The Price Is Right? The Impact of a Scenic View on the Pricing of Residential Property

by David Wyman, PhD, and Chris Mothorpe, PhD

Abstract

This study explores the real estate market's reactions to changes in proximate view amenities by examining home sales before, during, and after the construction of a new reservoir in Fayette County, Georgia. The study's findings reveal large increases in the price premium for parcels adjacent to the new reservoir, with higher-quality lake views earning the highest price premium. The study also finds the market anticipated the price premium for soon-to-be waterfront properties, with prices starting to increase prior to the opening of the reservoir and continuing to increase afterwards. In contrast, the price of interior non-view properties remained relatively flat in constant dollars. Overall, the study shows the inclusion of micro-spatial and temporal view variables in pricing models can help appraisers, researchers, and real estate professionals ensure accurate pricing.

Introduction

One of the more vexing issues in residential appraisal is the estimation of the value of a view. The quality of a scenic view is determined by the geometric relationship between a property site and its surrounding topography; however, the complexity of this relationship means neighboring properties can have radically different view corridors and thereby generate dissimilar view premiums.[1] Thus, the explicit pricing premium for any given view amenity is site specific. Extensive research has established a general hierarchy in the pricing of views. Typically, properties with no view amenity are situated at the base of the pyramid with price premiums increasing for higher quality views of open space, golf course, and water views respectively.[2] Waterfront adjacent properties with higher-quality views earn the highest price premium.[3]

The construction of Lake McIntosh (Fayette County, Georgia) in a community of pre-existing residential properties provides the opportunity to gain insights on the real estate market's valuation of view amenities.[4] This study exploits the construction of a new reservoir to estimate the price premiums for scenic views before, during, and after the construction of the Lake McIntosh reser-

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1. Robert Wallner, "GIS Measures of Residential Property Views," *Journal of Real Estate Literature* 20, no. 2 (2012): 225–224.

2. Neil Dunse, Michael White, and Carolyn Dehring, *Urban Parks, Open Space and Residential Property Values* (London: RICS, 2007); Steven C. Bourassa, Martin Hoesli, and Jian Sun, "What's in a View?," *Environment and Planning A: Economy and Space* 36, no. 8 (August 2004): 1427–1450; John L. Crompton, "The Impact of Parks on Property Values: A Review of the Empirical Evidence," *Journal of Leisure Research* 33, no. 1 (2001): 1–31; Mauricio Rodriguez and C. F. Sirmans, "Quantifying the Value of a View in Single-Family Housing Markets," *The Appraisal Journal* (October 1994): 600–603.

3. Randy E. Dumm, G. Stacy Sirmans, and Greg T. Smersh, "Price Variation in Waterfront Properties over the Economic Cycle," *Journal of Real Estate Research* 38, no. 1 (2016): 1–26; Earl D. Benson, Julia L. Hansen, and Arthur L. Schwartz Jr., "Water Views and Residential Property Values," *The Appraisal Journal* 68, no. 3 (July 2000): 260–271.

4. Fayette County, Georgia, is located on the southwest side of the Atlanta Metropolitan area.

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voir and offers four testable hypotheses. First, the study examines whether the construction of Lake McIntosh led to increased market value for all impacted residential properties. With over 53,000 man-made reservoirs in the United States—constituting approximately 48% of all lakes—reservoirs are an important water management tool,[5] while potentially serving as a view amenity for residential properties.[6] Second, the study examines to what extent the real estate market anticipated the rise in property prices associated with the construction of Lake McIntosh. Third, the study area includes extensive spatial heterogeneity with neighboring properties sharing different view amenities, including views of a golf course, woods, a creek, two ponds, and a lake. Using discrete geospatial tools, the hierarchical scope of pricing premiums for these different view amenities is examined. Finally, the study hypothesizes that the construction of Lake McIntosh did not impact the sale prices of non-lake view parcels.

The results reveal support for all four study hypotheses. In comparison to interior non-view parcels, the price premium increased by 165% for lake-impacted parcels with a pre-existing pond view and by 784% for lake-impacted parcels with a pre-existing forest view. Also, lake-impacted parcels with a pre-existing forest view sold at a price premium of 2.33% before construction of Lake McIntosh, compared to a premium of 8.58% during the construction and a 20.56% premium after its construction. These results support the study's second hypothesis—the real estate market anticipated the rise in property prices due to the construction of Lake McIntosh. The micro-spatial results reveal a clear hierarchy in the pricing of views with higher-quality water views of Lake McIntosh commanding the highest price premium.

Interestingly, the construction of the lake did not have any transferable impact on the pricing of non-lakefront property in the nearby Planterra Ridge subdivision. This may be due to negligible lake views from interior properties in the subdivision. To protect the quality of the water, Fayette County created an undisturbed buffer between the water line at 780 MSL (mean sea level) and 790 MSL where the cutting of trees or bushes is prohibited. The growth of vegetation in this undisturbed buffer acts to minimize any view corridor in an already heavily wooded area of rolling hills.[7] Additionally, the standard lakefront home in the subdivision is a two-story residence, which further limits lake views from interior properties. Complementing earlier view studies on the valuation of scenic views, the current study provides appraisers, developers, researchers, and policymakers with reference points to help construct future pricing models of view amenities.

The next section details background information on the study area and presents the literature review. The subsequent sections discuss the empirical methodology and the data. This is followed by presentation of the empirical results, with conclusions and recommendations for future research.

Background Information

Lake McIntosh and Planterra Ridge Subdivision

Lake McIntosh is a 650-acre reservoir within the Fayette County, Georgia, water system formed for the primary purpose of providing approximately 10 million gallons of drinking water per day to county residents. The area that eventually became Lake McIntosh was identified as a potential reservoir site in the 1960s, and Fayette County began purchasing land in the 1980s; however, approximately 30 years passed before the US Army Corps of Engineers approved the 404-water discharge permit in 2007.[8] The Lake McIntosh dam was built between January 2010 and November 2012, and Lake McIntosh achieved full pool in February 2013.[9]

5. EPA National Aquatic Resource Surveys, *National Highlight—Comparing Natural Lakes and Manmade Reservoirs*, available at https://bit.ly/45MvvmK (accessed on February 26, 2023).

6. Dumm, Sirmans, and Smersh, "Price Variation in Waterfront Properties over the Economic Cycle"; David Wyman and Stephen Sperry, "The Million Dollar View: A Study of Golf Course, Mountain, and Lake Lots," *The Appraisal Journal* (Spring 2010): 159–168.

7. Fayette County Water System letter to Peachtree City, dated October 22, 2008, regarding greenbelt, available at https://bit.ly/3rjNXEj.

8. Ben Nelms, "Lake McIntosh Is Now Officially Open for Public's Use," The Citizen (blog), Fayetteville, GA, July 3, 2013, available at https://bit.ly/3PzUdRM.

