LAKE BELLAIRE SHORELINE SURVEY SUMMARY REPORT

Three Lakes Association
PO Box 689
Bellaire, MI 49615

by
William Bohannon,
Braden Ackerman,
Wilhelmina Witt
and
TLA Volunteers

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Developed Lake Bellaire Shoreline

Undeveloped Lake Bellaire Shoreline

Landscaped region of Lake Bellaire Shoreline

Natural region of Lake Bellaire Shoreline

Lake Bellaire Shoreline Survey
Summary Report

PURPOSE

The purpose of the shoreline greenbelt survey was to evaluate the condition of the natural greenbelt buffer along the shoreline of Lake Bellaire in Antrim County, Michigan. Greenbelt buffers are extremely important to maintain high quality water and a healthy fishery. This survey provides a baseline of knowledge about the condition of the shoreline and points the direction toward its improvement. It is important for property owners to be aware of what constitutes a healthy shoreline. This report aims to encourage good stewardship of lakeshore properties.

The value of a greenbelt buffer is to provide a habitat for both animals and plants and reduce the impact of human activities on the lake. This buffer also forms a layer of protection to keep manmade chemicals and nutrients from entering the water. A key nutrient in our lakes produced by humans is phosphorus. The amount of phosphorus in a lake can make a huge difference on its health. Living organisms need phosphorus to live, but too much of this element can also be a problem. Some sources of phosphorus are lawn and farm fertilizers, decaying plants, runoff, and sewage. Runoff not only dissolves phosphorus from soils but also carries sediment rapidly into the lake. In areas with no greenbelt buffer the nutrients are carried directly into the lake. In extreme cases this can cause massive algal and aquatic plant growth. A greenbelt buffer is one of the best ways to protect the lake from both nutrients and sediment and native plants typically require less upkeep than invasives.

BACKGROUND

The boundary between the water and the land is important. When riparians alter this boundary the result can cause problems in maintaining a natural balance for aquatic life. Seawalls and riprap do not provide the natural habitat for aquatic creatures. A better solution would be to stabilize the shoreline with bushes and other plants. The deeper this buffer region the better, but this survey has concentrated on the region within 40’ of the shoreline.

Septic systems are commonly used in all residential building construction. Septic systems are regulated by the Northwest Michigan Community Health Agency Unified Sanitary Code. Revised in 2007 the code regulates new septic systems by requiring setbacks from surface water (lake or stream): 100’- absorption fields, 50’- septic tanks and 175’- toe of a mound system. A primary purpose of septic systems is to destroy pathogens. However, septic systems are not as efficient at removing nutrients from the waste stream. Municipal sewage systems, on the other hand, have a separate step to remove phosphorus and other nutrients. So, a significant portion of nutrients pass through the septic, enter the groundwater, and eventually enter the lake. Nutrients from fertilizers and septic systems are currently unregulated in the watershed. Besides a properly sited and maintained septic system and a minimal use of phosphorus containing

domestic waste, greenbelts and area plantings can reduce the amount of phosphorus than enters the groundwater.

According to the Grand Traverse Bay Watershed Protection Plan, the major threats to high water quality within the watershed are *sediments* from erosion and stormwater runoff and *nutrients* from fertilizers, stormwater runoff, and sewer and septic systems. *Sediments* are regulated by the Michigan Department of Environmental Quality. Antrim County is adopting a Soil Erosion, Sedimentation, and Stormwater Runoff Control Ordinance. Erosion is influenced by four factors: precipitation, soil type, slope, and vegetation. This survey looks at two of these our factors: slope and vegetation. According to the US Department of Agriculture General Soil Survey of Antrim County, Michigan (1978) the shoreline soil of Lake Bellaire is Tawas-Ensley-Roscommon. This soil is characterized by very poorly drained and poorly drained, mucky, loamy, and sandy soil.

SURVEY METHODS AND PARTNERS

During the summer of 2008, Three Lakes Association conducted a survey of the greenbelt buffer along the entire 10.6 mile shoreline zone of Lake Bellaire. The shoreline of Lake Bellaire is located in three townships: Custer, Forest Home, and Kearney. This survey was carried out by Three Lakes Association with high school interns from Elk Rapids, Central Lake, and Bellaire.

