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Wenck File #0002-210

DECEMBER 2013

Technical and Cost Specifications

Improvements to Lake Augusta Eurasian Water Milfoil Control

Project No. 01-2

Prepared for:

CLEARWATER RIVER WATERSHED DISTRICT

75 Elm Street East, Box 481
Annandale, MN 55302

Prepared by:

WENCK ASSOCIATES, INC.

1800 Pioneer Creek Center
Maple Plain, Minnesota 55359
(763) 479-4200

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P.O. Box 249
1800 Pioneer Creek Center
Maple Plain, Minnesota 55359-0249
(763) 479-4200

December 2013

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Engineers • Scientists
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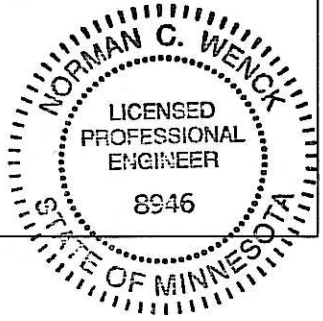
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of Minnesota.

Date: 12-9-2013

Norman C. Wenck, P.E. Registration No: 8946



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APENDICES

1.0 Summary

On October 9, 2013, the Clearwater River Watershed District (CRWD, District) received a petition from the Lake Augusta Association (LAA), which represents Lake Augusta in the Clearwater Chain of Lakes (Appendix A). The petition requests the District to consider improvements to the Lake Augusta Eurasian Watermilfoil Control Project No. 01-2 (Appendix B) to include the control and management of aquatic invasive species (AIS).

The District verified that the petition met the requirements for a valid petition and accepted the Petition.

At the November 13, 2013, meeting, the District ordered the District Engineer to prepare this Technical and Cost Specification for alterations to the project. This document is intended to fulfill the requirements of Minnesota Statutes Section 103D.635, Subdivision 1 for Improvements to a Project.

2.0 Introduction

Lake Augusta is the eighth lake in the Clearwater Chain of Lakes located between Lake Caroline and Clearwater Lake near South Haven and Fair Haven, Minnesota. Lake Augusta is 177-acre basin with a mean depth of 24.9 feet and a maximum depth of 82 feet. The littoral zone covers 65.3 acres. The main stem of the Clearwater River is the main inflow tributary into Lake Augusta. The outlet of Lake Augusta is the channel connecting the lake to Clearwater Lake.

The DNR documented the presence of curlyleaf pondweed in Lake Augusta in 2005 (Appendix C-1). The DNR performed a submerged vegetation survey in 2005 and documented findings on a map (Appendix C-2). The DNR has also documented the presence of bullheads and carp in this lake (Appendix C-3). A documented zebra mussel infestation is as close as Fish Lake in Wright County. The DNR has also mapped the emergent and floating-leaved vegetation of Lake Augusta (Appendix C-4) and has developed a Lake Management Plan (Appendix C-5).

This Technical and Cost Specifications addresses the management of AIS in Lake Augusta to preserve recreational opportunities such as fishing, swimming and boating in the lake as well as to preserve the aquatic ecosystem of the lake.

While management of the existing curlyleaf pondweed infestation in Lake Augusta is the only specific step identified at this time, the scope of these Technical and Cost Specifications is to consider AIS management in Lake Augusta as a whole, recognizing that new infestations and new technologies to prevent and manage them are evolving. Zebra mussels, common carp, and Asian carp are just a few of the other infestations that may require prevention or management in the near future. The CRWD recognizes that management of AIS is critical to maintaining recreational opportunities and lake ecosystems. The CRWD also recognizes that AIS management is a state-wide problem and is the purview of the DNR, and that measures taken by CRWD to manage AIS are complementary to Minnesota's overall AIS management strategy.

In spring, curlyleaf pondweed can form dense mats that may interfere with boating and other recreation on lakes. Curlyleaf pondweed also can cause ecological problems because it can displace native aquatic plants. In midsummer, curlyleaf pondweed dies back, which results in rafts of dying plants piling up on shorelines, and often is followed by an increase in phosphorus, a nutrient, and undesirable algal blooms. Like other aquatic vegetation, the abundance of curlyleaf varies from year to year depending on environmental conditions such as winter snow depth and spring water clarity, which can affect its growth.

The presence of curlyleaf pondweed and rough fish have been tied to degraded water quality, and conversely the management of the two have, in some cases, provided water quality benefits.

3.0 Alternative Solutions Considered

Several alternatives were considered to manage curlyleaf pondweed and AIS on Lake Augusta. They are described in the sections below.

3.1 ALTERNATIVE SOLUTIONS

3.1.1 Chemical Herbicide treatment

Chemical treatment of curlyleaf pondweed stands can control the severity of infestations. The Minnesota DNR requires a permit for such treatments. Lakes with poorly established or disrupted native vegetation populations are more susceptible to the spread of invasive species than those with healthy native plant communities. As such it may be preferable to use selective chemical treatments and employ a highly skilled applicator (in any case) to achieve desired herbicide concentrations for the required duration at the required time of year to treat the infestation and to minimize impact on native plants and aquatic macrophytes, as well as to minimize human exposure.

The DNR-recommended treatment for curlyleaf pondweed is currently endothall. Diquat and floridone have also been shown to be effective for controlling curlyleaf pondweed but are being evaluated by the DNR:

Endothall

A trade name for the dipotassium salt of endothall is Aquathol®. Endothall is a fast-acting non-selective contact herbicide which destroys the vegetative part of the plant but generally does not kill the roots. Endothall may be applied in a granular or liquid form. Typically endothall compounds are used primarily for short term (one season) control of a variety of aquatic plants. However, there has been some recent research that indicates that when used in low concentrations, endothall can be used to selectively remove exotic weeds; leaving some native species unaffected. Because it is fast acting, endothall can be used to treat smaller areas effectively. Endothall is not effective in controlling Canadian waterweed (Elodea canadensis) or Brazilian elodea.

Diquat

A trade name for diquat is Reward®. Diquat is a fast-acting non-selective contact herbicide which destroys the vegetative part of the plant but does not kill the roots. It is applied as a liquid. Typically diquat is used primarily for short term (one season) control of a variety of submersed aquatic plants. It is very fast-acting and is suitable for spot treatment. However, turbid water or dense algal blooms can interfere with its effectiveness. Diquat was allowed for use in Washington in 2003 and Ecology collected information about its efficacy against Brazilian elodea in 2003. A littoral zone treatment in Battle Ground Lake in Clark County Washington in 2003 resulted in nearly complete removal of Brazilian elodea in that water body.

Fluridone

Trade names for fluridone products include Sonar® and Whitecap®. Fluridone is a slow-acting systemic herbicide used to control Eurasian watermilfoil and other underwater plants. It may be applied as a pellet or as a liquid. Fluridone can show good control of submersed plants where there is little water movement and an extended time for the treatment. Its use is most applicable to whole-lake or isolated bay treatments where dilution can be minimized. It is not effective for spot treatments of areas less than five acres. It is slow-acting and may take six to twelve weeks before the dying plants fall to the sediment and decompose. When used to manage Eurasian watermilfoil in Washington, fluridone is applied several times during the spring/summer to maintain a low, but consistent concentration in the water. Granular formulations of fluridone are proving to be effective when treating areas of higher water exchange or when applicators need to maintain low levels over long time periods. Although fluridone is considered to be a broad spectrum herbicide, when used at very low concentrations, it can be used to selectively remove Eurasian watermilfoil. Some native aquatic plants, especially pondweeds, are minimally affected by low concentrations of fluridone.

3.1.2 Mechanical Harvesting

Severe curlyleaf pondweed infestations that impede recreation such as boating, fishing and swimming are sometimes managed through mechanical harvesting programs. A mechanical harvester is stored on the lake, or shared between lakes and run according to the operational organizations budget, staffing availability and treatment goals.

Curlyleaf pondweed infestations can spread through the fragmentation of plant stems caused by harvesting, which can actually exacerbate infestations. Curlyleaf pondweed turions can float to other parts of the lake and other lakes in the chain of lakes where they take root and expand the infestation.

Harvesting does not differentiate between AIS and native plants, and as such, native plant stands can be impacted by this method. Mechanical harvesting also only targets the top 4 feet of AIS, and requires ongoing treatment from year to year.

Due to the high capital cost of the harvesting equipment and the requirement of staff, this option is generally saved for the most severe infestations, and for organizations that have continual funding sources and full time staff. For example, the Minneapolis Park and Recreational Board, Lake Minnetonka Conservation District, and Three Rivers Parks Districts each run harvesting programs.

3.1.3 Manual Harvesting

Manual harvesting may be considered for small scale infestations, or to manage infestations on personal property. A skilled harvester can differentiate between native vegetation and exotics, and can reduce or eliminate the number of turions (plant fragments) formed that may spread the infestation to other parts of the lake. Further, selecting for native species can foster the growth of a healthy native plant population that can prevent the spread of curlyleaf pondweed. This method requires a high number of very well-trained volunteers/ staff members, and a relatively small infestation.

3.1.4 Habitat Manipulation

Fall drawdowns and dredging can be used to manage curlyleaf pondweed infestations by exposing lake sediments and thus, turions to freezing temperatures. This method requires moving large volumes of lake water out of a chain of lakes system.

3.1.5 Do Nothing

The conditions in Lake Augusta have been conducive to an ongoing curlyleaf pondweed infestation. In shallow areas it can impede recreational opportunities such as boating, fishing and swimming. The infestations alter native aquatic ecosystems by shading out and displacing native plants. However, in some lakes, curlyleaf pondweed appears to coexist with native flora and has little impact on fish and other aquatic animals (DNR AIS web site, 2011). A do-nothing approach would need to be conducted in conjunction with some monitoring to track the spread of curlyleaf pondweed within the chain of lakes. In the case of Lake Augusta, the curlyleaf pondweed infestation is ongoing and has been documented by residents as a severe nuisance level infestation.

3.2 PROPOSED SOLUTION AND SEQUENCING

The DNR recommends Endothall treatment in the early spring. The LAA will need to prepare an application and conduct the treatment activities to treat a portion of the littoral area.

It is also recommended that formal vegetation mapping be conducted on the chain of lakes: to track the extent of infestations and progress towards management goals, and every 2 to 3 years to identify, quantify and map the native species. This will help to track the efficacy of treatment, and to allow for course corrections along the way, as well as monitor impact on native vegetation. There may also be an AIS education component initiated by the District.

3.3 MANAGEMENT OF OTHER AIS

In the event that other AIS are discovered in Lake Augusta, specific management and control techniques will be established for each AIS. Prevention methods may also be implemented. AIS control and management will be performed in accordance with the District's approved 2010 Watershed Management Plan.

4.0 Benefits of Proposed Project

Management of AIS infestations like curlyleaf pondweed can preserve aquatic ecosystems and improve water quality, as well as preserving beneficial uses such as boating, fishing and swimming. Such programs can expand residents' knowledge and understanding of AIS which can delay the onset of other infestations.

5.0 Project Need

Aggressive management of new curlyleaf pondweed infestations can improve native plant populations and fisheries and protect lake beneficial uses. Management of curlyleaf pondweed can improve water quality by preventing the release of nutrients from decaying plants during the summer months. Sustained efforts are required in order to meet management goals. Conducting AIS management on Lake Augusta through the CRWD provides a stable funding source for the project to ensure early efforts are leveraged to maximum practical benefits.

6.0 Project Compatibility with State and Federal Law

6.1 PROJECT PETITION

On October 9, 2013, the Clearwater River Watershed District (CRWD, District) received a petition from the Lake Augusta Association (LAA), which represents Lake Augusta on the Clearwater Chain of Lakes (Appendix A). The petition was submitted in accordance with Minnesota Statutes chapter 103D.635.

6.2 WATERSHED DISTRICT AUTHORITY

The Clearwater River Watershed District's authority to take action on the improvement of this project in response to the petition is found in the Minnesota Watershed Act as taken from the Minnesota Statutes chapter 103D.635 and 103D.705.

6.3 CONTENT OF THE TECHNICAL AND COST SPECIFICATIONS

This Technical and Cost Specifications is prepared in accordance with the Minnesota Statute 103D.635 under the Minnesota Watershed Act.

6.4 CONFORMANCE WITH OVERALL PLAN

The Clearwater River Watershed District requires projects undertaken under its jurisdiction to be consistent with its 2010 Watershed Management Plan (Plan). This project is consistent with Appendix A of the Plan as specifically addressed in the Findings of Fact, item 3, "Promote and improve the recreational use of said lakes", item 8, "Preserve, maintain, protect and promote the natural beauty of the Clearwater River, its tributaries and other watercourses", and item 9, "Develop fully the water resources of the area for recreation."

6.5 OTHER REQUIREMENTS

A permit is required from the Minnesota Department of Natural Resources (MN DNR).

7.0 Financing

Financing for the project will be obtained by assessing the original project property owners using the same units of benefit following the original appraisal report for Project No. 02-1.

8.0 Certifications

It is certified that the improvements to the Lake Augusta Eurasian Watermilfoil Control Project No. 01-2, outlined in their document are required to attain the operating efficiency contemplated in the original project. The District should proceed as soon as possible to control and manage the existing curlyleaf pondweed infestation and to prevent the spread of other AIS.

The recommended improvements have been shown to be feasible and in the interest of the Public; therefore, it is recommended that the improvements be approved and implemented as soon as practical.

Appendix A

Petition to CRWD Dated October 9, 2013

PETITION

The undersigned, being at least 25 percent of the property owners or the owners of more than 25 percent of the property within the limits of the area proposed to be improved (the "Petitioners"] Hereby petition the Clearwater River Watershed District (the Watershed District"), pursuant to Minn. Statutes Section 103D.705 to undertake a project as follows:

1. **Description Of Proposed Word Change** of Fund **To Be Accomplished:**
   Lake Augusta Association, (LAA) non -profit association *made* up of dues paying members of riparian property in Steams/Wright County, petition the Watershed District to act as fiscal agent for the control and management of invasive species, at the time of this petition on Lake Augusta. The role of the Watershed District would be to collect reimbursements of riparian property owners and then reimburse the Lake Augusta Association for expenses incurred. The role of the Watershed District is necessary because it is the only way to assure that all benefitted properties are paying for the benefit received from invasive species control.

2. **Description Of The Property Were the Proposed Project Passes Over or is Located:**
   The project would include all riparian property owners on Lake Augusta. Riparian defined for these purposes as any property that has direct access to Lake Augusta.