9. John Munford, "Fayette OKs Lake McIntosh Park, Boat Ramp for $895K," The Citizen (blog), Fayetteville, GA, March 11, 2012, available at https://bit.ly/3LiEhRk; "Lake Mac Is Full," The Citizen (blog), Fayetteville, GA, February 3, 2013, available at https://bit.ly/45XWhbl.

The Planterra Ridge subdivision sits on the eastern shore of Lake McIntosh, and the subdivision consists of 435 single-family homes built between 1993 and 1999. Prior to the creation of Lake McIntosh there were two nearby, pre-existing ponds (the Western Pond and Eastern Pond) adjacent to the different portions of the Planterra Ridge subdivision; however, Lake McIntosh subsumed the Western Pond and enlarged the Eastern Pond once it reached full pool. In addition to bordering Lake McIntosh, the northwest portion of the subdivision borders the Line Creek Nature Area, which is a 70-acre public preserve owned by the city of Peachtree City, Georgia. Exhibit 1 displays the locations of Lake McIntosh, the Western Pond, the Eastern Pond, and the Line Creek Nature Area relative to the Planterra Ridge subdivision. Exhibit 2 shows the change in view amenities using satellite photos. Panel A of Exhibit 2 displays the Planterra Ridge subdivision on March 17, 2004, while Panel B of Exhibit 2 displays the same area 10 years later.

Parcels were assigned to a view amenity group if the parcel is adjacent to the view amenity; there are five view amenity groups: (1) *Eastern Pond*; (2) *Woods/Lake*; (3) *Line Creek*; (4) *Western Pond*; and (5) *No View Amenity*.[10] Exhibit 3 maps the Planterra Ridge parcels according to their assigned view amenity group. There are 54 parcels, representing approximately 12% of all parcels in Planterra Ridge, with a view of Lake McIntosh, and these lakeview parcels can be subdivided into two groups. The group entitled *Woods/Lake* consists of 31 parcels; these parcels had either a wooded or forest view prior to the construction of Lake McIntosh and a view of Lake McIntosh after 2012. The group *Western*

Exhibit 1 Planterra Ridge and Lake McIntosh

Feature
- Lake McIntosh
- Planterra Ridge Parcel
- Eastern Pond
- Line Creek Nature Area
- Western Pond
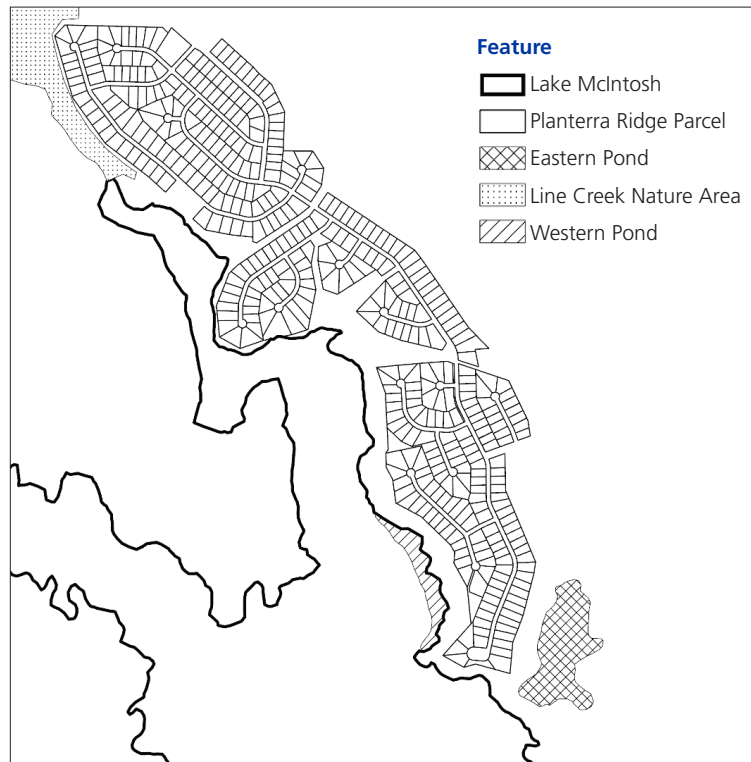
Pond consists of 23 parcels; these parcels had a view of the Western Pond prior to 2013 and a view of Lake McIntosh after 2012. Exhibit 3 also shows there are 18 parcels adjacent to the Line Creek Nature Area (*Line Creek* group), and 12 parcels with a view of the Eastern Pond within the *Eastern Pond* group. Although not depicted, the southern end of the neighborhood is intertwined with several holes of the Planterra Ridge golf course, and there are 81 parcels with golf course frontage.

Literature Review

View amenities are not a homogenous good, and many studies are not directly comparable due to the use of differing methodologies, spatio-temporal variation in customer preferences, and the site-specific quality of the view.[11] Researchers have examined the capitalization of

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10. The groups are nearly mutually exclusive as there is only one parcel belonging to more than one group. This parcel belonging to the *Western Pond* and *Eastern Pond* groups is not depicted in Exhibit 2; however, it was controlled for both amenities in the empirical analysis.

