Bass Lake
Lake Management Plan

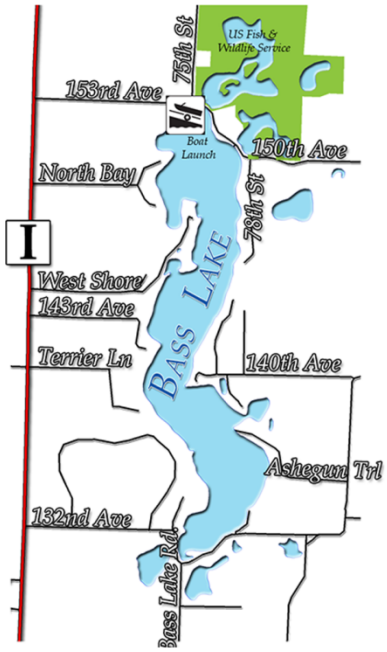
APPENDICES

December 2016

Appendix A. Social Science Assessment Results

University of Wisconsin-Stevens Point
College of Natural Resources

Bass Lake Community
Social Science Assessment



St. Croix County, Wisconsin

FINAL REPORT: JUNE 2016

SURVEY INVITATION LETTER

We're asking for your help! This survey, which we expect should take about 20 minutes to complete, is an important step to help in the development of a new management plan for Bass Lake. We're looking to understand the priorities of those who know the lake best: shoreline owners and other landowners in nearby areas of your watershed. The survey is being conducted by the UW-Extension Center for Land Use Education at UW-Stevens Point that is assisting local partners with this important step -- **so please contribute to this effort by completing the survey and returning it in enclosed postage paid envelope!**

Here are a few important notes about this study:

- Remember all results will be kept confidential, we're just looking for your important perspective about how to better manage Bass Lake and the surrounding watershed.
- All responses will be treated as anonymous and records used to contact respondents containing identifying information will be destroyed prior to the research team reviewing data.
- Please skip any questions that make you feel uncomfortable or that you don't know how to answer.
- We do not anticipate any potential for risk or harm due to participation in this study; however, if you have any complaints about your treatment as a participant in this study please contact Dr. Debbie Palmer, IRB Chair at (715) 346-3953, e-mail at dpalmer@uwsp.edu, or mail at University of Wisconsin-Stevens Point, Science Building D240, Stevens Point Wisconsin 54481.

While your participation is voluntary your input can help bring local voices into these important efforts to enhance Bass Lake! If you have any questions or comments about this project you may contact me using the information provided below.

Thank you for your time and we're looking forward to hearing from you!

Dr. Aaron Thompson, Assistant Professor
E-mail: aaron.thompson@uwsp.edu

UW Extension
University of Wisconsin-Extension

Bass Lake Social Science Assessment: A Community Profile of Lake Stakeholders

Principal Investigator:

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Acknowledgements

This work was made possible by support from the Wisconsin Department of Natural Resources and St. Croix County. Additional support was also provided by the University of Wisconsin-Stevens Point College of Natural Resources and the UW-Extension Center for Land Use Education.

I would also like to take this opportunity to thank the more than 60 community members who took the time to participate in the survey process. Their combined involvement represents more than 20 hours of volunteer time to help inform the watershed planning process – this work is not possible without the contribution of these individuals!

Suggested Citation

Thompson, Aaron (2016). Bass Lake Social Science Assessment: A Community Profile of Lake Stakeholders. Retrieved from the University of Wisconsin-Stevens Point, UWEX Center for Land Use Education website: http:www.uwsp.edu/cnr/landcenter/

For additional information or if you have questions about the work contained in this report contact:

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Table of Contents

Introduction

This report summarizes the results of a confidential survey of landowners designed to support the development of a lake management plan for Bass Lake in St. Croix County, Wisconsin. A social science assessment is used to better understand the stakeholders responsible for and impacted by the decisions that will be made as part of this planning process. The study objectives work to provide leaders with a clear picture of the priorities of stakeholders, an understanding of factors influencing behaviors related to water quality, and information on factors that influence engagement in efforts to preserve or enhance the watershed.

Method

Dr. Aaron Thompson with the UW-Extension Center for Land Use Education conducted a social survey to inform the development of lake management plans for Bass Lake in St. Croix County, Wisconsin. The surveys were sent to 110 landowners with shoreline access as well as nearby households identified by St. Croix County staff as part of the process of developing the lake management plan. The 8-page survey was administered using a 5-contact process, adapted from Dillman's Tailored Design Method (2000) from March to May 2016. This method was selected for increased response rate, reduction of response bias, and cost efficiency. Analysis work presented in this report describes the results of the survey (descriptive statistics) and differentiates stakeholder groups (factor analysis modeling) to create a stakeholder profile that supports understanding the unique differences amongst Bass Lake landowners.

Response Rate

The original mailing list did not yield any bad address or surveys returned by the postal service as undeliverable, so the total census size is 110 households. A total of 66 surveys were returned, which produced a response rate of 60.0 percent.

Project Timetable

- July – August 2015
  - Initial call / social science needs assessment discussion
  - Provided support for a visual shoreline landscape preference assessment
  - Initial survey development intended for 3rd party data collection
- January 2016 – February 2016: Contract development with UWSP for data collection
- March – May 2016: Survey Timeline
  - March 14th, 2016: Project funds approved for initiation by UWSP
  - March 22nd, 2016: Advance letter mailed (Contact #1)
  - March 30th, 2016: Survey packet #1 mailed (Contact #2)
  - April 7th, 2016: Reminder postcard #1 mailed (Contact #3)
  - April 20th, 2016: Team update on survey – reported 36.7% response rate

    - April 22nd, 2016: Survey packet #2 mailed (Contact #4)
    - April 29th, 2016: Reminder postcard #2 mailed (Contact #3
    - May 11th, 2016: Team update on survey – reported 57.0% response rate
    - May 16th, 2016: Closed data collection with response rate of 60.0%
- May – June 2016
    - Data analysis and final report development
    - Final Report Submitted to St. Croix County (June 16, 2016)

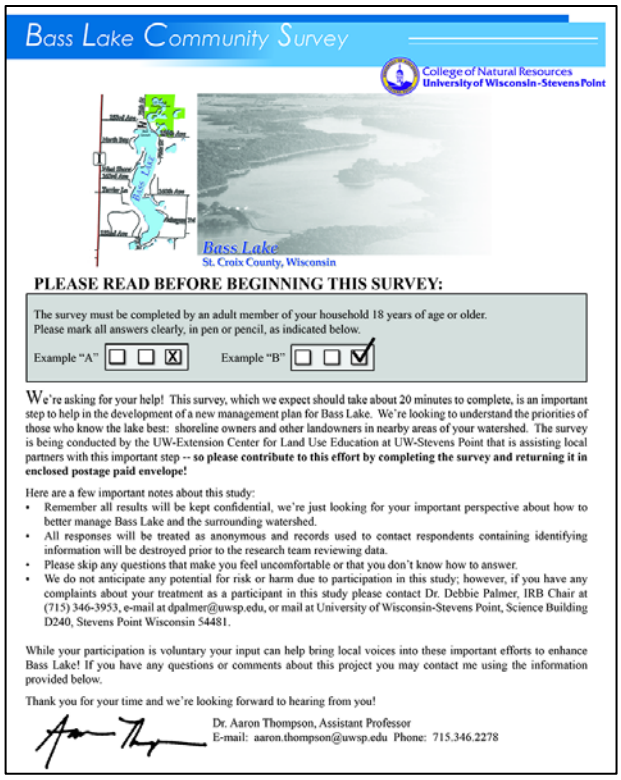
Sample and Non-Response Considerations

As with all scientific data collection it is important to evaluate the data to determine the best way to utilize the results and reveal any possible limitations. For this study we attempted a complete census of shoreline landowners and nearby residents of Bass Lake. Ensuring that non-response bias didn't limit the dataset was addressed at various stages of the research design and implementation, including:

- Eliminating participant selection bias -- the mailing list was generated by St. Croix County and was intended to ensure that no landowners within the selection criteria were excluded from the opportunity to participate.
- Eliminating interviewer bias – the survey cover letter / booklet cover clearly outlined that the data would be treated as anonymous, including the destruction of mailing addresses prior to examining results.

These approaches are typical of social science data collection and the strong response rate the likelihood of response bias is greatly diminished. However, the data below have been analyzed in a way that documents even minority opinions, recognizing the possibility that these views may be representative of those stakeholders that did not participate in the survey.

Bass Lake Community Survey


Bass Lake Community Survey

College of Natural Resources
University of Wisconsin-Stevens Point

Bass Lake
St. Croix County, Wisconsin

PLEASE READ BEFORE BEGINNING THIS SURVEY:

The survey must be completed by an adult member of your household 18 years of age or older.
Please mark all answers clearly, in pen or pencil, as indicated below.

Example "A" ☐ ☐ ☒ Example "B" ☐ ☐ ☑

We're asking for your help! This survey, which we expect should take about 20 minutes to complete, is an important step to help in the development of a new management plan for Bass Lake. We're looking to understand the priorities of those who know the lake best: shoreline owners and other landowners in nearby areas of your watershed. The survey is being conducted by the UW-Extension Center for Land Use Education at UW-Stevens Point that is assisting local partners with this important step -- **so please contribute to this effort by completing the survey and returning it in enclosed postage paid envelope!**

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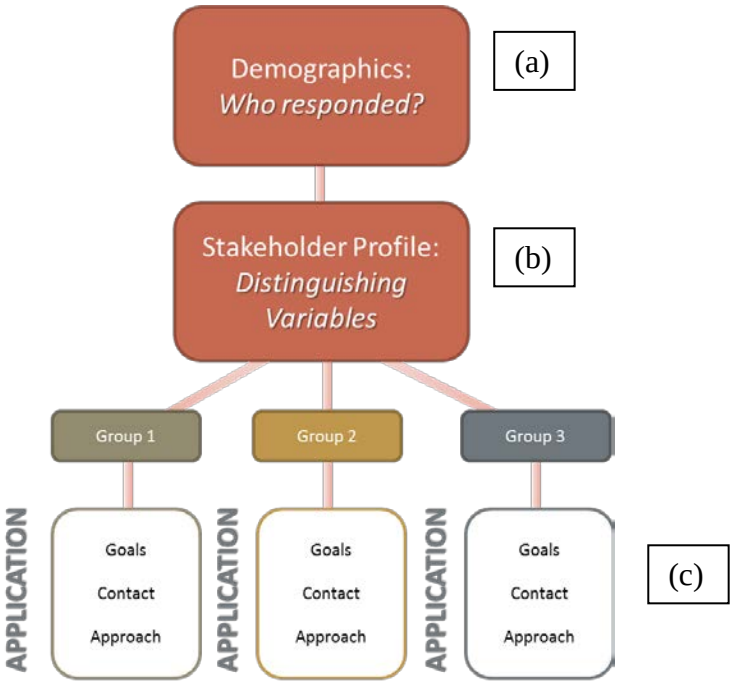
Dr. Aaron Thompson, Assistant Professor
E-mail: aaron.thompson@uwsp.edu Phone: 715.346.2278

A social science assessment is simply another tool that can be used to help develop a lake management plan and the implementation strategies that are needed to achieve the goals laid out by the planning process. This work is guided by the process shown in the graphic outline below that begins by collecting and analyzing (a) demographic characteristics of a key stakeholder audience, (b) developing a stakeholder profile to identify different groups based on attitudes toward key 'distinguishing' variables to better understand where landowners agree and where they don't, and (c) identifying key factors from this information that influence how to work with the different stakeholder groups on your lake. By meeting landowners where they're at, which includes understanding influences of conservation practice adoption (goals), who they wish to work with and who they don't (contact), and how they'd like to be included in decisions (approach) we can hope to improve community ownership of the not only the plan, but also the long term challenge of ensuring that their lake remains in the condition that they desire.



Who Responded? Demographics & Property Characteristics

The demographics section of the survey provides us with a snapshot of the landowners that live around Bass Lake. While we know that many surveys were returned from multi-member households, more often than not the male in the household completed the survey. On average survey respondents were 62.5 years old with at least a 4-year college degree and nearly half (43.9%) reported annual incomes of greater than $100,000. A large majority of respondents also reported that this was primary residence and nearly 90 percent had lived here more than 10 years.

FIGURE 1: Respondent Demographics

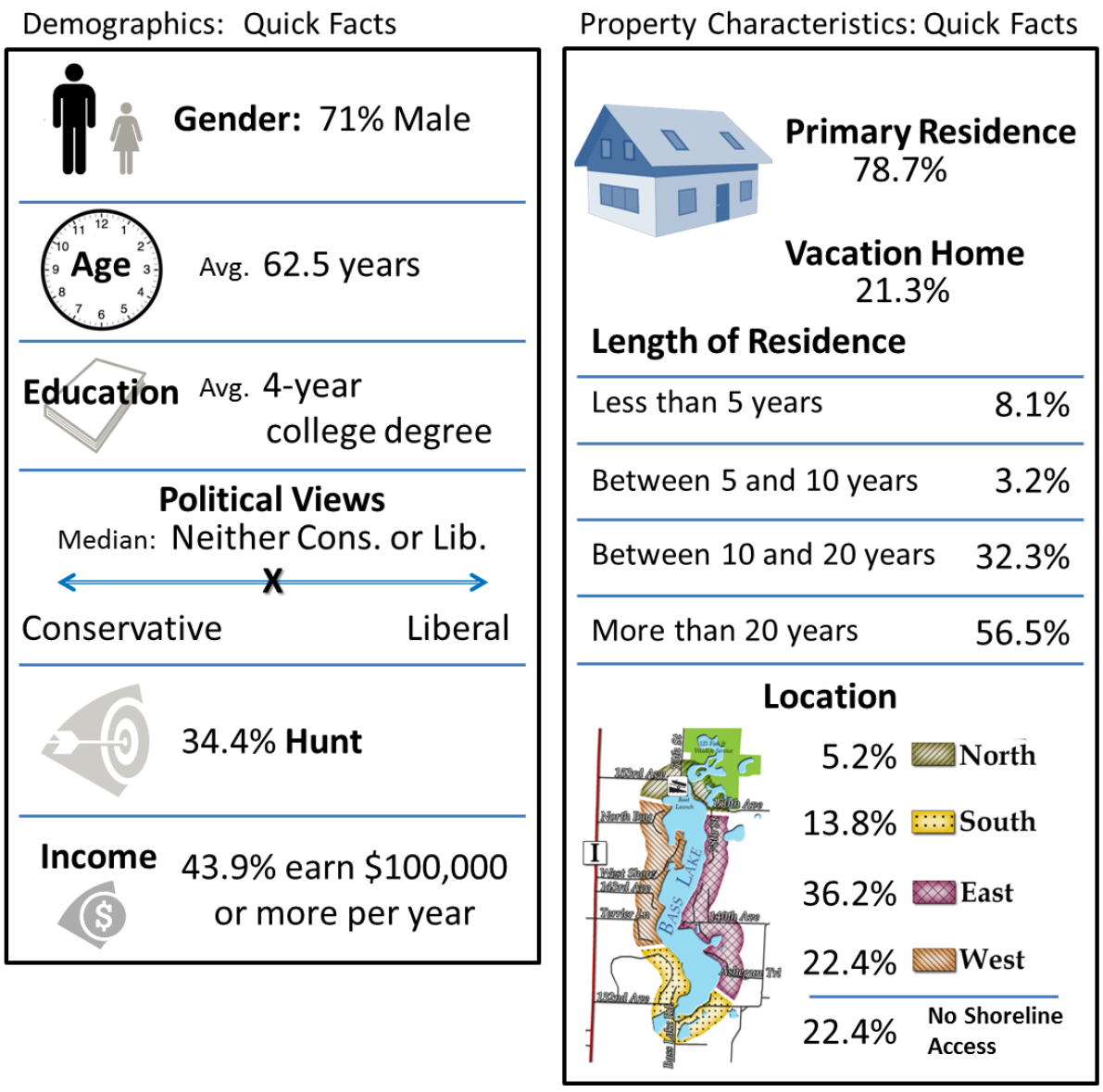
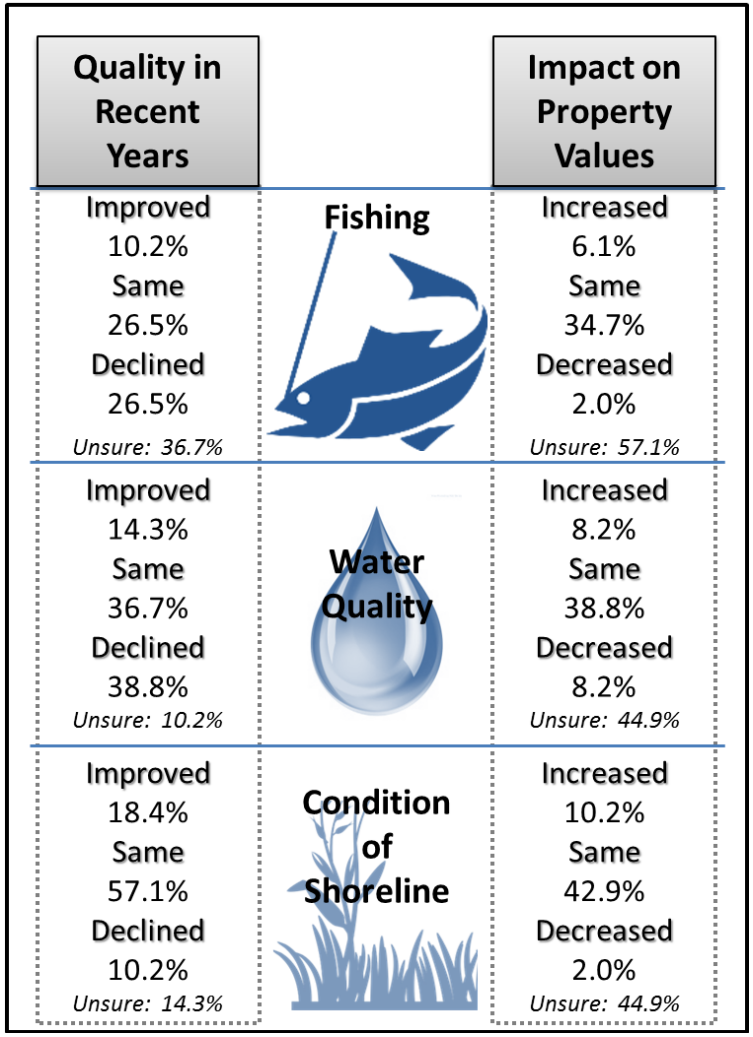


FIGURE 2: Assessment of Current Conditions

Current Conditions

So what do Bass Lake landowners see as the current state of their lake? Figure 2 shows the results of six questions that were placed on the first page of the survey as an introduction, but also to assess opinions about the current conditions of fishing, water quality, and shorelines along with their impact on property values.

