



Natural Shoreline, Comfort Lake, July 21, 2014

Shoreland Inventory of Comfort Lake, Chisago County, Minnesota in 2014

Date of Inventory: July 21, 2014

Prepared for:
Comfort Lake/Forest Lake
Watershed District



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This report has three parts:

1. Summary of shoreland conditions for the Comfort Lake.

This section summarizes the results of evaluating shoreland conditions for 107 parcels on Comfort Lake at normal water levels (Tables 1 and 2).

2. Photographic shoreland inventory evaluation for individual shoreland parcels.

This section is the photographic inventory evaluation. Photographs of 107 parcels have been evaluated. Results of these individual evaluations are found in Table 3.

3. List of potential corrective measures to improve shoreland conditions.

This section describes techniques for improving natural conditions in upland areas. Our evaluation found a number of parcels that have the potential to improve natural conditions. Techniques discussed in this section can serve as a guide for erosion control and improving natural shoreland conditions.

1. Summary of Shoreland Conditions

The shoreland area encompasses three components: the upland area close to the lake, the shoreline, and the shallow water in the nearshore area. The photographic inventory of the Comfort Lake shoreland was conducted in July 2014. The objective of the survey was to characterize existing shoreland conditions.

During the course of the survey on the lake, upland and shoreline conditions were estimated. In addition, for each photograph and for each parcel we looked at the shoreline and the upland condition to verify observations. Our criteria for natural conditions were the presence of 50% native vegetation in the understory and at least 50% natural vegetation along the shoreline in a strip at least 15 feet deep. We evaluated shorelines and uplands at the 75% natural level as well (Figure 1 illustrates the methodology). Photographs from 2014 are shown in the Appendix.

A summary of results of the inventory is shown in Table 1. For the inventory, 66% of the parcels in the Comfort Lake shoreland area met the criteria for having at least 50% of the shoreline as a natural shoreline buffer. This is average compared to other lakes found in the urban lake data set (Table 2).

A comparison of the Comfort Lake’s shoreland conditions to other lakes in Minnesota and Wisconsin is shown in Table 2 and in Figure 2.

Table 1. Summary of shoreline buffer and upland conditions in the shoreland area of Comfort Lake. Approximately 107 parcels were examined. The number in parentheses represents the number of parcels.

	2014 Comfort Lake (n=107)
Natural Upland Condition	
>50%	66% (71)
>75%	36% (39)
Natural Shoreline Condition and Shoreline Buffers	
>50%	73% (78)
>75%	61% (65)
Shoreline Structure	
Riprap	17% (18)
Retaining wall	0% (0)



Figure 1. [top] This parcel would rate as having a shoreline with a buffer greater than 50% of the lot width and an understory with greater than 50% natural cover. [bottom] This parcel would not qualify as having a natural shoreline buffer greater than 50% of the lot width. Also the understory in the upland area would be rated as having less than 50% natural cover.

Table 2. Summary of shoreland inventories for Comfort Lake and other lakes in Minnesota and Wisconsin.

