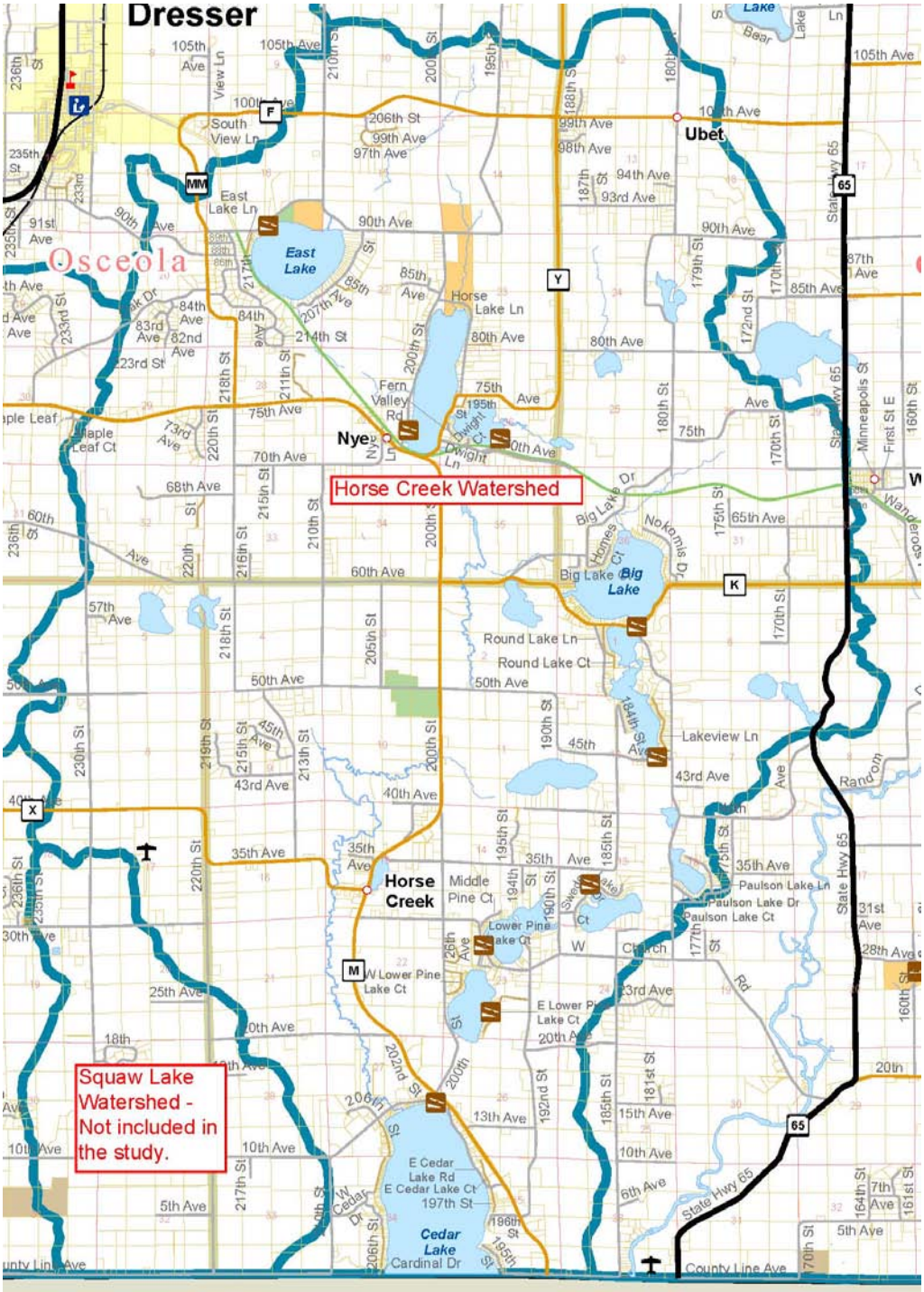
Horse Creek Watershed
Soil Fertility and Phosphorus Index Assessment
May 2013
Polk County Land and Water Resources Dept.

Eric Wojchik-Conservation Planner



Project Overview

As a part of the Cedar Lake Protection Grant the Polk County Land & Water Resources Department, with the assistance of the UW-Madison Nutrient and Pest Management program, conducted this evaluation to quantify the amount of phosphorus delivery from agriculture land uses to Horse Creek and Cedar Lake. Cedar Lake is on the Wisconsin Department of Natural Resources (WDNR) list of 303(d) impaired waters. According to the WDNR, the lake is impaired by phosphorus (P) as a result of agriculture, internal loading, and local land use. Throughout the Lake Protection Grant process extensive in-lake and stream monitoring was conducted. However, nothing was originally planned for evaluating agriculture land use contributions further up into the watershed. This project's objective was to work with the agriculture community to gather field soil test data, model estimated phosphorus delivery from fields, identify areas of concern and identify strategies to reduce nutrient runoff from non-point sources in the watershed. In addition, a soil fertility assessment was conducted on the residential properties surrounding the lake. This information will be used to help determine strategies to minimize the impact of the direct drainage area that surrounds the lake. See appendix A for residential soil sampling results and recommendations.