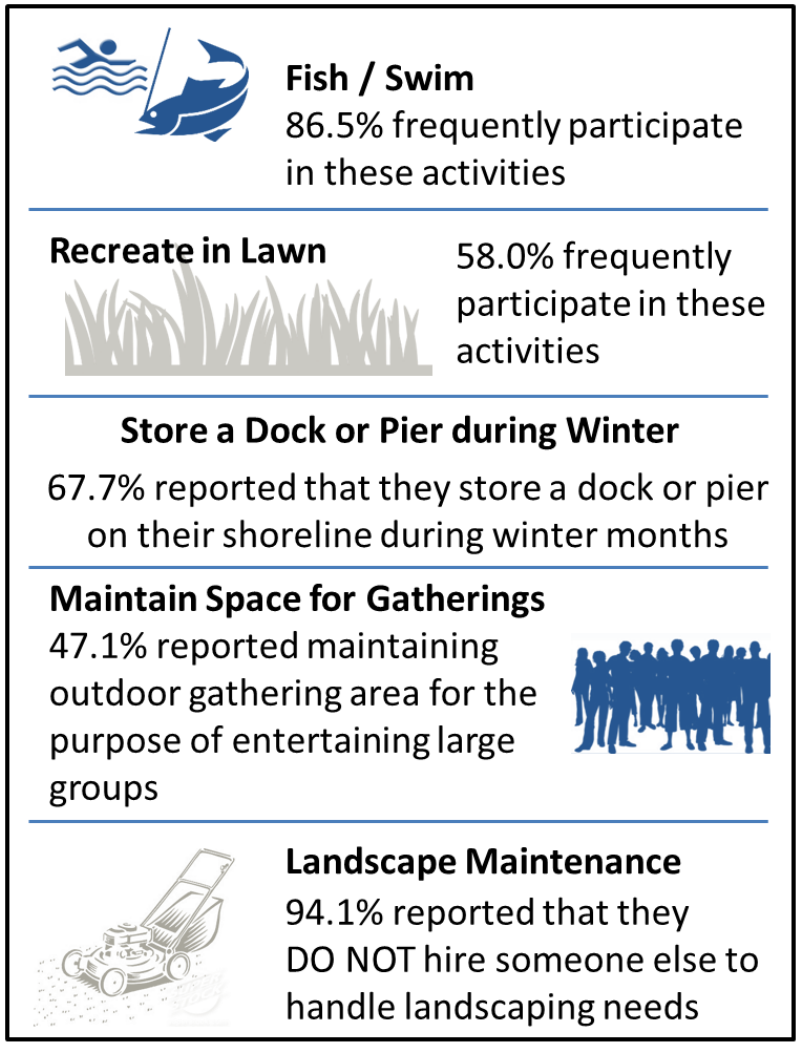
The results reveal that more residents, based on their experience living on Bass Lake, believe that water quality has declined (38.8 percent) than for fishing (26.5 percent) or shoreline conditions (10.2 percent). Few (18.4 percent or less) reported that they had seen the overall quality for any of these lake characteristics improve in recent years. Additionally, respondents were more certain about the quality of fishing, water quality, and shorelines than they were about the impact on property values, where a high percentage (>40 percent) reported that they were unsure of the impact. It should also be noted that for most respondents the quality of fishing, water quality, or shoreline conditions has had little effect (increase or decrease) on property values.



Use of Shoreline Property

Bass Lake landowners were asked to provide yes or no responses to a series of questions about how they use their shoreline. Questions ranged from an assessment of active recreation (fishing and swimming) to functional (maintenance and dock storage). In Figure 3 it becomes clear that Bass Lake residents are actively using their shoreline for fishing, swimming, and based on reports of pier storage also for boating. Nearly sixty percent reported frequently recreating in lawn or turf grass areas of their yard, while a smaller but substantial percentage (47.1 percent) reported maintaining large outdoor areas for the purpose of entertaining. An overwhelming majority (94.1 percent) responded that they do not hire someone else for their landscape maintenance, which suggests that most are largely responsible for their own mowing, managing, and seasonal maintenance of their properties.

FIGURE 3: Use of Shoreline Property



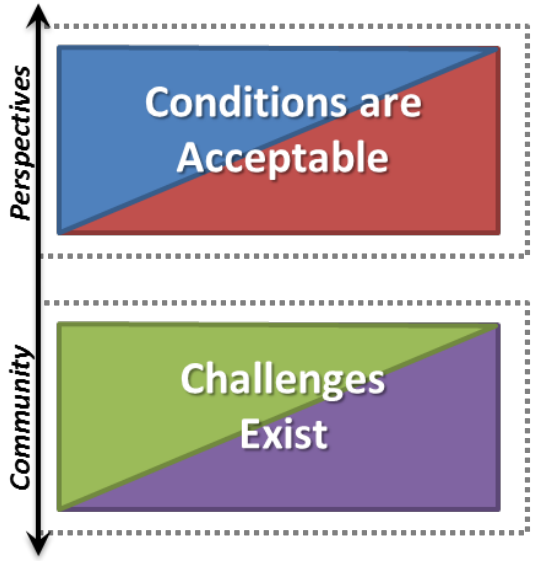
Stakeholder Profile: Group Identification Process

The use of distinguishing variables to identify distinct groups that share common attitudes toward a community resource (such as Bass Lake) is a critical aspect of the stakeholder profile. For this study two distinguishing variables were used, including a variable assessing community perspectives toward Bass Lake (analyzed using Inverted-R analysis) and a variable measuring shoreline landscape preference (analyzed using factor and cluster analysis techniques). As described in the following sections of this report the analysis of **"community perspectives"** and **"shoreline landscape preference"** variables revealed four distinct attitude positions (stakeholder groups) that are present within the Bass Lake community.

Differences: Community Perspectives of Bass Lake

The "community perspectives" variable was developed using questions that asked respondents to evaluate their agreement with 18 statements about Bass Lake (shown in Figure 5) ranging in content from perceptions of the current condition of the water to the reasons why it's a priority to protect and revitalize the lake. An Inverted-R analysis technique was used that assigns survey respondents into groups with like-minded people based on how each individual responded to the community perspective items (Thompson et al., 2013). The Inverted-R analysis revealed two competing perspectives of Bass Lake as described in Figure 4 below.

FIGURE 4: Distinguishing Variable #1

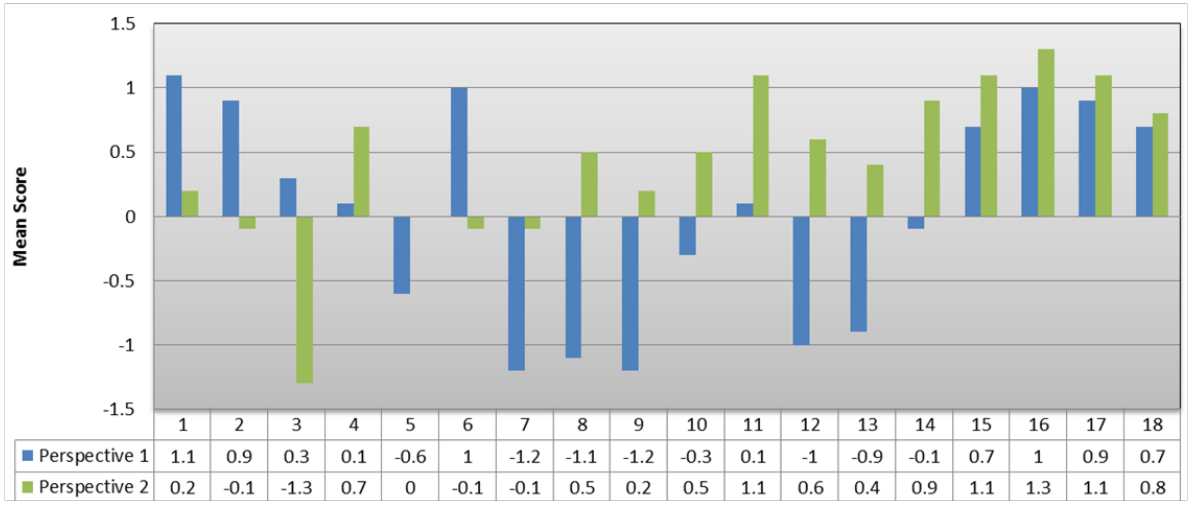


Perspective "A" Conditions are Acceptable: Respondents with this perspective believe that water quality in Bass Lake is better than most area lakes, and that while there are bad days generally Bass Lake meets their needs.

Perspective "B" Challenges Exist: Respondents with this perspective believe that the water in Bass Lake is getting dirtier, algae blooms in the summer are decreasing their desire to spend time here, and that they are being negatively affected by poor water quality that has reduced wildlife viewing and fishing opportunities.

FIGURE 5: Distinguishing Variable #1(all survey items)

Community Perspectives of Bass Lake



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Perspective 1	1.1	0.9	0.3	0.1	-0.6	1	-1.2	-1.1	-1.2	-0.3	0.1	-1	-0.9	-0.1	0.7	1	0.9	0.7
Perspective 2	0.2	-0.1	-1.3	0.7	0	-0.1	-0.1	0.5	0.2	0.5	1.1	0.6	0.4	0.9	1.1	1.3	1.1	0.8

1	I believe water quality in Bass Lake is better than most other lakes in the area.
2	Bass Lake provides good conditions for swimming near shore because the water clarity makes it is easy to see what is underwater.
3	Being able to safely use a large motor on my boat is an important part of my recreation on Bass Lake.
4	Recently there has been a large increase in the amount of weeds and other unwanted vegetation in Bass Lake.
5	When recreating on Bass Lake my enjoyment is frequently disrupted by other users.
6	There are bad days for water quality, but generally Bass Lake meets my needs as there are no days where I feel unsafe to swim or recreate in the water.
7	I'd like to eat more fish from the Bass Lake, but generally I don't feel safe due to concerns about water quality.
8	The presence of large algae blooms in Bass Lake during the summer months has greatly reduced my desire to spend time here.
9	I am negatively affected by poor water quality as I see less wildlife now at Bass Lake than were here in the past.
10	Heavy weekend boat traffic on Bass Lake seems to be responsible for cloudy water clarity that makes using the lake less enjoyable.
11	It is important that more vegetation be planted along shorelines to reduce runoff pollution from surrounding properties.
12	The water in Bass Lake is dirty and seems to be getting worse.
13	I am negatively affected by poor water quality that has decreased the number and type of fish caught on Bass Lake.
14	I am concerned about the possibility of new development along the shoreline of Bass Lake due to the demand for new housing in our area.
15	Local funding to address issues affecting water quality in Bass Lake is a great investment in our future.
16	It is important for shoreline owners to work with their neighbors to address issues affecting water quality in Bass Lake.
17	Providing better habitat for fish and wildlife motivates me to support efforts to improve Bass Lake.
18	Providing better opportunities for recreation motivates me to support efforts to improve water quality in Bass Lake.

Shoreline Landscape Preference

The development of a variable measuring shoreline landscape preference began as a result of community meetings with Bass Lake residents. The planning team coordinated with the Center for Land Use Education to develop a process to help understand what shoreline types are acceptable to landowners on Bass Lake. Initial data collection involved having meeting participants provide evaluations of a series of carefully selected images representing a continuum from less developed to more developed shorelines (as shown in Figure 6a below).

FIGURE 6a: Distinguishing Variable #2

These initial results revealed the presence of distinct shoreline landscape preferences among those attending the Bass Lake meetings. These results were then used to inform the development of two text-based attitudinal scales for collecting this information in a more streamlined format that is required in a mail survey questionnaire to obtain population information. The two scales use the combined scores of twelve statements, separately assessing preference for natural landscapes and preference for more highly maintained landscapes, were pre-tested and screened by lake experts to inform the measurement of these variables. The final statements, shown in Figure 6b, were then included in the survey and a combined score was created for each survey respondent for the **natural landscape scale** and the **maintained landscape scale** with each scale having a possible range of -12 (strongly disagree) to +12 (strongly agree).

FIGURE 6b: Distinguishing Variable #2

Shoreline Landscape Preference

		Mean Score
N1	An attractive shoreline landscape is one that maintains some of the wild characteristics of an undeveloped shoreline.	+1.26
M1	An attractive shoreline landscape is one that is well kept and doesn't look weedy or overgrown with vegetation.	-.13
N2	Shoreline properties that have a large vegetative buffer between the lake and the house have a big impact on clean water quality in the lake.	+1.23
M2	Developed shorelines with lawns to the water's edge have little impact on clean water quality in the lake.	-1.08
N3	As long as there is safe access to the water I don't need a lawn near my shoreline.	+1.03
M3	Maintaining a lawn, or other low vegetation, across my entire shoreline is necessary to ensure visibility that allows for safe water recreation.	-.94
N4	Leaving vegetation in the water near shore allows me to enjoy the fish and wildlife that use this habitat.	+.69
M4	Vegetation in the water near shore prevents me from doing the types of activities I enjoy most.	-.31
N5	I appreciate lake front landscapes that protect native vegetation while also allowing places for people to gather and access the water.	+1.26
M5	Tall grasses and other vegetation along the shoreline should be removed because they are full of ticks or other unwanted insect pests.	-.94
N6	Having a number of plants and trees between the house and shoreline provides me the privacy I seek.	+.66
M6	I want a landscape that provides benefits for wildlife, but it has to have a managed look to its appearance.	+.10

Natural Landscape Scale *(Items N1-N6): Mean = 6.22, Range -4 to +12, Cronbachs Alpha = .732*
Maintained Landscape Scale *(Items M1-M6): Mean = 3.65, Range -12 to +9, Cronbachs Alpha = .811*

A 2-step cluster analysis technique that sorts the individual responses to **natural landscape scale** and the **maintained landscape scale** supports grouping together similar responses. This process uses a statistical analysis technique that first identifies the number of representative groups and then assigns each individual, based on their responses to the attitude scales, to the group that best represents their pattern of responses (using a K-Mean Cluster technique). This analysis revealed the following 2 categories of shoreline landscape preference:

	Preference A	Preference B
Natural Landscape Scale (Mean score)	8.42	3.12
Maintained Landscape Scale (Mean score)	-6.54	.92

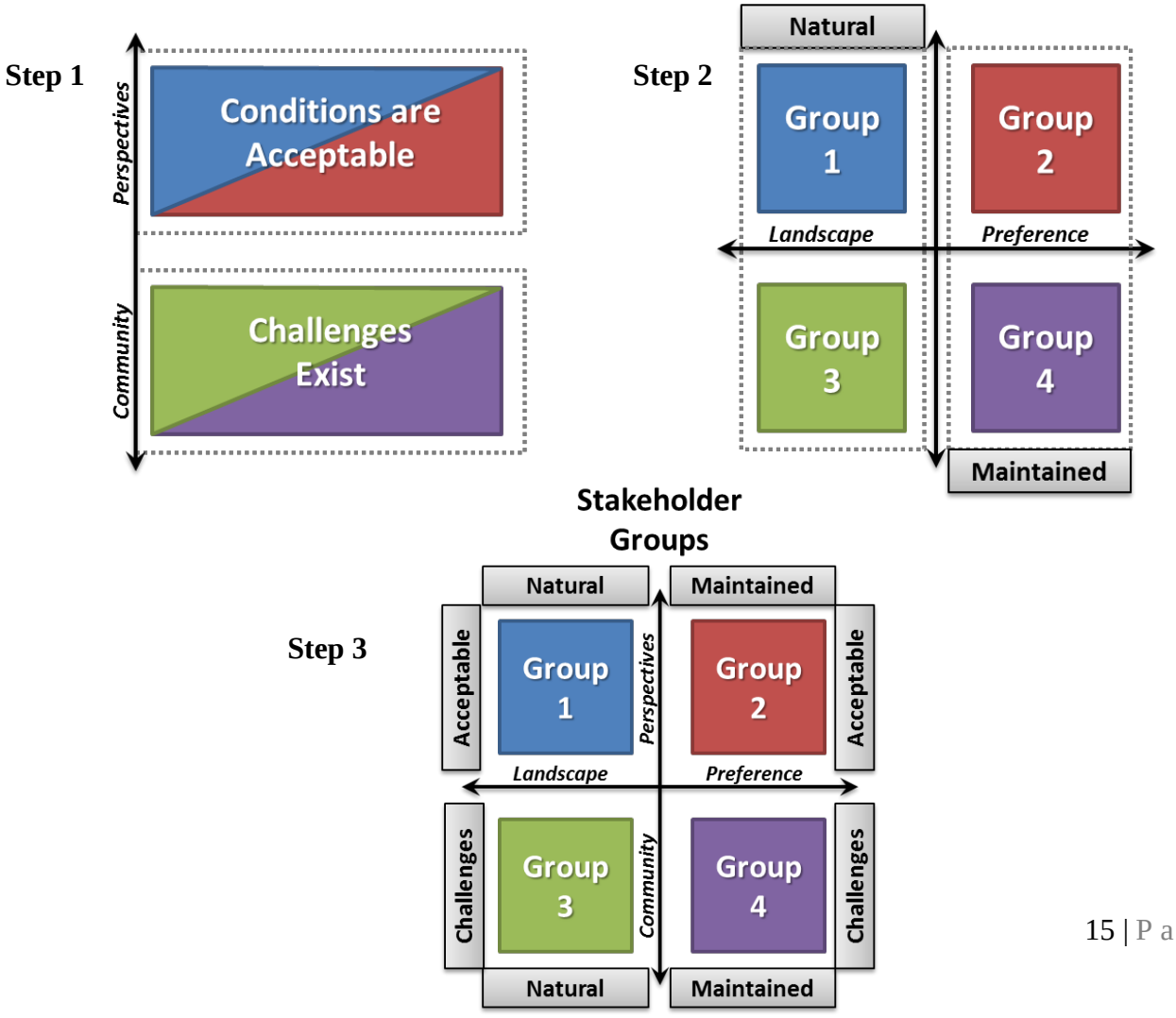
The results show that individuals that cluster together to form "Preference A" are significantly more supportive of natural landscaping and strongly against highly maintained landscape. Those who cluster with "Preference B" hold positive views of both natural and maintained landscapes,

although it is clear that they are not as supportive of natural landscaping. It is important to note that no group emerged that was strongly against natural landscapes, but rather that "Preference B" have a significantly higher level of agreement with the maintained landscape scale and a significantly lower level of agreement with the natural landscape scale based on ANOVA tests.