Lake	Eco-region	Date of Survey	Total Number of Parcels (#)	Undeveloped Parcels % (#)	Natural Upland Condition		Natural Shoreline Condition		Parcels with Erosion % (#)	Parcels with Shoreline Revetment % (#)
					> 50% % (#)	>75% % (#)	> 50% % (#)	>75% % (#)		
NORTHWOODS LAKES										
Ballard chain Vilas Co, WI	LF	7.23.99	110	--	98 (108)	96 (106)	96 (106)	95 (105)	--	0
Kimball Lakes Washburn Co, WI	LF	7.16-8.13.04	121	46 (38)	94 (114)	88 (107)	99 (120)	95 (115)	0 (0)	1 (1)
Pike Chain Price & Vilas Co, WI	LF	2001	722	380	92 (633)	87 (626)	95 (684)	91 (654)	--	5 (34)
Bear Oneida Co, WI	LF	6.8.99	115	6 (7)	93 (107)	78 (90)	84 (97)	77 (89)	1 (1)	8 (9)
Van Vliet Vilas Co, WI	LF	6.04	100	20 (20)	93 (93)	65 (65)	82 (82)	68 (68)	8 (8)	11 (11)
Muskellunge Vilas Co, WI	LF	8.7.04	129	8 (10)	81 (104)	62 (80)	88 (114)	76 (98)	2 (2)	18 (23)
Big Bear Lake Burnett Co, WI	LF	9.11.02	87	13 (11)	82 (71)	62 (54)	86 (75)	76 (66)	0	9 (8)
Nancy Lake Washburn Co, WI	LF	9.21.00	217	19 (41)	77 (167)	65 (141)	80 (174)	72 (156)		5 (11)
Plum Lake Vilas Co, WI	LF	7.26.01	225	13 (30)	75 (169)	58 (130)	81 (182)	708(158)	--	9(4)
Big Bearskin Oneida Co, WI	LF	8.10.99	130	--	73 (95)	63 (82)	80 (104)	67 (87)	--	0
COUNTRY LAKES										
North Pipe Lake Polk Co, WI	CHF	8.03	80	45 (36)	100 (80)	96 (77)	94 (75)	91 (73)	0	1 (1)
Upper Turtle Lake Baron Co, WI	CHF	7.23-24.02	309	28 (85)	72 (224)	58 (178)	76 (234)	68 (209)	0	20 (63)
Lower Turtle Barron Co, WI	CHF	7.23.04	127	9 (12)	43 (54)	29 (37)	82 (104)	71 (90)	1 (1)	6 (8)
Comfort Chisago Co, MN	CHF	7.21.14	107	7 (7)	66 (71)	36 (39)	73 (78)	61 (65)	0	17 (18)
Bone Lake Washington Co, MN	CHF	8.20.13	96	2 (2)	67 (64)	44 (42)	70 (67)	55 (53)	5 (5)	21 (20)
Pipe Lake Polk Co, WI	CHF	8.03	217	8 (17)	67 (144)	50 (108)	63 (137)	56 (121)	0	22 (48)
Little Pelican Otter Tail Co, MN	CHF	9.16.04	119	33 (39)	55 (65)	61 (51)	66 (79)	61 (73)	33 (39)	23 (27)
Comfort Chisago Co, MN	CHF	10.9-11.2.98	100	--	62 (62)	--	50 (50)	--	--	12 (12)
Lake Volney Le Sueur Co, MN	CHF	9.21.02	79	25 (20)	54 (43)	42 (33)	56 (44)	47 (37)	0	30 (24)
Rush Lake Chisago Co, MN	CHF	9.16.00	524	11 (58)	48 (253)	28 (147)	51 (267)	38 (201)	1 (3)	18 (92)
West Rush Lake, Chisago Co, MN	CHF	9.16.00	332	12 (40)	52 (171)	31 (103)	55 (184)	43 (142)	1 (2)	15 (50)
East Rush Lake, Chisago Co, MN	CHF	9.16.00	192	9 (18)	43 (82)	23 (44)	43 (83)	31 (59)	1 (1)	22 (42)
Fish Otter Tail Co, MN	CHF	9.16.04	95	21% (20)	38% (36)	36% (34)	43% (41)	36% (38)	48 (46)	7 (7)
Big Round Lake, Polk Co, WI	CHF	8.03	74	14 (10)	27 (20)	24 (18)	39 (29)	34 (25)	1 (1)	14 (10)
Bass Otter Tail Co, MN	CHF	9.16.04	22	0% (0)	6% (27)	3% (14)	41% (9)	41% (9)	68 (15)	2 (2)
Pelican Otter Tail Co, MN	CHF	9.16.04	881	14% (2)	21% (183)	14% (123)	21% (181)	16% (142)	2 (14)	80 (706)
Green Lake Kandiyohi Co, MN	CHF	9.19.01	721	1 (9)	20 (146)	12 (88)	19 (140)	14 (100)	0	62 (446)
Diamond Lake Kandiyohi Co, MN	CHF	8.13 & 14.02	344	2 (7)	13 (44)	11 (39)	16 (56)	12 (42)	1 (5)	49 (168)

Table 2. Concluded.