In all 293 properties were surveyed. For the purposes of this survey the shoreline zone extends 25 feet inland from the ordinary high water mark. Data was recorded on a survey sheet by trained observers. A survey form was completed and a photograph was taken of each property.

The survey method was modified from a method used by Tip of the Mitt Watershed Council on Walloon Lake and a more recent survey of Torch Lake done by the Watershed Center and White Pines Associates sponsored by the Michigan Department of Environmental Quality. Several volunteers from Three Lakes Association provided valuable field assistance.

Shoreline Greenbelt Survey

Lake: _____ **Date**: Month _____ Day _____ Year _____

Location Information:

Parcel Owner: _____**GPS Reading:** N45._____W085._____

House Description: Stories: 1 1.5 2 3

_____ Color _____Trim _____ Roof _____Shutters_____

B. House/Id Number: _____ C**. Street:** _____

D. City: _____ **E. Waterfront Footage:** _____ **feet**

F. Township: _____ **G. Map Number:** _____

Shoreline Information:

H. Shoreline Description: ___**Sa**ndy Shore ___ **Ro**cky Shore___ **Gr**assy Shore___**St**eep Shore

I. Slope Description: ___ **Fl**at Slope (0-5%) ___ **Ge**ntle Slope (5-10%)
___ **So**mewhat steep (10-15%) ___ **V**ery Steep (15%+)

J. Shoreline Condition: ___ **N**atural ___**L**andscaped

K. Shoreline Development: ___ **D**eveloped ___ **U**ndeveloped

L. Shoreline Access- Stairway: ___**Y**es ___ **N**o

M. Shoreline Access- Ramp: ___ **Y**es ___ **N**o

N. Shoreline Access- Ramp Materials: ___ **C**ement___ **G**rass___ **S**and___ **G**ravel

O. Shoreline Structures: ___ **N**one

___ **D**eck ___ **Pa**tio ___ **G**azebo ___ **O**ther

___ **B**oat house ___ **Pu**mp house ___**W**ater Intake___ **W**ater **O**utflow ___ **R**oad **D**rain

Observations:

Greenbelt Information:

P. Greenbelt Length:	___None	___<10%	___10-25%	___25-75%	___>75%
Score	0	1	2	3	4
Q. Greenbelt Depth:	___None	___<10’	___10-40’	___>40’	
Score	0	1	2	3	
R. Vertical Structure:	___ All	___Ground Cover	___Understory	___Overstory	
S. Score	3	1	1	1	
T. Turf:	___ (0%)	___<10%	___10-25%	___25-75%	___>75%
Score	0	-1	-2	-3	-4
U. Density:	___ None	___Sparse	___Medium	___Dense	
Score	0	1	2	3	
V. Species Diversity:	___ None	___Uniform	___ Several Species	___Many Species	
W. Score	0	1	2	3	

Erosion Information:

X. Erosion:	___None	___Minor	___Severe	
Y. Score	0	-1	-2	
Z. Erosion Structures:	___ None	___ Biotechnical	___ Riprap	___ Sea Wall
AA. Score	0	-1	-2	-3

AB. Emergent Vegetation: ___ Present ___ Absent

Observations:

Greenbelt Quality Definition: Quality Score = P+Q+S+T+W+Y+AA

Very Poor	-9 to 0
Poor	1 to 4
Good	5 to 9
Very Good	10 to 14
Excellent	15 to 16

RESULTS

The results of the Lake Bellaire Shoreline Greenbelt Survey were compiled into a series of Excel spreadsheets for each Township. The following graphs highlight the results and summarize some of the data included in the tables.

