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Literature Review of Hedonic Analysis Studies

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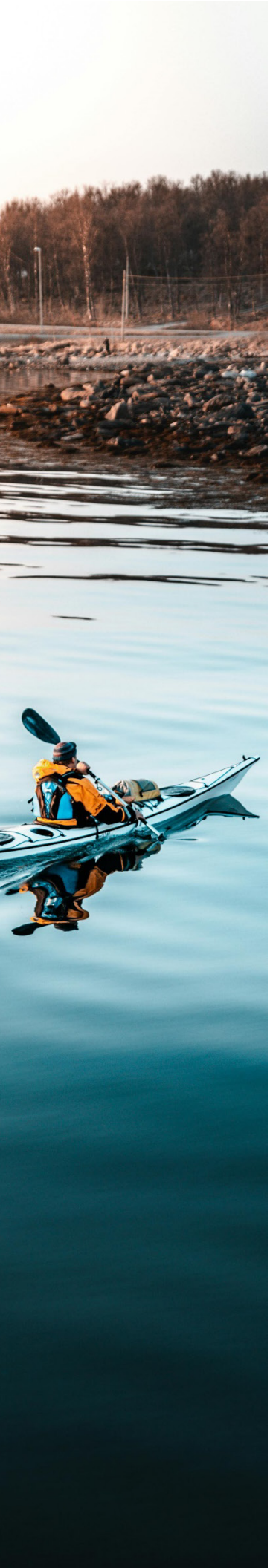

Table of Contents

Background and Purpose

Background

In May 2020, a 500-year flood devastated Gladwin and Midland Counties, resulting in the failure of the Sanford and Wixom Dams and significant damage to the Secord and Smallwood Dams. It also caused hundreds of millions of dollars in damage to personal property, placing additional financial burden on property owners to rebuild and restore these structures.

In response to this event, the FLTF was designated authority to take actions required to restore and recover the Four Lakes area. To help fund dam restoration and repair as well as lake-level recovery and restoration, the FLTF developed a lake-level special assessment role. This special assessment role imposes costs to property owners in the Four Lakes Special Assessment District (SAD) based on parcel factors like location of the lot in relation to the lake, frontage amount, waterfront views, estimated water depths once lake levels are restored, public use, and derived benefits (Four Lakes Task Force n.d.).

Purpose

To further refine their restoration plan, the Four Lakes Task Force (FLTF) engaged Public Sector Consultants (PSC) to conduct a literature review on how lakes can affect property values. The FLTF wants a better understanding of the financial effects experienced by area properties with lake proximity, adjacency, access, and views. Academics and researchers commonly use hedonic analysis to understand the financial benefits associated with lake proximity.

PSC has not analyzed properties in the Four Lakes area but has evaluated several peer-reviewed studies that analyze lake premiums using hedonic analysis. The research summarized in this report is useful in better understanding hedonic analyses for lake premium assessments and contextualizing the work completed by the FLTF.

PSC's literature review sought to answer the following questions:

1. What factor(s) drive the value of property?
2. What is the diminishment of home values and lake premiums based on distance from a lake?

PSC focused on studies that sought to answer similar questions, employed a high level of analytic rigor, underwent peer review, and were published in academic journals (with the exception of one study). PSC extrapolated key findings to illustrate the general impacts of lake amenities on communities, how lake benefits compare to other amenity types, and the effect of proximity on lake premiums.

Key Findings

The literature addressing lake benefits to property values shows a consistent pattern. The general theme among studies that have analyzed the impact of water on property indicate that:

1. **Proximity and adjacency to desirable bodies of water are major drivers of property value.** The value attributed to water is generally greater than other contributing factors, such as home size, lot size, number of bedrooms and bathrooms, as well as amenities like golf courses, parks, and wetlands. However, it is important to note that while lake proximity generally raises property value, findings across these studies are unique to the areas analyzed and the model parameters utilized, and there are likely exceptions to this generalization.
2. **There are high premiums among water-adjacent properties, and the value of the water-associated premiums decrease as distance from the body of water increases.** However, there are also large premiums associated with lake views where adjacency is not a factor. This is especially common among bodies of water with high desirability (i.e., aesthetic value, opportunities for recreational use). While decreases in property premiums due to increases in distance cannot be averaged across the studies reviewed, the findings clearly show that property premiums associated with water are less prominent with an increase in distance from a body of water. This indicates that the value of adjacency to a lake, river, or other water amenity is generally greater than water views.[1]

