

Upper Cannon Lobe
Waterbody/Watershed: Cannon River

Study	UCAP (2007-2009)	DNR Survey 2004	Macroinvertebrate Assessment 1994-1996 - Cannon River @ Morristown	Cannon River Survey (DNR) 1983 and 1984	Rice County 1972	Rice Co study 1972-1985
Reason for Study/Goals	1)Reduction of excessive bacterial, sediment and nutrient levels into the Upper Cannon River. 2) Increase and improve wildlife and aquatic habitats, as well as recreational opportunities in the watershed.	Survey done for management purposes (Rice and LeSueur Co)	None listed	Initial survey for inventory and management purposes.	Initial assessment surface water	Expand knowledge of surface water resources. Note changes since 1st study in 1972
Issues/Problems	Sampled 1 - (Shields Lake to Lake Dora Outlet)- 2nd highest Bacteria, Sampled 2 (Lake Dora Outlet to Sabre Lake Outlet)- 2nd highest TP load	Dams on river, poor water quality, destabilized flows = loss of habitat and decrease species, poor land use, feedlot runoff, inadequate septic treatment	Undercut bank, moderately stable, little bank erosion, 80% samples in 5-6 Tolerance rank (10 is most tolerant), dominant taxa is caddisfly, heavy algal bloom June/July, low nitrates, TSS and TVS high – mostly organic matter – high	Low flows during dry periods primary management problem, pollution from municipal and agriculture, high roughfish populations, poor land use practices.	Greatly influence by municipalities along banks. High nutrients and coliform (72,000!), BOD , ammonia	Nonpoint pollution is problem. High SS and N (risen substantially-ag sources) throughout year. Mackenzie Creek significant negative impact.
Good Stuff	NA	Importance of river as nursery, spring fishery	NA	Northern pike spawning, economic importance fisherman	NA	NA
Goals Set/Actions Suggested	*Retrofitting faulty septic fields. *Removing surface tile inlets. * Incorporating agricultural BMP's in areas of the sampled that are highly sloped and contain extensive pattern tile drainage systems. *Wetland restorations in areas that provide the "greatest water quality benefit receive priority". *Structural practices to reduce soil erosion and runoff. *Filter strips areas with steepest slopes, ditches	NA	NA	NA	Municipal treatment facilities should be evaluated	NA

Upper Cannon Lobe

Waterbody/Watershed: Whitewater/Waterville Creek (Sampled 4 - UCAP)

Study	UCAP
Reason for Study/Goals	1)Reduction of excessive bacterial, sediment and nutrient levels into the Upper Cannon River. 2) Increase and improve wildlife and aquatic habitats, as well as recreational opportunities in the watershed.
Issues/Problems	*Highest TSS lbs/acre load of all areas studied (2007-2008), *Highest Nitrate+Nitrite-N *Highest Bacteria
Good Stuff	None
Goals Set/Actions Suggested	*Inventory all surface tile inlet points in sampled, *Review feedlot compliance, *Feedlot and manure management workshops, *Review grazing management plans, *Inventory stream bank condition, *Identify areas in need of grass buffers, * Nutrient management initiatives and educational outreach to reduce over-application of nitrogen (N) and identify optimal N rates. *Noncompliant SSTS upgrades

Upper Cannon Lobe
Waterbody/Watershed: Cannon Lake

Study	Rice Co 1972	Rice Co 1972-1985	Cannon Lake Special Assessment (DNR) 2006	Cannon Lake Survey (DNR) - 2009	Status and Trends for Rice County 1999 (MPCA)	Lake Management Plan for Cannon River Chain, DNR, 1995
Reason for Study/Goals	See Cannon River	Follow up to 1972	Evaluate status of walleye population, determine presence of young of the year.	Monitor fish community and aquatic habitat	Baseline (?) WQ data	Walleye fishery
Issues/Problems	Poorest WQ in county. Extensive algae, high temps, high BOD esp bridge between Cannon and Wells, P levels high esp beach in WINTER, coliform levels high at beach and bridge, high mineral content likely. Problems due to runoff – urban and ag and possibility of inadequate septic	Not changed significantly since 1972		Abundant walleye – fishing reports poor? – little angler use,	TP, TN, Chl-a, TSS high. Secchi low. Nutrient loads high from upstream, Internal P recycling, Very severe nuisance algae blooms. Large watershed.	Low-head dams limit fish movement. P loading significant effect on fish through years. Winter fish kills. Ag drainage of wetlands significantly reduced northern pike spawning habitat.
Good Stuff	None	None	Above avg YOY, most likely due to stocking – natural reproduction limited.	Perch prolific, poor spawning habitat for northern pike, carp abundant, growth in white sucker population.	None	None
Goals Set/Actions Suggested	None	Close look at on-site sewage. North & South tribs look at feeldots.	None	To improve fishery anglers practice selective harvest – release of med and large fish. Buffer strip natural vegetation along shoreline.	See Cedar Lake list from same study.	Habitat restoration component aimed at reduced P loading and restore habitat value of tributary streams and peripheral wetlands.