11. Heather A. Sander and Stephen Polasky, "The Value of Views and Open Space: Estimates from a Hedonic Pricing Model for Ramsey County, Minnesota, USA," *Land Use Policy* 26, no. 3 (2009): 837–845.
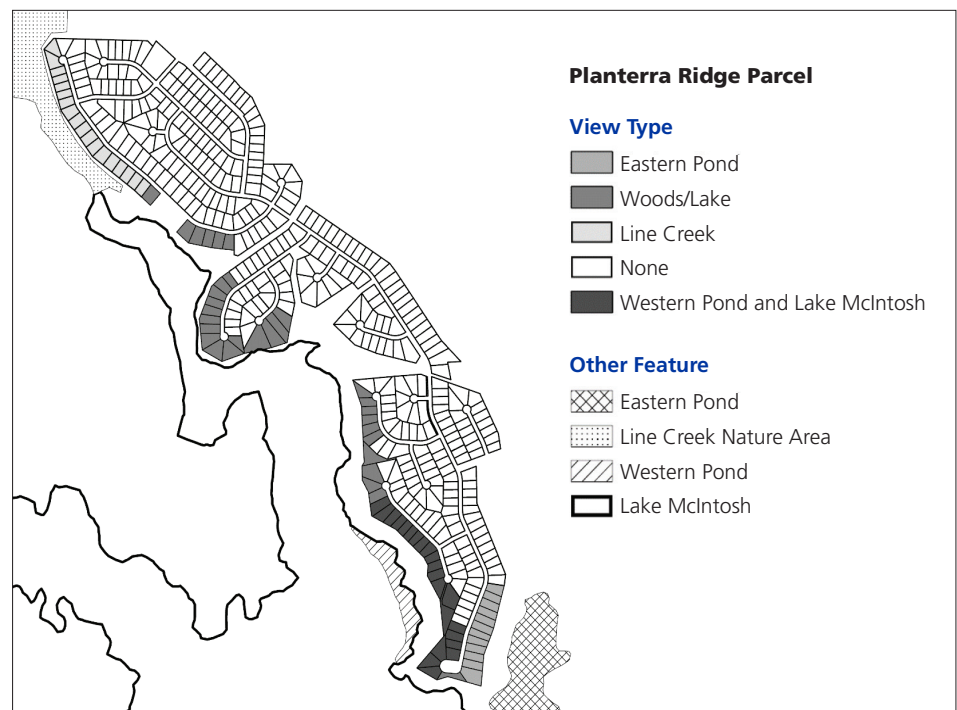
Exhibit 2 Satellite Photos 2004–2014
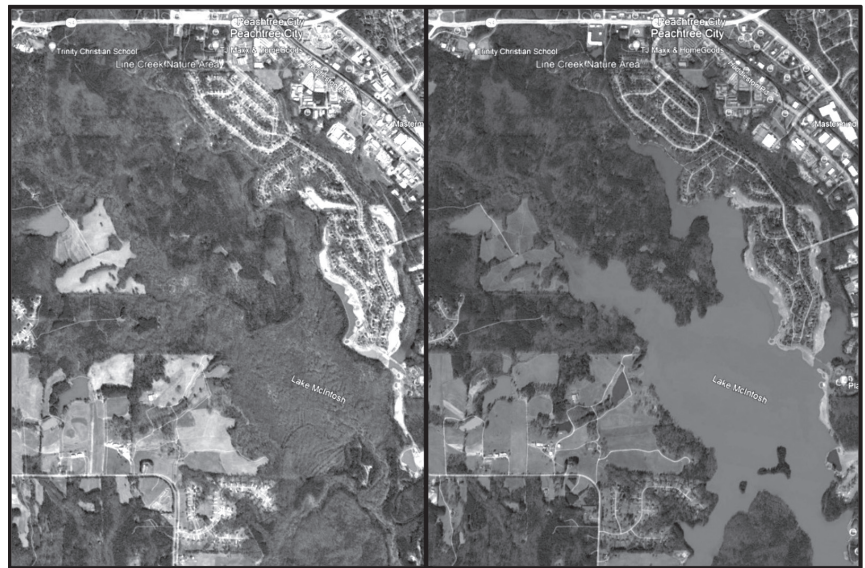
Panel A   **Panel B**

Notes: Panel A displays the Planterra Ridge subdivision located at top right and the area that would become Lake McIntosh on March 17, 2004. Google Earth V 7.3.6.9345. March 17, 2004. Peachtree City, Georgia. 33° 22′ 46.41 N 84° 35′ 48 W Eye altitude 19,914. Maxer Technologies 2023 (June 20, 2023).

Panel B displays the Planterra Ridge subdivision and Lake McIntosh on January 23, 2014. Google Earth V 7.3.6.9345. January 23, 2014. Peachtree City, Georgia. 33° 22′ 46.41 N 84° 35′ 48 W Eye altitude 19,914. (June 20, 2023).

Exhibit 3 Parcel View Types

Planterra Ridge Parcel

View Type
- Eastern Pond
- Woods/Lake
- Line Creek
- None
- Western Pond and Lake McIntosh

Other Feature
- Eastern Pond
- Line Creek Nature Area
- Western Pond
- Lake McIntosh

the scenic quality of view amenities including water, mountain, and other open space views. Rodriguez and Sirmans[12] estimate that the value of a good view (as classified by the Office of Assessment of Fairfax County) adds an 8% price premium to a residential property. A review by Crompton of thirty studies[13] uncovers a price premium starting at 20% for residential properties adjacent to a passive park with variations dependent upon type of park and park proximity. Using a zonal approach, Lutzenhiser and Netusil[14] identify significant price premiums for proximity to five different open spaces—cemeteries, urban parks, natural area parks, golf courses, and specialty parks—with natural area parks earning the largest price premium.

The concept of a hierarchy of price premiums is also revealed in studies with scenic views of mountains and water.[15] For example, a study of waterfront residential properties in Tampa Bay found a hierarchy of water view properties with bayfront properties earning an average price premium of 107% followed by river (62%), canal (61%), lake (15%), and pond (3.1%) views compared to non-waterfront properties.[16] Other studies confirm a hierarchy in the pricing of views including price premiums of 8% for views of non-recreational lakes in Nebraska[17] and approximately 56% for unobstructed views of Lake Erie.[18] Similarly, a study of residential properties in Bellingham, Washington, found a hierarchy of water views with price premiums ranging from 8% to 59%, depending on the quality of the view and distance from the water.[19]

Research on the pricing of the view amenity reveals non-linearity in distance-decay effects. Bourassa, Hoesli, and Sun[20] estimated a price premium of 59% for residential water views in Auckland, New Zealand, with the price premium decaying with distance from the coastline. They conclude a single, binary variable fails to account for the multidimensional elements of the view aesthetic. Conroy and Milosch[21] found that houses within 500 feet of the coast near San Diego earn an estimated price premium of almost 102%, declining to 62.8% at a distance from the coast of 500 to 1,000 feet, with the premium disappearing beyond six miles from the coast.

The emergence of geographic information systems (GIS) has offered researchers access to viewshed analysis and other advanced spatial modeling techniques. Mothorpe and Wyman[22] created a GIS spatial variable for water view area to estimate the quality of the water view by measuring the area of water view available for water view properties. They found that a 1% marginal increase in water view area is associated with a 3.85% increase in prices for waterfront properties on Lake Lanier, Georgia.

The estimates provided in the above studies illustrate the substantive "private benefits" accruing to residential property owners from proximate view amenities.[23] Next, we discuss the empirical methodology used in the current study.

12. Rodriguez and Sirmans, "Quantifying the Value of a View in Single-Family Housing Markets."

13. Crompton, "The Impact of Parks on Property Values: A Review of the Empirical Evidence."

14. Margot Lutzenhiser and Noelwah R. Netusil, "The Effect of Open Spaces on a Home's Sale Price," *Contemporary Economic Policy* 19, no. 3 (2001): 291–298.

15. David Wyman, Norman Hutchison, and Piyush Tiwari, "Testing the Waters: A Spatial Econometric Pricing Model of Different Waterfront Views," *Journal of Real Estate Research* 36, no. 3 (2014): 363–382.

16. Dumm, Sirmans, and Smersh, "Price Variation in Waterfront Properties over the Economic Cycle."

17. Steven Shultz and Nicholas Schmitz, "Viewshed Analyses to Measure the Impact of Lake Views on Urban Residential Properties," *The Appraisal Journal* (Summer 2008): 224–232.

18. Michael J. Seiler, Michael T. Bond, and Vicky L. Seiler. "The Impact of World Class Great Lakes Water Views on Residential Property Values." *The Appraisal Journal* (July 2001): 287–295.

19. Benson, Hansen, and Schwartz Jr., "Water Views and Residential Property Values."

20. Bourassa, Hoesli, and Sun, "What's in a View?"

21. Stephen J. Conroy and Jennifer L. Milosch, "An Estimation of the Coastal Premium for Residential Housing Prices in San Diego County," *Journal of Real Estate Finance and Economics* 42, no. 2 (2011): 211–228.