3. **A General Description Of the Watershed District Will Be Affected:**
   178 Acres of Lake Augusta

4. **Necessity Of The Project:**
   The control of Invasive Species in Lake Augusta is vital to the ecological and economic environment of the lake which are a significant part of the chain of lakes in the Watershed District.
   The proposed project will be conductive to the public health, convenience, and welfare of the Watershed District. The Petitioners hereby agree to pay all costs and expenses that may be incurred by the Watershed District if the proceeds are dismissed or a construction contract is not awarded for the project.

In witness whereof, the undersigned have executed this Petition as of the 9th day of Oct, 2013.

September 14, 2013 3:00 pm

Petition To Make Milfoil account to aquatic Species

1 Scott Niemann [signature] Kate Niemann
2 Dr. Dorothy Welch
3 Gary Steffen
4 [signature] Steffen
5 Diane Winston
6 Wayne Steffens + Jaclyn Steffens
7 [signature]
8 Rita DeBrabander
9 [signature] Zimmer
10 [signature] Zimmer
11 Joel Van Enk [signature] Van Enk
12. Keith Sadowsky + Linda Sadowsky
13. [signature] [signature]
14. [signature] Bayer
15. [signature]
16 [signature] [signature]
17 Deanna Gleason
18 [signature]
19 Roger Hanfeld Jr Shelly Hanfeld
20. Ellie Booy
21 Ed Booy
22 Duane Kassulker
23 JoAnn Kassulker
24 Kathy Halek [signature] Halek
25 Warren Weller [signature] Weller
26 [signature]
27 [signature]

28.
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46
47
48 Bernie & Mary Wo
49 Miriam & Eric Campbell
50
51
52

(3) Petition To Make Milfoil Fund account To aquatic Species Fund

53 [signature] Lisa Marie Jordet

54 John Hassler [signature] & Judith Hassler

55 Douglas Pollock [signature] Cindy Pollock

56 James Emmet [signature] Alex Schommer [signature]

57 [signature] Alice A. Selensky [signature]

58 James A. Barber Judie A. Barber

59 Julie Eaton [signature] [illegible]

60 Marz Melsha [signature] Jayne Ann Melsha

61 Blake Jacobson Blake Jacobson

62 Frank Jacobson Frank Jacobson

63 Larry Bataresal Connie Bataresal

64 Mike Anderson [signature] Michael Anderson
Micheal Anderson

65 Pat Willis [signature] Willis

66 Philip T. Jensen Jeanette Jensen

67 Evangeline E. Schatz EVANGELINE E. SCHATZ

68 [signature] & Lisa Mayer

69 Lois Le Mere [signature] Lois Le Mere

Nottingham 70 Jean Leuth[signature] Jean Leuthner & Richard Riggins Fuentes
Richard Riggins Fuentes

71 – Curtis Lindblom Curtis Lindblom
Jae-Dee Lindblom Jae-Dee Lindblom

13370 72 Richard Westerdahl RICHARD WESTERDAHL

Newcomb 73 Robert + Linda Oehlers
11141 ROBERT + LINDA OEHLERS

74 John E. Krista ~~Matthees~~ (matthees@lakedale.net

75. Carrie S Miller — Carrie S Miller
76. Roger [illegible] — Rita Stroute — STROUT
77. [illegible] — Donna Rauschenberger
78. Roger Frey — Roger Frey — Annette M. Frey — Annette Frey
79. [illegible] — Randy Anderson
80. Matthew Overbeck — Michelle Overbeck
81. Victor McGriff — [illegible] — McGRIFF

Petition Printed list

Line #	Name	Name	PID	TWR Lot #
1	Scott Niemann	Katie Niemann	217-700-100580	58
2	Dr. Dorothy Welch	no spouse	217-040-000020	
3 & 4	Gary Stigen	Liz Stigen	217-000-142101	
5	Diane Winston			
6	Wayne Steffens	Jaclyn Steffens	217-700-100170	17
7 & 8	Rod DeBrobander	Rita DeBrobander	217-700-100150	15
9 & 10	Nancy Zimmer	Stephen Zimmer	217-051000090	
11	Joel Von Ende	Kim M Von Ende	217-015-000040	
12	Keith Sadowsky	Linda Sadowsky	217-700-100470	47
13	Bob	Jess	Renter	21
14	Curt Boyes		09.05879.0000	Stearns Cnty
15	Rodney Sohr			
			217-015-000110	
16	Curt Quiner	Judith Quiner	217-015-000120	
17 & 18	Jack Gleason	Deann Gleason	217-053-002060	
19	Roger Halford Jr	Michelle (Shelly) Halford	217-053-002050	
20 & 21	Ed Bovy	Ellie Bovy	217-054-002140	
22 & 23	Duane Kassulker	JoAnn Kassulker	217-054-002141	
24	Jim Halek	Kathy Halek	217-052-001090	
25	Warren Weller	Kelly Weller	217-052-001080	
26 & 27	Clare Deslauriers	David Deslauriers	217-051-000080	
28	Jim Leslie	Karen Leslie	217-700-100340	34
29	Mark Hoberg	Cindee Hoberg	217-700-100190	19
30	Scott Ovshak	Kathy Ovshak	Motor Vehicle	10
31	Mark Tayler	Jenni Taylor	217-700-100600	60
32	Wayne Jarshaw	Karen Jarshaw	Motor Vehicle	59
33 & 34	Tanya Sirianni	Christopher Sirianni	217-015-000050	
35	Ron Heroff	Heidi Heroff	217-700-100280	28
36	Ronald H Knop	Sharon Knop	217-700-100630	63

37	Clifford Gullickson	Linda Gullickson	217-700-100070	7
38	Bob Young	Patricia Young	217-700-100010	1
39 & 40	Ingo Schalwig	Lucy Schalwig	217-700-100290	29
41	Tom Boos	Sue Boos	Motor Vehicle	31
42 & 43	Lloyd Decker	Nancy Decker	217-700-100160	16
44	Don Behrens	Joan Behrens	217-700-100430	43
45	Edgar Ochoa	Cindy Ochoa	New	25
46	Craig Baldy	Evon Baldy	Owner	21
47	Don Brinda	Diane Brinda	Motor Vehicle	61
48	Bernie Wurm	Mary Wurm	Renter	T1
49	Eric Campbell	Miriam Campbell	Motor Vehicle	53
50	Lawain Meier	Linda Meier	217-700-100450	45
51 & 52	James Kevin Campbell	Tami Peterson Campbell	Cabin	69
53	Jeremy Jordet	Lisa Marie Jordet	Motor Vehicle	65
54	John Hassler	Judie Hassler	Motor Home	52
55	Doug Pollock	Cindy Pollock	217-700-100320	32
56	Greg Schommer	Jeanne Frank	New Park Model	8
57	Arnold Sadowsky	Alice Sadowsky	Cabin	71
58	James Barber	Julie Barber	217-700-100180	18
59	Jim Stellmach	Julie Eaton	Renter	41
60	Mark Melsha	Jayne Melsha	Cabin	68
61 & 62	Blake Jacobson	Irene Jacobson	Motor Vehicle	62
63	Larry Battman	Connie Battman	Motor Vehicle	50
64	Mike Anderson	Rhonda Anderson	217-700-100420	42
65	Pat Willis	Patsy Willis	217-700-100510	51
66	Phil Jensen	Jenette Jensen	217-700-100370	37
67	Evandeline Schatz	no spouse	New Park Model	64
68	Tracy Mayer	Lisa Mayer	Motor Vehicle	44
69	Lois LeMere	no spouse	217-000-142101	
70	Richard Riggins Fuentes	Jean Leuthner	217-015-000230	
71	Curtis Lindblom	Jae Dee Lindblom	217-015-000092	
72	Richard Westerdahl	no spouse	217-015-000070	
73	Robert Oehlers	Linda Oehlers	217-040-002060	

74	John Matthees	Krista Matthees	09.05940.0303	Stearns Cnty
75	James Miller	Carrie Miller	217-700-100480	46
76	Roger Halford Sr.			
77	Roger Rauschendorfer	Donna Rauschendorfer	217-053-002040	
78	Roger Frey	Annette Freu	Cabin	67
79	Doug Anderson	Pandy Anderson	Motor Vehicle	35
80	Mathew Overbeek	Michelle Overbeek	217-700-100120	12
81	Victor McGriff	Lynn McGriff	217-700-100540	54

Appendix B

Excerpts from Engineer's Report,
Lake Augusta Eurasian Watermilfoil Control Project
No. 01-2

Engineers Report

Lake Augusta Eurasian Water Milfoil Control Project No. 01-2

Clearwater River Watershed District

Wenck File #0002-41

Prepared for:

CLEARWATER RIVER WATERSHED DISTRICT
P.O. Box 481
Annandale, MN 55302

Prepared by:

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1800 Pioneer Creek Center
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Maple Plain, Minnesota 55359-0249
(763) 479-4200

September 2001

Wenck

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ENGINEERS REPORT

for

LAKE AUGUSTA
EURASIAN WATER MILFOIL CONTROL PROJECT NO. 01-2

PREPARED FOR: Clearwater River Watershed District
P.O. Box 481
Annandale, Minnesota 55302

BOARD OF MANAGERS: Richard Eckman, President
Roland Froyen, Vice President
John Tracy, Secretary
Marvin Brunsell, Treasurer
Clarence Klein, Manager

PREPARED BY: WENCK ASSOCIATES, INC.
1800 Pioneer Creek Center
P.O. Box 249
Maple Plain, Minnesota 55359-0249
Telephone: (763) 479-4200
Facsimile: (763) 479-4242

Wenck File #0002-41

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of Minnesota.

Date: _____

_____

Norman C. Wenck, P.E. Registration No: 8946

1.0 Purpose

On August 8, 2001, the Board of Managers of the Clearwater River Watershed District (CRWD) received a petition (Appendix A) relating to Eurasian water milfoil control. At the meeting the Board ordered the District Engineer to prepare an Engineers Report for the project. This document is intended to fulfill the requirements of Minnesota Statutes Section 103D.335 for a project.

2.0 Introduction

Eurasian water milfoil (EWM) is a European aquatic plant that has been introduced accidentally to North America and is therefore an exotic species. EWM forms thick underwater stands of tangled stems and vast mats of vegetation at the water surface. In addition, EWM causes nuisance problems and interferes with boating, fishing, and swimming activities. If its growth and spread are left unchecked, EWM can have long-term deleterious effects on lake water quality.

3.0 Project Location

Lake Augusta is located in Sections 11 and 14 of T121N, R28W in Stearns and Wright Counties of Minnesota.

Lake Augusta has a surface area of 178 acres, a maximum depth of 82 feet, a mean depth of 25.3 feet, an approximate volume of 4,500 acre-feet and a drainage area of 68,000 acres. Its primary inflow is from the Clearwater River, which flows through an upstream chain of smaller lakes, then through Lake Augusta, then through Clearwater Lake, finally discharging downstream into the Mississippi River. In 1997, EWM was discovered in Lake Augusta. Currently, EWM impacts approximately 5 acres of the lake in near-shore areas (Figure 1).

4.0 Water Quality Benefits

The seasonal decay of EWM's huge biomass causes oxygen depletion, which in turn accelerates the release of phosphorus from the bottom sediments to the water column. EWM also upsets the fish community and may favor the growth of rough fish over game fish, thereby increasing the internal loading through bio-perturbation. Burton et al. (1979) estimated a reduction of phosphorus loading ranging from 0.15 to 1.20 grams per square meter per year for eutrophic lakes in the northern United States (such as Lake Augusta) as a result of removal of EWM and similar aquatic plants.

Even more importantly, if left unchecked, EWM could reasonably be expected to infect 50 to 60 acres of Lake Augusta. Reducing and eliminating EWM will improve the lake's recreational value (Cooke et al., 1986).

5.0 Project Need

In order to prevent further spreading of EWM, eliminate existing EWM, reduce internal phosphorus loading, and improve lake water quality, the herbicide 2,4-D can be applied to the lakes areas that are impacted by EWM. The application of 2,4-D is essentially an interim measure, even though it may successfully eliminate most of the now existing EWM stands. At present there is no known treatment or technique that is 100 percent effective at eliminating EWM. Therefore, a five-year program is envisioned; at the end of that period, a program review will lead to either an extension or an appropriate modification of the EWM program.

The minimum sustained 2,4-D concentration required for controlling EWM has been determined experimentally to be 0.05 to 0.10 milligrams per liter (mg/l) (Westerdahl and Hall, 1983). However, application rates of 20 to 40 pounds per acre (Frank, 1972) and 100 pounds per acre (Kretsch, 1989) have been cited as typical. The lower range was equated to average in-lake concentrations of 1.8 to 3.6 mg/l, based on a depth of 4 feet (Frank, 1972). An average depth of 7 to 8 feet is probably typical of the higher rate, and this implies an average in-lake concentration of about 5 mg/l. The mean depth for the Lake Augusta is approximately 23.5 feet, and the average depth of the impacted areas is approximately 10 feet (Figure 1). Therefore, 125 pounds of 2,4-D could be applied for each of the impacted acres of lake surface. The Lake Augusta Association has committed to providing the labor required for the chemical application (Appendix A).

6.0 Project Compatibility with State and Federal Law

6.1 WATERSHED DISTRICT AUTHORITY

The Clearwater River Watershed District's authority to take action on the implementation of this project is found in the Minnesota Watershed Act as taken from the Minnesota Statutes chapter 103D.335, manager's powers and duties.

6.2 CONTENT OF THE ENGINEER'S REPORT

This report is prepared in accordance with the Minnesota Statute 103D.711 Engineer's Report, under the Minnesota Watershed Act.

6.3 CONFORMANCE WITH OVERALL PLAN

The Clearwater River Watershed District requires projects undertaken under its jurisdiction to be consistent with the overall plan. This project is consistent with the overall plan as specifically addressed in Section 3.1, General Objectives. Section 3.1.D allows the District to provide for water quality improvements.

6.4 OTHER REQUIREMENTS

A permit will be required from the Minnesota Department of Natural Resources. A permit application will be prepared, sent to the Department and a permit received prior to the onset of treatment activities.

7.0 Economic Consideration and Benefits

7.1 EXISTING AND ANTICIPATED BENEFITS

The project will result in reduced phosphorus loading to Lake Augusta. This will have an effect of less vegetation growth and clearer water. The property values of the lots will increase in value after the installation of a community septic system.