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Graphs:

- Graph #1 - Lake Bellaire Shoreline Development: Developed and Undeveloped.
- Graph #2 - Lake Bellaire Shoreline Condition: Natural and Landscaped.
- Graph #3 - Lake Bellaire Shoreline Quality
- Graph #4 - Lake Bellaire Shoreline Erosion

Tables:

- Table #1 - Lake Bellaire Shoreline Development: Developed and Undeveloped
- Table #2 - Lake Bellaire Shoreline Condition: Natural and Landscaped
- Table #3 - Lake Bellaire Shoreline Quality
- Table #4 - Lake Bellaire Shore Erosion
- Table #5 – Lake Bellaire Greenbelt Length
- Table #6 – Lake Bellaire Greenbelt Depth
- Table #7 – Lake Bellaire Vertical Structures
- Table #8 – Lake Bellaire Turf
- Table #9 – Lake Bellaire Plant Density
- Table #10 – Lake Bellaire Species Diversity
- Table #11 – Lake Bellaire Emergent Vegetation
- Table #12 – Lake Bellaire Erosion Structures

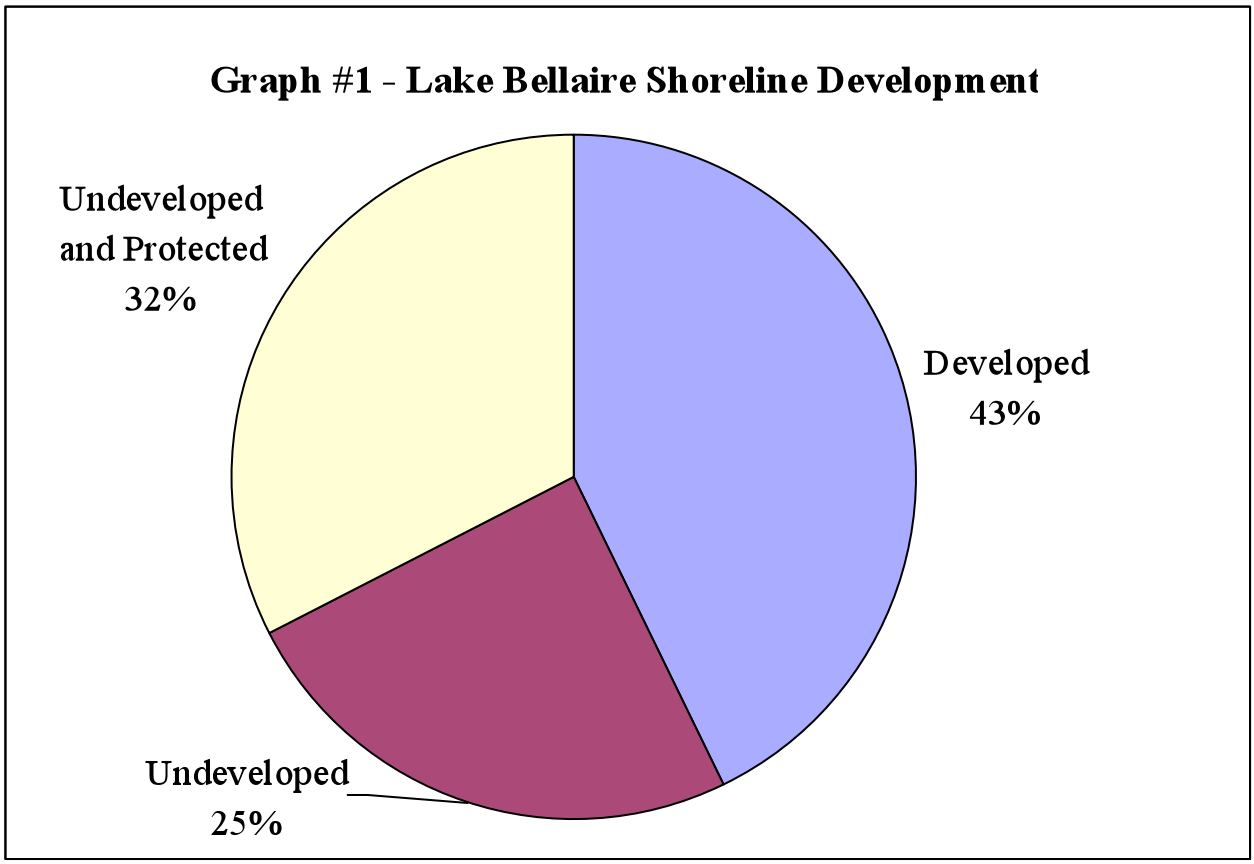

Table #1

Lake Bellaire Shoreline Development by Township

	Devel. Parcels	Feet	Percent	Prot.and Undevel. Parcels	Feet	Percent	Undevel Parcels	Feet	Percent	Tot. Ft.
Forest Home	157	19,076	39%	13	16,662	34%	71	12,764	26%	48,502
Kearney	29	3,136	74%	2	970	23%	3	133	26%	3,269
Custer	12	1,590	57%	0	0	0%	6	1,185	50%	2,774
Total	198	23,802		15	17,632		80	14,082		54,545