Attitude-Defined Stakeholder Groups

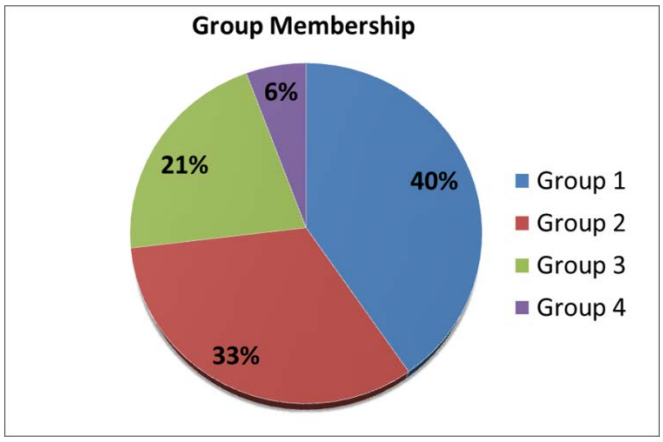
The final stakeholder groups were identified by combing the analysis results from the two distinguishing variables. In Step 1, as shown previously, respondents were grouped into two competing perspectives about Bass Lake. Next in Step 2, the cluster analysis revealed that shoreline landscape preference responses from Bass Lake landowners also were divided into 2 groups – those preferring natural, vegetated buffers and those with a stronger interest in highly maintained landscapes. All valid responses were then classified based on these results into the final stakeholder groups as shown in Step 3.

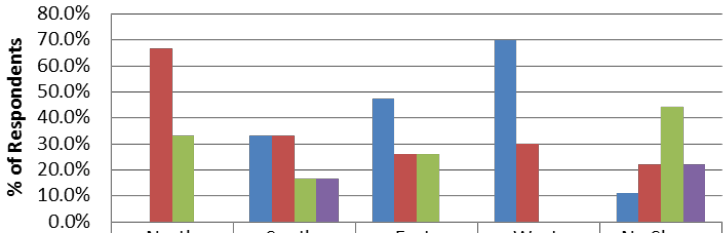
FIGURE 7: Combining Distinguishing Variables



To begin exploring the different stakeholder groups it's important to understand the relative size of each of the groups. As shown in Figure 8, Groups 1 and 2 that were initially clustered for their perspective that "conditions are acceptable" on Bass Lake (distinguishing variable #1) represent nearly 75 percent of all survey respondents; however, these groups split evenly on their shoreline landscape preference. The other 25 percent of respondents are members of Groups 3 or 4 that were initially clustered for their perspective that "challenges exist" (distinguishing variable #1). Of these it is clear that the dominant position (classified here as Group 3) among those that see challenges ahead for Bass Lake is a preference for natural landscapes as Group #4 ,with their preference for more maintained landscapes, represents only a small number of individuals. Additionally, we also see that there are some differences in where each of these groups lives around Bass Lake – notably membership in Groups 3 or 4 is absent on the West side of the lake.

FIGURE 8: Attitude Clusters (Group Membership)





	North	South	East	West	No Shore
Group 1	0.0%	33.3%	47.4%	70.0%	11.1%
Group 2	66.7%	33.3%	26.3%	30.0%	22.2%
Group 3	33.3%	16.7%	26.3%	0.0%	44.4%
Group 4	0.0%	16.7%	0.0%	0.0%	22.2%
Total # of Households	3	6	19	10	9

Group Descriptions: What we know about the Stakeholder Groups

The following sections focus on describing the differences between the four stakeholder groups identified by combining "community perspectives" and "shoreline landscape preference"; however, before jumping into the description of what makes these groups unique this section begins with a discussion about what the analysis reveals about areas of common agreement.

Commonalities: Community Perspectives of Bass Lake

The Inverted-R analysis also revealed areas of consensus (or common agreement or disagreement) among respondents. The areas of consensus identified by the Inverted-R analysis are shown in Figure 9 and clearly demonstrate that most Bass Lake landowners strongly agree that it is important to work with their neighbors to address issues affecting water quality in Bass Lake, also revealing that providing better habitat for fish and wildlife motivates (them) to support efforts to improve Bass Lake. There is also support for local funding and improved recreation as motivation (although mean scores weren't as high for these items).

FIGURE 9: Consensus Statements

Community Perspectives of Bass Lake

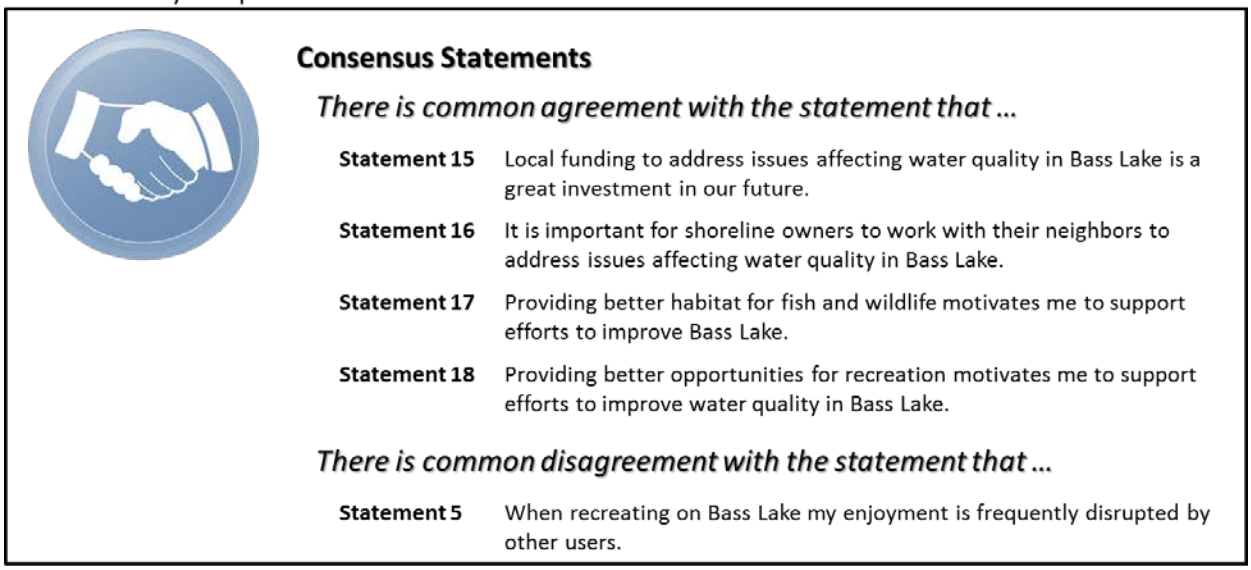
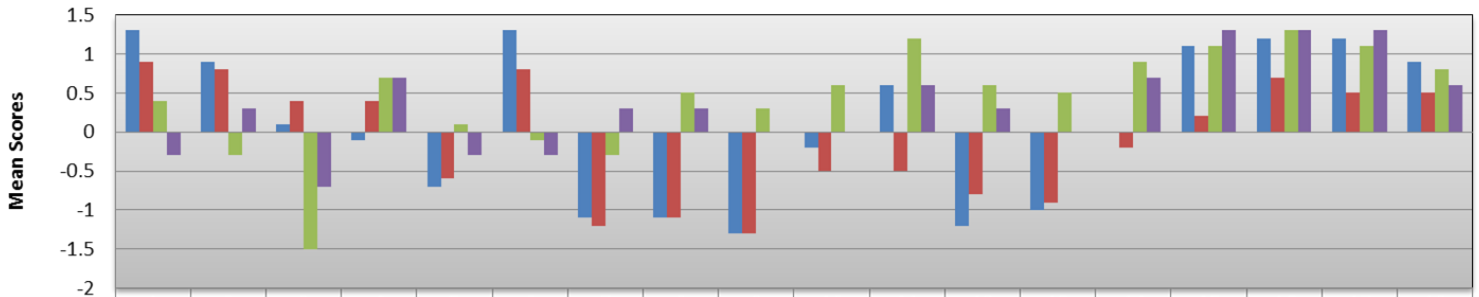


FIGURE 10: Distinguishing Variable #1(all survey items)

Community Perspectives of Bass Lake



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Group 2	0.9	0.8	0.4	0.4	-0.6	0.8	-1.2	-1.1	-1.3	-0.5	-0.5	-0.8	-0.9	-0.2	0.2	0.7	0.5	0.5
Group 3	0.4	-0.3	-1.5	0.7	0.1	-0.1	-0.3	0.5	0.3	0.6	1.2	0.6	0.5	0.9	1.1	1.3	1.1	0.8
Group 4	-0.3	0.3	-0.7	0.7	-0.3	-0.3	0.3	0.3	0	0	0.6	0.3	0	0.7	1.3	1.3	1.3	0.6

1	I believe water quality in Bass Lake is better than most other lakes in the area.
2	Bass Lake provides good conditions for swimming near shore because the water clarity makes it is easy to see what is underwater.
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7	I'd like to eat more fish from the Bass Lake, but generally I don't feel safe due to concerns about water quality.
8	The presence of large algae blooms in Bass Lake during the summer months has greatly reduced my desire to spend time here.
9	I am negatively affected by poor water quality as I see less wildlife now at Bass Lake than were here in the past.
10	Heavy weekend boat traffic on Bass Lake seems to be responsible for cloudy water clarity that makes using the lake less enjoyable.
11	It is important that more vegetation be planted along shorelines to reduce runoff pollution from surrounding properties.
12	The water in Bass Lake is dirty and seems to be getting worse.
13	I am negatively affected by poor water quality that has decreased the number and type of fish caught on Bass Lake.
14	I am concerned about the possibility of new development along the shoreline of Bass Lake due to the demand for new housing in our area.
15	Local funding to address issues affecting water quality in Bass Lake is a great investment in our future.
16	It is important for shoreline owners to work with their neighbors to address issues affecting water quality in Bass Lake.
17	Providing better habitat for fish and wildlife motivates me to support efforts to improve Bass Lake.
18	Providing better opportunities for recreation motivates me to support efforts to improve water quality in Bass Lake.

Group 1: Bass Lake is a treasure that needs more shoreline vegetation

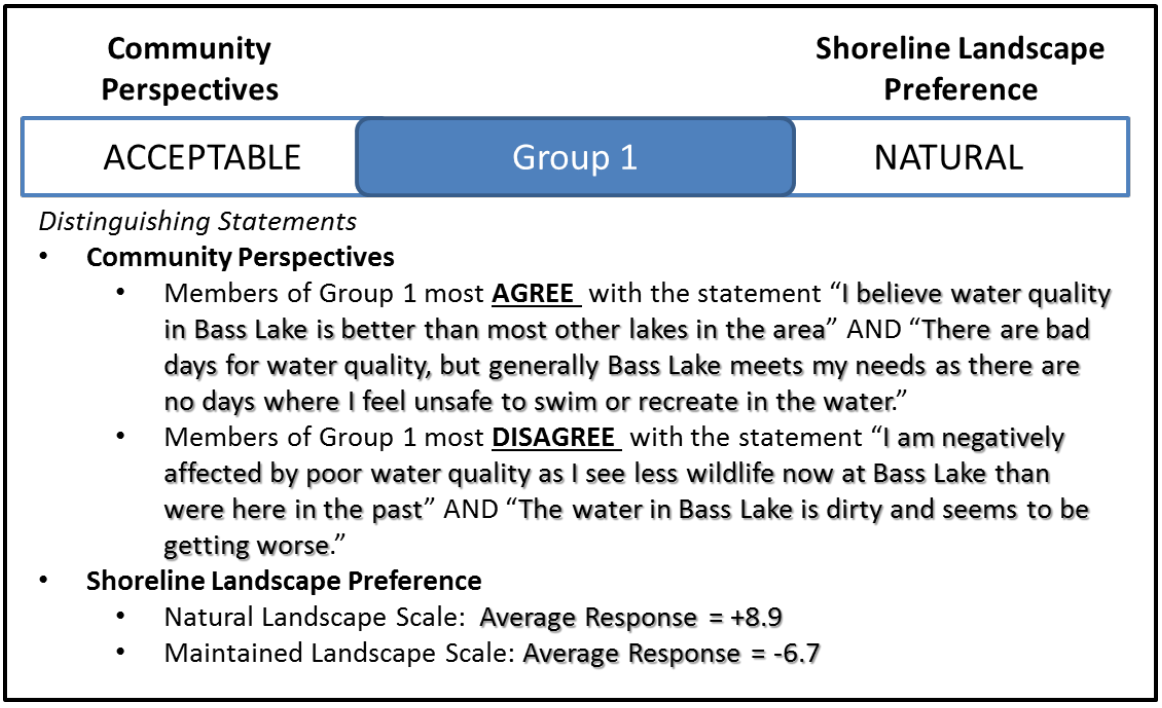
- Membership represents 40 percent of valid responses

The key to describing group differences is acknowledging that there are areas of agreement and disagreement between all four stakeholder groups. For Group 1 they share a community perspective with Group 2 that conditions on Bass Lake are acceptable, while sharing agreement with Group 3 regarding their preference for native vegetation and undeveloped shorelines.

What makes Group 1 unique?

It is also important then to discuss what makes each group unique and for Groups 1 it is clear that members agree most that the quality of Bass Lake is better than other area lakes (one member of this group commented that Bass Lake is a TREASURE)! Group 1 members don't believe that water quality is getting worse and while they accept that bad water quality days are part of this lake, they strongly agree that they never feel like it's unsafe to swim or recreate in the water. On the shoreline Group 1 members responded most positively to the natural landscape scale item, "Shoreline properties that have a large vegetative buffer between the lake and the house have a big impact on clean water quality in the lake" and negatively to the maintained landscape scale item, "Maintaining a lawn, or other low vegetation, across my entire shoreline is necessary to ensure visibility that allows for safe water recreation."