**Upper Cannon Lobe
Waterbody/Watershed: Wells Lake**

Study	Wells Lake Survey (DNR) - 2009
Reason for Study/Goals	Monitor fish community and aquatic habitat
Issues/Problems	Common carp most abundant fish. General poor water quality and a lack of aquatic vegetation limits game fish presence and abundance
Good Stuff	None
Goals Set/Actions Suggested	To improve fishery anglers practice selective harvest – release of med and large fish. Buffer strip natural vegetation along shoreline.

**Upper Cannon Lobe
Waterbody/Watershed: Cedar Lake**

Study	Rice Co 1972	Rice Co 1972-1985	Status and Trends for Rice County 1999 (MPCA)	Lake Survey Special Assessment (DNR) -2006	Lake Survey (DNR) 2008
Reason for Study/Goals	Initial Assessment	follow up initial		Research project walleye fingerling stocking	Monitor fish community and aquatic habitat
Issues/Problems	Poor water quality, P & Ammonia levels higher NW bay, high BOD, algae blooms warm season, NE and NW high coliform – winter samples human animal waste	Still high coliform Point A (south)– discharging sewage most likely.	2 distinct subwatershed – north and south. TP above avg, Chl-a very high, low clarity, Hypereuthrophic conditions. Internal P recycling.	Despite stocking walleye remain rare	Eurasian watermilfoil – 2001, Black crappie, white crappie, Bluegill, yellow perch decrease.
Good Stuff	None	Shown improvement since 1972 – TP and clarity improved.	None	None	Northern Pike increase.
Goals Set/Actions Suggested	None	None	Develop lake management plan. Continue to collect CLMP data. Development and land use should minimize impacts to water –shoreland and stormwater regs. Carefully plan changes to drainage and wetland removal – understand consequences. Association members seek representations on planning commission and boards. On-site septics – education and maintenance. Examine lawn fertilizer land use. Ag producers limit nutrient use as much as possible. Lake shorelines natural condition. Study economic contribution lakes make to area.	None	To improve fishery anglers practice selective harvest – release of med and large fish. Buffer strip natural vegetation along shoreline.

Upper Cannon Lobe
Waterbody/Watershed: Lake Frances

Study	Lake Survey (DNR) 2006	UCAP (2007-2009) - part of Sampled 5	Lake Survey Special Assessment (DNR) 2009	Lake Assessment Program (MPCA) 2002
Reason for Study/Goals	Monitor fish community and aquatic habitat	See Cannon River UCAP	Walleye study	Lake assessment (data collected in 1998) at request of lake association
Issues/Problems	Much of shoreline disturbed (70%) residential development, 30% turf grass to waters edge, shoreline erosion north bay , high dock density. Good spawning habitat northern pike.	NA	No YOY observed so lake was stocked	TP, Chl-a, Secchi w/in range for NCHF – eutrophic conditions.
Good Stuff	WQ good at time better than avg for area. P and Chl-a decrease. Good water clarity, diverse plant community	Lowest TP –close to meet standard, mod Chla	NA	Small watershed opportunities for improvement.
Goals Set/Actions Suggested	NA	NA	NA	Develop watershed management plan. Continue CLMP. Shoreline education/protection. Future development minimize impacts to lake. Lake association work with ag landowners. Minimize harvest/disturb aquatic plans.