Hedonic Analysis

To answer the question of how lakes and other water bodies contribute to property values, researchers and academics commonly employ hedonic analyses. Hedonic analysis is a statistical method used to estimate the value of a good or service by analyzing how its individual characteristics contribute to its overall price.[2] Hedonic analysis is used to isolate the impact of specific attributes —such as proximity to amenities, environmental features, or policy changes— on property values or other economic indicators. This approach is commonly applied in real estate, environmental economics, and public policy to quantify the economic benefits of factors like parks, water bodies, air quality, and infrastructure improvements.

Once accounting for all relevant factors that explain market values, the remaining difference between the expected market value and the actual value is then statistically determined as the overall average realized property premium (Monson 2009).

As an example, if a dam impoundment is an amenity that adds value to surrounding properties, people will be willing to pay more for a property near the impoundment than they would for a property not near the impoundment. Alternatively, if a dam impoundment is detrimental, people

[1] This is a generality, not a rule, as there are examples of bodies of water that communities viewed as undesirable, which negatively impacted the value of adjacent properties.

[2] The logic of housing price regression models originates from Rosen (1974) and the theory of hedonic pricing in implicit markets. The concept holds that a housing unit is a bundle of goods, rather than a single item. That is, a housing unit represents several consumption choices at once: a location decision that defines access to education systems, employment markets, environmental externalities and so on, as well as a piece of architecture, with size, quality, amenities, and maintenance characteristics. The selling price of a home is a combination of all these attributes that we can only observe in aggregate.

may want to pay less for a property near the impoundment than they would for a property farther from the impoundment (Nicholls and Crompton 2018).[3]

Drivers of Home Value

Home values are predicated on several factors such as lot size; house size, age, quality, condition, and geographic location; the number of bedrooms and bathrooms; the presence of home upgrades; and school district. These are variables commonly present in a hedonic analysis. When measuring property premiums associated with bodies of water, additional variables are included such as water adjacency, proximity, views, and access.

In general, residents consider proximity to water features as an amenity (Sander and Polasky 2009). Our literature review results largely uphold the premise that an increase in distance to a water feature is negatively correlated with property value premiums associated with the water feature. Plainly stated, the farther away a property is from a water feature, the less value that water feature contributes to the property. This hypothesis is supported in Nicholls and Crompton's 2018 metastudy, which found that of the 44 distinct reviewed studies that included tests of statistical significance, only two produced findings of a negative impact of water frontage or view and/or positive impact of increasing distance to a water body.

Likewise, as property distance from the water feature increases, there is generally a negative impact on property values, though the rate of impact diminishes as distance increases (e.g., adjacent properties with water frontage confer much higher premiums and risk greater premium dissipation from the loss of an impoundment than other proximate properties without water frontage) (Nicholls and Crompton 2018).

Because there is limited lake-adjacent property, developers usually restrict waterfront property lot size. Because smaller lots are generally considered less desirable than larger lots—holding all other factors constant—waterfront properties should cost less than larger lots away from the water. If an analysis compares the market value of waterfront lots to the value of lots away from the water without considering the smaller waterfront lot sizes, the analysis will underestimate the value the amenity brings to adjacent properties. Once the analysis acknowledges that smaller lot sizes along the water should suppress waterfront property values, the true relationship between prices and proximity to the water is revealed.