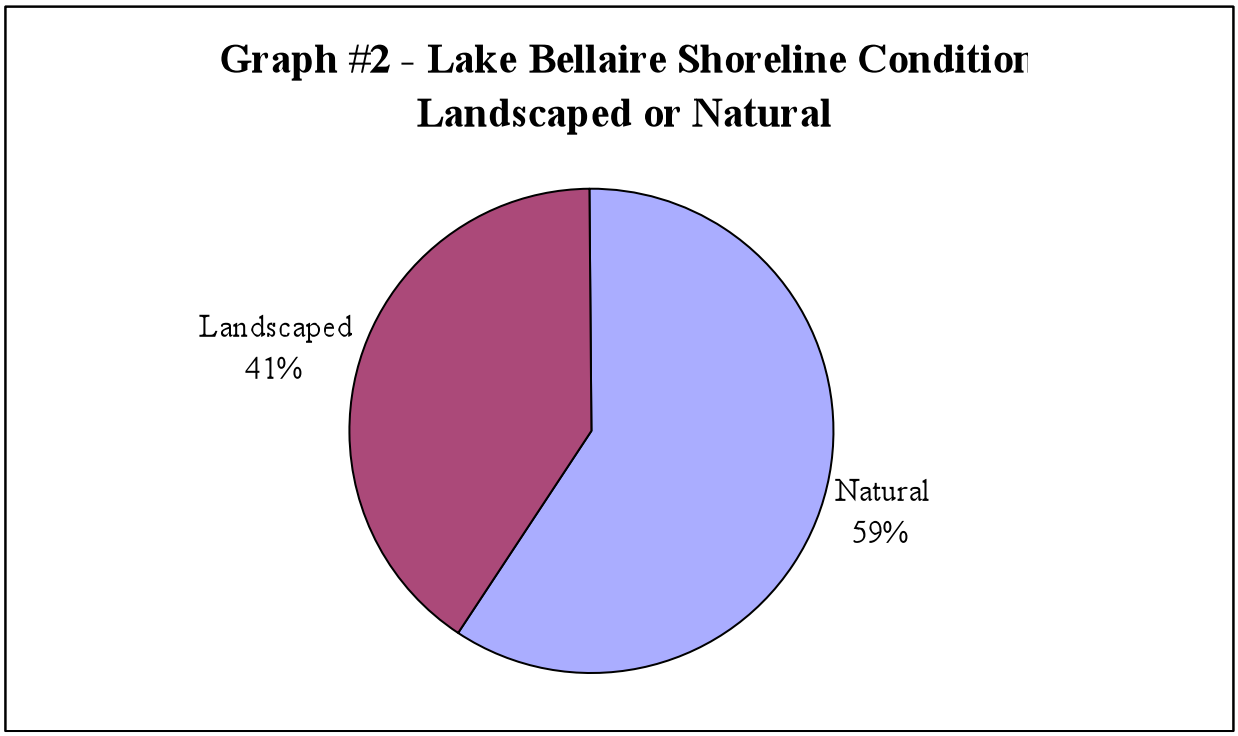

Table #2

Lake Bellaire Shoreline Condition by Township

	Landscaped			Natural			
	Parcels	Frontage Feet	Percentage	Parcels	Frontage Feet	Percentage	Total Feet
Forest Home	146	17,364	36%	95	31,139	64%	48,502
Kearney	30	3,362	79%	4	877	21%	4,239
Custer	13	2,110	66%	5	1,085	34%	3,194
Total	189	22,835	41%	104	33,100	59%	55,936