22. Chris Mothorpe and David Wyman, "Appraisal of Residential Water View Properties," *The Appraisal Journal* (Spring 2017): 130–141.

23. Lutzenhiser and Netusil, "Effect of Open Spaces on a Home's Sale Price."

Empirical Methodology

The empirical strategy in this study includes a series of semi-log, spatial hedonic models to estimate the marginal implicit prices of a set of independent variables, with a comparison of the marginal prices between the models. The generic hedonic model is shown in equation (1).

$$\ln(P_{it}) = \alpha + X_{it}\beta + Z_{it}\theta + Y_t + \varepsilon_{it} \qquad (1)$$

In equation (1), $\ln(P_{it})$ is the natural log of the inflation-adjusted sale price (in July 2022 dollars) for home i in year t, X_{it} is a matrix of variables measuring view amenity quality, Z_{it} is a matrix of observed, exogenous property and spatial characteristics, Y_t is a vector of year fixed effects, and ε_{it} is the error term. The matrix Z_{it} includes the age of the home at time of sale, the square of age, the square feet, the size of the parcel, basement square feet, the number fireplaces, and a binary variable indicating if the parcel is adjacent to a golf course. Year fixed effects capture macroeconomics shocks impacting all home sales. Finally, robust standard errors are used to control for heteroskedascity in the error term in lieu of cluster-robust standard errors since the home sale data is spatially concentrated in one subdivision.

The coefficients of interest in equation (1) are in the vector β, which capture price impacts from nearby view amenities, and the pricing impacts are measured for the four view amenity groups—*Western Pond*, *Woods/Lake*, *Line Creek*, *Eastern Pond*—relative to parcels without a nearby view amenity. For discussion purposes, we index the coefficients in β by j, where j represents a different amenity group (1 = *Western Pond*; 2 = *Woods/Lake*; 3 = *Line Creek*; 4 = *Eastern Pond*). Each β_j captures the average price for homes impacted by view amenity j relative to a home without any proximate view amenities conditional on the other covariates. A positive value for β_j indicates home buyers are willing to pay a premium for view amenity j, while a negative value for β_j indicates home buyers are willing to pay less for view amenity j.

To test the study hypotheses, we exploit temporal variation in the nearby view amenities by estimating a series of models over different sub-samples of the data. Model 1 employs sales between 1994 and 2005 and the coefficients reveal the real estate market's valuation of the various view amenities prior to the announcement and construction of Lake McIntosh. Model 2 employs sales between 2006 and 2012 to reveal the market's valuation of the view amenities during the construction of Lake McIntosh. Model 3 employs all sales after 2012—the period after Lake McIntosh was completed. For discussion purposes, each model's estimated coefficients is indexed by k (k = 1, 2, 3) in order to discuss and compare coefficients between models. The coefficient β_{jk} yields the average price impact for view amenity group j from model k. For example, β_{13} is the coefficient associated with the *Western Pond* group in Model 3.

With this notation each hypothesis can be expressed as a comparison of two or more coefficients. Exhibit 4 describes the four study hypotheses and displays the comparison of coefficients. Hypothesis 1 (H_1) stipulates that the construction of Lake McIntosh led to increased market valuations for all impacted parcels. To empirically test H_1, we compare changes in the pricing impacts for *Western Pond* parcels and *Woods/Lake* parcels between Model 1 and Model 3. If Lake McIntosh increased market valuations of parcels in these groups, then the market valuation of *Western Pond* parcels increases ($\beta_{13} > \beta_{11}$) and the market valuation of *Woods/Lake* increases ($\beta_{23} > \beta_{21}$).

Hypothesis 2 (H_2) states the real estate market anticipated the value of the future amenities and valuations began to rise during Lake McIntosh's construction. H_2 is examined by comparing the pricing impacts for the *Woods/Lake* group before the construction of Lake McIntosh was announced (Model 1) to the pricing impact during the construction phase (Model 2). If the market anticipated the future view amenity, then $\beta_{22} > \beta_{21}$. Hypothesis 3 (H_3) states a hierarchy in the pricing of water view quality exists with higher-quality water view commanding higher price premiums. To test H_3, we compare the pricing impacts for the *Western Pond* parcels in Model 3 to the pricing impact for *Woods/Lake* parcels. Since *Western Pond* parcels have a better view of Lake McIntosh relative to the *Woods/Lake* group, we expect $\beta_{13} > \beta_{23}$; i.e., the pricing impact for *Western Pond* parcels is greater than the pricing impact for the *Woods/Lake* group. The final hypothesis, H_4, states the construction of Lake McIntosh did not impact the market's valuation of the non-lake view amenities. To test H_4, we compare the pricing impacts for *Eastern Pond*

Exhibit 4 Testable Hypotheses

Hypothesis	Statement	Coefficient Comparison
1	The construction of Lake McIntosh led to increased market valuation for all impacted parcels	$\beta_{13} > \beta_{11}$ $\beta_{23} > \beta_{21}$
2	The real estate market anticipated the value of the future amenities, and prices began to rise during Lake McIntosh's construction	$\beta_{22} > \beta_{21}$
3	A hierarchy of water view quality exists; high-quality water views yield higher price premiums	$\beta_{13} > \beta_{23}$
4	The construction of Lake McIntosh did not impact the sale prices of non-lake view parcels	$\beta_{31} = \beta_{32} = \beta_{33}$ $\beta_{41} = \beta_{42} = \beta_{43}$

Notes: The coefficient β_{jk} represents view amenity j during period k. The values of j are *Western Pond*; *Woods/Lake*; *Line Creek*; and *Eastern Pond*. The values of k are pre-lake period; construction period; and post-lake period.

parcels and *Line Creek* parcels between Models 1, 2, and 3. If the construction of Lake McIntosh did not impact the valuation of the other view amenities, then the pricing impacts associated with those amenities will be relatively similar; i.e., $\beta_{31} = \beta_{32} = \beta_{33}$ and $\beta_{41} = \beta_{42} = \beta_{43}$.

Two sets of variables are used to capture the pricing impact from view amenities. The first set contains a series of binary variables—one for each view amenity group. The second set contains a continuous variable measuring the view quality of Lake McIntosh for the *Western Pond* and *Woods/Lake* groups and two binary variables for the *Eastern Pond* and *Line Creek* group. Our continuous measure of Lake McIntosh view quality—*Water View Area*—measures the natural log of the area of water view of Lake McIntosh available for each residential parcel.[24] Only parcels in the *Western Pond* and *Woods/Lake* groups have positive values since no other parcels have a view of Lake McIntosh. In the pre-lake and construction periods, the *Water View Area* variable captures the view area of the area that would eventually become Lake McIntosh.