**Upper Cannon Lobe
Waterbody/Watershed: French Lake**

Study	Rice Co 1972	Rice Co 1972-1985	Lake Survey (DNR) 2007	French Lake Water Quality Improvement Project - June 1993 – June 200 (Blue Water Science, 2001)
Reason for Study/Goals	Initial assessment	Follow up to 1972	assess the fish community and aquatic habitat conditions.	Reduce nutrient concentrations in French Lake. Secchi 1.1 m, TP 80 ppb,
Issues/Problems	Intermediate WQ, algae bloom, high BOD late summer	WQ data almost identical to 1972, P levels rising, NW inlet creek polluted with soils and nutrients.		Ditched wetlands are a significant P source.
Good Stuff		“Motivated lake associations are perhaps the most effective tool in protecting waters.” “French Lakers” resident group paid for good WQ in many ways. – good SSTS	Healthy population adult muskie. Crappie size improved, bluegills abundant,	
Goals Set/Actions Suggested	None	None	Improved watershed and shoreline management practices could improve the water quality and fish and wildlife habitat in the long term.	Worked on a variety of projects to include shoreland restoration, septic upgrades, curlyleaf cutting, fish removal, Ag land conservation practices, etc.

Upper Cannon Lobe
Waterbody/Watershed: Lake Gorman

Study	DNR Lake Vegetation Survey (2010)	UCAP (2007-2009)	DNR Fish Survey 2006	DNR Lake Management Plan for Cannon River Chain 1995
Reason for Study / Goals	Point-intercept survey for the distribution of curly-leaf pondweed.	1)Reduction of excessive bacterial, sediment and nutrient levels into the Upper Cannon River. 2) Increase and improve wildlife and aquatic habitats, as well as recreational opportunities in the watershed.		
Issues/ Problems	Frequency of curly-leaf pondweed from sampled sites was 45%. Frequency of sites with submersed native species: 67%	Lake Water Quality Grades. Secchi Disk - C, Total phosphorus - F, Chlorophyll-a - C. Overall - D+. Total phosphorus concentrations in Gorman and Sabre lakes were extremely high. Potential sources of phosphorus: 1. Curlyleaf pondweed dieback in the lakes: low to average contributor. 2. Fish, such as carp, bullheads, or freshwater drum, translocating nutrients from the lake sediments to the water column: average to slightly above average contributor. Fish surveys indicate fish populations are in a typical range for Cannon River watershed lakes. Fish are a factor, but not the major factor. 3. P-release from the sediments: probably a significant contributor. 4. Unmonitored watershed inputs: probably a significant contributor.	Gorman Lake continues to have poor production of young of the year walleye when compared to other lakes in the Cannon River chain of lakes.	A series of low-head dams limit movement of fish between some of these lakes and completely eliminates any prospect, desirable or otherwise, of colonization from below. Prior to the existence of these structures, it is probable that the fish fauna in these lakes was more diverse as a result of occasional immigration by species such as lake sturgeon and flathead catfish...Stable water levels resulting from the various weirs and phosphorus loading has tended to create an environment more favorable for phyto plankton than macrophytes. Agricultural drainage of peripheral wetlands has significantly reduced the amount of spawning habitat available to species such as northern pike.
Good Stuff				
Goals Set / Actions Suggested		An overall goal is to reduce phosphorus loading to the lakes and reduce the in-lake TP concentration. 1. Determine what is limiting algal growth in the Upper Cannon River watershed lakes. 2. Determine the source of the excess		

Upper Cannon Lobe
Waterbody/Watershed: Hunt Lake

Study	Rice County Water Quality Evaluation 1986
Goals/ Reason for Study	To ascertain how well Rice County waters have fared since 1972.
Issues/ Problems	The transparency data gathered since 1974 shows that Hunt Lake experiences summer algae blooms. This productivity results in abundant populations of fish. While sampling Hunt in January 1985 we witnessed the harvest of tons of carp, buffalo and bullheads during a commercial seine. This removal of rough fish might be responsible for the resurgence of large rotted water plants during the spring and summer of 1985. Because Hunt is relatively small, it is prone to wide variations in water quality from year to year.
Good Stuff	It is apparent that upon the conclusion of the sampling period, Hunt exhibited very good water quality. No significant fecal contamination was detected. Hunt was not studied in 1972 and therefore comparisons at this time are not possible.
Specific Projects/ Actions Suggested	There is a trend toward greater development of Hunt Lake. It has seen a 600% increase in total homes between 1967 and 1982. This increasing development will challenge lakeshore dwellers and local government. If this challenge to protect water quality is met the next study of Hunt Lake will show it.
Notes	Hunt Lake is tucked in a small depression at the head of the Cannon River just south of General Shields Lake.

