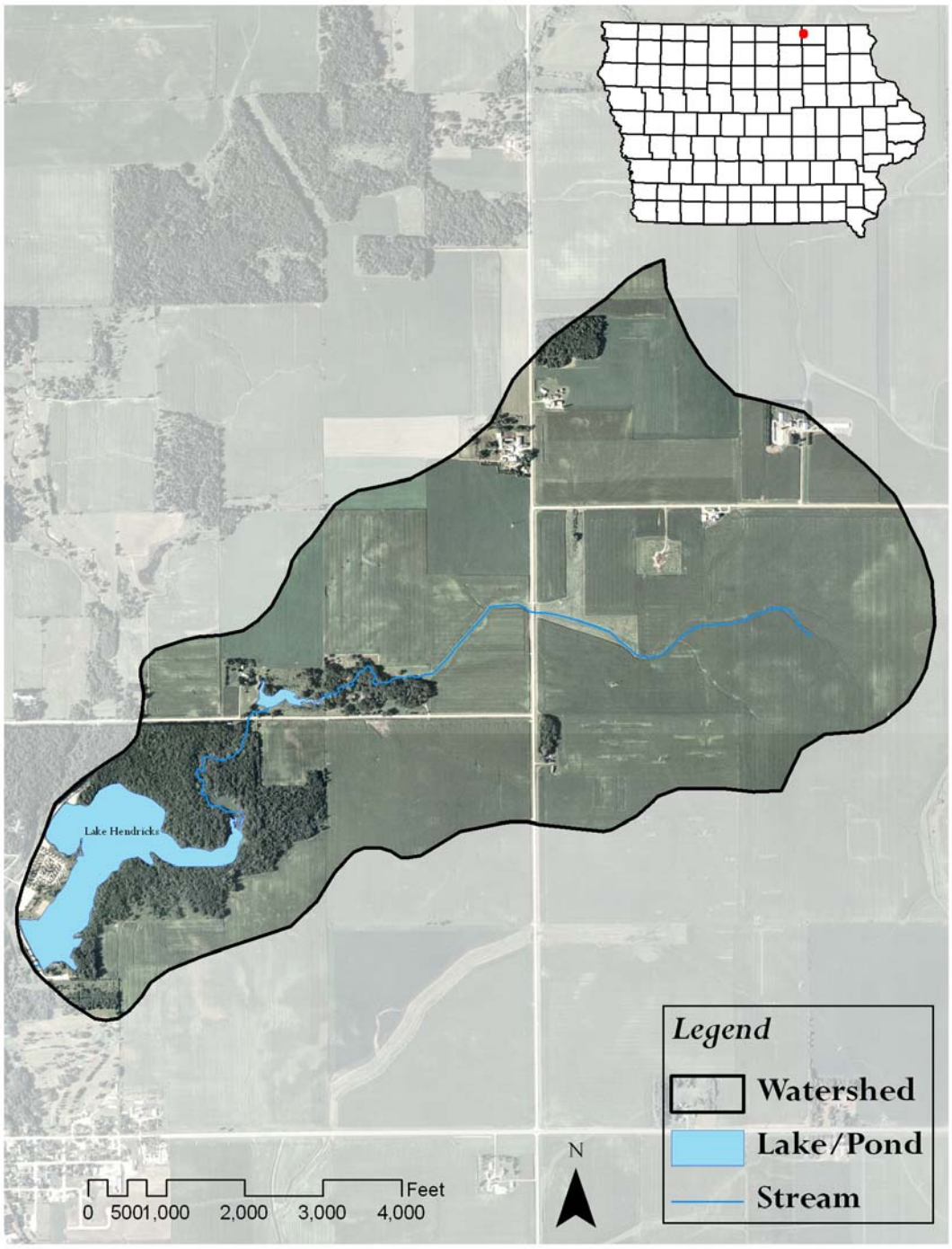
# Lake Hendricks Watershed Management Plan

Howard County Soil and Water Conservation District
August 11, 2009



## Watershed Description

The Lake Hendricks Watershed (HUC# 070801020102) is located on the west edge of Howard County in northeast Iowa. Less than 1 mile north of Riceville, the lake is a major asset to the city both socially and economically. Although a relatively small watershed (1,209 acres), the lake has a significant public impact through the location of the largest county-owned campground facility in northeast Iowa, known as Lake Hendricks Park. Built in 1960 with the assistance of the USDA Natural Resources Conservation Service, the 54-acre man-made lake is the central attraction to the 234-acre park. Fishing (electric-powered boats only) and swimming is permitted in the lake. With 80 modern and primitive camping sites, the camping revenue totaled over $41,000 during the Howard County Conservation Board's 2006 FY, averaging 3,160 camper days or approximately 10,000 campers. This figure does not account for the heavy day-to-day usage the park sustains by visiting or non-camping units. In 2005 the Iowa Lake Valuation Project of ISU estimated the total number of household trips to Lake Hendricks to be 21,149.

The designated use of Lake Hendricks is public recreation with the lake and park area receiving continual updates and improvements. Lake Hendricks Park, managed by the Howard County Conservation Board (HCCB), was recently renovated in August 2006 to include 55 designated campsites in the lower campground, with each site having its own electricity and water hookups, gravel pad, picnic table and fire ring. Along with the upper campground, 2 shelters, 2 shower/bath facilities, and 2 playgrounds, Lake Hendricks Park offers swimming, fishing, hiking, nature study/photography, baseball/softball, a butterfly garden, volleyball, biking, and an enclosed deer pen. The Wapsi-Great Western Trail recently received a $2 million grant to improve and extend the existing trail, a portion of which extends through Lake Hendricks Park.

In the early 1990's, local park officials began noticing an increase in the amount of in-lake vegetation and algae. The problem was exceedingly bad in 1995. In the fall, the overgrown vegetation began to die off as temperatures decreased. During the winter, the decaying vegetation depleted the dissolved oxygen (DO) levels in the lake to below minimum standards and a fish kill occurred. Shortly after, the Iowa DNR assisted the HCCB and installed an aeration system to increase DO during the winter months. The system has prevented further fish kills up to this point; however the in-lake vegetation and algae issues continue to get worse. Currently, Lake Hendricks is listed on the 303(d) list due to algae and pH.

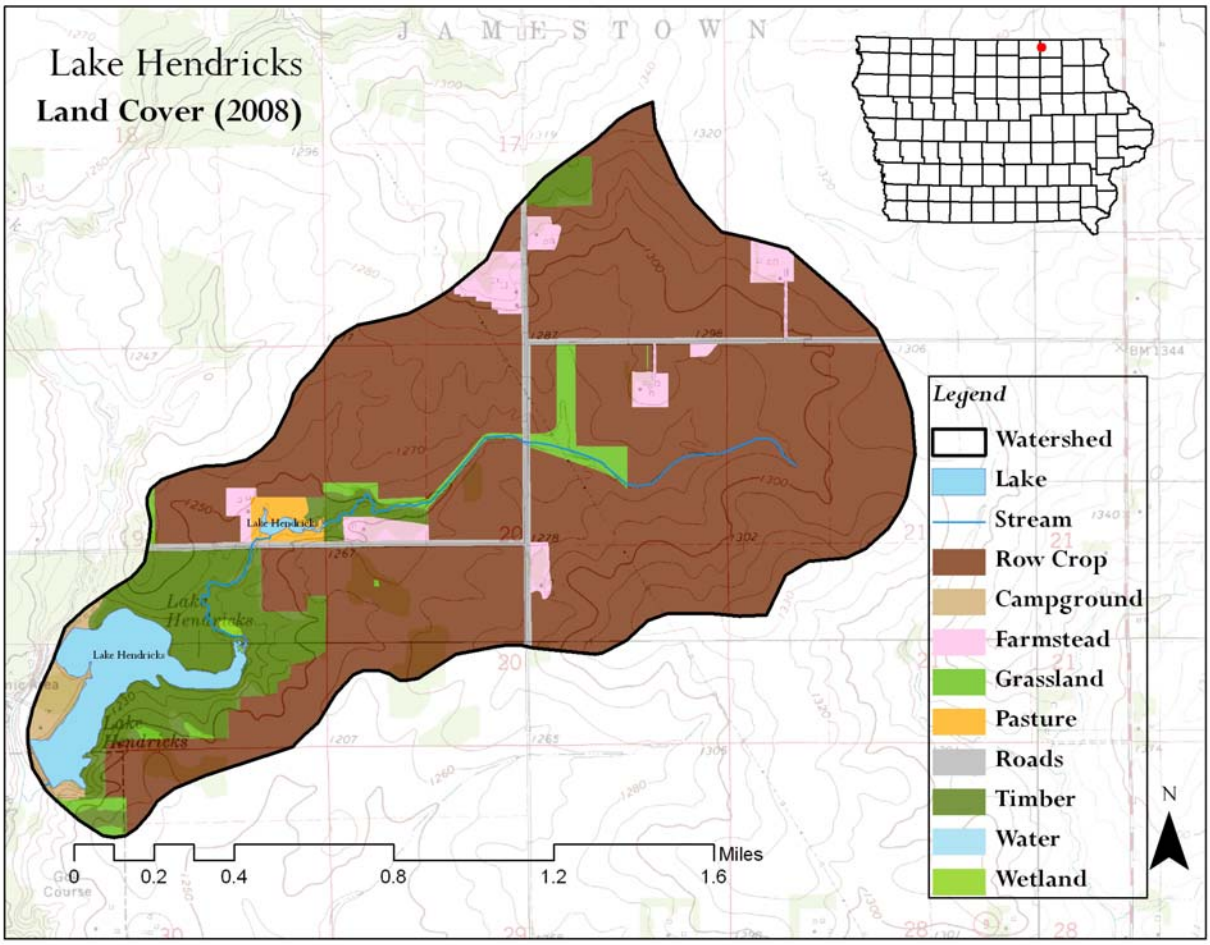
Further assessment and monitoring has concluded that excess nutrients are the cause and that they are being delivered to the lake via tile lines draining adjoining cropland areas. In addition, it appears runoff from fields that have had manure applications is contributing to the problem as well. Finally, even though overall erosion & sediment loading values are quite low, the vast bulk of the erosion is occurring on publicly owned land adjacent to the lake.

In short, the plan over a 6 year period will offer information & education along with various management practices to producers in the surrounding upland areas, and more focused structural practices in the areas adjacent to the lake to reduce both sediment and nutrient loading. In time, and through continued monitoring, the amount of sediment and nutrients delivered to the lake should be reduced by nearly 75%. Once a TMDL has been completed, this plan will be updated to include a management plan that addresses any internal nutrient recycling issues.

***Land Use***

Lake Hendricks is surrounded by a 1,209 acre watershed located in the Iowan Erosion Surface in northeast Iowa. An estimated 84% of the surrounding gently to moderately-sloping land has been converted to agricultural use, for which it is ideally suited. Of those lands engaged in agricultural production, an estimated 67% is in row crop and 17% in grass/hay, a small portion of which is in CRP. Timber is the next largest land cover category at 11%, followed by the lake itself (4%) and "other" at < 1% (Figure 1). By and large, the watershed's soils are not highly erodible due to level topography, except for those areas immediately adjacent to the lake as was discussed earlier. As a result, soil loss values from rill & sheet erosion are quite low, and any USDA conservation compliance issues are negligible. The dominant soils are Clyde (22%), Floyd (16%), and Bassett (12%). With a maximum depth of 19 feet in one small area, the average depth of Lake Hendricks is about 8 feet.