There are three sources of potential bias in the estimates. The first two are attributes separate from but highly correlated with water views. Previous studies identify a negative relationship between flood risk and home sale prices,[25] while other studies find a positive relationship between sale prices and lake access.[26] Therefore, the presence of flood risk or waterfront access makes it difficult to identify the separate pricing impacts from flood risk, water access, and water view quality using the hedonic methodology. Across the entire subdivision, there are a relatively low number of homes within a 100-year flood zone at time of sale. For example, 6 of 1,132 sales in the sample (approximately 0.5%) are in a 100-year flood zone. To determine the impact of sales within the 100-year flood zone on the coefficients, we estimate the models with and without sales in the 100-year flood zones and compare the coefficients. These comparisons demonstrate that sales in the 100-year flood zone do not significantly impact the sign, significance, or magnitude of the estimates; therefore, the main empirical results are based on the full sample of sales.[27]

24. Mothorpe and Wyman, "Appraisal of Residential Water View Properties."

25. Allan Beltrán, David Maddison, and Robert J. R. Elliott, "Assessing the Economic Benefits of Flood Defenses: A Repeat-Sales Approach," *Risk Analysis* 38, no. 11 (2018): 2340–2367.

26. David Wyman and Elaine Worzala, "Dockin' USA—A Spatial Hedonic Valuation of Waterfront Property," *Journal of Housing Research* 25, no. 1 (2016): 65–80.

27. These results are available from the author upon request.

To argue water access is not inflating the estimated coefficients for lake view premiums, we note the lake is surrounded by an undisturbed buffer between 780 mean sea level (MSL) and 790 MSL. Property owners are prohibited from cutting trees, bushes, and grasses (in the undisturbed buffer) as a water quality control measure.[28] Thus, while it is possible for a property owner to have a direct path to Lake McIntosh, property owners are prohibited from building structures such as docks directly on the lake. The only direct access to the lake is provided at Lake McIntosh Park available to all Fayette County residents for a fee. Additionally, use of the lake is restricted to fishing and access is restricted to non-gas-powered boats such as canoes, paddleboards, and sailboats.[29] Therefore, we believe any lake access premium will be negligible and not inflating the lake view estimates.

The third source of bias may be the misclassification of parcels. In particular, we are concerned with assigning a parcel to the *No View Amenity* group when the parcel is impacted by a view amenity. We examine the potential for the misclassification of parcels by estimating our three models but exclude any sale where the underlying parcel is adjacent to a parcel in the *Western Pond* or *Woods/Lake* group. The table of the results is omitted for brevity, but Wald *t*-tests indicate the coefficients are not statistically different from the main table of results; therefore, we conclude parcel misclassification is not biasing estimates.[30]

Data

The Fayette County Tax Assessor's office provided real estate transactions and home characteristics data covering December 1993 to June 2022. The transactions data includes the sale date, nominal sale price, and sale type, while the home characteristics data includes variables such as the year built, square footage, and number of fireplaces. The nominal sale prices are adjusted to June 2022 real prices using monthly inflation data from the US Bureau of Labor Statistics, and the data is cleaned to remove all non-fair market value, non-arm's-length transactions.[31] The final data set consists of 1,132 home sales across 432 parcels.

The Fayette County, Georgia, geographic information system department provided a digitized parcel map of the Planterra Ridge subdivision. Using the parcel map and satellite imagery data from ERSI's ArcMap platform, we created a digital map of the four nearby view amenities and the Planterra Ridge golf course. By combining the digital parcel data with the geographic features, every parcel could be manually assigned to a view amenity group if it is directly adjacent to the amenity. We then follow the Mothorpe and Wyman approach[32] and use the viewshed tool in ESRI's ArcMap software to calculate the natural log of the view area of Lake McIntosh for parcels in the *Western Pond* and *Woods/Lake* groups.

To determine flood zone status of each sale, we assigned each sale to the Q3 and the DFIRM datasets.[33] A sale is in the 100-year flood zone if the flood zone intersects the home's foundation and the 100-year flood zone was active at the time of sale. Finally, we removed sales from the 100-year flood zone if the homeowners successfully petitioned the Federal Emergency Management Agency to be removed and the sale occurred after the date of the petition. There were three such cases in the Planterra Ridge neighborhood; this information is available through the National Flood Hazard Layer (NFHL) website.

Panel A of Exhibit 5 displays summary statistics for building and transaction characteristics. The average home sale contains approximately

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28. Fayette County Water System letter to Peachtree City, October 22, 2008, available at https://bit.ly/3rjNXEj.

29. Nelms, "Lake McIntosh Is Now Officially Open for Public's Use."

30. These results are available upon request from the corresponding author.

31. We identify non-fair market value, non-arm's-length transactions using the Fayette County tax assessor's validity code, which classifies real estate transactions according to the transaction conditions and deed type, and the classification codes are bank sale, foreclosures, fair market value, short sale, tax sale, or other. We clean the data by removing any transaction not classified as a fair market value transaction.

32. Mothorpe and Wyman, "Appraisal of Residential Water View Properties."

33. The Q3 data is a digital representation of the original flood maps that became effective in the 1970s and 1980s. Prior to publication of the National Flood Hazard Layer (NFHL), the Federal Emergency Management Agency published the digital flood insurance rates maps (DFIRMs). For the Planterra Ridge subdivision, there are no changes between the DFIRMs and NFHL maps, and the effective date for the DFIRMs is September 26, 2008.

Exhibit 5 Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	Note
Panel A: Building and Sale Characteristics					
Real Price	448,372	99,746	265,170	947,934	June 2022 dollars
Square Feet	2536.11	342.09	1788.00	4233.00	Square feet of living area excluding the basement
Age	8.08	8.77	0.00	28.00	Home age at time of sale, in years
Fixtures	8.20	2.13	3.00	17.00	Count of bathroom fixtures
Fireplaces	1.03	0.21	0.00	2.00	Count of fireplaces
Basement Area	689.62	769.97	0.00	2827.00	Basement square feet
Acres	0.48	0.12	0.32	1.35	Lot size, in acres
Golf Course	0.16	0.37	0.00	1.00	Binary (181 sales)
100-Year Flood Zone	0.01	0.07	0.00	1.00	Binary (6 sales)
Pre-Lake Period	0.67	0.47	0.00	1.00	Binary (760 sales); sale between 1993 and 2005
Construction Period	0.10	0.30	0.00	1.00	Binary (111 sales); sale between 2006 and 2012
Post-Lake Period	0.23	0.42	0.00	1.00	Binary (261 sales); sale after 2012
Panel B: Amenity Characteristics					
Eastern Pond	0.03	0.17	0.00	1.00	Binary (33 sales)
Western Pond	0.03	0.18	0.00	1.00	Binary (38 sales)
Woods/Lake	0.05	0.23	0.00	1.00	Binary (60 sales)
Line Creek	0.04	0.20	0.00	1.00	Binary (49 sales)
No View Amenity	0.84	0.37	0.00	1.00	Binary (953 sales)
Lake View	0.20	0.86	0.00	6.25	View area of Lake McIntosh, in square miles
Lake View—Western Pond	3.47	1.60	1.01	6.25	View area of Lake McIntosh for Western Pond group, in square miles
Lake View—Woods/Lake	1.64	1.69	0.09	5.39	View area of Lake McIntosh for Woods/Lake group, in square miles

Note: There are 1,132 sales in the sample.