Upper Cannon Lobe
Waterbody/Watershed: Jefferson-German Chain of Lakes

Study	MSU Vegetation Survey (2009)	Clean Water Partnership Phase IIA and IIB 1998-2006	Diagnostic Study 1994
Reason for Study / Goals		1. Reduce Nutrient Loading through BMPs. 2. Increase public awareness of water quality issues. 3. Improve coordination of watershed activities. 4. Evaluate the project's effectiveness. 5. Reduce pollutant loadings through implementation of shoreland BMPs.	1. To evaluate the water quality of the five lake basins. 2. Identify and quantify non-point sources of nutrients and fecal coliform contaminants with special emphasis on phosphorus. 3. Identify the nature of phosphorus loading to Middle Jefferson. 4. To document historical eutrophication. 5. To develop a short and long range implementation plan to address nonpoint sources of pollution within the watershed.
Issues/ Problems	Curlyleaf Pondweed Coverage. German: 55%, East Jeff: 62%, Middle Jeff: 99%, Swedes Bay: 92%, West Jeff: 55%	Site 13 experienced an increase in phosphorus concentrations during 1994-96 and had become a significant driving force for the lake chain water quality. Middle Jefferson drives the water quality conditions to the adjacent lakes, depending on flow direction. The water quality of the two terminal lakes is highly dependent on the flow direction of the system. Follow up monitoring in subshed 14 indicates that pollution from the feedlot is still occurring.	The study defined that the majority of the lake phosphorus loading came from three subwatershed, 9, 10 and 14...Sites 9 and 10 contribute to Swede's Bay and Site 14 to Middle Jefferson...By controlling nutrient input at sites 14, 9 and 10 into Middle Jefferson and Swede's Bay not only would their water quality be improved but there could be significant impact on East Jefferson and German Lakes as well.
Good Stuff		During the first phase, corrections were made to the feedlots in 9 and 14. The feedlot is subwatershed 4 is no longer operational. Watershed specialist has been a key component in educating and promoting BMP'S to watershed residents. Individual was responsible for contacting landowners to promote conservation practices, and to convey the availability of other set aside programs provided through the SWCD/ NRCS/ FSA offices. Individual is critical to the long term success of the overall project.	German Lake exhibits the best water quality of the chain.
Goals Set / Action Suggested		Given the amount of nutrients within the lake, methods to control in- lake fertilization will eventually have to take place once inputs from the watershed are under control.	West Jeff Short Term Goal: 60-80, Long Term: < 50 Middle Jeff Short Term Goal: < 100, Long Term: < 90 East Jeff Short Term Goal: 70-90, Long Term: < 50 Swede's Bay Short Term Goal: < 100, Long Term: < 90 German Short Term Goal: 40-50, Long Term: < 40. Future Research Needs: Water Balance for West Jefferson, quantifying internal sources of nutrients.