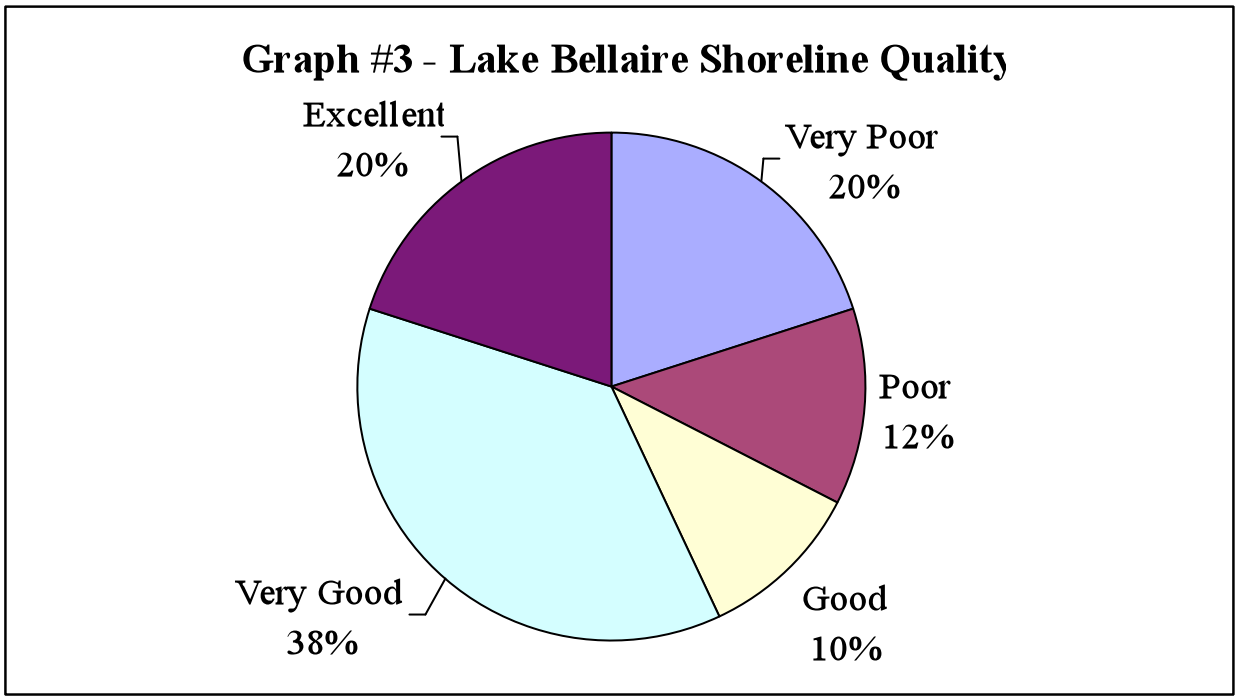

Table #3

Lake Bellaire Shoreline Quality by Township

	Very Poor			Poor		
	Parcels	Frontage Feet	Percentage	Parcels	Frontage Feet	Percentage
Forest Home	62	7,774	16%	45	5,930	12%
Kearney	20	2,217	52%	6	689	16%
Custer	7	1,218	38%	3	368	12%
Total	89	11,209	20%	54	6,988	12%

	Good			Very Good		
	Parcels	Frontage Feet	Percentage	Parcels	Frontage Feet	Percentage
Forest Home	42	4,981	10%	56	19,468	40%
Kearney	3	312	7%	4	920	22%
Custer	3	546	17%	3	395	12%
Total	48	5,839	10%	63	20,783	38%

	Excellent		
	Parcels	Frontage Feet	Percentage
Forest Home	36	10,349	21%
Kearney	1	100	2%
Custer	2	667	21%