7.2 ESTIMATED COSTS

Table 1 presents the estimated costs of the recommended alternative.

8.0 Environmental Assessment

The environmental effects of the project were assessed by completing an Environmental Assessment Worksheet (EAW) made available by the Environmental Quality Board. The EAW is included in Appendix B.

The project will reduce phosphorus loading to Lake Augusta and the Clearwater River Watershed District.

9.0 Financing

Financing for the project will be obtained by assessing benefited property owners. It is anticipated that the benefited properties shall be assessed based on a per lot basin. A listing of benefited property owners and tax parcel number(s) is shown in Appendix C.

10.0 Final Recommendations

It is recommended that EWM, currently present in at least 5 acres of the Lake Augusta and is expected to increase if uncontrolled and can be controlled by applying 2,4-D for the next five years, or until a better treatment or control practice is available.

The control of EWM is necessary to improve the water quality of Lake Augusta. Without such control the internal phosphorus loading in Lake Augusta could increase beyond the total (internal plus external) loading goal for the lake. To achieve control of the milfoil, application of the selected herbicide 2,4-D is the most practical and effective technique at present. The herbicide is to be applied on 5 plus acres of the lake that is impacted by EWM, at a rate of 125 pounds per acre. The impacted areas are shown in Figure 1.

Finally, a yearly evaluation of the EWM population and its spreading, and the treatment procedure is recommended in order to successfully control the EWM problem.

The recommended project has been shown to be feasible and in the interest of the Public, therefore, it is recommended that the project be approved and implemented as soon as practical.

11.0 References

Burton, T.M., King, D.L., and Ervin, L.L. 1979. Aquatic plant harvesting as a lake restoration technique. In *Lake Restoration: Proceedings of a National Conference,* U.S. Environmental Protection Agency, EPA-440/S-79-001, 177-185.

Cooke, G.D., Welch, E.B., Peterson, S.A., and Newroth, P.R. 1986. Lake and Reservoir Restoration, Boston: Ann Arbor Science, 302.

Frank, P.A. 1972. Herbicidal Residues in Aquatic Environments. *In Fate of Organic Pesticides in the Aquatic Environment*: A Symposium of the American Chemical Society, Los Angeles, March 29-31. 1974.

Krestch, K., Nov. 27, 1989. Personal Communication with J. Erdmann. (Mr. Kretsch is President of Lake Restoration, Hamel, Minnesota).

Westerdahl, H.E., and Hall, J.F. 1983. Threshold 2,4-D Concentrations for Control of Eurasian Watermilfoil and Sage Pondweek. Journ. Aquat. Plant Manage, 21:22-5.

TABLE 1
ESTIMATED COSTS

It is expected that the 2,4-D treatment will cost approximately $19,000 for the years 2002 through 2006. The following tables shows the estimated expense for the five-year program.

Item	Estimated Expense
Public Notice	$ 200
Public Hearing	$ 200
Engineering	$ 1,600
Legal/Administrative	$ 400
Chemical (2,4-D)[a]	
1st Year (2002)	$ 2,100
2003	$ 2,200
2004	$ 2,300
2005	$ 2,400
2006	$ 2,550
Volunteer Expenses	$ 1,500[a]
Equipment	$ 2,500[a]
Permits	$ 1,000[a]
TOTAL	$ 19,000

[a]5 Year Costs.

Environmental Assessment Worksheet (EAW)

Note To Preparers

This worksheet is to be completed by the Responsible Governmental Unit (RGU) or its agents. The project proposer must supply any reasonably accessible data necessary for the worksheet, but is not to complete the final worksheet itself. If a complete answer does not fit in the space allotted, attach additional sheets as necessary.

For assistance with this worksheet contact the Minnesota Environmental Quality Board (EQB) at (612) 296-8253 or (toll-free) 1-800-652-9747 (ask operator for the EQB environmental review program) or consult "EAW Guidelines," a booklet available from the EQB.

Note to Reviewers

Comments must be submitted to the RGU (see items 3) during the 30-day comment period following notice of the EAW in the EQB Monitor. (Contact the RGU or the EQB to learn when the comment period ends.) Comments should address the accuracy and completeness of the information, potential impacts that may warrant further investigation, and the need for an EIS. If the EAW has been prepared for the scoping of an EIS (see item 4), comments should address the accuracy and completeness of the information and suggest issues for investigation in the EIS.

1. Project Title Lake Augusta Eurasian Water Milfoil Control Project No. 01-2

2. Proposer

Contact person Richard Eckman

Address P.O. Box 481
Annandale, MN 55302

Phone (320) 529-1229

3. RGU Clearwater River Watershed District

Contact person Norman C. Wenck

and title Project Manager

Address Wenck Associates
1800 Pioneer Creek Center
P.O. Box 249
Maple Plain, MN 55359

Phone (763) 479-4201
FAX (763) 479-4242

4. Reason for EAW Preparation

[ ] EIS scoping [X] mandatory EAW [ ] citizen petition [ ] RGU discretion

[ ] Proposed volunteered

If EAW or EIS is mandatory give EQB rule category number(s)

5. Project Location

Section 11 Township 121N Range 28W

County Wright City/Township Fairhaven

Section 14 Township 121N Range 28W

County Stearns/Wright City/Township Southside

Attach copies of each of the following to the EAW:

a. a county map showing the general location of the project;

b. copy(ies) of USGS 7.5 minute, 1:24,000 scale map (photocopy is OK) indicating the project boundaries;

c. a site plan showing all significant project and natural features.

6. Description *Give a complete description of the proposed project and ancillary facilities (attach additional sheets as necessary). Emphasize construction and operation methods and features that will cause physical manipulation of the environment or produce wastes. Indicate the timing and duration of construction activities.*

The control of EWM is necessary to improve water quality of Lake Augusta. Without such control the internal phosphorus loading in Lake Augusta could increase beyond the total (internal plus external) loading goal for the lake. To achieve control of the milfoil, application of the selected herbicide 2,4-D is the most practical and effective technique at present. The herbicide is to be applied on 5 plus acres of the lake that is impacted by EWM, at a rate of 125 pounds per acre. The impacted areas are shown in Figure 1.

Provide a 50 or fewer abstract for use in EQB Monitor notice:

7. Project Magnitude Data

Total Project Area (acres) 178 acres *or Length (miles)*

Number of Residential Units

Unattached ____ *Attached*

Commercial/Industrial/Institutional Building Area (gross floor space)

Total 0 *square feet;*
Indicate area of specific uses:

Office NA *Manufacturing NA*

Retail NA *Other Industrial NA*

Warehouse NA *Institutional NA*

Light Industrial NA *Agricultural NA*

Other Commercial (specify) NA

Building Height(s) NA

8. Permits and Approvals Required *List all known local, state, and federal permits, approvals, and funding required:*

Unit of Government	Type of Application	Status
Minnesota Department of Natural Resources	Chemical Treatment of Lake for Eurasian Water Milfoil	Pending

9. Land Use *Describe current and recent past land use and development of the site and on adjacent lands. Discuss the compatibility of the project with adjacent and nearby land uses; indicate whether any potential conflicts involve environmental matters. Identify any potential environmental hazard due to past land uses, such as soil contamination or abandoned storage tanks.*

10. Cover Types *Estimate the acreage of the site with each of the following cover types before and after development (before and after totals should be equal):* ***N/A***

11. Fish, Wildlife, and Ecologically Sensitive Resources

a. Describe fish and wildlife resources on or near the site and discuss how they would be affected by the project. Describe any measures to be taken to minimize or avoid adverse impacts.

The project site is located Lake Augusta. The project will improve water quality.

b. Are there any state-listed endangered, threatened, or special-concern species; rare plant communities; colonial waterbird nesting colonies; native prairie or other rare habitat; or other sensitive ecological resources on or near the site? [ ] Yes [X] No. If yes, describe the resource and how it would be affected by the project. Indicate if a site survey of the resources was conducted. Describe measures to be taken to minimize or avoid adverse impacts.

12. Physical Impacts on Water Resources *Will the project involve the physical or hydrologic alteration (dredging, filling, stream diversion, outfall structure, diking, impoundment) of any surface water (lake, pond, wetland, stream, drainage ditch)? [ ] Yes [X] No. If yes, identify the water resource to be affected and describe: the alteration, including the construction process; volumes of dredged or fill material; area affected; length of stream diversion; water surface area affected; timing and extent of fluctuations in water surface elevations; spoils disposal sites; and proposed mitigation measures to minimize impacts.*

13. Water Use

a. Will the project involve the installation or abandonment of any wells? [ ] Yes [X] No. For abandoned

wells give the location and Unique well number. For new wells, or other previously unpermitted wells, give the location and purpose of the wells and the Unique well number (if known).

b. *Will the project require an appropriation of ground water or surface water (including dewatering)? [ ] Yes [X] No. If yes, indicate the source, quantity, duration, purpose of the appropriation and DNR water appropriation permit number of any existing appropriation. Discuss the impact of the appropriation on ground water levels.*

c. *Will the project require connection to a public water supply? [ ] Yes [X] No*
If yes, identify the supply, the DNR water appropriation permit number of the supply, and the quantity to be used.

14. Water-related Land Management Districts *Does any part of the project site involve a shoreland zoning district, a delineated 100-year flood plain, or a state or federally designated wild or scenic river land use district? [ ] Yes [X] No. If yes, identify the district and discuss the compatibility of the project with the land use restrictions of the district.*

15. Water Surface Use *Will the project change the number or type of watercraft on any water body? [ ] Yes [X] No. If yes, indicate the current and projected watercraft usage and discuss any potential overcrowding or conflicts with other users or fish and wildlife resources.*

16. Soils *Approximate depth (in feet) to:*
Groundwater: minimum _____ average ____.___ Bedrock: minimum _____ average_____Describe the soils on the site, giving SCS classifications, if known. (SCS interpretations and soil boring logs need <u>not</u> be attached.)

N/A.

17. Erosion and Sedimentation *Give the acreage to be graded or excavated and the cubic yards of soil to be moved:*
_____ acres;_____ cubic yards. Describe any steep slopes or highly erodible soils and identify them on the site map. Describe the erosion and sedimentation measures to be used during and after construction of the project.

N/A.

18. Water Quality - Surface Water Runoff

a. *Compare the quantity and quality of site runoff before and after the project. Describe methods to be used to manage and/or treat runoff.*

N/A.

b. *Identify the route(s) and receiving water bodies for runoff from the site. Estimate the impact of the runoff on the quality of the receiving waters. (If the runoff may affect a lake consult "EAW Guidelines" about whether a nutrient budget analysis is needed).*

N/A.

19. Water Quality - Wastewaters

a. *Describe sources, quantities, and composition (except for normal domestic sewage) of all sanitary and industrial wastewaters produced or treated at the site.*

N/A.

b. Describe any waste treatment methods to be used and give estimates of composition after treatment, or if the project involves on-site treatment systems, discuss the suitability of the site conditions for such systems. Identify receiving waters (including ground water) and estimate the impact of the discharge on the quality of the receiving waters. (If the discharge may affect a lake consult "EAW Guidelines" about whether nutrient budget analysis is needed.)

N/A.

c. If wastes will be discharged into a sewer system or pretreatment system, identify the system and discuss the ability of the system to accept the volume and composition of the wastes. Identify any improvements which will be necessary.

N/A.

20. Ground Water - Potential for Contamination

a. Approximate depth (in feet) to groundwater: 35 ft. minimum; 40 ft. average.

b. Describe any of the following site hazards to groundwater and also identify them on the site map: sinkholes; shallow limestone formations/karst conditions; soils with high infiltration rates; abandoned or unused wells. Describe measures to avoid or minimize environmental problems due to any of these hazards.

No specific hazards have been identified which could potentially impact groundwater and no known abandoned or unused wells are on the site.

c. Identify any toxic or hazardous materials to be used or present on the project site and identify measures to be used to prevent them from contaminating groundwater.
2,4-D will be used at the project site under the direction and permit from the MDNR.

21. Solid Wastes; Hazardous Wastes; Storage Tanks

a. Describe the types, amounts, and compositions of solid or hazardous wastes to be generated, including animal manures, sludges and ashes. Identify the method and location of disposal. For projects generating municipal solid waste indicate if there will be a source separation plan; list type(s) and how the project will be modified to allow recycling.

N/A.

b. Indicate the number, location, size and use of any above or below ground tanks to be used for storage of petroleum products or other materials (except water).

N/A.

22. Traffic *Parking spaces added 0; Existing spaces (if project involves expansion) 0; Estimated Total Average Daily Traffic (ADT) generated ___; Estimated maximum peak hour traffic generated (if known) and its timing ___. For each affected road indicate the ADT and the directional distribution of traffic with and without the project. Provide an estimate of the impact on traffic congestion on the affected roads and describe any traffic improvements which will be necessary.*

N/A.

23. Vehicle-related air emissions *Provide an estimate of the effect of the project's traffic generation on air quality, including carbon monoxide levels. Discuss the effect of traffic improvements or mitigation measures on air quality impacts. (If the project involves 500 or more parking spaces, consult "EAW Guidelines" about whether a detailed air quality analysis is needed.)*

Since the project will not affect traffic flow, there should not be any significant decrease in air quality.

24. Stationary source air emissions *Will the project involve any stationary sources of air emissions (such as boilers or exhaust stacks)? [ ] Yes [X] No If yes, describe the sources, quantities, and composition of the emissions; the proposed air pollution control devices; the quantities and composition of the emissions after treatment; and the effects on air quality.*

25. *Will the project generate dust, odors, or noise during construction and/or operation? If yes, describe the sources, characteristics, duration, and quantities or intensity, and any proposed measures to mitigate adverse impacts. Also identify the locations of sensitive receptors in the vicinity and estimate the impacts on these receptors.*

Typical noise from a pontoon boat is expected during the project. This impact will be temporary and generally confined to the project site.

26. *Are any of the following resources on or in proximity to the site:*

		Yes	No
a.	*archeological, historical or architectural resources?*	___	*X*
b.	*prime or unique farmlands?*	*X*	
c.	*designated parks, recreation areas, or trails?*	___	*X*
d.	*scenic views or visits?*	___	*X*
e.	*other unique resources?*	___	*X*

If any items are answered Yes, describe the resource and identify any impacts on the resource due to the project. Describe any measures to be taken to minimize or avoid adverse impacts.

27. *Will the project create adverse visual impacts? (Examples include: glare from intense lights; lights visible in wilderness areas; and large visible plumes from cooling towers or exhaust stacks.)*
[ ] Yes [X] No. If yes, explain.