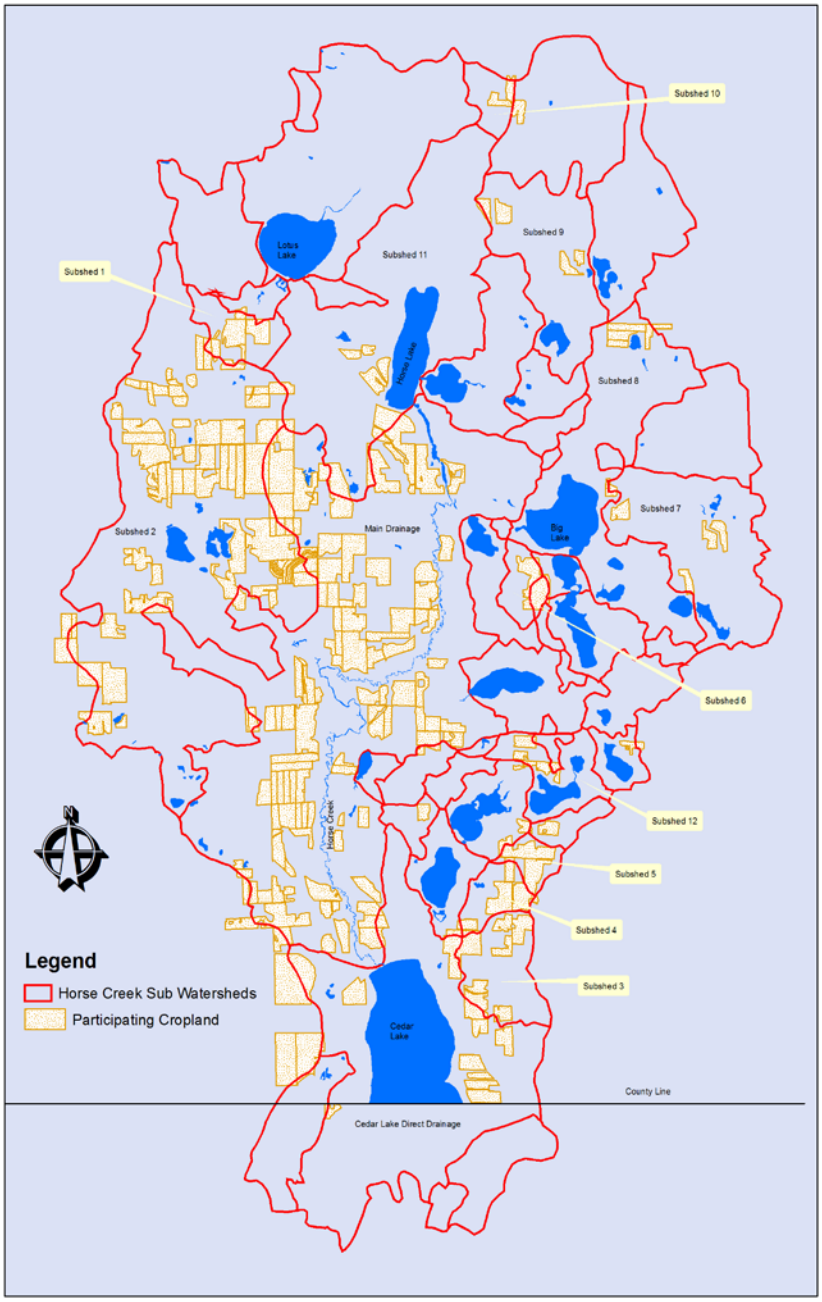


Figure 1 – Project Sub-watersheds

Project Area

The Horse Creek Watershed encompasses 30,373 acres (Figure 1). There is a diverse mix of land use in the watershed. According to the Nonpoint Source Control Plan for the Horse Creek Priority Watershed Project, agriculture is the most prevalent land use covering 34% of the watershed area. Row crop production makes up the majority of the farming practices within the project area. Dairy operations that were once common within the watershed have declined significantly. There are six known active dairy farms within the watershed, and there could be as many as ten, including small operations with few cattle. Small hobby beef and/or horse operations do exist in the watershed but these operations were not inventoried.

For this particular study the sub-watershed making up the main drainage to Horse Creek was the priority area of concern (Figure 1). Polk County LWRD, with the help of UW-Nutrient & Pest Management (UW-NPM) staff, concentrated most of the data collection efforts on agriculture operations within this area. In addition to the main drainage to Horse Creek, a substantial amount of field data was collected in sub-watershed 2 and in the direct drainage to Cedar Lake where the residential soil samples will be taken in the summer of 2013 (Figure 1).

Methods

Due to limited time to accomplish this project, soil sampling information collection was the main focus of the project. With field soil tests, crop rotation, plant nutrient applications, and tillage system information Polk County LWRD was able to determine an estimated Phosphorus Index (P Index) and soil loss for each field. The P Index is an estimation of a field's potential to deliver nutrients to surface waters. This value represents pounds of P delivered per acre of cropland, per year.

Soil loss was calculated with an equation known as the Revised Universal Soil Loss Equation (RUSLE 2) (Figure 2). This equation produces a numeric value in tons of soil lost per acre, per year. RUSLE 2 uses factors such as soil type, slope steepness, slope length, tillage system and other variables to calculate soil loss. All soils have a predetermined amount of soil they can lose annually and still maintain productivity. This value is called "T" or tolerable soil loss. The RUSLE 2 equation produces a value that can be compared to "T" to determine the rate at which soil is eroding. This calculation is helpful in evaluating phosphorus delivery because phosphorus bonds very strongly to soil particles. Therefore, if a producer minimizes soil

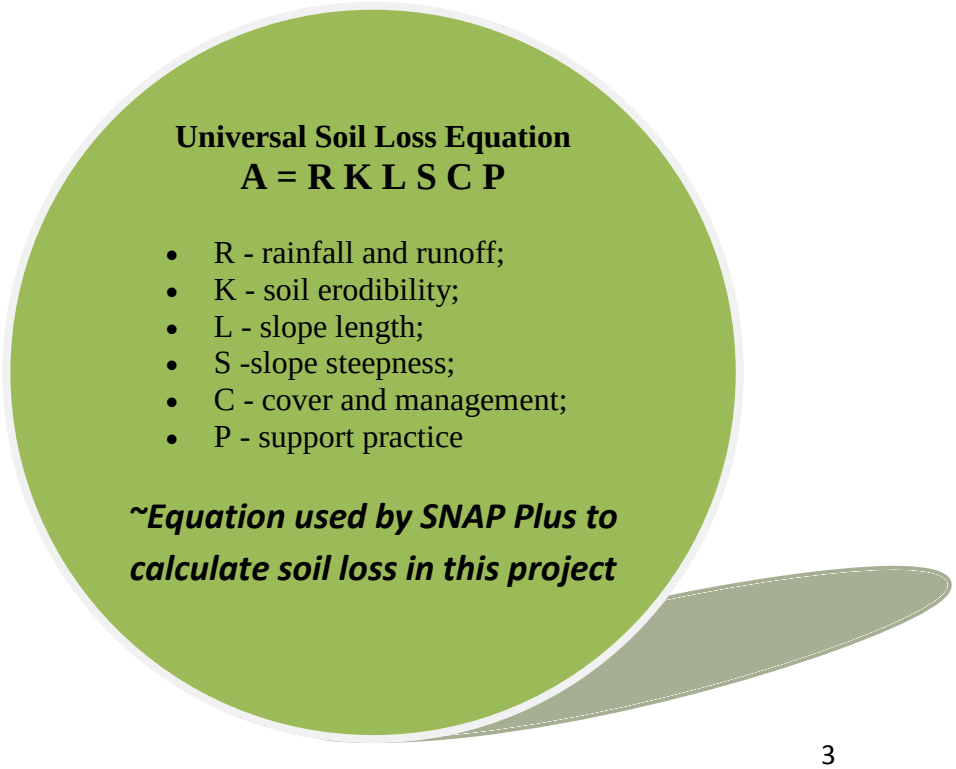


Figure 2 – Universal Soil Loss Equation

erosion, phosphorus delivery off the field is also minimized.

To determine project P Indexes and soil loss values, all soil test information was entered into the Soil and Nutrient Application Planning software (SNAP Plus). SNAP Plus is a program that estimates P Index and soil loss per field using field characteristics, soil test analysis, crop rotation, and commercial or organic nutrient application information. This program calculates a significant amount of information about the fields and the operation that must be obtained from the producer. Much of the information was already collected by local consultants. However LWRD staff, with the help of UW-River Falls student and UW-NPM intern Haily Henderson, spent many hours in the field interviewing agriculture producers in the watershed to obtain as much information to represent real management practices.

During the course of the project 17 agricultural producers were contacted and interviewed. Of these 17 producers 12 are row crop farmers and 5 crop and dairy farm. Sixteen of the 17 producers provided useable soil test information covering 4,781 acres (47% of the watershed cropland acres). One additional producer provided information for another 525 acres but the soil sampling method and results are suspected to be inaccurate so this information was not included in this report. The producer will be re-sampling this spring and will submit new samples when completed.

Once data was compiled, entered, and modeled in SNAP Plus, results were entered into ArcMap GIS to spatially illustrate the findings. ArcMap is a geographic information system that can analyze data and illustrate it visually so that trends, patterns, and "hot spots" may appear. ArcMap GIS was used to make maps for presenting and creating the database where all information was stored.

Results

Soil test data was collected in 13 sub-watersheds within the larger Horse Creek Watershed (Figure 1, pg. 2). Soil test information permitted the calculation of average soil phosphorus levels. Soil test phosphorus throughout the entire watershed was quite variable. Soil test phosphorus on all fields ranged from 5 parts per million (ppm) to 153 ppm. According to UW-Extension Publication A2809 *Nutrient Application Guidelines for Field, Vegetable, and Fruit crops in Wisconsin*; 19% of the fields were low to very low soil test phosphorus (17 ppm or less), 46% of the fields reviewed were found to fall in the optimum category (18-35 ppm) for soil fertility and the remaining 35% of the fields fell in the high to excessively high category (36 + ppm). It is important to mention that these fertility ranges pertain to the fertility needs of particular crops. Excessively high soil test phosphorus for crops does not mean there is an immediate threat to water quality. A fields potential to threaten water quality is dependent on a number of other factors including weather, topography, soil type, tillage, and crop management. This was demonstrated when fields within the main drainage and specifically fields adjacent to Horse Creek were evaluated.