Lake	Eco-region	Date of Survey	Total Number of Parcels (#)	Undeveloped Parcels % (#)	Natural Upland Condition		Natural Shoreline Condition		Parcels with Erosion % (#)	Parcels with Shoreline Revetment % (#)
					> 50% % (#)	>75% % (#)	> 50% % (#)	>75% % (#)		
URBAN LAKES										
Ravine Lake Washington Co, MN	CHF	7.19.01	9	100 (9)	100 (9)	100 (9)	100 (9)	100 (9)	0	0
Pike Lake, City of Maple Grove, MN	CHF	9.30 - 10.12.99	9	56 (5)	100 (9)	100 (9)	100(9)	100 (9)	0	0
Powers City of Woodbury, MN	CHF	1998	30	90 (27)	90 (27)	90 (27)	97 (29)	97 (29)	0	0
Lake Edward, City of Maple Grove, MN	CHF	9.30 - 10.12.99	34	12 (4)	91 (31)	88 (30)	76 (26)	71 (24)	6 (2)	3 (1)
Rice Lake, City of Maple Grove, MN	CHF	9.30 - 10.12.99	137	33 (45)	71 (97)	64 (87)	81 (111)	74 (102)	0	19 (25)
Lee Lake Dakota Co, MN	CHF	5.31.02	30	37 (11)	73 (22)	50 (15)	77 (23)	67 (20)	0 (0)	10 (3)
Marion Lake - 2010 Dakota Co, MN	CHF	9.11.10	178	19 (33)	80 (143)	63 (112)	60 (106)	54 (96)	0	33 (59)
Fish Lake, City of Maple Grove, MN	CHF	9.30 - 10.12.99	170	7 (12)	74 (126)	44 (75)	57 (97)	41 (70)	1 (1)	20 (34)
Alimagnet Lake Dakota Co, MN	CHF	8.6.03	108	37 (40)	54 (58)	47 (51)	69 (75)	61 (66)	0	16 (17)
Eagle Lake, City of Maple Grove, MN	CHF	9.30 - 10.12.99	90	14 (13)	64 (58)	52 (47)	47 (42)	41 (37)	0	35 (32)
Fish Lake, Scott Co, MN	CHF	9.1.06	71	34 (24)	62 (44)	54 (38)	68 (48)	62 (44)	0	15 (11)
Cedar Island Lake, City of Maple Grove, MN	CHF	9.30 - 10.12.99	93	5 (5)	62 (58)	35 (33)	55 (51)	39 (36)	0	22 (21)
Lac Lavon Dakota County, MN	CHF	9.9.03	110	7 (8)	54 (59)	44 (48)	42 (46)	30 (33)	0	8 (9)
Upper Prior Scott Co, MN	CHF	9.30 - 10.12.99	366	10 (37)	51 (187)	36 (132)	35 (128)	31 (113)	4 (15)	46 (168)
Weaver Lake City of Maple Grove, MN	CHF	9.30 - 10.12.99	111	5 (5)	47 (52)	28 (31)	44 (49)	29 (32)	0	14 (16)
Forest Lake Washington Co, MN	CHF	9.4-20.13	847	1 (9)	23 (197)	13 (107)	36 (301)	27 (229)	0	36 (301)
Lower Prior Scott Co, MN	CHF	9.24-30.99	691	10 (66)	36 (249)	24 (166)	22 (152)	17 (117)	5 (35)	54 (373)
Cobblestone Dakota Co, MN	CHF	8.31.06	40	0 (0)	30 (12)	30 (12)	30 (12)	30 (12)	0 (0)	8 (3)
Maple Grove Lake Summary, MN	CHF	9.30 - 10.12.99	644	14 (89)	67 (431)	48 (312)	60 (385)	48 (310)	1 (3)	20 (129)