FIGURE 11: Attitude-Defined Group 1



Group 2: Water is great, but need to remove weedy shoreline vegetation

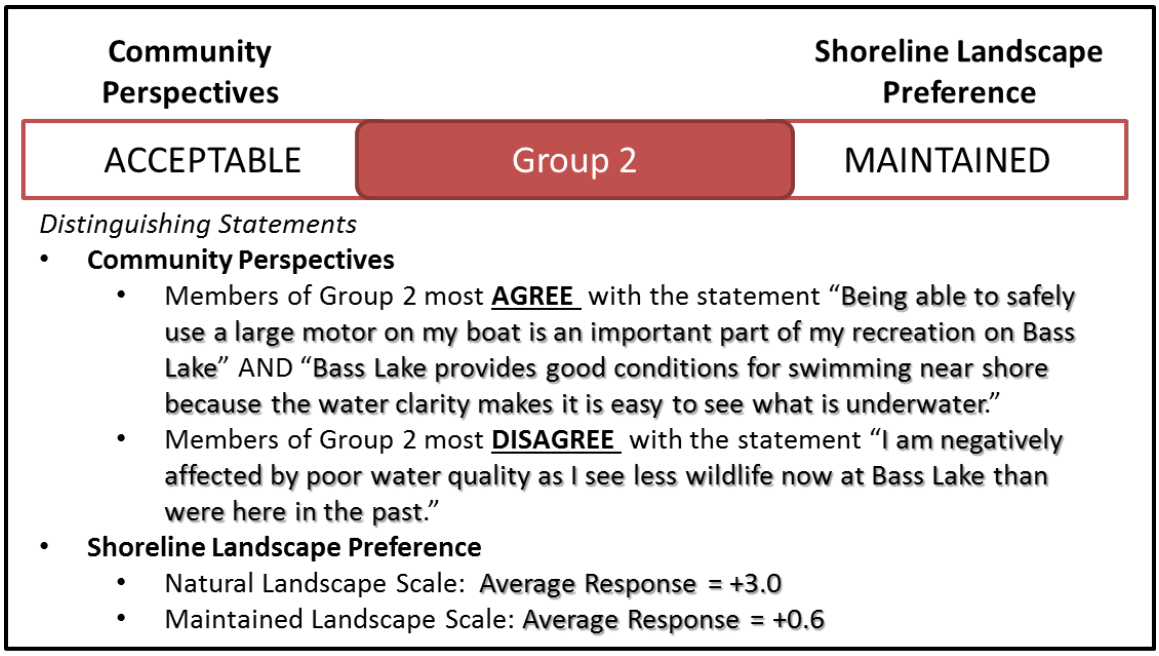
- Membership represents 33 percent of valid responses

As suggested by their common understanding of Bass Lake with Group 1, members of Group 2 value Bass Lake for what it is today. They are also the least supportive of all groups for the natural landscape scale, although they share shoreline preferences with members of Group 4.

What makes Group 2 unique?

Members of Group 2 are the most supportive of the statement that being able to use a large motor on my boat is an important part of my recreation; however, they also see Bass Lake (like group 1) as being better than other area lakes. Additionally, they strongly agree that good conditions for swimming near shore are important. What sets Group 2 apart in their preference for shoreline landscapes is agreement with the maintained landscape scale statement, "I want a landscape that provides benefits for wildlife, but it has to have a managed look to its appearance" and disagreement with the natural landscape scale statement, "Leaving vegetation in the water near shore allows me to enjoy the fish and wildlife that use this habitat."

FIGURE 12: Attitude-Defined Group 2



Group 3: Need to act now to protect water quality

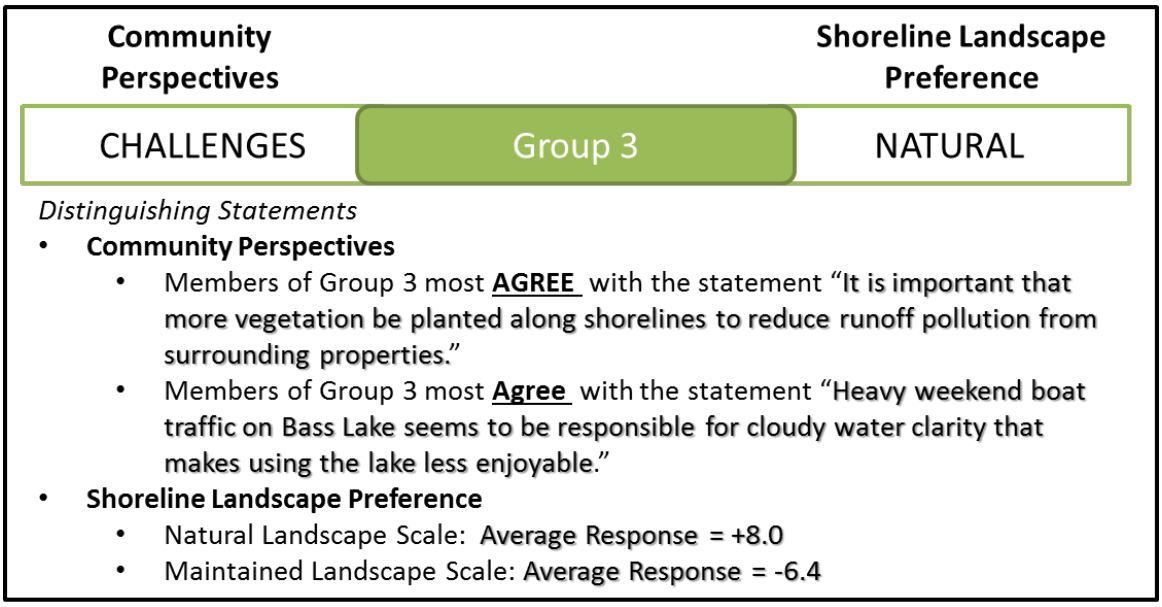
- Membership represents 21 percent of valid responses

As the only group with sizable membership and a distinct community perspective toward Bass Lake it's important to acknowledge their views are shared by more than 1 in 5 landowners. They see the conditions on the lake as declining and strongly feel the impact of poor water quality on their experience here. Their common shoreline landscape preference with Group 1 shows that there are areas of common agreement with others on the lake, but this group is highly motivated to act now to address the threats to Bass Lake that they feel are already damaging this resource that they care about, including the threat of new development along the lakeshore driven by demand for housing in the area (community perspectives statement #14).

What makes Group 3 unique?

They see challenges facing the future of their Lake and while they also generally agree (although at a much lower level than Groups 1 or 2) that Bass Lake is better than most area lakes they believe that it is now necessary to manage shoreline conditions to reduce runoff pollution and that heavy weekend boat traffic is responsible for poor water clarity. Along the shoreline members of this group show their preference for natural landscapes by strongly disagreeing with the statements, "Developed shorelines with lawns to the water's edge have little impact on clean water quality in the lake" and "I want a landscape that provides benefits for wildlife, but it has to have a managed look to its appearance.

FIGURE 13: Attitude-Defined Group 3



Group 4: Water is unsafe, but it's not caused by lawns

- Membership represents 6 percent of valid responses

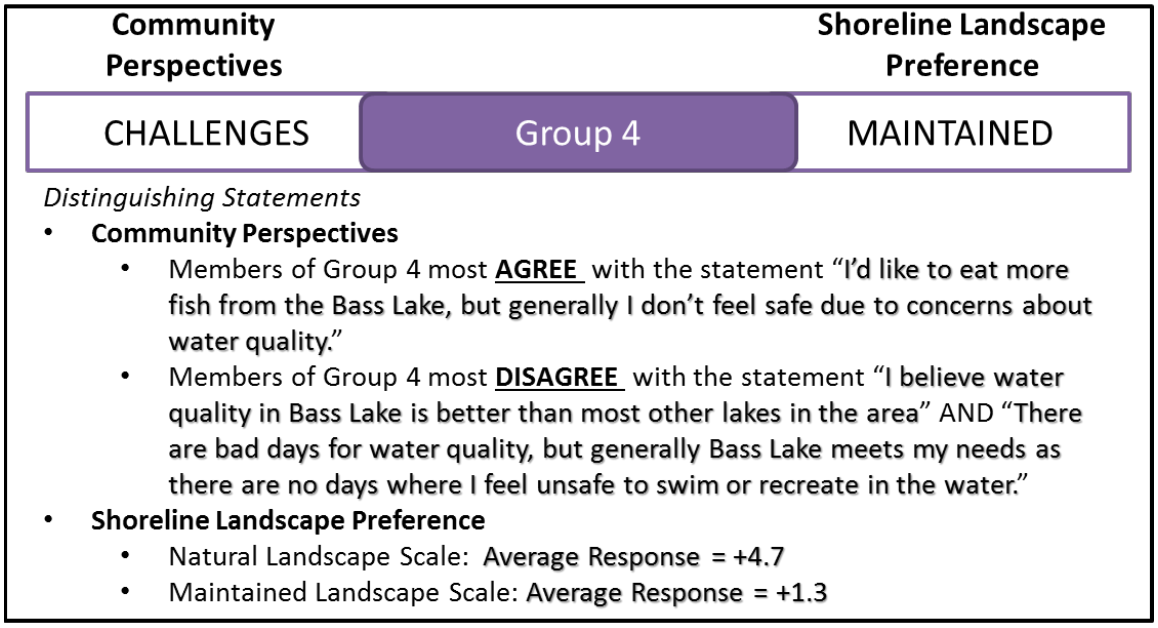
This group only accounted for six percent of all responses and is included in this discussion as a way of ensuring that all stakeholder perspectives identified by the analysis are shared – recognizing that it's possible that this view is shared by other Bass Lake landowners who did not complete the survey (although it is highly likely that this remains a minority viewpoint based on the response rate and efforts to reduce response bias). However, the small numbers of respondents that fall into this category mean that it's not possible for them to be included in the analysis of Application Section that follows these group descriptions.

Note: ***The small number of members in Group 4 prevents meaningful statistical comparisons for this group, so they have been excluded from the Application Section.***

What makes Group 4 unique?

Group 4 shares the perspective of Group 3 that challenges exist and Bass Lake water quality is in decline, disagreeing that the lake generally meets their needs. What sets this Group apart from Group 3 is their preference for highly maintained shoreline landscapes that is best seen in their strong agreement with the statement, "Developed shorelines with lawns to the water's edge have little impact on clean water quality in the lake" and "Vegetation in the water near shore prevents me from doing the types of activities I enjoy most."

FIGURE 14: Attitude-Defined Group 4



Group Demographic Differences

A number of different statistical analysis techniques are used in the development of the stakeholder profile. However, exploring key differences between stakeholder groups relies heavily on ANOVA tests to compare the differences in mean (or average) values across groups and determine if the differences in the mean scores are real (referred to as statistically significant). As shown below in Figure 15 a typical ANOVA table compares the difference between the attitude groups and in this case shows comparisons for gender, age, hunting, education, political orientation, income, and length of residence on Bass Lake. As shown in the right hand column below none of the mean scores for demographic characteristics of the four groups is significantly different (meaning that the significance value larger than .05). This means that even though Group 4 had a score indicating members are slightly more liberal than members of the other groups the difference is not large enough to suggest that a real difference exists for political orientation between members of the different stakeholder groups.

FIGURE 15: ANOVA Results for Demographics

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
What is your gender?	Between Groups	.307	3	.102	.526	.667
	Total	9.061	48			
Age in Years	Between Groups	90.398	3	30.133	.252	.859
	Total	5222.468	46			
Do you hunt?	Between Groups	.727	3	.242	1.063	.374
	Total	11.220	49			
What is your highest level of formal education?	Between Groups	1.135	3	.378	.177	.911
	Total	97.388	48			
How would you describe your political orientation?	Between Groups	9.314	3	3.105	2.380	.084
	Total	62.800	44			
What is your approximate annual income?	Between Groups	5.572	3	1.857	.938	.433
	Total	70.919	36			
How long have you owned property on (or near) Bass Lake?	Between Groups	2.238	3	.746	1.074	.369
	Total	34.180	49			

Application: Community Survey Results

The previous section describes how the stakeholder profile groups landowners together based on shared attitudes, which in this section are used to identify how to work with the different stakeholder groups on Bass Lake. By understanding the goals of each, who should contact each group, and how they'd like to be included in future decision making we can hope to improve community ownership of not only the plan, but also the long term challenge of ensuring that their lake remains in the condition that they desire.

Goals: Stakeholder priorities

Understanding the different goals that the stakeholder groups have for Bass Lake began by evaluating the combined responses for 10 lake characteristics from members Groups 1, 2, and 3 (ask explained above Group 4 has been excluded due to the small number of members preventing meaningful statistical comparisons). As shown in Figure 16 priorities are dispersed across most characteristics (without any really dominating other than controlling invasive species). It is worth noting that Group 1 members assigned no points to wildlife, Group 2 assigned no points to silent recreation, and Group 3 assigned no points to Fishing.

FIGURE 16: Lake Characteristics

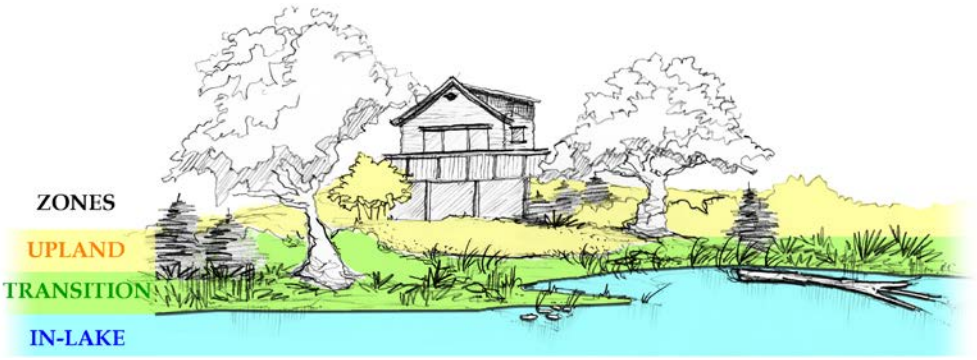
Lake Characteristics: Median Responses

The following section asks you to compare 10 lake characteristics by indicating the importance of each one compared to the rest of list. To do this we're asking you to assign 100 points among the items on this list. To indicate one item is more important to you than another you should allocate more points to it. You do not need to give points to all of the items, but remember that the total needs to equal 100.

	Group 1	Group 2	Group 3
Water clarity -- maintaining the ability to see clearly into the water	15.0	25.0	11.0
Lack of invasives -- controlling species like zebra mussels or Eurasian Watermilfoil	20.0	20.0	20.0
Wildlife -- increasing the diversity of wildlife seen on the lake	.00	10.0	10.0
Fish -- increasing the diversity of fish species and their habitats in the lake	8.0	10.0	10.0
Fishing -- increasing the quantity of fish caught	5.0	5.0	.00
Shore land buffers -- restoring natural shoreline to enhance water quality	10.0	5.0	10.0
Silent recreation -- enhancing conditions for swimming and no wake boating	5.0	.00	10.0
Nutrient management -- reducing storm water runoff to reduce algae blooms	12.5	5.0	10.0
Public access -- maintaining safe and appropriate boat landings	5.0	5.0	5.0
Aquatic plants -- protecting in-lake plant beds to help absorb excess nutrients	10.0	5.0	5.0
	TOTAL: 100		

Conservation Practices

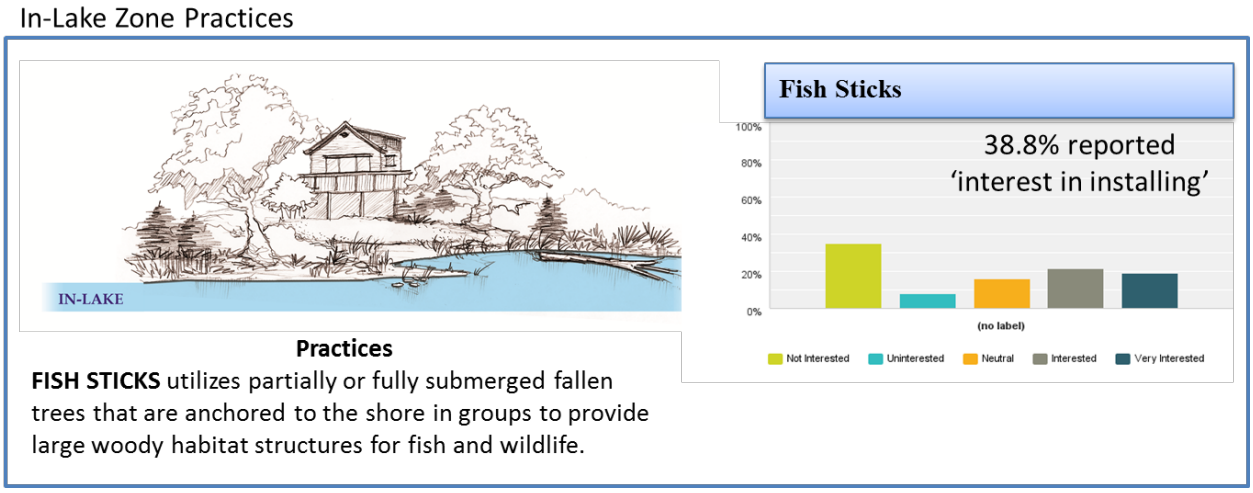
The conservation practices presented in the Bass Lake survey are those that are considered best practices for Upland, Transition, and In-Lake Zones of a lakeshore property (shown in the diagram below). More information about all of these practices can be found on the Wisconsin Healthy Lakes website, available at http://healthylakeswi.com/



In-Lake Zone Practices

This section examined one practice, Fish Sticks, that uses fallen trees to create structure for fish and wildlife along a shoreline -- more details are provided in Figure 17.