Fields adjacent to Horse Creek had the highest average soil test phosphorus levels at 52.4 ppm (Figure 3). When the field information was modeled in SNAP plus and other management practices and field characteristics were factored into the equation, these fields resulted in a very low Phosphorus Index of less than one pound of phosphorus contributed per acre, per year. Average soil loss was also very low with an estimate of only 1.1 tons/per acre/per year soil loss (Figure 5). This information is important as these fields are adjacent to the creek and could have high potential to contribute runoff to the creek. Additionally, most of these fields have been

observed to have conservation or no till cropping practices. These numbers confirm the value of these practices in minimizing a crop field's potential to pollute sediment and nutrients to surface waters. However, a strategy to draw down soil test P is wise, as lower soil test P will assure lower risk of surface water impact.

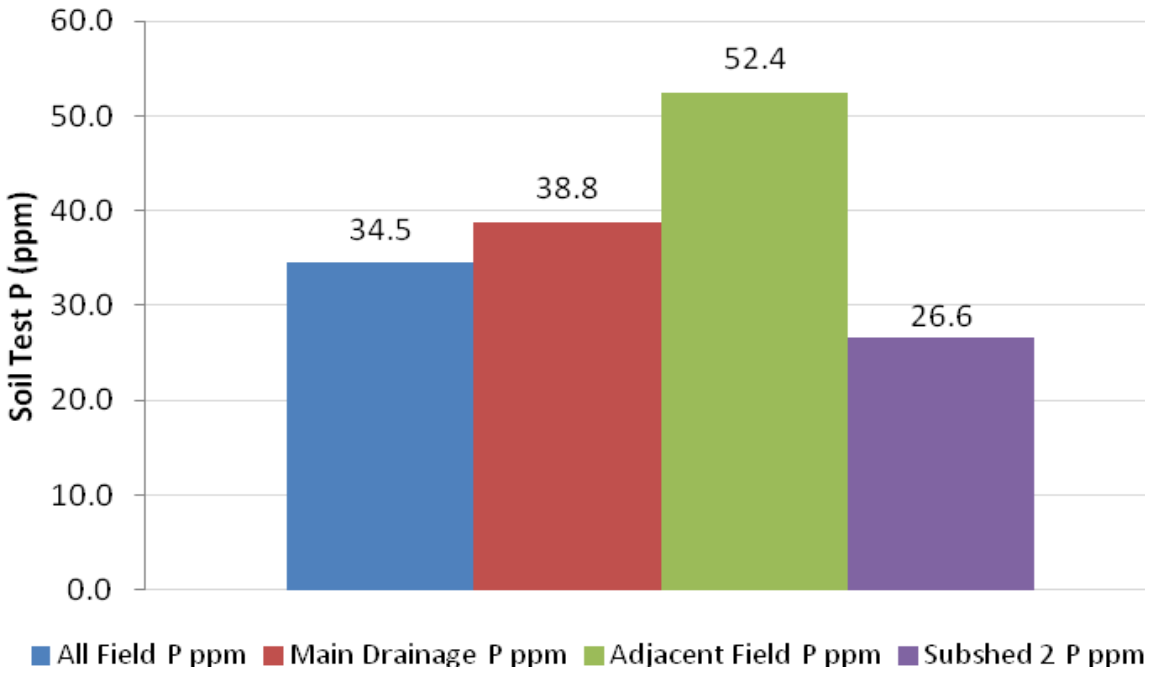


Figure 3

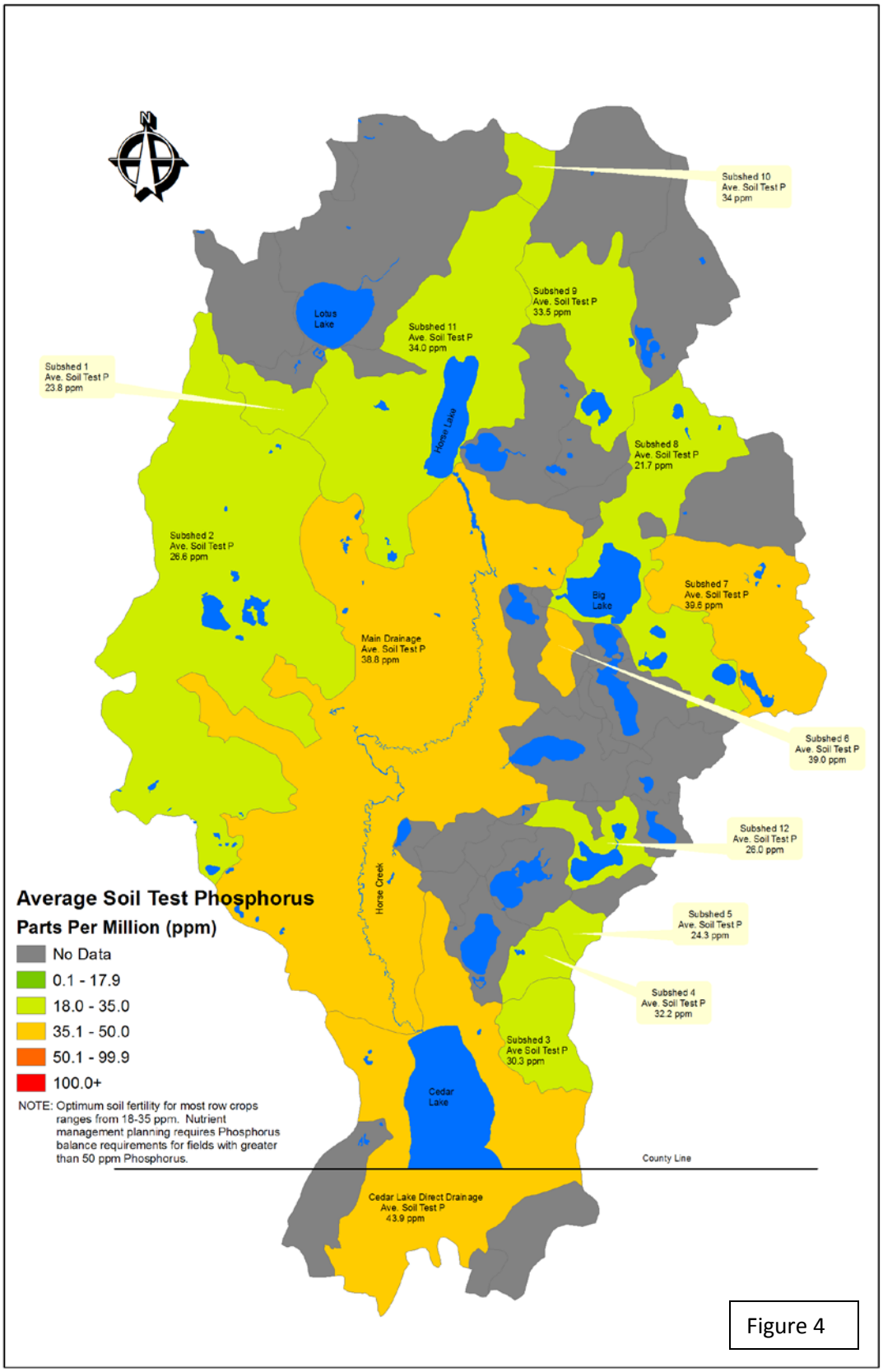

Subshed 10
Ave. Soil Test P
34 ppm
Subshed 9
Ave. Soil Test P
33.5 ppm
Lotus
Lake
Subshed 11
Ave. Soil Test P
34.0 ppm
Subshed 1
Ave. Soil Test P
23.8 ppm
Horse Lake
Subshed 8
Ave. Soil Test P
21.7 ppm
Subshed 2
Ave. Soil Test P
26.6 ppm
Big
Lake
Subshed 7
Ave. Soil Test P
39.6 ppm
Main Drainage
Ave. Soil Test P
38.8 ppm
Subshed 6
Ave. Soil Test P
39.0 ppm
Subshed 12
Ave. Soil Test P
26.0 ppm
Horse Creek
Average Soil Test Phosphorus
Parts Per Million (ppm)
No Data
0.1 - 17.9
18.0 - 35.0
35.1 - 50.0
50.1 - 99.9
100.0+
NOTE: Optimum soil fertility for most row crops ranges from 18-35 ppm. Nutrient management planning requires Phosphorus balance requirements for fields with greater than 50 ppm Phosphorus.
Subshed 5
Ave. Soil Test P
24.3 ppm
Subshed 4
Ave. Soil Test P
32.2 ppm
Subshed 3
Ave Soil Test P
30.3 ppm
Cedar
Lake
County Line
Cedar Lake Direct Drainage
Ave. Soil Test P
43.9 ppm