Upper Cannon Lobe
Waterbody/Watershed: Kelly-Dudley Lakes

Study	MPCA Status and Trend Monitoring 1999	Rice County Water Quality Evaluation 1986
Reason for Study / Goals		To ascertain how well Rice County waters have fared since 1972.
Issues/ Problems		
Good Stuff	The observed in-lake P for Kelly and Dudley lakes was about 30 µg/l which is quite similar to the predicted P of 28 µg/L ± 11. This suggests that the 1999 in-lake conditions are very close to that predicted for a lake with Kelly and Dudley’s morphometry and watershed area.	They are unlike other lakes in Rice County in many ways. They are small, very deep, and relatively infertile. It is likely that groundwater seepage into their basins significantly dilutes and cools their waters. Wide marshlands line the border of both lakes reducing nutrient invasion from their small watersheds. Both Kelly and Dudley have highly transparent, algae free water as a result of these unique characteristics. Lily pads, rooted plants, and emerging vegetation all vie for nutrients, leaving little for unicellular plants (algae). This is a fine environment for gamefish, yet unlike neighboring lakes, Kelly and Dudley do not have large foodbanks. Low fish populations reflect this side of the nutrient equation.
Goals Set / Actions Suggested	For lakes like Kelly and Dudley, it would be reasonable to set a goal of “protecting current conditions.” This would be based both on the observed data and model predictions. In turn, a plan could be derived that would look at things that could be done to protect the condition of the lakes.	Development around these pristine lakes has increased in recent years and it appears that phosphorus concentrations have jumped as well. Great care must be taken to avoid disturbing their balance. Proper sewage treatment and careful selection and maintenance of building sites will keep nutrients, sediment and fecal bacteria out of these lakes. The wetlands that catch the runoff from fields around Kelly and Dudley are also essential parts of these lakes. Destroying or draining these areas would allow the basins to fill with sediment and cloud the clear water.

Upper Cannon Lobe
Waterbody/Watershed: Rice Lake

Study	DNR Fish Survey 2010	UCAP (2007-2009)	DNR Cannon River Chain Lake Mgmt Plan 1995
Reasons for Study / Goals		1)Reduction of excessive bacterial, sediment and nutrient levels into the Upper Cannon River. 2) Increase and improve wildlife and aquatic habitats, as well as recreational opportunities in the watershed.	
Issues/ Problems	Black bullhead overwhelmed the gill net catch. Black crappie abundance dropped considerably from 2005 to 2010	Lake Water Quality Grades. Secchi Disk - D, Total phosphorus - F, Chlorophyll-a - A. Overall - D+. Potential sources of phosphorus: 1. Curlyleaf pondweed dieback in the lakes: low to average contributor. 2. Fish, such as carp, bullheads, or freshwater drum, translocating nutrients from the lake sediments to the water column: average to slightly above average contributor. Fish surveys indicate fish populations are in a typical range for Cannon River watershed lakes. Fish are a factor, but not the major factor. 3. P-release from the sediments: probably a significant contributor. 4. Unmonitored watershed inputs: probably a significant contributor.	
Good Stuff	The assessment turned up largemouth bass between 6 and 16 inches. Several year classes are present, and growth appears to be good. Very little development around the lake has left lakeshores, vegetation, and fallen timber intact to be used as cover by bass and other fish species.		
Goals Set/ Actions Suggested		An overall goal is to reduce phosphorus loading to the lakes and reduce the in-lake TP concentration. 1. Determine what is limiting algal growth in the Upper Cannon River watershed lakes. 2. Determine the source of the excess phosphorus found in the lakes.	Rice Lake could be stabilized by means of winter aeration and managed along with other Cannon River Chain Lakes

Upper Cannon Lobe
Waterbody/Watershed: Roberds Lake

Study	DNR Lake Vegetation Survey (2010)	MPCA Status and Trend Monitoring 1999	Rice County Water Quality Evaluation 1986	Rice County Water Quality Evaluation 1972
Reason for Study / Goals	Point-intercept survey for the distribution of curly-leaf pondweed.		To ascertain how well Rice County waters have fared since 1972.	Preliminary evaluation of a large number of lakes and sites on those lakes on which to base water management decisions.
Issues/ Problems	Frequency of curly-leaf pondweed from sampled sites was 44%. Frequency of sites with submersed native species: 36%	Total phosphorus concentrations were very high throughout the summer in Roberds Lake. Concentrations were in the 200 µg/L range in July and increased to the 300 µg/L range in August and September. Hypolimnetic TP concentrations were excessively high at 900 and 1,130 µg/L in July and August respectively. Any wind mixing that allows the bottom waters to mix with the surface waters will lead to increased surface water concentrations.	Roberds has been one of the most heavily used and thoroughly studied lakes in Rice County. The data from both the 1972 and 1956 (DNR Lake Survey, Jerome H. Kuehn) indicated that Roberds has had these problems for many years. Roberds is heavily enriched by agricultural runoff, lakeshore development, and its own nutrient rich sediment. Each year the huge algae crop dies and falls to the bottom. This builds a thick decomposing muck that consumes oxygen. Unfortunately these conditions can lead to oxygen depletion and winter kills.	Roberds Lake is in that group of lakes which have poor water quality. The secci disc readings in Roberds Lake reflect the presence of algal blooms during most of the warm season. The levels of coliform bacteria were not at a level which would cause great concern, however, during the spring and summer sampling times, the north west bay did have more coliform bacteria than the other two sampling sites.
Good Stuff				
Goals Set / Action Suggested			Removing the threat posed by fecal contamination of Roberds Lake must be the priority for the future. Because much of the development was completed prior to tight regulation of on-site sewage systems and the Shoreland Management Act, many old nonconforming systems probably still pollute Roberds.	