* CHF = Central Hardwood Forest Ecoregion

** LF = Lake and Forests Ecoregion

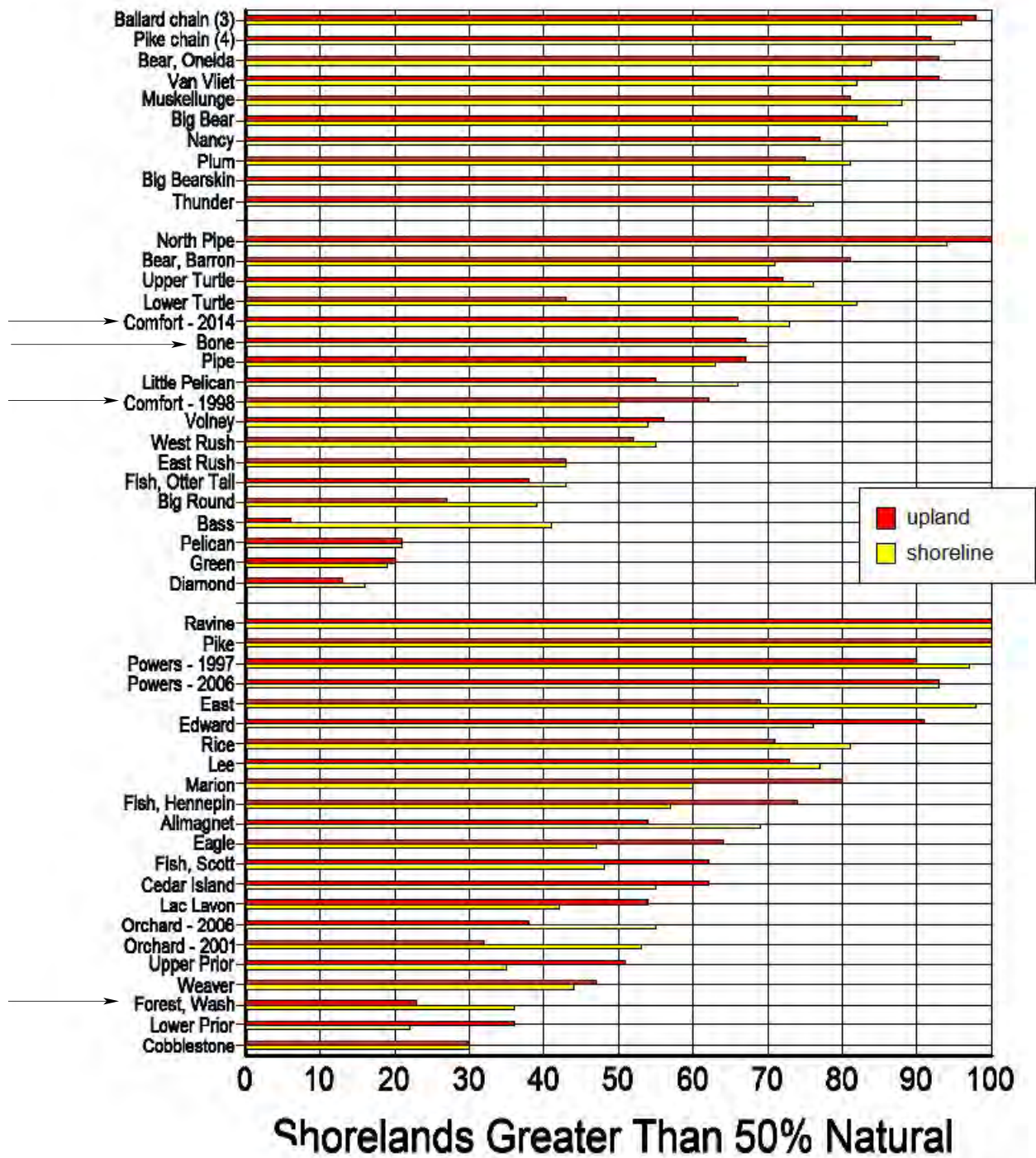


Figure 2. A summary of shoreland inventory results for lakes using an evaluation based on shoreland photographs. For each lake the percentage of shoreline and upland conditions with greater than 50% natural conditions is shown. The first tier of lakes are located in northern Wisconsin which are 4 to 5 hours from a major metropolitan area. The middle tier of lakes are about an hour's drive from the Twin Cities, and are considered to be "country" lakes. The lower tier of lakes are in the Twin City Metropolitan area and are categorized as urban lakes. Several lakes of the "urban" lakes have most of their shoreland owned by the city and there is a high percentage of natural conditions.

Comfort Lake is considered a country lake for this inventory. Natural shoreland conditions for Comfort Lake are average compared to the other country lakes.

2. Evaluation of Individual Shoreland Parcels

Results of individual parcel evaluations are shown in Table 3. A key to parcel locations is shown on the map below (Figure 3).

A “parcel” represents either a photo of an undeveloped shoreline area or an approximation of a developed lot. It’s possible several lots were missed or boundary lines were misinterpreted. However, the overall “picture” of the shoreland conditions should be accurate.