Total	39	11,116	20%

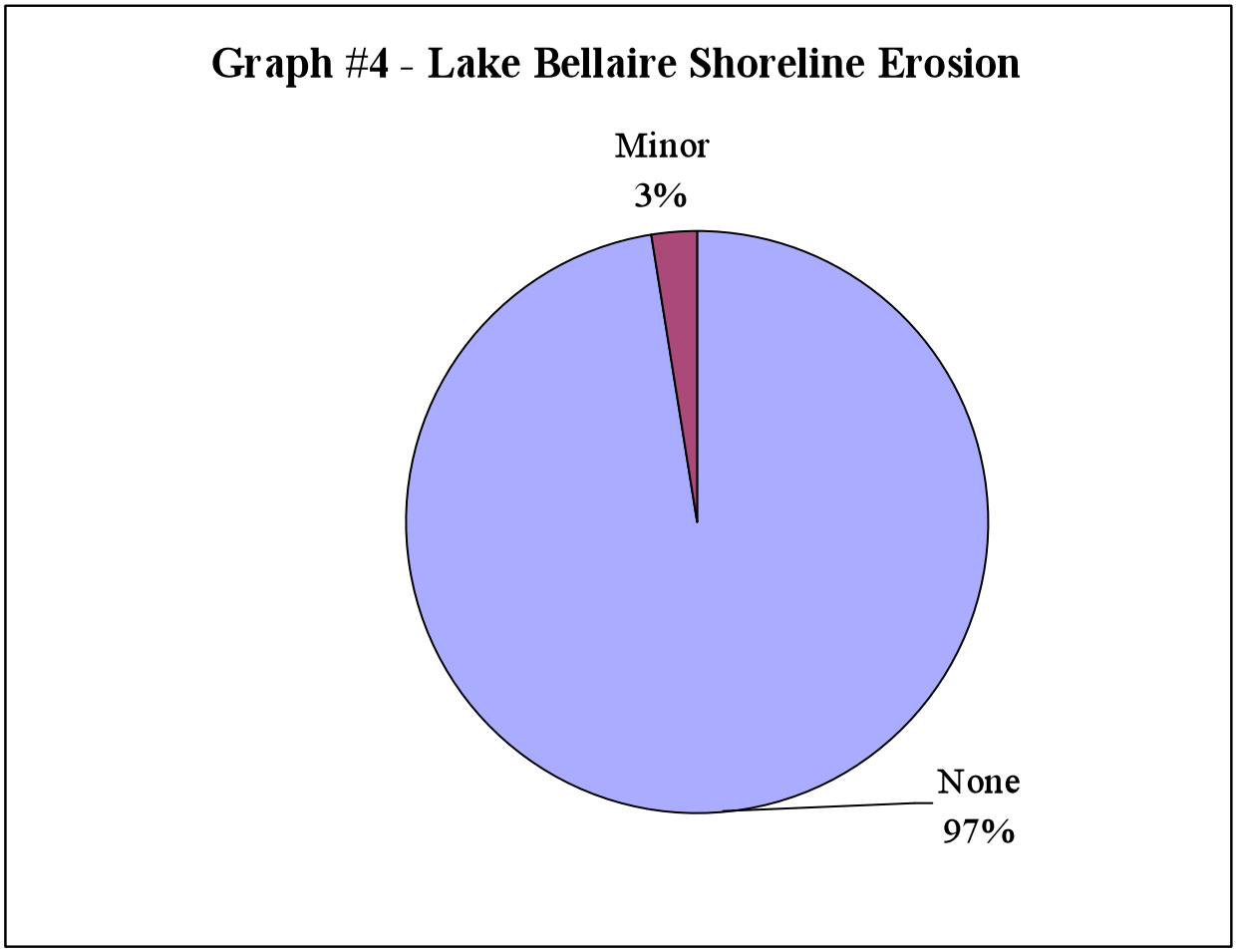

Table #4

Lake Bellaire Shoreline Erosion by Township

	No Erosion			Mild Erosion		
	Parcels	Frontage Feet	Percentage	Parcels	Frontage Feet	Percentage
Forest Home	232	47,245	97%	9	1,258	3%
Kearney	33	4,065	96%	1	174	4%
Custer	18	3,194	100%	0	0	0%
	283	54,504		10	1,431	

Table #5

Lake Bellaire Greenbelt Length by Township

	Very Poor			Poor		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	62	299	1%	45	2,359	5%
Kearney	21	44	1%	5	195	5%
Custer	7	10	0%	3	119	4%
Total	90	353		53	2,673	

	Good			Very Good		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	42	3,335	7%	56	16,813	35%
Kearney	3	91	2%	4	805	19%
Custer	3	319	12%	3	346	12%
Total	48	3,745		63	17,964	