Figure 4

The soil loss evaluation portion of this study yielded higher than expected values in some areas. However, in the sub-watershed areas showing above tolerable soil loss levels more field information is needed. As shown on the average soil loss map sub-watershed 7, 9, and 10 show higher than average tolerable (4 t/ac/yr) levels (Figure 6). The data acquired is representative of the few fields evaluated within these sub-watersheds. However, it may not be representative of the sub-watershed as a whole. More field data is needed in these areas. Not all of the cropland within these sub-watersheds was evaluated due to time limitations and lack of farmer participation.

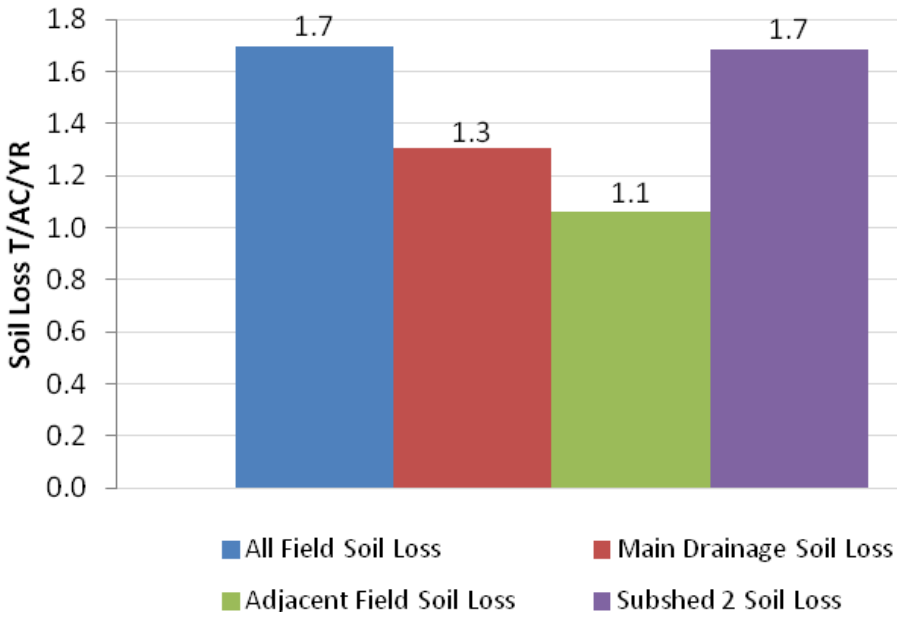


Figure 5

In sub-watershed 2 and the main drainage to Horse Creek, where there has been enough data collected to achieve representative data, we see much lower soil loss levels. Soil loss of 1.7 t/ac/yr or less in these two watersheds is quite acceptable from a conservation planning standpoint. However, fields do exist in this area that exceed the tolerable level for these soils. Six fields within sub-watershed 2 exceed the watershed average tolerable soil loss of 4 t/ac/yr. These fields range from 4.1 to 9.6 t/ac/yr and make up 8% of the total fields evaluated.

Within the main drainage watershed there are 5 fields that exceed the average tolerable soil loss of 4 t/ac/yr for the watershed. These fields range from 4.1 to 5.8 t/ac/yr and make up 5% of the cropland. Since some of the above mentioned fields may not be exceeding the field specific tolerable soil loss level we must look at what the field "T" values are. In the main drainage 4 out of the 5 fields actually exceed the field specific tolerable soil loss amount. The most a field exceeds "T" in this watershed is 1.8 t/ac/yr.

All 6 fields in sub-watershed 2 exceed the field specific tolerable soil loss and one field is two times higher than the tolerable level. This may be an issue and something the LWRD will pursue to further verify these numbers because the majority of fields within this watershed that are exceeding "T" may be a result of incomplete rotations entered into the SNAP plus program. Only two years of accurate data was provided by the producer. Ideally 6 to 8 years of data is needed to be entered in to SNAP Plus to accurately estimate soil loss values and Phosphorus Index.