2,500 square feet of living space, sits on a half-acre lot, and sold for $450,000. Approximately 16% of the sample, or 181 sales, have golf course frontage, and approximately 1% of the sample (6 sales) are situated in the 100-year flood zone. Roughly two-thirds of all sales (760 sales) occur in the pre-lake period, while 10% (111 sales) occur in the construction period and 23% (261 sales) occur in the post-lake period. Panel B of Exhibit 5 displays summary statistics for each amenity group. The vast majority of parcels in the Planterra Ridge subdivision—84% (948 sales)—are in the *No View Amenity* group and are

not directly adjacent to an amenity. The *Woods/Lake* group consists of 65 sales or 6% of the sample, while the *Line Creek* group consists of 49 sales or 4% of the sample. The *Western Pond* and *Eastern Pond* groups contain roughly 3% of the sample. Finally, across all parcels, the average view of Lake McIntosh is 0.20 square miles; however, for those sales in the *Woods/Lake* group the average view area is 1.64 square miles and for those parcels in the *Western Pond* group the average view area is 3.47 square miles.

Exhibit 6 displays sale counts (Panel A) and mean sale price by amenity group (Panel B) and

Exhibit 6 Sale Count and Mean Sale Price by Amenity and Period

| Group	Pre-Lake	Construction	Post-Lake
Panel A: Sale Counts			
Eastern Pond	23	4	6
Woods/Lake	38	9	13
Line Creek	26	8	15
Western Pond	29	2	7
No Amenity	645	88	220
Total	761	111	261
Panel B: Mean Sale Price			
Eastern Pond	535,774	567,994	541,893
Woods/Lake	475,306	550,338	672,014
Line Creek	485,619	531,897	535,734
Western Pond	601,850	515,892	727,227
No Amenity	408,984	455,794	482,477

Notes: The Pre-Lake period is from 1993 to 2005; the Construction period is from 2006 to 2012; the Post-Lake period is from 2013 onward; one parcel belongs to both the Eastern Pond and Western Pond groups and this parcel sold in the Pre-Lake period.

sale period. The pre-lake period contains the highest number of home sales; however, the pre-lake period is the longest and contains the years when the subdivision was first created (when a higher number of home sales occurred). The construction period contains the lowest sale count, not only because it is the shortest duration, but also because it overlaps with the 2008 financial crisis and resulting housing market downturn. The post-lake period's sale count falls between the sale count for the pre-lake and construction periods.

Panel B of Exhibit 6 displays the unconditional mean sale price by view amenity group and sale period. The differences in the mean sale price between view amenity groups support the testable hypothesis listed in Exhibit 4. The change in mean sale price between the pre-lake and post-lake period for the *Western Pond* group is $125,377 (20.8%), while for the *Woods/Lake* group the change is $196,708 (41.4%). In contrast, the unconditional mean sale price change for the *Eastern Pond* group is $6,119 (1.1%), for the *Line Creek* group the change is $50,115 (10.3%), and for the *No View Amenity* group the change is $73,493 (17.9%). Thus, the two groups impacted

by the construction of Lake McIntosh, the *Western Pond* and *Woods/Lake* groups, experienced much larger increases in mean sale price relative to the other amenity groups, which supports hypothesis H_1. Additionally, a comparison of the mean sale price for the *Woods/Lake* group across the pre-lake, construction, and post-lake period reveals the mean sale price increased in each period. This trend supports hypothesis H_2 that the real estate market anticipated the value of the future amenity and prices began to rise during Lake McIntosh's construction.

Exhibit 7 plots the unconditional, mean sale price in the Planterra Ridge subdivision by year. The sale price trend roughly follows the national housing market trend. Home sale prices increased between 1993 and 1999 before regressing in 2000. The market then experienced another long period of increasing sale prices, between 2001 and 2007, until the housing market crashed in 2008. Sale prices continued to decline until they reached a low point in 2013. After 2013, the market experienced rapid price increases between 2014 and 2017, a stable period between 2018 and 2020 where prices in the subdivision remained level and then a rapid increase in prices in 2021

Exhibit 7 Sale Price Trend
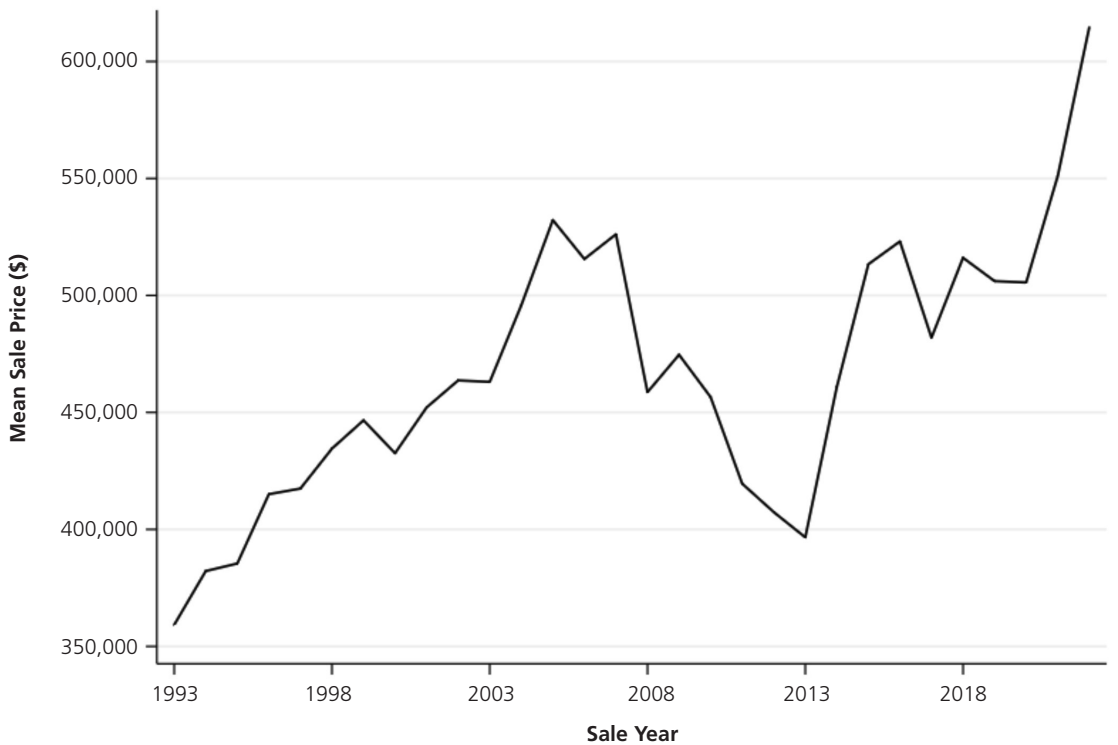
and 2022. Overall, the data in Exhibit 7 strongly supports the notion of including year fixed effects in the empirical model to capture macroeconomic shocks impacting all home sales.