28. Compatibility with plans *Is the project subject to an adopted local comprehensive land use plan or any other applicable land use, water or resource management plan of an local, regional, state, or federal agency? [ ] Yes [X] No If yes, identify the applicable plan(s), discuss the compatibility of the project with the provisions of the plan(s), and explain how any conflicts between the project and the plan(s) will be resolved. If no, explain.*

29. Impact on Infrastructure and Public Services *Will new or expanded utilities, roads, other infrastructure, or public services be required to serve the project? [ ] Yes [X] No. If yes, describe the new or additional infrastructure/services needed. (Any infrastructure that is a "connected action" with respect to the project must be assessed in the EAW; see "EAW Guidelines" for details.)*

30. Related Developments; Cumulative Impacts

a. Are future stages of this development planned or likely? [ ] Yes [X] No
If yes, briefly describe future stages, their timing, and plans for environmental review.

b. Is this project a subsequent stage of an earlier project? [ ] Yes [X] No
If yes, briefly describe the past development, its timing, and any past environmental review.

c. Is other development anticipated on adjacent lands or outlots? [ ] Yes [X] No

d. If a, b, or c were marked Yes, discuss any cumulative environmental impacts resulting from this project and the other development.

31. Other Potential Environmental Impacts If the project may cause any adverse environmental impacts which were not addressed by items 1 to 28, identify and discuss them here, along with any proposed mitigation.

No other potential environmental impacts have been identified at this time.

32. Summary of Issues *(This section need not be completed if the EAW is being done for EIS scoping: instead, address relevant issues in the draft Scoping Decision document which must accompany the EAW.) List any impacts and issues identified above that may require further investigation before the project is commenced. Discuss any alternatives or mitigative measures that may have been or may be considered for these impacts and issues, including those that have been or may be ordered as permit conditions.*

The need for further investigation of previously discussed items is not anticipated at this time. The project will comply with all provisions required under the pending MDNR permit.

Certifications by the RGU *(all 3 certifications must be signed for EQB acceptance of the EAW for publication of notice in the EQB Monitor)*

A. I hereby certify that the information contained in this document is accurate to the best of my knowledge.

Signature_____

B. I hereby certify that the project described in this EAW is the complete project and there are no other projects, project stages or project components, other than those described in this document, which are related to the project as "connected actions", or "phased actions," as defined, respectively, at Minn. Rules, pts. 4410.0200, subp. 9b and subp. 60.

Signature _____

C. I hereby certify that copies of the completed EAW are being sent to all points on the official EQB EAW distribution list.

Signature _____

Title of signer Date_____

Appendix C

DNR Reports on Lake Augusta

C-1 Augusta Lake, Wright County, 2005 Curled Pondweed Distribution

C-2 Augusta Lake (86-284) 2005 Lake Survey Submergent Vegetation

C-3 Minnesota DNR Lake Survey Report

C-4 Augusta Lake (86-284) 2005 Lake Survey Emergent & Floatingleaf Vegetation

C-5 Lake Management Plan

Appendix C-1
Augusta Lake, Wright County, 2005 Curled Pondweed Distribution

DNR Fisheries,
Montrose 2005

Augusta Lake, Wright County
2005 Curled
Pondweed Distribution

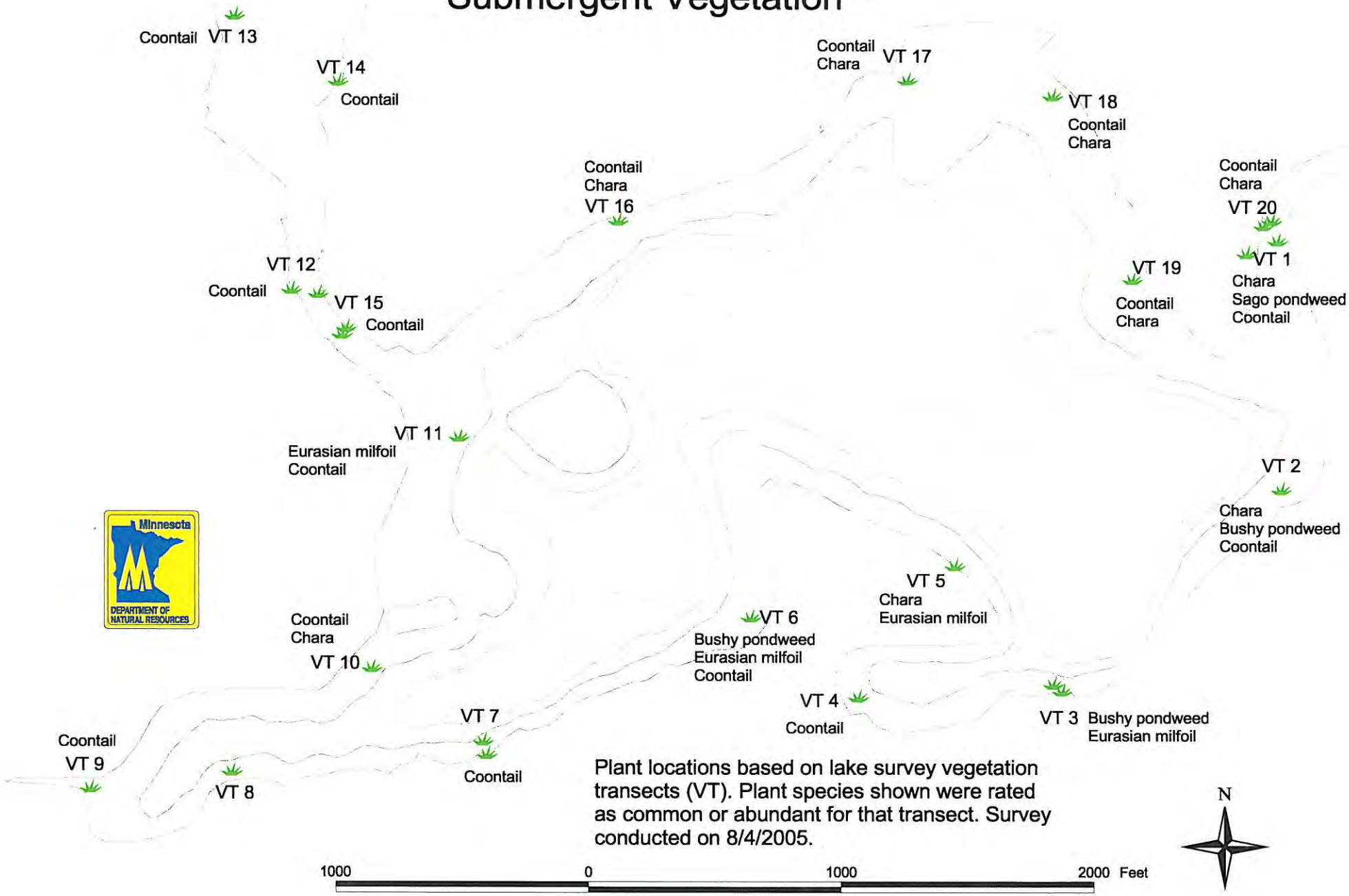
0 0.05 0.1 0.15 0.2 0.25 Miles

Mapped on June 3rd, 2005 by MNDNR Fisheries, Montrose. Green shaded areas represent where curled pondweed was observed at a "nusiance" level of abundance. Yellow shaded areas represent where curled pondweed was growing near the surface of the water.

Total lake area shown = 167 acres
Total curled pondweed = 19.5 acres, 11.7%

Appendix C-2
Augusta Lake (86-284) 2005 Lake Survey Submergent Vegetation

Augusta Lake (86-284)
2005 Lake Survey
Submergent Vegetation



Appendix C-3
Minnesota DNR Lake Survey Report

03/21/2006

Minnesota Department of Natural Resources
Section of Fisheries

Lake Survey Report

Division of Waters inventory number:	86-0284-00	Starting date of survey:	07/11/2005
Lake name:	Augusta	Alternate name:	N/A
Lake class:	24	Alternate classes:	N/A
Area code:	340	Map ID:	80494
Survey type:	Resurvey		

Lake Location Information

Counties:	Wright, Stearns	Nearest town:	Fairhaven
Legal description:	Township - 121N; Range - 28W; Sections - 11, 14		

Public Access

ID #:	Ownership:	Type:	Location Description and Comments:
AC- 1	Other	Other	Augusta Lake can be reached by the Clearwater River (M-71) from the West basin of Clearwater Lake (86-252).

Previous Surveys and Investigations

Initial Survey:	
Resurveys:	1997;1985;
Population assessments:	1991;1979;
Special assessments:	
Creel surveys:	
Other kinds of survey:	

Lake and Watershed Characteristics

Lake area (acres):	177	Shoreline length (mi):	4.93
Area in MN (acres):	177	Maximum fetch (mi):	0.89
DOW area (acres):	186	Fetch orientation:	WSW
Littoral acres:	65.3	Watershed size (acres):	2536
Maximum depth (feet):	82	Major watershed number:	17
Mean depth (feet):	24.9	Minor watershed number:	010
Primary USGS Quad map code:	Q 13 c		

Current Water Level

Date	Level	Station Code	Reading
7/11/2005	Normal	GA-1	1.79

Benchmark or Gauge Descriptions/Locations

Station Code	Description/Location
GA - 1	Temporary staff gage at LeMere residence on south side of lake, 13656 100th St, white fence by flea market.

The History of Water Levels

Normal water level: 991.30 feet at sampling station BM-1
Average annual fluctuations: 1.05 feet for 13 years of data, and for 300 readings.
Source of data: MN DNR DOW
Highest recorded water level: 993.29 feet at station BM-1 on 07/25/1997
Lowest recorded water level: 990.61 feet at station BM-1 on 09/03/2001
Source of data: MN DNR DOW
History of water level:

Inlets

Inlets Information for Field Work Done from 7/11/2005 to 7/13/2005

ID#	Name	Tributary Number	Origin and Cover Type or Land Use	Surface Temp. (F)
IN -4	Unnamed stream	N/A	Spring Mixed forest; Residential	53.6
IN -3	Unnamed stream	N/A	Spring Mixed forest; Residential	55.4
IN -2	Unnamed stream	N/A	Spring Mixed forest; Residential	55.4

Inlets Information for Field Work Done from 7/11/2005 to 7/13/20057/13/2005 (continued)

ID#	Name	Tributary Number	Origin and Cover Type or Land Use	Surface Temp. (F)
IN -1	Clearwater River	M-71	Lake Mixed forest; Marsh	80.0

Additional Inlet Information

ID#	Mean Width (ft)	Mean Depth (ft)	Flow CFS	Barriers to Fish Movement	Known Fish Spawning Runs
IN -4	1.00	0.10	0.2	Yes; waterfalls	No Data Available
	Comments:	Spring in hillside			
IN -3	1.25	0.10	0.2	Yes; waterfalls	No Data Available
	Comments:	Spring in hillside			
IN -2	3.00	0.25	0.8	Yes; waterfalls	No Data Available
	Comments:	Spring in hillside, total length approximately 200 yards.			
IN -1	100.00	3.00	N/A	No barrier	No Data Available

Outlets

Outlet Information for Field Work Done from 7/11/2005 to 7/13/2005

ID#	Name	Tributary or DOW#	Tributary to (Tributary or DOW#)
OU-1	Clearwater River	M-71	Clearwater Lake (86-252)

Additional Outlets Information

ID#	Mean Width (ft)	Mean Depth (ft)	Flow CFS	Barriers to Fish Movement
OU-1	45.00	3.00	N/A	No barrier

No water control structures were observed on outlets of this lake.

Surrounding Watershed Characteristics

Use / Coverage	% Use	Relief	Location / Comments
Undeveloped forest or Woodland	14	Rolling	N/A
Agricultural crops	61	Rolling	N/A
Livestock / pasture	14	Rolling	N/A
Marshland	3	Flat	N/A
Grassland	1	Rolling	N/A
Municipal	4	Rolling	N/A
Other	3	Flat	N/A

Dominant soil types: Sand; Loam
Comments about soils: source: surgo data

Shoreline Characteristics

Use / Coverage	% Use	Relief	Location / Comments
Undeveloped forest or Woodland	62	Gradual	N/A
Marshland	11	Flat	N/A
Grassland	11	Flat	N/A
Residential	16	Gradual	N/A

Number of homes/cabins: 92
Comments about shoreline development: 100 foot buffer around lake

Resorts / Campgrounds

ID#	Name	Cabins	Campsites	Comments
RE-1	Timberwoods Resort	6	65	Campsites include RV Camping Trailers

Fish Diseases and Parasites

Species	Disease/ Parasite	Number Infested	Number Examined Internally	Number Examined Externally
Black Bullhead	None observed	9	0	9
Black Crappie	None observed	37	0	37

Fish Diseases and Parasites (continued)

Species	Disease/ Parasite	Number Infested	Number Examined Internally	Number Examined Externally
Bluegill	None observed	246	0	246
Bowfin (Dogfish)	None observed	11	0	11
Brown Bullhead	None observed	1	0	1
Common Carp	None observed	2	0	2
Green Sunfish	None observed	3	0	3
Hybrid Sunfish	None observed	11	0	11
Largemouth Bass	None observed	27	0	27
Northern Pike	Neascus	1		
Northern Pike	None observed	72	0	73
Pumpkinseed Sunfish	None observed	8	0	8
Painted Turtle	None observed	17	0	17
Snapping Turtle	None observed	5	0	5
Softshell Turtle	None observed	1	0	1
Tullibee (Cisco)	None observed	2	0	2
Walleye	None observed	10	0	10
White Sucker	None observed	1	0	1
Yellow Bullhead	None observed	103	0	103
Yellow Perch	None observed	17	0	17

Aquatic Vegetation and Shoalwater Substrates

Number of transects: 20
Maximum depth of aquatic vegetation sample (ft): 14.0
Dates of field work: 08/04/2005 through 08/04/2005

Abundance of Aquatic Plants (in transects)

Common Name	Type	Frequency of Occurence (%)	Abundance Rating	Mean Abundance
Swamp Milkweed	Emergent	10	Rare	1.7
Muskgrass Group	Submergent	70	Rare	26.7
Wire-grass Sedge (Narrow-leaf Group)	Emergent	15	Rare	2.5
Broad-Leaf Sedge Group	Emergent	15	Rare	2.5
Coontail	Submergent	100	Common	45.0
Giant Water Hemlock	Emergent	5	Rare	0.8
Sedge Group	Emergent	5	Rare	0.8
Canada Waterweed	Submergent	50	Rare	8.3
Filamentous Algae	Submergent	70	Rare	25.0
Mud Plantain	Emergent	35	Rare	5.8
Jewelweed Group	Emergent	25	Rare	4.2
Lesser Duckweed	Emergent	60	Rare	18.3
Star Duckweed	Emergent	5	Rare	0.8
Northern Milfoil	Submergent	10	Rare	1.7
Eurasian Milfoil	Submergent	65	Rare	17.5
Bushy Pondweed (N.flexilis)	Submergent	40	Rare	11.7
Common White Waterlily	Emergent	70	Rare	25.0
Common Yellow Waterlily	Emergent	10	Rare	1.7
Smartweed Group	Emergent	20	Rare	3.3
Curly-leaf Pondweed	Submergent	15	Rare	2.5
Reed Canary Grass	Emergent	55	Rare	10.8
Cane	Emergent	20	Rare	3.3
Illinois Pondweed	Submergent	10	Rare	1.7
Clasping-leaf Pondweed	Submergent	25	Rare	4.2
Narrow-leaf Pondweed Group	Submergent	15	Rare	2.5
Sago Pondweed	Submergent	95	Rare	17.5
Straight-leaf Pondweed	Submergent	20	Rare	3.3
Flat-stem Pondweed	Submergent	30	Rare	5.0
Arrowhead Group	Emergent	15	Rare	2.5
Leafy Bulrush	Emergent	5	Rare	0.8
Greater Duckweed	Emergent	80	Rare	21.7
Broad-leaved Cattail	Emergent	5	Rare	0.8
Cattail Group	Emergent	50	Rare	21.7
Water Celery	Submergent	10	Rare	1.7
Blue Vervain	Emergent	5	Rare	0.8
Water Meal Group	Emergent	5	Rare	0.8

Notes: 1. Floating-leaf and wetland species may be tallied with emergent species
2. See User's Manual for calculation details.