Upper Cannon Lobe
Waterbody/Watershed: Sabre Lake

Study	DNR Fish Survey (2009)	UCAP (2007-2009)
Reason for Study / Goals		1)Reduction of excessive bacterial, sediment and nutrient levels into the Upper Cannon River. 2) Increase and improve wildlife and aquatic habitats, as well as recreational opportunities in the watershed.
Issues/ Problems	Walleye continue a low level of abundance in Sabre Lake. Walleye averaged 1.3 fish per lift. Better angling options for walleye exist in the area, as well as within the Cannon River chain of lakes.	Lake Water Quality Grades. Secchi Disk - C, Total phosphorus - F, Chlorophyll-a - C. Overall - D+. Total phosphorus concentrations in Gorman and Sabre lakes were extremely high. Potential sources of phosphorus: 1. Curlyleaf pondweed dieback in the lakes: low to average contributor. 2. Fish, such as carp, bullheads, or freshwater drum, translocating nutrients from the lake sediments to the water column: average to slightly above average contributor. Fish surveys indicate fish populations are in a typical range for Cannon River watershed lakes. Fish are a factor, but not the major factor. 3. P-release from the sediments: probably a significant contributor. 4. Unmonitored watershed inputs: probably a significant contributor.
Good Stuff	Northern pike were the most abundant fish in the gill net catches.Northern pike abundance has picked up since 2004 test netting. Pike have many prey options in Sabre Lake, including an abundance of white sucker (4.5 per gill net lift), yellow perch (4.7 per gill net lift), or young freshwater drum (sheepshead).	
Goals Set / Action Suggested		An overall goal is to reduce phosphorus loading to the lakes and reduce the in-lake TP concentration. 1. Determine what is limiting algal growth in the Upper Cannon River watershed lakes. 2. Determine the source of the excess phosphorus found in the lakes.

Upper Cannon Lobe
Waterbody/Watershed: Tetonka and Sakatah

Study	DNR Lake Survey of Tetonka 2009	Flyover 2008	UCAP (2007-2009)	MSU Cannon River-County Ditch 59 Watershed of Lake Tetonka 1979
Reason for Study				
Issues/ Problems	Only 14 fish per hour of run time were sampled of largemouth bass. This sample may have not been representative because of cold weather. Tetonka is usually considered a good bass fishing lake; at one time it was the home of the Minnesota state record largemouth bass	Non-point runoff were observed on 32 of the 42 sites analyzed. The non-point runoff sources are probably the largest loading contributors. Thirteen areas of non-point septic concerns were identified and should be groundtruthed. Five areas of point septic concerns were identified and should be groundtruthed. Twenty-five impervious areas were identified. These areas may be mitigated by restoration of vegetative buffers and berms. The fish hatchery on site 32 has the potential to add large amounts of nutrients.	Tetonka Water Quality Grade: C-; Lower Sakatah: D-; Upper Sakatah: D; For other UCAP information see Sabre Lake.	The bottom line of the water quality study is that Lake Tetonka's upstream concern should be with the Cannon River and not County Ditch 59. Over 50 times the phosphorus and 14 times the nitrogen is coming from the River versus the Ditch. The water quality coming directly from Lake Sabre is of much lower quality than that from the ditch but between Lake Sabre and the confluence of the ditch the water quality in the river deteriorates!
Good Stuff	Water clarity was excellent; secchi depths measured 8.5ft. A small population of smallmouth bass exists in Tetonka Lake.			
Goals Set / Action Suggested		A shoreline buffer campaign is recommended. Native vegetation systems will lessen the influences of stormwater runoff and provide a needed balance of terrestrial habitat needed for a healthy fishery and lake in the near shore area. A mass balance should be conducted on the hatchery using phosphorus input/output calculations and discharge testing.		

