Environmental Quality Board
520 LAFAYETTE ROAD NORTH
ST. PAUL, MN 55155
PHONE: 651-757-2873
WWW.EQB.STATE.MN.US

VIA E-MAIL AND U.S. MAIL

September 27, 2012

Mr. Craig Affeldt
Minnesota Pollution Control Agency
Env Review Unit – 4th Floor
520 Lafayette Road North
St. Paul, MN 55155

RE: Citizen Petition for EAW for Reichman Land & Cattle LLP Feedlot
and Curtis and Angela Blair Feedlot

Dear Mr. Affeldt:

The Environmental Quality Board (EQB) has received a petition requesting that an Environmental Assessment Worksheet (EAW) be prepared on the projects described in the petition, and has determined that Minnesota Pollution Control Agency is the appropriate governmental unit to decide the need for an EAW.

The requirements for environmental review, including the preparation of an EAW, can be found in the Minnesota Rules, chapter 4410. The procedures to be followed in making the EAW decision are set forth in part 4410.1100. Key points in the procedures include:

1. No final government approvals may be given to the project named in the petition, nor may construction on the project be started until the need for an EAW has been determined. Project construction includes any activities which directly affect the environment, including preparation of land. If the decision is to prepare an EAW, approval must be withheld until either a Negative Declaration is issued or an Environmental Impact Statement (EIS) is completed (see part 4410.3100, subpart 1).

2. A first step in making the decision regarding the need for an EAW would be to compare the project to the mandatory EAW, EIS and Exemption categories listed in parts 4410.4300, 4410.4400, and 4410.4600, respectively. If the project should fall under any of these categories, environmental review is automatically required or prohibited. If this should be the case, proceed accordingly.

3. If preparation of an EAW is neither mandatory nor exempted, the County has the option to prepare an EAW. The standard to be used to decide if an EAW should be done is given in part 4410.1100, subpart 6. Note that this requires that a record of decision, including specific findings of fact, be maintained.

4. You are allowed up to 30 working days (Saturdays, Sundays, and holidays do not count) for your decision if it will be made by a council, board, or other body which meets only periodically, or 15 working days if it will be made by a single individual. You may request an extra 15 days from the EQB if the decision will be made by an individual.

5. You must notify, in writing, the proposer, the petitioners' representative and the EQB of your decision within five working days. I would appreciate your sending a copy of your record of decision on the petition along with notification of your decision for our records. This is not required, however.

6. If for any reason you are unable to act on the petition at this time (e.g., no application has yet been filed or the application has been withdrawn or denied), the petition will remain in effect for a period of one year, and must be acted upon prior to any final decision concerning the project identified in the petition.

Notice of the petition and its assignment to your unit of government will be published in the *EQB Monitor* on October 15, 2012.

If you have any questions or need any assistance, please do not hesitate to call. The telephone number is 651-757-2873.

Sincerely,

Jeff Smyser, AICP
Principal Planner

JS:mbo

Enclosure

cc: David Anderson, Petitioners' Representative

If no one requests that the Board make the decision, or if no Board member agrees that the Board should hear the matter, the decision will be made by the Commissioner.

Once the decision is made, the Commissioner will issue findings of fact outlining the agency's decision whether to grant or deny the petition. The MPCA will then notify the petitioner's representative, the project proposer, and other parties of the result of the petition review, within five days of the decision, as directed by EQB rules.

If you have any questions about this letter, please contact Nancy Drach of the Environmental Review Unit staff, at 651-757-2317. If you wish to contact a Board member, please refer to the enclosed listing.

Sincerely,

Craig Affeldt

Craig Affeldt
Supervisor
Environmental Review Unit
Resource Management and Assistance Division

CA:mbo

Enclosure: Board Member List

RECEIVED
SEP 26 2012
BY:

September 25, 2011

Environmental Quality Board
658 Cedar Street
300 Centennial Building
St Paul, Minnesota 55155

Dear Sir,

Reichman Land & Cattle, LLP has requested a conditional use permit to expand an existing feed lot from 957.6 AU to 1900 AU of beef feeder cattle with no expansion of lot size. Curtis and Angela Blair have also requested a conditional use permit to expand an existing feed lot from 950 AU to 1900 AU of beef feeder cattle with no expansion of lot size,. The area of the two requested conditional use permits falls within the runoff area that leads into Lake Ann (Environmental Lake) and Lake Reno (Recreational Lake) within Pope County. These properties are located at PT N1/2N1/4 as Rec On Doc# 253591. Ac 36.10. Section 22 (Reno Twp) and PT SW1/4NW1/4 and PTNW1/4SW1/4 as Rec On Doc# 229630 Ac 17.7.Section 23 (Reno Twp).

Lake Ann and Lake Reno have been deemed impaired lakes by the study (Pope 8 Lakes TMDL Implementation Plan) of Emmons and Oliver Resources, Incorporated for the Minnesota Pollution and Control Agency and the Pope Soil and Water Conservation District (draft) in 2010. Such an increase in phosphorus levels may be directly related to watershed runoff, and the study recommends that Lake Ann's phosphorus level be reduced by 90% and Lake Reno's phosphorus level be reduced by 36%.

Minnesota administrative rule 7020.225 land application of manure, subparagraph 7, manure & processed waste water application states that manure and process wastewater applied within 300 feet of open tile intakes, and where manure-contaminated runoff may flow into the open tile intake, must be injected or incorporated within 24 hours of application according to the schedule in items A and B unless other agency-approved water quality protection management practices are implemented in accordance with item C. On September 21st at approximately 7PM, equipment was noticed and photographed (photo attached) spreading manure within less than 100 feet of lake shoreline and a runoff ditch that leads directly into Lake Reno. The areas where the manure were deposited are areas that could not allow for incorporation of manure into the soil due to wooded conditions.

Therefore, the petition signed by over 130 Minnesota residents would like to request that prior to the issuance of any conditional use permit for the above stated requests, an Environmental Assessment Worksheet be prepared.

Our main concerns with this project are

- The MPCA currently has litigation or law review involving Reichman Land & Cattle, LLP in reference to the possible mismanagement of livestock operations located in Pope County.
- The water quality of Lake Reno is 52 PPB Phosphorus while Lake Ann is 306 PPB Phosphorus. Lake Reno drains into Maple Lake and Maple Lake has continued to show a decline in its water quality.
- Recently a new 36" culvert was installed between Lake Reno & Maple Lake. Since Reno drains into Maple, Maple drains into Turtle, and Turtle drains into Long Lake; all of these lakes will now be impacted.
- There are also several wetlands that will be impacted

- Ground water contamination is a concern as numerous residences within a mile of the farm have a private wells that will be impacted.
- Soil contamination with excess phosphorus is a concern
- Increased semi-trailer traffic is anticipated since offsite hauling is part of their proposal with the possibility of spills on the roadways. Manure production of solid waste for these cattle is estimated to be 57 ton per day per feedlot.
- Decreased air quality. The odor will increase proportional to the increased cattle lot size.
- Storm runoff and farm tile inlets drain into Lake Reno and Lake Ann from property that is adjacent to the lake
- An uncovered lagoon of liquid waste could fail or run over if not maintained properly or during heavy rainfall.
- Property in the immediate area consists of residential and agricultural properties, that may well be impacted for the use and enjoyment of land owners due to the increase of odors. There have been several complaints regarding this issue.
- The topography indicates that these feed lots are located higher than both lakes and there may be more than a 2% slope as noted on the attached USGS topographical map.