Figure 1: Lake Hendricks Land Cover



## Water Quality Problems and Causes

Lake Hendricks, a Class A (primary contact recreation) water body, appears on Iowa's 303(d) List of Impaired Waters for 2002, 2004 and 2006 as a result of the ISU Limnology Laboratory's statewide lake survey. Originally the lake was placed on the list due to low dissolved oxygen and organic enrichment leading to oxygen depletion. Fortunately, the artificial aeration during the winter has been successful and the low DO levels are no longer the considered the primary water quality problem. However, recent assessments completed by Iowa State University (Table 1) have identified the primary problems to currently be high levels of chlorophyll *a* and suspended algae in the water, moderately poor water transparency, and very high levels of phosphorus in the water column. The lake has relatively low levels of inorganic solids which suggest the poor transparency impairment is due to algae and not excessive sediment loading. According to the draft 2008 impaired water list, Lake Hendricks is impaired due to algae, and pH.

**Table 1: ISU Limnology Data on Lake Hendricks:**

| Parameter | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 | 2001 | 2000 |
|---|---|---|---|---|---|---|---|---|---|
| Secchi Disk Depth (m) | 1.2 | 0.8 | 1.9 | 0.8 | 1.1 | 1.8 | 0.9 | 1.5 | 2.0 |
| Turbidity (NTU) | 22 | 25 | 9.6 | 17.6 | 13.3 | 26.4 | 23.5 | 22.3 | 5.1 |
| Chlorophyll a ( ug/L) | 16.5 | 67.3 | 49.8 | 167.3 | 41.8 | 17.5 | 68.2 | 41.7 | 18.2 |
| Total Phosphorus as P ( ug/L) | 50 | 130 | 92 | 96 | 68 | 124 | 132 | 63 | 149 |
| Total Nitrogen as N (mg/L) | 5.0 | 3.1 | 3.4 | 3.04 | 9.44 | 3.07 | 1.49 | 4.51 | 5.29 |
| Total Suspended Solids (mg/L) | 14 | 9.3 | 8 | 15 | 9 | 15 | 10 | 16 | 9 |

Lake Hendricks has been tested systematically since 2000 by ISU Limnology. Using the median values from 2002 through 2008 (approximately 30 samples), Carlson's (1977) trophic state indices for Secchi depth, chlorophyll *a*, and total phosphorus were 61, 65, and 68 respectively for Lake Hendricks. According to Carlson (1977) the Secchi depth and chlorophyll *a* values place Lake Hendricks in between the *eutrophic* and *hypereutrophic* categories, while the value for total phosphorus places Lake Hendricks in the *hypereutrophic* category. High algae growth in this shallow of an area makes fishing, boating and swimming undesirable(Picture 1).

Picture1: Looking to the north you can see large mats of green algae developing along the shoreline.

The existing monitoring enabled the local sponsors to identify the existing water quality problems in the lake. However, the data had limited use for identifying the various *sources* of the impairments. As a result, the local sponsors partnered with the Howard SWCD and the DNR-Geological and Water Survey Bureau to conduct additional monitoring in 2007 as part of an IDALS-DSC Project Development and Planning Assistance Grant (Figure 2).

Even though the lake has significant levels of phosphorus in the water column, the monitoring indicates the outside source(s) of phosphorus appear to be concentrated at Sites 1 & 3, with a few spikes at Sites 7 & 11 (Figure 3). The monitoring reflects total phosphorus, including phosphorus attached to sediment particles and in the dissolved state. Samples from Site 1 were taken in the creek, which drains much of the watershed. Therefore, it would be safe to assume the samples from this site included both phosphorus attached to sediment as well as dissolved phosphorus. However, since many of the monitoring sites were located at tile outlets, one would expect most of the phosphorus being sampled would be in the dissolved state. However, upon further review, there appears to be a series of surface intakes along the tile lines draining into Sites 3, 9, 10 and 11. Thus, the elevated levels at these sites may include both dissolved and phosphorus attached to sediment.

Figure 2: Location of streams/tiles being monitored for Lake Hendricks. Site 12 (wetland site) is not shown on this map.

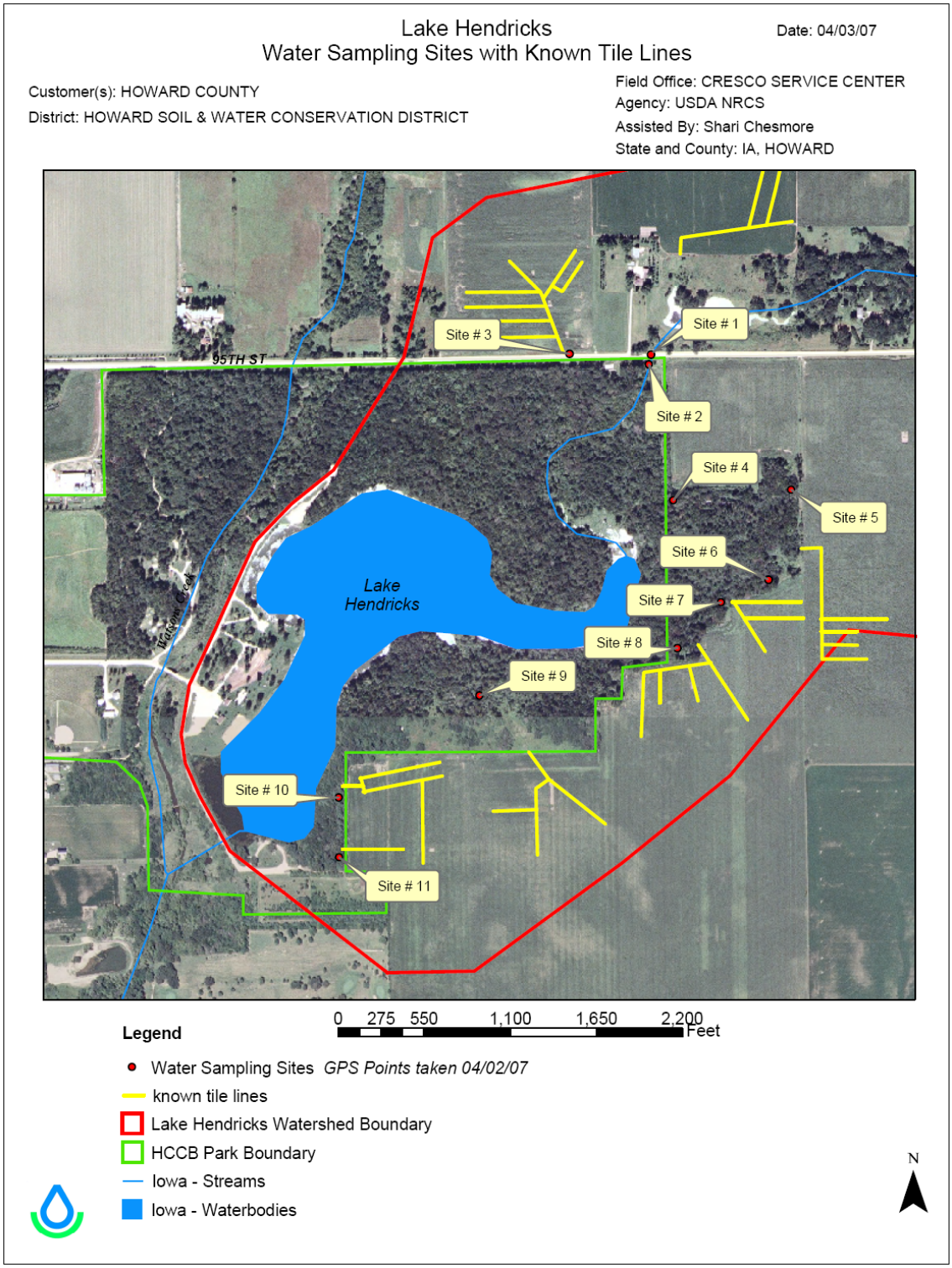
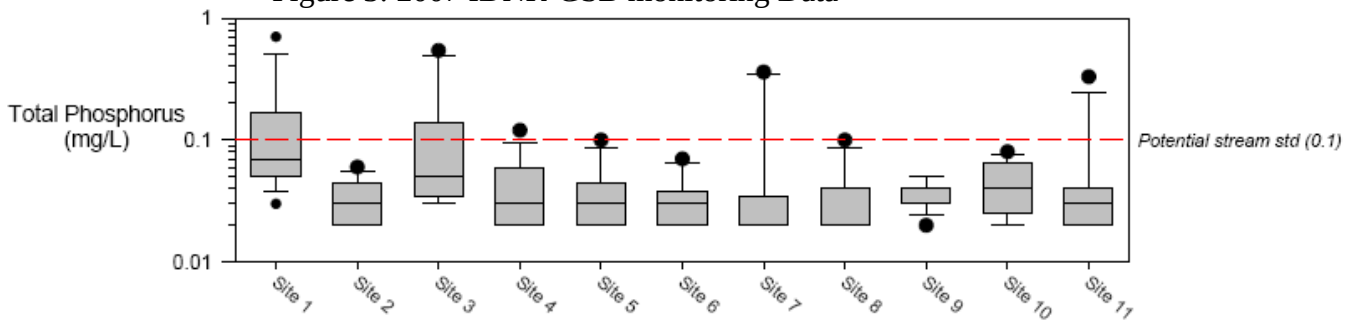
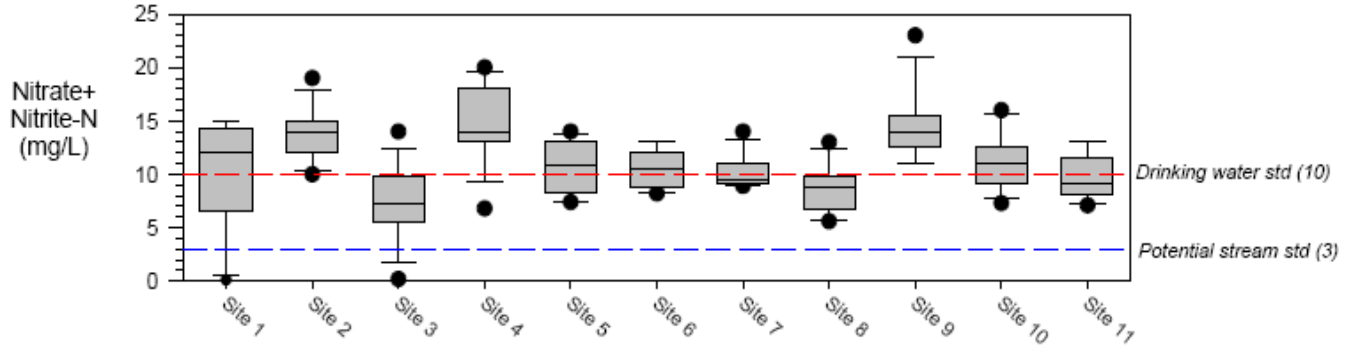


Figure 3: 2007 IDNR-GSB monitoring Data




Nutrients in the form of phosphorus may not be the only nutrient problem in the lake. The levels of Nitrate+Nitrite-N appear to be high at all sites, especially at Sites 2, 4, & 9 (Figure 4). To a certain degree, this could be expected due to abundance of row crop agriculture and subsurface drainage in the watershed, however these levels are quite significant and far above average for this region.

