The Impact of Water Clarity on Home Prices in Vilas and Oneida Counties, Wisconsin

A Hedonic Study

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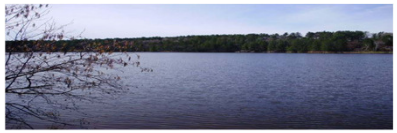
Executive Summary

This study estimates the residential property value gains associated with improvements in water clarity on 60 Northern Wisconsin lakes. Using a two-stage hedonic model applied to Wisconsin DNR water clarity data and data associated with 271 residential home sales obtained from Zillow.com and County property records. **We conclude that a one (1) meter improvement in water clarity would produce a $8,090.87 – $32,171.12 improvement in the market price of an average residential property on a lake within the study area.** We also conclude that in addition to water clarity the main non-housing attributes that drive property value in the region are the local tax rate and the distance to a public airport.



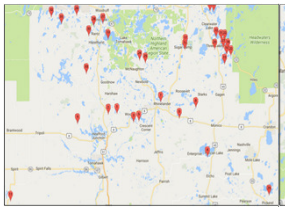
Cranberry Lake, WI

Purpose

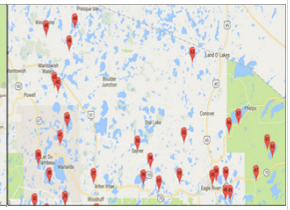
There exist a significant number of lakes in Northern Wisconsin that exhibit low levels of water clarity. It is also a well-established fact that perceptions of water quality and water clarity have a significant bearing upon residential property values. It is the case that an improvement in water clarity on those lakes that currently exhibit low clarity would result in a significant improvement in property values. (Not to mention a number of other economic benefits – such as increased tourism.) Rising property values also means increased property valuations and – potentially – State and local tax revenue. On the other hand, improving water clarity is not without costs. The matter is therefore a balancing act: In cases where the economic benefits exceed the costs associated with water clarity improvement there is a clear case to be made for said improvements.

Study Area

Vilas and Oneida Counties in Northern Wisconsin have, in total, well over 300 lakes that are greater than 100 acres in area. The two counties are sparsely populated with the majority of residents living directly on or very near a lake. The region is also distant from a metro area. The nearest -- Wausau, WI -- being roughly 62 miles away from Oneida County and one-hour drive time. It is safe to say that the lakes themselves, and the leisure activities associated with them, constitute a major economic driver for the region. Should the lakes not be properly maintained or damaged in some way, it would result in significant economic loss to the area.



Lakes from Study in Oneida County



Lakes from Study in Vilas County

Quick Q & A

Q: Does the clarity of lake water have an impact on home prices?

A: Yes, we find that home prices rise as water clarity improves. Using actual home sales data, we find that within Vilas and Oneida Counties that an improvement of water clarity by one meter would increase average home sale prices by 8 to 32 thousand dollars.

Q: How do you determine the clarity of a lake?

A: We use Secchi disk readings averaged over the year in which the house was most recently sold to determine water quality. This has been shown to be the most reliable and objective measure.

Q: Is water clarity the same as water quality?

A: No, our study measures the impact of water clarity, not water quality. Undoubtably water quality also affects property prices but that was not the focus of our study. Previous work has shown that the perception of water quality (clarity) has the most significant impact upon property prices.

Q: do the benefits of improving water clarity outweigh the costs?

A: Uncertain, the causes of poor water quality and costs associated with improving clarity vary from lake to lake. Poor clarity can be indicative of poor water quality or it can be the result of the natural environment in which the lake is located. This study only considers the benefits to a single family home sale prices associated with improved water clarity.

Q: Are your findings consistent with other similar studies?

A: Yes, although our findings differ somewhat from other similar studies, they are within the expected ranges.

Manitowish Lake, WI

Method

Data

Water clarity data was obtained using Wisconsin DNR reports for 60 Northern Wisconsin Lakes. For our purposes we use the reported objective measure – Secchi Disk readings. Secchi disks are used to measure the maximum water depth at which an object may be observed from the surface.

Housing sale prices and attributes for 271 properties were taken from the website Zillow.com, including square meters of living space, sale date, lake frontage, fireplace, number of bedrooms and bathrooms, basement, deck, garage, lot size, local tax rate, and lake area. The prices and attributes of all houses and vacant properties sold in the years 2014-2018 over the study area were used.