FIGURE 17: In-Lake Practices

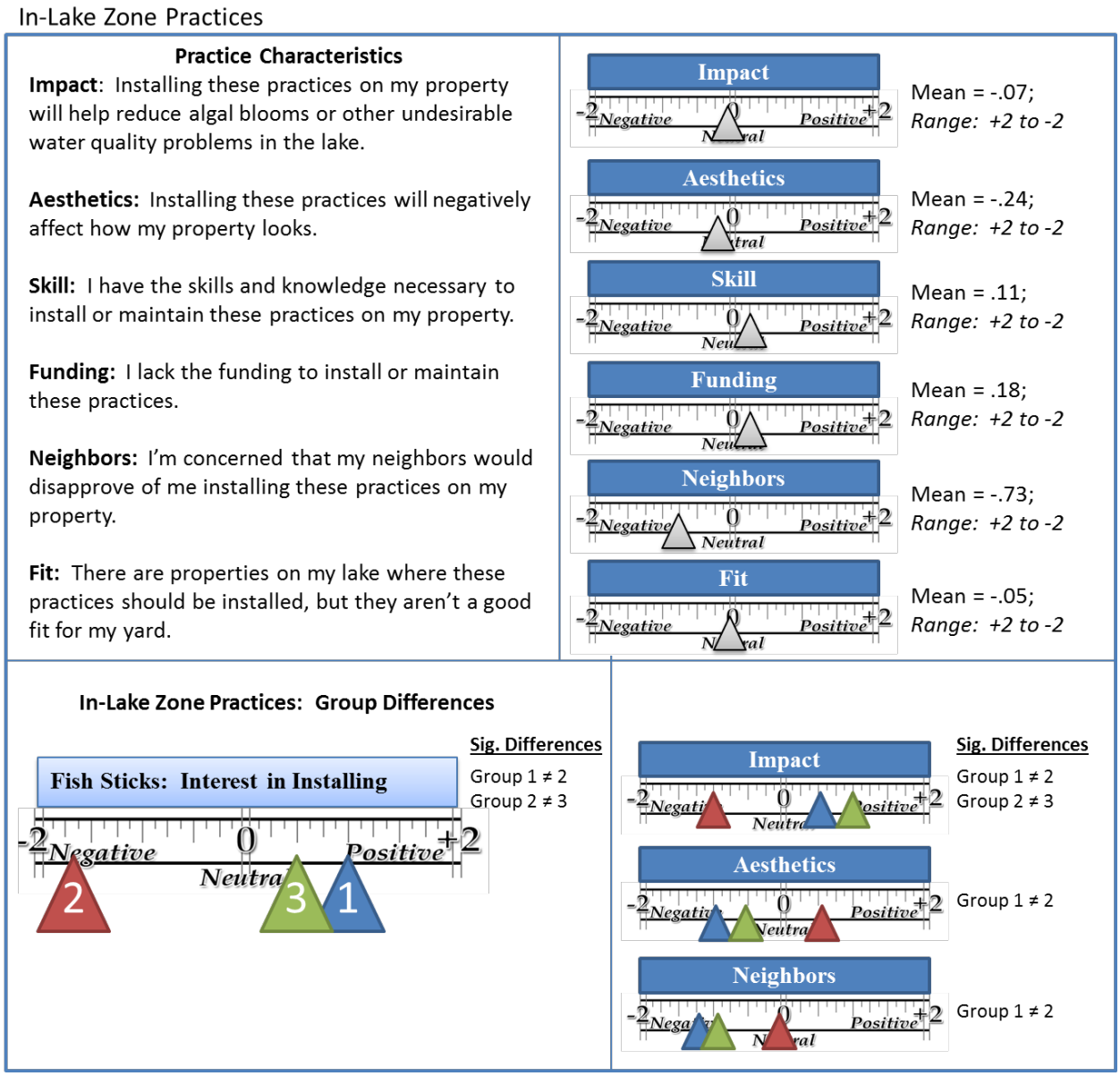


What do we know about In-Lake Zone Practices?

While nearly 40 percent of respondents indicated that they were interested in fish sticks, a big difference was observed between the groups (see Figure 18) with Group 2 members reporting nearly uniformly that they are 'not interested'. The concerns of Group 2 seem to be related to

the aesthetics of installing this practice along the shoreline and a percieved lack of impact on improving water quality. Also, it is clear among all respondents that the benefits of this practice aren't strongly associated with reduction water quality problems.

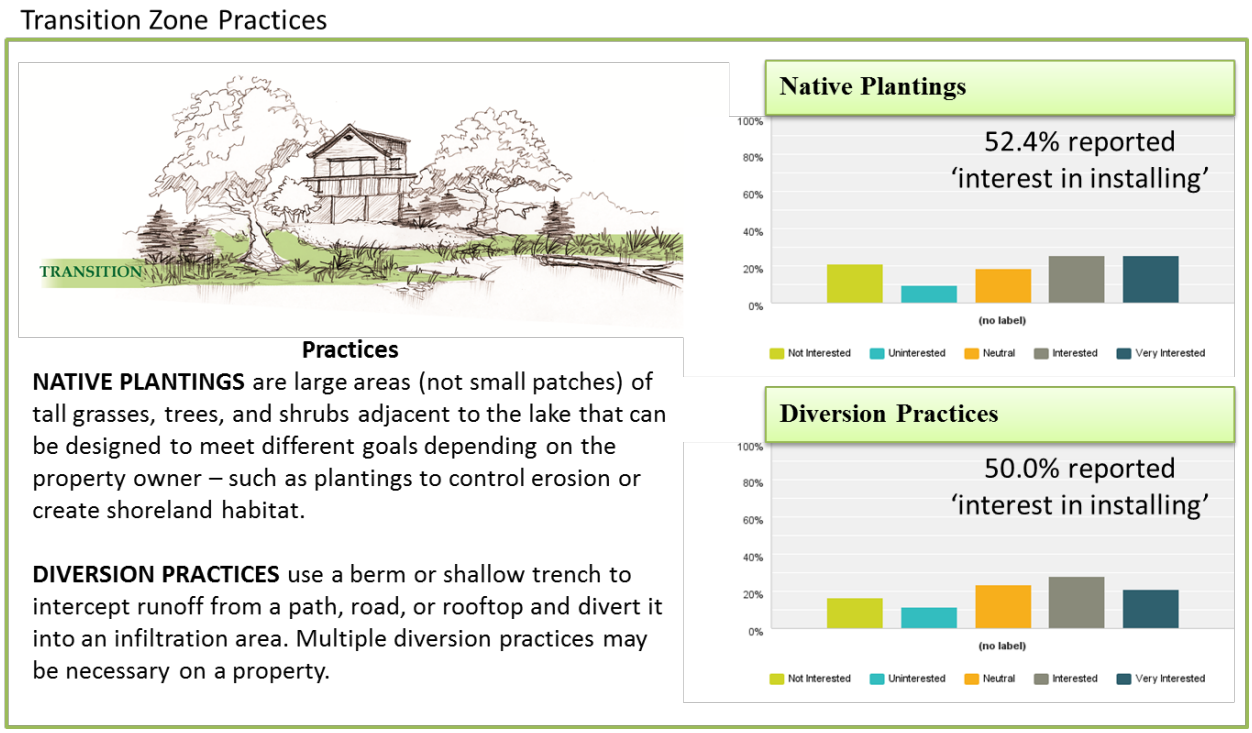
FIGURE 18: In-Lake Practices (group differences)



Transition Zone Practices

The emphasis on the area between the water and upland areas (typically nearer to the house) is largely due to the transition zone's role in dissipating wave energy from the water and managing upland runoff that can result in erosion damage to a shoreline property. The practices examined in this section address different parts of these concerns as native plantings can be designed to address both challenges, while diversion practices are better suited for runoff control.

FIGURE 19: Transition Practices



What do we know about Transition Zone Practices?

Strong interest in the transition zone practices is consistent with what was learned from the "shoreline landscape preference" variable that suggests that most Bass Lake landowners are supportive of some level of natural landscaping in their yard. Among all respondents we see in Figure 20 that they see these practices as having a positive impact, that they will improve the look of their landscape (disgree that it will netatively affect the look), have the skill needed to install and maintain, and believe their neighbors will approve. Much like was observed with the In-Lake Zone practices though, Group 2 members are not interested in these practices – disagreeing with other landowners that they will improve water quality conditions, believeing that they will negatively affect the look of their landscape, and reporting that they are more conerned their neighbors will disapprove of their installation.

FIGURE 20: Transition Zone (group differences)

Transition Zone Practices

Practice Characteristics

Impact: Installing these practices on my property will help reduce algal blooms or other undesirable water quality problems in the lake.

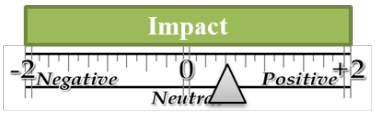
Aesthetics: Installing these practices will negatively affect how my property looks.

Skill: I have the skills and knowledge necessary to install or maintain these practices on my property.

Funding: I lack the funding to install or maintain these practices.

Neighbors: I'm concerned that my neighbors would disapprove of me installing these practices on my property.

Fit: There are properties on my lake where these practices should be installed, but they aren't a good fit for my yard.



Mean = .36;
Range: +2 to -2

Mean = -.51;
Range: +2 to -2

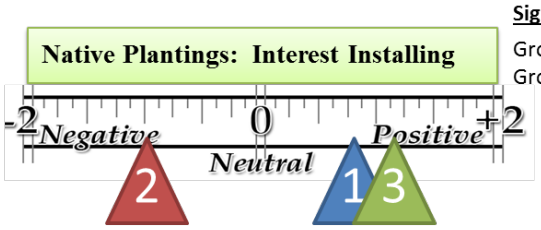
Mean = .28;
Range: +2 to -2

Mean = .24;
Range: +2 to -2

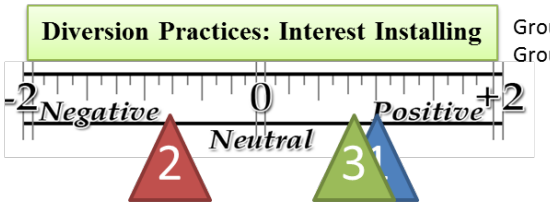
Mean = -1.04;
Range: +2 to -2

Mean = -.04;
Range: +2 to -2

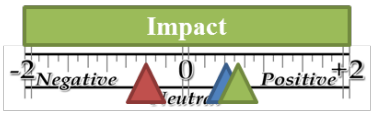
Transition Zone Practices: Group Differences



Sig. Differences
Group 1 ≠ 2
Group 2 ≠ 3



Group 1 ≠ 2
Group 2 ≠ 3



Sig. Differences
Group 1 ≠ 2
Group 2 ≠ 3

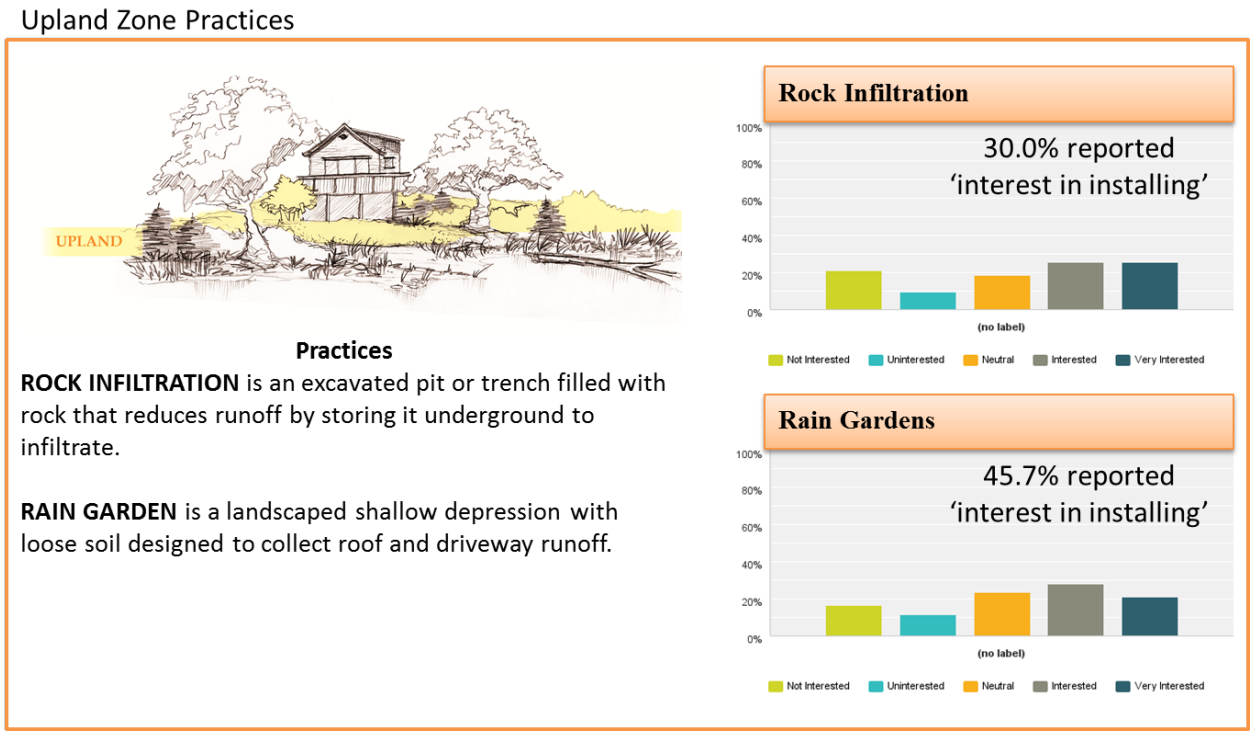
Group 1 ≠ 2
Group 2 ≠ 3

Group 1 ≠ 2

Upland Zone Practices

The practices that can be put into place around the home, driveways, or to address runoff from access roads fall into the upland areas of the property. The survey focused on only 2 practices, although there are a number of other options available to landowners that could achieve the same goal of slowing water down, increasing infiltration, and protecting the shoreline and water from upland runoff.

FIGURE 21: Upland Practices



What do we know about Upland Zone Practices?

Overall there is less interest in these practices than for transitional zone practices, although Rain Gardens still had a strong positive response. Similar trends are observed for practice characteristics (Figure 22) as were seen for Upland Zone practices with Groups 1 and 3 seeing these as having a positive impact on water quality and the look of their property's landscape. Group 2 again does not see these benefits and also on average they agree that there are properties on the lake where they should be installed, but not in their yard. There is one positive in the Upland Zone for Group 2 as they reported a much higher level of interest in Rain Gardens than for any of the other practices asked about in the survey.

FIGURE 22: Upland Practices (group differences)

Upland Zone Practices

Practice Characteristics

Impact: Installing these practices on my property will help reduce algal blooms or other undesirable water quality problems in the lake.

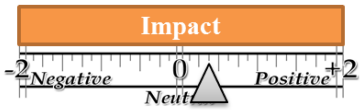
Aesthetics: Installing these practices will negatively affect how my property looks.

Skill: I have the skills and knowledge necessary to install or maintain these practices on my property.

Funding: I lack the funding to install or maintain these practices.

Neighbors: I'm concerned that my neighbors would disapprove of me installing these practices on my property.

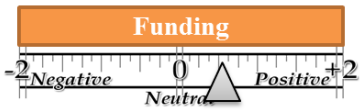
Fit: There are properties on my lake where these practices should be installed, but they aren't a good fit for my yard.



Mean = .24;
Range: +2 to -2

Mean = -.67;
Range: +2 to -2

Mean = .07;
Range: +2 to -2

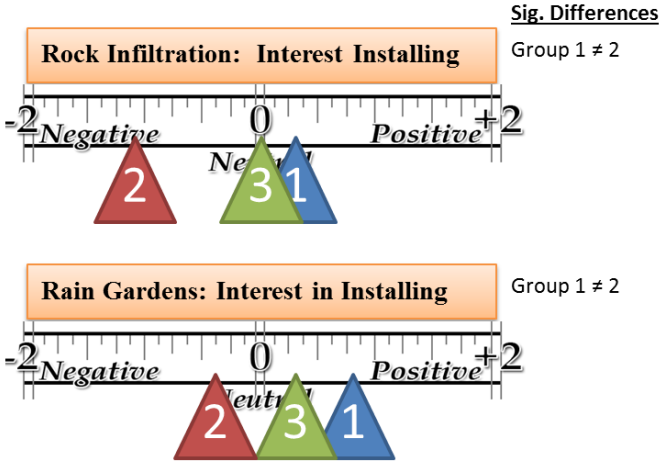


Mean = .32;
Range: +2 to -2

Mean = -.93;
Range: +2 to -2

Mean = -.19;
Range: +2 to -2

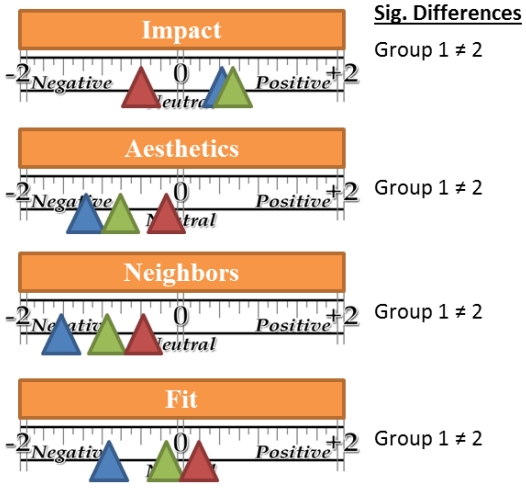
Upland Zone Practices: Group Differences