Figure 4: 2007 IDNR-GSB Monitoring Data




These values raised several questions. If the water exiting the tile lines is this nitrogen enriched, why do the levels monitored in the lake appear to be below critical levels? The best answer may be the fact that the ISU samples were pulled in June, July and August, just as the rate of in-lake plant growth and algae production were at their peak. As a result, the amount of nitrogen in the actual water column appeared normal.

Even though there never has been an identified E. coli impairment in the lake, the stakeholders wanted to assess the level of threat the watershed posed in regards to this very common problem in Iowa. The results of the E. coli monitoring indicated a relatively significant amount of bacteria being carried to the lake via the existing tile lines, especially at Sites 1, 3 and 10 (Figure 5). In order to determine the source of the bacteria, these results were compared with the chloride (Figure 6) and ammonia-N monitoring (Figure 7). At this time no data is available to measure in-lake bacteria levels. Since the average chloride levels appear low, the probability of the source of the bacteria being human is also relatively low. However, since the ammonia-N values are higher than average (especially at Site 1), the source of the bacteria is likely livestock waste, and since there are relatively few open feedlots and no grazing in the watershed, the likely source of the bacteria appears to be land applied manure.

Figure 5: 2007 IDNR-GSB Monitoring Data

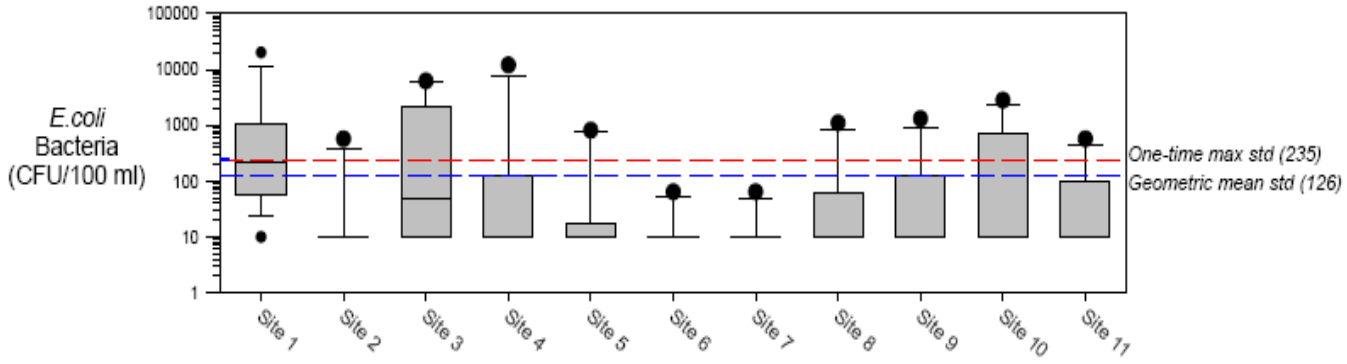



Figure 6: 2007 IDNR-GSB Monitoring Data

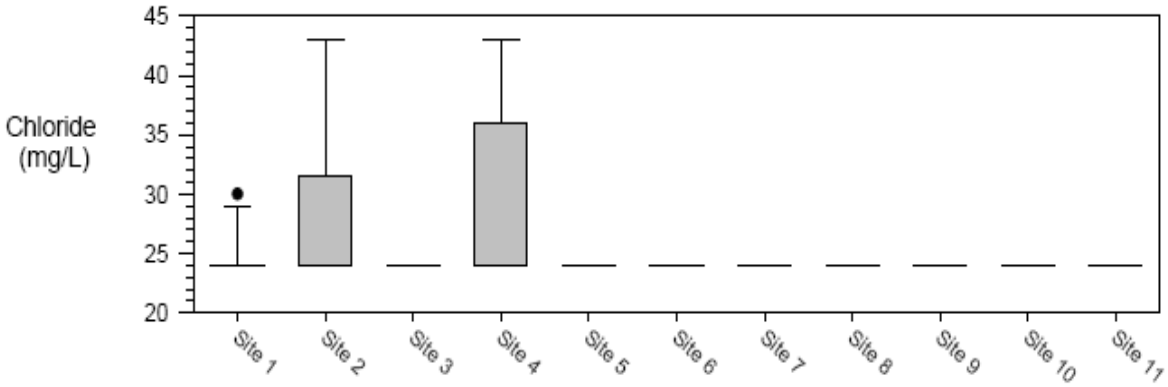
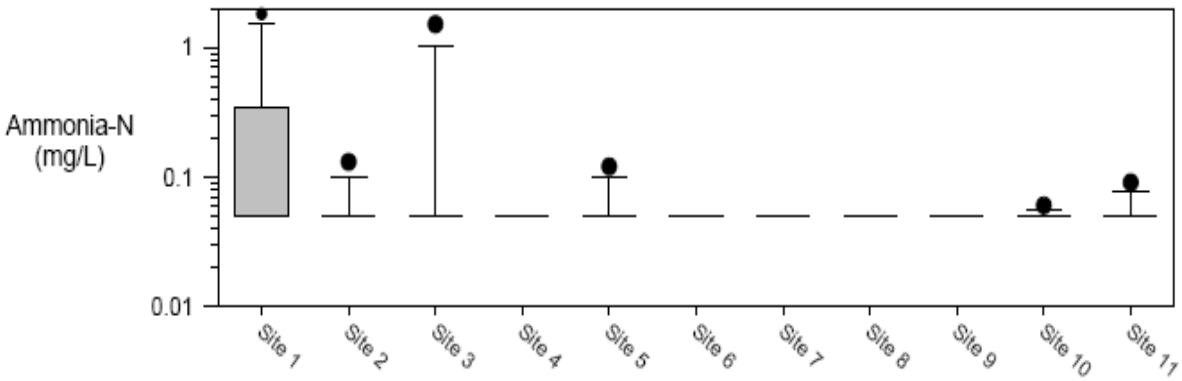



Figure 7: 2007 IDNR-GSB Monitoring Data




In regards to soil erosion and sediment delivery, the assessment concluded that:

1. According to DNR GIS data(Figure 8), the average soil losses from sheet & rill erosion is less than 1 ton/acre/year, and the estimated sediment delivery(Figure 9), from sheet & rill erosion, for the entire watershed is only 139 tons/year.
2. Nearer the lake, the slopes become steeper and more susceptible to erosion. But, many of these acres are covered in timber, thus average rill & sheet erosion estimates are still quite

3. Even though there is little of what most would consider a stream within the watershed, there are a few isolated locations of accelerated streambank erosion within the timbered areas of the park.

Given the unique topography of the watershed and the existing sediment trapping structure north of the lake, the total sediment loading is quite low compared to other agricultural watersheds. Local park officials confirm this low total through observations they made in the past when the lake was lowered for some maintenance work. They were very surprised to find very little accumulated sediment near the lake margins where the stream enters the lake.

## Status of Total Maximum Daily Load (TMDL)

The DNR has not yet scheduled a TMDL for the watershed.

## Sources of the Problem

As a result of the monitoring effort both in the lake as well as the surrounding watershed, this plan will focus on the following three significant sources of nonpoint source pollution within this watershed:

1. Nutrients from underground drainage tile around the perimeter of the lake
2. Sediment loading from active gully & streambank erosion adjacent to the lake
3. Fecal bacteria from land applied manure moving via both surface and subsurface runoff

## Current Level of Pollutant Loading

Members of the DNR's TMDL staff provided a rough estimate of phosphorus loading based upon the existing in-lake monitoring data. The model they used estimates current phosphorus loading to be between 800 lbs. and 1700 lbs per year. Regrettably, the means to effectively estimate loading reductions in response to individual BMP implementations is very limited. Therefore, unless the means to measure such progress is provided, the plan proposes to measure progress through reductions of in-lake concentrations through the continued use of monitoring. It must be noted that these estimates are total load in the lake (internal and external) so not all of this is a result of overland flow carrying sediment to the lake. It would require more sophisticated modeling to determine what fraction of this load is internal versus external.

On the other hand, the means are at hand to measure loading reductions, pre- and post-implementation, when addressing sediment loading. During the assessment, the project determined that 783 tons of sediment is delivered annually to the lake (table 2).

Table 2: Sediment loading to lake by source

| Sediment Source | Total Sediment Loading |
|---|---|
| Upland rill & sheet erosion | 141 ton/year |
| Gully erosion near the lake | 600 tons/year |
| Streambank erosion near lake | 42 tons/year |
| **Total** | **783 tons/year** |

Qualified NRCS technical and local field office staff evaluated the surrounding county-owned timbered areas for gully erosion. Based upon their input, IDALS staff used the Sediment Delivery Calculator to estimate sediment loading contributions from gully erosion to be 600 tons/year. Of the 600 tons/year, 71% of the loading comes from the timber on the south end of Lake Hendricks (figure 11). The sponsors also asked local County Conservation Board staff to determine the extent and rate of shoreline erosion. IDALS staff used these inputs, as well as the Sediment Delivery Calculator to estimate sediment loading contributions from shoreline erosion to be 40 tons/year.