Respectfully Yours,

Gary Modlin
12344 Sugar Drive
Lowry, MN 56349

612.202.6036

David R. Anderson
23750 127th Street
Glenwood, MN 56334 ~~DJANDERS~~

320.760.8020 DJANDERS@runestone.net

Attachments:
Ann Lake TMDL Pg 29-43
Reno Lake TMDL Pg 124-139
USGS Topographical Map with Aerial Photos
Signed Petition w/ backup
Planning Commission Data Sheets
10 Tips for 10,000 Lakes from Initiative Quarterly
Photo
Notification Letters

September 25, 2012

Pope County Board of Commissioners
130 East Minnesota Avenue
Glenwood, Minnesota 56334

Reference: Proposal by Reichman Land & Cattle to increase animal units
Proposal by Curt and Blair to increase animal units

Dear Sir,

On Thursday, September 20, 2012, during a public hearing, the Pope County Planning Commission heard requests to increase the animal units to 1900 on two parcels of property located in Pope County and adjacent to two state bodies of water.

Discussion of these proposals are slated to be heard at 9AM, Tuesday, October 2, 2012 at the next scheduled Board of Commissioners meeting.

Concerned citizens in the area have signed a petition requesting that the Board of Commissioners, table the discussion on these two properties until such time that an Environmental Assessment Worksheet be performed to determine any further water quality impact upon Lake Ann and Lake Reno.

Attached is a full set of documents that have been forwarded to the Environmental Quality Board, St Paul, Minnesota.

Respectfully submitted,

Gary Modlin
12344 Sugar Drive
Lowry, MN 56349

612-202-6036

Dave Anderson
23750 127th Street
Glenwood, MN 56334

320-760-8020

September 25, 2012

Reichman Land & Cattle, LLP
15290 127th Street
Villard, MN 56385

Curt & Angela Blair
13452 240th Avenue
Lowry, MN 56349

Reference: Conditional Use Per Request in Pope County, Minnesota - Increase of Animal Units

Dear Project Representative,

A petition has been developed and forwarded to the Environmental Quality Board in St Paul, Minnesota. In regards to your request to increase the animal units upon property that you own, lease, rent, or intend to in the near future. These proposals were discussed at the Pope County Planning Commission Public Hearing held on Thursday, September 20, 2012 in Glenwood, Minnesota.

This petition was signed by over 130 individuals requesting that prior to the issue of an increase of animal units in the watershed of Lake Reno and Lake Ann, that an Environmental Assessment Worksheet (EAW) be performed to determine any further impact upon these two state bodies of water.

Copies of this petition and supporting documents have also been provided to the Pope County Board of Commissioners.

Respectfully,

Gary Modlin
12344 Sugar Drive
Lowry, MN 56349
612-202-6036

David Anderson
23750 127th Street
Glenwood, MN 56334
320-760-8020

4 ANN LAKE TMDL

4.1 Lake Assessment

4.1.1 Physical Characteristics

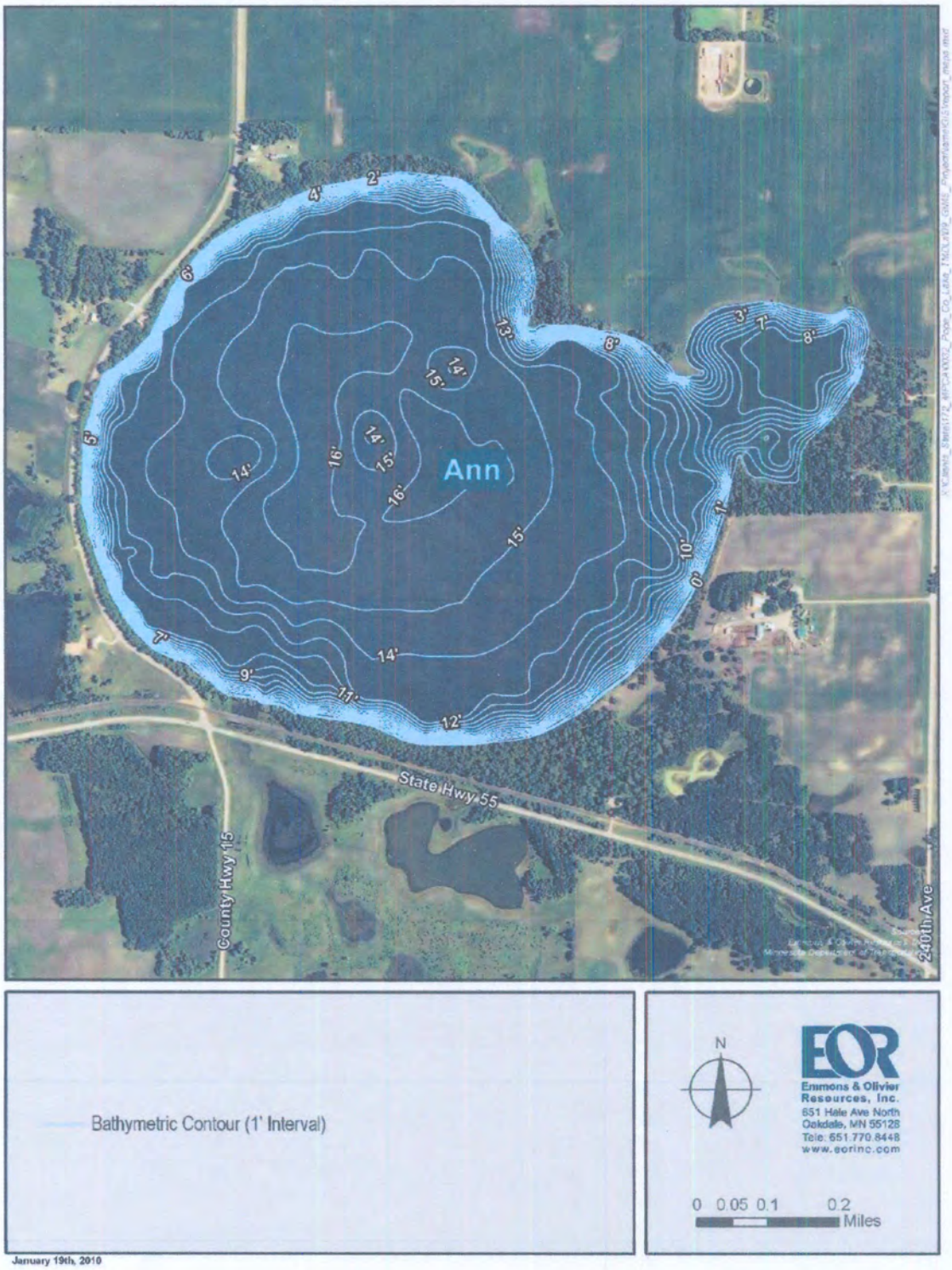
Ann Lake is located northwest of the City of Glenwood in north central Pope County. The lake is 365 acres in size with a watershed area draining to the lake of 4,882 acres (Table 8 and Figure 6). Ann Lake was assessed by the MPCA as a shallow lake based on DNR bathymetry; however, during 2009, bathymetry was surveyed and it was determined that the lake was only 70% littoral. At the time the 2009 bathymetry measurements were made, the lake elevation was slightly higher than the ordinary high water level. The bathymetry of the lake suggests that a one-foot change in lake elevation could result in the lake being 91% littoral. A review of depth profiles indicates that the lake does not stratify during the growing season and aquatic vegetation has been described as covering the entire lake in the past. This TMDL is therefore considering Ann Lake to be a shallow lake.