Results

Exhibit 8 presents the study's main empirical results. Columns (1), (2), and (3) report estimates employing the first set of view amenity measures (binary variables for each view amenity group) for the pre-lake, construction, and post-lake periods, respectively. Columns (4), (5), and (6) are similar to columns (1), (2), and (3) except they employ the second set of view amenity measures (continuous view area for the *Western Pond* and *Woods/Lake* groups and binary variables for the *Eastern Pond* and *Line Creek* groups). Overall, the results indicate that the real estate market values view amenities. The empirical estimates indicate the market valuation for water views range between 8% and 31%, or $36,000 to $138,392 at the mean sale price.

The estimates in Exhibit 8 columns (1), (2), and (3) provide evidence of the following trends

regarding the *Western Pond* and *Woods/Lake* groups. First, the real estate market's valuation of the *Western Pond* group was 11.6% (or $52,000 at the mean sale price) in the pre-lake period but increased to 31% ($138,000) in the post-lake period. Both pricing impacts are statistically significant at the 1% level, and the percent change in magnitude is 165.4%. Second, the market valued the *Woods/Lake* group amenity more in the pre-lake period relative to a *No View Amenity* group by 2.3% ($10,000) but the valuation impact is not statistically significant. During the construction period, the market's valuation for the *Woods/Lake* group view amenity increased to 8.6% ($38,000), and the valuation further increased to 20.6% ($92,000) in the post-lake period. The percent change in magnitude between the pre-lake and post-lake period is 795.7%, which is much greater than the percent change for the *Western Pond* group amenity.

The results for the *Western Pond* and *Woods/Lake* coefficients in columns (1), (2), and (3) of Exhibit 8 provide evidence supporting hypotheses H_1, H_2, and H_3. More specifically, the results

show that the construction of Lake McIntosh increased the market valuation for impacted parcels, defined as those in the *Western Pond* and *Woods/Lake* groups. Exhibit 9 illustrates the differential price impacts for parcels with no pre-existing water view (the *Woods/Lake* group) relative to those with a pre-existing water view (the *Western Pond* group), and there are two important trends. First, both groups experienced increases in the price premium after the construction of Lake McIntosh. Second, the price premium for the *Woods/Lake* group increased during the construction period (2006 to 2012) and then increased again after 2012. The stepwise increases for the *Woods/Lake* group provide evidence that the real estate market valued the future view amenity long before it actually existed. The results also provide evidence of a hierarchy in the pricing of views, with *Western Pond* parcels enjoying the highest price premium followed by *Woods/Lake* parcels. The *Line Creek* and *Eastern Pond* parcels were priced lower followed by residential properties with no view amenity.

Additional evidence supporting the notion the real market anticipated the future view amenity can be found by examining key words in the public comments of MLS listing data. Exhibit 10 shows the results of keyword search for the word "lake" in the 659 MLS listings for the Planterra Ridge subdivision between 1996 and 2018, broken down by period and amenity group. The keyword search shows that only 1.2% of listings mentioned the word "lake" in the pre-construction period compared to 12.5% of listings during the construction period and 30.2% during the post-lake period. For the *Western Pond* and *Woods/Lake* groups, the increase in the number of listings with the word "lake" is even more pronounced. For example, 0% of listings in the *Woods/Lake* group in the pre-lake period contained the word "lake"; however, the percentage rises to 37.5% in the construction period and 100% in the post-lake period. We surmise that the potential formation of Lake McIntosh was not a major selling point before its construction, but the market was increasingly aware during its construction and reacted through anticipatory price increases.

The empirical results also support hypothesis H_4, which states the construction of Lake McIntosh did not impact the sale prices of non-lake view parcels. The market's valuation for a parcel in the *Eastern Pond* group remained relatively stable, varying between 8.1% ($36,000) and 10.9% ($49,000) across all three time periods. The estimated price impacts for the *Eastern Pond* parcels are similar in magnitude for the market's valuation of *Western Pond* group parcels during the pre-lake period. The market valuation for the *Line Creek* group also remained relatively stable, ranging from 5% in the post-lake period to 13% in the construction period (between $23,000 and $58,000); though, we note the pricing impact is statistically insignificant in the post-lake period.

Columns (4) through (6) of Exhibit 8 employ continuous water view area measures for the *Western Pond* and *Woods/Lake* group and binary variables for the *Eastern Pond* and *Line Creek* groups. During the pre-lake period, a 1% increase in the view of the *Western Pond* group and the area that would eventually become Lake McIntosh led to a 0.68% increase ($3,000 at the mean sale price) compared to a 1.63% increase ($7,000) in the post-lake period. Both pricing impacts are statistically significant at the 1% level. *Woods/Lake* parcels experienced a 0.17% increase in sale price ($800) for a 1% increase in view quality during the pre-lake period, but the coefficient is not statistically significant. During the construction period, the pricing impact is statistically significant and increased to 0.55% ($2,500), while the pricing impact increased to 1.28% ($5,750) in the post-lake period. Similar to columns (1) through (3), we find relatively stable market valuations for the *Eastern Pond* and *Line Creek* groups across columns (4) through (6). Combined, the results in columns (4), (5), and (6) provide further evidence supporting the main hypothesis.

The estimated coefficients for the other independent variables are as expected. Larger homes, homes with more bathroom fixtures, homes with basements, and golf course front homes earn higher market valuations. The coefficient for the age of the home at time of sale is negative and statistically significant in the construction period, but statistically insignificant during the pre-lake and post-lake period. A likely explanation for this trend is the relatively small variation in the year of construction (all homes were constructed in a seven-year time span) relative to other contemporary valuation studies.