Figure 8: Sheet & Rill Erosion

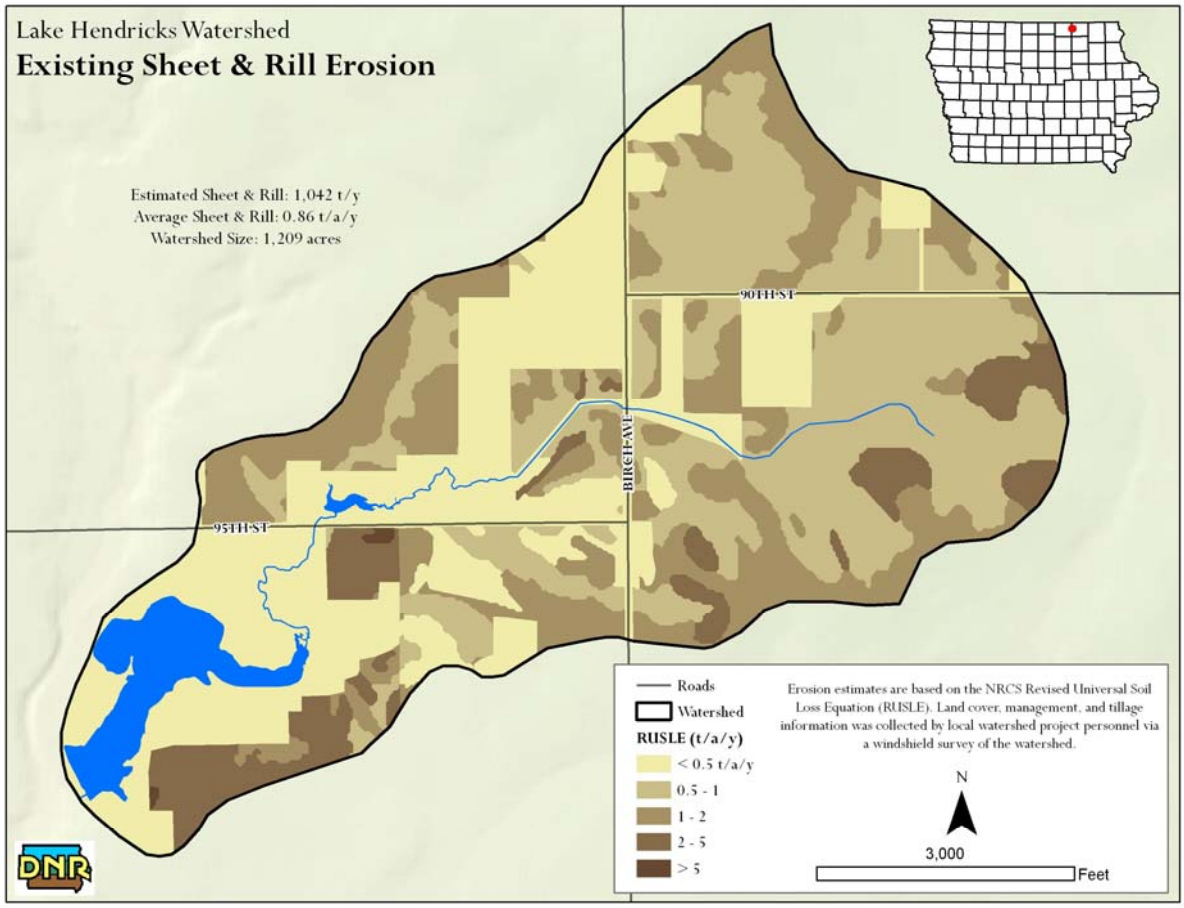
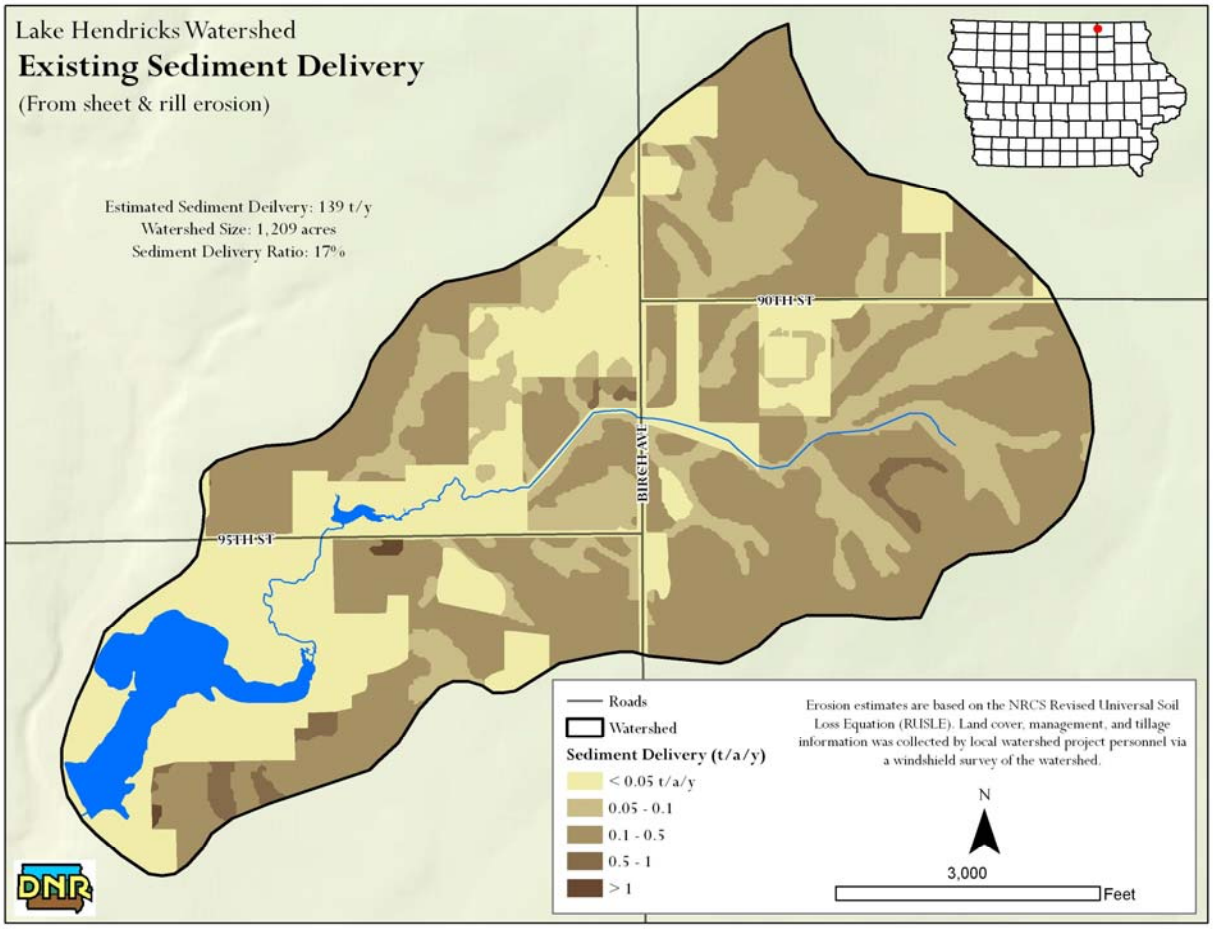



Figure 9: Sediment Delivery from sheet & rill erosion




In total, the project estimates total sediment loading to only be 783 tons/year. As one can see, sediment loading from rill & sheet erosion on the upland areas poses little threat to the water quality of the lake (figure 8).

## Watershed Goals and Objectives

In light of the future development of a Water Quality Improvement Plan (otherwise known as a TMDL) by the DNR, the sponsors of this plan are aware the following objectives may have to be revised to meet any changing water quality needs identified in the final document. However, based upon the assessment & planning activities conducted thus far in the development of this plan, the local partners offer the following objectives:

Objective 1: Reduce nutrient concentrations in the lake by 35%

Since the means are not at hand to effectively convert nutrient concentrations within the lake to loading estimates, progress will be measured by reductions in actual in-lake nutrient concentrations. The average in-lake concentration of total phosphorus from 2000 to 2008 ranged

from 63 to 149 ug/L, with an average of 108 ug/L, so a 35% reduction should lower *average* concentrations to 70 ug/L. The proposed BMPs should not only achieve reductions in phosphorus, but in nitrate+nitrite-N concentrations as well.

Objective 2: Reduce sediment loading from near-lake sources by 70%

Overall sediment loading from upland sources is very minor. However several key sediment sources exist along the margins of the lake within the timbered areas of the park. Numerous gullies and some limited streambank erosion contribute an estimated 640 tons of the total 781 tons of sediment delivered to the lake per year. Through the use of the Sediment Delivery Calculator, the project will track sediment loading reductions as the planned BMPs are implemented.

Objective 3: Increase the sense of local ownership of the lake with stakeholders and the public

Park users, anglers and campers have long understood the importance of water quality as it relates to recreation. Significant increases in property values and income from tourism are only a couple of the benefits a healthy lake can have on a community the size of Riceville. For this positive relationship to continue to grow, the lake's water quality will need to be improved and protected over the long-term. This will take the effort of not only local officials, but the entire community as well as the producers farming within the watershed. Various information & educational activities, signs, press releases, and an informational kiosk will be implemented to promote the project, educate the stakeholders and most importantly strengthen the bond between the lake and the community.

Objective 4: Establish a local Advisory Committee for the long-term protection of the lake

The HCCB will act as a hub, to develop a Lake Hendricks Advisory Committee (LHAC) among the participating stakeholders (including the Howard SWCD). The LHAC will meet in a public setting on at least an annual basis if not more frequently to collectively identify emerging water quality problems, and actively seek opportunities to work together using local resources to mitigate future threats to the water quality of the lake.

## Practices needed to achieve goals

As the data shows, sediment loading from the upland areas poses little threat to the lake. However, the nutrients applied to these same acres do pose a significant threat to water quality. Unfortunately, in light of current commodity and rental prices, producers are becoming less inclined to enroll acres into some form of nutrient management planning program based upon reducing fertilizer inputs. Fortunately, there are a few of the more common BMPs which will enable the project to continue to preach soil conservation, but more importantly reduce nutrient loading by reducing runoff. Practices promoting high residue systems (no-till, conservation tillage & cover crops on chopped fields) will reduce nutrient movement, thus increasing the time available for uptake. Manure management plans will encourage applicators to spread the manure more evenly over a wider area and incorporate manure more quickly, again in order to reduce nutrient movement. Finally, grassed waterways will not only reduce ephemeral gully erosion, the grasses will absorb much of the excess nutrients that previously left the field in storm water flow.

Collectively these traditional upland practices designed to address soil erosion will have a pronounced impact on nutrient movement within the watershed. Table 3 shows the total cost of implementation and monitoring of the Lake Hendricks Watershed to reach our objectives.

Table 3: Financial and BMP needs for the Lake Hendricks Watershed

| **BMPs for Upland Treatment** | **No. for Entire Watershed** | **Funds Needed (Estimated)** |
|---|---|---|
| No-till farming | 150 acres | $11,250 |
| Conservation Tillage | 400 acres | $6,800 |
| Manure Management Plans | 250 acres | $4,500 |
| Cover Crop | 100 acres | $1,000 |
| Grassed Waterways | 10 acres | $15,000 |
| **BMPs for Critical Areas Near the Lake** | | |
| Tile Bio-Filters | 4 | $20,000 |
| Water & Sediment Basins | 6 | $48,000 |
| Grade Stabilization Structures | 3 | $36,000 |
| Wetlands (to reduce nutrient loading) | 1 | $76,000 |
| Streambank Stabilization | 500 feet | $10,000 |
| Timber Stand Improvement | 150 acres | $7,000 |
| **Water Monitoring Costs (Ten years- 6 years implementation + 4 years of follow up monitoring)** | | $100,000 |
| **Landowner Contributions** | | $51,250 |
| **Office space/equipment** | | $20,200 |
| **Information & Education** | | $7,400 |
| **Staffing Needs for the watershed (1/2 time project coordinator)** | | $260,000 |
| **Total Cost to Implement Plan** | | **$662,400** |