	Excellent		
	Parcels	Frontage Feet	Percent
Forest Home	36	9,056	19%
Kearney	1	88	2%
Custer	2	584	21%
Total	39	9,728	

Table #6

Lake Bellaire Greenbelt Depth by Township

	None			Depth<10'		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	54	7,287	15%	47	5,529	11%
Kearney	17	1,923	45%	8	909	21%
Custer	7	796	29%	2	201	7%
Total	78	10,006		57	6,639	

	Depth 10'-40'			Depth>40'		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	79	13,077	27%	61	22,610	47%
Kearney	6	587	14%	3	820	19%
Custer	2	268	10%	7	1,509	54%
Total	87	13,932		71	24,939	

Table #7 Lake Bellaire Vertical Structures by Township

	All			Ground Cover		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	76	22,336	46%	70	15,072	31%
Kearney	5	1,020	24%	3	909	21%
Custer	6	1,286	8%	2	224	8%
Total	87	24,642		75	16,205	

	Understory			Overstory		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	19	1,564	3%	50	6,514	13%
Kearney	2	212	5%	20	2,253	53%
Custer	xx	xx	xx	100	1,264	46%
Total	21	1,776		170	10,031	

	None		
	Parcels	Frontage Feet	Percent
Forest Home	26	3,017	6%
Kearney	4	405	10%
Custer	xx	xx	xx
Total	30	3,422	

Table #8 Lake Bellaire Turf by Township

	>75%			25-75%		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	94	19,665	41%	30	3,802	8%
Kearney	18	2,042	48%	4	449	11%
Custer	4	496	18%	3	369	13%
Total	116	22,203		37	4,620	

	10-25%			<10%		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	10	1,268	3%	3	359	1%
Kearney	1	112	3%	3	343	8%
Custer	2	222	8%	3	524	19%
Total	13	1,602		9	1,226	

	0%		
	Parcels	Frontage Feet	Percent
Forest Home	104	23,409	48%
Kearney	8	1,293	31%
Custer	6	1,162	42%
Total	118	25,864	

Table #9

Lake Bellaire Plant Density by Township

	None			Sparse		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	41	4,916	10%	72	8,566	18%
Kearney	9	896	21%	13	1,613	38%
Custer	2	220	8%	6	677	24%
Total	52	6,032		91	10,856	

	Medium			Dense		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	70	12,784	26%	58	896	21%
Kearney	10	959	23%	2	770	18%
Custer	7	1,115	40%	3	762	27%
Total	87	14,858		63	2,428	

Table #10

Lake Bellaire Species Diversity by Township

	None			Uniform		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	46	5,654	12%	85	10,039	18%
Kearney	11	1,503	35%	10	915	38%
Custer	2	220	8%	6	746	24%
Total	59	7,377		101	11,700	

	Several Species			Many Species		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	50	6,733	14%	60	26,077	54%
Kearney	10	907	21%	3	913	22%
Custer	7	1,046	38%	3	762	27%
Total	67	8,686		66	27,752	

Table # 11

Lake Bellaire Erosion Structures by Township

	None			Biotechnical		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	108	33,593	1%	0	0	0%
Kearney	10	1,268	30%	0	0	0%
Custer	4	967	35%	0	0	0%
Total	122	35,828		0	0	

	Riprap			Sea Wall		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	125	13,972	23%	8	938	2%
Kearney	16	2,256	53%	8	715	17%
Custer	7	724	26%	7	1,082	39%
Total	148	16,952		23	2,735	

Table #12

Lake Bellaire Emergent Vegetation by Township

	Absent			Present		
	Parcels	Frontage Feet	Percent	Parcels	Frontage Feet	Percent
Forest Home	112	1,443	30%	129	34,060	70%
Kearney	34	4,239	100%	0	0	0%
Custer	10	1,385	50%	8	1,389	50%
Total	156	7,067		137	35,449	

CONCLUSIONS

- The perimeter of Lake Bellaire is 10.5 miles
- About 42% of the perimeter is developed, and 58% is undeveloped
- 48% of the shoreline's greenbelt satisfies the criteria for very good or excellent condition
- 59% of the Lake Bellaire shoreline exists in a natural condition, and 41% is landscaped
- 30% of the shoreline is owned by the public or by Grass River Natural Area. These parcels are protected from residential development.
- 93% of Lake Bellaire has either a flat or gentle slope, 7% is steep or very steep
- 30 parcels or about ¾ of a mile of the Lake Bellaire shoreline could be drastically improved
- There were only ten mild erosion sites on Lake Bellaire.