Specific Effects of Water Adjacency to Property Value

Many factors impact home prices, including geographic location, environmental settings, nearby recreational amenities, property size and characteristics, and even time of year (this being more critical in regions with greater variances in seasonal weather patterns). The literature reviewed

[3] A dam can be perceived as detrimental for many reasons, and can also have real implications to property value depending on its hazard classification.

clearly shows a higher premium afforded to properties due to lake adjacency, access, and views compared to several other factors impacting prices.[4]

Isely et al. (2017) conducted an analysis of residential properties adjacent to the scenic Huron River (a prime recreational river in the state, featuring 13 parks and recreational areas along its banks) in Oakland and Wayne Counties. The findings show that the premium conferred to properties due to river adjacency was 39 percent in Oakland County and 65 percent in Wayne County. The same model showed that an additional foot of floor space and an additional acre in parcel size contributed to 0.04 percent and 4.55 percent (respectively) of the mean sale price. While this study is not yet peer reviewed, it demonstrates the value that proximity to large bodies of water with a positive aesthetic and recreational utility can bring to communities.[5]

Espey et al. (2007) studied residential properties in three counties in upstate South Carolina. The study compares the location impacts in urban, rural, and interface[6] areas, as well as the premiums afforded by three lake-proximity factors. The results showed that properties with lakefront locations held premiums of 52 to 61 percent; properties with lake access held premiums of 34 to 39 percent, and properties with lake views held premiums of 26 to 36 percent.[7] Location in the urban fringe[8] was estimated to increase property prices by just over 11 percent relative to urban locations, while location in the urban-rural interface increased property prices between 7 percent and 14 percent relative to urban locations. Location in the rural fringe and rural areas did not have a statistically significant impact on property prices, positively or negatively. This clearly demonstrates the significance of water on property values relative to various locations in the urban-rural environment.

Kruse and Ahmann (2009) assessed the economic value of residential property located near the Klamath River in California. Results showed significant price premiums per acre for properties adjacent to (108 percent), across the street from (68 percent), and with a view of (28 percent) a reservoir.[9]

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[4] One factor not commonly addressed in these studies is lake quality and recreational utility, which plays a large role in lake property premiums. Environmental conditions—including water quality, recreational opportunities on and off the water, and overall natural aesthetics—is a common theme that appears throughout other pieces of literature impacting residents' willingness to pay to be closer to a body of water (Snyder, 2012). This caveat is important to note because—in the absence of primary data on residents' sentiment toward a water body or data on quality of a lake and its impact on recreational utility—hedonic modeling can be a challenge absent information that may impact results.

[5] This study does not appear to use distance as a unit of measure in the hedonic analysis, instead using a binary indicator for adjacency. This limits the results of the analysis such that there is no identified premium fluctuation at varying distances.

[6] Interface areas are transitional spaces between urban and rural areas where the two characteristics mix.

[7] Results of the hedonic analyses produced premium ranges as four different regression models were employed.

[8] An urban-fringe is characterized by suburban neighborhood features, while an urban-rural interface is a transitional environment with similar land uses but may experience challenges related to services, infrastructure, and planning for growth.

[9] Important to note is the difference between the natural environment/setting in a coastal state like California and Michigan. Regional characteristics play a role in property values and property premiums. Because of this, studies in regions vastly different from one another are not always appropriate for direct comparison. Meaningful insights can be drawn from the relativity among the three water-proximity factors.

Bond et al. (2002) and Seiler et al. (2001) both studied the impacts on residential property values with views of Lake Erie in Cuyahoga County, Ohio. Both studies had statistically significant results. Bond's study found that properties with Lake Erie views sold for $256,545 more than properties without that view—a premium of 90 percent—and the Seiler study found that properties with Lake Erie views assessed at $115,000 more than non-view properties, a premium of 56 percent.

Nelson (2010) conducted a study that accounted for lake frontage and seasonality in Deep Creek Lake in western Maryland. This analysis tested ten models, finding residential property premiums due to lake frontage ranging from 43 to 44 percent in the summer and 21 percent in the winter. Properties located across the road from the lake conferred premiums of 11 to 12 percent during the summer months in all models tested.

Anderson and West (2006) studied residential property premiums in the Minneapolis-St. Paul area, demonstrating the premiums afforded homes located in proximity to the nearest lake compared to other environmental amenities. Findings showed that sales prices increased 0.034 percent for each 1 percent decrease in distance to the nearest lake, compared with proximity to parks (0.004 percent), special-use parks (0.025 percent), and golf courses (0.006 percent).