Ann Lake outlets to John Lake to the west. John Lake is typically below its runout elevation. Periodically, a backwater effect occurs when John Lake drains into Ann Lake for a short period of time (DNR, 2009).

Table 8. Ann Lake Characteristics

Characteristic	Value	Source
Lake total surface area (ac)	365	MPCA Minnesota Inventory of Impaired Lakes database (July 2008)
Percent lake littoral surface area	70 - 91%	Calculated based on bathymetry
Lake volume (ac-ft)	4,525	Calculated (mean depth x surface area)
Mean depth (ft)	12	Bathymetry
Maximum depth (ft)	17	Bathymetry
Drainage area (acres)	4,882	DNR Waters Lakesheds (2004)
Watershed area : lake area	13	Calculated

Figure 6. Ann Lake Bathymetry, 2009



Land Use

Land use throughout the watershed is primarily agriculture. 80% of the land is categorized as cultivated crop land and pasture/hay land. Table 9 shows the total acres and percent of the watershed for each type of land use. There are six homes on the shores of the lake.

Table 9. Ann Lake Watershed Land Use

Land Use	Total Acres	% of Watershed
Barren Land (Rock/Sand/Clay)	0	0%
Cultivated Crops	3,254	67%
Deciduous Forest	281	6%
Developed, High Intensity	0	0%
Developed, Low Intensity	66	1%
Developed, Medium Intensity	2	0%
Developed, Open Space	240	5%
Emergent Herbaceous Wetlands	53	1%
Evergreen Forest	7	0%
Grassland/Herbaceous	90	2%
Mixed Forest	3	0%
Open Water	253	5%
Pasture/Hay	631	13%
Shrub/Scrub	0	0%
Woody Wetlands	2	0%
Total	**4,882**	**100%**

Source: National Land Cover Database 2001, U.S. Geological Survey, USGS.

4.1.2 Biological Characteristics

Fisheries

Ann Lake has one public access on the northwest side of the lake. The lake is classified as a natural environment lake by the DNR's shoreland management lake classifications. Black bullhead abundance is extremely high (2005 DNR fish survey). In general, bullheads are benthivorous fish; they forage in the lake sediments, which physically disturbs the sediments and causes high rates of phosphorus release from the sediments to the water column. Sunfish are present but abundance is extremely low. Sunfish are considered planktivores, so the low predation on the zooplankton could partially explain the lower chlorophyll-*a* concentrations in relation to TP. Very few adult game fish were present, primarily northern pike, largemouth bass, and walleye. As these species are the top predators in the fishery, this causes a reduction in predation on the benthivores and planktivores. The DNR stocks Ann Lake with walleye, and in 2004 introduced 40 pairs of adult largemouth bass to increase the numbers of predatory, popular game fish.

Macrophytes

An aquatic vegetation survey was completed by the DNR in July of 2000. This survey showed the dominant vegetation within the lake to be coontail, northern water milfoil, sago pondweed, and flatstem pondweed. Curlyleaf pondweed was recorded as rare. Observations of the macrophyte community were recorded during a 2005 DNR fish survey, in which extremely high submergent vegetation abundance was noted. Curlyleaf pondweed was observed to dominate the aquatic vegetation, likely contributing to the internal loading through phosphorus release from decaying curlyleaf pondweed in the spring.

Although curlyleaf pondweed was not present in high abundance in the 2000 vegetation survey, it does not mean that curlyleaf pondweed was not present that year; the survey was completed in July, which is after typical curlyleaf pondweed senescence.

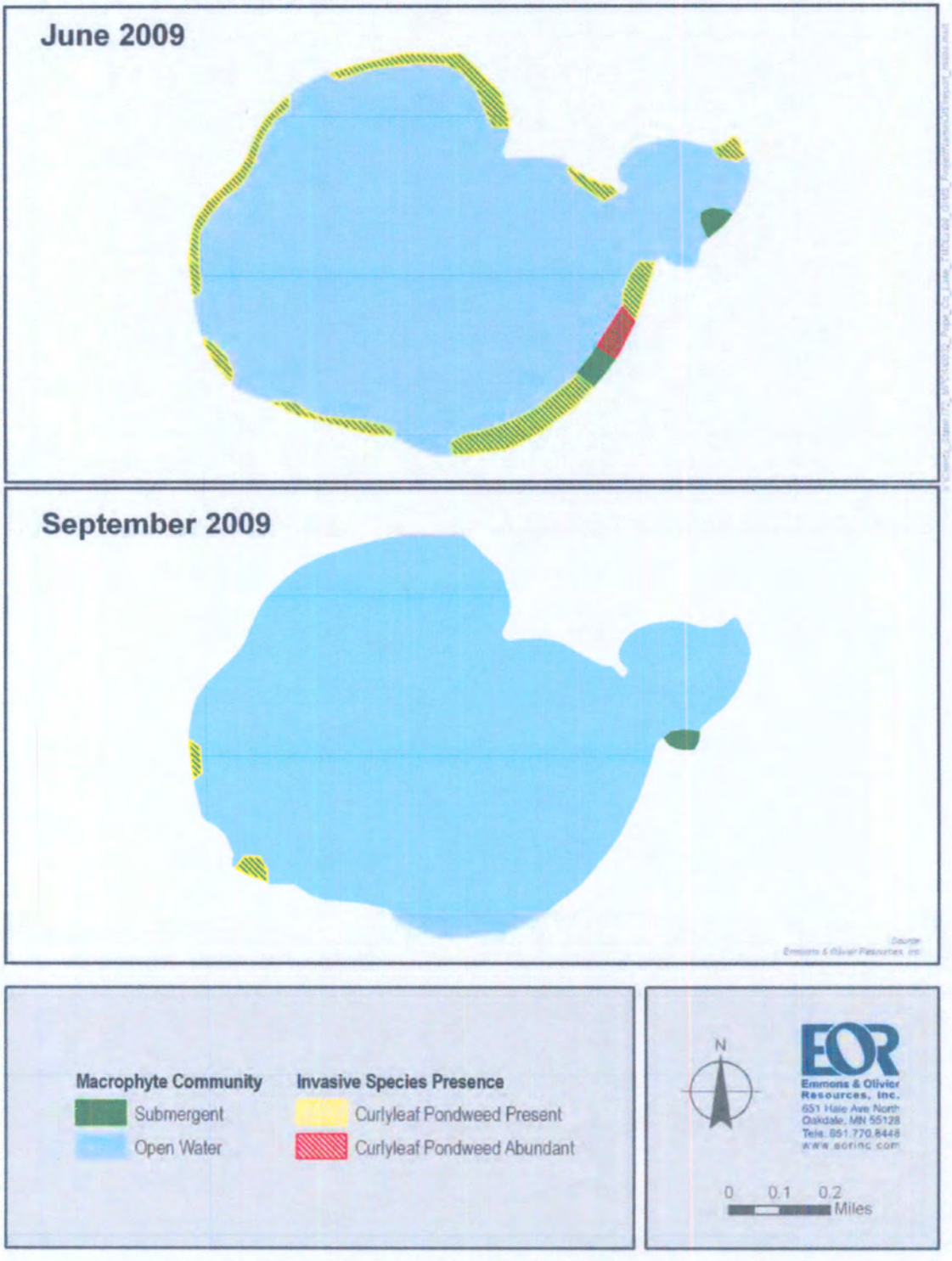
A macrophyte survey was completed again in 2009 during the summer and fall (Figure 7 and Table 10). During 2009, there was a notable lack of macrophytes in the lake. A ring of curlyleaf pondweed was present along the perimeter of the lake during the summer. Very few macrophytes were present in the fall. A ring of dense blue-green algae was found around the perimeter of the lake extending out at least 30 feet from the shore and somewhat in the center.