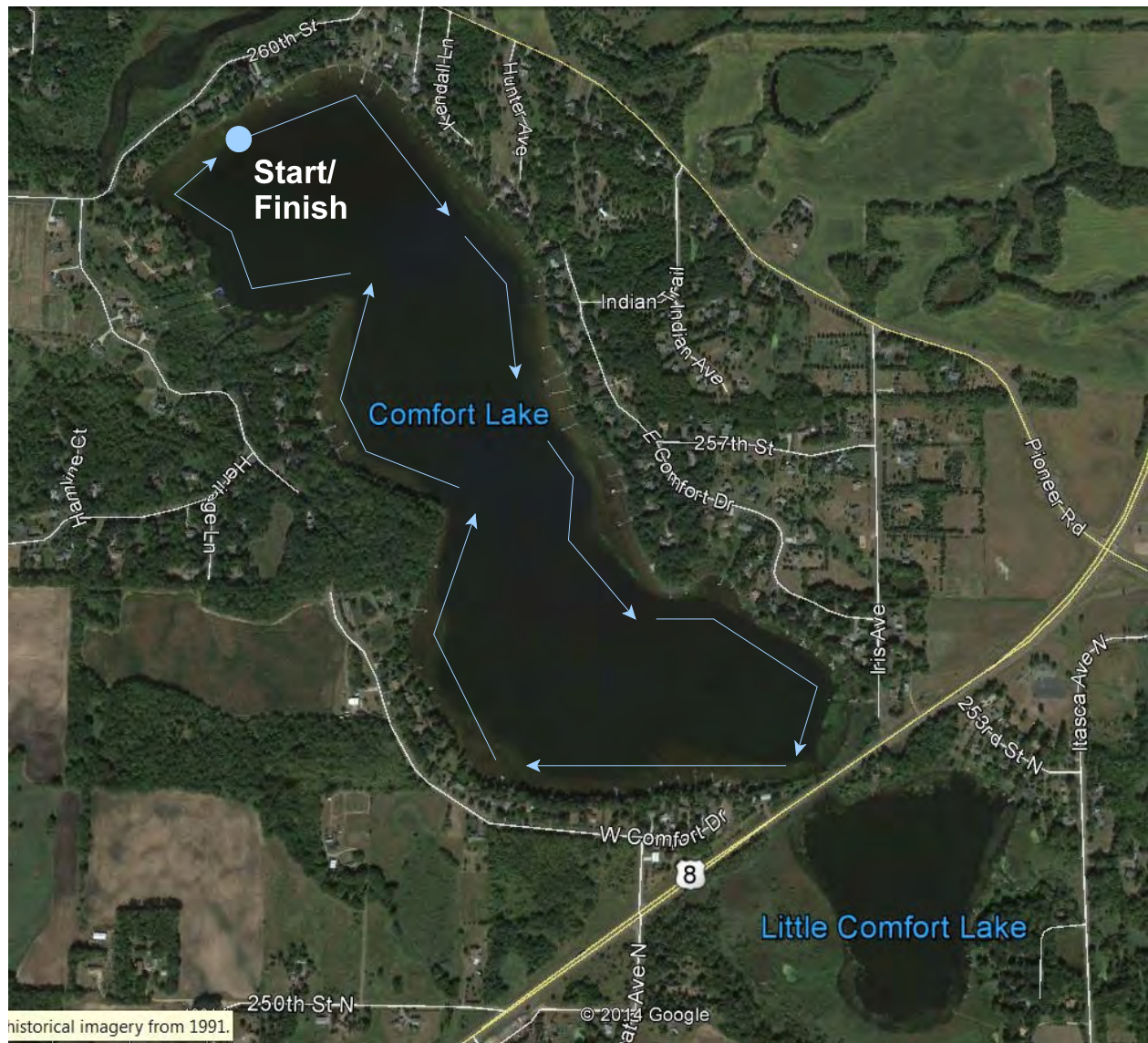


Figure 3. Key to shoreland photo parcels for Comfort Lake, July, 2014.

Table 3. Comfort Lake shoreline inventory, July 21, 2014. Shorelands that meet the natural condition of either 50% or 75% of natural cover are shown with a “Y”. Shorelands with less than 50% or 75% natural cover are shown with an open box or “N”.