Exhibit 8 Regression Results

Variables / Years	(1) 1994–2005	(2) 2006–2012	(3) 2013–2022	(4) 1994–2005	(5) 2013–2022	(6) 2006–2012
Western Pond	0.110***		0.269***			
	(0.0239)		(0.0591)			
Woods/Lake	0.0230	0.0823*	0.187***			
	(0.0204)	(0.0457)	(0.0553)			
ln(Western Pond View)				0.00680***		0.0163***
				(0.00143)		(0.00353)
ln(Lake McIntosh View)				0.0017	0.00551*	0.0128***
				(0.00132)	(0.00308)	(0.00349)
Eastern Pond	0.0777***	0.103**	0.0938	0.0786***	0.105**	0.0979*
	(0.0225)	(0.0513)	(0.0573)	(0.0225)	(0.0518)	(0.0565)
Line Creek	0.0849***	0.122***	0.0505	0.0853***	0.121***	0.0507
	(0.0232)	(0.0340)	(0.0373)	(0.0232)	(0.0340)	(0.0371)
Square Feet	0.000132***	0.000160***	0.000154***	0.000132***	0.000159***	0.000152***
	(1.29e-05)	(3.89e-05)	(3.13e-05)	(1.29e-05)	(3.88e-05)	(3.13e-05)
Age	−0.00369	−0.0939***	0.0215	−0.00376	−0.0943***	0.0209
	(0.00548)	(0.0302)	(0.0466)	(0.00548)	(0.0301)	(0.0464)
Square of Age	0.000118	0.00388***	−0.000758	0.000121	0.00390***	−0.000742
	(0.000565)	(0.00125)	(0.00107)	(0.000564)	(0.00125)	(0.00107)
Bathroom Fixture	0.0147***	0.00109	0.0134***	0.0147***	0.00119	0.0133***
	(0.00218)	(0.00492)	(0.00449)	(0.00217)	(0.00493)	(0.00441)
Fireplaces	−0.00822	−0.136***	−0.0370	−0.00733	−0.134***	−0.0330
	(0.0217)	(0.0344)	(0.0441)	(0.0217)	(0.0355)	(0.0435)
Basement (sq. ft.)	9.64e-05***	9.63e-05***	7.95e-05***	9.61e-05***	9.66e-05***	7.97e-05***
	(5.91e-06)	(1.58e-05)	(1.40e-05)	(5.89e-06)	(1.58e-05)	(1.36e-05)
Acres	0.155***	0.336***	0.0613	0.154***	0.337***	0.0534
	(0.0367)	(0.109)	(0.0850)	(0.0365)	(0.109)	(0.0842)
Golf Course	0.126***	0.0785**	0.0730*	0.125***	0.0769**	0.0698*
	(0.0121)	(0.0335)	(0.0405)	(0.0120)	(0.0340)	(0.0399)
Constant	12.33***	13.06***	12.42***	12.33***	13.06***	12.43***
	(0.0392)	(0.198)	(0.531)	(0.0391)	(0.197)	(0.529)
Observations	760	109	261	760	109	261
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Adjusted *R*-squared	0.774	0.786	0.713	0.774	0.785	0.716

Notes: The dependent variable is the natural log of the inflation-adjusted sale price; robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Exhibit 9 Estimate Price Impacts by Group
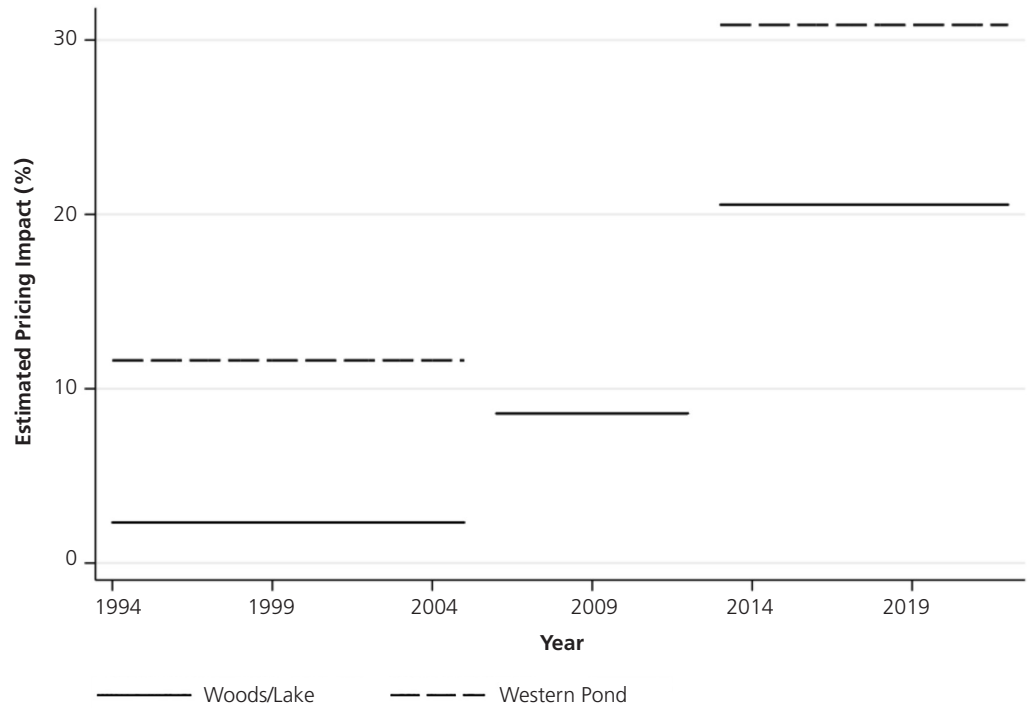
Exhibit 10 Keyword Search "Lake"

Period	Eastern Pond	Western Pond	Woods/Lake	Line Creek	Control	Total
Panel A: All Listings						
Pre-Lake	12	5	13	8	294	332
Construction	7	5	8	12	136	168
Post-Lake	2	6	10	10	131	159
Panel B: Listings Mentioning "Lake"						
Pre-Lake	2	2	0	0	0	4
Construction	2	5	3	3	8	21
Post-Lake	1	6	10	6	25	48
Panel C: Percentage Mentioning "Lake"						
Pre-Lake	16.67%	40.00%	0.00%	0.00%	0.00%	1.20%
Construction	28.57%	100.00%	37.50%	25.00%	5.88%	12.50%
Post-Lake	50.00%	100.00%	100.00%	60.00%	19.08%	30.19%

Conclusion

This study of the Planterra Ridge subdivision offers the opportunity to estimate the price premium for a scenic view ex-ante and ex-post the recent construction of Lake McIntosh. Carefully defining the amenities groups, we estimate a series of spatial hedonic models over different sub-samples of the data. The data show that view premiums for residential properties after the construction of Lake McIntosh increased by 165% to 784%, depending on the ex-ante view quality. Further, the results indicate the real estate market anticipated the value of the future amenity, leading to increases in the price premium long before Lake McIntosh was completed. Echoing prior studies, the differentiated quality of the view amenity leads to a hierarchy of pricing premiums. The importance of measuring site-specific scenic views is confirmed by the dissimilar pricing premiums that even neighboring residential properties enjoyed. Overall, this study reveals that the inclusion of micro-spatial view variables in pricing models can help appraisers, researchers, and real estate professionals ensure the "price is right."

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David Wyman, PhD, serves as an associate professor in the Department of Management and Marketing and as the director of the Center for Entrepreneurship at the College of Charleston School of Business. Wyman's academic research in entrepreneurship and real estate has been cited in publications ranging from *The Wall Street Journal* to *Links* magazine. He has received two major university teaching awards: Undergraduate Student Government Excellence in Teaching Award from Clemson University and Business Professor of the Year award from the University of San Diego. Wyman is a successful entrepreneur with over fifty products invented/licensed to major toy companies. One of his inventions, the bluffing game "13 Dead End Drive," has celebrated its twenty-fifth anniversary with over three million copies sold. Wyman has a PhD from the University of Aberdeen, Scotland, an MBA from Cranfield University, and a BA in honors economics from Cambridge University, England. **Contact: wymandm@cofc.edu**

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Additional Resources

Suggested by the Y. T. and Louise Lee Lum Library

Appraisal Institute
    Lum Library, Knowledge Base [Login required]
    Residential properties—externalities