St
Edgerton WI 53534
(608) 884-8468

*Business type:* Real Estate

*Customer base:* Residential, local, people moving to the area. Lake Koshkonong is a significant impact on her business. Waterfront homes gain value faster and have recovered faster. The more people know about our area, the busier we are.

*Percentage of business from boaters*
One third of the sales relates to waterfront sales. Many times when people are looking on the waterfront, they want to be on navigable water for boating and other activities.

*Other details:* Does not do rentals. Many people handle that on their own now.

*Typical boating week versus week when the lake is not as usable for boating*
When you cannot boat on it, then the shoreline is unattractive with cracks, dirt, muck, smells, people are pushing their piers out further and further. When you’re bringing a customer by to look at properties, they are alarmed. That is one of the biggest hinges for sales. They can go to an area where water is deeper so they do not experience those low water levels like those on Lake Koshkonong.

*Impact of extending the boating season two to three weeks*
In August typically water levels get low and the water seems stagnant. They slow down marketing at that time because they prefer to show the lake when it’s more attractive. To be able to boat longer, vacation longer, etc. would mean more sales. To be able to keep showing the lake longer would mean more sales.

*Would adding seven inches to the target water level increase the number of boats on the lake?*
It would increase the number of boats on the lake. It would make the properties look better. The piers wouldn't have to be pushed out so far. It would make boating and fishing better. The water would look nicer.

*Impact of more boats using the water*
It would be a good impact.

*Impact of larger/more variety of boats using the lake*
The higher end boats tend to go hand-in-hand with higher-end homes. We have water homes that are worth $550K or more. Those people do want better boats. It would bring us more higher-end buyers in my business. Did not see any potential negative impacts from more or larger boats using the lake.
Payroll impact from higher predictability of water levels toward end of season
Payroll reduces at the end of the boating season. Commissioned realtors cover payroll hours during the off-boating season. When the water is higher in the summer and when we have better boating later in the summer, we will see our busier season extend into September and even October. We would love to have an increased likelihood of having longer seasons as a result of raising the target water level. Maybe then we would have only a couple months of slow down as opposed to as many as six months of slow time.

Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating
Many clients use the water in multiple ways.

They do not necessarily say that they hunt; however, for those only looking for hunting access, properties in the northern part of the state are much more affordable. This would not be a prime market for people strictly interested in waterfowl hunting.

Recreational boating, pre-economic downtown, made up about one-third of the business. Right now it is about 25 percent. Would like to get that percentage higher and nicer water on Lake Koshkonong would help make that happen faster as the economy slowly recovers.

People report that they go fish the other lakes because they are deeper. They believe that fish supply is limited because of the depth. They will go to Kegonsa and Monona and Mendota. With increased water levels, we might see better species and more thriving species. I think it would make a better fishing environment.

Effects of water clarity
My favorite time to show houses is when it is cool and the ice has just melted because the water is incredibly clear. With deeper water, perhaps sediment would settle better.

Estimated overall effect of a seven-inch increase in target water levels
I think it would be a positive impact overall. I would estimate at least a 25 percent overall surge. I also think that those people who own weekly rentals would benefit. To keep people here spending money locally would be good. We wouldn’t see the rapid drop off so fast. It would be more of a taper. And I think it would be a little longer lasting to where maybe our slower months of business would only be the true winter months.
Chico Pope, Owner  
Buckhorn Supper Club  
11802 N Charley Bluff Rd  
Milton WI 53563  
(608) 868-2653  
thebuckhorn.net

Business type: bar, restaurant serving evening meals on weekends (and Thursdays during summer season)

Customer base: Tourists make up the biggest share of the customer base, not so much the local people. It is also people who spend the whole summer here. It is people who want to get out and see the water.

Percentage of business from boaters  
Boaters are a significant part of the business when they can get to the supper club. Buckhorn has a 200-foot pier with an average of two-feet of water at the end of it. Larger boats are reluctant to come in. Pontoon boats are the most popular type of boat using the pier. It would be a bigger part of our business if they felt it was safe for them to come on their boat.

Other details: Have outdoor seating as well as indoor seating. Business is known as having one of the best views of the lake. Have a pig roasts and lobster boils and other outdoor activities in the summer to get people out by the shoreline.

Typical boating week versus week when the lake is not as usable for boating
Buckhorn sees 25 to 30 percent difference in business between peak boating week and a week when the lake is not as boatable. During 2008 when the lake couldn’t be used due to flooding, business was down 50 percent. High water also affects the business because when the pier is underwater it cannot be used.