Table 10. Plant Species Observed During 2009 Ann Lake Macrophyte Surveys

Scientific Name	Common Name	Summer	Fall
Potamogeton crispus	Curlyleaf pondweed	X	X
Potamogeton pectinatus	Sago pondweed		X
Potamogeton filiformis	Slender pondweed	X	
	Blue green algae	X	X

1

Figure 7. Ann Lake Macrophytes, 2009



4.1.3 Existing Studies and Monitoring

Status and Trend Monitoring Summary for Selected Pope and Douglas County, Minnesota Lakes

In 2001, the MPCA produced the "Status and Trend Monitoring Summary for Selected Pope and Douglas County, Minnesota Lakes." Ann Lake was included in the summary report and characterized as a hypereutrophic lake. Water quality samples were collected from Ann Lake monthly from June through September of 2000. The lake water quality summer mean for total phosphorus was 264 µg/L, the highest total phosphorus of all seven lakes in the study. The summer mean for chlorophyll-*a* was 38 µg/L and the Secchi depth summer mean was 2.0 meters. As part of the study, a Minnesota Lake Eutrophication Analysis Procedure (MNLEAP) model was used to model Ann Lake's TP, chlorophyll-*a*, and Secchi values. The MNLEAP predicted values were significantly lower than the observed values. The study suggested that the difference in predicted and observed water quality was due to watershed nutrient loading. The study also showed that blue-green algae dominated the algal community within the lake (MPCA, 2001a). The report can be found at http://www.pca.state.mn.us/cs.html?url=http%3A//www.pca.state.mn.us/index.php/download-document.html%3Fgid%3D6615&charset=iso-8859-1&qt=Status+and+Trend+Monitoring+Summary+for+Selected+Pope+and+Douglas+County%2C+Minnesota+Lakes&col=newsite&n=1&la=en.

Trapper's Run Creek Watershed Project

In 1994, a water resources study of Trapper's Run Creek was completed by the DNR to analyze the physical, biological, and chemical characteristics of the creek and identify point and non-point sources of pollution. Lake Minnewaska and Pelican Lake are two of the most aesthetically and economically valuable water resources within Pope County and are directly impacted by the poor water quality draining from Trapper's Run Creek. The study identified high nutrient concentrations, low biodiversity, and low dissolved oxygen levels within the creek (Pope County, 1994). Ann Lake was included in the Trapper's Run Creek Watershed Project due to an intermittent stream that flows periodically from Ann and John Lakes down to the Peopple's Wetland and Trapper's Run Creek (Pope County, 1996).

In 1995 the study continued by looking at the runoff to the creek, collecting additional flow data along the stream, evaluating the status of contributing lakes including Ann Lake, and starting inventories of the tile systems within the watershed, feedlots, and septic systems. At that time, Ann Lake was found to be hypereutrophic with a mean TP concentration of 146 µg/L.

The project report published by Pope County Environmental Services in 1996 provided a comprehensive look at all of the inventoried data on the creek and identified goals and objectives to prevent further degradation of the water quality and protect Pelican and Minnewaska. The report identified additional monitoring that could be done, programs to implement, and best management practices that could be used throughout the watershed. The problems within the watershed were diagnosed in 1996 and the largest contributors included feedlot runoff, extensive tiling, non-code septic systems, and fertilizer runoff. The data collected within the subwatersheds of the creek that fall within the Ann Lake watershed were analyzed and it was concluded that feedlots were the main causes of pollution to the creek in that area (Pope County, 1996). The

water quality collected at monitoring sites showed the highest fecal coliform values in the entire Trapper's Run Creek Watershed.

From 2000 to 2004, with grant assistance from the MPCA, the Trapper's Run Creek Watershed Project implemented programs to identify and upgrade non-compliant feedlots, set up a manure management planning program, conduct additional water quality monitoring and data assessment on the watershed, and start an incentive-based program for septic system upgrades.

4.1.4 Impairment Assessment

Monitoring data are available from as far back as 1992, although there were only one or two samples taken per year and conclusions should not be drawn from sampling at this low frequency. Sampling frequency increased in 1999, and samples have been collected every year since then. The last ten years of data were used to calculate the water quality data means (Table 11).

Ann Lake is a hypereutrophic lake, with TSI values for chlorophyll-*a* and TP in the hyper-eutrophic range and Secchi depth in the eutrophic range (Table 11). TP annual mean concentrations have improved since 2001 when the annual mean spiked to 479 µg/L (Figure 8); the annual means after 2001 range from 200 µg/L to 350 µg/L. There was no spring (June) sample in 2001, which artificially raised the mean TP concentration for that year. The high TP relative to the chlorophyll-*a* and the Secchi depths suggests that the lake has so much phosphorus in it that the algae are not limited by phosphorus, but by some other limiting factor. This does not mean that TP doesn't impact the water quality of the lake, but rather it means that phosphorus will have to be reduced by a substantial amount before improvements in the chlorophyll-*a* are realized.

The TP standard for shallow lakes in the North Central Hardwood Forest (NCHF) ecoregion is 60µg/L. TP concentration growing season means in the years 1999 to 2007 exceeded the standard every year with means ranging from 202 µg/L to 479 µg/L (Figure 8). Chlorophyll-*a* concentration growing season means ranged from to 14 µg/L to 142 µg/L in the years 1999 to 2007 (Figure 9), only meeting the NCHF ecoregion shallow lakes standard of 20 µg/L in 2001 and 2004. The Secchi depth growing season means ranged from 0.9 m to 2.9 m in 1992 to 2007 (Figure 10), meeting the NCHF ecoregion shallow lakes standard of 1.0 m in all years except 2003 and 2007.

TP consistently increases throughout the growing season (Figure 11); however, the seasonal patterns of chlorophyll-*a* and transparency are not as defined. There is also not a clear relationship between TP and chlorophyll-*a* (Figure 12), indicating that phytoplankton biomass is likely not currently limited by phosphorus. Phytoplankton growth is likely either limited by nitrogen, since TP concentrations are so high, or the biomass is being grazed by zooplankton, keeping the algal concentration relatively low.

Table 11. Surface Water Quality Means, Ann Lake, 1998 - 2007

Parameter	Growing Season Mean (June – September)	Trophic Status Index	NCHF Shallow Lakes Standard
TP	306 µg/L	87	< 60 µg/L
Chlor-*a*	60 µg/L	71	< 20 µg/L
Secchi depth	1.8 m	50	> 1.0 m