Figure 10: Priority BMPs in Lake Hendricks Watershed

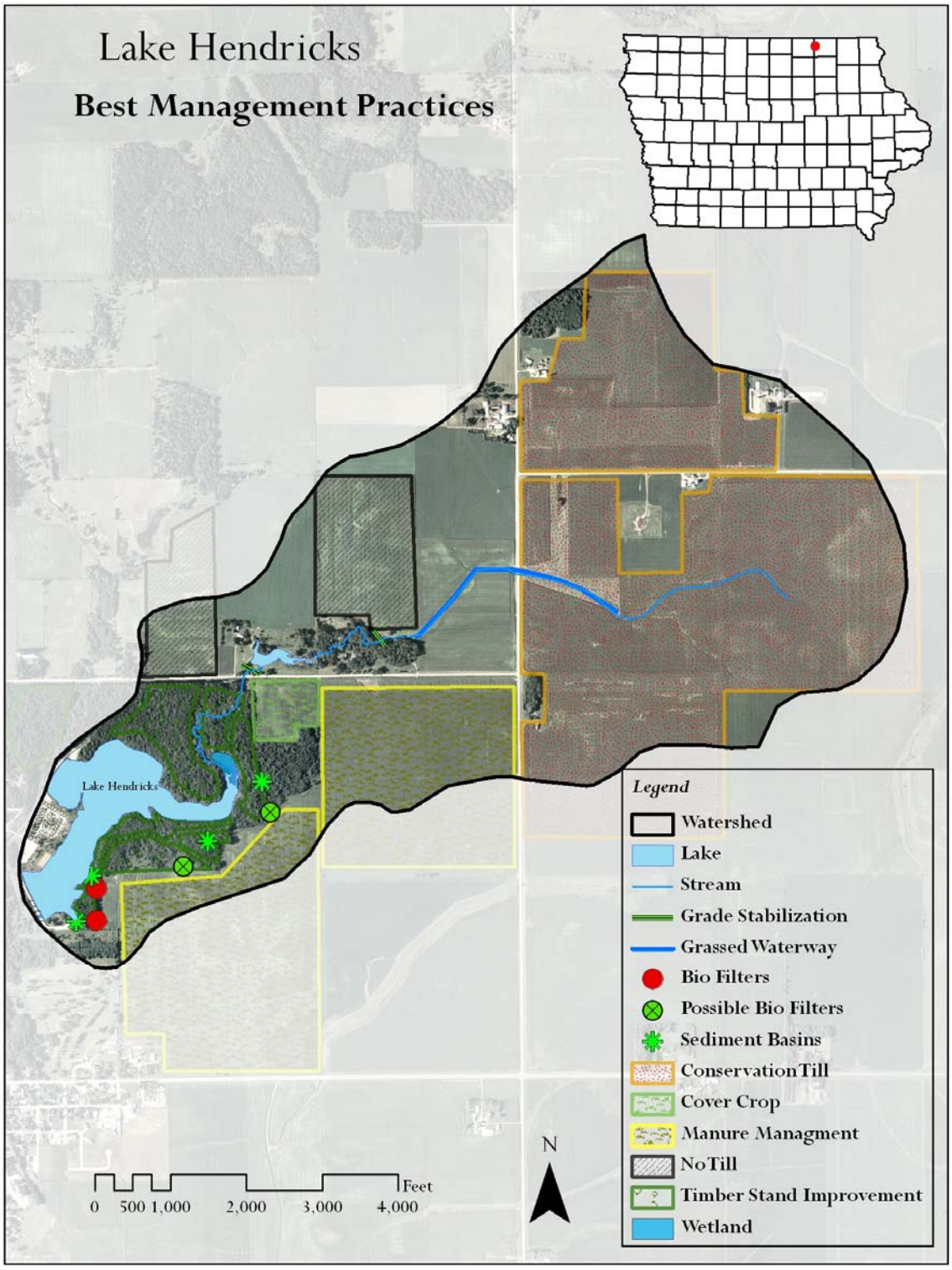


Figure 11: Location of high priority structures in Lake Hendricks Watershed.

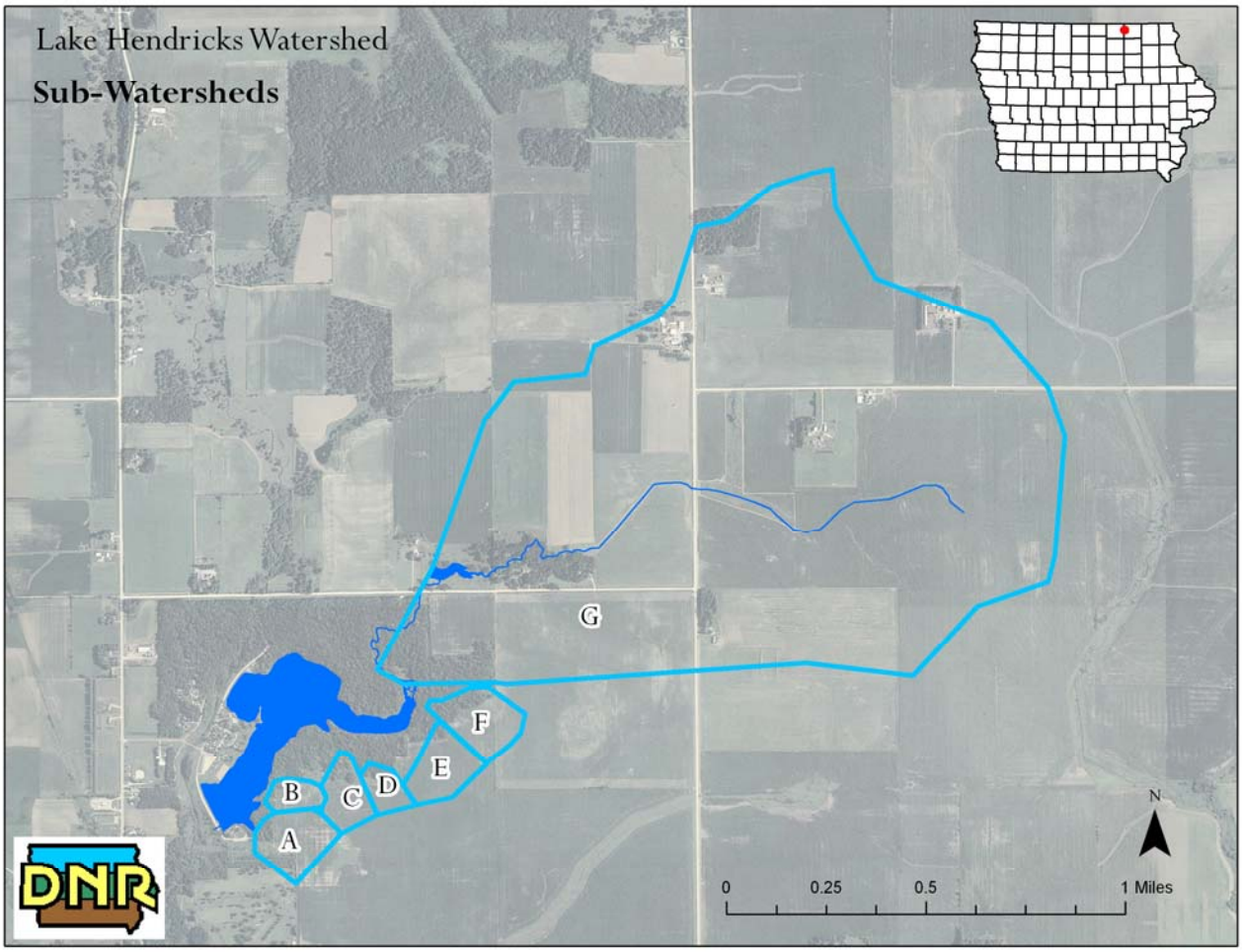
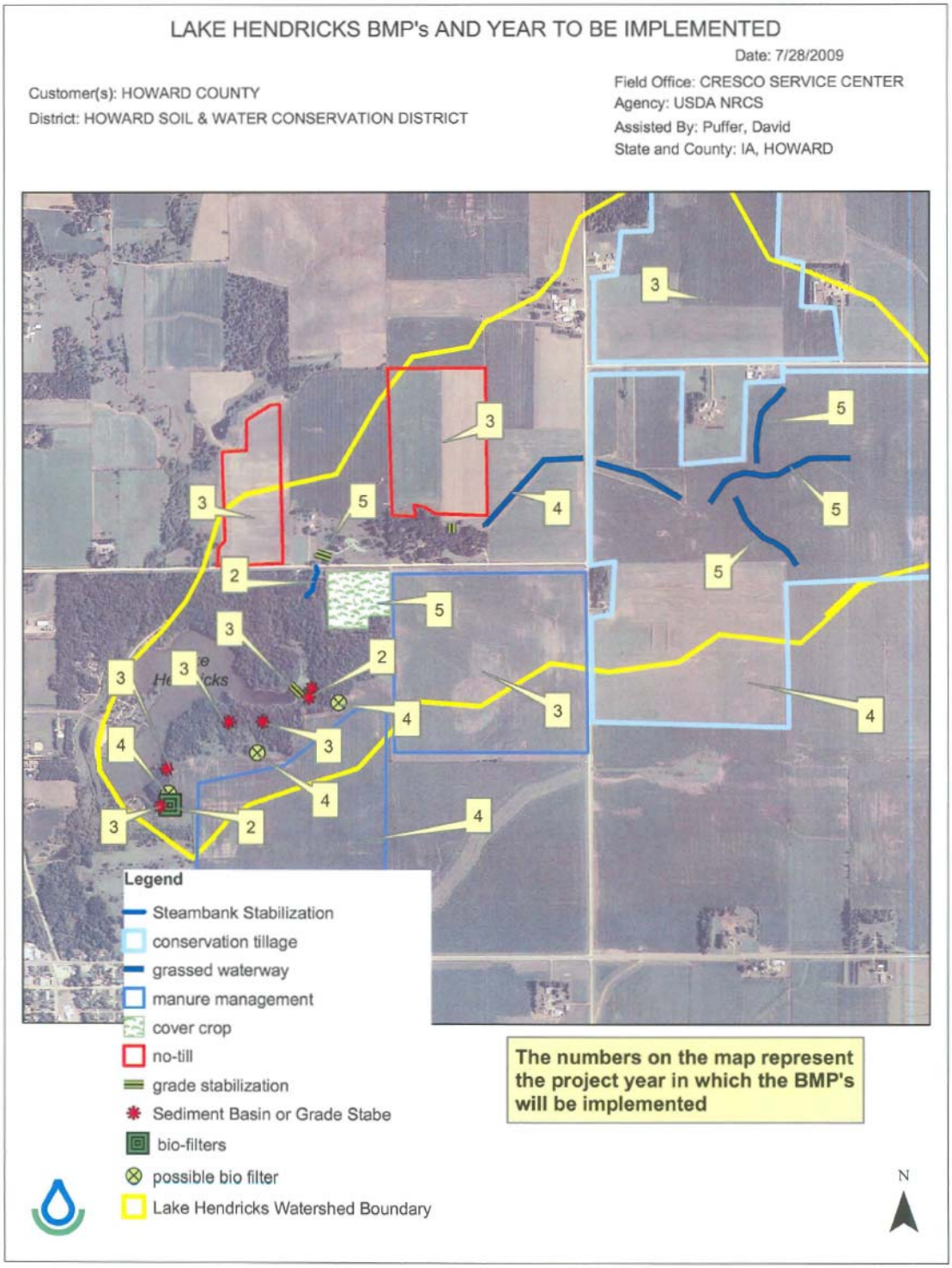


**Table 4: Load Reduction Calculations**

| | Lake Hendricks Load Reduction Calculations | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | **Drainage Area (Acres)** | **Sediment Delivery Pre-Implementation (tons/yr)** | **Sediment Delivery After Implementation (tons/yr)** | **Total Sediment Loading Reduction (tons/yr)** | **Phosphorus Reduction (lbs)** |
| | | | | | |
| **Grade Stabe A** | 14.8 | 58 | 4 | 54 | 70 |
| **Grade Stabe B** | 7.8 | 26 | 1 | 25 | 33 |
| **Grade Stabe C** | 10.8 | 42 | 2 | 40 | 52 |
| **Grade Stabe D** | 7.8 | 54 | 2 | 52 | 68 |
| **Grade Stabe E** | 15.8 | 126 | 4 | 122 | 159 |
| **Grade Stabe F** | 20.1 | 137 | 4 | 133 | 173 |
| **Wetland/Grade Stabe G** | 902 | 652 | 526 | 126 | 169 |
| **Timber Stand Improvement** | 25 | 100 | 25 | 20 | 26 |
| **Streambank Stabilization** | 500 ft. | 42 | 25 | 17 | 22 |
| **Grassed Waterway** | 10 | 12 | 4 | 8 | 10 |
| | | | | | |
| | | | | | |
| **Total Reduction** | | | | **597** | **782** |
| **Percent Reduction** | | | | **76%** | **~52%** |
| | | | | | |

Figure 11 and Table 4 provide load reduction calculations for BMPs in the Lake Hendricks watershed. Practices like no-till, cover crops, manure management, and conservation tillage and more difficult to quantify. Not only will they provide some additional load reduction in the watershed, but they will extend the life of the grade stabilization structures near the lake.