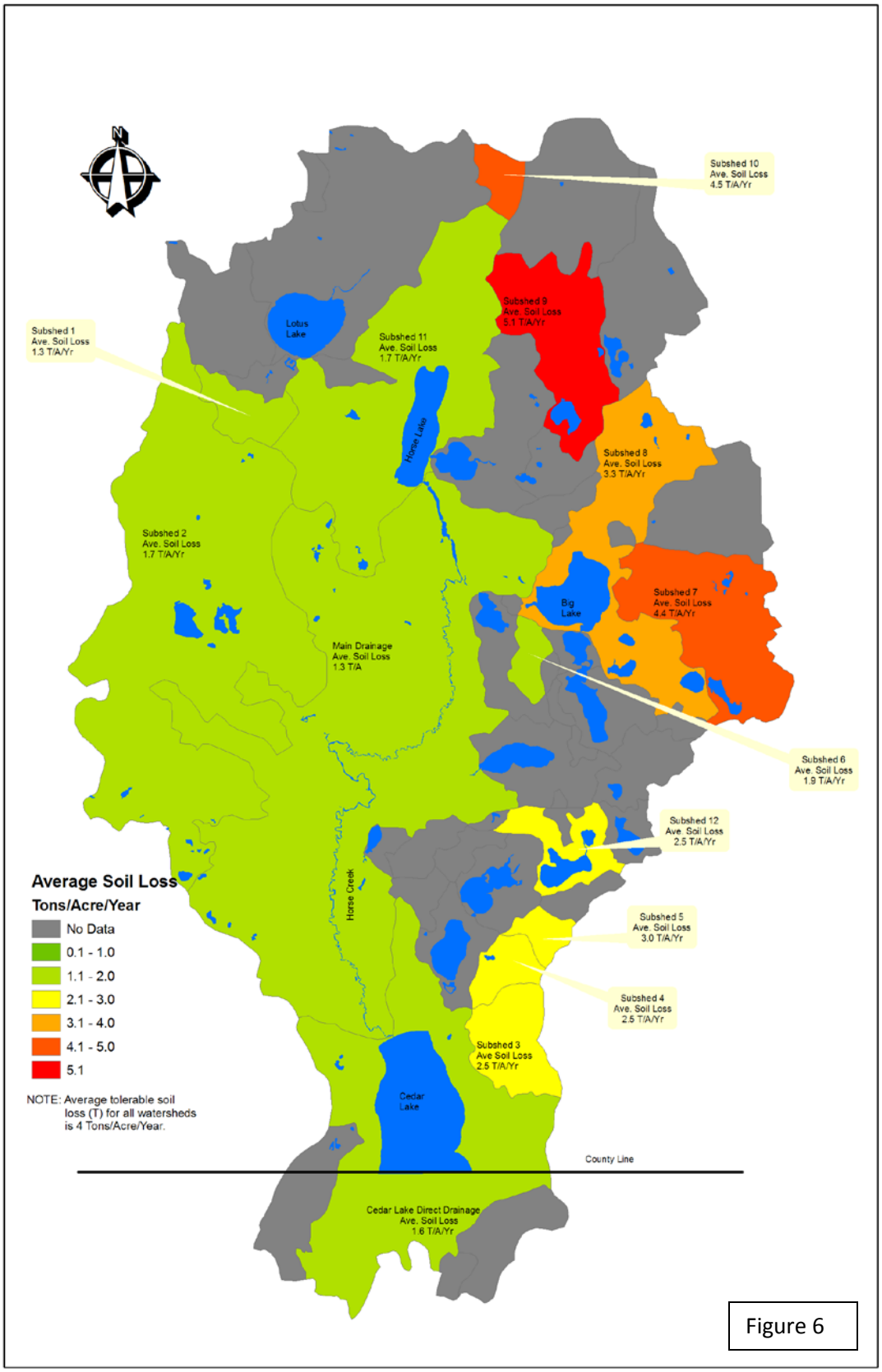

Subshed 10
Ave. Soil Loss
4.5 T/A/Yr
Subshed 9
Ave. Soil Loss
5.1 T/A/Yr
Subshed 1
Ave. Soil Loss
1.3 T/A/Yr
Lotus
Lake
Subshed 11
Ave. Soil Loss
1.7 T/A/Yr
Horse Lake
Subshed 8
Ave. Soil Loss
3.3 T/A/Yr
Subshed 2
Ave. Soil Loss
1.7 T/A/Yr
Big
Lake
Subshed 7
Ave. Soil Loss
4.4 T/A/Yr
Main Drainage
Ave. Soil Loss
1.3 T/A
Subshed 6
Ave. Soil Loss
1.9 T/A/Yr
Subshed 12
Ave. Soil Loss
2.5 T/A/Yr
Horse Creek
Subshed 5
Ave. Soil Loss
3.0 T/A/Yr
Subshed 4
Ave. Soil Loss
2.5 T/A/Yr
Subshed 3
Ave Soil Loss
2.5 T/A/Yr
Cedar
Lake
County Line
Cedar Lake Direct Drainage
Ave. Soil Loss
1.6 T/A/Yr
Average Soil Loss
Tons/Acre/Year
No Data
0.1 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1
NOTE: Average tolerable soil loss (T) for all watersheds is 4 Tons/Acre/Year.

Figure 6

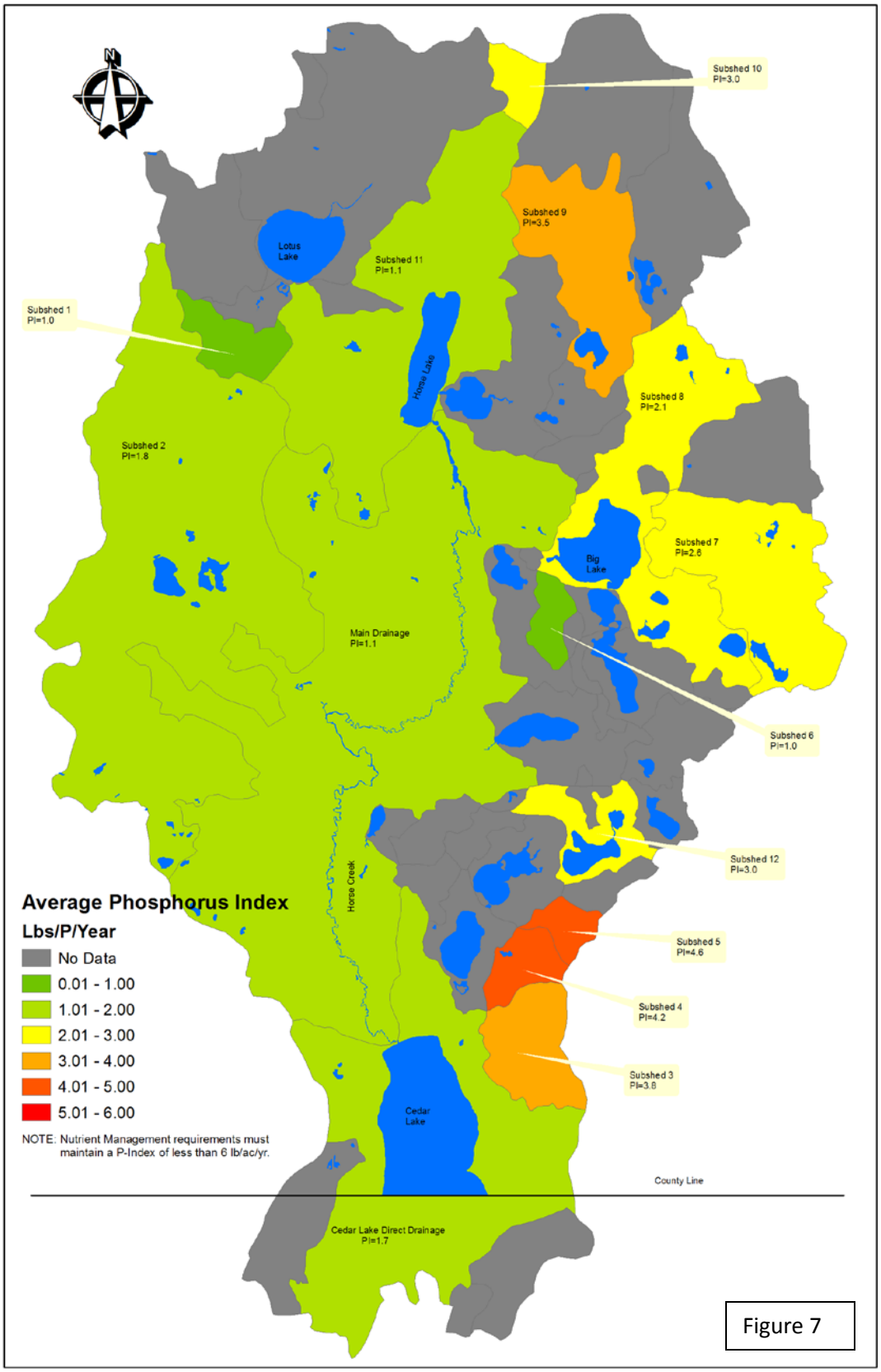

N
Subshed 10
PI=3.0
Subshed 9
PI=3.5
Lotus
Lake
Subshed 11
PI=1.1
Subshed 1
PI=1.0
Horse Lake
Subshed 8
PI=2.1
Subshed 2
PI=1.8
Subshed 7
PI=2.6
Big
Lake
Main Drainage
PI=1.1
Subshed 6
PI=1.0
Subshed 12
PI=3.0
Horse Creek
Average Phosphorus Index
Lbs/P/Year
No Data
0.01 - 1.00
1.01 - 2.00
2.01 - 3.00
3.01 - 4.00
4.01 - 5.00
5.01 - 6.00
Subshed 5
PI=4.6
Subshed 4
PI=4.2
Subshed 3
PI=3.8
Cedar
Lake
NOTE: Nutrient Management requirements must
maintain a P-Index of less than 6 lb/ac/yr.
County Line
Cedar Lake Direct Drainage
PI=1.7

Figure 7

The Phosphorus Index for the project area represents a collection of all field data obtained from soil test information and farmer interviews. The P Index represents a fields estimated potential to deliver phosphorus to nearby surface waters based on a farmer's planned management. The units for the P Index values are in pounds of phosphorus lost per acre, per year. The state of Wisconsin sets an upper threshold of 6 lbs/ac/yr. For nutrient management planning, anything over a P Index of 6 is unacceptable and may result in a change in crop management.