Figure 8. Total Phosphorus Monitoring Data, Ann Lake

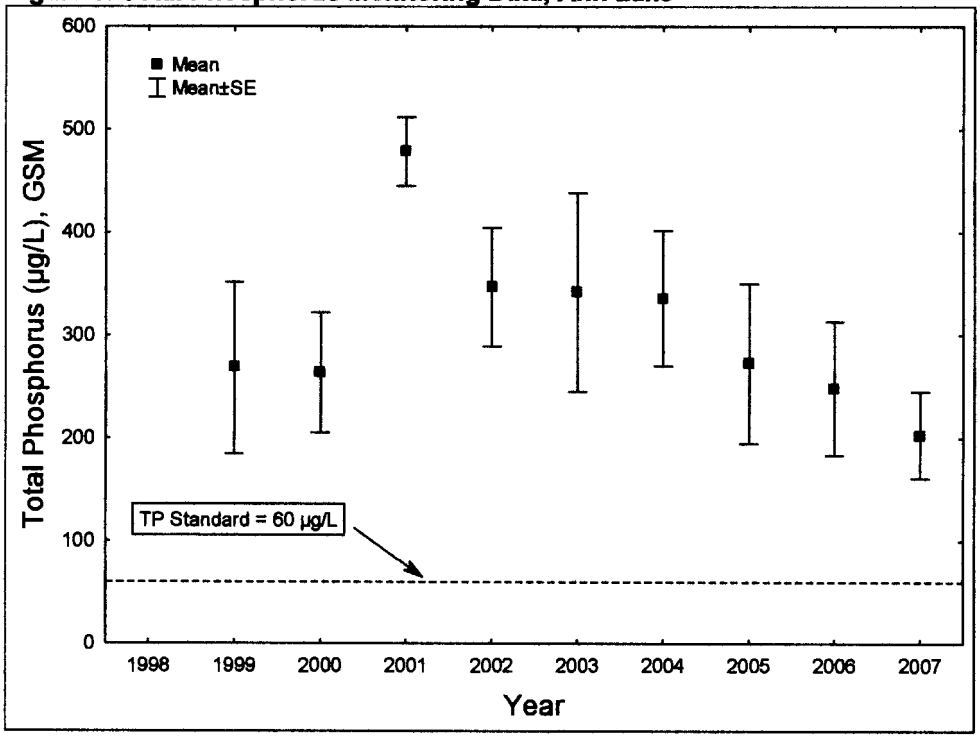


Figure 9. Mean Chlorophyll-*a* Monitoring Data, Ann Lake

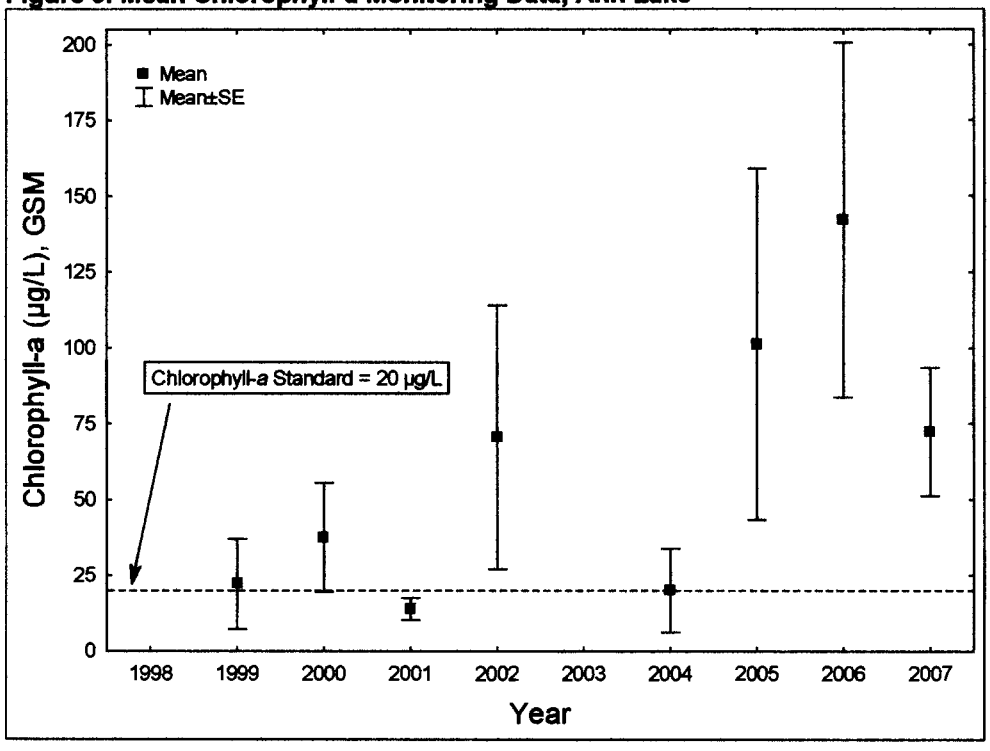


Figure 10. Secchi Depth Monitoring Data, Ann Lake

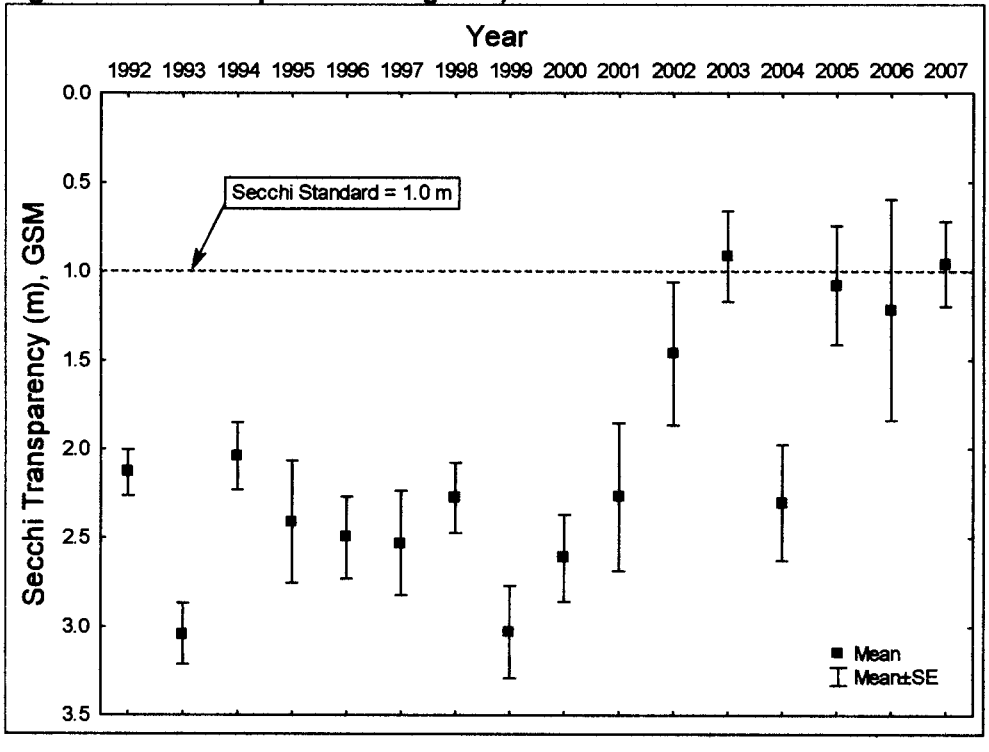


Figure 11. Ann Lake Seasonal TP Patterns, 1998-2007

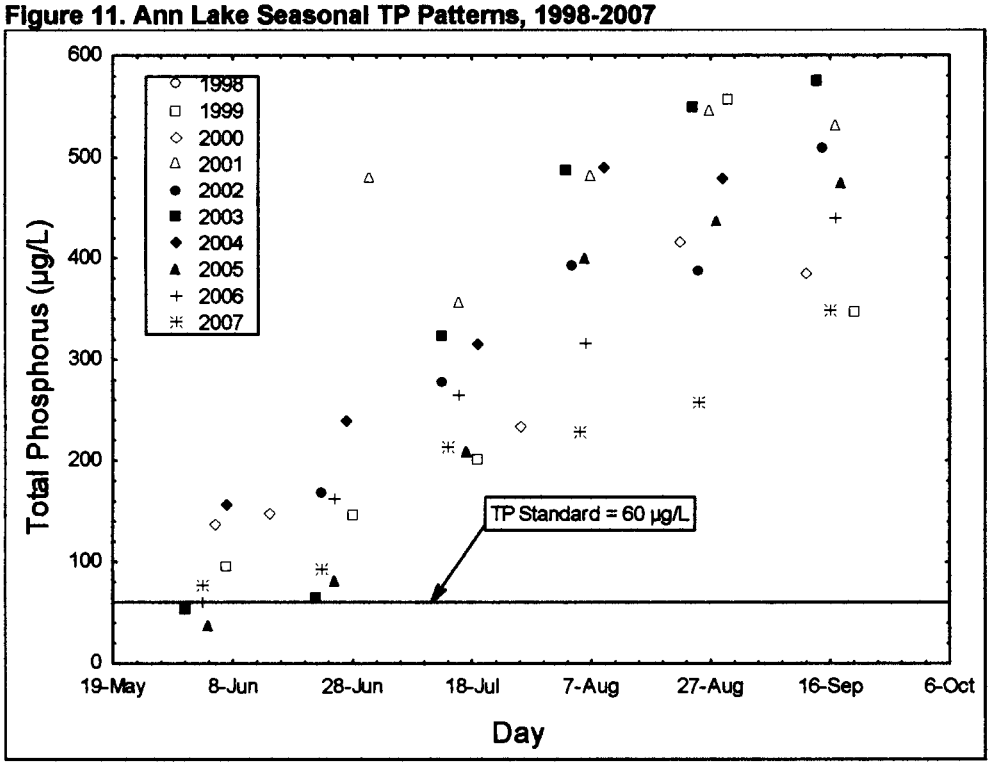
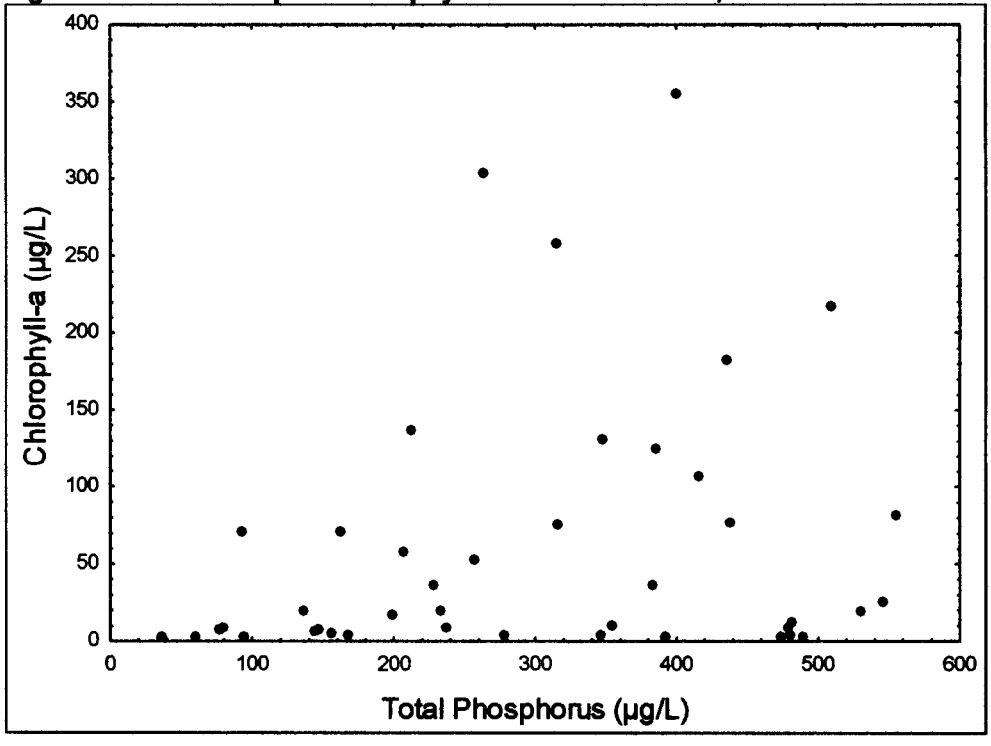


Figure 12. Relationship of Chlorophyll-*a* to TP in Ann Lake, 1998 - 2007



4.2 Phosphorus Source Assessment

It is estimated that Ann Lake receives between 12,295 and 13,776 pounds of phosphorus annually from external and internal sources combined. Much of the external phosphorus to Ann Lake is coming from the watershed and feedlots (Figure 13, Table 12). Using the methods developed for this study to estimate watershed loads, it was determined that 1,350 pounds of phosphorus are from known external sources, and 182 to 1,663 pounds are from internal loading. The exact sources of the remaining 10,763 pounds are not known; this load is likely attributable to watershed sources such as nutrient management practices on agricultural fields, drain tiles, and non-compliant feedlots (see discussion in Section 3.1.1 regarding feedlots requiring NPDES permit coverage), in addition to internal loading