**Figure 12: Prioritization of BMPs by project year**



The practices that will have the most impact will be implemented within the critical timbered areas surrounding the lake itself. The wetland will create a pool area of 7-10 acres and will have a watershed of approximately 950 acres, for a 0.8% to a 1.1% wetland to watershed ratio. If successful, this will enable the project to install a CREP-like wetland on public land as its centerpiece in reducing nutrient loading to the lake. Similar wetlands in Iowa have reduced nitrogen loading by 40-90%.

The water & sediment basins and grade stabilization structures constructed within the timbered areas will eliminate the bulk of the gully erosion problems, and create small pools of water below many of the tile outlets. Even though their collective nutrient loading reductions may not be as effective as the CREP-like wetland, they will still be beneficial and their sediment loading contributions, along with the streambank stabilization, will have a significant impact on the lake.

Finally, the monitoring indicated that Sites 10 and 11 are significant contributors of nonpoint source pollution to the lake. Based upon an in-field inspection, the topography of the site offers few opportunities to build a wetland or some form of sediment trapping structure. However, the site would lend itself well to some form of tile bio-filtering device, such as those involving a trench filled with wood chips, which filter the nutrient laden tile water. One of the key advantages of employing this technology at this site is that it will be installed on public land, increasing the visibility of the innovative system, as well as the likelihood of long-term maintenance. The means to quantify the load reduction from these structures is unknown since we do not have flow data from the tile lines. Most research across the U.S suggests that we should achieve a nitrogen reduction of 40-60%. A priority list for BMP implementation has been developed (figure 12).

## Implementation of the Plan

The implementation stage of the plan will be broken into three phases. Three phases will allow time for the Howard CCB to secure funding and allow for follow-up monitoring. Since the majority of BMPs are located on county property, the CCB must spread out the cost of implementation.

## Phase 1:

**Cost: $414,775**

This 2 ½ year phase will be coordinated by the Howard SWCD, with significant input from the primary stakeholder in the watershed, the HCCB. Funds will be requested to support a ½ FTE staff to coordinate project activities on behalf the SWCD.

| BMPs for Upland Treatment | No. of BMPs Planned | Funds Needed |
|---|---|---|
| No-till farming | 50 acres | $3,750 |

| | | |
|---|---|---|
| Conservation Tillage | 75 acres | $1,275 |
| Manure Management Plans | 75 acres | $1,350 |
| Cover Crop | 30 acres | $300 |
| Grassed Waterways | 5 acres | $7,500 |
| **BMPs for Critical Areas Surrounding the Lake (*)** | **No. of BMPs Planned** | |
| Tile Bio-Filters | 1 | $5,000 |
| Water & Sediment Basins | 4 | $32,000 |
| Grade Stabilization Structures | 2 | $24,000 |
| Wetlands | 1 | $76,000 |
| Streambank Stabilization | 500 feet | $10,000 |
| Timber Stand Improvement | 50 acres | $2,300 |
| Landowner Contributions (cost share) | | $38,900 |
| Office Space/Equipment | | $10,200 |
| Water Monitoring (Component A&B of water monitoring plan) | | $77,500 |
| Staffing Needs | | $120,000 |
| Information & Education | | $4,700 |

(*) The land around the lake on which the proposed BMPs will be installed is publicly owned. As a result, it would technically be eligible for USDA's EQIP program. However, the ranking would be so low; any such applications would likely be denied. Therefore, 75% cost share will be sought via the WSPF/WPF/319 programs.

## Phase 2:

## Cost: $240,125

Phase 2 will also be coordinated by the Howard SWCD, with significant input from the primary stakeholder in the watershed, the HCCB. Funds will be requested to support a ½ FTE staff for 3 ½ years to coordinate project activities on behalf the SWCD. The remaining BMPs will be implemented during phase 2.

| **BMPs for Upland Treatment** | **No. of BMPs Planned** | **Funds Needed** |
|---|---|---|
| No-till farming | 100 acres | $7,500 |
| Conservation Tillage | 325 acres | $5,525 |
| Manure Management Plans | 175 acres | $3,150 |
| Cover Crop | 70 acres | $700 |
| Grassed Waterways | 5 acres | $7,500 |
| **BMPs for Critical Areas Surrounding the Lake (*)** | **No. of BMPs Planned** | |
| Tile Bio-Filters | 3 | $15,000 |
| Water & Sediment Basins | 2 | $16,000 |
| Grade Stabilization Structures | 1 | $12,000 |
| Timber Stand Improvement | 100 acres | $4,700 |
| Landowner Contributions (cost share) | | $12,350 |
| Water Monitoring (Component B only) | | $10,500 |
| Office Space/Equipment | | $10,000 |
| Information & Education | | $2,700 |
| Staffing Needs for the watershed (1/2 time project coordinator) | | $140,000 |
| **Total Cost to Implement Plan** | | **$247,625** |

## Table 5: Implementation Schedule and Milestones

| Goal 1: RESTORE LAKE TO A HEALTY AND SAFE PLACE FOR PEOPLE TO BOAT, FISH, AND SWIM | | Milestone Metric | Milestone Totals | Phase 1 (2009-2011) | | | Phase 2 (2012-2014) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Year 1 | Year 2 | Year 3 | Year 1 | Year 2 | Year 3 |
| Objective 1 & 2 | **Reduce nutrient concentrations in the lake by 35% and sediment loading from near lake sources by 70%** | | | | | | | | |
| Task 1 | No-Till Incentive | Acres | 150 | | | 150 | | | |
| Task 2 | Manure Management Incentive | Acres | 250 | | | 75 | 175 | | |
| Task 3 | Cover Crop Incentive | Acres | 100 | | | 30 | | 70 | |
| Task 4 | Grassed Waterways | Acres | 10 | | | | 5 | 5 | |
| Task 5 | Tile Filters | Number | 4 | | 1 | | 3 | | |
| Task 6 | Sediment Basins or Grade Stabilization Structure | Number | 6 | | 2 | 2 | 1 | 1 | |
| Task 7 | Grade Stabilization Structures | Number | 3 | | | 2 | | 1 | |
| Task 8 | Wetlands | Number | 3 | | 1 | | 1 | 1 | |
| Task 9 | Streambank Stabilization | Feet | 1000 | | 500 | | | 500 | |
| Task 10 | Timber Stand Improvement | Acres | 150 | 25 | | 25 | 25 | 50 | 25 |
| | | | | | | | | | |
| Objective 3 | **Increase a sense on local ownership of the lake with stakeholders and the public.** | | | | | | | | |
| Task 1 | Park Kiosk | Number | 2 | 2 | | | | | |
| Task 2 | Informational BMP Signs | Number | 8 | | 2 | 2 | 2 | 2 | |

## Phase 3:

## Cost: $12,000

Phase 3 will be coordinated by IA DNR – Water Monitoring Section. Funding will be requested to continue in-lake monitoring for approximately 4 years (component B of the water monitoring plan) after implementation has been completed. This monitoring should be sufficient to remove the waterbody from the impaired waters list if water quality improvements have been achieved.

## Potential Funding Sources

Iowa DNR – Section 319 program
Watershed Improvement Review Board (WIRB)
Iowa Department of Ag and Land Stewardship - Watershed Protection Fund
Low Interest Loan Programs
REAP grants
Natural Resource Conservation Service
County Conservation Board
USDA Farm Bill programs
Diamond Jo Casino
City of Riceville

## Measures of Success

To measure the success of the Lake Hendricks project local SWCD personnel, and Iowa DNR-Water Monitoring Staff will use the following methods to evaluate the water quality impact of applying BMPs to targeted areas:

**Sediment loading reductions:** Reductions will be measured using the Iowa Sediment Delivery Calculator as BMPs are implemented to reduce rill, sheet, gully, and streambank erosion. The total reductions will be compared to pre-project values identified earlier in the plan.

If all the BMPs proposed were installed, the estimated sediment delivery from sheet & rill, stream bank, and gully erosion would be reduced by 610 tons/year (78% reduction). As a result, the amount of phosphorus delivered to the lake will be reduced by an estimated 793 lbs/year. Project Milestones are included in Table 5.

## Criteria to Detect Improvements in Water Quality

To measure improvement in water quality during the progression of the watershed management plan the Secchi Depth Trophic State Index (TSI) will be monitored. The current Secchi Depth TSI is 67 and the benchmark for "fullysupporting" is 60 (Table 6).

**Table 6: Water Quality Milestones for Lake Hendricks Watershed**

| | Current Value | End of Phase 1 | End of Phase 2 | End of Phase 3 (Target Value) |
|---|---|---|---|---|
| Reduction in Phosphous (lbs) | 0 | 198 | 396 | 772 |
| Secchi Depth TSI | 67 | 65 | 61 | 60 |

If the milestones listed above are not achieved at the end of each phase, the Lake Hendricks Advisory Committee would reevaluate the current plan and form a plan B. Plan B could involve alternate management strategies, or just changing the prioritization of implementation practices.

## Lake Hendricks Monitoring Plan

A detailed water quality monitoring plan will be implemented in the Lake Hendricks watershed to track changes in water quality conditions. The water monitoring plan will also help evaluate, to the extent possible, the effectiveness of the BMPs in reducing the delivery of sediment and phosphorus to the lake.

There will be two components to the Lake Hendricks monitoring plan:

**Component A** – Lake Hendricks watershed staff will be sampling 12 stream/tile sites (figure 2) every two weeks from April through November for the parameters listed below. All analyses will be completed by the University Hygienic Lab.

- Total Suspended Solids
- P-series (Ortho P and Total P; ortho P will not be field filtered)
- N-series (Ammonia-N, TKN, NO2+NO3-N)
- TOC
- *E. coli* bacteria

Eleven of these 12 sites represent sites that have been monitored by Lake Hendricks watershed staff during 2007 and 2008. An additional site will be added in 2009 near where the proposed wetland will be located. This will allow upstream and downstream monitoring of the wetland once is has been completed. Table 7 provides an estimated budget for this component of the monitoring.