Method

Hedonic Regression Analysis

A hedonic model was used to estimate changes associated with a change in a specific home attribute, using actual home sales data. Similar methods are used to determine the change in home value associated with – for example – a bathroom update. Using regression analysis, we are able to statistically isolate the marginal value of structural, locational, and environmental attributes. Attributes with estimated positive coefficients have a positive impact on property prices, while attributes with negative coefficients have a negative impact on property prices.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	131489.2	58811.16	2.235787	0.0262
AIRPORT_KM_	-2300.013	876.4545	-2.624234	0.0092
BATH	25830.64	14552.85	1.774954	0.0771
BED	-4512.547	11218.66	-0.402236	0.6878
BSMNT	23688.16	18045.41	1.312698	0.1905
DECK	-13521.22	18875.84	-0.82238	0.4117
FIRE	-21482.4	19651.63	-1.093162	0.2754
FRONTAGE	7.948251	43.65249	0.18208	0.8557
GARAGE	7605.058	7742.518	0.982246	0.3269
LKAREA_HECTARES_	29.79152	20.43138	1.458126	0.146
LOT_SZ_HECTARES_	-15319.37	15508.32	-0.987816	0.3242
LVAREA_SQM_	1058.919	124.6287	8.496593	0
MEDICAL_KM_	-707.2768	875.542	-0.807816	0.4199
TAXRT	-7955.321	3976.759	-2.000453	0.0465
LNWC_M_	66262.82	13618.22	4.865746	0

Results

On lakes where water clarity is fairly low (about 1 meter), gaining one meter of clarity will improve home values by about 10 -12% (Roughly 23-26K in this case). On lakes where water clarity is currently high (about 3 meters) losing one meter of clarity will cause homes to lose roughly 15 – 18K. All things equal the gains to improved clarity are greatest in low clarity environments. All things equal, losing clarity causes more lost value than gaining clarity.