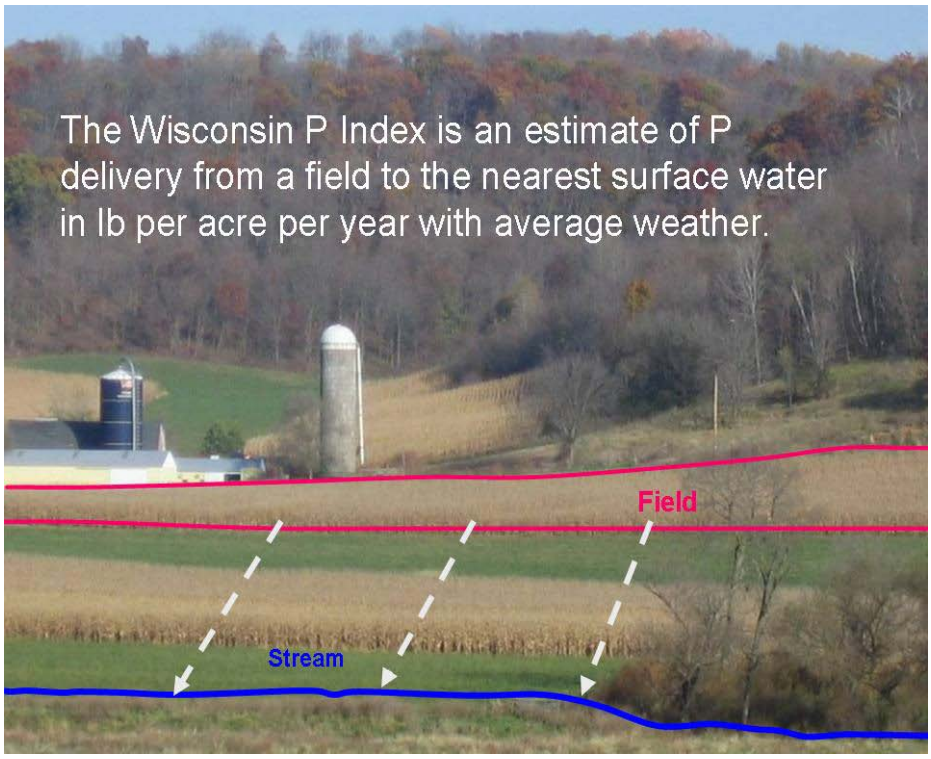


Photo Courtesv UW-Wisconsin Madison

During this project approximately 4,700 acres were evaluated totaling 207 separate fields within the Horse Creek watershed. Phosphorus Index values range from 0 to as high as 8 lbs/ac/yr. With an average of 1.6, or 2 lbs/ac/yr as P Index is always reported in whole numbers. In addition to all of the participating fields in the watershed the main drainage to Horse Creek was evaluated as well as fields located adjacent to the creek. As you can see from the graph below (Figure 8) both the main drainage and adjacent fields were lower than the participating field average.

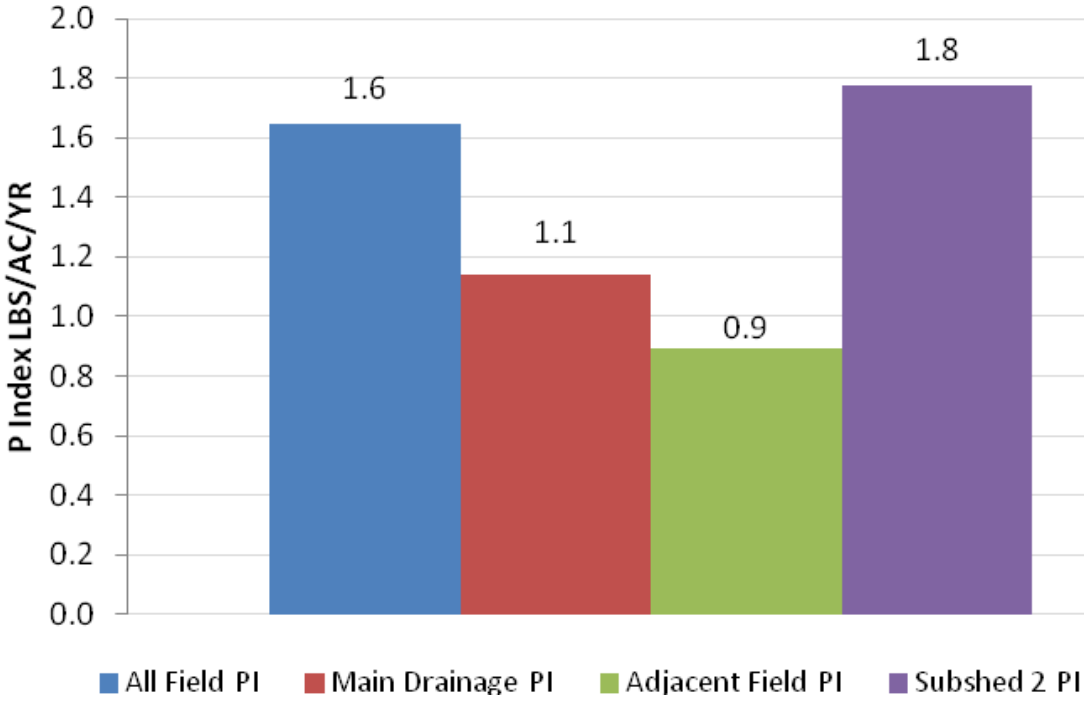


Figure 8

Low P Index numbers are important as these fields are close to Horse Creek which increases the runoff risk. It appears the conservation tillage and no-till practices implemented on these fields are performing well to minimize risk to surface water.

Overall the Phosphorus Index numbers are acceptable. More data would help verify the accuracy of the modeling effort and it is difficult to project what the P Index may be after additional Best Management Practice adoption because there are so many variables affecting a grower's management decisions. Also, it is difficult to get P Indexes any lower than what we see here and still meet the needs of the grower. However, in an effort to estimate an achievable reduction in phosphorus delivery, fields within the main drainage to Horse Creek were modeled with additional Best Management Practices to calculate the percent reduction of the P Index. Best Management Practices available in SNAP Plus included; Conservation Tillage and No Till practices, edge of field filter strips, strip cropping and farming on the contour. For this exercise all row crops were changed to no till that were not in the year of plow down or forage establishment. Next, edge of field filter strips were added to all fields that were located adjacent to Horse Creek. Finally, when the field orientation and field slope were appropriate for farming on the contour, this practice was applied. With all of these practices applied to the fields in the main drainage the P Index was reduced by .48 lbs/ac/yr resulting in an estimated reduction of 56%.

Conclusions and Recommendations

Overall this project was successful. Time and farmer participation were limiting factors. Farmer participation in projects like this takes time. Project results would have greatly improved if this was a five to 10+ year study. It was a challenge to collect enough field data with quality application and rotation data to obtain good representative numbers. This is a good start; baseline data is very important and this effort accomplished that goal.

Most of the information collected in this watershed project was not unlike what has been collected in neighboring watersheds where soil test and P Index information was estimated. Relatively low P Index values were seen throughout. There were 13 fields that have a P Index of greater than 6. These fields will be monitored and could be a result of incomplete rotation data in the model. If eight years of rotation data is not entered into the model results can be higher than actual. It will be important to continue data collection if possible which should result in more accurate data and possible lower P Indexes on these 13 fields.

A 56% reduction in P Index is very positive. However, for this reduction to be possible nearly every grower in the main drainage would need to adopt no till practices. This would be very difficult. No till farming is a delicate process and does not work on all soil types. It is unlikely that no till would work exclusively throughout the main drainage watershed. If no till was adopted exclusively the water quality problems associated with dissolved reactive phosphorus may persist because of the amount of un-incorporated nutrient applications. Making this reduction more difficult, contour farming and filter strips on all fields would need to be installed where these practices would be appropriate. Contour farming would not be as difficult as filter strip installation. With the current commodity prices it is unlikely growers would give up field acres to install grassed filter strips. With this, it is recommended that a lesser percent reduction be adopted as a goal. A goal less than or equal to 30% would be more feasible over an extended amount of time.