Table 7: Sampling for Lake Hendricks stream/tile line component.

| Parameter | Number of samples (also includes one duplicate per month; 12 sites sampled 16 times plus 8 | Estimated Costs |
|---|---|---|

| | duplicates) | |
|---|---|---|
| Total Suspended Solids | 200 | $2,400 |
| P-series (ortho P and Total P) | 200 | $4,800 |
| N-series (Ammonia-N, TKN, NO2+NO3-N) | 200 | $10,800 |
| TOC | 200 | $6,000 |
| *E. coli* bacteria | 200 | $3,000 |
| Courier cost | 16 | $1,600 |
| | | |

Estimated yearly cost for Component A: $28,600

**Component B** – DNR fisheries staff will be sampling 4 sites on Lake Hendricks on a monthly basis from May through October (figure 12) for the parameters listed below. All analyses will be completed by the University Hygienic Lab.

- P series(Ortho P and Total P; ortho P will not be field filtered)
- Chlorophyll
- N-series (Ammonia-N, TKN, NO2+NO3-N)
- Total Suspended Solids
- Secchi Depth

Three of the lake sites (1L, 2L, and 3L) represent sites that have been monitored by DNR Fisheries staff as part of a vegetation survey (Figure 12). The fourth site, labeled WQ Site in Figure 13, represents the lake monitoring site associated with the DNR's Lake Program. An additional site will be added in 2009 near where the proposed wetland will be located. Table 8 provides an estimated budget for this component of the monitoring.

Table 8: Sampling plan for Lake Hendricks monitoring component.

| Parameter | Number of samples (4 sites sampled 6 times) | Estimated Cost |
|---|---|---|
| Total Suspended Solids | 24 | $288 |
| P-series (ortho P and Total P) | 24 | $576 |
| N-series (Ammonia-N, TKN, NO2+NO3-N) | 24 | $1296 |
| Chlorophyll | 24 | $360 |
| Courier cost | 6 | $480 |
| | | |

Estimated Yearly Cost for Component B: $3,000

**Yearly Cost of monitoring in Lake Hendricks Watershed: $31,600**

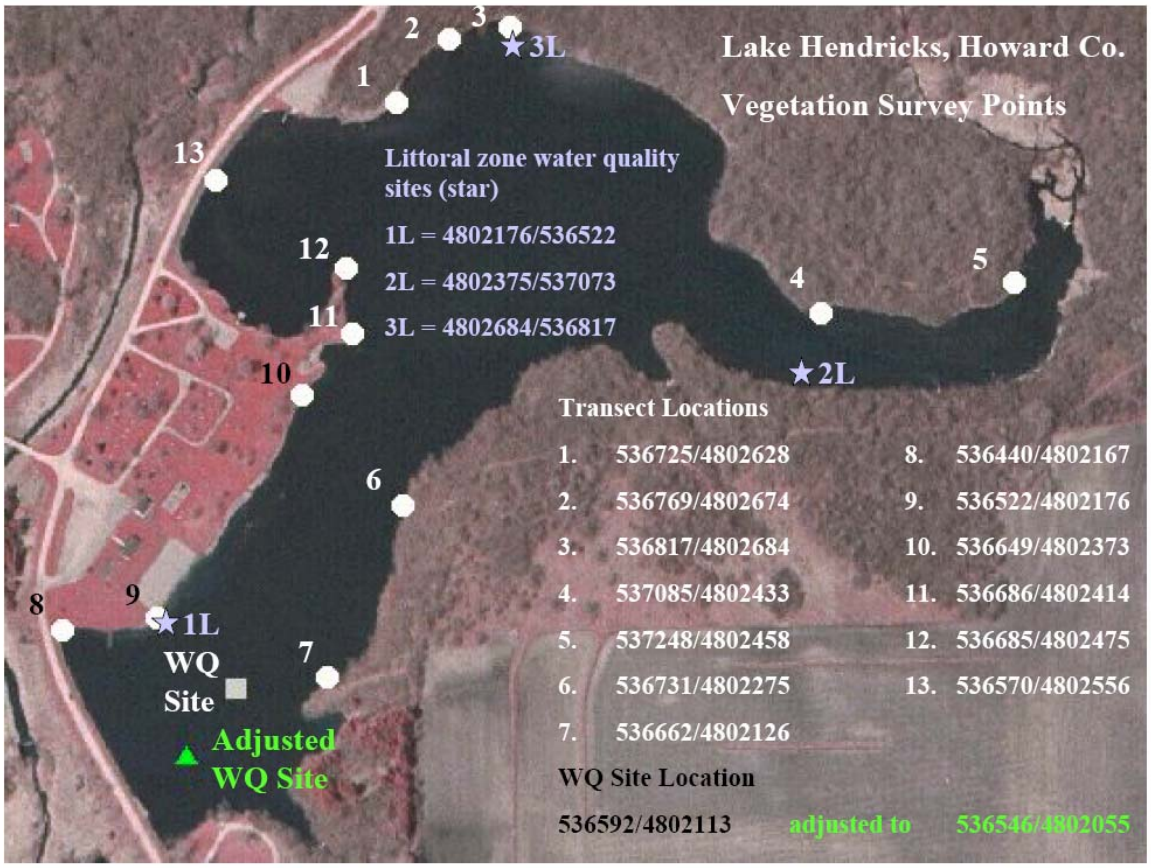



Figure 13: Location of lake sites monitored as part of the Lake Hendricks 319 project. Sites 1L, 2L, and 3L have been monitored by DNR Fisheries staff as part of a vegetation survey, while the WQ Site is the site monitored as part of the DNR's Lake Program.

Component A will continue for approximately 4 sampling seasons, while Component B will continue for 10 years (4 years after implementation schedule is completed).

# Information & Education

**Public Outreach Plan**

**1. SET YOUR PLAN GOALS**

- Reduce nutrient concentrations in the lake by 35 percent
- Reduce sediment loading from near-lake sources by 70 percent
- Increase sense of local ownership of lake with stakeholders and the public

- Establish a local advisory committee for the long-term protection of the lake

## 2. DETERMINE YOUR TARGET AUDIENCES

Who do you depend on to make changes to the land and in the water?

- Six landowners in the watershed
- Howard County Conservation Board
- Recreational lake and park users

Who do you depend on to keep your project afloat?

- Lake Hendricks Advisory Committee
- Howard County board of supervisors
- City of Riceville mayor
- Riceville City Council
- State Senator Amanda Ragan
- State Representative Mark Kuhn
- U.S. Senators Chuck Grassley and Tom Harkin
- U.S. Representative Tom Latham
- DNR, IDALS-DSC, NRCS

Who do you depend on to spread your message to these people?

- Respected individuals in the Riceville community that can serve as project leaders and spokespeople (referred to in plan as "community leaders")
    - James Green
    - Darlene Seidel
- Project partners and stakeholders
    - DNR,IDALS-DSC ,NRCS, Howard SWCD
- Local agriculture-based and outdoor recreation-based businesses and clubs
    - Pheasants Forever
    - Ducks Unlimited
- Newspapers:
    - Riceville Recorder newspaper
    - Times Plain Dealer (Cresco)
    - Mason City Globe-Gazette newspaper
- Radio:
    - KVIK-FM (104.7; DECORAH)
    - KSMA-FM (98.7 FM; OSAGE)
    - KCZQ-FM (102.3 CRESCO)
    - KJCY (95.5 FM; ST. ANSGAR)
    - KGLO (1300 AM; MASON CITY)
- Television:
    - KIMT, Mason City
    - KTTC, Rochester, Minn.
    - KAAL, Austin, Minn.

## 3. RESEARCH YOUR TARGET AUDIENCES

Lake Hendricks presents unique challenges in researching its audiences, given its small watershed and the fact that only six landowners control the private land in the watershed. Traditional research methods, such as surveys, may not be effective for such a small number of landowners. However, surveys may be beneficial in gathering information on the community's (and/or county's) use and perceived value of the lake, residents' knowledge of water quality problems and solutions, and residents' willingness to take part in actions to improve the lake. Follow-up surveys midway and at the end of the project can measure if people's understanding and actions have changed over the course of the project. To save time and money, the project could use a random sample of county residents, rather than the entire population.

In this situation, it may be most beneficial to schedule one-on-one meetings with each landowner to introduce them to the project, listen to their concerns, learn about their farming goals and how they make land management decisions, and how they prefer to communicate with the project. It is critical that the project coordinator work to develop healthy, long-term relationships with each landowner, as well as with the Howard County Conservation Board, which also controls land in the watershed.

**Research strategies:**

1. Meet with individual landowners, CCB:
   With this small audience, it may be most helpful to fill out the information below for ***each*** individual landowner after separate meetings with each

***Landowner 1:***

Barriers to participating in project:

- Not sure how practices will benefit his farming practices

Motivators, incentives or benefits for participating in project:

- Practices can help keep valuable topsoil in place, protecting farming operation
- Conservation tillage, management plans can save money

Preferred ways to receive watershed project information:

- Mail
- Newspaper

How landowner makes decisions regarding his or her land:

- return on investment
- If it requires major changes
- If it will improve or protect his farming investment

Perception of current water quality in Lake Hendricks:

- Not sure

Landowner's perceived value of Lake Hendricks:

- Sees value to the Riceville community

Most familiar conservation practices to landowner:

- Conservation tillage

***Landowner 2:***

Barriers to participating in project:

- Not sure how practices will benefit his farming operation

Motivators, incentives or benefits for participating in project:

- Practices can help keep valuable topsoil in place, protecting his farming operation

Preferred ways to receive watershed project information:

- Mail
- Newspaper

How landowner makes decisions regarding his or her land:

- Return on investment
- If it requires major changes
- If it will improve or protect his farming operation

Perception of current water quality in Lake Hendricks:

- It could use improvements

Landowner's perceived value of Lake Hendricks:

- Sees value for the Riceville community

Most familiar conservation practices to landowner:

- Waterways
- Conservation tillage

***Landowner 3:***

Barriers to participating in project:

- Not sure if the practices are worth the hassle
- Not sure how the practices will benefit his farming operation

Motivators, incentives or benefits for participating in project:

- Conservation tillage, management plans can save money

Preferred ways to receive watershed project information:

- Mail
- Newspaper

How landowner makes decisions regarding his or her land:

- If it will improve or protect his farming investment

Perception of current water quality in Lake Hendricks:

- Thinks it is poor quality

Landowner's perceived value of Lake Hendricks:

- Sees value to the Riceville community

Most familiar conservation practices to landowner:

- Waterways
- Terraces

***Landowner 4:***

Barriers to participating in project:

- New practices are unfamiliar, different from traditional farming practices
- Not sure how practices will benefit his farming operation

Motivators, incentives or benefits for participating in project:

- Practices can help keep valuable topsoil in place, protecting farming operation

Preferred ways to receive watershed project information:

- Newspaper
- Mail

How landowner makes decisions regarding his or her land:

- Return on investment
- If it requires major changes
- If it will improve or protect his farming operation

Perception of current water quality in Lake Hendricks:

- Thinks it is poor

Landowner's perceived value of Lake Hendricks:

- See value for the community of Riceville

Most familiar conservation practices to landowner:

- Waterways

***Landowner 5:***

Barriers to participating in project:

- Not sure how practices will benefit his farming operation

Motivators, incentives or benefits for participating in project:

- Practices can help keep topsoil in place, protecting farming operation

Preferred ways to receive watershed project information:

- Phone
- Mail

How landowner makes decisions regarding his or her land:

- If it will improve or protect his farming operation

Perception of current water quality in Lake Hendricks:

- Thinks it could use improvement

Landowner's perceived value of Lake Hendricks:

- Thinks it is good for the county

Most familiar conservation practices to landowner:

- Conservation tillage

***Landowner 6:***

Barriers to participating in project:

- Not sure how practices will benefit his farming operation
- Believes installation of practices may be too expensive

Motivators, incentives or benefits for participating in project:

- Practices can help keep valuable topsoil in place, protecting farming operation

Preferred ways to receive watershed project information:

- Mail

How landowner makes decisions regarding his or her land:

- If it requires major changes
- If it will improve or protect his farming investment

Perception of current water quality in Lake Hendricks:

- Thinks that it is poor

Landowner's perceived value of Lake Hendricks:

- Sees value to the community of Riceville

Most familiar conservation practices to landowner:

- Terraces
- Conservation tillage

2. Survey county residents
   The best way to learn about how the community values Lake Hendricks, its understanding of water quality issues and its willingness to support and help watershed efforts is to research them – most likely by survey. This could be a random sample, mailed survey of Riceville or the county; a questionnaire handed out after Community Club meetings; a survey mailed to stakeholders; or an interview survey conducted by volunteers at the park on a weekend, among other options.