Photo ID	Natural Upland Conditions		Natural Structure conditions		Shoreline Erosion	Undeveloped Lot	Shoreline Structure		# of Docks	Boats		Comments
	>50%	>75%	>50%	>75%			riprap	wall		Pontoon	Other	
1	Y	Y	Y	Y					1			Landing
2									1			Same as Picture 1.
3	Y	Y	Y	Y		1			0			
4									0			Two houses
5	Y	N	Y	Y					1	2	1	Two houses
	N	N	N	N			1		1		2	
6									1			
7	Y	N	Y	Y					1	1		Brown house
8	Y	N	N	N								
9	N	N	N	N					1			Two house with swimming raft
	N	N	N	N					1		1	
10	N	N	N	N			1		1	1		Two houses
	N	N	N	N			1				1	
11	N	N	N	N					1		2	Two houses
	N	N	N	N			1					
12	N	N	N	N					1	1		
13	N	N	N	N			1		1	1		Yellow house
14	Y	N	Y	N					1	1	1	
15	N	N	N	N					1	1		
16	Y	Y	Y	Y					1	1	2	991
17	Y	N	Y	Y					1		1	
18	Y	N	Y	Y					1	1	3	Two houses
	Y	N	Y	Y								
19	Y	N	Y	N					1		1	994
20	Y	N	Y	N			1		2		1	
21	N	N	Y	N					1			
22	Y	Y	Y	Y					1		3	
23												Same as Picture 22.
24	N	N	N	N					1		1	Brown log cabin house with flag 999
25	N	N	Y	N					1		1	Grey house
26	N	N	Y	N			1		1			Two houses, second house brown
	N	N	N	N			1		1		2	
27	Y	N	Y	Y					1		1	House with flower beds
28	Y	Y	Y	Y					1		3	
29	N	N	N	N					1		1	Two houses
	N	N	N	N					1	1		
30	N	N	Y	Y					1	1	1	
31	N	N	Y	Y					1	1	1	
32	Y	N	Y	Y					1	1		House is set way back from the lake
33	Y	Y	Y	Y					1		1	Boat lift with blue canopy 0010
34	N	N	Y	Y					1			
35	N	N	Y	Y					1	1	1	
36	Y	Y	Y	Y					1	1	1	
37	Y	Y	Y	Y					1		1	Grey house with boat lift with white canopy
38	Y	N	Y	Y					1		1	
39	Y	N	Y	Y					1			0016
40	Y	Y	Y	Y					1	1		
41	Y	Y	Y	Y					1		1	Grey house with red jet ski
42	Y	Y	Y	Y								Yellow house, red jet ski may belong to this house
43	Y	N	Y	Y					1	1		
44	Y	N	N	N			1		1		1	
45	N	N	Y	Y					1	1		Cream house
46	Y	Y	Y	Y					1	1		Boat lift with blue canopy
47	Y	N	Y	Y								
48	Y	N	Y	N					1	1		Tan house
49	Y	N	Y	Y					1	1	2	
50	Y	N	Y	Y					1		3	
51	N	N	N	N			1		1	1	1	Keystone wall 0028
52	Y	Y	Y	Y								
53	Y	N	Y	Y					1	1	2	

Table 3. Comfort Lake shoreline inventory, July 21, 2014. Shorelands that meet the natural condition of either 50% or 75% of natural cover are shown with a “Y”. Shorelands with less than 50% or 75% natural cover are shown with an open box or “N”.

Photo ID	Natural Upland Conditions		Natural Structure conditions		Shoreline Erosion	Undevel Lot	Shoreline Structure		# of Docks	Boats		Comments
	>50%	>75%	>50%	>75%			riprap	wall		Pontoon	Other	
54	Y	Y	Y	Y								Highway 0031
55	Y	Y	Y	Y								Highway 0032
56	N	N	Y	Y								
57	Y	Y	Y	Y					1	1		
58	N	N	N	N			1		1	1		
59	N	N	N	N			1		1		2	
60	Y	Y	Y	Y			1		1		2	Tan house with stairs
61	Y	N	Y	Y					1	1		
62	Y	N	Y	Y					1		1	
63	Y	N	N	N			1				4	Green house
64	Y	Y	N	N			1		1	1		House under construction
65	Y	Y	N	N			1					Brown house
66	Y	Y	Y	N					1	1		
67	Y	Y	Y	Y								
68	Y	N	Y	Y					1			Yellow house
69	Y	Y	Y	Y					1			
70	Y	N	Y	N					1	1		Boat lift with green canopy 47
71	N	N	N	N			1		1	1		Two houses
72	N	N	N	N			1					Dark grey house
73	N	N	Y	Y								
74	Y	Y	Y	N					1		3	
75	Y	N	Y	Y					1		1	
76	Y	N	Y	Y					1	1	1	53
77	N	N	N	N					1			
78	N	N	Y	N					1		1	
79	Y	Y	Y	Y		1						56
80	N	N	N	N					1			
81	Y	Y	Y	Y					1		1	
82	Y	Y	Y	Y		1						Unknown
83	Y	Y	Y	Y		1						Unknown
84	Y	Y	Y	Y					1			Dock only
85	Y	Y	Y	Y					1		2	Boat lift with blue canopy
86	Y	Y	Y	Y					1	1	3	
87	Y	N	Y	N					1			Tan boat house
88	N	N	Y	N					1	1	1	Flag on dock
89	Y	N	Y	Y					1		2	
90	Y	Y	Y	Y		1						Undeveloped
91	Y	Y	Y	Y		1						Undeveloped
92	Y	Y	Y	Y								
93	Y	Y	Y	Y								Inlet
94	Y	Y	Y	Y								
95	Y	N	Y	Y					1		2	Green roof house with blue canopy 72
96	Y	Y	Y	Y					1		1	Big house
97	N	N	N	N					1		1	
98	Y	N	Y	Y					1		2	
99	N	N	N	N					1			
100	Y	Y	Y	Y					1	1	1	
101	Y	Y	Y	Y		1						
102	Y	N	Y	Y					1		1	
103	Y	Y	Y	Y					1			Landing 80
Total	0.5	0.75	0.5	0.75	0	7	18	0	84	35	77	