Impact of extending the boating season two to three weeks
That would be big. As a member of the restaurant association, we got legislation passed to extend summer through Labor Day. Adding two weeks to our season due to school starting later made a huge difference. Having two to three more weeks of predictable water levels would add 10 percent to annual sales. Normal conditions for July and August could see the water too low.

Would adding seven inches to the target water level increase the number of boats on the lake?
“I’m sure it would.” Some of the Buckhorn customers use other lakes because they have bigger boats and cannot use Lake Koshkonong. When people have a better experience on the lake, they are more likely to come back and tell others about the lake.
Impact of more boats using the water
More boats would definitely mean more business.

Impact of larger/more variety of boats using the lake
Being able to accommodate higher-end boats on the lake would benefit Buckhorn because it is a higher-end restaurant attracting customers in a higher income bracket. Those customers have the bigger, better boats so that would fit perfectly with Buckhorn’s marketing and price point. Did not anticipate any negative impacts from larger boats using the lake. Fishermen would still have many quiet bays to use. The lake tends to be rough due to wind so wakes would not be an issue.

Payroll impact from higher predictability of water levels toward end of season
It’s a fair assumption that we might employ more people longer. Our hours of operation might be longer. We start scaling our hours back right at Labor Day. Anytime we can extend the season and have more business we would surely have more people working.

Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating
Hunters are negligible as a part of the business. They may come in once a year when they have guests from out of town.
Recreational boaters are a big part of the business. It brings people up for the weekend or the whole summer. They are eating, drinking, looking for ways to enjoy themselves. They buy gas and other things. They are here to spend money.
The people here fishing are not here to spend money at places like Buckhorn.

Effects of water clarity
People often want to swim when they come to the lake. Reality is that in August people probably can’t swim, especially along the shore. So they go to a different lake when it isn’t clear. Clearer water is better for sure.

Estimated overall effect of a seven-inch increase in target water levels
I think it would add at least 10 percent, maybe 15 percent to our business. I think it would escalate the growth of the use of the resource we have here. People would continue to invest in their properties and more people would move here. It would be a sparkplug to be able to say we are never going to have that lower level where you have to worry about dinging up your boat. If we can guarantee a safer level than it is now that would benefit business.
Mark Richardson
Harbor Recreation
807 Harbor Road
Milton WI 53563
(608) 884-6007
harborrec.com

Business type: Marina selling boats, motors, marine equipment, hoists

Customer base: a mix between local and vacationers from north of Madison to Rockford

Percentage of business from boaters: 100 percent

Typical boating week versus week when the lake is not as usable for boating
It depends a lot on weather. The busiest time is July, but if the weather is nice earlier, then the season will pick up sooner. Low water levels make it difficult to get launched and boaters cannot use the entire lake because some areas will be too low. The other problem is that people start hitting bottom sooner with their boats. A lot of people just will not come up here to use the water. The customers accessing the marina for repairs due to the low water levels will not replace the increase that would occur if the lake had a better reputation among boaters.

Impact of extending the boating season two to three weeks
As far as the end of the season goes, much of that depends on weather as well as water levels. Would rather see a longer season, though. When the water is higher longer, it helps people use their boats through the season when the weather is friendly. If the water level is lower toward the end of the season people will pull their boats off earlier or the boats get stuck.

Would adding seven inches to the target water level increase the number of boats on the lake?
It would definitely increase it. It would be more usable, and there wouldn't be as much fear about coming up here to find that it isn't usable. Seven inches would make a big difference on this lake. It would increase the types of boats that could use the lake.

Impact of more boats using the water
The more usable the water is, the busier we will be more consistently. More repair work, more sales in general, engine sales...more boats means more business.
Impact of larger/more variety of boats using the lake
The stern drive inboard, outboard boats draft more water and it would benefit them. Heavier boats, too, would benefit.

Payroll impact from higher predictability of water levels toward end of season
Payroll decrease is largely related to winter. Weather determines demand. During the busy time, the amount of water would impact how busy the company is and would increase payroll. If the season were busy later, then payroll reduction would start later.

Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating
Estimates that recreational is 50 percent. Fishing is 40 percent, and hunters 10 percent.

Effects of water clarity
Clearer water would benefit the business. Fishing is better with clearer water.