While obtaining nutrient management plan information it was apparent that nutrient management planning efforts need to be improved, not only in this watershed, but statewide. Incomplete, outdated, and false information is still being written into nutrient management plans to meet only the needs of the 590 requirements. This compromises the efficacy of nutrient management planning and results in a product with little value to the grower. For the most part the plans reviewed during this project were satisfactory. However, few of them met full NRCS 590 standard compliance. Though full 590 compliance is not entirely critical to achieve environmental and water quality benefit, it does assure it in most cases if the plan is implemented as written. Most of the growers who are actively engaged in nutrient management planning are following the plans to the best of their ability. Even though some of the recommendations are not compliant with 590 the basics of the plan are almost always understood and likely implemented. Awareness of sensitive areas, moving manure to fields that need it and soil testing are all basics of a plan. When these basics are implemented it less likely that excess nutrients, including phosphorus, will be applied to the land. With this, it appears that the educational aspect of nutrient management planning is almost more effective in minimizing risk as having a plan written.

Soil test levels within the main drainage area, specifically the fields adjacent to Horse Creek are high according to the needs of the row crops planted there. Even though the growers are doing an excellent job keeping sediment and particulate phosphorus on the land, Polk County LWRD recommends any effort to draw down these levels. With lower soil test phosphorus on these fields the risk of impacting surface water is reduced when crop or tillage

management practices change in the future. Knowing these fields are trending high in phosphorus is helpful alone. This information will be presented to the growers in that area and efforts can be started to slowly draw down these levels. Average soil test phosphorus on these fields between 18 and 35 parts per million would be preferred.

Edge of Field Monitoring Station

Positive Project Outcomes

This project has had very positive impacts on the Horse Creek watershed area that are worth mentioning in this report. In addition to building relationships with the growers and getting baseline data on phosphorus levels in the watershed, a progressive conservation minded farming community along with water quality monitoring data has brought a significant amount of conservation related attention and project funding to the area. Since this project started, LWRD staff recommended this watershed for a UW-Nutrient and Pest Management program grant to monitor field edges for sediment and nutrient delivery to surface water. This proposal was successful and the Horse Creek watershed is now home to two edge-of-field monitoring sites that were successful in collecting runoff in the spring of 2013. These sites have yielded samples, however the results are not available yet. They are still at the lab for analysis. These sites will be critical in providing quality site specific baseline data for well run conservation systems.

Another exciting project has developed since the start of this watershed wide soil fertility assessment, the development of farmer-led watershed councils. Due to the watershed assessment project and the extensive amount of watershed information collected, positive agriculture involvement in water quality efforts, and an impaired water resource, Horse Creek watershed was a perfect fit for this type of project.

The farmer-led watershed council project is a pilot project in four counties; Polk, Dunn, Pierce and St. Croix. It is a grant funded project from both government and private foundations that have committed project funding for at least 5 years. A watershed council coordinator has been hired to assist with the facilitation and administrative needs of each council. Polk County had two council meetings in spring 2013 where some goals and objectives for this group have been developed. The council will have the opportunity to learn more about the watershed as a system, they will be involved in securing additional edge-of-field monitoring sites, and administering funding to reward agriculture producers who implement best management practices to improve water quality on their own. The primary goal of this pilot project is to allow members of the agriculture community an opportunity to become actively involved in the process of developing a strategy to improve water quality and to take an active role in the projects adoption, and ultimately its success.

Appendix A

Residential Soil Sampling

In an effort to identify the soil test phosphorus levels on residential properties surrounding Cedar Lake, soil samples were taken on properties with cooperating land owners. This portion of the watershed assessment study was conducted to provide baseline data on near shore soil fertility, compare land use soil fertility levels, and reinforce the need for residential best management practices on near shore properties, especially if new construction or soil disturbance takes place near Cedar Lake.

Soil samples were collected on 39 lake properties. One composite sample, made up of 10 to 15 core samples, was taken on each property. Samples were taken in the lawn area only, with core samples taken throughout the entire lawn area of each property. All the samples taken in this portion of the study were new samples. No property owner had previously taken soil samples and submitted them to Polk County Land and Water Resources Department (LWRD). Unlike the agriculture community surrounding Cedar Lake, the residential property owners are not actively soil sampling. Obviously this is due to the absence of crop production. However, information on soil fertility is important in maintaining a lawn area that minimizes runoff impact to surface waters. Although fertilizing lawn areas is not always recommended and is often times prohibited on near shore properties, fertilizer without phosphorus and lime may help minimize the risk of soil erosion by thickening grass and eliminating bare soil. Regardless, soil fertility information is important as an educational component because even though a property owner is not fertilizing phosphorus is present naturally in the soil.

Turf grass does not demand much phosphorus and does not need as much phosphorus as a typical row crop like corn or soybeans. Turf grass will grow with low to very low soil test phosphorus. However, stand density will lack and root development will suffer. On near shore properties soil disturbance from construction is occasionally an issue. However, the risk of nutrient loading to surface water is largely due to surface runoff from impervious surfaces or from compacted lawn areas with sparse grass. Research has shown that vegetated cover is imperative to minimizing surface water runoff. A healthy, dense stand of turfgrass can reduce runoff volume to almost zero. (5) Conversely, lawn areas with sparse grass can have potential risks to surface water due to the lack of vegetative cover. According to UW Extension Publication A2809 *Nutrient Application Guidelines for field, vegetable, and fruit crops in Wisconsin*, research has found that as soil test phosphorus levels increase, phosphorus loss to surface water can also increase. Generally this may be the case; however, loss can be largely mitigated by good management practices. Best management practices have value in the residential community just as they do in the agricultural community.

Soil Sampling Results

Of the 290 lake front properties on Cedar Lake, 39 were soil sampled for soil test phosphorus (13% of the total). Of the 39 samples, 8% if the samples tested very low or low (less than 18 ppm), 26% tested in the optimum range (18-35 ppm), 15% tested high (36-50 ppm), 46% tested very high (51-99 ppm), and 5% tested excessively high (over 100 ppm). Of the samples taken 66% indicated high soil test phosphorus for the needs of turf grasses. The lowest soil test phosphorus level was 15 ppm and the highest was 172 ppm. The average was 51.4 ppm.