sources. MPCA staff, through discussions with local partners, a review of past permits, and conversations with Pope County staff, has determined that the majority of this additional phosphorus load potentially comes from land application of manure within the watershed; it will be referred to as such in this report.

Figure 13. Ann Lake External Phosphorus Inventory

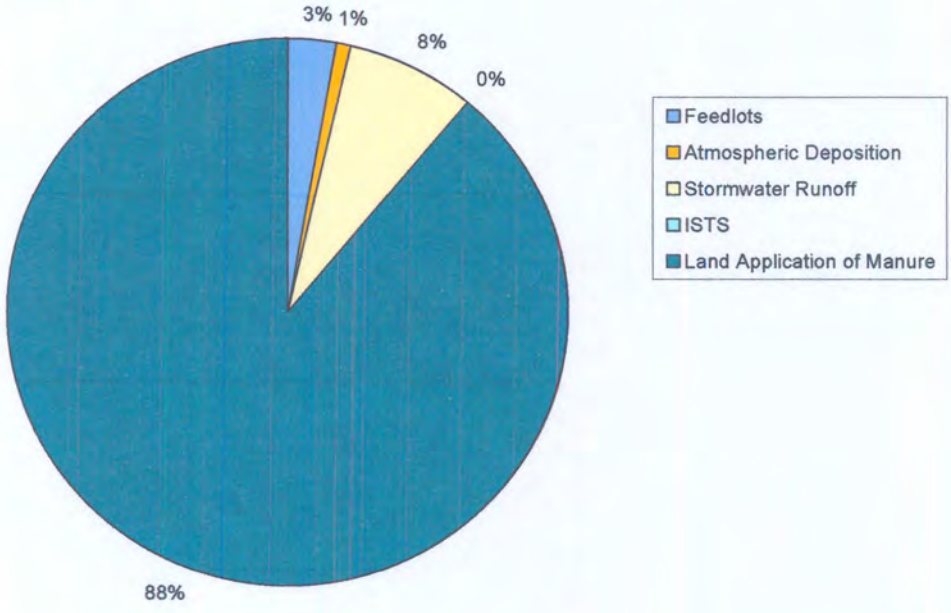


Table 12. Ann Lake External Phosphorus Source Summary

Phosphorus Source	Annual TP Load [lbs/yr]
Stormwater Runoff	921
Feedlots	336.4
Atmospheric Deposition	85
SSTS	8.3
Land Application of Manure	10,763
Total	**12,113.6**

4.2.1 Sources of Phosphorus Requiring NPDES Permit Coverage

Feedlots

From 2003 to 2008 there was one NPDES permitted feedlot within the TMDL study area: Blair Farms Inc. (Permit #MN0066273) located within the Ann Lake and Reno Lake watersheds. A new permit was issued in 2009. Due to the fact that these open lots were not permitted through the NPDES program prior to 2003 and based on information that suggests the feedlots did contribute phosphorus to the lake prior to permit issuance in 2003, this feedlot is accounted for as a feedlot not requiring NPDES permit coverage. Going forward, it will be assumed that under the existing NPDES permit, discharge from this feedlot will not reach Ann Lake.