Estimated overall effect of a seven-inch increase in target water levels
It would definitely have a positive impact. If the weather is nice and the water level is at a better level, then everyone will be happier. In addition to business revenue going up, the property values will be higher. We see people who will not come up here because they are afraid to come up here due to low water levels.

Jim Dovgin
JAD Realty
W8569 White Crow Rd
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(608) 695-8389
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Business type: Real Estate Broker dealing with sales and rentals

Customer base: Specializes in waterfront properties in the Lake Koshkonong and Rock River areas helping with sale, purchase and rental of properties

Percentage of business from boaters
Lake users are a “huge” part of his business. Once people move onto the water, they are moving on for certain reasons: fishing, water ski, pontoon boat rides, etc.

Typical boating week versus week when the lake is not as usable for boating
For Dovgin, when the lake is not usable by boaters, it’s disastrous for his business. People are moving here to use the lake, for them to say I can’t boat or I can’t get my
Boat off my boat lift, that’s discouraging. He is honest about the fact that on Lake Koshkonong, low water periods are common and that contributes to problems with boats stranded on lifts. It’s important for customers to know what they are getting into. It would be nice if there was a more consistent and higher water level so that at least you can always get your boat off your boat lift.

*Impact of extending the boating season two to three weeks*
It would be huge. For people who live on the river it is extended.

*Would adding seven inches result in more boats on the lake?*
It would definitely add more boats in a normal summer season.

*Impact of more boats using the water*
The lake is 10,500 acres, so more boats would be like adding a couple more drops of water into a bucket because it is so big. It’s not a negative issue like it would be on more crowded lakes.

*Impact of larger/more variety of boats using the lake*
Adding seven inches wouldn’t make a big difference. It’s not a big enough difference for larger boats to be able to use the lake.

*Payroll impact from higher predictability of water levels toward end of season*
No impact anticipated. If there was increased demand it would make him busier with sales and rentals on this lake, but it wouldn’t result in added payroll.

*Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating*
Recreational use is first, and fishing is second priority for customers. Hunters are a limited number. Less than 5 percent would be looking at this area specifically for waterfowl hunting.

*Effects of water clarity on business*
Absolutely clear water is good for business. He likes to show properties when the lake is clearer. Water quality is huge in terms of desirability and value of property. For example, properties on Lake Ripley which is a smaller lake, but it’s spring-fed and clear, are in the $210-225 per sq. ft. range where on Lake 145-170 per sq. ft. range.

*Estimated overall effect of a seven-inch increase in target water levels*
To add seven more inches of water means that we can get to more beaches and we can get our boats off our lifts and we don’t have to run our piers out 300 feet. It would create greater demand for homes in the area. The reputation of this lake is that it’s very shallow and that many times you cannot take your boat out. Higher water levels mean that our ramps around the lake would be more usable. During periods of low water, they are not usable.
Jim Bowers  
Newville Marine  
541 Lake Drive Rd  
Edgerton WI 53534  
(608) 220-7918  
ewvillemarine.com

Business type: Marine services including dock and lift sales and service, barge service and recovery, boat hauling and winterizing, shrink wrap and storage

Customer base: boaters that live on Lake Koshkonong and Rock River seasonally

Percentage of business from boaters: 100 percent

Typical boating week versus week when the lake is not as usable for boating  
Normal week in peak boating season we have boats on the water on the weekends and some out during weekdays but not as many. We have good water for boating. If we have good water for boating it makes it easier for customers. When the water is low, boats get stuck on their lifts and they may hit things in the water. Some customers with 300-foot docks cannot get their boats off their docks. There is a decline in usability. If the water was more boatable it would be better for my business.

Impact of extending the boating season two to three weeks  
For the lake to be usable, for my customers to be able to come longer and use it would mean that customers would be more inclined to invest in their properties, meaning more inclined to buy a dock, more inclined to have a boat lift for their boat. Some customers don’t keep their boat at their house because there isn’t enough water to keep their boat there.

Would adding seven inches to the target water level increase the number of boats on the lake?  
Yes because it would allow boaters to use the water more.

Impact of more boats using the water  
If more boats are using the lake, we will see more people investing in boating. If they can use it more, then they will invest in docks, new boats, etc.