Sig. Differences

Group 1 ≠ 2

Group 1 ≠ 2



Sig. Differences

Group 1 ≠ 2

Group 1 ≠ 2

Group 1 ≠ 2

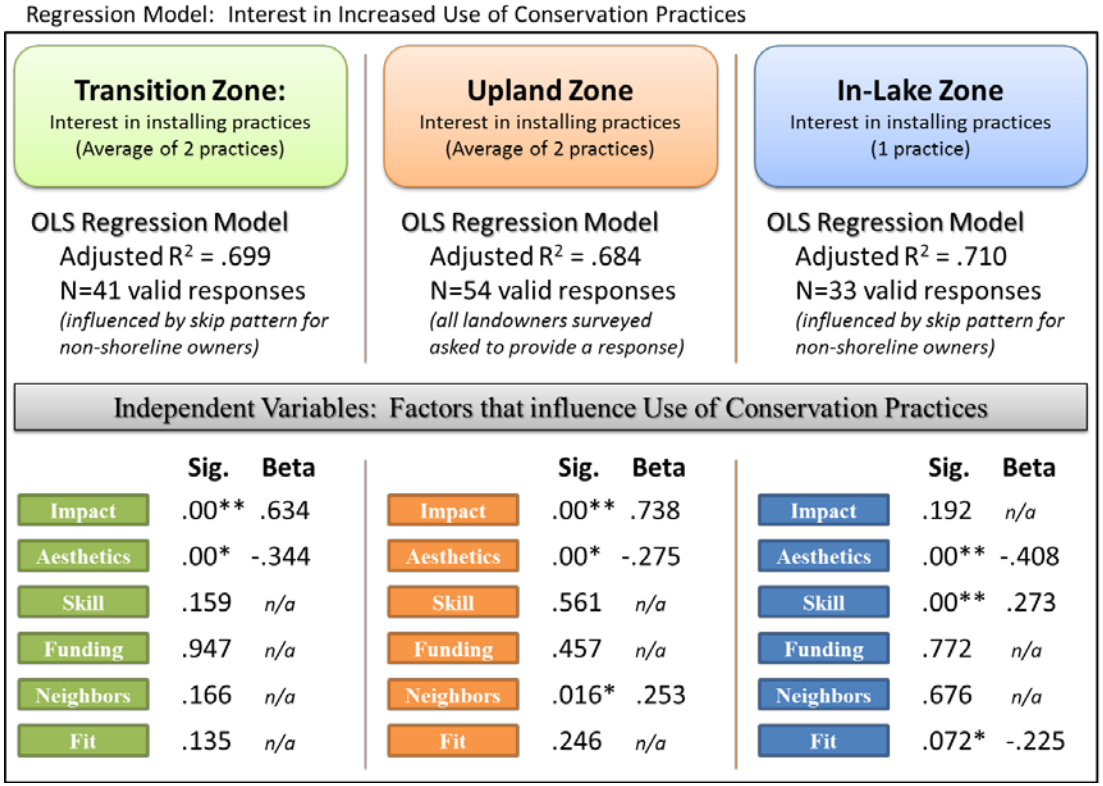
Group 1 ≠ 2

Factors Influencing Practice Adoption

The regression models performed well explaining around 70 percent of the variation in each (represented by the adjusted R^2). Results revealed the following characteristics influence practice adoption:

- **Transitional Zone Practices:** Adoption is most strongly influenced by perceived impact of the practice on reducing water quality problems, additionally the more that someone believes it will negatively affect the look of their yard the less likely they are to adopt.
- **Upland Zone Practices:** Similar to the transitional zone, impact and aesthetics play a large role in practice adoption. However, the disapproval of neighbors is also significant although difficult to explain as disapproval is show to support higher levels of interest in practice adoption.
- **In Lake Zone:** The use of fish sticks is most strongly influenced by the aesthetics with landowners who feel this will negatively affect how their property looks being less likely to adopt. Additionally, the perception that they have the skills needed to implement positively influences adoption and those that believe that this practice is better suited for somewhere else on the lake (not my property) are less likely to adopt as well.

FIGURE 23: Behavioral Modeling

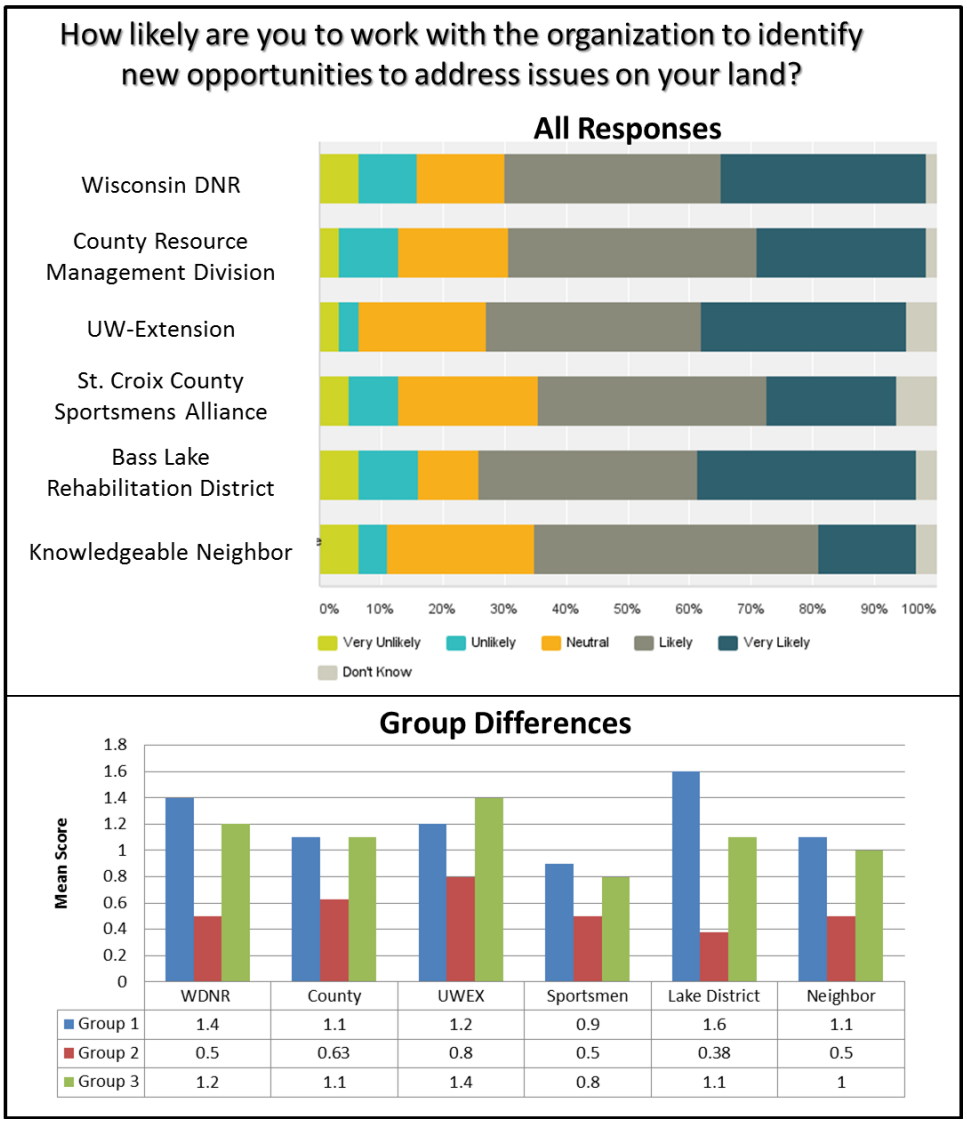


In order to understand the impact of the six studied characteristics of practices (impact, aesthetics, skill, funding, neighbors, and fit) have on conservation practice adoption a multiple regression (OLS) behavioral modeling approach was used.

Contact: Who do they trust?

Overall landowners around Bass Lake are very willing to work with many different partners, including WDNR, County Resource Management Division, UW-Extension, and Bass Lake Rehabilitation District with the highest positive willingness reports.

FIGURE 24: Trust



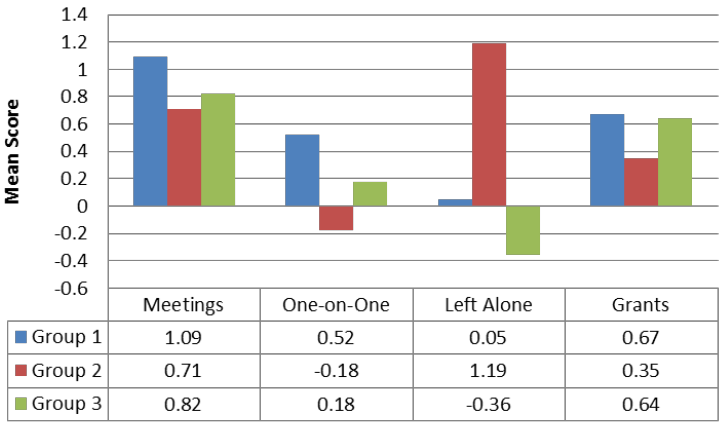
	WDNR	County	UWEX	Sportsmen	Lake District	Neighbor
Group 1	1.4	1.1	1.2	0.9	1.6	1.1
Group 2	0.5	0.63	0.8	0.5	0.38	0.5
Group 3	1.2	1.1	1.4	0.8	1.1	1

Group Differences: No significant differences were identified between the attitude groups; however, the graph in Figure 24 does show that Group 2 is less willing to work with all partners than members of Groups 1 or 3.

Approach

The survey revealed strong support for continued use of meetings, newsletters, or other enhanced communication efforts to help inform all stakeholders about what is being done to address water quality on Bass Lake. There is mixed support for other approaches with the second most supported option being access to grant funding for installing conservation practices.

FIGURE 25: Approaches to Move Forward



	Meetings	One-on-One	Left Alone	Grants
Group 1	1.09	0.52	0.05	0.67
Group 2	0.71	-0.18	1.19	0.35
Group 3	0.82	0.18	-0.36	0.64

Moving forward I would prefer...

Meetings ... to know more about what's being done to address water quality around Bass lake through regular newsletters or meetings.

One-on-One ...to have the opportunity to meet one-on-one with someone who can help me understand what steps I need to take on my property to improve water quality.

Left Alone ...to simply be made aware of any water quality issues and left alone to handle my property.

Grants ...to have access to small grants or discounts on materials to support installing practices on my property to improve water quality.

Group Differences: The only statistically significant difference for the approach questions is that members of Group 2 reported that they would like to "simply be made aware of any water quality issues and left alone to handle my property" at a much higher level of agreement than members of either Group 1 or Group 3. This was their most supported option, which is also supported by their negative mean score for meeting one-on-one with someone to discuss management of their property.

Collaboration: Working Together for Bass Lake Improvement

The survey responses and resulting stakeholder profiles provide a lot of information about the groups who live, work, and recreate on Bass Lake. Shedding light on similarities and differences is important for efforts to address water quality challenges, so how can we use this information to inform future action? As an initial starting point this report highlights 3 key findings based on the survey results.

Key Finding #1 – Lacking a call to action

The community perspectives (distinguishing variable #1) demonstrate a real challenge for efforts to improve conditions on Bass Lake. Nearly 75 percent of all survey respondents (those in Stakeholder Groups 1 and 2) agree that conditions today are acceptable and that Bass Lake is in better shape than other area lakes. This is supported by the assessment of current conditions that revealed that 51.0 percent of survey respondents believed that water quality is either the same today or is improving (and only 38.8 percent believe it has declined). However, the survey analysis reveals a pronounced difference of opinion between this dominant perspective and those held by members of Group 3 (and the small membership of Group 4), whose views of declining water quality and need for immediate action is best summed up by the member quote below.

> ***"We owe it to future generations to leave the lake better then we found it. More people living on the lake and using it increases the pressures on the resources. Everyone has to give a little and not think only of their own interests."*** *– Member of Group 3*

Calling attention to this contrast isn't intended to suggest that either perspective is inaccurate or more valuable than the other; these are broadly held beliefs (although some more widely shared than others) about Bass Lake from those that know this lake best. Often, perception of poor or declining water quality serves as the call to action for a water community. In the case of Bass Lake the vast majority of landowners are comfortable with the current state of their water, which calls to attention the need for a visioning process for Bass Lake landowners – what is their desired future condition for the lake and is it simply to maintain the conditions as they are today?

Key Finding #2 – Conservation Practices: Proving Impact

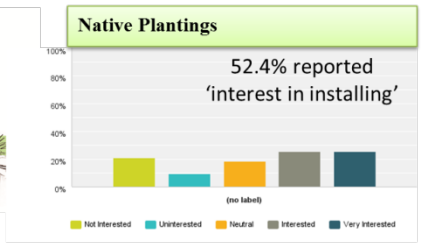
Survey respondents reported a high level of interest in Transition Zone practices, including native plantings and diversion practices, which could address upland runoff into the lake and reduce erosion. These practices that have broader appeal can serve as a way to reach many landowners interested in taking some beginning steps toward increased natural landscapes on the shoreline, which the survey revealed is supported by all Stakeholder Groups. Additionally, the description of what influences adoption of In-Lake Zone, Transition Zone, and Upland Zone practices provided on pages 25-31 can help with more developing strategies for increasing adoption of more advanced practices like fish sticks and rain gardens.

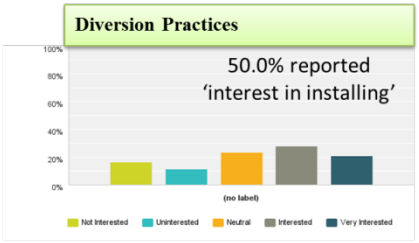
Transition Zone Practices

Practices

NATIVE PLANTINGS are large areas (not small patches) of tall grasses, trees, and shrubs adjacent to the lake that can be designed to meet different goals depending on the property owner – such as plantings to control erosion or create shoreland habitat.

DIVERSION PRACTICES use a berm or shallow trench to intercept runoff from a path, road, or rooftop and divert it into an infiltration area. Multiple diversion practices may be necessary on a property.





What will it take to get increased conservation practice adoption?

- Demonstrating the impact of a practice to improve water quality – the survey suggests that we may need to rethink how to approach recruitment, especially as it likely requires land management changes on multiple properties to realize significant changes in water quality. Conservation practice implementation efforts may need to focus on working with neighboring landowner groups for implementation rather than just with individual property owners in order to concentrate efforts and demonstrate the impact.
- The influence of funding availability was notably absent from the regression model results, and while we know that this is a factor as an individual landowner moves into the 'project phase' of implementation it is noticeably different at the decision stage. It is also important to note that nearly half of survey respondents reported annual income greater than $100,000, but still most do their own landscape maintenance – perhaps teaching practices that result in a reduction in maintenance time is equally important to advertising grant funding for new shoreline landscape practices.

Key Finding #3 – Moving Forward

The results are clear that Bass Lake landowners care about their lake and many are willing to engage in efforts to improve conditions. One of the real strengths is the willingness to work with all partners, which increases the ability to bring quality advice and programming to Bass Lake to support their efforts. Support for approaches for moving forward varied across the four alternatives presented within the survey; however, additional opportunities to communicate with one another (meetings, newsletters, etc.) were broadly supported by all stakeholder groups. Also, while we saw that funding wasn't strongly influencing decisions to adopt conservation practices there is a need identified by all 3 groups that access to small grants are likely a necessary component of seeing these practices installed on the landscape.

One challenge did emerge from the survey analysis as one-third of all landowners (Group 2) strongly agreed that they would like to simply be made aware of the issues and then left alone to manage their properties. This desire can be difficult to achieve in the implementation phase of a lake management plan as it is contrast with the 41.0 percent of all landowners who specifically asked for someone to come out and meet with them to discuss steps that could be taken on their property to improve water quality. Balancing these competing ways that landowners would like to be involved will be a complex task and require a well-designed outreach effort, perhaps one utilizing neighbor to neighbor communication to identify property owners interested in taking steps on their land prior to direct engagement attempts.

References

Dillman, D.A., Christian, L.M., Smyth, J.D. 2000. Internet, mail, and mixed mode surveys: The tailored design method. Wiley, John & Sons, Inc. 1.

Thompson, Aaron, Dumyahn, S., Prokopy, S., Amberg, S., Baumgart-Getz, A., Jackson-Tyree, J., Perry-Hill, R., Reimer, A., Robinson, K., Saylor, A. (2013). Comparing Random Sample Q and R Methods for Understanding Natural Resource Attitudes. Field Methods 25 (1): 25-46.

Appendix B. Summary of Past Lake Studies

Voss, Karen. *Shoreland Development and Land Uses on Bass Lake, St. Croix County Summary Report.* October 1990.

Inspections were conducted from April to June 1990. Of 118 total parcels, there were 102 with developed home sites or developed access for more distant homes. The report identified structures that had apparent violations and the type of violation. It also recorded vegetation in the near shore area and described access to the lake by category. Specific concerns such as cattle and horse pastures and eutrophic ponds were identified. Inspection questionnaire/information and site sketches are included in notebook with the report.

Wisconsin Department of Natural Resources, West Central Regional Planning Commission. *Phase I Diagnostic and Feasibility Study for Bass Lake St. Croix County, Wisconsin.* August 1992.

This is a 97 page report plus associated data, tables, and figures. It includes information about the lake location, geology, public access, lake users, historical use and development, a watershed land use assessment, limnological data, and lake and watershed hydrology. A phosphorus budget is developed and presented. Aquatic plant survey results are included in the report. Nutrient loads from various land use scenarios were used to predict impacts on lake trophic state.

An extensive residential development and shoreland zoning audit was conducted as part of this project. It included an evaluation of conformance with zoning regulations and historical permits for each lot. A sketch was made of each lot. A septic system survey evaluated whether systems were in compliance, seasonally failing, or failing.