Value of Lake Proximity

The literature reviewed has established the benefits to properties associated with lake adjacency, access, and views. Another important element in understanding the premiums conferred by lakes is determining the change in premiums as distance from a lake increases. Much of the research shows high premiums among lake-adjacent properties and a diminishment of those associated values with incremental increases in distance from a lake. The change in premiums with increasing distance is generally expressed in the literature as a dollar value (or percentage of value) per distance unit from the amenity within the defined study area.

Brown and Pollakowski (1977) reported that sales prices decreased with increasing distance from three Seattle lakes and rose with for all lake-adjacent properties with up to 300 feet of setback distance. The rate of distance-related declines (i.e., loss of amenity value) was greatest for the lake with no setback, suggesting homebuyers place value on the opportunities for recreational access provided by public setbacks.

Jiao and Liu (2010) conducted a study in Wuhan, China, which found increasing proximity to East Lake had a positive impact on apartment prices. Compared to an apartment 800 meters (approximately half a mile) from East Lake, those 400 meters away exhibited premiums of 1,063 yuan/m^2, while those next to the area exhibited premiums of 2,126 yuan/m2 (where the average price of all apartments in the sample was 5,918 yuan/m2).

Wen, Bu, and Qin (2014) found that proximity to West Lake in Hangzhou, China, had a positive impact on apartment prices. Prices declined by 0.159 percent with each 1 percent increase in distance from the lake (or by 3.91 percent per kilometer). Further analysis demonstrated the

decline was neither linear (prices fell most quickly within a short distance) nor directionally homogeneous (prices fell at different rates in different geographical directions).

Mahan, Polasky, and Adams (2000) demonstrated an increase in sales price of $1,644 with each 1,000 feet closer in distance to the nearest lake in Portland, Oregon (relative to the average $122,570 house one mile from a lake). This compared to $259 in increased marginal value for streams and $993 for open water areal wetlands.[10] An increase in proximity to other wetland types as well as emergent vegetation and scrub-shrub environments decreased marginal implicit values.

Doss and Taff (1996) assessed property values in Ramsey County, Minnesota, finding a decline of $188 with each ten-meter increment in distance from a lake (where the average value of properties in the study area was $104,956).

Sander and Polasky (2009) also found the marginal implicit price for reducing the distance to the nearest lake by 100 meters generated a $216 increase in sales price in Ramsey County, Minnesota (for the average-priced home located one kilometer from the nearest lake). The increase in premium found with an increase in lake proximity was the largest among the resource types considered in the study (i.e., parks, trails, and streams).

These studies illustrate that residential property prices and values are affected by proximity to a lake and other natural amenities, and that premiums associated with lakes mostly decline (with a few notable fluctuations) with increasing distance. A change in lake premium due to distance is unique to each study. Geographic location, lake desirability and recreational utility, and other attributes, as well as the study area parameters used in the modeling all impact results differently.[11] Broad conclusions can be drawn from the findings of the literature reviewed, which is that property value and lake premiums are highest among water-adjacent locations and diminish with distance from a desirable body of water. However, across the study areas, properties located farther from a water amenity still benefited from the feature. The variation in benefits depend upon numerous factors unique to each analysis, study area, and water amenity characteristics.

Concluding Statements

The literature reviewed shows a clear pattern of premiums afforded to residential properties with water amenity adjacency, access, or views. The premiums associated with lake or water feature proximity are greater than other amenities or resource types, suggesting a willingness to pay that exceeds the desire for proximity to other amenity features. These benefits extend to property in the furthest reaches of the study areas but increase as distance to a water feature decreases.

These findings are useful in better understanding the general impacts of water amenities on communities, how lake benefits compare to other amenity types, and the effect of distance on lake premiums. They also contextualize the work completed by the FLTF and the methodology

[10] These are typically large, shallow bodies of water with minimal vegetation.

[11] In distance modeling, the size and nature of the study area play critical roles in interpretation of the results, making comparison to peer studies a challenge.

used to develop the special assessment role, which includes similar factors to those found in the studies like lot location in relation to the lake, frontage amount, waterfront views, estimated water depths once lake levels are restored, and public use. The conclusions from this literature review and included studies can be used to better understand how the presence of lakes can impact property values generally and further inform the FLTF's restoration plan.

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