Impact of larger/more variety of boats using the lake  
It would bring slightly larger boats, yes, but more importantly, it would bring more inboard motorboats. We have bigger wakes so you need a bigger boat to use the lake. Having inboard and other boats that need a little deeper water would bring in a whole new customer base. No negative effects were anticipated.
**Payroll impact from higher predictability of water levels toward end of season**
Payroll levels currently decrease at the end of the season, but the activities at the end of the season would still need to be done. More boat activity would result in more payroll due to more need for lift repairs, dock repairs, etc.

**Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating**
Fifty percent are recreational boaters. Forty percent are fishing. Ten percent are hunting.

**Effects of water clarity**
It encourages people to boat, they will invest in their shorelines. You won’t see swim rafts on this lake as much as others because it isn’t a clear.

**Estimated overall effect of a seven-inch increase in target water levels**
It’s going to add so much to our season. It will make the customers be able to do so much more with the water. Customers that have long docks and still can’t put their boats on their docks would be able to keep their boats there. It would make my customers happier.

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**Lorri Nastala, Owner**
**Rock River Marina and Motorsports**
520 Richardson Springs Rd.
Edgerton, WI 53534
(608) 884-9415
rockrivermarina.com

**Business type:** Marine sales and service

**Customer base:** campground users, Illinois tourists camping and boating who want everything to run smoothly and will pay to have things taken care of for them.

**Percentage of business from boaters:** 100 percent

**Other details:** Sell boats, jet skis, offer slip rentals by the season, sell gas on the water, recently began selling and servicing snowmobiles in the winter

**Typical boating week versus week when the lake is not as usable for boating**
Usually early in the season when the water is high the lake is set as a no wake zone, so a lot of people are hesitant to put their boats in. If the water is too high too far into the season, say into July, then people may choose not to even come use the lake.
for the entire season. When that happens, we lose all those customers who would be buying gas, groceries, renting slips, and so on for that entire season. We lose the revenue from getting boats ready for summer and from winterizing their boats. They have not used their boats, so there is no service that needs to be done. If they have a trailer, they will take their boat elsewhere.

Customers also have a hard time knowing where to go for information on water levels and whether the lake is no wake zone status on any given day. Often they will call us. It is very hard to predict. This past summer it was no wake for the longest time and then all of a sudden they took the no wake zone status off. It was good and then two weeks later the lake was too low. So we had a two-week period of good boating.

Sometimes when it’s too low it will bring in business from people damaging their props, but when people end up spending more money than they want to in a season, they may give up boating or take their boats elsewhere.

Another big problem for us is that we sell docks. When the water is fluctuating so much, we have a lot of angry customers who cannot get their boats off their docks. They don’t want to pay another time to move their dock. Then if the water level moves up, the boat may float away. Some people have gotten so frustrated that they sell their property and move away.

Impact of extending the boating season two to three weeks
What is more important is predictability of water level to keep customers happy.

Would adding seven inches to the target water level increase the number of boats on the lake?
We might see larger boats. What we see a lot here are pontoon boats. We used to sell Sea Jet boats, but they do not make them anymore. The jet skis work really well when water level was low. If we had more water, some other types of boat could use the lake, but right now it is too dangerous.

Impact of more boats using the water
More boats would be good for business. I might be able to hire more people if we had more traffic in and out of the store.

Impact of larger/more variety of boats using the lake

Payroll impact from higher predictability of water levels toward end of season
Water levels would not have much impact on end-of-season payroll levels. That is more weather-related. When it gets too cold people need to start winterizing their boats so that they do not get damaged from the cold. Also, some people take their boats out in September because they are only up here for the summer.
Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating
Hunting is a small portion. Recreational boaters are the majority with a fairly good portion coming from fishermen as well.

Effects of water clarity
Maybe we would get more fishermen. We have never really had clear water here. It would be more important to control the algae so that people think that it is safe to water ski and swim.

Estimated overall effect of a seven-inch increase in target water levels
It might keep people boating longer so long as the weather is good. It would be ok if it was seven more inches, but it would be more important for the water level to be consistent. It is the fluctuation level of the water that causes the most trouble for boaters. That would depend on whether it would result in more no wake zone days. If it did not result in more no wake days, then it would probably be fine.

Ken Zolper, Manager
Sunset Bar & Grill
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(920) 563-5702
sunsetbaronthelake.com

Business type: Bar and restaurant on the lake with a pier

Customer base: In summer people ages 21-65 years old; in winter people 30-65 years old; 50/50 residents versus tourists

Percentage of business from boaters
Boaters are a significant portion of the business. Zolper estimated 35 percent of business in summer months.