4.2.2 Sources of Phosphorus Not Requiring NPDES Permit Coverage

Stormwater Runoff

The entire Ann Lake drainage area (4,882 acres) was modeled using the Simple Method. A total of 949 pounds of phosphorus per year are generated by stormwater runoff. Currently, approximately 28 pounds of phosphorus per year are being removed from runoff due to buffers throughout the watershed.

Loading from Upstream Waters

There are no upstream waters to Ann Lake with sufficient data to evaluate.

Runoff from Feedlots Not Requiring NPDES Permit Coverage

Within the Ann Lake watershed, there are six feedlots under 1,000 AU in size, all of which are open lot feedlots. In addition, included in the calculations is one feedlot requiring NPDES permit coverage, as explained above in *Sources of Phosphorus Requiring NPDES Permit Coverage.* These feedlots house a total of 2,706.9 animal units (AU) mostly consisting of beef and dairy cattle (Table 13). The estimated TP load coming from these feedlots within the watershed under average flow conditions is approximately 336.3 lbs/yr.

Table 13. Phosphorus Contributed to Ann Lake from Open Lot Feedlots

Animal	Animal Units	Phosphorus contributing to surface waters during average flow year (lbs/yr)
Beef	1,405.7	174.6
Dairy	1,265.3	157.6
Sheep	30.0	3.9
Horse	6.0	0.2
Total	**2,706.9**	**336.3**

Atmospheric Deposition

The TP load from atmospheric deposition is 85 lbs/yr (Table 14).

Table 14. Ann Lake Atmospheric Deposition

Source	Phosphorus Deposition (lbs/yr)
Wet Deposition	60
Dry Deposition	25
Total	**85**

Subsurface Sewage Treatment Systems

There are six homes on Ann Lake that use an SSTS. Of these systems, it is estimated that 40% are failing and that all of the homes are permanent residences. The total estimated TP load from SSTS to Ann Lake is 8.3 lbs/yr.

4.3 TMDL Loading Capacity and Allocations

For Ann Lake, where the observed phosphorus concentration was above the range of values considered acceptably close to the modeled value, the calibration process for the lake response model (Bathtub) was different than for the other lakes. First, in order to account for recent trends in the lake's water quality, only the last three years (2005-2007) of data were used to calculate mean phosphorus, chlorophyll-*a*, and Secchi depth (see Figure 8 through Figure 10). It was determined that the high observed phosphorus concentration was most likely the result of an additional load, and not simply due to the typical variability in lake response to external loading. This additional phosphorus load, attributed to the land application of manure (see Section 4.2), was included on the "internal load" input screen. This load was adjusted until the modeled phosphorus concentration matched the observed mean concentration. Finally, the calibration coefficients for the chlorophyll-*a* concentration and Secchi depth values were adjusted so that modeled values also matched the observations for these parameters.

To arrive at the goal phosphorus concentration in the lake model, the additional load (land application of manure) described above was first removed from the simulation, prior to reducing the tributary phosphorus concentration.

The phosphorus loading capacity of Ann Lake is 1,184 lbs/yr, to be split among allocations according to Table 15. The NPDES-permitted sources in the Ann Lake watershed receive individual WLAs (Table 16).

Table 15. Ann Lake Allocation Summary

Allocation	TP (lbs/yr)	TP (lbs/day)
TMDL	1,184	3.2
MOS	118.4	0.32
WLA	5.5	0.015
LA	1,060	2.9

Table 16. Ann Lake WLAs

Source	Permit #	TP WLA	
		lbs/yr	lbs/day
Construction stormwater	Various	0.20	0.00055
Industrial stormwater	No current regulated sources	5.3	0.0146
Blair Farms Inc.	MN0066273	0	0

4.4 Implementation Strategy

4.4.1 Approach to Lake Restoration

Lake restoration activities can be grouped into two main categories: those practices aimed at reducing external nutrient loads, and those practices aimed at reducing internal loads. The focus of restoration activities depends on the lake's nutrient balance and opportunities for restoration. A reduction of 10,929 pounds of total phosphorus annually is needed to achieve the Ann Lake TMDL and meet water quality standards.

Ann Lake has a fairly small watershed. As described in Section 4.2, a substantial source of phosphorus has been identified that is likely from a combination of internal loading, poor nutrient management on agricultural fields, feedlots, and drain tile in the watershed. MPCA staff, through discussions with local partners, review of past permits, and conversation with Pope County staff, has determined that the majority of this load is potentially from land application of manure. Each of these potential sources will need to be further evaluated to determine the most appropriate suite of activities and practices aimed at improving the water quality of Ann Lake.

Due to the potential for extensive watershed loads to the lake, in-lake management activities should not be conducted until there are significant reductions in watershed loading to the lake. This discussion separates the management strategies into practices addressing watershed load and internal load. The total cost for implementation is estimated to be $200,000 - $450,000. Implementation costs do not take into account existing programs and are assumed to be spent over the next 20 to 30 years.

4.4.2 Watershed Load Reduction Activities

Reduction of TP reaching the lake from the watershed will be the primary implementation activity for Ann Lake. Further quantification of the sources of TP to the lake will be critical to developing appropriate strategies to improve the lake water quality. A diagnostic study of the watershed should be undertaken that could include mapping and monitoring of drain tile outlets to the lake, mapping of drain tile inlets within the watershed, survey of watershed farmers to determine nutrient management practices, and soil testing. Monitoring for water quality parameters should be conducted at tile and ditch outlets to the lake to determine nutrient loadings from each source. Monitoring of the tiles should begin during or close to spring melt to determine the impact of snowmelt on in-lake nutrient loadings and continue through the growing season. The results of this work will focus watershed implementation activities on fields and activities that are the greatest contributors of TP to the lake.

Overall watershed loadings will be reduced through a variety of mechanisms including expansion of existing programs to encourage and promote agricultural BMPs such as conservation tillage, alternative tile inlets, and buffers. Enhanced feedlot BMPs and nutrient management plans will need to be developed and implemented. Wetland restoration can also be used to provide water quality treatment in the watershed.

4.4.3 Internal Load Reduction Activities

Internal loading of TP will need to be addressed, but not until watershed loads are identified and mitigated. In-lake TP concentrations should be lowered considerably before in-lake restoration efforts should be pursued. In-lake activities could include management of the abundant curlyleaf pondweed, chemical treatment to precipitate phosphorus out of the water column, and fisheries management.