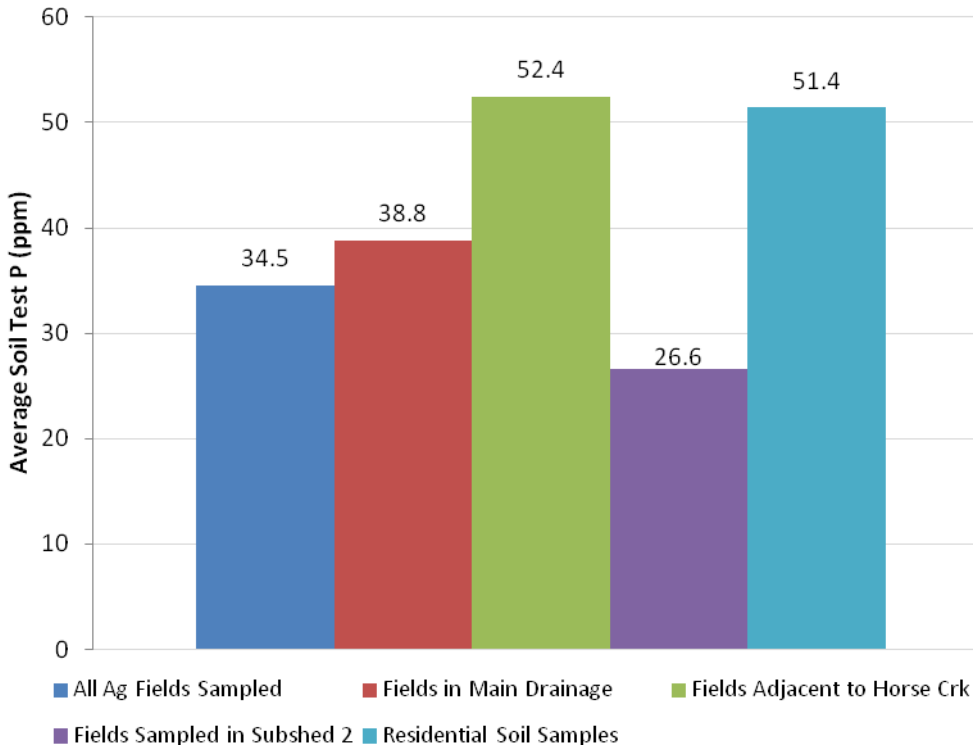
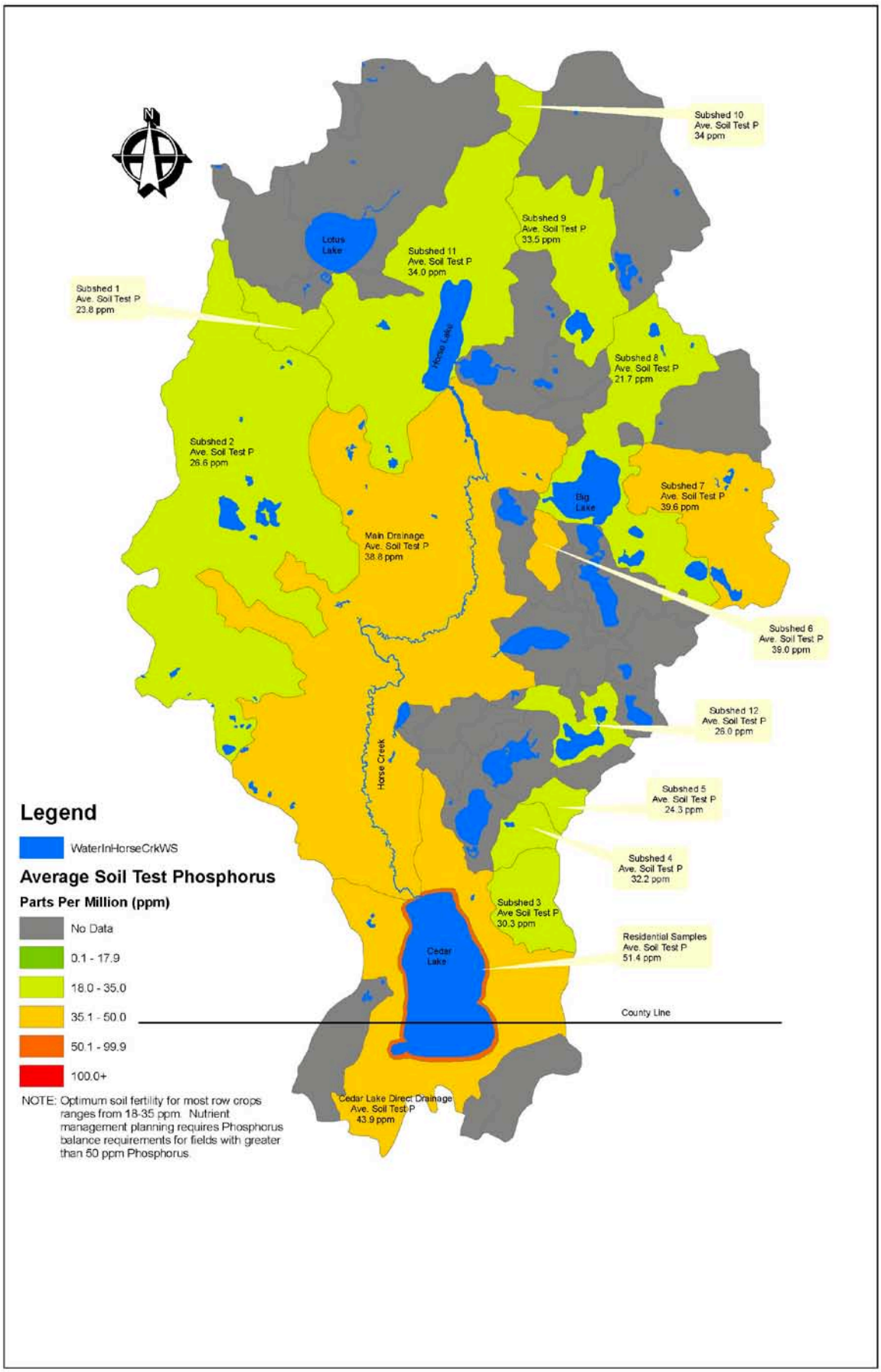


Figure A1

The average soil test phosphorus was greater for residential soil samples (51.4 ppm) as compared to all agricultural fields (34.5ppm) in the watershed. Residential soil samples averaged nearly the same as the agricultural fields tested that are located adjacent to Horse Creek (52.4 ppm).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Subshed 3
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30.3 ppm
Residential Samples
Ave. Soil Test P
51.4 ppm
Cedar
Lake
County Line
Cedar Lake Direct Drainage
Ave. Soil Test P
43.9 ppm
Legend
WaterInHorseCrkWS
Average Soil Test Phosphorus
Parts Per Million (ppm)
No Data
0.1 - 17.9
18.0 - 35.0
35.1 - 50.0
50.1 - 99.9
100.0+
NOTE: Optimum soil fertility for most row crops ranges from 18-35 ppm. Nutrient management planning requires Phosphorus balance requirements for fields with greater than 50 ppm Phosphorus.

Recommendations

Although the risks of runoff from near shore properties is lessened by the presence of permanent vegetation, impacts are still possible. With the elevated average soil test levels found on these properties and the close proximity to Cedar Lake, residents should take appropriate measures to minimize the possibility of nutrient rich runoff entering Cedar Lake.

Unlike row crops, where nutrients are often removed and exported, managing high nutrients in turf grass situations can be a challenge. For landowners with high soil test phosphorus the Polk County LWRD recommends the following ideas to minimize risk of phosphorus entering Cedar Lake.

1. Minimize the amount of impervious surfaces (roofs, driveways, sidewalks) on your lake property.
2. Collect surface water runoff using rock pits or trenches, rain gardens, shoreline buffers and even rain barrels. Detention and infiltration of surface runoff is critical to settle out nutrients before they reach surface waters.
3. Maintain an adequate buffer area of natural vegetation that is not mowed directly adjacent to the lake.
4. Grass clippings contain phosphorus. Keep grass clippings out of the lake and off of impervious surfaces where they may run into the lake with surface water runoff.
5. If possible remove grass clippings from lawns and compost in an area that will not drain to the lake.
6. Maintain a minimum of 3 to 4 inches of grass length in lawns at all times and aerate as needed to prevent compaction and encourage infiltration.
7. Maintain grass stand thickness so no bare soil exists and a good thatch layer is present to prevent erosion. If fertilizer is used to enhance grass stands, keep fertilizer applications off impervious surfaces such as driveways and sidewalks. This will minimize risk of soluble nutrients reaching Cedar Lake following a rain event. Please remember: According to Chapter 94 Wisconsin State Statutes; fertilizer containing phosphorus can only be applied when establishing a lawn and when a soil test indicates a phosphorus deficiency. (6)

Conclusions

Soil test findings for the residential area around Cedar Lake are not unlike the findings around other lakes in Polk County where samples were taken on near shore property. Typically, near shore soil tests average around 50 ppm. This held true for the agricultural fields tested adjacent to Horse Creek as well. This could be a result of soil type and position on the landscape. Fertile soils are often found in lower areas of the landscape due to erosion and higher organic matter.

Phosphorus index numbers were not provided in this report because the SNAP Plus program is not designed to provide phosphorus index numbers for residential land uses. Soil erosion calculations were not available because of the same limitations with the SNAP Plus program.

This soil test information is valuable as baseline data for Polk County LWRD and for lake shore residents. Knowing lake lot fertility levels, specifically phosphorus, can help landowners make future management decisions regarding the prevention of surface water runoff to Cedar Lake. If the above recommendations are adopted, each lake shore property owner can assume they are doing their part to minimize the amount of surface water runoff and erosion entering Cedar Lake.

References

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