3. Overview of Corrective Measures

Improving Upland Native Landscape Conditions

In the glacial lake states, three broad vegetative groups occur: pine forests with a variety of ground cover species including shrubs and sedges; hardwood forests with a variety of understory species, including ferns; and tall grass prairie with a variety of grasses as well as bur oaks and willow trees. Residences around Comfort Lake are in the hardwood forest group.

Reestablishing native conditions in the shoreland area not only improves stormwater runoff quality, it also attracts a variety of wildlife and waterfowl to the shoreland area. Benefits multiply when other neighbors naturalize because the effects are cumulative and significant for water quality and wildlife habitat.

When installing native vegetation close to the shoreline residents are actually installing a buffer. A buffer is a strip of native vegetation wide-enough to produce water quality and wildlife improvements. Much of the natural vegetative buffer has been lost in shoreland areas with development where lawns have been extended right down to the shore.

Lawns are not necessarily bad for a lake. However they can be over fertilized and then runoff carries phosphorus to the lake. Also, lawns function as a low grade open prairie, with poor cover for wildlife and a food supply that is generally poor, except for geese who may find it attractive. Replacing lawn areas with native landscaping projects reduces the need for fertilizer, reduces the time it takes to mow, increases the natural beauty of a shoreland area, and attracts wildlife.

Lawns do not make very good upland buffers. With runoff, short grass blades bend and do not serve as a very effective filter. Tall grass that remains upright with runoff is a better filter. Kentucky bluegrass (which actually is a non-native grass) is shallow-rooted and does not protect soil near shorelines as well as deep-rooted native prairie grasses, shrubs, or other perennials. Grass up to the shoreline offers poor cover, so predators visit other hiding areas more frequently reducing the prey food base and limiting predator populations in the long run. Also with short ground cover, ground temperatures increase in summer, evapotranspiration increases and results in drying conditions, reducing habitat for frogs and shoreline dependent animals.

Buffer Strip Considerations

A functional upland buffer should be at least 15 feet deep. With this you start getting water quality and wildlife habitat benefits. But a 25 foot deep buffer is recommended. In the past, before lakeshore development, buffers ringed the entire lake. For lakeshore residents it is recommended the length of the buffer extend for 75% of the shoreline, although 50% would produce buffer benefits.

A buffer strip can address two problem areas right away. Geese are shy about walking through tall grass because of the threat of predators. There will always be a few who charge right through but it is a deterrent for most of them. Also, muskrats shouldn't be a problem. They may burrow into the bank, but generally not more than 10 feet. With a buffer going back 15 to 25 feet, you won't be mowing over their dens. An occasional den shouldn't produce muskrat densities that limit desirable aquatic vegetation.

Several types of buffers can be installed or propagated that offer nutrient removal as well as wildlife benefits. Examples include:

Tall grass, sedge, flower buffer: Provides nesting cover for mallards and blue-winged teal. Provides above ground nesting habitat for sedge wrens, common yellow throat and others.

Shrub and brush buffer: Provides nesting habitat for lakeside songbirds such as yellow warblers, common yellowthroat, swamp sparrows, and flycatchers. It also provides significant cover during migration.

Forested buffers: Provides habitat for nesting warblers and yellow-throated vireo, herons, woodducks, hooded mergansers, and others. Upland birds such as red-winged blackbirds, orioles, and woodpeckers use the forest edge for nesting and feeding habitat.

Even standing dead trees, which are referred to as snags, have a critical role. When they are left standing they serve as perching sites for kingfishers and provide nesting sites for herons, egrets, eagles, and ospreys. In the midwest over 40 bird species and 25 mammal species use snags. To be useful, they should be at least 15 feet tall and 6-inches in diameter.