Additional Species Found (outside transects)

Common Name	Comments
	No data found

Shoalwater Substrates (in transects)

Common Name	Frequency of Occurence (%)	Abundance Rating	Mean Abundance
Detritus	15	Rare	2.5
Gravel	15	Rare	5.8
Muck	55	Rare	24.2
Rubble 3-10	20	Rare	3.3
Sand	45	Rare	19.2
Silt	65	Rare	30.8

See User's Manual for calculation details.

Field Notes

07/11/2005
Recreational Survey
74 fishing boats
79 pontoons
28 rec/ski boats
30 paddleboats
10 personal watercraft
12 canoe
2 sailboats

Residential Dwellings
92 year-round houses
6 camping trailers
1 RV campground
1 Resort

Curled Pondweed was mapped in June 2005 and was observed growing at the surface of 11.7% of the lake.

Wartershed and shoreline landuse based on 1990 data. Shoreline landuse based on 100 foot buffer around edge of lake.

Physical and Chemical Characteristics of Lake Water

Station ID	Sampling Date	Bottom Depth (ft)	Depth (ft)	Water Temperature (F)	Dissolved Oxygen (ppm)
WQ-1	7/11/2005	81.0	0.0	81.0	9.5
			1.0	72.3	0.7
			3.0	80.6	9.7
			6.0	80.4	9.7
			8.0	78.1	8.4
			9.0	76.5	6.6
			10.0	75.0	5.6
			11.0	73.9	4.1
			12.0	71.2	0.7
			13.0	71.2	0.7
			14.0	70.0	0.3
			15.0	67.8	0.2
			16.0	64.0	0.1
			17.0	61.7	0.0
			18.0	59.5	0.0
			19.0	57.4	0.0
			20.0	54.7	0.0
			22.0	51.3	0.0
			24.0	49.1	0.0
			25.0	46.6	0.0
			30.0	44.1	0.0
			35.0	42.6	0.0
			40.0	41.5	0.0
			45.0	41.0	0.0
			50.0	40.8	0.0

Water Quality

Station ID	Sample Date	Sample Depth	Secchi (ft)	pH	Alkalinity	Water Color	Color Cause
WQ-1	7/11/2005	0	10.5	8.38	252	Brown	Unknown
						Color description: light brown stain	

Laboratory Analysis of Lake Water

Station ID	Sample Date	Sample Depth (ft)	Sulphate Ion (ppm)	Total Phos. (ppm)	Chloride Ion (ppm)	Total Alk. (ppm)	TDS (ppm)	TLKJ Nitrogen (ppm)	Chloro-phyll A (ppb)	Conduct-ivity (micro-mho)
WQ-1	7/11/2005	N/A	N/A	0.042	N/A	N/A	N/A	N/A	29	390

Laboratory Analysis of Lake Water (continued)

Station ID	Sample Date	Sample Depth (ft)	pH	Ortho Phos. (ppm)	Ammonia (ppm)	Nitrogen NO2 (ppm)	Nitrogen NO3 (ppm)	ODS	Suspend. Solids (ppm)
WQ-1	7/11/2005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Net Catch Summary for GN
Standard gill net sets.

Number of sets: 6
First net set on: 07/11/2005
Last net lifted on: 07/14/2005
Sampling method: Standard sampling
Target species: None

Summary by Numbers

Species	Total Fish	Number per Set	Quartiles for Lake Class 25%	50%	75%
Black Bullhead	9	1.50	2.50	10.46	44.95
Bluegill	86	14.33	N/A	N/A	N/A
Bowfin (Dogfish)	5	0.83	0.20	0.50	0.80
Brown Bullhead	1	0.17	0.39	0.83	2.00
Northern Pike	86	14.33	1.50	3.75	7.29
Tullibee (Cisco)	2	0.33	0.33	0.56	2.25
Walleye	7	1.17	1.17	2.82	6.33
White Sucker	1	0.17	0.40	1.00	2.17
Yellow Bullhead	93	15.50	0.50	2.00	7.51
Yellow Perch	1	0.17	2.00	10.50	27.94
Total fish/set:		48.50			

Summary by Weight (lbs)

Species	Total Weight	Lbs per Set	Mean Weight	Quartiles* for Lake Class 25%	50%	75%
Black Bullhead	5.52	0.92	0.61	0.29	0.44	0.66
Bluegill	19.75	3.29	0.23	N/A	N/A	N/A
Bowfin (Dogfish)	9.31	1.55	1.86	2.44	3.25	4.21
Brown Bullhead	1.11	0.18	1.11	0.50	0.75	1.00
Northern Pike	202.81	33.80	2.36	2.02	2.68	3.50
Tullibee (Cisco)	1.50	0.25	0.75	0.53	1.01	1.59
Walleye	19.13	3.19	2.73	1.20	1.81	2.69
White Sucker	2.87	0.48	2.87	1.55	2.00	2.38
Yellow Bullhead	66.64	11.11	0.72	0.46	0.61	0.82
Yellow Perch	0.13	0.02	0.13	0.10	0.13	0.18
Total lbs fish/set:		54.79		* Quartiles for mean weight		

Length Frequency Distribution for GN
Standard gill net sets.

for Field Work between 7/11/2005 and 7/14/2005

Length Category	BLB	BLG	BOF	BRB	NOP	TLC	WAE	WTS	YEB
< 3.00	-	-	-	-	-	-	-	-	-
[3.00 - 3.49)	-	-	-	-	-	-	-	-	-
[3.50 - 3.99)	-	1	-	-	-	-	-	-	-
[4.00 - 4.49)	-	-	-	-	-	-	-	-	-
[4.50 - 4.99)	-	-	-	-	-	-	-	-	-
[5.00 - 5.49)	-	19	-	-	-	-	-	-	-
[5.50 - 5.99)	-	6	-	-	-	-	-	-	-
[6.00 - 6.49)	-	16	-	-	-	-	-	-	-
[6.50 - 6.99)	-	19	-	-	-	-	-	-	-
[7.00 - 7.49)	-	13	-	-	-	-	-	-	-
[7.50 - 7.99)	-	6	-	-	-	-	-	-	-
[8.00 - 8.49)	-	3	-	-	-	-	-	-	1
[8.50 - 8.99)	1	2	-	-	-	-	-	-	1
[9.00 - 9.49)	4	1	-	-	-	1	-	-	6
[9.50 - 9.99)	-	-	-	-	-	-	-	-	16
[10.00 - 10.49)	2	-	-	-	-	-	-	-	22
[10.50 - 10.99)	1	-	-	-	-	-	-	-	14
[11.00 - 11.49)	1	-	-	-	-	-	-	-	12
[11.50 - 11.99)	-	-	-	-	-	-	-	-	3
[12.00 - 12.99)	-	-	-	1	-	-	-	-	9
[13.00 - 13.99)	-	-	1	-	-	1	-	-	9
[14.00 - 14.99)	-	-	-	-	1	-	-	-	-
[15.00 - 15.99)	-	-	-	-	1	-	1	-	-
[16.00 - 16.99)	-	-	1	-	-	-	1	-	-
[17.00 - 17.99)	-	-	1	-	4	-	1	-	-
[18.00 - 18.99)	-	-	-	-	5	-	1	-	-
[19.00 - 19.99)	-	-	2	-	9	-	1	1	-
[20.00 - 20.99)	-	-	-	-	19	-	1	-	-
[21.00 - 21.99)	-	-	-	-	16	-	-	-	-
[22.00 - 22.99)	-	-	-	-	11	-	-	-	-
[23.00 - 23.99)	-	-	-	-	6	-	-	-	-
[24.00 - 24.99)	-	-	-	-	1	-	-	-	-
[25.00 - 25.99)	-	-	-	-	4	-	-	-	-
[26.00 - 26.99)	-	-	-	-	1	-	-	-	-
[27.00 - 27.99)	-	-	-	-	-	-	1	-	-
[28.00 - 28.99)	-	-	-	-	-	-	-	-	-
[29.00 - 29.99)	-	-	-	-	3	-	-	-	-
[30.00 - 30.99)	-	-	-	-	2	-	-	-	-
[31.00 - 31.99)	-	-	-	-	1	-	-	-	-
[32.00 - 32.99)	-	-	-	-	-	-	-	-	-
[33.00 - 33.99)	-	-	-	-	-	-	-	-	-
[34.00 - 34.99)	-	-	-	-	-	-	-	-	-
[35.00 - 35.99)	-	-	-	-	-	-	-	-	-
=> 36.00	-	-	-	-	1	-	-	-	-
Total by mesh size	9	86	5	1	85	2	7	1	93
Min. Length (inch)	8.98	3.74	13.70	12.99	14.57	9.29	15.98	19.80	8.43
Max. Length (inch)	11.42	9.06	19.49	12.99	36.02	13.90	27.99	19.80	13.98
Mean Length (inch)	9.84	6.48	17.45	12.99	21.78	11.59	19.29	19.80	10.83
Number Measured	9	83	5	1	70	2	7	1	93
No Lengths For	0	0	0	0	1	0	0	0	0

Supplemental Length Frequency Distribution for GN
Standard gill net sets.
for fish equal to or greater than 36 inches in length

Length Category	NOP
< 36.00	85
[36.00 - 36.99)	1
[37.00 - 37.99)	-
[38.00 - 38.99)	-
[39.00 - 39.99)	-
[40.00 - 40.99)	-
[41.00 - 41.99)	-
[42.00 - 42.99)	-
[43.00 - 43.99)	-
[44.00 - 44.99)	-
[45.00 - 45.99)	-
[46.00 - 46.99)	-
[47.00 - 47.99)	-
[48.00 - 48.99)	-
[49.00 - 49.99)	-
[50.00 - 50.99)	-
[51.00 - 51.99)	-
[52.00 - 52.99)	-
[53.00 - 53.99)	-
[54.00 - 54.99)	-
[55.00 - 55.99)	-
[56.00 - 56.99)	-
[57.00 - 57.99)	-
[58.00 - 58.99)	-
[59.00 - 59.99)	-
[60.00 - 60.99)	-
[61.00 - 61.99)	-
[62.00 - 62.99)	-
[63.00 - 63.99)	-
[64.00 - 64.99)	-
[65.00 - 65.99)	-
[66.00 - 66.99)	-
[67.00 - 67.99)	-
[68.00 - 68.99)	-
[69.00 - 69.99)	-
[70.00 - 70.99)	-
[71.00 - 71.99)	-
[72.00 - 72.99)	-
[73.00 - 73.99)	-
[74.00 - 74.99)	-
[75.00 - 75.99)	-
[76.00 - 76.99)	-
[77.00 - 77.99)	-
=> 78.00	-
Total by mesh size	86
Min. Length (inch)	14.57
Max. Length (inch)	36.02
Mean Length (inch)	21.78
Number Measured	70
No Lengths For	0

Historic Catch Summary for GN
Standard gill net sets.