   If the watershed project chooses not to pursue this research, it may choose to use the following *assumptions* to guide outreach efforts to the community:

Assumed barriers to participating or supporting project:

- Little or no understanding of water quality problems
- Little or no understanding of how watershed improvement works and why it is necessary
- Feeling that there's nothing they can do to help lake; up to government or others

Motivators, incentives or benefits for participating or supporting project:

- Improving the water quality will make it more acceptable for recreational needs
- Improving the water quality will increase the demand for tourism
- The structural conservation practices will provide several more recreational opportunities
- Financial benefits to the community

Preferred ways to receive watershed project information:

- Riceville Recorder newspaper
- Direct mailings
- Riceville Community Club meetings
- In-park signs and kiosks

Perception of current water quality in Lake Hendricks:

- The general perception is that the water quality is poor

Community's perceived value of Lake Hendricks:

- The lake is economically and socially very important to the entire community.

## 4. USE RESEARCH TO DEVELOP YOUR OUTREACH STRATEGY

***Goal 1:*** Reduce nutrient concentrations in the lake by 35 percent

*Audience:*

- Landowners
    - All of the landowners would like to keep updated on all of the activities as well as all of research conclusions

*Barriers to landowners adopting practices:*

- All of the landowners are concerned about how the practices will benefit his farming operations.
- Not sure if the practices are worth the hassle (Landowner 3)
- New practices are unfamiliar, different from traditional farming practices (Landowner 4)
- Believes installation of practices may be too expensive (Landowner 6)

*Possible solutions:*

- Show landowners how conservation practices can benefit their land and farming operations
- Show landowners how practices will protect their land and land down the watershed

*Message:*

- Conservation practices can reduce nutrient concentrations
- Fertilizer management can also save money by helping you use only the amount of fertilizer you need.

*Message delivery:*

- In-person meetings with landowners
- Have "community leaders," if one is a landowner, talk to his/her neighbors about practices, explain why they use them

***Goal 2:*** Reduce sediment loading from near-lake sources by 70 percent

*Audience:*

- Landowners
    - All of the landowners support the project to reduce sediment loading

*Barriers to landowners adopting practices:*

- All of the landowners are concerned about how the practices will benefit his farming operations.
- Not sure if the practices are worth the hassle (Landowner 3)
- New practices are unfamiliar, different from traditional farming practices (Landowner 4)
- Believes installation of practices may be too expensive (Landowner 6)

*Possible solutions:*

- Show landowners how conservation practices can benefit their land and farming operations
- Show landowners how practices will protect their land and land down the watershed

*Message:*

- Conservation practices can reduce erosion and increase soil quality.

*Message delivery:*

- In-person meetings with landowners

- Have "community leaders," if one is a landowner, talk to his/her neighbors about practices, explain why they use them
- News releases
- Updated information to be mailed in bulk to the landowners
- Power point presentations for the community

*Second audience for goal 2:*
- Howard County Conservation Board

*Barriers to County Conservation Board adopting practices:*
- Concerned about cost
- Concerned about placement of certain practices
- Concerned about ability to maintain accessibility to all areas of park

*Possible solutions*
- Discuss concerns with CCB staff, how project can address those concerns

*Message:*
- Conservation practices can reduce erosion and increase soil quality.

*Message delivery:*
- In-person meetings with County Conservation Board

***Goal 3:*** Increase sense of local ownership of lake with stakeholders and the public
*Audience:*
- Local community (Riceville and Mitchell and Howard counties)
- Stakeholders

*Assumed barriers:*
- Little or no interest
- Little or no understanding of water quality problems
- Little or no understanding of how watershed improvement works and why it is necessary
- Little or no understanding of role they play in protecting the lake, or assuming it is someone else's responsibility

*Possible solutions:*
- Better explain how water quality is tied to fishing, other recreation, tourism, etc.
- Explain water quality problems and how project will address them
- Explain what community can do on an individual level to help the lake (give them simple tasks that are easy to take ownership of – picking up trash, etc.)
- Meet with Pheasants Forever, Ducks Unlimited, other stakeholder group members to see how they can help spread message

- Periodically survey community (by mail or interview at park, meetings) to gauge changes in water quality knowledge, concern and support for the project and lake; evaluate and adjust outreach strategies as needed

*Message:*

- The increased water quality of the lake will benefit the entire community as well as the surrounding areas through improved recreation, tourism and economic development.

*Message delivery:*

- News releases highlighting how watershed work will benefit community
- Presentations at Riceville Community Club meetings
- Advisory Committee meetings
- Advisory Committee, stakeholders and "community leaders" spreading message among friends, family, neighbors
- PowerPoint presentations to community groups, at stakeholder meetings
- Create informational kiosk at park to provide background on the project and updates
- Develop simple program giving lake users five or 10 things they can do in the park to help the lake; create incentive program to track participation and progress; use as a way to get "foot in the door" about talking about watershed project – need to balance responsible use of the lake with the larger water quality issues in the watershed.
- Hold large community celebration event at lake to draw community and explain project's purpose
- Place signs identifying conservation practices in watershed
- In last year of project, develop a promotional plan to encourage landowners and residents to keep up water quality improvement after project ends

***Goal 4:*** Establish a local advisory committee for the long-term protection of the lake

*Barriers:*

*Possible solutions:*

*Message:*

*Message delivery:* The Advisory Committee has been created.

## 5. CARRY OUT THE PLAN

*YEAR 1:*

*First quarter:*

- The Lake Hendricks Project was developed

*Second quarter:*

- News releases ( Moving forward)
- Community Club meetings
- Attended various wildlife banquets with a watershed display
    - Ducks Unlimited, Pheasants Forever

- One on one meetings with the landowners

*Third quarter:*

- Newspaper articles about the project
- Attended two Community Club meetings
- Meeting with the landowners in the watershed

*Fourth quarter:*

- PowerPoint presentation for the community of Riceville
- Watershed display at the county fair
- Newspaper articles about the project
- Park kiosks built

*YEAR 2:*

*First quarter:*

- Newspaper articles about the project conservation practices
- Information placed in the built kiosks
- Attend a Community Club meeting

*Second quarter:*

- Newspaper articles about the project conservation practices
- Attend a Community Club meeting
- Display booth at a Pheasants Forever banquet
- Signs describing conservation practices made and placed at the sites

*Third quarter:*

- Newspaper articles about the project
- Attend a Community Club meeting
- Advisory Committee meeting
- PowerPoint presentation describing the progress of the project for the community of Riceville.

*Fourth quarter:*

- Newspaper articles about the project
- Attend a Community Club meeting
- Update the information kiosk
- Signs describing conservation practices made and placed at the sites

*YEAR 3:*

*First quarter:*

- Newspaper articles about the project conservation practices
- Attend the Community Club meeting
- Advisory Committee meeting

*Second quarter:*

- Newspaper articles about the watershed
- Attend a Community Club meeting
- Update the informational kiosk
- Display at the Ducks Unlimited Banquet

*Third quarter:*

- Power Point Presentation for the community of Riceville
- Advisory Committee meeting
- Display at the Ducks Unlimited banquet
- One on one meeting with the landowners

*Fourth quarter:*

- Newspaper articles about the project
- Attend a Community Club meeting
- Update the information kiosk
- Signs describing conservation practices made and placed at the sites

*YEAR 4:*

*First quarter:*

- Newspaper articles about the project conservation practices
- Attend the Community Club meeting
- Advisory Committee meeting
-

*Second quarter:*

- Newspaper articles about the project conservation practices
- Attend a Community Club meeting
- Update the informational kiosk
- Display at the wildlife banquet

*Third quarter:*

- Newspaper articles about the project
- Advisory Committee meeting
- Display at the wildlife banquet
- PowerPoint presentation describing the progress of the project

*Fourth quarter:*

- Newspaper articles on the progress of the project
- Attend a Community Club meeting
- Update the informational kiosk
- Signs describing conservation practices made and place at the site

*YEAR 5:*

*First quarter:*

- Newspaper articles discussing the progress of the project
- Attend a Community Club meeting
- Advisory Committee meeting
- One on one meeting with the landowners

*Second quarter:*

- Newspaper articles about the projects conservation practices
- Attend a Community Club meeting
- Update the informational kiosk
- Display at the Pheasants Forever banquet

*Third quarter:*

- Newspaper articles about the project
- Advisory Committee meeting
- Display at the Pheasants Forever banquet
- Power Point presentation describing the progress of the project

*Fourth quarter:*

- Newspaper articles on the progress of the project
- Attend a Community Club meeting
- Update the informational kiosk
- Signs describing conservation practices made and placed at the site

*YEAR 6:*

*First quarter:*

- Newspaper articles discussing the progress of the project
- Attend a Community Club meeting
- Advisory Committee meeting
- Begin developing end-of-project promotional plan

*Second quarter:*

- Newspaper articles about the projects conservation practices
- Attend a Community Club meeting
- Update the informational kiosk
- Display at the Ducks Unlimited banquet

*Third quarter:*

- Newspaper articles on the completion of the project
- Power Point presentation on the completion of the Lake Hendricks Project
- Display at the Ducks Unlimited banquet

*Fourth quarter:*

- Newspaper articles about the success of the project
- Continued updates of the kiosk on future park projects
- Final signs placed at the project BMP sites

## 6. MEASURE AND EVALUATE EFFECTIVENESS; PROMOTE SUCCESSES

Measures:
As the Lake Hendricks Project evolves and practices are installed we will again engage the community and the landowners to give their opinion on how well the project in progressing.

- Number of articles published in newspaper
- Attendance at presentations and public meetings
- Park usage
- Lake usage

- Community's value of lake
- Community's understanding and knowledge of water quality issues affecting the lake
- Community's recognition of items posted on lake kiosk
- Number of conservation practices installed in priority areas
- Sediment delivery
- Nutrient delivery

Promote successes:

We will offer a series of field trips to the community and schools to continue the education process on practices installed and what effects these are having on the quality of the lake's water. The same will be applied in periodicals to the rest of the area who cannot attend these field trips. These periodicals will be in the form of newspaper articles as well as updated information at the kiosks in the park for the out of area visitors.

**References:**

Carlson, R.E. 1977. A trophic state index for lakes. Limnology and Oceanography. 22:361-369.