Lake, 2017 (or most recent)	WC Mean (m)	Current Water Value	Value Increase 1	Value Increase 2	Value Loss 1	Value Loss 2
Anvil Lake	3.60	101,120.78	13,034.98	23,921.76	16,242.51	37,805.91
Big Lake	1.02	46,589.22	26,648.21	45,601.04	45,277.05	46,589.22
Big Saint Germain	3.04	93,134.14	14,493.66	26,270.42	18,578.34	44,487.53
Big Stone	0.89	41,161.38	28,140.47	47,830.65	42,181.38	42,181.38
Black Oak	6.70	135,257.02	8,090.87	15,300.45	9,218.01	19,928.82
Blue	5.65	125,542.64	9,282.68	17,421.11	10,798.28	21,705.50
Boom	1.05	47,566.09	26,126.34	45,116.84	44,333.12	47,566.09
Buckskin	2.70	86,693.82	15,852.03	28,634.37	20,878.18	51,532.00
Catfish Lake	1.40	59,647.24	23,602.74	39,425.54	34,570.96	59,647.23
Cranberry Lake	1.30	55,190.91	23,921.76	41,461.04	37,805.91	55,190.91
Crawling Stone Lake	4.66	114,155.37	10,887.16	20,235.45	13,054.58	29,277.08
Crescent	3.48	99,169.29	13,350.77	24,457.46	16,737.38	39,185.48
Deer	1.20	52,245.41	24,828.24	42,847.34	40,164.27	52,245.41
Fifth Lake	0.73	36,320.07	30,227.76	50,908.85	36,320.07	57,173.69
Flambeau Lake	5.48	125,840.91	9,243.77	17,354.47	10,745.63	23,577.63
George	1.04	47,888.54	26,220.76	44,917.80	44,167.47	47,888.54
Hancock	1.65	64,577.07	21,215.20	37,260.09	31,394.29	64,577.07
Indian	2.74	87,406.33	15,701.08	28,385.24	20,616.20	50,704.34
Island	2.06	74,109.33	18,737.01	33,324.08	26,220.76	70,248.20
Kawaguesaga Lake	3.48	99,169.29	13,350.77	24,457.46	16,737.38	39,185.48
Kentuck Lake	2.63	85,428.19	16,123.35	29,081.21	21,353.13	53,053.50
Killarney	0.72	35,160.92	30,654.74	51,532.08	35,160.92	35,160.92
Lake Minocqua	4.96	118,283.88	10,277.96	19,173.72	12,170.14	27,089.99
Laurel	0.75	37,081.72	29,949.81	50,301.53	37,081.72	37,081.72
Little Fork Lake	1.56	62,287.53	21,892.38	38,754.54	32,871.40	62,287.53
Little Saint Germain	1.43	58,834.18	22,838.74	39,791.38	35,133.66	58,834.18
Little Star Lake	4.24	110,004.08	11,532.09	21,353.13	13,972.20	31,700.39
Long Lake	1.35	56,615.97	23,493.15	40,802.03	36,730.19	56,615.97
Lost Lake	1.56	60,716.31	22,295.66	38,944.40	33,846.71	60,716.01
Manitowish Lake	2.56	90,182.14	15,125.36	27,433.20	19,631.43	47,651.16
Maple Lake	4.35	110,506.96	11,453.05	21,215.20	13,855.01	31,394.29
McCormick	0.66	31,146.77	32,171.12	53,734.52	31,146.77	31,143.77
North Twin Lake	8.76	150,557.40	6,501.57	12,421.82	7,269.58	15,300.45
Oscar Jenny	1.65	64,577.07	21,215.20	37,260.09	31,394.29	64,577.07
Otter Lake	0.56	42,531.05	28,010.66	47,851.10	42,531.05	42,531.05
Papoose Lake	3.00	91,850.77	14,786.12	26,867.26	19,062.63	45,929.89
Pelican Lake	1.45	58,011.01	23,079.78	40,164.27	35,715.43	58,011.01
Pickerel	1.62	63,822.60	21,422.75	37,585.62	31,855.72	63,822.65
Planting Ground	1.30	55,190.91	23,921.76	41,461.04	37,805.91	55,190.91
Plum	2.56	90,858.36	14,987.63	27,202.17	19,389.84	46,946.73
Presque Isle	7.35	140,627.03	7,495.31	14,228.28	8,452.57	18,143.21
Scattering Rice	2.40	81,090.83	17,084.48	30,054.74	23,079.78	58,795.21
Shishebogama	2.86	88,460.36	15,479.38	28,019.66	20,293.45	49,512.51
Snipe Lake	2.83	88,635.08	15,443.74	27,959.69	20,173.36	49,319.57
South Turtle Lake	1.97	72,131.18	19,229.74	34,115.94	27,202.77	72,131.18
South Twin Lake	3.17	93,818.42	14,399.00	26,229.75	18,422.80	44,027.47
Spectacle Lake	2.47	82,441.18	16,779.99	30,157.80	22,525.15	56,912.62
Spirit	3.71	87,418.05	13,711.15	25,091.83	17,308.88	40,802.03
Squash	4.85	117,049.41	10,456.76	19,486.02	12,421.82	27,722.28
Squaw	1.16	51,029.54	25,210.60	43,429.12	41,194.83	51,029.54
Squirrel	2.75	87,583.27	15,663.76	28,323.65	20,551.74	50,501.55
Sugar Camp	1.70	102,545.88	13,782.34	23,493.15	15,852.03	36,730.19
Tom Doyle	1.46	60,183.77	22,448.10	39,185.48	34,205.96	60,183.77
Tomahawk	5.38	122,796.14	9,648.28	18,068.53	11,296.47	24,922.73
Trowanda Lake	3.10	93,495.88	14,462.10	26,326.34	18,526.08	44,331.12
Two Sisters	4.43	112,051.83	13,210.26	30,795.58	33,500.89	30,475.36
Upper Buckatabon Lake	2.00	73,892.43	18,730.50	33,412.82	26,326.34	70,659.65
Virgin Lake	1.23	52,545.92	24,734.46	42,704.61	39,914.88	52,545.92
White Sand Lake	4.00	106,645.89	12,081.14	22,293.60	14,786.12	33,848.75
Yellow Birch Lake	1.43	58,834.18	22,838.74	39,791.38	35,133.66	58,834.18

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