Recommendations included *(updates in italics)*:

1) Development and implementation of a comprehensive nonpoint pollution control program.
   A. Participation in the Nonpoint Source Pollution Abatement Program *(Lakes Cluster Priority Watershed Project completed 1998-2009?)*
   B. Develop stormwater management regulations, construction site erosion control ordinances, and development limits in critical areas.
   C. Survey farm owners and recommend BMPs to limit nutrients in agricultural runoff.

2) Relocate cattle from pasture at northwest end of Bass Lake. *(Rehabilitation District paid for fencing beginning in the late 1980s. Pasture land purchased by St. Croix County December 15, 2015.)*

3) Relocate horses from pasture on east side of the lake.
4) Study nutrients from septic systems on the east side of the lake.
5) Correct identified failing or seasonally failing septic systems *(Letters went out in May 1994, no update of progress from these letters).*

6) Reduce runoff from residential development. Use educational meetings and materials. Hire a consultant to provide technical assistance where needed.
7) Require inspection and certification of septic systems prior to additions.
8) Strengthen shoreland zoning permit and enforcement process.
9) Conduct water quality monitoring on pond receiving runoff from cattle barnyard on the northeast end of the lake.
10) Survey between this pond and the lake to see when/if the pond will overflow to the lake.
11) Encourage retention of brush and vegetation below the ordinary high water mark. Educate landowners.
12) Develop effective strategies for enforcing and implementing new regulations.

Wisconsin Department of Natural Resources, West Central Regional Planning Commission. *Phase I Diagnostic and Feasibility Study Citizen Summary for Bass Lake St. Croix County, Wisconsin.* June 1992.

The citizen summary is a shorter version of the full report at 29 pages. It includes an overview of study findings and recommendations with a proposed implementation schedule.

St. Croix County Zoning Office. *Letters to residents with failing or seasonally failing septic systems (copies).* May 1994.

Copies of letters sent to the owners of 14 properties identified in the septic system survey as having either failing or seasonally failing septic systems. (Table 15.2.1 in feasibility study shows 5 failing and 12 seasonally failing.) The letters direct owners to correct the situation by August 1994 or face citations and fines.

Wisconsin Department of Natural Resources. Wisconsin Department of Agriculture, Trade and Consumer Protection, St. Croix County Land Conservation Department and Polk County Land Conservation Department. *Nonpoint Source Control Plan for the St. Croix County Lakes Cluster Priority Watershed Project.* April 1997.

Includes results of watershed inventories and outlines available technical and financial assistance for best management practices. Lake to watershed ratio is 1:6. During watershed inventory there were record high water levels flooding timber and roads. Bass Lake has good water quality. Fluctuating water levels cause management concerns and slow-no wake ordinance was implemented in 1995 during a time of high water levels. Changes in the aquatic plant community especially loss of emergent species due to flooding was an identified concern. Project funding was available through 2009.

Bass Lake Watershed

Land Use	Acres	Percentage of Watershed
Crop	912	32
Pasture	258	9
Natural Area	224	8
Wetland	65	2
Forest	470	17
Developed	411	15
Open Water	484	17
Total	**2824**	100

Bass Lake Inventoried Phosphorus Load

Nonpoint Source	P Load (lbs.)	% of Total
Uplands	83	12
Gullies	5	<1
Shoreline	242	34
Barnyards	14	2
Residential	149	21
Precipitation	102	14
Groundwater	118	17
Total	**713**	100

Shoreline erosion was a very high contributor to the lake phosphorus budget during the inventory for the watershed plan. Phosphorus inputs from shoreline erosion were expected to decline with declining water levels.

Goals for Perch and Bass Lake

Maintain and enhance current good water quality conditions

Protect and improve shallow water and terrestrial habitat along shoreline

Protect and enhance existing aquatic plant beds

Protect and restore wetland habitat (only one prior converted wetland in the watershed)

Maintain or moderately improve the fishery

Objectives

Reduce phosphorus runoff from residential areas by 50%

Reduce phosphorus from shoreline erosion by 50%

Protect groundwater by installing best management practices

Wisconsin Department of Natural Resources. *Priority and Priority Lake Program Final Report. St. Croix Lakes Cluster. Draft.* December 31, 2008.

Bass Lake Rehabilitation District, St. Croix County Land & Water Conservation Department, St. Croix County Sportsmen's Alliance, WI Department of Natural Resources. *Bass Lake Management Plan 2009.*

Establishes the following management goals for Bass Lake:

GOAL I: Protect water quality, prevent the occurrence of algae blooms and reduce nutrient levels in Bass Lake.

GOAL II: Protect and improve the diverse aquatic life of Bass Lake;

including a self sustaining fishery and diverse aquatic plant community.

GOAL III: Protect and restore healthy, stable shoreland habitats.

GOAL IV: Prevent the expansion and new infestations of invasive species.

GOAL V: Provide safe and multifaceted recreational opportunities.

Each goal includes a brief description and planned management actions. See progress report summary below for a description of actions implemented from 2009-2015.

The plan also includes an overview of lake information:

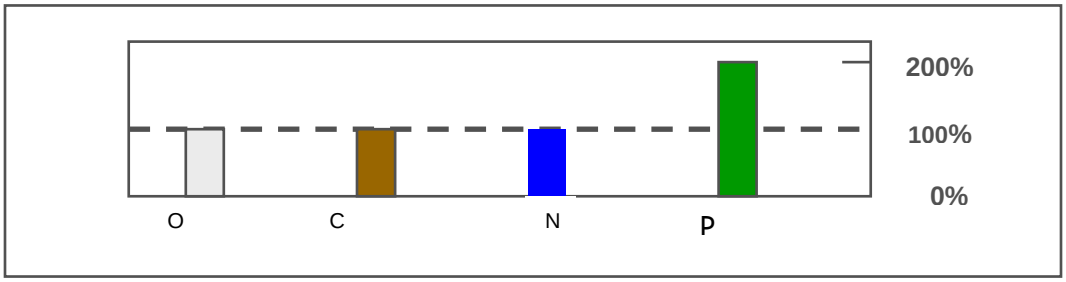
- *Water quality*
- *Land use*
- *Water quality monitoring*
- *Fisheries*
- *Aquatic plants*
- *Sensitive areas*
- *Eurasian watermilfoil*
- *Lake levels*
- *Bass Lake District survey results*

Appendix C. Understanding Lake Information

To help understand the water quality study results in this plan, an introduction of limnology - the study of lakes - follows.

Importance of Phosphorus

The two nutrients of greatest interest in lakes are nitrogen and phosphorus. Both are required for plant and algae growth, but phosphorus is the most common limiting nutrient in lakes. "Limiting" means that of all nutrients available, phosphorus will be the first to run out and therefore limit plant growth. Therefore, increasing phosphorus can result in increases in plant and algae growth. Because algae absorb phosphorus directly from the water column, they will often respond most dramatically to increases in phosphorus availability.



This graph shows the resultant algae growth by adding 0.05 micrograms per liter (ppb) of each nutrient in an unproductive (low nutrient) lake[29]. As can be observed in the graph, in a phosphorus-limited lake, raising the phosphorus by 0.05 micrograms per liter can double the algae growth while there is no increase with addition of the other nutrients. In a lake setting, increasing phosphorus content by l pound can result in 500 pounds of algae growth.

Aquatic plants will also respond to increases in phosphorus, but many are rooted and absorb the phosphorus from the sediment. As a result, they may not reflect increases in phosphorus concentrations in the water as quickly (except for plants such as coontail which doesn't need to root).

Forms of Phosphorus

Phosphorus usually exists in the form of phosphate (PO_4^{-3}). Phosphate can exist in various forms: organic, inorganic, soluble, and insoluble. The first important form is referred to as soluble reactive phosphorus (SRP) - a common form of phosphorus in fertilizers. This form is dissolved readily in the water and is immediately available for plant and algae growth.

The second important form is total phosphorus (TP). This is the measurement of all forms of phosphorus in the water. Total phosphorus is important because it reflects the amount of phosphorus potentially available for plant and algae growth. Phosphorus has a propensity to bind to sediments. If an increased amount of sediment is introduced in a lake, the TP will most likely rise as well. Phosphorus can also be contained in the tissue of microorganisms and algae

[29] From *Water on the Web*. University of Minnesota. 2008.

which would also be reflected in TP. A high TP value does not necessarily indicate immediate algae growth, since some or much of the total phosphorus may not be in the usable, SRP form.

If a large amount of the TP in runoff to the lake is SRP, it is most likely coming from sources such as sewage, fertilizers, and manure. If the TP has very little SRP in it, then most of the phosphorus is in other forms such as those tied to sediment or present in plant tissue. Phosphorus in an unusable form must be converted by biological or chemical reactions before it is available as SRP.

Sources of Phosphorus

Phosphorus can come from many sources. Any tissue or waste from living or once living organisms can be a source of phosphorus. Therefore, any human or animal waste (from septic systems and manure) contains phosphorus. Any leaves or grass clippings can also contain phosphorus. Decomposition of dead plants and animals releases phosphorus.

As mentioned earlier, phosphates tend to bind to sediment. Whether water carrying sediment runs directly from the land into the water, or is carried in streams to the lake, it is a source of phosphorus. High levels of erosion can create significant phosphorus loads.

Phosphorus is also concentrated in raindrops. Raindrops pick up dust and other particulate matter in the air and deposit the phosphorus into the lake as precipitation. In many lakes, this can be a significant source of phosphorus, especially in more pristine lakes that receive little phosphorus from other sources.

As precipitation hits the land around the lake (the watershed), some of the rain will infiltrate into the soil and some will run-off. As the water runs off of the land, it can pick up sediments, dead and living matter, and dissolved forms of phosphorus. When this water reaches the lake, it brings the phosphorus with it. The amount of rain, soil type, the topography, and the degree of vegetative cover will affect the concentration of phosphorus carried in runoff water. When the land is covered with forest, the soil is more stable. The raindrops dissipate and infiltrate into the soil, and therefore, the runoff volume and phosphorus content is low. On the contrary, a row crop field such as a cornfield will not dissipate the raindrops, and the exposed soil will be much less stable. This results in increased erosion and runoff volume and therefore, higher phosphorus concentration and higher phosphorus loads into the lake.

Another source of phosphorus in a lake is the release from the lake bottom sediments. As decomposers break down the dead organic matter in the lake bottom sediment, phosphorus is released. Much of the sediment in lakes will bind phosphorus just as on land. The major contributor to this binding is iron. When iron is in high enough oxygen conditions, it has a +3 charge and therefore binds the phosphate (which has a -3 charge) forming an insoluble particle and remaining in the sediment. When the oxygen content decreases, the iron is reduced to a +2 charge, becomes soluble, and tends to release the phosphate ions. As a result, the sediment can release very large amounts of phosphorus into the water column. Phosphorus release occurs at a threshold of low dissolved oxygen – referred to as anoxia - of 1 mg/l or less. The length of time the sediment is anoxic and the size of the area that goes anoxic determines the amount of

phosphorus released. Release of phosphorus from lake bottom sediment is one component of the lake's internal load.

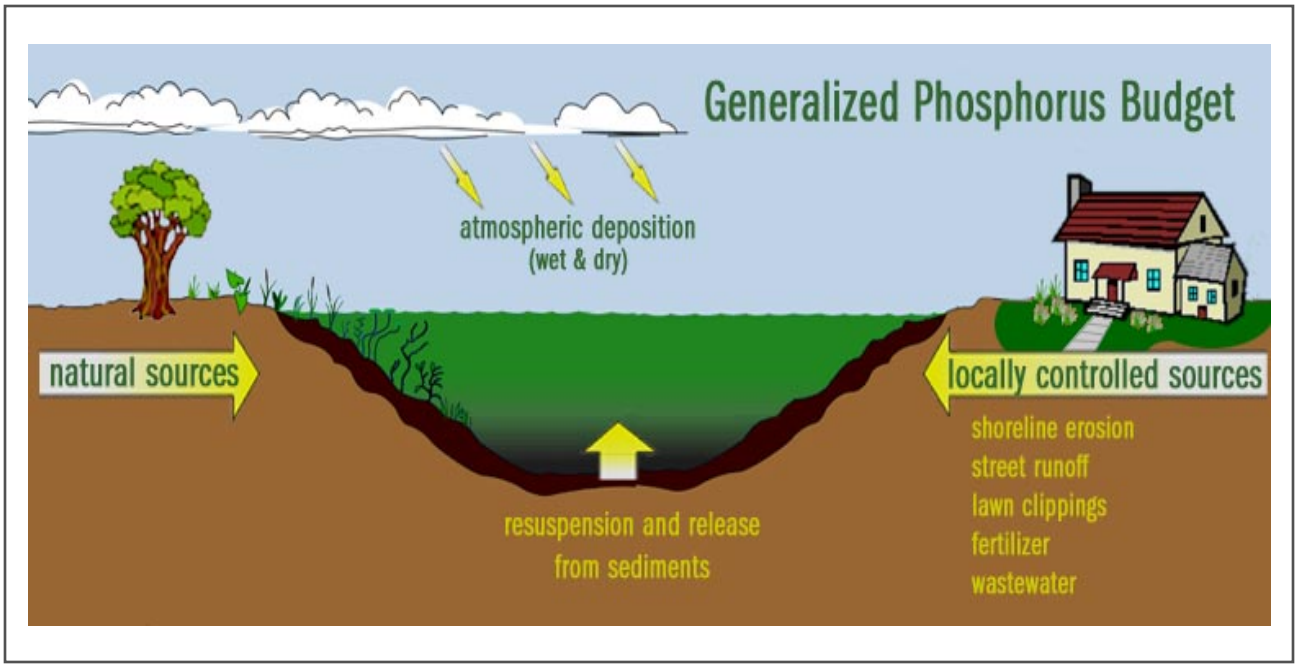
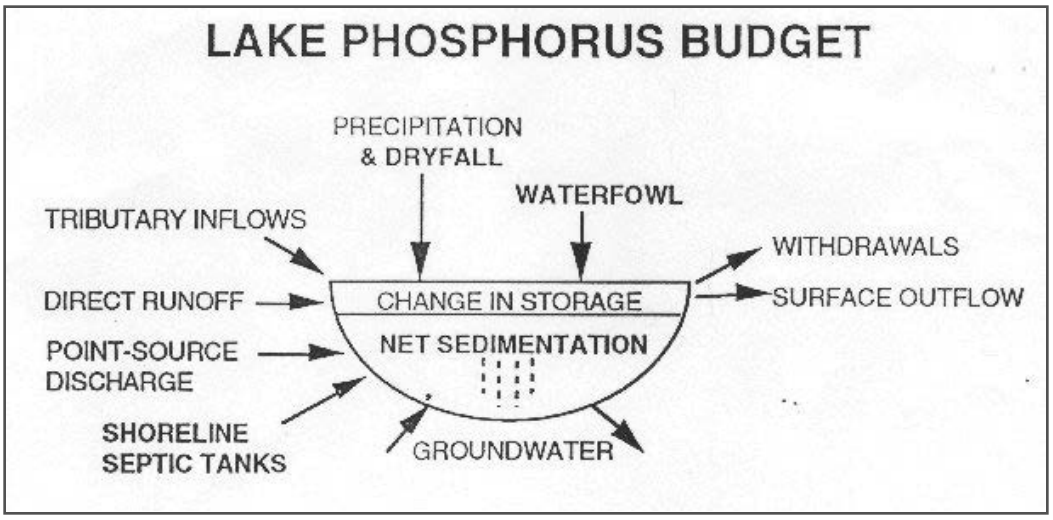


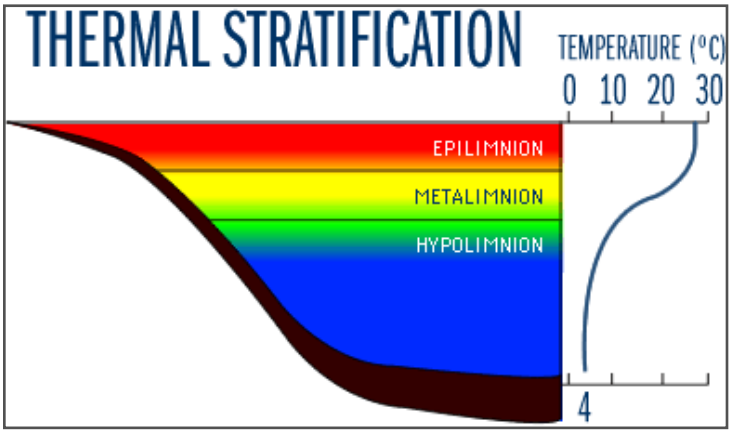
Figure obtained from "Water on the Web" (www.waterontheweb.org) an educational website of the University of Minnesota.

A summary of the phosphorus sources and losses are outlined in the diagram below. [30]



In many cases, a lake will stratify during the summer months. When a lake stratifies, the colder water stays on the bottom (hypolimnion) of the lake while the warmer water remains on the surface (epilimnion). If this stable situation remains, the lake water does not mix. The phosphorus released from the bottom sediment (where low oxygen levels occur) remains in the hypolimnion until the lake turns over in the fall. If the lake is weakly stratified, the lake may mix prior to the fall turnover. With anoxic conditions that release phosphorus, phosphorus will be mixed into the water column where it is available for uptake by algae.