Native Landscaping for Buffers: Three Approaches

Native landscaping efforts can be put into three categories:

1. Naturalization
2. Accelerated Naturalization
3. Reconstruction

1. Naturalization: With this approach, the landowner is going to allow an area to go natural. Whatever is present in the seedbank is what will grow. If they want to install a buffer along the shoreline, let a band of vegetation grow at least 15 feet deep from the shoreline back and preferably 25 feet or deeper. Just by not mowing will do the trick. Residents can check how it looks at the end of the summer. It will take up to three years for flowers and native grasses to grow up and be noticed. Residents can also select other spots on their property to “naturalize”.

2. Accelerated Naturalization: After developing a plant list of species from the area, landowners may want to mimic some features right away. They can lay out a planting scheme and plant right into existing vegetation. Several Minnesota nurseries can supply native plant stock and seeds. The nurseries can also help select plants and offer planting tips. Wildflowers can be interspersed with wild grasses and sedges. Mulch around the new seedlings. With this approach landowners can accelerate the naturalization process.

3. Reconstruction: To reestablish a native landscape with the resident’s input and vision, another option is to reconstruct the site with all new plants. Again plant selection should be based on plants growing in the area. Site preparation is a key factor. Residents will want to eliminate invasive weeds and eliminate turf. This can be done with either herbicides or by laying down newsprint or other types of paper followed by 4 to 6 inches of hardwood mulch. Plantings are made through the mulch. This is the most expensive of the three native landscaping categories. Landowners can do the reconstruction all at once, or phase it in over 3 to 5 years. This allows them to budget annually and continue evolving the plan as time goes by.

Also mixing and matching the level-of-effort categories allows planting flexibility. Maybe a homeowner employs naturalization along the sides of the lot and reconstruction for half of the shoreline and accelerated naturalization for the other half. Examples of the three approaches are shown in Figure 4.

1. Naturalization: The easiest way to implement a natural shoreline setting is to select an area and leave it grow back naturally.



2. Accelerated Naturalization: To accelerate the naturalization, plant shrubs, wild flowers, or grasses into a shoreland area.



3. Restoration: This involves removing existing vegetation through the use of paper mats and/or mulching and planting a variety of native grasses, flowers, and shrubs into the shoreland area.



Figure 4. Examples of three shoreland management options.

4. Comparison of 1998 and 2014 Results

Methodology for both the 1998 and 2014 surveys were the same. Photos were taken from a boat that traveled parallel to the shoreline at about 100 feet from the shoreline and going at a slow but steady speed. The full lake shoreline was photographed. In 1998 individual pictures were evaluated in the lab while in 2014 the shoreline conditions were determined in the field as the picture was taken. Results from 1998 and 2014 were similar however both the natural upland conditions and the natural shoreline conditions increased in 2014 compared to 1998 (Table 4).

Table 4. Summary of shoreline buffer and upland conditions in the shoreland area of Comfort Lake in 1998 and 2014. The number in parentheses represents the number of parcels.

	1998 Comfort Lake (n=100)	2014 Comfort Lake (n=107)
Natural Upland Condition		
>50%	62% (62)	66% (71)
>75%	--	36% (39)
Natural Shoreline Condition and Shoreline Buffers		
>50%	61% (61)	73% (78)
>75%	--	61% (65)
Shoreline Structure		
Riprap	12% (12)	17% (18)
Retaining wall	0	0% (0)

Shoreland Inventory Pictures

Key to picture location

(Several pictures have more than one shoreline parcel)

Comfort Lake Photo Inventory- Parcel Numbers



UTM NAD 1983
Blue Water Science

Comfort Lake Photo Inventory



UTM NAD 1983
Blue Water Science

Comfort Lake, July 21, 2014



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1



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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Comfort Lake, July 21, 2014



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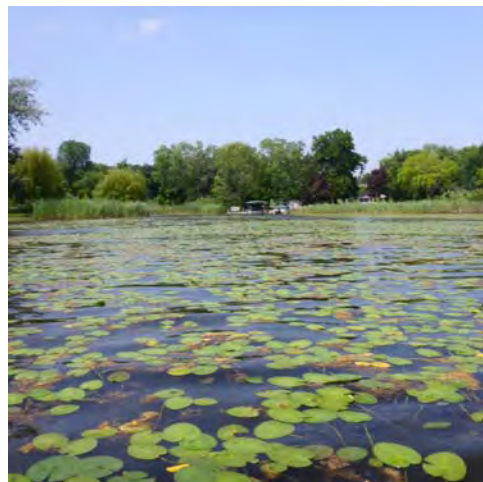
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Comfort Lake, July 21, 2014



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