Typical boating week versus week when the lake is not as usable for boating
When lake is not as good for boating then business can be cut by 50 percent. Lower water reduces number of boats that can access the pier. If the water level is too low then they can’t get here: they hit bottom.

Impact of extending the boating season two to three weeks
Extending the boating season may or may not improve business depending on the weather. This year the water level did not affect our business at the end of the season. The weather was a factor more than the water level. This year the season for
them ended middle of September. The pier was pulled at the end of October, but the weather turned cold the second week of September.

*Would adding seven inches to the target water level increase the number of boats on the lake?*

During the Memorial Day to Labor Day season, if there was an seven-inch increase in the target water level, then business would increase 10-15 percent. Every boat that comes in here, we figure it is on average $100. More boat traffic would likely increase the number of boats that come here.

*Impact of more boats using the water on the business*

During the good weather, the more boats there are, the better the business we will have.

*Impact of larger/more variety of boats using the lake*

Seven inches would permit more types of boats. The boats that people are worried about bringing in here due to low water are $100,000 boats, so those people have more expendable income, are likely to spend more money. That results in more revenue per boat. So having bigger boats would be a positive impact for the business.

*Payroll impact from higher predictability of water levels toward end of season*

The timing of the drawdown of payroll is impacted by the weather more than anything. Higher water level later in the season would not necessarily mean more business.

*Percentage of customers primarily using the lake for each of the following: fishing, hunting and recreational boating*

Of the boaters who visit the Sunset Bar & Grill
Recreational is 60 percent, 30 percent fishing 10 percent hunting.

*Effects of water clarity*

Clarity of the water matters. When the algae blooms it discourages boating.

*Estimated overall effect of a seven-inch increase in target water levels*

“We would have sales increase due to bigger boats, more money, they spend more. If they are able to get around a lot better, that would definitely be a positive. That would be good for every business on this lake. The more boaters there are the more customers. More water would increase sales. Definitely.”
Appendix B: Economic Impact of The Wealth Effect

The initial portion of this report focused on the loss in property value appreciation brought about by the change in Lake Koshkonong’s water level. This appendix translates that loss of potential wealth into a loss in economic activity for the region. The aggregate difference in property value appreciation between waterfront residences on Lake Koshkonong versus Lake Sinnissippi (the most conservative estimate) is $8,353,458. This loss in wealth is considered in the calculation of the short term economic impact of the water level reduction. This model is based on the assumption that in the absence of the water level reduction, this wealth would be transmitted into the overall economy through increased consumer spending.

Methodology

To calculate the economic impact, an IMPLAN input-output model economy was utilized. The IMPLAN model is designed to determine the ultimate economic impact on the local economy which results from the reduction in initial spending by the homeowners from the loss in wealth using the data obtained through this research. IMPLAN estimates to what extent different spending categories affect the local economy in terms of direct spending, indirect spending, and induced spending. These categories are defined as follows:

- **Direct Spending**: Initial wealth effect.
- **Indirect Spending**: Spending brought on by businesses that benefited from this wealth effect.
- **Induced Spending**: The additional spending by employees of the businesses who have more labor income due to putting in more hours

Determining the extent of each of the spending categories is critical to measuring the extent of the impact that various forms of funding have on the local economy. The Direct Spending is
determined by estimating the impact on consumer spending: had these properties increased in value by $8,353,458, we estimate that homeowners would have altered their wealth expectations and increased their consumer spending by about $400,000 (or decreased savings by $400,000) for 20 years (Kashian, Reid and Kueffer 2014).

**Conclusion**

Had the homeowners on Lake Koshkonong witnessed the type of appreciation created by Big Muskego or Lake Sinsinippi, the families associated with this increase in value would have seen their wealth increase. As a result, one possible consideration would be to alter their spending patterns in light of this addition to the value of their assets. The increase in property appreciation and wealth in the absence of the water level reduction is estimated at $8,353,458 which would result in an additional $400,000 in consumer spending to the region. The total economic impact of this potential increase in wealth is therefore 9 full time jobs, $262,719 in labor income, and $682,753 in sales. These jobs would be the result of the added economic security and wealth offered by this property appreciation, which is then transmitted throughout the economy through increased consumer spending. The Rock Koshkonong Lake District has lost an estimated 9 full-time equivalent jobs, $262,719 in labor income, and $682,753 in sales as a result of the lack of property value appreciation which resulted from lower lake water levels and uncertainty surrounding the water level.

**References**