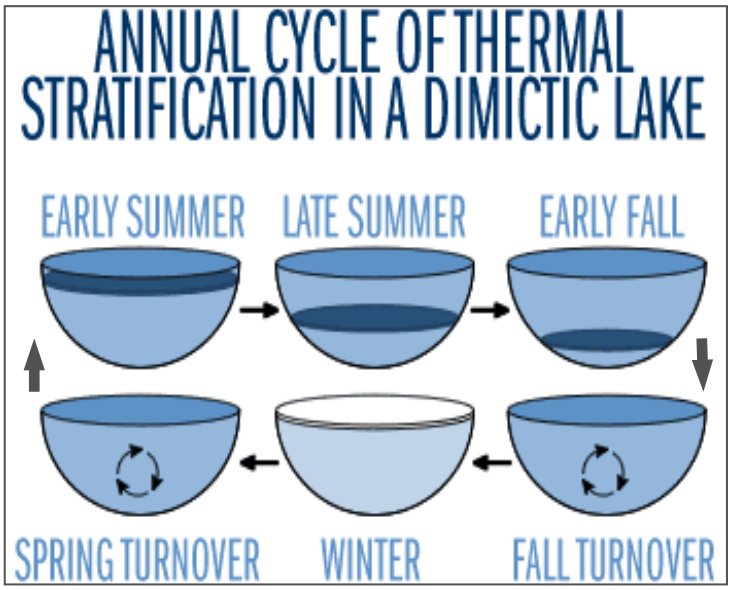
Photosynthesis and wave action are major contributors of oxygen to a lake. However, when a lake stratifies, there is no opportunity for oxygen to get to the bottom of the deep portions of the lake. On the bottom, microorganisms will use and deplete the oxygen during respiration. If the lake does not mix and has no photosynthesis, the lake will tend to reach anoxic conditions. The rate of stratification and the rate of respiration (from breaking down organic matter) will determine how early in the summer the lake will go into anoxia on the bottom.



As the water cools in the fall, that water becomes denser and sinks, mixing the lake. This process is called fall turnover. When the lake freezes, the ice floats. In the spring when the ice melts, the

[30] From *Water on the Web*. University of Minnesota. 2008.

cold water sinks, again mixing the lake (spring turnover). If anoxic conditions occurred during the summer months, a phosphorus load will usually be released in the water column during fall turnover.

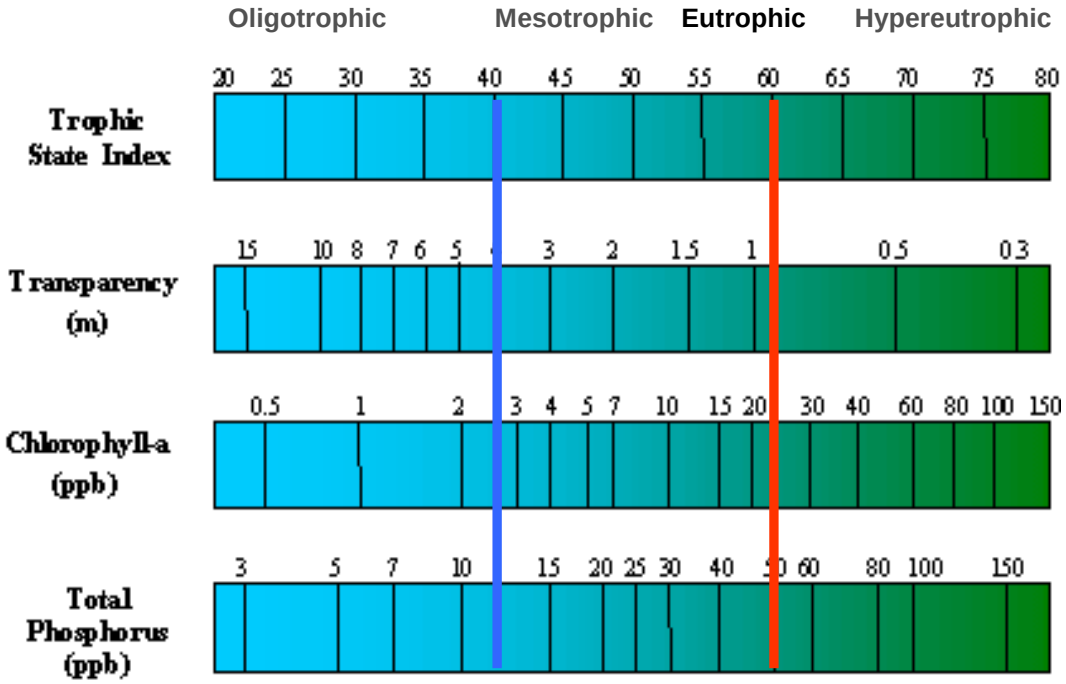


Trophic State

Trophic state describes the productivity of a lake. The least productive lakes are oligotrophic. The most productive lakes are referred to as eutrophic. Those in the middle are called mesotrophic. The more nutrients available in a lake, the more productive the lake will be. If a watershed with little runoff and phosphorus loading surrounds a lake, the water will tend to have low phosphorus levels. This will result in limited plant and algae growth, causing it to be classified as an oligotrophic lake.

Trophic state (the Carlson Trophic State Index) can be based upon three measurements: total phosphorus, secchi depth, and chlorophyll a. If the phosphorus is high, the algae will grow more, resulting in high chlorophyll a and reduced water clarity. Water clarity is measured by the secchi disk reading. If there is limited phosphorus, the water will have little algae growth, and therefore low chlorophyll a readings and high secchi depths.
This table shows the Carlson Trophic State value in the left column and the characteristics of each lake type in the right column.

Index Value	Trophic State and Description
<40	Oligotrophic: clear water; high hypolimnetic O_2 year-round but possible anoxia in the deeper hypolimnion part of year
40-50	Mesotrophic: moderately clear water; possible hypolimnetic anoxia in summer and/or under ice. Fully supportive of all swimmable /aesthetic uses; possible cold-water fishery
50-60	Mildly eutrophic: decreased secchi; anoxic hypolimnion; possible heavy aquatic plant growth; warm-water fishery; supportive of all swimmable /aesthetic uses but “threatened”
60-70	Eutrophic: blue-green algal dominance with scums possible; extensive aquatic plant growth; not supportive of all beneficial uses
>70	Hypereutrophic: heavy blooms and scums in summer likely; dense “weed” beds; hypereutrophic; possible fish kills; fewer plant beds due to high algae; not supportive of many beneficial uses



Management of Phosphorus

Some sources of phosphorus can be managed very effectively, while other sources cannot be managed. Atmospheric deposition is not manageable since it is carried from other locations and deposited via rain. However, when sources of phosphorus are from the watershed, various management options are available. Any practice that can reduce runoff and retain the water or infiltrate the water into the soil is very beneficial. Because phosphorus is tied to sediment, phosphorus loading can be reduced by preventing water with sediment and dissolved phosphorus from making its way into the lake. If the water is infiltrated, it will return to the water table, and the soil it filters through will remove the phosphorus. Land cover with significant vegetation will slow the runoff of water and help reduce phosphorus loading.

For these reasons, restoring areas that contain exposed soil, have vegetation with very shallow root structure, or are prone to erosion and the release of sediment can significantly reduce phosphorus loading. Many agricultural and lawn care practices involve fertilizing with soluble phosphorus. As a result, these areas can greatly increase phosphorus loading. However, if the water runoff can be reduced by planting buffers of taller vegetation or changing agricultural practices to grow crops such as grasses, the phosphorus can be retained and not reach the lake as readily.

Impervious surfaces are those that do not allow water to soak in and result in increased runoff. Roads, driveways, roofs, sidewalks and parking lots are all examples of impervious surfaces. Large amounts of sediment, and therefore phosphorus, are carried to the lake when significant impervious surfaces are present. If that water can be slowed, or better yet, infiltrated into the soil, the loading can be significantly reduced.

In this photo, a sediment plume is very evident. Notice the degree of development and the large amount of impervious surfaces.

Septic system malfunctioning can also cause loading of phosphorus. A typical septic system relies on the soil's ability to retain the nutrients from human waste by infiltrating the water in a

drain field. If the system is not functioning properly and lacks the infiltration and ultimate phosphorus removal, the nutrients can reach the lake. Holding tanks that do not leak and are routinely pumped can reduce failure and therefore phosphorus inputs.

Appendix D. Related Plans, Regulations, and Ordinances

St. Croix County

A summary of St. Croix County ordinances from the county web site is included below.

Land Division

The Community Development Department is required to administer the Land Division ordinance in order to regulate and control subdivision development within St. Croix County. There are two types of land divisions - Certified Survey Maps (CSM's) - 4 lots or less and considered minor subdivisions. A major subdivision is a plat of 5 lots or more.

If you are intending to either sell or purchase property, please contact the Community Development office to insure that the correct procedures are being followed to create a legal lot. A surveyor will draft your map and assist in the subdivision process.

Applications are due the first Monday of every month. The Technical Review Committee, made up of staff, will hold two meetings per month to process and approve applications.

Sanitary Program – Private On-site Wastewater Treatment System

A State sanitary permit is required for the installation of a private on-site wastewater treatment system (POWTS) and may only be submitted by a licensed plumber. A County sanitary permit is required for the repair, reconnection, or rejuvenation of a POWTS or for the installation of non-plumbing sanitation (i.e. privy, composting toilet, etc).

A sanitary permit is required prior to obtaining a building permit from the Town. Staff will conduct at least one inspection for all work requiring a sanitary permit.

The proper maintenance of a POWT's is essential to ensure the longevity of your private sewage system and to avoid premature failure. When obtaining a sanitary permit you are required to submit a signed agreement indicating that as the property owner, you will maintain your septic system properly and report this maintenance to the Community Development Office.

Zoning

Special Exception permits are required for a use that is listed as a “Special Exception” within a zoning district. A list of possible special exceptions are included in the St. Croix County Zoning Ordinance under each Zoning District. A special exception request is reviewed by the Board of Adjustment. It is strongly recommended the applicant meet with staff to discuss the request before an application is submitted. Applications are due the first Monday of the month.

Variances allow development that is inconsistent with the dimensional standards contained in the ordinance, variances cannot be issued to approve uses that are inconsistent with the ordinance. The Board of Adjustment is authorized by statute to

grant variances to the strict terms of the Land Use Ordinance only when certain criteria exist. It is the applicant's responsibility to prove that those criteria exist at the site and that a variance can be granted. Staff should be contacted if you believe you have a valid request for a variance. Applications are due the first Monday of every month.

Non-Metallic Mining

Non-metallic mining is part of the Special Exception permit process, but it has its own St. Croix County Ordinance, Chapter 14 Non-metallic mining. A Non-metallic Mining Supplemental Information Sheet is helpful in filling out the permit application.

Enforcement

When a violation of the Land Use Ordinance is discovered, staff will take all possible measures to rectify the problem. Individuals who feel that a violation of a Land Use Ordinance exists may file a complaint. Submit as much supporting evidence (i.e. photos, documents, etc.) as possible in support of the complaint.

Please be advised that under Wisconsin's Public Records Law, Wis. Stats. §19.31, et al., the complaint and supporting evidence will be available for public review upon request. Only in an exceptional case may access be denied.

Town of St. Joseph

http://www.ecode360.com/SA1784

Chapter 168. Subdivision of Land

The ordinance establishes a 3-acre minimum lot size.

Chapter 149. Roads, driveways and trails erosion and sediment control and right of way construction

Chapter 141. Public Parking Lots and Boat Launches (Addresses disorderly conduct and noise.

Chapter 74. Activities on Town Property. Article I. Alcoholic Beverages and Controlled Substances.

Chapter 183. Vehicles and Traffic Article I. Parking (183-3-D)

Chapter 123. Lakes and Waterways. Article III. Perch and Furgers Lake (No operation of motor boats.)

Appendix E. Rapid Response for Early Detection of Aquatic Invasive Species

<u>Definition: Aquatic Invasive Species (AIS)</u> are non-native plant and animal species that can out-compete and overtake native species damaging native lake habitat and sometimes creating nuisance conditions. AIS currently in Bass Lake include Eurasian Water Milfoil (EWM), zebra mussels, and curly leaf pondweed (CLP). Additional AIS threaten the lake and will be monitored throughout the lake by volunteers and at selected points in a periodic WNDR survey.

1. Hold training for volunteer monitors (Bass Lake Rehabilitation District- BLRD, WDNR). Conduct volunteer monitoring throughout the lake. If a suspected plant is found, contact the Site Coordinator for Homestead Park.

2. Direct lake residents and visitors to contact the Site Coordinator for Homestead Park if they see a plant or animal in the lake they suspect might be an aquatic invasive species. Bass Lake links to web pages will provide photos and descriptions, contact information, and instructions for monitoring for volunteers and lake and watershed residents. Signs; Clean Boats, Clean Waters staff and volunteers; and brochures at the public boat landing will instruct visitors in proper AIS prevention measures.

3. If a volunteer locates a likely AIS, instructions will request that the volunteer record the location of suspected AIS using GPS, if available, or mark the location with a small float. *Provide instructions on marking with float. Note that because EWM populations are of interest for management efforts, this includes EWM.*

   If a plant:

   a. Take a digital photo of the plant in the setting where it was found (if possible). Then collect 5 to 10 intact specimens. Try to get the root system, and all leaves as well as seed heads and flowers when present. Place in a zip lock bag with no water. Place on ice and transport to refrigerator.

   b. Inform Site Coordinator for Homestead Park.

   If an animal other than a fish:

   a. Take a digital photo of the animal in the setting where it was found (if possible). Then collect up to five specimens. Place in a jar with water; put on ice and transport to refrigerator. Transfer specimen to a jar filled with rubbing alcohol (except for Jellyfish – leave in water).

   b. Inform Site Coordinator for Homestead Park.

4. The Site Coordinator for Homestead Park will tentatively confirm identification of plant or animal AIS then,

   If a plant:

   a. Fill out plant incident form http://dnr.wi.gov/lakes/forms/3200-125-plantincident.pdf
   b. Contact WDNR staff, then deliver collected plants to the WDNR (1300 West Clairemont, Eau Claire, WI 54701) as soon as possible (or to the location they specify).

   If an animal:

   a. Be sure the suspected invasive species has not been previously found on the waterbody
   b. Fill out form 3200-126 – Aquatic Invasive Animal Incident Report

5. If identification is positive the Site Coordinator for Homestead Park will:
   a. Inform the person who reported the AIS.

   b. Mark the location of AIS with a more permanent marker.

6. Wisconsin DNR may also identify AIS during an aquatic plant point intercept survey. When a new AIS introduction is confirmed:

   a. The Site Coordinator for Homestead Park will post a notice at the public landing and provide a notice for the St. Croix County, BLRD, Town of Somerset, and Town of St. Joseph websites. Notices will inform residents and visitors of the approximate location of AIS and provide appropriate means to avoid its spread.

7. Determine the extent of the AIS introduction (BLRD in cooperation with St. Croix County and WDNR). Divers may be used. If small amounts of AIS are found during this assessment, divers may be directed to identify locations with GPS points and hand pull plants found. All plant fragments will be removed from the lake when hand pulling.

8. The WDNR will select a control plan in cooperation with the BLRD, Homestead Park Site Manager, Town of St. Joseph, Town of Somerset and lake owners. The goal of the rapid response control plan will be eradication of the AIS.

   Control methods may include hand pulling, use of divers to manually or mechanically remove the AIS from the lake bottom, application of herbicides, and/or other effective and approved control methods.

9. Implement the selected control plan including applying for the necessary permits. Regardless of the control plan selected, it will be implemented by persons who are qualified and experienced in the technique(s) selected.

10. BLRD funds may be used to pay for any reasonable expense incurred during the implementation of the selected control plan, and implementation will not be delayed by waiting for WDNR to approve or fund a grant application.

11. The BLRD will work with the WDNR to confirm, as soon as possible, a start date for an Early Detection and Rapid Response AIS Control Grant. Thereafter, the BLRD shall formally apply for the grant.

12. Frequently inspect the area of the AIS to determine the effectiveness of the treatment and whether additional treatment is necessary (WNDR and/or professional monitor).

13. Review the procedures and responsibilities of this rapid response plan on an annual basis. (BLRD and St Croix County)

EXHIBIT A[1]

BASS LAKE REHABILITATION DISTRICT

Chairman	Tom Spaniol: (715) 222-6235 chair@townofstjoseph.com
Commissioner	Bill Holmberg (651)278-7595 wrholmberg@gmail.com

ST CROIX COUNTY

Site Coordinator for Homestead Park	Justin Townsend: (715) 716-0172 justin.townsend@co.saint-croix.wi.us

TOWN OF ST. JOSEPH

Town Chairman	Tom Spaniol: (715) 222-6235 chair@townofstjoseph.com

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

AIS Coordinator, AIS Identification	Jodi Lepsch: (715) 838-8385 Jodi.Lepsch@wisconsin.gov
Permits, AIS Identification and Notice	Scott Provost: 715-421-7881 scott.provost@Wisconsin.gov
Grants, AIS Identification and Notice	Buzz Sorge: 715-839-3794 Patrick.Sorge@Wisconsin.gov

ST CROIX RIVER ASSOCIATION

Invasive Species Coordinator	Angelique Dahlberg: (715) 716-0172 angeliqued@scramail.com

DIVERS

St. Croix Scuba	Terry Nooner: (715) 531-5300 twnooner@aol.com

ADDITIONAL REFERENCES

WDNR websites on AIS
http://dnr.wi.gov/lakes/invasives/GoalsNew.aspx?show=emerging
http://dnr.wi.gov/lakes/invasives/AISDiscoveryCommunicationProtocol.pdf

[1] This list will be reviewed and updated each year.

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