Survey Date	Number of Nets	Species	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
7/11/2005	6	Yellow Perch	1	0.17	0.02	0.13
	6	Yellow Bullhead	93	15.50	11.11	0.72
	6	White Sucker	1	0.17	0.48	2.87
	6	Walleye	7	1.17	3.19	2.73
	6	Tullibee (Cisco)	2	0.33	0.25	0.75
	6	Northern Pike	86	14.33	33.80	2.36
	6	Brown Bullhead	1	0.17	0.18	1.11
	6	Bowfin (Dogfish)	5	0.83	1.55	1.86
	6	Bluegill	86	14.33	3.29	0.23
	6	Black Bullhead	9	1.50	0.92	0.61
7/7/1997	6	Yellow Perch	127	21.17	2.06	0.10
	6	Yellow Bullhead	62	10.33	5.45	0.53
	6	White Sucker	10	1.67	4.18	2.51
	6	Walleye	33	5.50	15.26	2.77
	6	Tullibee (Cisco)	4	0.67	0.49	0.73
	6	Rock Bass	5	0.83	0.32	0.39
	6	Pumpkinseed Sunfish	4	0.67	0.04	0.06
	6	Northern Pike	32	5.33	11.41	2.14
	6	Largemouth Bass	3	0.50	0.58	1.16
	6	Hybrid Sunfish	4	0.67	0.04	0.06
	6	Common Carp	1	0.17	0.75	4.52
	6	Bluegill	28	4.67	0.81	0.17
	6	Black Crappie	31	5.17	0.73	0.14
7/22/1991	6	Yellow Perch	74	12.33	1.20	0.10
	6	Yellow Bullhead	108	18.00	9.98	0.55
	6	White Sucker	3	0.50	1.13	2.27
	6	Walleye	21	3.50	11.08	3.17
	6	Tullibee (Cisco)	73	12.17	6.42	0.53
	6	Pumpkinseed Sunfish	2	0.33	0.03	0.10
	6	Northern Pike	28	4.67	16.32	3.50
	6	Largemouth Bass	2	0.33	0.03	0.10
	6	Hybrid Sunfish	1	0.17	0.02	0.10
	6	Common Carp	3	0.50	0.58	1.17
	6	Bluegill	233	38.83	7.98	0.21
	6	Black Crappie	124	20.67	3.17	0.15
	6	Black Bullhead	5	0.83	0.72	0.86
7/22/1985	6	Yellow Perch	1	0.17	0.03	0.20
	6	Yellow Bullhead	133	22.17	9.88	0.45

Historic Catch Summary for GN (continued)

Survey Date	Number of Nets	Species	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
	6	White Sucker	20	3.33	8.03	2.41
	6	Walleye	22	3.67	16.42	4.48
	6	Rock Bass	2	0.33	0.10	0.30
	6	Pumpkinseed Sunfish	2	0.33	0.02	0.05
	6	Northern Pike	48	8.00	25.87	3.23
	6	Hybrid Sunfish	2	0.33	0.03	0.10
	6	Brown Bullhead	5	0.83	0.55	0.66
	6	Bowfin (Dogfish)	1	0.17	0.53	3.20
	6	Bluegill	170	28.33	6.50	0.23
	6	Black Crappie	96	16.00	3.83	0.24
	6	Black Bullhead	33	5.50	3.03	0.55
8/13/1979	1	Yellow Perch	3	3.00	0.25	0.08
	1	White Sucker	2	2.00	6.00	3.00
	1	Walleye	2	2.00	9.50	4.75
	1	Tullibee (Cisco)	1	1.00	3.50	3.50
	1	Northern Pike	2	2.00	4.00	2.00
	1	Black Crappie	4	4.00	1.00	0.25
	1	Black Bullhead	3	3.00	0.50	0.17

Net Catch Summary for TN
Standard 3/4-in mesh, double frame trap net sets.

Number of sets: 9
First net set on: 07/11/2005
Last net lifted on: 07/14/2005
Sampling method: Standard sampling
Target species: None

Summary by Numbers

Species	Total Fish	Number per Set	Quartiles for Lake Class 25%	50%	75%
Black Crappie	26	2.89	1.83	6.50	21.16
Bluegill	125	13.89	7.54	23.13	62.50
Bowfin (Dogfish)	6	0.67	0.38	0.75	1.29
Common Carp	2	0.22	0.38	0.74	2.00
Green Sunfish	2	0.22	0.20	0.50	1.29
Hybrid Sunfish	10	1.11	N/A	N/A	N/A
Largemouth Bass	6	0.67	0.20	0.33	0.67
Northern Pike	2	0.22	N/A	N/A	N/A
Pumpkinseed Sunfish	5	0.56	0.74	2.00	4.24
Painted Turtle	17	1.89	N/A	N/A	N/A
Snapping Turtle	5	0.56	N/A	N/A	N/A
Softshell Turtle	1	0.11	N/A	N/A	N/A
Walleye	2	0.22	0.27	0.60	1.24
Yellow Bullhead	10	1.11	0.88	2.15	5.68
Yellow Perch	1	0.11	0.25	0.60	1.67
Total fish/set:		21.89			

Summary by Weight (lbs)

Species	Total Weight	Lbs per Set	Mean Weight	Quartiles* for Lake Class 25%	50%	75%
Black Crappie	10.89	1.21	0.42	0.18	0.24	0.33
Bluegill	30.47	3.39	0.24	0.13	0.18	0.25
Bowfin (Dogfish)	19.38	2.15	3.23	2.28	3.33	4.10
Common Carp	23.15	2.57	11.57	2.58	4.07	6.02
Green Sunfish	0.03	0.00	0.02	0.07	0.10	0.17
Hybrid Sunfish	3.25	0.36	0.32	N/A	N/A	N/A
Largemouth Bass	8.12	0.90	1.35	0.15	0.31	0.91
Northern Pike	3.36	0.37	1.68	N/A	N/A	N/A

Summary by Weight (lbs) (continued)

Species	Total Weight	Lbs per Set	Mean Weight	Quartiles* for Lake Class 25%	50%	75%
Pumpkinseed Sunfish	0.95	0.11	0.19	0.10	0.13	0.18
Painted Turtle	12.91	1.43	0.76	N/A	N/A	N/A
Snapping Turtle	ND	ND	ND	N/A	N/A	N/A
Softshell Turtle	ND	ND	ND	N/A	N/A	N/A
Walleye	8.41	0.93	4.21	0.80	1.50	2.78
Yellow Bullhead	9.85	1.09	0.99	0.50	0.67	0.84
Yellow Perch	0.04	0.00	0.04	0.10	0.13	0.20
Total lbs fish/set:		13.10		* Quartiles for mean weight		

Length Frequency Distribution for TN
Standard 3/4-in mesh, double frame trap net sets.

for Field Work between 7/11/2005 and 7/14/2005

Length Category	BLC	BLG	BOF	CAP	GSF	HSF	LMB	NOP	PMK	PNT	SNT	SST	WAE	YEB	YEP
< 3.00	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-
[3.00 - 3.49)	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
[3.50 - 3.99)	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
[4.00 - 4.49)	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-
[4.50 - 4.99)	-	3	-	-	-	-	-	-	-	4	-	1	-	-	1
[5.00 - 5.49)	-	9	-	-	-	-	-	-	-	4	-	-	-	-	-
[5.50 - 5.99)	-	8	-	-	-	1	-	-	1	6	-	-	-	-	-
[6.00 - 6.49)	-	12	-	-	-	-	-	-	1	3	-	-	-	-	-
[6.50 - 6.99)	-	16	-	-	-	4	-	-	2	-	-	-	-	-	-
[7.00 - 7.49)	-	38	-	-	-	3	-	-	-	-	-	-	-	-	-
[7.50 - 7.99)	1	23	-	-	-	1	-	-	-	-	-	-	-	-	-
[8.00 - 8.49)	-	3	-	-	-	1	-	-	-	-	1	-	-	-	-
[8.50 - 8.99)	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[9.00 - 9.49)	5	-	-	-	-	-	-	-	-	-	1	-	-	-	-
[9.50 - 9.99)	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[10.00 - 10.49)	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[10.50 - 10.99)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
[11.00 - 11.49)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[11.50 - 11.99)	-	-	-	-	-	-	1	-	-	-	-	-	-	4	-
[12.00 - 12.99)	-	-	-	-	-	-	-	-	-	-	3	-	-	5	-
[13.00 - 13.99)	-	-	-	-	-	-	2	-	-	-	-	-	-	1	-
[14.00 - 14.99)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
[15.00 - 15.99)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
[16.00 - 16.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[17.00 - 17.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[18.00 - 18.99)	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
[19.00 - 19.99)	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-
[20.00 - 20.99)	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
[21.00 - 21.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[22.00 - 22.99)	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
[23.00 - 23.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[24.00 - 24.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[25.00 - 25.99)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
[26.00 - 26.99)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
[27.00 - 27.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[28.00 - 28.99)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
[29.00 - 29.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[30.00 - 30.99)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
[31.00 - 31.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[32.00 - 32.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[33.00 - 33.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[34.00 - 34.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[35.00 - 35.99)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
=> 36.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total by station	26	124	6	2	2	10	6	2	5	17	5	1	2	10	1
Min. Length (inch)	7.80	3.23	18.62	28.74	2.68	5.79	10.83	20.08	2.52	4.53	8.07	4.72	19.88	11.54	4.53
Max. Length (inch)	10.43	8.27	26.77	30.31	2.91	8.11	15.08	20.91	6.81	6.42	12.80	4.72	25.00	13.27	4.53
Mean Length (inch)	9.18	6.52	21.35	29.53	2.80	6.99	13.16	20.49	5.62	5.44	10.98	4.72	22.44	12.19	4.53
Number Measured	26	114	6	2	2	10	6	2	5	17	5	1	2	10	1
No Lengths For	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Historic Catch Summary for TN
Standard 3/4-in mesh, double frame trap net sets.

Survey Date	Number of Nets	Species	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
7/11/2005	9	Yellow Perch	1	0.11	0.00	0.04
	9	Yellow Bullhead	10	1.11	1.09	0.99
	9	Walleye	2	0.22	0.93	4.21
	9	Softshell Turtle	1	0.11	N/A	N/A
	9	Snapping Turtle	5	0.56	N/A	N/A
	9	Painted Turtle	17	1.89	1.43	0.76
	9	Pumpkinseed Sunfish	5	0.56	0.11	0.19
	9	Northern Pike	2	0.22	0.37	1.68
	9	Largemouth Bass	6	0.67	0.90	1.35
	9	Hybrid Sunfish	10	1.11	0.36	0.32
	9	Green Sunfish	2	0.22	0.00	0.02
	9	Common Carp	2	0.22	2.57	11.57
	9	Bowfin (Dogfish)	6	0.67	2.15	3.23
	9	Bluegill	125	13.89	3.39	0.24
	9	Black Crappie	26	2.89	1.21	0.42
7/7/1997	6	Yellow Perch	3	0.50	0.03	0.07
	6	Yellow Bullhead	45	7.50	4.47	0.60
	6	Walleye	1	0.17	0.44	2.65
	6	Snapping Turtle	5	0.83	N/A	N/A
	6	Painted Turtle	35	5.83	N/A	N/A
	6	Pumpkinseed Sunfish	32	5.33	0.45	0.09
	6	Largemouth Bass	1	0.17	0.63	3.80
	6	Hybrid Sunfish	27	4.50	0.42	0.09
	6	Green Sunfish	29	4.83	0.24	0.05
	6	Common Carp	4	0.67	6.28	9.42
	6	Brown Bullhead	2	0.33	0.30	0.91
	6	Bowfin (Dogfish)	4	0.67	2.22	3.33
	6	Bluegill	56	9.33	1.11	0.12
	6	Black Crappie	19	3.17	0.63	0.20
	6	Black Bullhead	2	0.33	0.24	0.73
7/22/1991	6	Yellow Perch	10	1.67	0.17	0.10
	6	Yellow Bullhead	179	29.83	18.17	0.61
	6	White Sucker	3	0.50	1.58	3.17
	6	Walleye	6	1.00	2.52	2.52
	6	Tullibee (Cisco)	2	0.33	0.18	0.55
	6	Snapping Turtle	3	0.50	N/A	N/A
	6	Pumpkinseed Sunfish	30	5.00	0.68	0.14
	6	Northern Pike	5	0.83	2.15	2.58
	6	Largemouth Bass	11	1.83	0.22	0.12

Historic Catch Summary for TN (continued)

Survey Date	Number of Nets	Species	Fish Caught	Number per Set	Lbs. per Set	Mean Weight (lbs)
	6	Hybrid Sunfish	17	2.83	0.68	0.24
	6	Common Carp	6	1.00	2.57	2.57
	6	Brown Bullhead	4	0.67	0.72	1.08
	6	Bowfin (Dogfish)	4	0.67	2.65	3.98
	6	Bluegill	806	134.33	25.40	0.19
	6	Black Crappie	109	18.17	3.27	0.18
	6	Black Bullhead	23	3.83	3.08	0.80
7/22/1985	6	Yellow Perch	2	0.33	0.05	0.15
	6	Yellow Bullhead	101	16.83	9.05	0.54
	6	White Sucker	2	0.33	0.93	2.80
	6	Walleye	7	1.17	0.80	0.69
	6	Snapping Turtle	3	0.50	N/A	N/A
	6	Shorthead Redhorse	1	0.17	1.13	6.80
	6	Pumpkinseed Sunfish	30	5.00	0.73	0.15
	6	Northern Pike	4	0.67	1.07	1.60
	6	Largemouth Bass	6	1.00	0.57	0.57
	6	Hybrid Sunfish	20	3.33	0.53	0.16
	6	Common Carp	5	0.83	2.18	2.62
	6	Brown Bullhead	3	0.50	0.30	0.60
	6	Bowfin (Dogfish)	5	0.83	2.80	3.36
	6	Bluegill	481	80.17	17.22	0.21
	6	Black Crappie	167	27.83	6.75	0.24
	6	Black Bullhead	22	3.67	1.80	0.49
8/13/1979	3	Yellow Bullhead	22	7.33	5.00	0.68
	3	Walleye	2	0.67	2.33	3.50
	3	Pumpkinseed Sunfish	5	1.67	0.25	0.15
	3	Northern Pike	1	0.33	2.00	6.00
	3	Common Carp	4	1.33	11.83	8.88
	3	Bluegill	15	5.00	0.52	0.10
	3	Black Crappie	19	6.33	2.33	0.37
	3	Black Bullhead	30	10.00	3.00	0.30

Electrofishing Catch Summary for EF
Standard electrofishing.

Total run-time for all stations: 00:42:00
Total on-time for all stations: 00:40:31
Sampling date: 05/19/2005
Target species: Largemouth Bass
Sampling method: Standard sampling
Sampling period: Night

Summary by Numbers

Species	Total Number	Number per hr Run-time	Number per hr On-time
Largemouth Bass	11	15.71	16.29
Walleye	1	1.43	1.48

Summary by Weight (lbs)

Species	Total Weight	Lbs per hr Run-time	Lbs per hr On-time	Mean Weight
Largemouth Bass	12.69	18.13	18.79	1.15
Walleye	4.08	5.83	6.04	4.08

Length Frequency Distribution for EF
Standard electrofishing.

for Field Work on 5/19/2005

Length Category	LMB	WAE
< 3.00	-	-
[3.00 - 3.49)	-	-
[3.50 - 3.99)	-	-
[4.00 - 4.49)	-	-
[4.50 - 4.99)	-	-
[5.00 - 5.49)	-	-
[5.50 - 5.99)	-	-
[6.00 - 6.49)	-	-
[6.50 - 6.99)	-	-
[7.00 - 7.49)	-	-
[7.50 - 7.99)	-	-
[8.00 - 8.49)	-	-
[8.50 - 8.99)	-	-
[9.00 - 9.49)	-	-
[9.50 - 9.99)	1	-
[10.00 - 10.49)	2	-
[10.50 - 10.99)	-	-
[11.00 - 11.49)	1	-
[11.50 - 11.99)	-	-
[12.00 - 12.99)	3	-
[13.00 - 13.99)	2	-
[14.00 - 14.99)	-	-
[15.00 - 15.99)	-	-
[16.00 - 16.99)	2	-
[17.00 - 17.99)	-	-
[18.00 - 18.99)	-	-
[19.00 - 19.99)	-	-
[20.00 - 20.99)	-	-
[21.00 - 21.99)	-	-
[22.00 - 22.99)	-	1
[23.00 - 23.99)	-	-
[24.00 - 24.99)	-	-
[25.00 - 25.99)	-	-
[26.00 - 26.99)	-	-
[27.00 - 27.99)	-	-
[28.00 - 28.99)	-	-
[29.00 - 29.99)	-	-
[30.00 - 30.99)	-	-
[31.00 - 31.99)	-	-
[32.00 - 32.99)	-	-
[33.00 - 33.99)	-	-
[34.00 - 34.99)	-	-
[35.00 - 35.99)	-	-
=> 36.00	-	-
Total measured	11	1
Min. Length (inch)	9.61	22.76
Max. Length (inch)	16.26	22.76
Mean Length (inch)	12.51	22.76
Number Measured	11	1
No Lengths For	0	0

Historic Catch Summary for EF
Standard electrofishing.