DISCUSSION

43% of Lake Bellaire shoreline is *developed* (parcels with dwellings) compared to 86% on Torch Lake. 58% of the Lake Bellaire shoreline is in Very Good or Excellent condition compared to 32% of the shoreline on Torch Lake. 33% of Lake Bellaire shoreline is permanently protected from development and 58% is undeveloped. So, a significant portion of Lake Bellaire has a natural greenbelt.

Developed properties are less likely to have a greenbelt. This is why greenbelts are more a priority on developed property than undeveloped. In developed areas there are opportunities for improvement. Some already have good greenbelt regions, but many areas have turf that extends up to the shoreline and others have riprap or seawalls at the water's edge. This could be improved with greenbelt plantings. Public access areas have minimal greenbelts and some erosion.

Extensive use of boats and docks can disrupt habitat for aquatic wildlife but is not part of the survey as it presently exists.

RECOMMENDATIONS

1. Because much of the shoreline of Lake Bellaire has been developed, property owners should be encouraged to plant vegetative greenbelts and reduce the use of fertilizer and pesticides. In fact phosphorus free fertilizers are widely available, and if appropriate should be used. In order to determine how the appropriate nutrients needed for particular areas Michigan State Extension Service offers soil testing services. Simply not mowing grass near the shoreline is a good way to begin a greenbelt.

2. Some residents can protect the existing natural shoreline with deed restrictions and conservation easements.

3. Public and private property owners should restore erosion sites.

4. Because the Northwest Michigan Community Health Agency Unified Sanitary Code does not regulate failing septic systems, a Point of Sale Inspection Ordinance for all septic systems around the lake should be created.

5. There needs to be an educational program to inform property owners about the best practices for protecting water quality.

SOLUTIONS

The magnitude of these problems on Lake Bellaire with 293 parcels and 10.5 miles of shoreline requires a systematic, long-term, collaborative approach. The selected activities must be sustainable by local organizations and governments.

Two major goals have been identified:

- Restore the shore so it functions like a natural shoreline to protect water quality and the rural character of the landscape
- Promote shoreline stewardship to reduce stormwater runoff, soil erosion, and non-point source pollution.

Recommended Activities:

To raise awareness about this survey, its findings, and the importance of shoreline greenbelts, a letter and greenbelt brochure will be mailed to all property owners. Greenbelt displays, greenbelt garden designs and presentations will be made available to township officials, lake associations and civic groups. To encourage behavior change, The Watershed Center will work with local governments and install greenbelt demonstration projects on public property around the lake in 2008 and 2009.

Bibliography:

Antrim County Soil Erosion, Sedimentation, and Stormwater Runoff Control Ordinance DRAFT 2006. www.antrimcounty.org.

Soil Survey of Antrim County, Michigan by R. Larson, D. Buchanan, R. Larson (US Dept. of Agriculture, Soil Conservation Service in cooperation with the Michigan Agricultural Experimental Station), Dec. 1978. www.antrimcounty.org

Torch Lake Shoreline Greenbelt Survey Summary Report, May 21, 2008 by the Grand Traverse Bay Watershed Center.

Conducting a Shoreline Greenbelt Survey – Training Manual, June 2008, Grand Traverse Bay Watershed Center.

Grand Traverse Bay Watershed Protection Plan, Dec. 2003, S. U'Ren Project Coordinator, The Watershed Center, Traverse City, Michigan. www.gtbay.org/protectionplan.asp

Development of a Predictive Nutrient-Based Water Quality Model for Lake Bellaire and Clam Lake by D. Endicott, D. Branson, N. Bretz, T. Hannert, sponsored by TLA and GLEC. Apr. 23, 2007, 155 pp

Health Department of Northwest Michigan - District Sanitary Code, Counties of Antrim, Charlevoix, and Otsego, Effective Date: Feb. 25, 2007. www.nwhealth.org/permits/District_Sanitary_Code.pdf