10 RENO LAKE TMDL

10.1 Lake Assessment

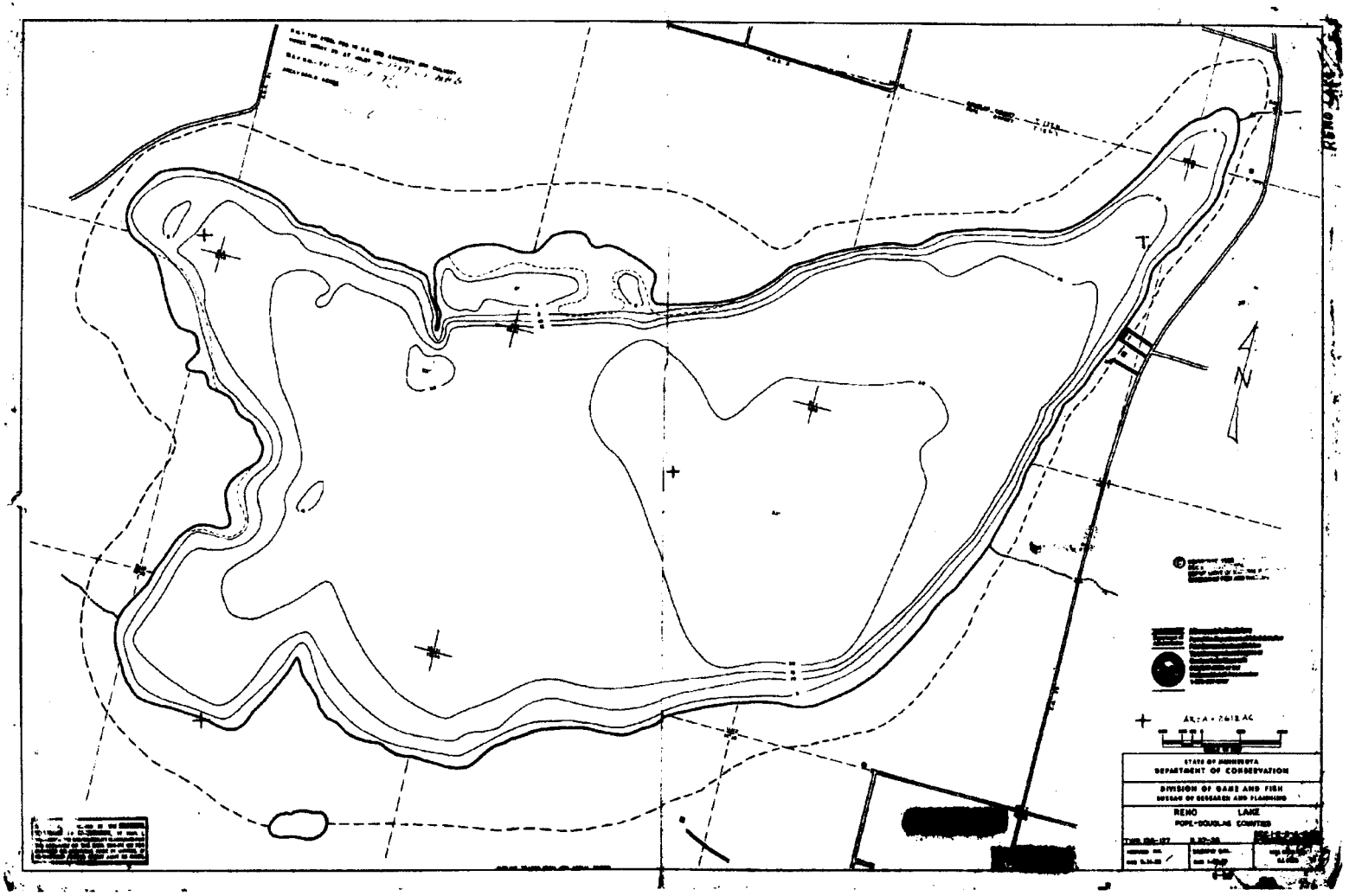
10.1.1 Physical Characteristics

Reno Lake, the largest lake in this study, is located in north-central Pope County with a small portion crossing into Douglas County. Reno is located approximately ten miles south of the City of Alexandria, Minnesota, the largest city in Douglas County. Reno Lake has a surface area of 3,509 acres (Figure 74 and Table 62) and outlets into Maple Lake to the north. Reno Lake has also been known to periodically receive inflow from Maple Lake, depending on lake elevations. Maple Lake has very good water quality, with a ten-year GSM TP concentration of 17 µg/L. Maple is typically below its runoff elevation so water rarely outlets from Reno and Maple.

Table 62. Reno Lake Characteristics

Characteristic	Value	Source
Lake total surface area (ac)	3,509	MPCA Minnesota Inventory of Impaired Lakes database (July 2008)
Percent lake littoral surface area	34%	DNR Lake Finder
Lake volume (ac-ft)	52,635	Calculated (mean depth x surface area)
Mean depth (ft)	15	COLA (2005)
Maximum depth (ft)	23	DNR Lake Finder
Drainage area (acres)	5,497	DNR Waters Lakesheds (2004)
Watershed area : lake area	2	Calculated

Figure 74. Reno Lake Bathymetry



Land Use

Land use throughout the watershed is primarily agriculture. Urban and residential developed areas make up only 4% of the watershed while 82% of the land is used for cultivated crops and pasture and hay. Approximately 114 homes are on the shores of the lake. Table 63 summarizes the total acres and the percent of the watershed of the different land uses.

Table 63. Reno Lake Watershed Land Use

Land Use	Total Acres	% of Watershed
Barren Land (Rock/Sand/Clay)	0	0%
Cultivated Crops	3,680	67%
Deciduous Forest	319	6%
Developed, High Intensity	0	0%
Developed, Low Intensity	76	1%
Developed, Medium Intensity	0	0%
Developed, Open Space	185	3%
Emergent Herbaceous Wetlands	78	1%
Evergreen Forest	7	0%
Grassland/Herbaceous	31	1%
Mixed Forest	0	0%
Open Water	292	5%
Pasture/Hay	829	15%
Shrub/Scrub	0	0%
Woody Wetlands	0	0%
Total	**5,497**	**100%**

Source: National Land Cover Database 2001, U.S. Geological Survey, USGS.

10.1.2 Biological Characteristics

Fisheries

Reno Lake has two public access sites, one on the southwest shore and one on the northeast tip of the lake. The lake is classified as a recreational development lake by the DNR shoreland management lake classifications. Reno Lake is known for quality walleye fishing and is used for boating, swimming, and other lake recreation. A number of resorts and rental properties with private sandy beaches exist on the shores of Reno, making it a common vacation destination. Reno Lake is stocked with walleye. The gamefish populations have benefited from the slight increase in water and habitat quality with the fishery transcending back to more diverse fishery (2006 DNR fish survey). Some rough fish are present in Reno Lake but their populations are on the low end of the normal range for similar lakes.

Macrophytes

An aquatic vegetation survey was performed by the DNR in July 1994. This survey listed filamentous algae and narrowleaf cattail as the most common macrophytes. The study concluded that submergent vegetation was dense in limited areas around the lake. The 2006 DNR fish survey discusses how an extended period of high water levels in the mid-1980s greatly reduced the submergent and emergent vegetation abundance and diversity.

In 2009, a macrophyte survey was conducted as part of this TMDL study (Table 64 and Figure 75). The survey was conducted in September and found a healthy population of aquatic macrophytes including both submergents and emergents within the entire littoral area. Submergent plant species were dominated by sago pondweed and also included coontail, muskgrass, bushy pondweed, other native pondweeds, and one incidence of curlyleaf pondweed. Emergents include bulrushes and cattail beds.

Table 64. Plant Species Observed During 2009 Reno Lake Macrophyte Surveys

Scientific Name	Common Name	Fall
Ceratophyllum demersum	Coontail	X
Chara vulgaris	Muskgrass	X
Myriophyllum exalbescens	Northern water milfoil	X
Najas flexilis	Bushy pondweed	X
Potamogeton pectinatus	Sago pondweed	X
Potamogeton richardsonii	Claspingleaf pondweed	X
Potamogeton zosteriformis	Flat-stemmed pondweed	X
Scirpus acutus	Hardstem bulrush	X
Typha sp	Cattails	X
Utricularia macrorhiza	Bladderwort	X