Sampling Date	Run-Time (hours)	On-Time (hours)	Species	Fish Caught	Fish Caught per Hour Run-time	Fish Caught per Hour On-time	Mean Length (in)
5/19/2005	0.70	0.68	Walleye	1	1.43	1.48	22.76
			Largemouth Bass	11	15.71	16.29	12.51

Seining Catch Summary for SE
Standard shoreline seining

Number of seine hauls: 3
First haul on: 08/30/2005
Last haul on: 08/30/2005
Sampling method: Standard sampling
Target species: Young of Year (All Species)

Seining Catch

Species	Total Number YOY	Number Age >1	Number Measured	Mean Length (in)	Length Range (in) Minimum	Maximum
Banded Killifish	0	7	0			
Brook Silverside	0	138	0			
Black Crappie	11	0	11	3.03	2.64	3.43
Bluegill	323	41	49	2.19	1.18	5.63
Bluntnose Minnow	0	18	0			
Blacknose Shiner	0	5	0			
Green Sunfish	0	6	1	2.68		
Hybrid Sunfish	0	7	1	6.18		
Largemouth Bass	9	1	10	3.08	1.81	4.21
Northern Pike	1	0	1	8.15		
Pumpkinseed Sunfish	0	3	3	3.23	2.99	3.43
Yellow Perch	1	15	16	3.97	2.76	4.80

Mean, minimum, and maximum lengths for all fish, all ages

Length Frequency Distribution for SE
Standard shoreline seining

for Field Work on 8/30/2005

Length Category	BLC	BLG	GSF	HSF	LMB	NOP	PMK	YEP
< 3.00	5	349	6	-	4	-	1	1
[3.00 - 3.49)	6	1	-	-	1	-	2	-
[3.50 - 3.99)	-	2	-	-	4	-	-	8
[4.00 - 4.49)	-	5	-	-	1	-	-	6
[4.50 - 4.99)	-	1	-	-	-	-	-	1
[5.00 - 5.49)	-	1	-	-	-	-	-	-
[5.50 - 5.99)	-	5	-	-	-	-	-	-
[6.00 - 6.49)	-	-	-	1	-	-	-	-
[6.50 - 6.99)	-	-	-	-	-	-	-	-
[7.00 - 7.49)	-	-	-	-	-	-	-	-
[7.50 - 7.99)	-	-	-	-	-	-	-	-
[8.00 - 8.49)	-	-	-	-	-	1	-	-
[8.50 - 8.99)	-	-	-	-	-	-	-	-
[9.00 - 9.49)	-	-	-	-	-	-	-	-
[9.50 - 9.99)	-	-	-	-	-	-	-	-
[10.00 - 10.49)	-	-	-	-	-	-	-	-
[10.50 - 10.99)	-	-	-	-	-	-	-	-
[11.00 - 11.49)	-	-	-	-	-	-	-	-
[11.50 - 11.99)	-	-	-	-	-	-	-	-
[12.00 - 12.99)	-	-	-	-	-	-	-	-
[13.00 - 13.99)	-	-	-	-	-	-	-	-
[14.00 - 14.99)	-	-	-	-	-	-	-	-
[15.00 - 15.99)	-	-	-	-	-	-	-	-
[16.00 - 16.99)	-	-	-	-	-	-	-	-
[17.00 - 17.99)	-	-	-	-	-	-	-	-
[18.00 - 18.99)	-	-	-	-	-	-	-	-
[19.00 - 19.99)	-	-	-	-	-	-	-	-
[20.00 - 20.99)	-	-	-	-	-	-	-	-
[21.00 - 21.99)	-	-	-	-	-	-	-	-
[22.00 - 22.99)	-	-	-	-	-	-	-	-
[23.00 - 23.99)	-	-	-	-	-	-	-	-
[24.00 - 24.99)	-	-	-	-	-	-	-	-
[25.00 - 25.99)	-	-	-	-	-	-	-	-
[26.00 - 26.99)	-	-	-	-	-	-	-	-
[27.00 - 27.99)	-	-	-	-	-	-	-	-
[28.00 - 28.99)	-	-	-	-	-	-	-	-
[29.00 - 29.99)	-	-	-	-	-	-	-	-
[30.00 - 30.99)	-	-	-	-	-	-	-	-
[31.00 - 31.99)	-	-	-	-	-	-	-	-
[32.00 - 32.99)	-	-	-	-	-	-	-	-
[33.00 - 33.99)	-	-	-	-	-	-	-	-
[34.00 - 34.99)	-	-	-	-	-	-	-	-
[35.00 - 35.99)	-	-	-	-	-	-	-	-
=> 36.00	-	-	-	-	-	-	-	-
Total by station	11	364	6	1	10	1	3	16
Min. Length (inch)	2.64	1.18	2.68	6.18	1.81	8.15	2.99	2.76
Max. Length (inch)	3.43	5.63	2.68	6.18	4.21	8.15	3.43	4.80
Mean Length (inch)	3.03	2.19	2.68	6.18	3.08	8.15	3.23	3.97
Number Measured	11	49	1	1	10	1	3	16
No Lengths For	0	0	0	6	0	0	0	0

Historic Catch Summary for SE
Standard shoreline seining

Sampling Date	Number of Hauls	Species	Fish Caught	Number per Haul	Lbs. per Haul	Mean Length (in)
8/30/2005	3	YOY Yellow Perch	1	0.33	0.00	2.76
	3	Yellow Perch	15	5.00	0.14	4.05
	3	Pumpkinseed Sunfish	3	1.00	0.02	3.23
	3	YOY Northern Pike	1	0.33	0.04	8.15
	3	YOY Largemouth Bass	9	3.00	0.04	2.95
	3	Largemouth Bass	1	0.33	0.01	4.21
	3	Hybrid Sunfish	7	2.33	0.46	6.18
	3	Green Sunfish	6	2.00	0.03	2.68
	3	Blacknose Shiner	5	1.67	N/A	N/A
	3	Bluntnose Minnow	18	6.00	N/A	N/A
	3	YOY Bluegill	323	107.67	0.81	1.56
	3	Bluegill	41	13.67	0.31	4.13
	3	YOY Black Crappie	11	3.67	0.05	3.03
	3	Brook Silverside	138	46.00	N/A	N/A
	3	Banded Killifish	7	2.33	N/A	N/A
8/29/1997	3	YOY Yellow Perch	15	5.00	N/A	2.82
	3	Yellow Perch	64	21.33	N/A	N/A
	3	Pumpkinseed Sunfish	2	0.67	N/A	N/A
	3	YOY Largemouth Bass	4	1.33	N/A	2.31
	3	Largemouth Bass	1	0.33	N/A	4.13
	3	Johnny Darter	1	0.33	N/A	N/A
	3	Hybrid Sunfish	11	3.67	N/A	2.59
	3	Green Sunfish	12	4.00	N/A	2.88
	3	Bluntnose Minnow	53	17.67	N/A	N/A
	3	YOY Bluegill	52	17.33	N/A	1.51
	3	Bluegill	18	6.00	N/A	N/A
	3	Banded Killifish	10	3.33	N/A	N/A

Age Class Frequency Distribution

Age Class Frequency Distribution for Survey Dated 7/11/2005

Species and Gear	Number of Fish Aged*	Number of Fish Keyed*	Number of Fish Unaged*	Number of Fish in Year Class and Age Group 05 0	04 1	03 2	02 3	01 4	00 5	99 6	98 7	97 8	96 9	95 10	94 11	93 12	92 13	91 14	<91 >14
Black Crappie																			
TN	20	6	0	0	0	0	1	9	13	3	0	0	0	0	0	0	0	0	0
Bluegill																			
GN	24	60	2	0	1	0	15	16	23	25	2	2	0	0	0	0	0	0	0
TN	38	87	0	0	0	11	16	14	16	48	6	14	0	0	0	0	0	0	0
Totals:	62	147	2	0	1	11	31	29	40	73	8	16	0	0	0	0	0	0	0
Largemouth Bass																			
EF	11	0	0	0	0	0	3	1	3	2	2	0	0	0	0	0	0	0	0
TN	5	1	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0
Totals:	16	1	0	0	0	0	3	2	4	6	2	0	0	0	0	0	0	0	0
Northern Pike																			
GN	48	21	17	0	0	1	7	19	29	13	0	0	0	0	0	0	0	0	0
TN	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Totals:	49	21	18	0	0	1	7	20	29	13	0	0	0	0	0	0	0	0	0
Walleye																			
GN	7	0	0	0	0	0	0	1	3	1	1	0	1	0	0	0	0	0	0
TN	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
Totals:	9	0	0	0	0	0	0	1	3	1	2	0	2	0	0	0	0	0	0
Yellow Perch																			
TN	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Number of Fish Aged = fish that were aged from bony parts
Number of Fish Keyed = fish assigned an age with an age-length key or by expansion of mesh or station age distributions.
Number of Fish Unaged = fish that were not aged and were not assigned an age.

Key to sampling gears included in this report:

Gear	Description
TN	Standard 3/4-in mesh, double frame trap net sets.
GN	Standard gill net sets.
EF	Standard electrofishing.

Minnesota Department of Natural Resources
Section of Fisheries

Length at Capture Report

Northern Pike, from summer trap nets and gill nets

Males

Year Class	Age	N	Length at capture (mm) Average	Minimum	Maximum
2005	0				
2004	1				
2003	2	1	370	370	370
2002	3	2	428	383	473
2001	4	7	505	464	523
2000	5	8	524	445	564
1999	6	1	573	573	573

Females

Year Class	Age	N	Length at capture (mm) Average	Minimum	Maximum
2005	0				
2004	1				
2003	2				
2002	3	4	489	458	516
2001	4	4	519	453	567
2000	5	12	559	485	640
1999	6	9	697	532	790

Minnesota Department of Natural Resources
Section of Fisheries

Length at Capture Report (continued)

Black crappie, from summer trap nets and gill nets

Year Class	Age	N	Length at capture (mm) Average	Minimum	Maximum
2005	0				
2004	1				
2003	2	1	198	198	198
2002	3	6	228	218	252
2001	4	10	238	226	250
2000	5	3	259	254	265

Bluegill, from summer trap nets and gill nets

Year Class	Age	N	Length at capture (mm) Average	Minimum	Maximum
2005	0				
2004	1				
2003	2	11	97	82	117
2002	3	13	131	110	148
2001	4	8	152	130	174
2000	5	8	167	156	180
1999	6	15	190	167	210
1998	7	2	208	198	218
1997	8	5	206	194	230

Walleye, from summer gill nets and trap nets

Year Class	Age	N	Length at capture (mm) Average	Minimum	Maximum
2001	4	1	406	406	406
2000	5	3	439	420	463
1999	6	1	488	488	488
1998	7	2	507	505	509
1997	9	2	673	635	711

Minnesota Department of Natural Resources
Section of Fisheries

Length at Capture Report (continued)

Largemouth bass, from spring electrofishing

Year Class	Age	N	Length at capture (mm) Average	Minimum	Maximum
2005	0				
2004	1				
2003	2				
2002	3	3	255	244	266
2001	4	1	282	282	282
2000	5	3	315	307	327
1999	6	2	340	338	342
1998	7	2	412	410	413

Discussion

Lake Augusta is a 177 acre lake located along the Clearwater River in Wright County. Lake Augusta has no public access but it can be accessed from Clearwater Lake. In 2005, all of the lakes along the Clearwater River were surveyed. These include: Louisa/Marie, Caroline, Augusta, Clearwater, and Grass lakes.

Largemouth Bass Electrofishing Survey
Night electrofishing on May 19, 2005 produced a catch rate of 16.3 largemouth per hour. The mean length of largemouth was 12.5 inches. Some problems were encountered with the electrofishing gear so the sampling effort was incomplete. Connecting lake, Clearwater, produced a catch of 48.9 and 98.2 largemouth per hr in the east and west basins, respectively.

Gill Net Survey
The northern pike gill net catch rate in 2005 (14.3 fish/net) increased significantly over 1997 (5.3 fish/net) and was twice the third quartile value for class 24 lakes. A total of 85 northern pike were sampled by gill net and ranged in length from 14.6 to 36.0 inches. Mean length and weight of northern pike sampled was 21.8 inches and 2.4 pounds, respectively.

The walleye gill net catch (1.2 fish/net) significantly declined from 1997 (5.5 fish/net). This catch rate is equal to the first quartile value for class 24 lakes. A total of seven walleye were sampled by gill net and ranged in length from 16.0 to 28.0 inches. Mean length and weight for walleye sampled was 19.3 inches and 3.2 pounds. No walleye are stocked in Lake Augusta, but fish may move into the lake from adjoining Clearwater Lake.

Trap Net Survey
Bluegill (13.9 fish/net) was the dominant species sampled with trap nets. The catch rate was between the first and second quartile of expected values for class 24 lakes, but higher than that observed during the 1997 survey (9.3 fish/net). One hundred twenty-five bluegills were sampled during the trap net survey and ranged in length from 3.2 inches to 8.3 inches with a mean length of 6.5 inches.