Upper Cannon Lobe
Waterbody/Watershed: Shields Lake

Study	UCAP (2007-2009)	DNR Lake Survey 2006	Rice County Water Quality Evaluation 1986	Rice County Water Quality Evaluation 1972
Reason for Study / Goals			To ascertain how well Rice County waters have fared since 1972.	Preliminary evaluation of a large number of lakes and sites on those lakes on which to base water management decisions.
Issues/ Problems	Water Quality Grades. Secchi Disk: C, TP: F, Chlorophyll-a: C. Overall: D+. For other UCAP information see Sabre Lake.		Shields Lake has experienced a slow, steady decline in transparency and fluctuation in nutrient concentrations since 1972.	Shields Lake is in that group of lakes with intermediate water quality.....Phosphate levels, while not extremely high, were higher than some of the other lakes in Rice County and remained higher throughout the summer. Of particular interest is the phosphate level in the sample taken in the north bay. This level was higher than other samples from Shields Lake in both winter and spring sampling times.
Good Stuff		The shoreline and riparian zone of Shields Lake is in relatively good condition, especially when compared to other area lakes. Observations and vegetation transect sites indicate that approximately 37% of shoreline has been disturbed and modified for residential development. Shields Lake supports a fairly diverse aquatic plant community, providing valuable cover habitat and spawning substrate for a variety of fishes.	No consistent fecal contamination was noticed over the study period.	Coliform levels were not at the level they would generate a lot of concern.
Goals Set / Actions Suggested			Intercepting major tributaries with marsh impoundments or diversions would help remove the non-point pollution they carry. Undoubtedly, much of the Shields Lake watershed was wetland before being drained and put into production. Returning some of this area to its original state would prolong the life of the lake and improve wildlife habitat.	

Upper Cannon Lobe
Waterbody/Watershed: Lake Volney

Study	MSU Vegetation Survey (2009)	Organic Carbon Study 2005	Diagnostic Study 1997	MPCA Lake Assessment Program 1986
Reason for Study / Goals		1. Determine effectiveness of a potential lake sediment alum treatment. 2. Based on preliminary positive indicators that organic carbon could improve lake water quality, design an organic carbon project.		Pilot program to assist lake associations in collecting baseline water quality data for the purpose of assessing the current trophic status of their lake and to assist in the development of lake management strategies.
Issues/ Problems	Our FQI value for Lake Volney is 2.31, an extremely low value. FQI values less than 20 are indicative of degraded habitats with very little natural vegetation left in the ecosystem	1. Alum: A conventional one time alum dose to inactivate phosphates in lake sediments would not improve water clarity for more than a few years. 2. Organic carbon amendment: Based on results of laboratory testing and on literature research, crushed corn was found to be a suitable organic carbon amendment that had the potential to improve water clarity in Lake Volney over the summer. However, a project of this size had never been attempted and there would be some uncertainty regarding the outcome.	Sub watershed 7 and 8 (northwest corner of lake) discharged the most nutrients per area while subwatershed 3 (parshall flume site) was by far the largest and dominant source of nutrient loading.	Exhibited very high phosphorus concentrations averaging 0.16 mg/L. Grab samples of selected tributaries to Lake Volney indicated very elevated nutrient levels. These high nutrient levels are likely due to the drainage from feedlot areas, from other agricultural lands in the watershed, including wetland areas now being cultivated, and residential sources such as lawn runoff and septic tanks.
Good Stuff				Future of the lake seems bright given the morphometry of the lake, it was estimated that the lake retains 90% of the phosphorus coming into it, which means that the lake will tend to respond quickly to reductions in nutrient loadings
Goals Set / Actions Suggested	Efforts to reestablish macrophytes within the Lake may provide a valuable means of removing excess nutrients from the water column in the future.			Target mass loading of 1,500 pounds Phosphorus from all sources is proposed- this would require a reduction of about 4,000 pounds P/ year. Formation of a lake improvement district or a watershed district should also be considered to help fund lake/watershed improvement measures.