The black crappie catch rate (2.9 fish/net) was similar to that observed in 1997 (3.2 fish/net) and was between the first and second quartiles of expected values. A total of 26 black crappies were sampled during the trap net survey and ranged in length from 7.8 to 10.4 inches with a mean length of 9.2 inches.

Status of the Fishery

Lake Augusta is a 177 acre lake located along the Clearwater River in Wright County. Lake Augusta may be accessed from Clearwater Lake. In 2005, all of the lakes along the Clearwater River were surveyed including Louisa/Marie, Caroline, Augusta, Clearwater, and Grass lakes.

Largemouth Bass
Night electrofishing on May 19, 2005 produced a catch of 16.3 largemouth per hour. The mean length of largemouth was 12.5 inches. Some problems were encountered with the electrofishing gear so the sampling effort was incomplete. Connecting lake, Clearwater, produced a catch of 48.9 and 98.2 largemouth per hr in the east and west basins, respectively. Anglers can expect good fishing for largemouth.

Northern Pike
The northern pike gill net catch rate in 2005 (14.3 fish/net) was significantly higher than that observed in 1997 (5.3 fish/net). Northern pike ranged in length from 14.6 to 36.0 inches. Mean length and weight of northern pike sampled was 21.8 inches and 2.4 pounds. Anglers have reported good fishing for smaller sized northern pike.

Walleye
The walleye gill net catch rate in 2005 (1.2 fish/net) declined from that observed in 1997 (5.5 fish/net). However, the mean length and weight for walleye sampled was above average at 19.3 inches and 3.2 pounds. No walleye are stocked in Lake Augusta, but fish may move into the lake from adjoining Clearwater Lake. With recent stocking success at Clearwater Lake it is expected that walleye will become more abundant at Augusta Lake also.

Bluegill
The bluegill catch rate (13.9 fish/net) was similar to that observed during the 1997survey (9.3 fish/net). Bluegill sampled ranged in length from 3.2 inches to 8.3 inches with a mean length of 6.5 inches. Sunfish are the most commonly caught fish in Augusta and Clearwater Lakes.

Black Crappie
The catch rate of black crappie (2.9 fish/net) was similar to that observed in 1997 (3.2 fish/net) and is within the range of expected values for similar lakes. Black crappies ranged in length from 7.8 to 10.4 inches with a mean length of 9.2 inches.

Other fish species sampled during the survey included: black, brown and yellow bullheads, bowfin, common carp, green and pumpkinseed sunfish, tullibee, and white sucker.

Paul Pudrach 3/21/06

Area Fisheries Supervisor Date

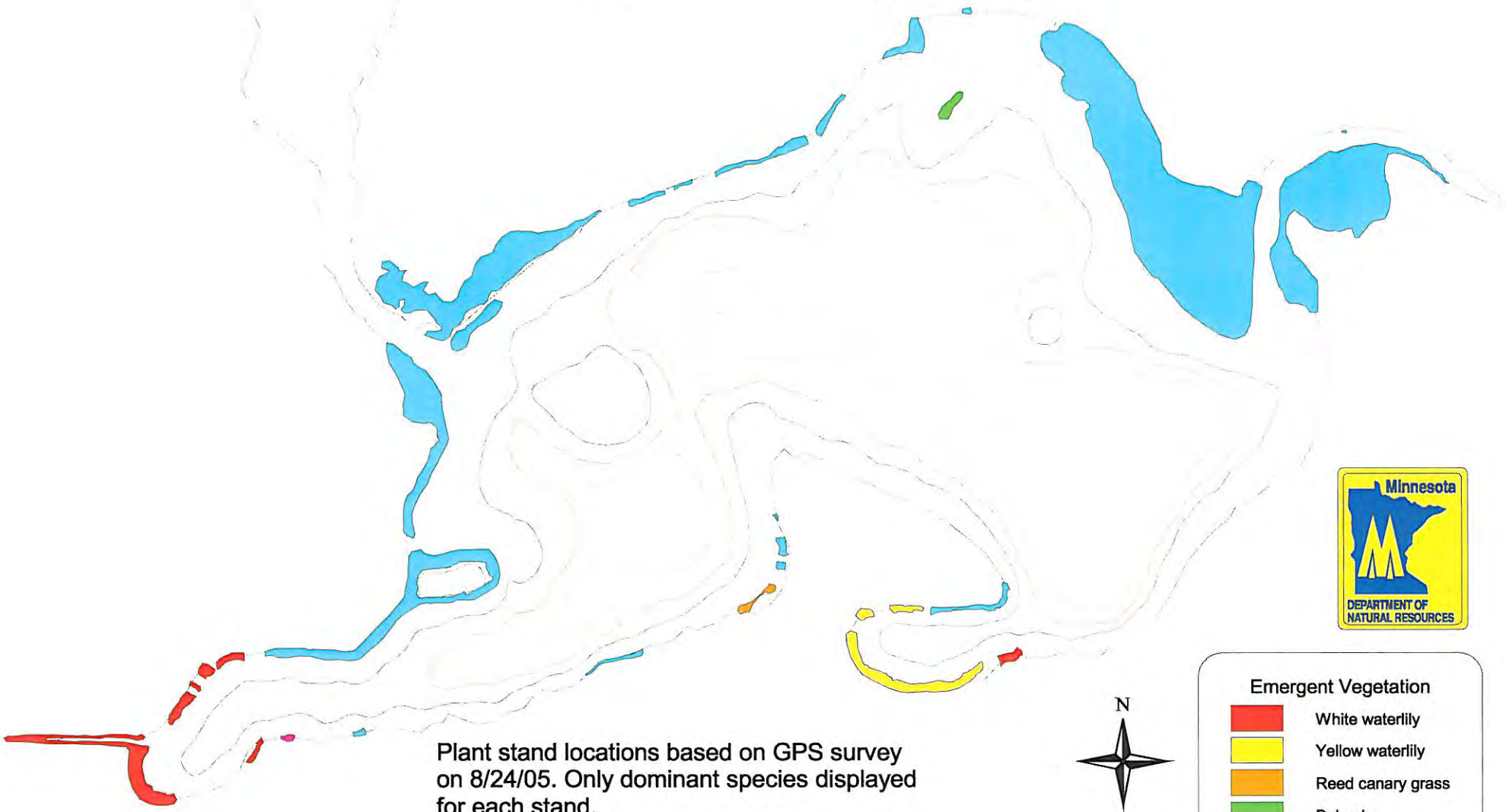
Regional Fisheries Manager Date

Report Subsections for Which No Data Were Found

Subsection Title
Fish Spawning Conditions
Erosion and Pollution
Stocking History (not stocked, 1991-2005)

Appendix C-4
Augusta Lake (86-284) 2005 Lake Survey Emergent & Floatingleaf Vegetation

Augusta Lake (86-284)
2005 Lake Survey
Emergent & Floatingleaf Vegetation



Minnesota
DEPARTMENT OF NATURAL RESOURCES

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Emergent Vegetation
- White waterlily
- Yellow waterlily
- Reed canary grass
- Bulrush
- Giant burreed
- Cattail

Plant stand locations based on GPS survey on 8/24/05. Only dominant species displayed for each stand.

Total emergent vegetation: 21.15 acres, 11.9% of surface area.
Total floatingleaf vegetation: 2.05 acres, 1.2% of surface area.

1000 0 1000 2000 3000 Feet

Appendix C-5
Lake Management Plan

NA-01570-01

LAKE MANAGEMENT PLAN

DEPARTMENT OF
MINNESOTA
NATURAL RESOURCES

Region	Area	D.O.W. Number	County	D.O.W Lake Name	Acreage
III	Montrose	86-284	Wright	Augusta	178

Long Range Goal:

Provide a northern pike and walleye population at 4-6/gill net with the average size greater than two pounds.

Operational Plan:

1. Conduct a resurvey 2015 to include an assessment of the largemouth bass by electrofishing or tournament monitoring.

2. Issue permits for commercial utilization of undesirable fish species if there is a demand.

Mid Range Objective:

Evaluate changes in the fish community and fish population structure as they are affected by projects of the Clearwater River Watershed District.

Potential Plan:

Recreational use survey 500.

TOTAL $500.

Primary Species Management	Secondary Species Management	FOR CENTRAL OFFICE USE ONLY	
Northern pike, Largemouth bass	Panfish, Walleye		
Area Supervisors Signature	Date __ __ / __ __ / __ __	Entry date	Year Resurvey
Regional Supervisors Signature	Date __ __ / __ __ / __ __	Stock species - Size - Number per Acre Pr./Sec	

NARRATIVE:
(Historical perspectives - various surveys; past management; social considerations; present limiting factors; survey needs; land acquisition; habitat development and protection; commercial fishery; stocking plans; other management tools; and evaluation plans)

Schedule	Year Beginning
Population Manipulation 9 YES 9 NO	Year __ __
Development 9 YES 9 NO	Year __ __
Creel or Use Survey 9 YES 9 NO	Year __ __
Other	

Surveys Population assessments 1991 and 1979. Resurveys 2005, 1997, 1985 and initial lake survey 1958. Natural reproduction check 1980. Annual fish house counts 1976-93, and every third year thereafter.

Past Management Stocking records show that during the period from 1909 to 1942, lake trout, walleye, bass, sunfish and crappies were stocked at various times. In 1954 largemouth bass and sunfish were stocked. There is currently no active management occurring on the lake other than lake surveys. Note: Clearwater Lake has been stocked with walleye and these fish can readily migrate upstream to Augusta.

Social Considerations A property owners association is active. The Clearwater River Watershed District has been working since about 1975 to restore the quality of the Clearwater River Chain of Lakes. A great deal of progress has been made to reduce both point and non-point sources of pollution. Extensive water quality monitoring has been undertaken to evaluate the project progress. Some of the projects implemented have been wetland treatment systems, hypolimnetic aeration systems, erosion control; and a no till drill has been provided to farmers.

Lake Augusta is highly developed (classed recreational development). In 2005 there were 92 homes, 6 trailers, 1 RV campground and 1 resort with cabins on the lake. During the years 1993-2004 for which data is available an average of 12 fish houses were counted on the lake during the first week of January.

Present Limiting Factors - Excessive nutrient loading has been a problem since the 1960's. Even after point pollution sources have been cleaned up, 4,000 pounds of phosphorous still enter Clearwater Lake during years of average precipitation and run-off. Moderate to heavy blue-green algae blooms occur during summer months. The only access to Lake Augusta is through the channel from Clearwater Lake. Water quality data means (2004) and associated Carlson Trophic Status Index Values for Lake Augusta are: Total phosphorous, 43 ppb (58); Chlorophyll a, 29 ppb (63); and Secchi disk, 4.9' (52) (2004 Water Quality Monitoring Report prepared for Clearwater River Watershed District, Wenck Associates).

Historical net catches of some important species (lake class 24:

Species	1958	1979	1985	1991	1997	2005	1st - 3rd quartiles
Northern pike	1.7	2.0	8.0	4.7	5.3	14.3	1.5 - 7.3
Carp	0.0	1.3	0.8	1.0	0.7	0.2	0.4 - 2.0
Black bullhead	0.6	10.0	3.7	3.8	0.3	0.0	0.7 - 25.7
Bluegill	22.0	5.0	80.2	134.3	9.3	13.9	7.5 - 62.5
Black crappie	7.6	6.3	27.8	18.2	3.2	2.9	1.8 - 21.2
Yellow perch	17.3	3.0	0.2	12.3	21.2	0.2	2.0 - 27.9
Walleye	2.0	2.0	3.7	3.5	5.5	1.2	1.2 - 6.3

In 2005 catches of bluegill, black crappie and walleye fell within the range of expected values for lake class 24. Catches of carp, black bullhead and yellow perch were below the first quartile value; and the catch of northern pike was above the 3rd quartile value.

Night electrofishing on May 19, 2005 produced a catch of 16.3 largemouth per hour. The mena length of largemouth was 12.5 inches. Some problems were encountered with the electrofishing gear so the sampling effort was incomplete. Connecting lake, Clearwater, produced a catch of 48.9 and 98.2 largemouth per hr in the east and west basins, respectively.

Survey Needs - It is proposed to assess the fish populations in all the lakes of the watershed every 8-10 years. Of special interest was the 1991 tullibee catch of 12.2/gill net. Catches in 1997 and 2005 were much lower, 0.7 and 0.3/gill net, respectively.

A recreational use and creel survey should be conducted when funding allows to determine the amount and character of recreational use.

Habitat Development and Protection - The Clearwater River Watershed District installed a hypolimnetic aeration system on Lake Augusta to aid in the restoration of water quality. However, there were some design flaws in the system and it never did operate as it was supposed to. By the mid-1990's the aeration system was non-functional (removed in 1997).

Eurasian water milfoil became established in Augusta Lake sometime after 1991. At the present time it does not limit the recreational use of the surface waters.

A total of four permits for 35 permittees were issued in 2004 for aquatic plant management.

A survey of curled pondweed was made on June 3, 2005. During peak abundance it was found that curly leaf was growing at or near the surface on 19.5 acres, 11.7% of the lakes' surface.

Mark Campa, Watershed Manager, reported that in 2000 he and other volunteers from the lake association raised beetles for control of purple loosestrife. The release has been effective and we noted dying plants on several lakes of the Clearwater River.

Land Acquisition - The 1991 plan suggested that a public access be acquired for Lake Augusta. This could still be considered if a willing seller comes forward. The public access to Clearwater Lake is under-sized for that lake alone, only 32 parking spaces for approximately 3,200 acres!

Commercial Fishery - There is no record of carp or bullhead removal for Lake Augusta.

Watershed considerations: Work with local units of government to reduce non-point pollution sources. The Stearns and Wright County Soil and Water Conservation District can suggest best management practices for area agriculturalists. The Clearwater River Watershed District has implemented many projects to reduce pollution.

The immediate watershed of the lake has been mapped and land use practices identified from aerial photos. The land uses (%) are: 28, forest; 40, agricultural crops; 7, livestock/pasture; 4, marsh; 16, residential; and 5, other. These statistics were derived from land use information collected for minor watershed number 10 by the Wright County Planning and Zoning Department.

Stocking Plans No stocking is necessary to meet the current long range goal for northern pike. Stocking of walleye could be considered for Lake Augusta but it is thought that the fish would re-orient themselves to Clearwater Lake or wherever their preference. Also, netting from 1985-1997 showed that walleye catches were very near the goal for the lake.

Evaluation Conduct a recreational use survey as funding permits. Fishing pressure is generally thought to be heavy during the open water season.

Engineers • Scientists
Business Professionals